

Host



ICORIS 2026 | HYBRID CONFERENCE

8TH INTERNATIONAL CONFERENCE ON CYBERNETICS AND INTELLIGENT SYSTEMS

~ Convergence of AI, Data, and Systems for Sustainable
Development Goals (SDGs) ~



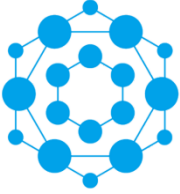
25-26th September 2026



Universitas Teknologi Bandung
Bandung - West Java
Indonesia

Co-Host





ICORIS2026

**The 8th International Conference on
Cybernetics and Intelligent System**

**PROGRAM BOOK
ICORIS 2026**

**The 8th International Conference
on Cybernetics and Intelligent Systems**



**UNIVERSITAS TEKNOLOGI BANDUNG
2026**

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PREFACE



It is with great honor and privilege that we welcome you to The 8th International Conference on Cybernetics and Intelligent Systems (ICORIS 2026), convened on 25th – 26th September 2026 at Universitas Teknologi Bandung, West Java, Indonesia. This year's conference carries the theme "*Convergence of AI, Data, and Systems for Sustainable Development Goals (SDGs)*". This theme addresses the rapid advancements in signal processing, computing systems, and communication networks, while fostering meaningful technological contributions toward achieving global sustainable development goals.

This proceeding compiles high-quality scientific articles that have undergone a rigorous peer-review process by esteemed reviewers and domain experts. We hope these scholarly works serve as a valuable reference and help broaden collaborative academic networks among researchers, practitioners, and academicians across institutions.

We extend our deepest appreciation and gratitude to all authors for trusting ICORIS 2026 with their finest research contributions, the Reviewers and Technical Program Committee members for their dedication to maintaining the high quality of the submitted papers, the executive leadership of Universitas Teknologi Bandung, co-hosting institutions, and sponsors for their generous support, as well as the organizing committee members for their hard work and commitment toward the successful execution of the conference and publication of these proceedings.

May the ideas and research presented in these proceedings contribute significantly to the advancement of science and technology.

Bandung, September 2026.

Prof. Dr. Ir. Evi Triandini, M. Eng
(Organizing Chair)

OPENING SPEECH



Distinguished guests, honorable speakers, co-hosts, sponsors, fellow academics, researchers, practitioners, and participants from around the world,

Good morning.

On behalf of Universitas Teknologi Bandung, it is my great pleasure to welcome all of you to Bandung, West Java, Indonesia. It is truly an honor for us to host The 8th International Conference on Cybernetics and Intelligent Systems – ICORIS 2026.

This year's theme, **“Convergence of AI, Data, and Systems for Sustainable Development Goals (SDGs)”** is highly relevant to the challenges and opportunities of our time. Artificial Intelligence, data, and intelligent systems are advancing rapidly and transforming the way we learn, work, make decisions, and envision the future.

However, for us, the most important question is not only how advanced the technology we can create is, but also who it is created for and what meaningful impact it can bring.

At Universitas Teknologi Bandung, we believe that technology is not an end in itself. Technology is a means to create opportunities, improve quality of life, develop adaptive and future-ready talent, and deliver solutions that create real value for society.

For this reason, collaboration among universities, researchers, industry, government, and the global community has become increasingly important. Hosting ICORIS 2026 reflects UTB's commitment to expanding international collaboration and strengthening our academic contribution in addressing global challenges.

We also believe that universities today must go beyond producing graduates. Universities must prepare future talent—individuals who are competent, resilient, adaptable, and ready to contribute both nationally and globally.

I would like to express my sincere appreciation and gratitude to all co-hosts, sponsors, partners, organizing committees, and everyone who has contributed to making this conference possible.

I hope this conference will not only be a platform for presenting completed research, but also a space to discover new questions, new perspectives, and new opportunities for collaboration.

Let us ensure that our research and innovation do not stop at publication, but continue to grow into solutions that create tangible impact for society, while contributing to the achievement of the Sustainable Development Goals and a more sustainable future.

Once again, on behalf of Universitas Teknologi Bandung, I warmly welcome you all:

Welcome to Universitas Teknologi Bandung.

Welcome to Bandung.

And welcome to ICORIS 2026.

Go Global, Impact The Nation.

Thank you.

Rector of Universitas Teknologi Bandung

Dr. Muchammad Naseer, S.Kom., M.T.

COMMITTEES

STEERING COMMITTEE

- Dr. Ir. Djoko Soetarno, D.E.A (Universitas Bina Nusantara)
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- Prof. Andrew Tanny Liem, PhD (Universitas Klabat), Indonesia
- Dr. Bambang Krismon Triwijoyo(Universitas Bumigora), Indonesia

PROGRAM STRUCTURE

Friday - Saturday, 25-26 September 2026

Venue: Universitas Teknologi Bandung

25 September 2026:

Registration:	
13:00 - 17:00	Participant Registration

26 September 2026:

Conference Opening:	
07:00 - 07:30	Event Preparation
07:30 - 07:45	Participant Registration
08:00 - 09:00	<div>Opening Ceremony<ul style="list-style-type: none">• Singing the National Anthem "Indonesia Raya"• Singing the "Universitas Teknologi Bandung" Mars• Opening Dance• Prayer• Speech by the Head of the Committee• Speech by the Chair of Coris• Speech by the Rector of Universitas Teknologi Bandung (officially opening the event)• Group Photo Session• Closing of the Opening Session</div>
09:00 - 09:15	Coffee Break

Keynote Session:

09:15 - 09:45	Keynote Speaker 1 Prof. Ir. Zainal Arifin Hasibuan, MLS.,Ph.D (Indonesia Computer University)
09:45 -10:15	Keynote Speaker 2 Prof. Dr. Biswajeet Pandey (GL Bajaj Institute of Technology and Management)
10:15 - 10:45	Q&A

Parallel Sessions for Paper Presentation

10:45 - 11:00	Breakout Room Preparation
11:00 - 12:00	Paper Presentations by Authors (Session 1)
12:00 - 12:45	Ishoma (Rest, Pray, and Lunch)
12:45 - 15:00	Paper Presentations by Authors (Session 2)
15:00 - 15:15	Coffee Break
15:15 - 16:45	Paper Presentations by Authors (Session 3)

Conference Closing:

16:45 - 16:50	Event Preparation
16:50 - 17:15	Closing Ceremony

PARAREL PRESENTATION SCHEDULE

DATE Saturday, 26/09/2026	TIME	ONSITE				VIRTUAL																							
		Track1		Track2		Track3		Track4		Track5		Track6		Track7		Track8		Track9		Track10		Track11		Track12					
		Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#	Topics	#				
Session 1	11:00 - 12:00 WIB / UTC+7	CP	1	SE	85	CP	31	CP	183	CN	260	CP	277	CP	424	RC	630	CN	121	SE	18	SE	442	SP	620				
		CP	83	CP	23	CP	37	CP	190	CP	494	CP	284	CP	435	RC	632	CN	249	SE	48	SE	447	SP	631				
		CP	174	SE	39	CP	38	CP	193	CP	506	CP	290	CP	445	RC	663	CN	338	SE	51	SE	449	SP	653				
		SP	149	SE	244	CP	44	CP	194	CP	524	CP	298	CP	453	RC	2	CN	495	SE	80	SE	497	SP	221				
Session 2	12:45 - 15:00 WIB / UTC+7	CP	273	SE	241	SP	187	CP	198	CP	670	CP	306	CP	465	RC	29	CN	608	SE	84	SE	482	SP	243				
		CP	372	SE	626	SP	493	CP	203	CP	635	CP	326	CP	469	RC	282	CN	611	SE	110	SE	483	SP	280				
		CP	505	CP	661	SP	499	CP	204	SE	573	CP	330	CP	484	RC	589	CP	60	SE	113	SE	487	CP	102				
		SP	672	SE	665	CP	101	CP	205	CP	577	CP	333	CP	491	RC	627	CP	47	SE	123	SE	519	CP	115				
		CP	673	SE	98	SP	472	CP	206	CP	596	CP	340	CP	496	RC	628	CP	62	SE	180	SE	544	SP	473				
		SE	622	SE	669	SP	475	CP	207	CP	621	CP	363	CP	500	RC	629	SP	479	SE	259	SE	566	SP	192				
		SE	440	SE	666	CP	129	CP	211	SP	452	CP	365	CP	518	SP	116	SP	490	SE	262	SE	578	SP	196				
		SE	441	CP	667	CP	134	CP	219	CP	179	CP	367	CP	548	SP	119	SP	492	SE	297	SE	580	SP	202				
		SE	594	CP	238	CP	181	CP	607	SP	598	CP	419	SP	461	SP	124	SP	539	SE	11	SP	446	SP	287				
Session 3	15:15 - 16:45 WIB / UTC+7	#N/A		#N/A		CP	160	CP	220	CP	245	CP	383	CP	564	SP	156	SP	547	SE	315	SE	597	SP	291				
		#N/A		#N/A		CP	161	CP	232	CP	676	CP	390	CP	583	SP	565	SP	553	SE	400	SE	640	SP	356				
		#N/A		#N/A		CP	173	CP	246	CP	662	CP	401	CP	585	SP	569	SP	561	SE	412	SE	683	SP	305				
		#N/A		#N/A		CP	176	CP	252	CP	485	CP	409	CP	604	SP	425	SP	563	SE	428	SE	684	SP	591				
		#N/A		#N/A		CP	155	CP	256	CP	660	CP	319	CP	609	#N/A		SP	324	SE	454	SP	467	SP	302				
		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A					

TECHNICAL SESSION SCHEDULE

Day/Date : Saturday, 26th September 2026
Time : 11.00-17:10
Zoom ID : 854 1698 3960
Passcode : ICORIS2026

<https://us06web.zoom.us/j/85416983960?pwd=FpjJQGgkbMUrKLn7WwYl2SJyOcZRe.1>

Track 1: ONSITE Session Chair: Adrian J. Forca James Ryan B. Ga Session co-chair: Dhenia Sanish				
Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CP	1	Indriyani Indriyani, Paula Dewanti, Nurul Hidayat and Evi Triandini	Adaptive AI and Big Data Analytics Platform to Enhance the Competitiveness of Indonesian MSMEs in Digital Services Export
	CP	83	Nurfaizah Nurfaizah, Didit Suhartono, Arifah Budi Hidayah, Wisnu Mu'Amar and Iwan Haryanto	Pseudo-Label Distillation for Indonesian YouTube Sentiment Analysis under Limited Annotation
	CP	174	Budi Juarto and Yulianto Yulianto	Formula One Car Detection Using Comparative Deep Learning Models
	SP	149	Arief Menon, Louis Dominic, Michael Elijah, Rico Halim and Bakti Jabar	A Comparative Evaluation of Naive and Codon Tokenization in Translation Initiation Site Prediction
	CP	273	Muhammad Akmal Fairuz, Muhamad Rifki Ramdani, Raihan Satya Natha Hamzah and Dany Eka Saputra	A Conditional Evaluation of Large Language Models for Enhancing Neural Recommender Systems in Personalized Movie Recommendation Tasks
	CP	372	Budi Juarto, Mulyani Karmagatri, Dani Suandi and Arifpermana Ratum	Benchmarking Convolutional, Transformer, and YOLO

Track 1: ONSITE Session Chair: Adrian J. Forca James Ryan B. Ga Session co-chair: Dhenia Sanish				
12:45 - 15:00 WIB / UTC+7				Architectures for Automated Poultry Fecal Disease Screening
	CP	505	Christian Putra Mahardika, Sultan Naufal Ghatfan El Anwary, Ifan Ahnaf Sakhi Bakri, Reinert Yosua Rumagit and Reina Setiawan	Optimizing Data Acquisition to Achieve Sufficient Confidence in Predicting Football Player Value
	SP	672	Muhammad Zakariyah, Sutarman Sutarman, Indrayanti Indrayanti, Moh. Ali Romli, Umar Zaky and Vivianti Vivianti	Leakage-Free Optimization of Regularized Logistic Regression for Prediabetes Prediction from Hourly Wearable Biomarkers
	CP	673	Cintiya Dewiani Putri, Evi Triandini and Putu Desiana Wulaning	A Hybrid AHP–SAW Framework for KPI-Based Employee Performance Evaluation
	SE	622	Evi Lestari Pratiwi, Ramadhani Noor Pratama, Inayatul Ulya Ahyati, Paula Dewanti and Muhammad Ihza Alhafiz	AI-Driven Hybrid Recommendation for SDG 4-Aligned Final Project Topic Selection in Indonesian D3 Information Systems Education
	SE	440	James Ryan B. Ga, Harya Gusdevi, Loveson C. Gallos, Divon G. Tamdang, Alfred John G. Borreros, Rachel Gallego, Lilian Diana B. Parreño	Uncovering Insights in Guimaras Production for Food Security using Graph Database
	SE	441	Adrian Jaleco Forca, Evi Triandini and Lilian Diana Parreño	Field to Fork: Developing a Mobile Application to Connect Farmers and Consumers for Sustainable Food Systems
	SE	594	Dedi Rosadi, Edi Supriyadi, Hadiano Hadiano, Ahsani Takwim, Regina Sukma and Dewi Mustikasari	EcoGrid-Agent A Digital Twin and Cognitive AI Smart Grid Controller for Microgrid Decarbonization

Track 2: ONSITE Session Chair: Sandy Kosasi Session co-chair : Radit Julian Rukmana Naura				
Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	SE	85	Nila Astiti, Dicky Hida Syahchari, Sulisty Heripracoyo, Agung Gita Subakti, Supina Sapri Djalalm and Murty Magda Pane	The Role of Self-Efficacy, Sustainable Innovation, and Management Commitment on AI Adoption
	CP	23	Biky Chouhan, Mageshkumar Duraisamy, Shailesh Kadam, Sakthivel Periyasamy, Arun Kumar Singh and Mahfooz Alam	Design, Implementation, and Evaluation of a Cloud-Native Real-Time Distributed System Using Kubernetes and AWS
	SE	39	Biky Chouhan, Shalini Sudarsan, Nixalkumar Patel, Anshul Sharma, Dharma Rao Gorja and Nihar Karra	Multi-Agent Coordination with Human Oversight: A Formal Analysis of Responsibility Allocation in AI-Assisted Decision Systems
	SE	244	Bhakti Parashar, Lianna Wijaya, Tiurida Lily Anita, Rianto Nurcahyo, Made Irma Lestari and Novan Zulkarnain	Stimulus-Organism-Response Analysis of Augmented Reality Features in Online Cosmetic Retails: The Role of Informativeness and Personalization
12:45 - 15:00 WIB / UTC+7	SE	241	Tiurida Lily Anita, Maria Pia Adiati, Aditya Pratomo, Vanessa Yovo, Sylvia Samuel and Geline T Bravo	AI Chatbot Service Quality, Guest Trust, and Revisit Intention in Hotel Front Office Operations: The Mediating Role of Guest Satisfaction
	SE	626	Stenly Richard Pungus	An Innovative Approach to Data Modelling: Exploring the Components of a Context-Awareness Framework
	CP	661	Abdurrohman Abdurrohman, Edi Supriyadi, Muhamad Sabar, Gunawan Gunawan, Yasri Yasri and Ari Hadhiwibowo	K-Means Clustering for Skincare Price Segmentation in Digital Marketplaces

Track 2: ONSITE Session Chair: Sandy Kosasi Session co-chair : Radit Julian Rukmana Naura				
	SE	665	Arlinda Rusmartiana, Jack Febrian Rusdi, Muchammad Naseer, Ruth E. Sanchez, Danny Aidil Rismayadi and Mohammad Kchouri	Beyond Screen Time: The CDB-AF Multidimensional Framework for Children's Digital Behavior and Risk Analysis
	SE	98	Sandy Kosasi, Suci Ramadhani Arifin, Muh. Syahlan Natsir, I Dewa Ayu Eka Yuliani, Hasan Hasan and Dewi Putri Selpi	AI Capabilities: The Impact of IT Governance and IT Innovation on Organizational Performance
	SE	669	Aridwan Aridwan, M Dimas Daniswara Putra, Nova Agustina, Danny Aidil Rismayadi and Eka Hidayat	Mobile Application For Video-To-Text Sign Language Translation Based On Deep Learning Using Bidirectional Gru
	SE	666	Ahmad Zaenal Muttaqin, Ajri Muhammad Sidiq, Nova Agustina and Danny Aidil Rismayadi	Development of an E-Commerce Platform and Implementation of the Apriori Algorithm for a Product Recommendation Feature
	CP	667	Multi Nadeak	Risk-Aware Flood Route Recommendation System in Jakarta Using BPBD-Calibrated Labels and Corridor Projection Algorithm
	CP	238	Erfan Hasmin, Nurul Aini, Sitti Aisa, Asmah Akhriana, Sriwahyuningsih Piu and Suryani Suryani	Data-Driven Insights into Death Reporting Timeliness via Advanced Clustering Algorithms

TRACK 3: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Jani Kusanti | Paula Dewanti****Session co-chair: Jasmine | Azlia**

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CP	31	Selvi Lukman, Keisa Putri Alisa, Marcellino Varian Saputra and Shieren Revalina Jesslyn	A Hybrid Fuzzy Logic–Based Intelligent Traffic Signal Control with Optimization Mechanism
	CP	37	Selvi Lukman, Pasya Kemal Halim, Bambang Arayana Saputra and Muhamad Rifki Ramdani	Market Regime Classification and Entry Window Prediction for IDX Blue Chips Using Random Forest and BiLSTM Models
	CP	38	Kevin Halim, Margaretha Haryanto, Chang Minfang, Setiawan Joddy and Irene Anindaputri Iswanto	A Comparative Study of Speech Recognition Models in Smart Home Multitasking: Streaming, Batch, and Hybrid Processing
	CP	44	Erwin Kartinawati, Wiwit Supriyanti and Andrik Purwasito	Public Opinion Analysis on Indonesia's Joining the Peace Council (BoP) Amidst the Escalation of the US-Israel and Iran Conflicts with Fine-Tuning IndoBert
12:45 - 15:00 WIB / UTC+7	SP	187	Najwa Abdulateef and Zakariya Oraibi	Analysis of Skin Lesion Cancer using a Robust Deep Learning Framework
	SP	493	Pamela Barboza, Víctor Castelli, Bruna de Vargas, Belén Pereira and Ricardo Bedin	Benchmarking ResNet Backbones in RT-DETR: Impact of Depth and Regularization under environmental conditions
	SP	499	Pamela Barboza and Ashneet Khandpur	On the Effect of Input Resolution on Backdoor Attacks and Defenses in Traffic Sign Classification
	CP	101	Arizal Firdaus Bagus Pratama, Muhammad Hanif Hidayah Saputra, Muhammad Zidane Ramadhan, Rajnaparamitha Kusumastuti and Dewi Oktafiani	Multi-Branch CNN with Multi-Signal Fusion for AI-Generated Image Detection

TRACK 3: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Jani Kusanti | Paula Dewanti

Session co-chair: Jasmine | Azlia

	SP	472	Yamin Thwe, Dechrit Maneetham and Padma Nyoman Crisnapati	EEG Session Screening for Subject-Specific Motor Imagery Classification Using EMOTIV Insight
	SP	475	Rama Ngurah Putera Pinatih, I Made Agus Wirawan and I Nyoman Saputra Wahyu Wijaya	DESIGN AND IMPLEMENTATION OF A REAL-TIME EMOTION RECOGNITION INTEROPERABILITY SYSTEM BASED ON LAB STREAMING LAYER USING EEG DATASET SIMULATION
	CP	129	I Putu Harrys Putra Mulyawan, M. Azman Maricar, Ni Made Dewi Kansa Putri and Muhamad Rihamzah	The Impact of LUTs and DCTL Integration on Enhancing Visual Literacy and Color Grading Efficiency for Content Creators
	CP	134	Robi Wariyanto Abdullah, Miftakhurrokhmat Miftakhurrokhmat, Adam Pradipta Yogaswara, Ina Sholihah Widiati, Widiyanto Hadi and Febrianta Surya Nugraha	Real-Time Video-Based Sign Language Recognition for Automatic Text Sentence Compositing Using EfficientNet
	CP	181	Taryadi Taryadi, Era Yunianto and Hari Agung Budijanto	The Using Convolutional Neural Networks to Identify Rice Leaf Diseases
15:15 - 16:45 WIB / UTC+7	CP	160	Melvin Wijaya, Kenneth Katojaya, Kevano Christiawan, Bakti Amirul Jabar and Rico Halim	Comparative Analysis of Algorithms for Disease Classification Based on Symptom Text
	CP	161	Timothy Sibarani, Darrell Tandean, Bakti Jabar and Rico Halim	Evaluation of the Effectiveness of the Multi-Debate Agent System on the Small Language Model in Reducing the Level of Hallucinations and Increasing the Accuracy of Reasoning.

TRACK 3: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Jani Kusanti | Paula Dewanti

Session co-chair: Jasmine | Azlia

	CP	173	Budi Juarto and Soni Yora	On-Device Multi-Class Urban Issue Classification for Citizen Reporting in Smart Cities
	CP	176	Dian Novianto, Sujono Sujono, Yohanes Setiawan Japriadi, Lukas Tommy and Indra Samsie	Comparative Analysis Between Ensemble Learning (XGBoost) and Lightweight Transformers (DistilBERT) in Detecting AI-Generated Misinformation
	CP	155	Yoel Uktolseja, Giovan Wongso, Brandon Alexander, Bakti Jabar and Rico Halim	A Comparative Clustering-Based Decision Support Framework for Marketing Strategy Development in Banking
	#N/A		#N/A	#N/A

TRACK 4: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Edy Victor Haryanto****Session co-chair: Reni | Fabel**

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CP	183	Gavin Indra Artajaya, Gregory Adrianus Sugiono, Violitta Yesmaya and Muhammad Rizky Nur Majiid	Hybrid Machine Learning for Detecting Cognitive Interruption and Recovery in Digital Learning Environments
	CP	190	Satriedi Wahyu Binabar, Nathanael Santoso, Nur Fadhillah and Paminto Agung Christianto	Computational Evaluation of Digital Music Application Interaction in Basic Music Theory Learning: An Empirical HCI-Oriented Study
	CP	193	Ichwan Kurniawan, Sutarto Wijono and Radius Tanone	Lightweight Attention-Based YOLOv8n for Cross-Domain Low-Light Object Detection
	CP	194	Eko Budi Susanto, Eko Sedyono and Ferry Fredy Karwur	Benchmarking Similarity Measures for Retrieve-Stage Case-Based Reasoning in Medical Tabular Classification
12:45 - 15:00 WIB / UTC+7	CP	198	Ema Utami, Suwanto Raharjo, Mohammad Diqi and Najwa Rashika Az-Zahra Raharema	Optimization Dynamics of Boosting Ensembles Under Extreme Class Imbalance in Large-Scale Predictive Systems
	CP	203	Sujono Sujono, Dian Novianto, Yohanes Setiawan Japriadi, Lukas Tommy and Melati Suci Mayasari	Comparative Analysis of Naive Bayes and SVM for Indonesian Culinary Review Sentiment Classification
	CP	204	Elly Yanuarti, Rahmat Sulaiman, Ellya Helmud, Anisah Anisah, Delpiah Wahyuningsih and Tri Sugihartono	Machine Learning-Based Prediction of Prospective Student Re-Enrollment Using Naive Bayes and KNN
	CP	205	Anisah Anisah, Ellya Helmud, Delpiah Wahyuningsih, Elly Yanuarti, Melati Suci Mayasari and Harizzki Arie Pradana	A Comparative Machine Learning Approach for the Classification of Regional Potential in Student Admissions Using C4.5

TRACK 4: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Edy Victor Haryanto

Session co-chair: Reni | Fabel

				Decision Tree and Naïve Bayes
	CP	206	Tri Sugihartono, Gusti Syarifudin, Rahmat Sulaiman, Elly Yanuarti, Fitriyani Fitriyani, Benny Wijaya and Eza Budi Perkasa	Comparative Analysis of Random Forest and Gradient Boosting for Forecasting Vegetable Oil Export Volume and Value: A Case Study of Bangka Belitung Province, Indonesia
	CP	207	Rezky Yuranda, Delpiah Wahyuningsih and Devi Irawan	Measuring Persistence Blast Radius in Declarative and Imperative Operating Systems: Comparative Evidence from NixOS and Debian
	CP	211	Widiyono Widiyono, Riski Sulistiyaningsih and Ari Putra Wibowo	The Edge-Based Aggregated DEFLATE Compression for Efficient IoT Sensor Data Transmission to Cloud
	CP	219	Ni Luh Indri Yuni, Dandy Pramana Hostiadi and Roy Rudolf Huizen	An Empirical Study on the Combinatorial Effects of Traditional Preprocessing in Transformer-Recurrent Hybrid Models
	CP	607	Stenly Richard Pungus, Andrew Tanny Liem, Semmy Wellem Taju, Reynoldus Andrias Sahulata, Green Ferry Mandias and George Morris William Tangka Tangka	Development of a Web-Based Contract Management System Integrated with a Document Chatbot
15:15 - 16:45 WIB / UTC+7	CP	220	Andrew Yohanson, Evan Pahan, Samson Ndruru and Ivan Edbert	Multi-Layer Perceptron Approach for Body-to-Clothing Mapping in Fashion E-Commerce
	CP	232	Faris Febrianto and Eka Miranda	Predicting Aircraft Fueling Safety With Data Mining
	CP	246	Aldi Rifaldi Saputra and Eka Miranda	Improving Multi-Class Bird's Eye Chili Ripeness Detection

TRACK 4: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Edy Victor Haryanto****Session co-chair: Reni | Fabel**

				Using YOLOv8s Under Moderate Class Imbalance Conditions
	CP	252	Anastasia Pramono, Alexander Gunawan and Rilo Pradana	Early Detection of Diabetes Mellitus Using Medical Data and Lifestyle Factors via Machine Learning
	CP	256	Mas Ayoe Elhias Nst, Syahril Efendi, Sutarman Sutarman and Poltak Sihombing	Machine Learning-Based Demand Forecasting for Perishable Food Distribution in Dynamic Market Environments
	#N/A		#N/A	#N/A

TRACK 5: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Wilem Musu

Session co-chair: Revalina | Sehani

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CN	260	Budi Triandi, Lili Tanti, Intan Dwi Rahma and Ilham Ramadhan	Random Forest-Based Detection of Phishing E-mails Using Feature-Engineered Machine Learning Attributes
	CP	494	Fandi Presly Simamora and Juliana Damayanti Manurung	A Feature-Level Attention BiLSTM Network with Huber Loss for Microclimate-Adaptive Rice Planting Calendars
	CP	506	Teguh Ikhlas Ramadhan, Missi Hikmatyar, Agus Supriatman, Yusuf Summaryana, Evi Dewi Sri Mulyani and Muhammad Setra Satria Imbara	Zero-Shot Benchmarking of Open-Source Large Language Models for Indonesian Domain-Specific Question Answering: A Case Study on University Information Services
	CP	524	Sunaryo Winardi, Yuni Marlina Saragih, Ng Poi Wong and Carles Juliandy	Assessing SHAP Explanation Reliability Across Tree-Based Ensemble Models for Credit Risk Prediction
12:45 - 15:00 WIB / UTC+7	CP	670	Andi Irmayana, Nurul Aini, Ramlah P, Muhammad Husnul and Zalsabila S	Identification of Determinant Factors and Prediction of High-Value Waste Prices Using Long Short-Term Memory (LSTM)
	CP	635	Edson Yahuda Putra and Ibrena Reghuella Chrisanti	An Integrated Fuzzy-BWM-MARCOS decision Framework for Optimizing Social Media Platform Selection in Higher Education Marketing
	SE	573	Suryani Suryani, Komang Aryasa, Muhammad Fauzan Virgiawan, Ahmad Afdhal, Moch. Farhan Juliansyach Putra Taufiq and Ahyar Muawwal	From Assistance to Reliance: A KNN Baseline for Classifying Students' AI-Use Profiles
	CP	577	Shinta Siti Sundari, Teuku Mufizar, Ruuhwan Ruuhwan, Aso Sudiarjo,	MobileNetV2-Based Lightweight CNN for Classifying Can and

TRACK 5: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Wilem Musu

Session co-chair: Revalina | Sehani

			Rudi Hartono and Tyo Nurhakim	Styrofoam Waste Based on Physical Condition
	CP	596	Juliana Damayanti Manurung and Fandi Presly Simamora	Comparative Analysis of LDA and BERTopic for Topic Modeling of Indonesian Fiscal Policy Discourse on X
	CP	621	Vincent Fernandes, Nikita Putri Alexia, Andry Chowanda and Franz Adeta Junior	Directional Multi-Relational Graph Neural Networks for Fake Account Detection: A Robustness and Interpretability Study
	SP	452	Dinda Salma Septriani, Aji Gautama Putrada and Nur Ghaniaviyanto Ramadhan	Time-Series Split for Efficient SHAP-Based Occupancy Rate Forecasting in Smart Parking
	CP	179	Ramlah Amir Sangga, Wilem Musu, Jufri Jufri and Indra Samsie	HealthSlangNorm: A Domain-Specific Slang Normalization Framework for Indonesian Healthcare Social Media
	SP	598	Muh Teguh Adhi Putra, Santi Santi, Suarga Suarga and Stiffany Lourens Zeannyfer	Indonesian Lip Reading Dataset for Deaf Communication Using Controlled Vocabulary
15:15 - 16:45 WIB / UTC+7	CP	245	Irfhan Mappasomba, Santi Santi, Muh. Syahlan Natsir and Wilem Musu	Hybrid Feature Engineering for Detecting Online Sales Fraud on Facebook: A Random Forest Evaluation
	CP	676	Benedictus Herry Suharto	Fog Deployment of a Compressed Occupancy-Aware Spatio-Temporal Graph Model for Multi-Building Energy Forecasting
	CP	662	Dedi Julyan Sukawanto, Jufri Jufri and Erfan Hasmin	Characterizing Request Patterns of Web Crawlers on a Regional News Website Using Browser Fingerprinting
	CP	485	Ratih Puspasari	Association Rule Mining for Consumer Purchase Pattern Analysis at PT Kids Automotive Indonesia

TRACK 5: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Wilem Musu****Session co-chair: Revalina | Sehani**

	CP	660	Radhinal Mucthar, Jufri Jufri and Erfan Hasmin	Multi-Attribute Performance Evaluation of Family Planning Cadres Using K-Means Clustering
	#N/A		#N/A	#N/A

TRACK 6: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Raden Meina Widiastuti****Session co-chair: Putri | Sifa**

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CP	277	Bayu Yanuargi, Ema Utami, Kusrini Kusrini and Arli Parikesit	Aspect Count-Guided Adaptive Top-K Correction for Multi-Aspect Sentiment Analysis in Hotel Reviews
	CP	284	Ivander Agung Saptono, Nararya Effendy, Prabowo Wahyu Sudarno and Muhammad Rizki Nur Majiid	Integrating Global and Local Explainable Artificial Intelligence for Enhancing Transparency in Financial Fraud
	CP	290	Rachmat Prasajo, Joseandrew Chrisma Winanta, Weninggalih Ciesa Kuadrilion and Fathimah Al-Ma'Shumah	Portfolio Optimization Models: Traditional Markowitz, Dynamic Markowitz, and Reinforcement Learning Approaches on Stock and Cryptocurrency Asset
	CP	298	Catherine Averina Johan, Praya Zahwaa Ananda, Kenneth Christian Yapri and Jeffrey Junior Tedjasulaksana	Optimizing Stroke Prediction Performance using Synthetic Minority Over-sampling Technique and Grid Search Cross Validation
12:45 - 15:00 WIB / UTC+7	CP	306	Melodiel Bokko	Analysis of Hematological Parameter Contributions in Acute Myocardial Infarction Classification using Permutation Feature Importance
	CP	326	Nathan Kurniawan, Nathaniel Abby Thamrin, Vincent Tadeo Margono and Muhammad Fikri Hasani	Using Metaheuristic Algorithm to Optimize Highway Layout Based on Topographical Data
	CP	330	Joseph Adriel Solichin and Andika Elok Amalia	Gaussian Hidden Markov Model for Detecting Liquidity-Driven Regime Shifts in Gold and Equities
	CP	333	Eric Gunawan	Log Summaries on Android Logcat Based on Big or

TRACK 6: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Raden Meina Widiastuti****Session co-chair: Putri | Sifa**

				Streaming Data Using Large Language Model
	CP	340	Ahmad Yusuf, Ida Hastuti, Kemas M. Yunus and Wahid Adi Nugroho	Head-to-Head Comparison of CNN Architectures on Traditional Cake Image Dataset
	CP	363	Kelvin Marcelino, Evaristus Didik Madyatmadja and Mulyono	Comparative Analysis of BiLSTM and XGBoost in Predicting Top-Tier Indonesian Banking Stock Prices
	CP	365	Kasimirus Derryl Odja and Setiawan Joddy	Comparative Study of Sparse and Dense Retrieval Models in Question Answering Systems
	CP	367	David Cahyadi and Anang Prasetyo	Sentiment Classification of Indonesian Google Play Reviews: A Hybrid Evaluation of Random Forest, CNN, and IndoBERT
	CP	419	Louis Oktovianus and Andry Chowanda	Optimizing Stacking Ensemble Models for Heart Disease Prediction Using Hyperparameter Tuning on Imbalanced Clinical Data
15:15 - 16:45 WIB / UTC+7	CP	383	Vincent Yanputra and Ajeng Wulandari	Deep Learning-Based Acanthosis Nigricans Detection: A Comparative Study of YOLOv11s and YOLOv8s
	CP	390	Yan Yang Thanri, Safrizal Safrizal, Lili Tanti, Juli Iriani, Luthfi Zaidi and Budi Prastyo	Ensemble Learning for Air Quality Classification Using Bagging and Boosting Methods with Feature Importance Analysis
	CP	401	Jason Trianto, Rafif Diya, Ahmad Daffa Hidayatullah, Rico Halim and Bakti Jabar	Distant Supervision for Indonesian Food Allergen NER: A Preliminary Evaluation with OCR Integration
	CP	409	Satriadi Putra Santika, Yaya Heryadi, Lili Ayu Wulandhari, Abba	Deep Autoencoder-Based Anomaly Detection with Filter-Based Feature Selection for

TRACK 6: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Raden Meina Widiastuti****Session co-chair: Putri | Sifa**

			Suganda Girsang and Ilvico Sonata	Large-Scale Intrusion Detection Systems
	CP	319	Lili Tanti, Santi Santi, Budi Triandi, Leonyta Trianingrum, Khairun Dini and Romi Antoni	Explainable Stacking Ensemble for Mushroom Toxicity Classification with SHAP Interpretability
	#N/A		#N/A	#N/A

TRACK 7: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Khalif Maulana Syahid****Session co-chair: As'ad | Argie**

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CP	424	Budiman Budiman, Nur Alamsyah, Muhamad Achya Arifudin, Elia Setiana, Arnold Ropen Sinaga and Imannudin Akbar	Comparative Analysis of Original and Denoising Autoencoder-Based Feature Representations for Explainable Breast Cancer Classification Using SVM and Random Forest
	CP	435	Timotius Dylan Lauwren, Reynold Setia Winanto, Valen Frank and Franz Adeta Junior	NETWORK INTRUSION DETECTION ON IMBALANCED DATASET USING OPTIMIZED MACHINE LEARNING
	CP	445	Herlinda Angelica Tanjaya, Kevin Reynald, Ribby Aulia Barlie, Irene Anindaputri Iswanto and Arya Krisna Putra	A Lightweight MobileNetV2 with Dual-Level Feature Fusion for Fruit and Vegetables Freshness Classification
	CP	453	Ammara Ananti, Farah Qothrunnada, Tasya Pricilia Harianja and Mediana Aryuni	Explainable Machine Learning for Child Development Detection Using Imbalanced Data
12:45 - 15:00 WIB / UTC+7	CP	465	Luis Wang Ciputro, Edward Kenjiro Tan, Chrisvian Purnama Rahardjo and Adele B L Mailangkay	Performance and Limitation Analysis of YOLOv11 for Multi-Object Waste Detection
	CP	469	Evi Dewi Sri Mulyani, Shinta Siti Sundari, Teuku Mufizar, Cepi Rahmat Hidayat, Dede Syahrul Anwar and Rosi Maelani	Classification of Biodegradable and Non-Biodegradable Waste using Convolutional Neural Network Method with ResNet152V2 Architecture
	CP	484	Sisilia Aileen, Stella Sugianto, Vincent Atmadjaya, Arya Putra and Irene Iswanto	Knowledge Distillation for Lightweight Food Image Classification on UECFOOD256: Optimizing EfficientNet-B0 Toward Full-Model Performance

TRACK 7: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Khalif Maulana Syahid

Session co-chair: As'ad | Argie

	CP	491	Brian Filbert, Farrel Surbakti, Reina Setiawan and Reinert Rumagit	Measuring and Quantifying Feature Contribution Inequality in Machine Learning Models: A Case Study on Fraud Detection
	CP	496	Roony Soon, Jazlyn Phylcia, Zephania Widjaja and Abram Setyo Prabowo	Comparative Analysis of Hybrid GARCH-LSTM and LSTM-Transformer Models for Stock Price Prediction
	CP	500	Samuel Joseph Wijaya, Jovan Yehezkiel Farand Siallagan, Jerry Grabiell Marco, Satriadi Putra Santika and Hidayaturrahman Hidayaturrahman	An Experimental Evaluation of YOLOv8n for Real-Time Safety Helmet Detection in High- Density Urban Traffic
	CP	518	Florencia Olga, Michelle Angela Pang, Diana Diana and Shania Priccilia	Evaluating Face Verification Accuracy of ArcFace vs FaceNet Under Varying Lighting Conditions
	CP	548	Muhammad Ribhi Ramadan, Raivan Farraz Anrivy, Jeffrey Junior Tedjasulaksana and Stefanus Benhard	Predicting Food Security Index Using Food Price and Socioeconomic Indicators in Indonesia with Machine Learning Approach
	SP	461	Anas Wicaksono and Gede Putra Kusuma	Selective Model Retraining: Balancing Predictive Robustness and Operational Efficiency under Concept Drift
15:15 - 16:45 WIB / UTC+7	CP	564	Jeanette Hauw Chandra, Katarina Hilary Chandra and Abram Setyo Prabowo	Development of an Artificial Intelligence-Based Automated Short Answer Assessment System Using Sentence-BERT to Improve the Efficiency of Academic Evaluation
	CP	583	Matthew Sutiono, Winko Winko, Juan Sebastian, Irene Anindaputri Iswanto and Arya Krisna Putra	Robustness Evaluation of Individual and Random Choice Ensemble Data Augmentation Strategies on CIFAR-10/CIFAR-10-C

TRACK 7: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Khalif Maulana Syahid****Session co-chair: As'ad | Argie**

	CP	585	Jericho Teneddy, Darrell Santoso, Stefanus Benhard and Derwin Suhartono	Validation Strategy Sensitivity Analysis of Machine Learning Models for Imbalanced Credit Card Fraud Detection
	CP	604	Frederica Sharon Sastradi and Adhe Lingga Dewi	Eye Fatigue Detection Using Convolutional Neural Networks Based on PERCLOS and Blink Rate Analysis
	CP	609	Salman Halim Razak, Kettin Kettin, Bambang Aranaya Saputra, Gilbert Owen, Muhammad Fikri Hasani and Andien Dwi Novika	Impact of Text Preprocessing Techniques on Sentiment Analysis Model Performance for Low-Resource Sundanese Language
	#N/A		#N/A	#N/A

TRACK 8: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Agus Heryanto****Session co-chair: Khalil | Alkhansa**

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	RC	630	Honghui Shi, Padma Nyoman Crisnapati and Dechrit Maneetham	Simulation-Based Safety Analysis of an IoT-Enabled Hydrogen Generator
	RC	632	Dingli Wan, Padma Nyoman Crisnapati and Dechrit Maneetham	Google Colab-Based Interactive Joint-Space Modeling of a 6-DOF Robotic Hand
	RC	663	Jack Febrian Rusdi, Muhammad Shahmi Hafizin Nor Hisham, Vicente Aquino Pitogo, Zurina Sa'Aya, Rina Indrayani and Ari Hadhiwibowo	Multi-Sensor Based Vehicle Temperature Anomaly Detection Using IoT and Cloud Architecture
	RC	2	Ivan Alexander, Marcel Saputra, Natario Thomas and Sherrane Kuo	Design and Evaluation of an ESP32-Based Automated Hanging Weighing System for Poultry
12:45 - 15:00 WIB / UTC+7	RC	29	Nathaniel Melvin Setiawan, Efendi Efendi and Ivan Alexander	Design and Implementation of a Smart Aquarium Monitoring and Automatic Feeding System Using ESP32
	RC	282	Marcellino Adhiwono, Heikal Ghazni Ibrahim, Hans Hendyanto and Bobby Siswanto	Ball-Plate Balancing Robot With PID and FeedForward Algorithm
	RC	589	Yericho Lim, Yudhistira Ari Nugroho, Adhe Lingga Dewi and Muhammad Rizki Nur Majiid	Time – Series Anomaly Detection in ESP32 Based Environmental Sensor Data Using LSTM Autoencoder
	RC	627	Hongyu Huang, Padma Nyoman Crisnapati and Dechrit Maneetham	Dynamic Modeling of Servo-Assisted Gyroscopic Roll Stabilization Under Wave-Like Disturbances
	RC	628	Feiteng Wei, Padma Nyoman Crisnapati and Dechrit Maneetham	Angle Tracking and Safety Evaluation of a PID-Controlled CPM Knee Rehabilitation Device

TRACK 8: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Agus Heryanto****Session co-chair: Khalil | Alkhansa**

	RC	629	Jingyuan Liu, Padma Nyoman Crisnapati and Dechrit Maneetham	UWB-EKF Localization and Pick-and-Place Control of a Differential-Drive Mobile Robotic Manipulator
	SP	116	Bagaskoro Saputro and Yohanes Suyanto	Objective Evaluation of Audio Transmission Quality Degradation in Networked Music Performance and WebRTC
	SP	119	Nuk Ghurroh Setyoningrum, Mohammad Diqi and Mae B. Lodana	RTTE: Resonance-Time Texture Encoding for Enhanced Human Screaming Detection
	SP	124	Marcello Evan Wijaya, Filipus Darren Siswanto, Ignasius Holy Prasetya and Muhammad Rizki Nur Majiid	Alzheimer's Disease Stage Classifier from MRI Scans Using DINO-ViT and Grad-Cam++ on the OASIS Dataset
15:15 - 16:45 WIB / UTC+7	SP	156	Jesslyn Trixie Edvilie, Brian Juniarta Darmadi and Elizabeth Gunawan	Cross-Output Saliency Comparison for Multi-Output Image Regression in Nutritional Estimation
	SP	565	Nadya Salsabila, Aaron Nikolas Tondosaputro, Justin Lysander Setiawan, Irene Anindaputri Iswanto and Arya Krisna Putra	Enhanced Skin Lesion Classification for Melanoma Detection Using EfficientNet-B3 and Convolutional Block Attention Module (CBAM) with Explainable AI
	SP	569	Talethia Hayfa Syukur, Nicholas Widagdo, Orsino Jerrell Bruinier and Kartika Purwandari	Multi-Class Emotion Classification in Short Indonesian-Language Movie Reviews
	SP	425	Nikolaus Christian	Design of a Wideband RF Power Combiner for Passive Radar Space Debris Detection
	#N/A		#N/A	#N/A

TRACK 9: VIRTUAL (ZOOM BREAKOUT ROOM)
Session Chair: Dewi Shintya Pratiwi
Session co-chair: Anisa Febrianti | Moch Sultan Fathur

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	CN	121	Mochammad Riyan Firmansyah, Steven Geovino, Agiel Nugroho and Riyan Leandros	Vulnerability Risk Assessment for Sensitive Applications Based on the OWASP Web Security Testing Guide
	CN	249	Jahns Lewi Gerrard Naibaho, Andreas Tri Dewa Putra, Alf Yusrotis Zakiyyah and Ayu Maulina	Hybrid Deep Autoencoder and Temporal Convolutional Network (TCN) for Anomaly Detection in Encrypted Traffic
	CN	338	Vincentius Jonathan Liem and Adhe Lingga Dewi	Design and Implementation of IoT-Based Antenna Control System for Stabilizing Point-to-Point Radio Link in Maritime Environment
	CN	495	Mario Benedict, Michael Kevin Pratama, Franz Adeta Junior and Andry Chowanda	SecBERT-Enhanced Multi-Label Vulnerability Detection for FHEVM Smart Contracts
12:45 - 15:00 WIB / UTC+7	CN	608	Filbert Alfredo Saputro, Jip Tyrone Ativiirya Janaprasetya, Mary Anggita Priscilla and Ventje Jeremias Lewi Engel	Evaluating Open-Source Large Language Models for Emerging Threat Intelligence in Dark Web Forums
	CN	611	Farrel Hakim Amran Rosadha, Prabowo Wahyu Sudarno and Fredy Purnomo	Robust-Phish: Enhancing Network Security Against URL Phishing via Gated Recurrent Unit (GRU) Architectures
	CP	60	Muhamad Achya Arifudin, Nur Alamsyah and Budiman Budiman	Non-Intrusive Behavioral Biometric Identification Using Typing Dynamics and Ensemble Learning for Continuous Authentication

TRACK 9: VIRTUAL (ZOOM BREAKOUT ROOM) Session Chair: Dewi Shintya Pratiwi Session co-chair: Anisa Febrianti Moch Sultan Fathur				
	CP	47	Alfi Yusrotis Zakiyyah, Yonathan Immanuel Nurhan and Darrius Salim	User Authentication Using Keystroke Dynamics with Deep Learning Models
	CP	62	Rike Aqila Nurfi and Emny Yossy	Empirical Assessment of Robot Framework Test Automation Integrated with Microsoft Teams Webhooks Using Ordinary Least Squares Regression
	SP	479	Jolin Tiomar and Dani Suandi	An Ablation Study of Attention Mechanism and Deep Supervision in Swin UNETR for Brain Tumor Segmentation under Limited Computational Resources
	SP	490	Marvell Winanto, Anggit Adhikary, Louiza Tanaya, Meiliana and Fiqri Ramadhan Tambunan	Efficiency–Performance Trade- off of Lightweight and Transformer-based Models for Disaster Tweet Classification
	SP	492	Jason Francesco Tay, Dedrick Justin, Stefanus Benhard and Jeffrey Junior Tedjasulaksana	Optimizing Cardiovascular Diagnostics: A Performance Evaluation of Ensemble and Standard Classifiers
	SP	539	Jeremy Susilo, Beben Sianipar, Andry Chowanda and Franz Junior	SMOTE Variants Analysis for Imbalanced Stroke Prediction Dataset
15:15 - 16:45 WIB / UTC+7	SP	547	Audi Rahardja, Aldeeza Praditha Efendi, Diana and Shania Pricillia	Evaluating & Analyzing Performance Degradation of Intelligent Systems Models against Degraded Datasets
	SP	553	Farrel Putra Imanuel The, Gilbert Arya Utama, Hans Marvel Lesmana, Irene Anindaputri Iswanto and Arya Krisna Putra	Experimentation on Various Loss Function Configurations Effects on Liver Tumor Segmentation Performance of TransUNet
	SP	561	Johanna Wudianto, Sandy Lim and Irene Anindaputri Iswanto	Architectural Enhancement of BERT-base-uncased Model for

TRACK 9: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Dewi Shintya Pratiwi

Session co-chair: Anisa Febrianti | Moch Sultan Fathur

				Cross-Lingual Sentiment Analysis on Indonesian Reviews
	SP	563	Sabrina Arfanindia Devi, Brian Nicholas Tedjo, Kristian Novan, Arya Krisna Putra and Irene Anindaputri Iswanto	Decoding Neural Representations: CAV-Based Activation Engineering for Explainable Brain Tumor Segmentation across Multiple Architectures
	SP	324	Michael Wijaya, Nikolas Aesculapius, M. Alif Rinaldi, Muhammad Fikri Hasani and Andien Dwi Novika	Hybrid CNN–Vision Transformer for Three-Class ACL Injury Classification in Knee MRI with Attention-Guided Full-Slice Analysis
	#N/A		#N/A	#N/A

TRACK 10: VIRTUAL (ZOOM BREAKOUT ROOM) Session Chair: Titania Sari Session co-chair: Adrian Patma				
Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	SE	18	Cornelius Sarungu, Farhan Fadillah, Aulia Azzahra and Muhammad Rydwan	Prototype Design of Wheelchair Accessibility Information System in Jakarta Tourism Using BERT-Based Sentiment Analysis
	SE	48	Rahmat Sulaiman, David David, Agustina Mardeka Raya, Tri Sugihartono, Eza Budi Perkasa and Fitri Yani	Analysis of Plantation Commodity Dominance and Regional Distribution Inequality in Bangka Belitung Province Using Location Quotient and Gini Index Approaches Based on the 2023 Agricultural Census
	SE	51	Diandra Salma Navara and Puji Prabowo	The Impact of AI Adoption and Digital Capability on Innovation Capability among Business Owners and Office Workers: The Mediating Role of Strategic Decision-Making Quality
	SE	80	Soraya Agustina Situmorang, Allan Desi Alexander and Hiram Reagan Panggabean	The Algorithmic Nudge: Green Signaling and User Engagement on Social Media AI
12:45 - 15:00 WIB / UTC+7	SE	84	Hilyah Magdalena, Ade Septryanti and Yohanes Setiawan Japriadi	Graduation Volume Forecasting Across Program Lifecycles in a Transforming Indonesian Higher Education Institution Using ARIMA and LSTM
	SE	110	Herimanto Herimanto	Digital Solutions for Limited Mobility Areas: A Software Engineering Approach to Multi-Tier Delivery Systems
	SE	113	Jason Sulistyawan, Mahmud Isnani, Kuncahyo Nugroho, Teddy Suparyanto and Bens Pardamean	SmartSawitGrader: On-Device Palm Oil Ripeness Detection

TRACK 10: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Titania Sari

Session co-chair: Adrian | Patma

	SE	123	Baghas Wicaksono, Rini Sari and Marita Salandanan	How Green HRM Enhances Enterprise Resource Management Performance: The Mediating Role of Digital Capability and Sustainable Work Practices
	SE	180	Eko Budi Susanto, Paminto Agung Christianto, Bambang Ismanto, Riski Sulistiyaningsih and Kassymova Gulzhaina Kuralbayevna	A Proxy-Data Proof-of-Concept for AI-Based Risk Assessment and Tamper-Evident Audit Logging in MBG-like Public Food Distribution
	SE	259	Danny Bramantyo, Albert Mahendra Hario Broto, Kevin Anggileo and Aldian Nurcahyo	A Data-Driven Framework for AI-Assisted Batik Design Innovation in Indonesian SMEs
	SE	262	Evan Kimelim, Andrew Arinardi, Alexander Gunawan and Rilo Pradana	Comparative Performance Analysis of Javascript REST APIs with Prisma ORM and MariaDB in a Controlled Environment
	SE	297	Adil Setiawan, Husain T, Yiska Dayanti Zagoto, Ayu Nadia, Haliza Savira and Rizki Alfarizy	IoT Based Automated Poultry Farm Monitoring and Control System
	SE	11	Stefanus Rumangkit, Antonius Satria Hadi, Ilham Sentosa, Rosni Abwahid and Muhamad Zulkiflee Osman	AI Influencer Integration in Marketing Information Systems: Emotional Response as a Purchase Driver
15:15 - 16:45 WIB / UTC+7	SE	315	Laurentius Brandon Vikario, Mikhael Celieano, Antony Wijaya and Reina Setiawan	Price Forecasting of Major Forex Pairs Using ARIMA, LSTM, and Hybrid Model with Web-Based Visualization
	SE	400	Mikhael Filemon, Alexander Bagus Wijanarko, Anselmus William Putra Adji,	Analyzing the Impact of Cross-Model Synthetic Contamination on LLM Coding Logic and Security

TRACK 10: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Titania Sari****Session co-chair: Adrian | Patma**

			Andien Dwi Novika and Muhammad Fikri Hasani	
	SE	412	Jayden Samuel Kurniawan, Charles Noble Wijaya Salim, Adhe Lingga Dewi and Muhammad Rizki Nur Majiid	Internet of Things Based Hybrid Air Quality Index Monitoring Using Multi Sensore Arrays
	SE	428	Raymond Ivander, Darren Aditya, Muhamad Salman Hakim and Franz Adeta Junior	Social Engineering Detection Using BERT and Graph Neural Network
	SE	454	Putu Adi Guna Permana, I Putu Ramayasa and A.A Ayu Meitridwiasiti	Development of a Laravel-Based Web Back-Office for Real-Time Attendance Monitoring and Reporting in Village Government: A Case Study of Blahkiuh Village
	#N/A		#N/A	#N/A

TRACK 11: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Desi Indrawati

Session co-chair: Devina Febriani Permana | Reva

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	SE	442	Rachel Gallego, Anggit Suryopratomo, James Ryan Ga, Adrian J. Forca, Desiree G. Morales , Jerico E. Galila, Loveson C. Gallos	Development of University Transportation Management System
	SE	447	James Ryan B. Ga, Sandy Kosasi, Rachel Gallego, Divon G. Tamdang, Alfred John G. Borreros, Loveson C. Gallos, Lilian Diana B. Parreño	Development of Research Management Information System
	SE	449	Deo Genisan, Reymart Carmelo, Jhosua Logronio, Mary Rose Artagame Artagame, James Ryan Ga and Rachel Gallego	Care Card: Mobile Application for Special Sector Identification and Incident Management
	SE	497	Putu Gede Semara Putra, Dandy Pramana Hostiadi and Gede Angga Pradipta	Feasibility of Using a 1-Bit Language Model as a Lightweight Decision Engine
12:45 - 15:00 WIB / UTC+7	SE	482	Ariana Kaye Mola, Faisal Amir Harahap, Hanz Maveric Naldoza, Justine Galea, Angelica Siodena, James Ryan Ga, Rachel Gallego	Daho!: Mobile Application Linking Local Courier and Pasalubong Centers using Geographic Information Systems
	SE	483	Princess Hiponia, Shem Patrick Cantara, Catlane John Talagon, Rey Constantino Gonzaga and James Ryan Ga	Basic Commodity Price Prediction using SARIMA Algorithm
	SE	487	Jan Vincent Bolong, John Cristian Ganea, Jomel Aquino, Catherine Garque, Caryll Jeanne Cazandra	Unified Agricultural Products Insurance System for the Department of Agriculture

TRACK 11: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Desi Indrawati****Session co-chair: Devina Febriani Permana | Reva**

			Esmama and James Ryan Ga	
	SE	519	Hugo Wahyu Bagas Putra Pratama, Reinert Yosua Rumagit and Reina Setiawan	Quantifying Data Quality Sensitivity in Tabular Machine Learning Pipelines
	SE	544	Divon G. Tamdang, Kiswanto, James Ryan B. Ga, Alfred John G. Borreros, Loveson C. Gallos, Adrian J. Forca, Lilian Diana B. Parreño	Optimizing R&D Decisions via Data Analytics: A Guimaras State University Case Study
	SE	566	Andrea Duspar, Vergel Gonzales, Daven Labordo and Adrian Jaleco Forca	AgriScan: A Mobile App for Detecting Calcium Carbide Treated Agricultural Product
	SE	578	I Gede Suka Yasa, Roy Rudolf Huizen and Dandy Pramana Hostiadi	URL-Based Phishing Website Detection Using Machine Learning: A Comparative Study of URL Feature Extraction and XGBoost Optimization
	SE	580	Anggi Susanti, Wisnu Rasyidin Azhari, Dicky Kurniawan, Indrawan Ady Saputro, Muhammad Setiyawan and Afnan Rosyidi	PlateRush: Real-Time Hand Gesture-Based Nutrition Education Game Using MediaPipe Tasks Vision
	SP	446	John Rey B. Galon, Stenly Richard Pungus, Seoj Clyde Mainar Galila, Jerald O. Cascara, Keith Gabriel Ymalay, G.Loveson C. Gallos, Rachel Gallego	Project G.U.A.R.D.I.A.N. (Guimaras Unified Architecture for Remote Sensing and Deep Learning Integrated Analysis Networks): A Multimodal AI Architecture for Spatial and Temporal
15:15 - 16:45 WIB / UTC+7	SE	597	Salvi Joyce V. Estember, Wilem Musu, Eve Yuri D. Ariza, Lucel F. Depiedra, Paolo M. Nanagad,	Water Incident Reporting and Management System with GIS and Machine Learning Prediction

TRACK 11: VIRTUAL (ZOOM BREAKOUT ROOM)**Session Chair: Desi Indrawati****Session co-chair: Devina Febriani Permana | Reva**

			Loveson C. Gallos, Rachel Gallego	
	SE	640	Athallah Rafif Rijal Belvana, Yasin Taryaquil Aghyar, Nathasa Bintang Kayesa, Sebastian Chang, Muhammad Fikri Hasani and Andien Dwi Novika	Evaluating Real-World QR Code Scanner in Detecting Quishing (QR Code Phishing): A Comparative Empirical Security Study
	SE	683	Raphy Dalan, Las Johansen Caluza, Rico Combinido and Cesar Celestial Jr	Feature-Engineered Support Vector Machine for Barangay Justice Case Classification in the Philippines
	SE	684	Las Johansen Caluza, Raphy Dalan, Rico Combinido and Cesar Celestial Jr	Predictive Public Safety: An AutoML Framework for Forecasting Barangay Justice System Blotter Volumes
	SP	467	Jonathan Sujadi, Takka Najib, Muhammad Majiid and Prabowo Sudarno	Light-Resilient CIELAB-Driven Random Forest for Computer Vision-Based Banana Ripening Classification
	#N/A		#N/A	#N/A

TRACK 12: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Hadah Muallimah

Session co-chair: Azmii Fauziyyah | Alif Aiman

Time	Topics	#	Author	Title
11:00 - 12:00 WIB / UTC+7	SP	620	Indrawan Ady Saputro, Ina Sholihah Widiati, Riyan Abdul Aziz, Ahmad Muhariya, Iwan Ady Prabowo and Sri Widiyanti	Adaptive Texture-Guided Fragile Watermarking for Image Authentication and Self-Recovery (ATSRW)
	SP	631	Joy Nasten Sinaga, Caroline Caroline and Yuni Marlina Saragih	A Silhouette-Guided Pseudo-Label Generation Framework for Indonesian Depression Detection Using Contextual IndoBERT Embeddings
	SP	653	Jeremy Sean Sitranata, Stevan Pohan, Hans Christian Soebroto and Violitta Yesmaya	IndoFinBERT: Benchmarking a Domain-Adapted BERT Against Multilingual Models for Indonesian Financial Sentiment Classification
	SP	221	Agustina Mardeka Raya, Erfan Hasmin, Rahmat Sulaiman and Detin Sofia	Predicting Wasting Nutritional Status in Children Aged 0–24 Months Using Support Vector Machine with Kernel Optimization
12:45 - 15:00 WIB / UTC+7	SP	243	Andrey Apriliady, Ezra Mayurga, Keanu Stadeva, Bakti Jabar and Rico Halim	Comparative Analysis of Classical Machine Learning vs Deep Learning for Stock Price Prediction in Volatile Markets
	SP	280	I Gede Oka Permana Putra, Gede Angga Pradipta and Roy Rudolf Huizen	Comparative Sentiment Analysis of BPJS KRIS Using TF-IDF, FastText, and BERT with Naive Bayes and SMOTEENN
	CP	102	Mohammad Diqi, Nuk Ghurroh Setyoningrum and Herison Surbakti	Micro Neural Trustworthy Representation with Dynamic Quantized Uncertainty for Edge Intelligence
	CP	115	Darren Limantoro, Nicholas Tjoe, Kenji	Hybrid Feature Selection and Machine Learning for Biomarker Discovery in Cholangiocarcinoma

TRACK 12: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Hadah Muallimah

Session co-chair: Azmii Fauziyyah | Alif Aiman

			Lawrence, Rico Halim and Bakti Jabar	
	SP	473	Karina Wardoyo, Samuel Setiawan, Nidya Tjokroseputro and Muhammad Majiid	From CNNs to LightGBM: Optimizing Urban Environmental Sound Classification for Resource-Constrained Deployment
	SP	192	Gena Darma, Aji Gautama Putrada and Khalis Sofi	DenseNet-121 and Xception Ensemble with Grad-CAM for Explainable Breast Cancer Ultrasound Classification
	SP	196	Ellya Helmud, Anisah Anisah, Yuyi Andrika, Elly Yanuarti, Sujono Sujono and Supardi Supardi	Deep Transfer Learning for Multi-Class Fish Disease Classification: A Comparative Performance Evaluation
	SP	202	Salsabila Rahayu Putri, Aji Gautama Putrada and Khalis Sofi	Post-Training Quantization with ResNeXt-101 for Efficient and Optimum Ultrasound-Based Breast Cancer Classification
	SP	287	Aviel Aquino, Jayson Prasada Siswoyo, Samson Ndruru and Ivan Sebastian Edbert	Dynamic Range Quantization for Vision-Based Parking Detection on Resource-Constrained Edge Infrastructure
15:15 - 16:45 WIB / UTC+7	SP	291	Jerome Budianto, Gabriella Antoniette, Muhamad Putra, Bakti Jabar and Rico Halim	Stacking Transformer Architectures for Robust Sentiment Analysis of Indonesian Financial Slang
	SP	356	Kelvin Alexander Harli, Ferdy Saputra and Edi Purnomo Putra	YOLOv8-Based River Debris Monitoring System With Meteorological Data for Flood Mitigation
	SP	305	Heinrich Heinrich, Giovan Fernandes, Alexander Agung Santoso Gunawan and Rilo Chandra Pradana	Comparative Deep Learning Models for Binary-Class Sickle Cell Disease from Microscopic Blood Smear Images

TRACK 12: VIRTUAL (ZOOM BREAKOUT ROOM)

Session Chair: Hadah Muallimah

Session co-chair: Azmii Fauziyyah | Alif Aiman

	SP	591	Hikmahtiar Aryojuno, Jane Angel Brilian Natasya and Meta Amalya Dewi	Data-Driven Supervision Prioritization of Inactive Taxpayers Using K-Means Clustering and Cluster Validation
	SP	302	Darlyn Meinardy, Ivan Edbert and Devi Fitrianah	Benchmarking Modern Object Detectors for Real-Time Traffic Density Estimation in Intelligent Traffic-Light Control
	#N/A		#N/A	

KEYNOTE SPEAKER PROFILE

KEYNOTE SPEAKER 1



Prof. Ir. Zainal Arifin Hasibuan, MLS., Ph.D., is a Professor of Computer Science currently serving as the Vice Rector for Information Systems and International Programs Universitas Komputer Indonesia. He has also served as the Chairman of the Association of Indonesian Higher Education in Computer Science (APTİKOM) 2014-2022. His areas of expertise include e-learning, information retrieval, and information systems. As a prolific academic, Prof. Zainal has published over 273 scientific works since 1989, with more than 3,600 citations, demonstrating a significant impact on the scientific community. Prof. Zainal's contributions to education and research have been widely recognized, including his ranking at 70th place in the 'Indonesia Top 10,000 Scientists' for the Engineering & Technology category by the AD Scientific Index in 2023. His dedication to advancing the field of computer science has made him a central figure in Indonesia's academic community.

KEYNOTE SPEAKER 2



Prof. (Dr.) Bishwajeet Kumar Pandey is an Indian academic and researcher who earned his PhD in Computer Science and Engineering from the Gran Sasso Science Institute in Italy. He has further expanded his academic expertise through Post-Doctoral Fellowships at Universiti Sultan Zainal Abidin in Malaysia, Yarsi University in Indonesia, and Western Sydney University in Australia. Currently serving as a Professor in Computer Science at the GL Bajaj Institute of Technology and Management, his extensive career includes professorial, research, and visiting roles at institutions such as Astana IT University, Eurasian National University, and Jain University. Highly recognized within his field, he was named "Professor of the Year, 2023" by the London Organization of Skills Development, and he holds prestigious affiliations as a Senior Member of the IEEE and a Fellow of the IETE. Demonstrating a strong global footprint, Dr. Pandey has visited 49 countries and has delivered keynote speeches and paper presentations in 23 of them.

Dr. Pandey possesses an exceptional research portfolio, having authored a total of 376 papers, which includes over 260 Scopus-indexed research papers that have garnered more than 5,000 citations and an H-index of 32. His scholarly contributions extend to 30 published books with renowned publishers like Springer, CRC, and Taylor & Francis, as well as 24 published patents, three of which have been officially granted. He has also secured significant funding, notably a 100 million KZT grant from the National Science Council of Kazakhstan for a computer vision and artificial nose project. As a mentor, he has successfully supervised two completed PhD theses and is currently supervising five additional scholars. Complementing his theoretical research, Dr. Pandey holds numerous practical industry certifications from AWS, IBM, Cisco, the EC Council, and Palo Alto Networks, highlighting his technical proficiency in cybersecurity, ethical hacking, and cloud computing.

PRESENTED PAPER ABSTRACTS

Paper ID #1

Adaptive AI and Big Data Analytics Platform to Enhance the Competitiveness of Indonesian MSMEs in Digital Services Export

Indriyani; Paula Dewanti, Evi Triandini, Nurul Hidayat

ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) are integral to Indonesia's economic development but often face limitations in competing within the global digital service export market. This study presents the development of an Adaptive AI and Big Data Analytics Platform aimed at enhancing the international competitiveness of Indonesian MSMEs. Implemented as a lightweight, client-side web application, the platform integrates simulated AI techniques, including semantic search through vector embeddings and cosine similarity, automated sentiment analysis, and dynamic tag generation based on service descriptions, while leveraging big data analytics to process diverse market information and customer insights. Evaluation of the prototype demonstrates effective semantic relevance in search results, intuitive user interaction, and real-time sentiment mapping from large-scale data sources. With its modular architecture and emphasis on usability, the platform addresses key barriers to technology adoption for MSMEs. The findings suggest that such AI and data-driven tools can significantly support MSMEs in increasing visibility, conducting data-informed market research, and tailoring service offerings, thereby strengthening their position in the global digital services landscape. .

Keywords: Adaptive AI, Big Data Analytic, Competitiveness, Digital Service Exports, MSMEs.

Design and Evaluation of an ESP32-Based Automated Hanging Weighing System for Poultry

Ivan Alexander, Marcel Saputra, Natario Thomas, Sherrane Kuo

ABSTRACT

Manual chicken weighing remains a common practice in poultry farms, despite being time-consuming and prone to recording errors and data manipulation. This study proposes an ESP32-based automated hanging weighing system designed to improve efficiency, accuracy, and data reliability in small- to medium-scale poultry operations. The system integrates a load cell sensor and HX711 module for weight measurement and enables automatic data transmission to a local database. Experimental evaluations were conducted using standardized weights to assess system performance in terms of accuracy, response time, power consumption, and data transmission reliability. The results show that the system achieves a maximum error of -0.64% and a standard deviation below 0.011 kg, indicating high accuracy and measurement stability. The average response time was recorded at 6.89 seconds, while the system was able to operate for approximately 7 hours using a 1000 mAh battery. Reliable data transmission was achieved under stable network conditions; however, data loss occurred during connectivity disruptions due to the absence of local buffering. Overall, the proposed system demonstrates the feasibility of a low-cost automated poultry weighing prototype under controlled laboratory conditions with the potential to reduce human error, improve operational efficiency, and support the digitalization of farming processes.

Keywords: automated weighing, ESP32, load cell, HX711, local database, poultry farming.

Paper ID #11

AI Influencer Integration in Marketing Information Systems: Emotional Response as a Purchase Driver

Stefanus Rumangkit, Antonius Satria Hadi, Ilham Sentosa, Rosni AbWahid,
Muhamad Zulkiflee Osman

ABSTRACT

Utilizing the Stimulus–Organism–Response (S-O-R) theoretical framework, this study examines how Electronic Word-of-Mouth (E-WOM), Social Media Engagement and Perceived AI Influencer effect Purchase Intention mediated by Emotional Response. Data were collected using purposive sampling of 100 Indonesian online consumers and analyzed using SmartPLS with a quantitative method. The analysis further shows only a marginal significance of E-WOM impact on Emotional Response, and reveals that Social Media Engagement and Perceived AI Influencer significantly positively influences emotional response. Furthermore, Emotional Response serves as a considerable mediator for the relationships between Social Media Engagement and Purchase Intention; Perceived AI Influencer and Purchase Intention. E-WOM has a direct effect but it is mediated by Emotional Response. The results offer an insight by revealing that the fundamentals of emotional engagement is a specific and distinct construct on its own that drives digital marketing effectiveness in the case of AI-powered influencer communication practices in Indonesia social commerce landscape.

Keywords: AI Influencer, Social Media, E-WOM, Purchase Intention.

Prototype Design of Wheelchair Accessibility Information System in Jakarta Tourism Using BERT-Based Sentiment Analysis

Farhan Fadillah, Aulia Azzahra, Muhammad Rydwan, Cornelius Sarungu

ABSTRACT

The lack of availability of accessibility information creates barriers to inclusive tourism among wheelchair users. We created a web-based prototype that makes use of aspect-based sentiment analysis (ABSA) on Google Maps reviews on 30 destinations in Jakarta. With the aid of the fine-tuned XLM-RoBERTa, which is trained with 25,404 accessibility reviews, we obtained 91.70% accuracy across three sentiment classes compared to our baseline models (IndoBERT, mBERT, BiLSTM, SVM). Most importantly, the multi-language model used can process English and Indonesian languages without any need for translation and accurately identify polarity reversal even in highly complex sentences. All the required tests have been passed by the prototype, which provides a map interface together with listing destinations.

Keywords: inclusive tourism, wheelchair accessibility, sentiment analysis, aspect-based sentiment analysis, BERT, web scraping, natural language processing, prototype information system.

Design, Implementation, and Evaluation of a Cloud-Native Real-Time Distributed System Using Kubernetes and AWS

Mageshkumar Duraisamy, Shailesh Kadam, Sakthivel Periyasamy, Biky Chouhan, Arun Kumar Singh, Mahfooz Alam

ABSTRACT

Cloud-native platforms help to create scalable distributed systems but real-time predictable performance is still a daunting task to achieve, mainly because of the resource virtualization and dynamic scheduling systems. The given study outlines the design, implementation, and empirical evaluation of a cloud-native distributed system in real-time on Amazon Web Services (AWS) with the help of Kubernetes. There is the interpretation of latency-sensitive autoscaling and orchestration in the architecture to meet the strict real-time requirements. Empirical evidence shows that mean end-to-end latency increases between 45ms and 120ms with an increase of request rates between 100 and 500 requests/second and indicates almost linear response to the addition of up to five service replicas. Moreover, the system has a well-defined autoscaling behavior and can recover immediately after failures have been deliberately injected, which highlights the practicability of achieving so-called real-time performance in cloud-native systems without compromising scalability or reliability.

Keywords: Cloud-native computing, real-time systems, Kubernetes orchestration, distributed systems, autoscaling control, performance evaluation.

Paper ID #29

Design and Implementation of a Smart Aquarium Monitoring and Automatic Feeding System Using ESP32

Nathanael Melvin Setiawan, Efendi, Ivan Alexander, Jennifer Alexandra

ABSTRACT

This paper presents the design and implementation of an Internet of Things (IoT)-based smart aquarium system that integrates real-time water quality monitoring and automated fish feeding. Maintaining optimal environmental conditions and consistent feeding schedules is essential for aquarium fish health yet remains challenging for owners with limited availability. The proposed system utilizes an ESP32 microcontroller to collect data from multiple sensors, including temperature (DS18B20) and pH (PH4502C) sensors, with enhanced analog accuracy provided by the ADS1115 module. The system supports real-time monitoring and control through a mobile application (Blynk) and a local LCD display, while data is stored in a cloud-based Firebase database. An automated feeding mechanism using a stepper motor enables both scheduled and manual feeding with controlled portioning. Experimental results demonstrate that the system achieves an average temperature measurement error of $\pm 0.42^{\circ}\text{C}$ and pH measurement error within ± 0.14 . The feeding mechanism achieves portioning errors ranging from 3% to 6%, with feeding schedule delays of 3–5 seconds. These results indicate that the proposed system provides a reliable and efficient solution for remote aquarium management.

Keywords: Internet of Things (IoT), Smart Aquarium, ESP32, Automatic Fish Feeder, Remote Monitoring.

A Hybrid Fuzzy Logic–Based Intelligent Traffic Signal Control with Optimization Mechanism

Keisa Putri Alisa, Marcellino Varian Saputra, Shieren Revalina Jesslyn, Selvi Lukman

ABSTRACT

Fixed-time traffic lights are still used in many intersections, although this method is not always suitable when the traffic condition changes from one period to another. When the signal timing is too rigid, vehicles may wait even when the road is not crowded, while queues can become longer during busy conditions. This work discusses a Smart Traffic Light Control System using Fuzzy Logic. The system uses two input variables, namely the waiting time and number of vehicles, to decide the green-light duration. These inputs are converted into linguistic categories and processed using fuzzy rules that follow common traffic-control reasoning. The evaluation shows that the system gives different green-light decisions for different traffic situations. The waiting-time values used in the evaluation include 15 seconds for a short condition, 60 seconds for a medium condition, and 90 seconds for a long condition. From these results, the proposed system shows that Fuzzy Logic can support a more flexible signal-control process than a fixed-time approach. This study contributes by combining vehicle volume and waiting time in one fuzzy decision framework for intersection management. Future work can continue this study through real-time testing with IoT-based traffic sensors and integration with intelligent transportation systems.

Keywords: artificial intelligence, fuzzy logic, smart traffic light, intelligent transportation system.

Market Regime Classification and Entry Window Prediction for IDX Blue Chips Using Random Forest and BiLSTM Models

Pasya Kemal Halim, Bambang Aranaya Saputra, Muhammad Rifki Ramdani,
Selvi Lukman

ABSTRACT

This paper suggests a repeatable model of classifying the market regimes and predicting the market entry windows in blue-chip stocks in the IDX. Regimes are determined using daily price data since 2004, where volatility and trend characteristics are used to define the regimes. It is backed with four interpretable technical indicators and clear labeling guidelines. Two random forest and Bidirectional Long Short-Term Memory (BiLSTM) models are compared based on 80:20 ratio, time based train test split. Empirical findings demonstrate the BiLSTM is an important improvement over the Random Forest in regimes classification due to its ROC-AUC of 0.919. This success highlights the significance of the time context in market dynamics modelling. Nevertheless, the BiLSTM prediction is also more difficult with an entry window prediction achieving a ROC-AUC of 0.743 since only slight improvements were running using ensemble methods. Such results suggest the entry signals are less clear and label-design and class imbalance sensitive. In general the temporal model supplements regime identification, similarly entrance prediction needs more polishing on the part of prediction. The future directions include exploring feature representations that are richer and employ alternatively labeling techniques and broader coverage of assets in addition to integrating macroeconomic variables, sentiment indicators and attention-driven architectures. Therefore, it would be more instructive to consider a model based on the indicators of economic performance and transaction costs to deepen the understanding of its real opportunities of application.

Keywords: Market regime, Financial time series, Random forest, BiLSTM, IDX blue chip, volatility.

A Comparative Study of Speech Recognition Models in Smart Home Multitasking : Streaming, Batch, and Hybrid Processing

Kevin Halim, Margaretha Haryanto, Chang Minfang, Setiawan Joddy, Irene Anindaputri Iswanto

ABSTRACT

Automatic speech recognition (ASR) has a central role in smart-home applications, where accurate and responsive speech interaction is crucial. We compare streaming, batch and hybrid ASR processing in recognition accuracy, latency and computational resource consumption in a controlled setting on the LibriSpeech test-clean dataset. We evaluated three pipelines: Kaldi Vosk for streaming, batch processing with OpenAI Whisper, and a hybrid pipeline using Vosk and Wav2Vec2 for periodic contextual refinement. The hybrid method achieved the lowest WER (3.59%) and CER (1.31%), while streaming had the lowest latency (1.32 s). Batch processing achieved WER at 5.07%, latency of 3.32s, hybrid processing required 4.01s latency and 15.97GB RAM. Our results show a trade-off between accuracy, latency and resource consumption. Streaming is better for latency sensitive applications . Hybrid processing is better when highlighting recognition accuracy . The evaluation was performed on clean speech, thus the results provide a controlled benchmark, rather than a direct validation for real-world smart-home environments. .

Keywords: Smart Home, Automatic Speech Recognition (ASR), Streaming Processing, Batch Processing, Hybrid ASR, Vosk, Whisper, Wav2Vec2, Multitasking. .

Multi-Agent Coordination with Human Oversight: A Formal Analysis of Responsibility Allocation in AI-Assisted Decision Systems

Shalini Sudarsan, Nixalkumar Patel, Anshul Sharma, Dharma Rao Gorja, Nihar Karra, Biky Chouhan

ABSTRACT

The growing use of artificial intelligence into decision-making systems that involve collaboration raises critical concerns regarding accountability because human decision-making is spread across human and AI agents. We propose a formal approach to allocating responsibility in human-supervised, collaborative, multi-agent AI systems. The framework considers collaboration as a method of shared control and uses causal attribution analysis and a normalization of responsibility measures to achieve proportional and dynamic accountability of agents and the human supervisor. The model is tested in a multi-agent simulation model with stochastic disturbances over 100 decision cycles. Our experimental findings demonstrate that responsibility is spread out and not concentrate in the human supervisor, who has the greatest (0.28-0.29), followed by the AI agents (0.20-0.27). The study also shows that moving towards agent autonomy increases system error (0.17-0.27) and that human-AI collaboration results in better decision-making (from ~ 0.70 to ~ 0.76). The results demonstrate the need for human supervision to improve performance and accountability. The analytical framework enables the design of transparent, trustworthy and accountable multi-agent AI systems.

Keywords: Human–AI collaboration, responsibility allocation, human oversight, multi-agent systems, accountable AI, decision-support systems.

Paper ID #44

Public Opinion Analysis on Indonesia's Joining the Peace Council (BoP) Amidst the Escalation of the US-Israel and Iran Conflicts with Fine-Tuning IndoBERT

Erwin Kartinawati, Wiwit Supriyanti, Andrik Purwasito

ABSTRACT

Indonesia's participation in the Board of Peace (BoP) has attracted public attention during the intensifying conflict concerning the United States (US), Israel, and Iran. This study analyzes sentiment expressed in Indonesian language YouTube comments concerning Indonesia's participation in the BoP during this period of geopolitical tension. A quantitative sentiment analysis approach was employed using the IndoBERT Transformer model. Publicly available comments from relevant YouTube news videos were collected through web scraping and processed through text preprocessing, SmSA based fine tuning, model evaluation, and target domain inference. The fine tuned IndoBERT model achieved 0.92 for Accuracy, Precision, Recall, and F1 Score on the held out SmSA test set. The resulting model was subsequently applied to 10,842 sampled YouTube comments, producing three sentiment categories: negative, positive, and neutral. The results show that negative sentiment was the dominant model predicted category with 7,700 comments (71.11%), positive sentiment with 1,784 comments (16.46%) and neutral sentiment with 1,358 comments (12.52%). Lexical and temporal analyses indicate that the sampled YouTube discourse was associated with geopolitical conflict, government policy, domestic priorities, and perceptions of Indonesia's international role. These findings characterize sentiment expressed within the sampled YouTube discourse and should not be interpreted as a statistically representative measure of national public opinion. The study demonstrates the applicability of fine tuned IndoBERT for large scale analysis of Indonesian language online discourse concerning complex geopolitical issues and provides insights that may support evidence-informed public communication and policy discussion related to foreign affairs.

Keywords: board of peace; IndoBERT; Indonesia; sentiment analysis; US-Israel-Iran conflict.

User Authentication Using Keystroke Dynamics with Deep Learning Models

Darius Salim; Yonathan Immanuel Nurhan; Alfi Yusrotis Zakiyyah; Syarifah Diana Permai

ABSTRACT

Keystroke dynamics is an emerging behavioral biometric that enables user authentication based on typing and keystroke patterns. This study investigates the performance of two deep learning architectures, Bidirectional Long Short-Term Memory (Bi-LSTM) and a one-dimensional Convolutional Neural Network (1D-CNN), for fixed-text keystroke-based user identification using the CMU Keystroke Dynamics Benchmark Dataset. Beyond comparing architectures, this study considers timing measurement arrangement as a second experimental factor. It compares a flat format, where all features are assumed to be from a single timestep, to a per-keystroke model where the same measurements are structured as eleven timesteps of three features. All four combinations were trained under an identical hyperparameter search and evaluated over five random seeds. The per-keystroke representation diminishes Bi-LSTM accuracy from 91.66% to 87.70% ($p < 0.001$, $d = 0.95$) due to overfitting, while the 1D-CNN remains unaltered ($d = -0.05$). The structures are statistically indistinguishable under the flat representation ($p = 0.626$). The 1D-CNN achieves an Equal Error Rate of 0.0154 compared to 0.0153 for the Bi-LSTM, with no substantial difference ($p = 0.701$), utilizing 8.8 times fewer parameters and exhibiting 3.3 times reduced CPU latency. For brief fixed-text sequences, enforcing a sequential structure provides no advantage, and the choice of model should be mostly influenced by deployment expenses rather than precision.

Keywords: keystroke dynamics, behavioral biometrics, user authentication, deep learning, Bi-LSTM, 1D-CNN.

Analysis of Plantation Commodity Dominance and Regional Distribution Inequality in Bangka Belitung Province Using Location Quotient and Gini Index Approaches Based on the 2023 Agricultural Census

Rahmat Sulaiman, David, Agustina Mardeka Raya, Tri Sugihartono, Eza Budi Perkasa, Fitriyani

ABSTRACT

This study presents a spatial analysis of plantation commodity dominance and regional distribution inequality across six regencies in Kepulauan Bangka Belitung Province, Indonesia. Utilizing primary data from the 2023 Agricultural Census (Sensus Pertanian 2023, Phase II) conducted by the Central Bureau of Statistics (BPS), along with supplementary production data from Bangka Belitung in Figures 2026, the research applies the Location Quotient (LQ) method to identify agricultural base sectors at the regency level and the Gini Index to quantify the degree of inter-regional production inequality across six major plantation commodities: oil palm (Kelapa Sawit), rubber (Karet), coconut (Kelapa), pepper (Lada), coffee (Kopi), and cocoa (Kakao). The analysis employs RapidMiner Studio as the computational platform, leveraging its data integration and scripting capabilities to process a dataset comprising 6 regencies and 6 commodities derived from producing tree (tanaman menghasilkan, TM) counts as a proxy for productive capacity. Results indicate that Bangka Regency demonstrates the broadest commodity base, achieving LQ values above unity for four commodities, with particularly high specialization in cocoa (LQ = 2.85) and coconut (LQ = 2.37). Belitung and Belitung Timur exhibit strong specialization in pepper, recording LQ values of 2.66 and 2.84 respectively, while Bangka Barat and Bangka Tengah establish comparative advantages in rubber and coffee. Gini Index calculations reveal that oil palm and pepper exhibit the most equitable regional distributions (Gini = 0.27 and 0.29), whereas cocoa demonstrates the highest inequality (Gini = 0.51), indicating extreme production concentration in one or two regencies. These findings provide quantitative evidence for spatially targeted agricultural development policies, emphasizing the need for commodity diversification in underspecialized regencies and equitable redistribution strategies for highly concentrated commodities.

Keywords: Location quotient; Gini index; plantation commodities; regional inequality; Bangka Belitung; RapidMiner; agricultural census; spatial analysis.

Paper ID #51

The Impact of AI Adoption and Digital Capability on Innovation Capability among Business Owners and Office Workers: The Mediating Role of Strategic Decision-Making Quality

Diandra Salma Navara, Puji Prabowo

ABSTRACT

In the case of entrepreneurs and employees within an office environment, the implementation of technology transformation should go together with improved strategic decision-making quality. In this study, we focus on the elements affecting innovation capability, utilizing the PLS-SEM model to analyse the data collected. It is shown that the use of AI and digital capabilities significantly contribute to innovation capability. Moreover, strategic decision-making quality acts as a mediating element between AI adoption and digital capability and innovation capability.

Keywords: AI-adoption, Digital Capability, Innovation Capability, Strategic Decision-Making Quality, PLS-SEM.

Non-Intrusive Behavioral Biometric Identification Using Typing Dynamics and Ensemble Learning for Continuous Authentication

Muhamad Achya Arifudin, Nur Alamsyah, Budiman

ABSTRACT

Continuous authentication remains vulnerable after an initial login because active sessions can be compromised through credential theft, session hijacking, or impersonation. This study presents a non-intrusive behavioral biometric framework that represents fixed text typing with 31 temporal features and integrates calibrated ensemble learning, user-specific verification thresholds, anomaly detection, and explainable artificial intelligence. The benchmark contains 10,533 keystroke events from six participants. After training-only Winsorization, key-rollover decomposition, leakage-free scaling, and sequence validation, 10 hold-time features, 9 down-down latencies, 9 up-down latencies, and global rhythm measures were modeled by isotonic-calibrated Random Forest and Gradient Boosting classifiers combined through a logistic-regression stacking meta learner. On the independent password-level test partition, the proposed ensemble achieved 97.52% identification accuracy, a macro F1-score of 0.9675, and a cross-entropy log loss of 0.0767. Replacing a universal decision threshold with subject-specific calibration reduced the average Equal Error Rate from 6.81% to 0.00% for the validated subjects. TreeSHAP further showed that transitional flight latencies were more discriminative than individual dwell durations.

Keywords: behavioral biometrics, keystroke dynamics, continuous authentication, stacking meta ensemble, Equal Error Rate, Explainable AI, TreeSHAP, Zero-Trust Security.

Paper ID #62

Empirical Assessment of Robot Framework Test Automation Integrated with Microsoft Teams Webhooks using Ordinary Least Squares Regression

Rike Aqila Nurfi, Emny Harna Yossy

ABSTRACT

Regression testing is a major bottleneck for large-scale enterprise systems, especially when large business scenarios need to be validated during frequent software releases. Automated testing frameworks are widely used, but existing studies rarely provide statistically grounded evaluations with paired empirical designs and they rarely integrate real-time reporting mechanisms within continuous integration (CI) environments. In order to fill this gap, this study proposes a lightweight regression-testing architecture that integrates Robot Framework, GitLab CI, and Microsoft Teams webhooks to provide structured real-time execution notifications after each testing cycle. The proposed approach is evaluated using a paired one to one experimental design where each business feature is tested manually and automatically under the same conditions. We analyze execution efficiency using a semi-log OLS regression model with HC3 robust standard errors, and release-level testing effectiveness is measured with the Effective Pass Rate (EPR), which accounts for both test coverage and execution success. Experimental results of 54 paired observations in an enterprise insurance environment show that automated testing reduces execution time by approximately 79% compared with manual testing, with the confidence interval consistently indicating a substantial efficiency improvement. During the single release evaluated in this study, all 54 required automated test cases were executed and passed, resulting in an EPR of 1.00. This result is interpreted descriptively and does not establish general reliability across releases. The study contributes an applied empirical evaluation of an integrated Robot Framework, GitLab CI, and Microsoft Teams architecture, with particular emphasis on paired efficiency comparison under controlled conditions.

Keywords: automated testing, GitLab CI, Ordinary Least Squares (OLS), regression testing.

The Algorithmic Nudge: Green Signaling and User Engagement on Social Media AI

Soraya Agustina Situmorang, Allan Desi Alexander, Hiram Reagen
Panggabean

ABSTRACT

Sustainability messages on Instagram are encountered through a social-media environment in which content is algorithmically mediated. This study investigates how users' perceptions of sustainability-oriented brand communication relate to user engagement and brand image, with particular attention to the mediating role of user engagement. In this study, algorithmic green signalling refers to users' perceptions of green communication encountered in this environment, not to a technical assessment of Instagram's recommendation or ranking system. Data were obtained from 100 valid responses from Instagram users in Tangerang, Indonesia, and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) in SmartPLS. Bootstrapping with 5,000 resamples was used to assess the hypothesised relationships. Perceived algorithmic green signalling was positively related to user engagement ($\beta = 0.65$, $p < 0.001$), while user engagement was positively related to brand image ($\beta = 0.58$, $p < 0.001$). The direct relationship between perceived algorithmic green signalling and brand image was also significant, although weaker ($\beta = 0.21$, $p = 0.015$). More importantly, the indirect relationship through user engagement was significant ($\beta = 0.38$, $p < 0.001$). The results point to engagement as an important link between sustainability-oriented communication and consumers' brand perceptions. Rather than treating algorithmic mediation as a measurable technical mechanism, the study shows how users' perceptions of green communication within an algorithmically mediated environment are associated with engagement and subsequent brand image.

Keywords: Algorithmic Green Signaling; User Engagement; Brand Image; AI-Driven Social Platforms; Sustainability Communication.

Pseudo-Label Distillation for Indonesian YouTube Sentiment Analysis under Limited Annotation

Nurfaizah, Didit Suhartono, Arifah Budi Hidayah, Wisnu Mu'amar, Iwan Haryanto

ABSTRACT

Sentiment analysis of Indonesian YouTube comments remains challenging because the data are highly informal, noisy, and often lack sufficient manually labeled instances for robust model development. At the same time, transformer-based models offer strong predictive performance but are computationally expensive for large-scale deployment. This study aims to develop and evaluate a pseudo-label distillation framework that transfers supervision from an Indonesian RoBERTa teacher model to a lightweight TF-IDF-SVM student model under limited manual annotation conditions. The study employed a controlled teacher-student learning design involving data collection, limited manual annotation for gold-standard evaluation, pseudo-label generation with confidence filtering, student-model training, and performance evaluation using accuracy, macro F1-score, AUC, and inference latency. The optimal binary student model achieved 82.99% accuracy, a macro F1-score of 0.77, and an AUC of 0.885, while reducing inference time from 3.8×10^{-1} to 5.9×10^{-5} seconds per sample, equivalent to a $6,398.91\times$ acceleration. These findings indicate that pseudo-label transfer can provide an effective balance between predictive quality and computational efficiency, making the proposed framework promising for real-time sentiment monitoring in resource-constrained Indonesian NLP applications.

Keywords: .

Graduation Volume Forecasting Across Program Lifecycles in a Transforming Indonesian Higher Education Institution Using ARIMA and LSTM

Hilyah Magdalena, Ade Septryanti, Yohanes Setiawan Japriadi

ABSTRACT

Between 2004 and 2025, ISB Atma Luhur graduated 5,690 students. Over these 21 years, the institution underwent three structural transformations—evolving from AMIK to SMTIK, and finally to ISB. This study was motivated by the need for PDDikti reporting, institutional accreditation, and campus resource allocation planning. It utilizes a longitudinal dataset to predict graduation rates by comparing ARIMA and LSTM methods. Both models were tested against short-term data containing structural shocks resulting from the institutional transformations. The results indicate that the ARIMA (1,1,1) model consistently predicts graduation rates for the Diploma (D3) program—incorporating MAE/RMSE methods to mitigate mathematical bias when graduation figures approach zero—whereas the LSTM model proves more robust in predicting graduation rates for active Bachelor's (S1) programs. Projections indicate that graduation volume will stabilize at 332–411 students per year through 2030, with significant growth in the Postgraduate (S2) program effectively offsetting the complete phase-out of Diploma programs.

Keywords: ARIMA; graduation volume forecasting; higher education analytics; LSTM; time series.

The Role of Self-Efficacy, Sustainable Innovation, and Management Commitment on AI Adoption

Nila Astiti , Dicky Hida Syahchari, Sulistyo Heripracoyo, Agung Gita Subakti,
Murty Magda Pane, Supina Sapri Djalam

ABSTRACT

This study investigates how self-efficacy, sustainable innovation, and management commitment collectively shape artificial intelligence adoption in the hotel industry of Greater Jakarta. In this dense hospitality market, digital transformation remains urgently needed yet conspicuously underutilized. Survey data from 258 hotel staff, analyzed using structural equation modelling, reveal that all three predictors exert statistically significant positive effects on AI adoption, with self-efficacy demonstrating the strongest influence ($\beta = 0.375$), followed by sustainable innovation ($\beta = 0.342$) and management commitment ($\beta = 0.262$, $p < 0.05$). The model explains $R^2 = 71.9\%$ of the variance in AI adoption, substantially exceeding comparable studies. Theoretically, the research advances a socio-technical integration of psychological, strategic, and governance mechanisms, challenging the prevailing assumption that leadership signalling dominates technology uptake. Critically, management commitment exhibits contingent rather than linear effects, suggesting that above a certain threshold, top-down endorsement may fragment rather than facilitate diffusion. Practically, the findings urge hotel managers to embed AI within sustainability narratives that frame adoption as advancing resource efficiency and circularity, while distributing commitment across mid-level leaders and designing low-stakes sandboxes that convert self-efficacy into sustained practice. The study's significance extends beyond hospitality, offering replicable logic for sectors navigating the intersection of digital urgency and environmental accountability in Global South urban contexts.

Keywords: AI Adoption, Hotel Industry, Management Commitment, Self-Efficacy, Sustainable Innovation.

AI Capabilities: The Impact of IT Governance and IT Innovation on Organizational Performance

Sandy Kosasi, Suci Ramadhani Arifin, Muh. Syahlan Natsir, I Dewa Ayu Eka Yuliani, Hasan, Dewi Putri Selpi

ABSTRACT

The existence of IT governance, IT innovation, and AI capabilities has been widely discussed in various literatures, but most still examine the three separately and tend to consider AI only as part of the IT infrastructure, and have not been able to describe the interaction and synergistic contribution between these constructs to the overall organizational performance. The purpose of this study is to develop and test a comprehensive conceptual model to empirically explain the relationships among constructs that improve organizational performance. This study uses a convergent triangulation approach in an explanatory design to analyze IT service-based creative industry MSMEs in West Kalimantan that have been operating for more than five years. Data were collected via an online survey using a random sampling technique from 310 respondents; 262 provided complete responses, yielding an 84.52% response rate. Data were processed using a Likert scale and PLS-SEM analysis tools. The results of the study show IT governance and IT innovation as complementary factors with an emphasis on the mediating role of AI capabilities, which reflects a weak positive influence, meaning that it still supports organizational performance but is not a dominant factor directly and simultaneously improving organizational performance.

Keywords: IT Governance, IT Innovation, AI Capabilities, Organizational Performance.

Multi-Branch CNN with Multi-Signal Fusion for AI-Generated Image Detection

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Muhammad Zidane Ramadhan, Rajnaparamitha Kusumastuti, Dewi Oktafiani

ABSTRACT

Synthetic images generated by Generative AI are becoming increasingly difficult to distinguish from photographs taken by real cameras. This increasingly common situation has raised significant concerns regarding content authenticity, public trust, and the security of AI systems. More clearly, if people cannot verify the authenticity of a particular image or content, over time they will doubt all information they see, and even the security defenses of AI system itself will be compromised. Methods for detecting synthetic images have been proposed before, but in this particular area of research, few researchers have conducted a direct side-by-side comparison of various CNN structure designs and corresponding feature fusion strategies. Prior to this, few studies have specifically focused on the task of distinguishing synthetic images generated by AI, comparing the performance of various designs and methods individually. This study focuses on synthetic image detection and tests and compares three feature fusion strategies within a Multi-Branch CNN architecture: addition-based fusion and attention-based fusion. The developed model for image detection and analysis does not extract information through sequential processing, but instead simultaneously extracts necessary features from four sources. The four sources are spatial features, SRM-based noise patterns, Sobel gradient information, and FFT-based frequency representation. We conducted several additional experiments using the CIFAKE dataset, generated using Stable Diffusion v1.4. The images in the dataset have an original resolution of 32x32 and are based on CIFAR-10 images. With no change in its dimensions, the experiment actually produced a highly unexpected result.: extreme upscaling to a resolution of 224x224 actually reduced accuracy by 31.55%. We tried conducting three independent experiments, Each used a different seed. In all three experiments, the three fusion methods we used in this study were fully implemented.

Keywords: AI-generated image detection, multi-branch convolutional neural network, feature fusion, SRM noise residual, FFT frequency spectrum, Sobel gradient, CIFAKE dataset.

Micro Neural Trustworthy Representation with Dynamic Quantized Uncertainty for Edge Intelligence

Mohammad Diqi, Nuk Ghurroh Setyoningrum, Herison Surbakti

ABSTRACT

Realizing edge artificial intelligence on microcontrollers must strike a balance between three goals that are typically challenging to fulfill concurrently, including low-computational resources and low inference latency, and robust decision-making. Whereas reliable generative architectures like TRUE-Net not only offer robust uncertainty information via dual-generator fusion and Bayesian prediction but also heavily investigate the parameter selection deserves attention, since those models demand many parameters and are fairly complex in computational terms, they are impractical with TinyML hardware, such as ESP32-S3, ARM cortex-M processors, and Coral Edge TPU. In order to overcome these limitations, the proposed study presents MICRO-TRUE, which is a lightweight Micro framework based on Neural Trustworthy Representation by bringing together three integrated innovations, namely: Dynamic Quantized Uncertainty Routing enabling adaptive INT8 inference, a Binary Latent Adversarial Generator which compresses latent representation into binary states without reducing the entropy, and an objective based on energy consumption which optimally balances classification precision, calibration quality and machine consumption. A benchmarking evaluation of a Twitter spam test shows that MICRO-TRUE has 0.972 accuracy and 0.994 AUROC and decreases FLOPs, latency and energy usage by a significant margin relative to TRUE-Net. The framework also enhances the reliability of the calibration, to confirm that faithful inference and extreme micro-edge compression may co-exist competently within a single runtime-compatible TinyML-friendly platform.

Keywords: trustworthy AI, edge intelligence, dynamic routing, uncertainty estimation, quantization.

Digital Solutions for Limited Mobility Areas: A Software Engineering Approach to Multi-Tier Delivery Systems

Herimanto

ABSTRACT

People living in remote areas often struggle to access important community services because they are far from cities, have poor transportation and do not have many local businesses. This study presents the development and evaluation of an Android-based mobile delivery application that incorporates the Euclidean Distance algorithm to identify the nearest driver and the Haversine formula to calculate delivery distances, offering an adaptive technological solution. The research employs a mixed-methods approach, utilizing a case study in a remote North Sumatran community situated 10 kilometers from the nearest city center. Survey results from 69 respondents reveal that 73% of residents require regular delivery services, while 94.2% lack access to private transportation. The application was developed using a multi-tier architecture and achieved a user satisfaction rating of 90.10%. Algorithm validation demonstrated high accuracy: the Euclidean Distance algorithm achieved 99.78% accuracy for nearest driver identification ($MAE = 0.8$), and the Haversine formula achieved 99.18% accuracy for distance calculation with a 0.09 km error. Customer Satisfaction Score (CSAT) assessments indicated very high satisfaction levels: accessibility (93.07%), UI/UX (93.07%), functionality (87.12%), and overall satisfaction (90.10%), with a "Very Large" effect size (Cohen's $d > 1.5$, $p < 0.001$). The findings confirm the effectiveness of digital solutions in mitigating accessibility barriers in remote areas and offer a scalable framework for similar regions.

Keywords: Remote Areas, Transportation, Euclidean Distance, Haversine, Multi-Tier Architecture.

SmartSawitGrader: On-Device Palm Oil Ripeness Detection

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ABSTRACT

Although Indonesia produces over 55% of global crude palm oil, the value recovered from each harvest still hinges on judging the ripeness of fresh fruit bunches (FFBs) by eye — subjective grading that causes 15–25% rater disagreement and avoidable post-harvest losses. The main contribution of this work is not a new detection architecture but an end-to-end mobile AI system, SmartSawitGrader, that brings automated FFB ripeness grading to standard smartphones. Detection runs entirely on the device, which matters in plantations where connectivity is limited or unstable and cloud-based inference is impractical. The detector is YOLO26, a 2026 anchor-free, NMS-free member of the YOLO family designed for low-latency edge inference; we train it on 7,757 annotated images across four ripeness classes (Raw, Underripe, Ripe, Overripe) and export it to TensorFlow Lite INT8 for on-device execution within a cross-platform Flutter application backed by a lightweight cloud service for accounts and history. On a held-out test set the deployed INT8 model attains a mean average precision (mAP@50) of 98.7%. On a mid-range smartphone (MediaTek Helio G99) a single INT8 inference takes 243 ms (about 4 frames per second) with the NNAPI accelerator, covering model inference only (excluding pre- and post-processing). A System Usability Scale (SUS) study with fifteen field users returned 82.5 ('Excellent'). SmartSawitGrader shows that accurate, fully offline FFB grading is achievable on commodity smartphones.

Keywords: palm oil ripeness detection, on-device inference, edge AI, YOLO26, TensorFlow Lite, mobile application.

Hybrid Feature Selection and Machine Learning for Biomarker Discovery in Cholangiocarcinoma

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Bakti A. Jabar

ABSTRACT

Cholangiocarcinoma (CCA) is a cancer with a very high mortality rate that attacks the bile ducts. Early detection of CCA is really difficult because conventional biomarkers such as CA19-9 don't provide optimal results, especially in the early stages of the disease. Public gene expression datasets already provide a large amount of biological data that we can use to identify new more optimal biomarkers. However, these have drawbacks such as varying dimensions and distributions of markers which can impair the model's performance and increase risk of model overfitting. This research proposes a hybrid machine learning framework that aims to help CCA biomarker identification using integrated geo-datasets. This framework combines multiple systems like Differential Expression Analysis (DEA), Minimum Redundancy Maximum Relevance (mRMR), and LASSO to reduce data dimensionality while still retaining biologically relevant genes. The three classification models used in this study were Support Vector Machine (SVM), Random Forest (RF), and Logistic Regression (LR). They were then evaluated using metrics that are appropriate for imbalanced data, such as F1-score, AUC-ROC, and Matthews Correlation Coefficient (MCC). On our external validation, Random Forest achieved the highest AUC (0.923) and MCC (0.346), while Logistic Regression achieved the highest F1-score (0.921) and recall (0.866); pairwise differences between the models were not significant (paired t-test, $p > 0.05$). SHAP analysis identified COL10A1, PPAP2B, CXCL2, KCNT2, and SOX4 as genes with the highest influence in predicting CCA.

Keywords: Cholangiocarcinoma, biomarker identification, machine learning, SHAP analysis, GEO datasets.

Objective Evaluation of Audio Transmission Quality Degradation in Networked Music Performance and WebRTC

Bagaskoro Saputro, Yohanes Suyanto

ABSTRACT

The 2020 Covid-19 pandemic increased the use of Networked Music Performance (NMP) platforms by musicians around the world as a tool of remote music creation. Minimal latency platforms like Jacktrip, Soundjack, and Jamulus have a latency of about 25 ms (when properly configured), but their audio transmission quality had never been objectively and rigorously evaluated. This paper is a systematic objective analysis of audio transmission quality on three NMP platforms (Jacktrip, Soundjack, and Jamulus) and two reference communication platforms (WebRTC and Zoom). The objective MOS-LQO scoring is done using ITU-standard algorithms ViSQOL and PEAQ with full-band audio (20 Hz–24 kHz), supplemented by a subjective MOS-LQS test. The transmission of ten audio stimuli was done over inner-city (~10 km) and inter-city (~120 km) network configurations. Findings show that with a sampling buffer of 128 or 64 frames, Soundjack and Jacktrip (on macOS) score 4.69 and 4.68 out of 4.75 on the ViSQOL scale, indicating almost transparent transmission. Scores are reported with 95% confidence intervals and Friedman significance tests, and cross-method agreement is quantified. These results offer empirical information about NMP as a feasible high-fidelity audio infrastructure for professional remote musical collaboration.

Keywords: Networked Music Performance; Objective Perceptual Evaluation; PEAQ; ViSQOL; MOS-LQS; WebRTC.

RTTE: Resonance-Time Texture Encoding for Enhanced Human Screaming Detection

Nuk Ghurroh Setyoningrum, Mohammad Diqi, Mae B. Lodana

ABSTRACT

Human scream detection is a safety audio event relevant activity where there are operational impacts on false alarms and missed distress signals. The paper is an audio representation, Resonance Time Texture Encoding, also known as RTTE, which is adaptive complex resonance kernel, dual temporal resonance mapping, clip-level resonance energy normalization and gradient texture construction. The common corpus features 3,493 audio clips, 862 screams and 2,631 non scream. Testing is performed on fixed clip holdout of 626 clip on a fixed 326 scream samples and 300 non scream samples and the rest of 2,867 clips is the development partition. At the same back- end of RTTE, the accuracy of 97.12 percent, the scream precision of 97.53 percent, the recall of 96.93 percent, and the F1 of 97.23 percent are reached compared to the MFCC with 95.05 percent accuracy and 95.27 percent F1. RTTE also decreases the false positives to 8, and boosts ROC AUC to 0.989. The formulation clearly defines a complex resonance kernel whose energy-controlled temporal decay and gives an analytical sensitivity and computation complexity analysis. Resonance texture is also found to be a promising representation to detect a human scream besides determining the measurements that are still needed to validate the classifier independent, cross corpus, and target device.

Keywords: human scream detection, audio representation, resonance analysis, wavelet transform, texture encoding, MFCC.

Vulnerability Risk Assessment for Sensitive Applications Based on the OWASP Web Security Testing Guide

Mochammad Riyan Firmansyah, Steven Geovino, Agiel Nugroho, Riyan Leandros

ABSTRACT

Web application security is a critical aspect of preserving data confidentiality, integrity, and availability, particularly for systems that aggregate vulnerability intelligence. This study focuses on an internal security reporting application at PT Negeri Seni Teknologi that serves as a centralized repository for security findings from other applications, making it a high-value target for potential cyber-attacks. To strengthen its security posture, we executed a complete penetration-testing cycle—covering planning, vulnerability analysis, exploitation, remediation, and verification—guided by the Open Web Application Security Project (OWASP) Web Security Testing Guide (WSTG) v4.2 and benchmarked against the OWASP Top 10 2021. The assessment identified eleven valid vulnerabilities, with a dominance of logic-based issues such as insecure direct object references (IDOR) and session management flaws, predominantly at a medium technical severity level. After implementing the recommended fixes and re-testing, all eleven (100%) vulnerabilities were successfully remediated, demonstrating the effectiveness of the remediation process in this specific context. The assessment demonstrates the applicability of OWASP WSTG in evaluating and hardening the studied security reporting application, while underscoring the need to address logic-based vulnerabilities that are often under-detected by automated tools. Future work includes periodic reassessment and extending the scope to infrastructure and Application Programming Interfaces (APIs) to maintain resilience against evolving cyber threats.

Keywords: cybersecurity, web application, penetration testing, OWASP.

How Green HRM Enhances Enterprise Resource Management Performance: The Mediating Role of Digital Capability and Sustainable Work Practice

Baghas Budi Wicaksono, Rini Kurnia Sari, Marita Salandanan

ABSTRACT

This study examines the factors influencing Enterprise Resource Management Performance in sustainable digital business environments by focusing on Green Human Resource Management (Green HRM), Digital Capability, and Sustainable Work Practices. Using a quantitative approach and Structural Equation Modeling (SEM), the research evaluates both measurement and structural models through reliability, convergent validity, and discriminant validity testing. The findings confirm that all constructs satisfy the required reliability and validity criteria, indicating a robust measurement model. Structural analysis reveals that Green HRM and Digital Capability significantly influence Sustainable Work Practices, which subsequently have a positive effect on Enterprise Resource Management Performance. The results indicate that organizations with stronger environmentally oriented human resource practices and higher digital capability are better able to develop sustainable operational processes and improve enterprise resource efficiency and organizational performance. However, the moderating effect of Digital Capability on the relationships between Green HRM, Sustainable Work Practices, and Enterprise Resource Management Performance is not statistically significant. This finding suggests that digital technologies alone are insufficient to strengthen enterprise performance without strong sustainability-oriented human resource strategies and effective sustainable work implementation. The study contributes to the sustainable management and digital business literature by providing empirical evidence regarding the relationships among Green HRM, Digital Capability, Sustainable Work Practices, and Enterprise Resource Management Performance in sustainable digital enterprise environments.

Keywords: Digital Capability, Enterprise Resource Management Performance, Green Human Resource Management (Green HRM), Structural Equation Modelling (SEM), Sustainable Digital Enterprise, Sustainable Work Practices.

Alzheimer's Disease Stage Classification from MRI Scans Using DINO-ViT and Grad-CAM++ on the OASIS Dataset

Marcello Evan Wijaya, Filipus Darren Siswanto, Ignasius Holy Prasetya,
Muhammad Rizki Nur Majiid

ABSTRACT

Alzheimer's disease is the number one cause of dementia in the world. Because the damage it causes is irreversible, identifying the disease early and placing patients in the right severity tier is crucial to planning treatment and controlling costs across health systems. This is something that Standard Convolutional Neural Networks (CNNs) tend to have a hard time with. Their receptive fields are localized and so they are unable to capture the wide-ranging and interconnected structural changes that occur with the progression of Alzheimer's. Moreover, most of the deep learning models are black boxes that provide doctors only a label without any explanations. We have created an explainable four-stage classification pipeline that addresses these two issues. Our method fuses a self-supervised vision transformer, DINOv2, with Grad-CAM++ saliency mapping. Alzheimer's disease is the number one cause of dementia in the world. Because the damage it causes is irreversible, identifying the disease early and placing patients in the right severity tier is crucial to planning treatment and controlling costs across health systems. This is something that Standard Convolutional Neural Networks (CNNs) tend to have a hard time with. Their receptive fields are localized and so they are unable to capture the wide-ranging and interconnected structural changes that occur with the progression of Alzheimer's. Moreover, most of the deep learning models are black boxes that provide doctors only a label without any explanations. We have created an explainable four-stage classification pipeline that addresses these two issues. Our method fuses a self-supervised vision transformer, DINOv2, with Grad-CAM++ saliency mapping. Together, these results suggest that a reliable staging system could be supported by combining self-supervised feature extraction with gradient-guided interpretability, one that could extend to multi-centre clinical trials and ViT-native explainability tools.

Keywords: Alzheimer's Disease, Vision Transformer (ViT), DINOv2, Grad-CAM++, MRI Classification, Explainable Artificial Intelligence (XAI).

The Impact of LUTs and DCTL Integration on Enhancing Visual Literacy and Color Grading Efficiency for Content Creators

I Putu Harrys Putra Mulyawan, M. Azman Maricar, Ni Made Dewi Kansa Putri, Muhamad Rihamzah

ABSTRACT

The global community of digital creators is growing quickly, but many of the people who work in it aren't keeping up with the visual literacy of the newcomers. This is especially true during post-production color grading. As a result, new creators have a hard time making work that looks professional and consistent. We are looking into whether combining Look-Up Tables (LUTs) with DaVinci Color Transform Language (DCTL) can help with more than just speeding up production. We are also looking into whether it can be used to teach visual literacy. We used two parallel designs for evaluation. A Posttest-Only Control Group Design with 30 people tracked changes in processing time and stylistic quality, while a One-Group Pretest-Posttest Design with 40 people tracked changes in visual literacy. Editing time dropped from an average of 43.28 minutes to 14.17 minutes for the experimental group that used the LUTs-DCTL workflow (mean difference: 29.11 minutes, 95% CI [-38.39, -19.83]). In addition, their work got an impressive mean visual quality score of 90.54, which was much better than the control group's score of 68.63 (Hedges' $g = 3.68$, 95% CI [2.52, 4.85]). The video was looked at by three skilled colorists who did not know each other. The results showed that there was high inter-rater agreement ($ICC(2,k) = 0.979$). Along with improving technical speed, artists showed big improvements in ten areas of visual literacy. An N-Gain score of 0.842 shows that their conceptual understanding went from a low of 2.09 to a high of 4.54. This integrated workflow makes it easier to understand complicated operational node routing, which lowers mental load and lets beginners focus on color harmony and theory. Because this was a single-treatment design before an experiment, these results on visual literacy are strong preliminary proof.

Keywords: Color Grading, Content Creator, DaVinci Color Transform Language, Look-Up Tables, Visual Literacy.

Real-Time Sign Language Alphabet Classification for Fingerspelling Recognition Using EfficientNet

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ABSTRACT

Sign language alphabet recognition can support communication by enabling alphabetic hand gestures to be converted into text. However, reliable real-time fingerspelling recognition remains challenging, particularly under varying environmental conditions. This study presents a real-time frame-based alphabet classification system using the EfficientNet architecture. The system classifies hand gestures corresponding to 26 alphabetic signs from individual video frames and sequentially combines the predicted alphabet labels to form fingerspelled strings. The proposed system extracts spatial features from hand gesture images using EfficientNet-B0 and EfficientNet-B2 as the CNN backbone architectures. This study also tested optimizers—AdamW and SGD—using different input resolutions and augmentations. The dataset comprises 2,600 static images representing hand gestures for 26 alphabetic classes from A to Z. The experiments compare EfficientNet-B0 and EfficientNet-B2 using the AdamW and SGD optimizers with input resolutions of 224×224 and 160×160 pixels, both with and without data augmentation. The dataset contains hand gesture images representing the letters A through Z. Test results show that EfficientNet-B2 with the SGD optimizer achieved the best classification performance at a resolution of 160×160 without data augmentation, achieving 98.85% accuracy, 98.93% precision, 98.82% recall, and 98.84% F1-score. These results demonstrate that the proposed model achieves high accuracy in alphabetic hand gesture classification and supports real-time frame-based recognition of sequential fingerspelling gestures. .

Keywords: Computer vision, EfficientNet architecture, hand gesture classification, real-time processing, alphabetic sign recognition, fingerspelling recognition .

A Comparative Evaluation of Naive and Codon Tokenization in Translation Initiation Site Prediction

Arief Arya Menon, Louis Dominic, Michael James Elijah, Rico Halim, Bakti Amirul Jabar

ABSTRACT

Recent genomic foundation models use natural language processing techniques, such as Byte-Pair Encoding or Naive 1-bp sliding windows, which ignore genomics and the concept of codons, to identify Translation Initiation Sites (TIS), sometimes resulting in a deviation in the location of TIS that has been predicted. Thus, we developed and benchmarked models based on Position Weight Matrices and Codon Usage Bias along with Codon Tokenization and tested them in whole genome scanning and fixed window binary classification. In whole genome scanning across 24 target regions, frame-aligned codon tokenization combined with Codon Usage Bias cut Mean Absolute Error by 58.32% from 34.677 bp down to 14.454 bp while reducing intergenic false positives by 45.93% and driving Specificity from 4.25% up to 48.10%. In fixed window binary classification, combining Position Weight Matrices with Codon Usage Bias improved the Matthews Correlation Coefficient from 0.188 up to 0.404. This demonstrates that Codon Tokenization makes a model more precise in predicting where a TIS is, and is also a very efficient way to tokenize sequences compared to Natural Language Processing alternatives like Byte-Pair Encoding.

Keywords: Codon Tokenization, Translation Initiation Site, Position Weight Matrix, Codon Usage Bias, Genomic annotation, Bioinformatics.

Cross-Output Saliency Comparison for Multi-Output Image Regression in Nutritional Estimation

Jesslyn Trixie Edvilie, Brian Juniarta Darmadi, Elizabeth Paskahlia Gunawan

ABSTRACT

Image-based deep learning predicts dish-level nutritional values from a single photograph with strong accuracy, but model opacity limits clinical and consumer adoption. Explainable AI (XAI) methods have been widely compared for image classification but rarely evaluated on multi-output regression, which is the setting in which multiple correlated continuous targets are predicted from a shared backbone. This work compares Grad-CAM, SHAP, LIME, and the Chefer transformer attribution across ResNet-50 and ViT-B/16 on the Nutrition5k four-output regression task (calories, fat, carbohydrates, protein). The evaluation includes faithfulness via deletion and insertion AUC, weight-dependence via sanity test, and label-sensitivity operationalized through pairwise heatmap similarity across the four outputs. A regression-mode adaptation of the Chefer attribution is introduced and validated through the sanity criterion. On fine-tuned ResNet-50, Grad-CAM achieves an order-of-magnitude lower deletion AUC than the random validity floor. On cross-output similarity, LIME is the most output-discriminating method on both architectures (SSIM 0.586 on ResNet-50; 0.592 on ViT-B/16) while Chefer is the most output-insensitive (SSIM 0.921), with sharp Friedman + Nemenyi separation. The results provide a property-driven method-selection guide for practitioners deploying multi-output image-regression models.

Keywords: Explainable Artificial Intelligence, Multi-Output Regression, Nutritional Estimation, Saliency Methods, Vision Transformers.

Comparative Analysis of Algorithms for Disease Classification Based on Symptom Text

Melvin Wijaya, Kenneth Katojaya, Kevano Christiawan, Bakti Amirul Jabar,
Rico Halim

ABSTRACT

Disease diagnostic process that is performed by a doctor is really time consuming. Variation in domain knowledge among doctors also affects the time and consistency of the diagnosis given. This study aims to solve this problem by using a light weight NLP-based approach. We applied a Medical Context Normalization (MCN) layer with TF-IDF and BERT embedding as a feature extraction. Logistic Regression and Linear SVM alongside a fine-tuned BERT model as a baseline from earlier research for a disease classification problem. SMOTE was also applied to test whether it could improve model performance with the imbalance in data. Some of the proposed models achieve the similar base line model that used BERT + adamW reaching 97% accuracy meanwhile the proposed model having far better efficiency in training time . In conclusion a simpler model with the help of MCN layer is enough to handle this classification task and also perform better in terms of efficiency.

Keywords: Disease Classification, BERT, TF-IDF, Support Vector Machine, SMOTE, Natural Language Processing, Symptom Analysis, Machine Learning.

Evaluation of the Effectiveness of the Multi-Debate Agent System on the Small Language Model in Reducing the Level of Hallucinations and Increasing the Accuracy of Reasoning.

Darrell Nicholas Tandean, Timothy Alexandro Sibarani, Bakti Amirul Jabar,
Rico Halim

ABSTRACT

Access to premium cloud-based Large Language Models (LLMs) is limited by things such as cost barriers, data privacy concerns, and local hardware limitations. While local Small Language Models (SLMs) offer a free and private alternative, their standalone deployment often suffers from significant weaknesses in reasoning capabilities and high hallucination rates. To fix this problem, we created an offline system where two local agents debate each other. Controlled by custom Python middleware, the 4-bit quantized gemma4:e2b model is alternately loaded and unloaded to prevent out-of-memory errors on consumer laptops with limited VRAM. This method enables the agents to identify and correct their own errors. The average Reasoning Accuracy went up from 65.0% to 71.25% ($p = 0.015$), and the hallucination rate went down from 35.0% to 28.75%. From the hardware statistic the peak VRAM is 4.2GB. This keeps it safe from the laptop VRAM limit (6GB). So anyone can safely use this method.

Keywords: Generator-verifier, multi-agent, SLMs, hallucination mitigation, reasoning accuracy.

On-Device Multi-Class Urban Issue Classification for Citizen Reporting in Smart Cities

Budi Juarto, Soni Yora

ABSTRACT

One crucial element of current Smart City activities is getting residents actively involved in identifying problems that can lead to the degradation of the urban environment (e.g., potholes, road defects, broken street signs, acts of vandalism, car accidents, garbage dumped on streets). Despite high classification accuracy of deep learning methods, little is understood about their deployment performance in a real-world scenario based on a citizen-reported mobile application, than based on typical benchmarks, which perform an evaluation in offline mode. This paper introduces an all-inclusive multi-class urban issue classifier developed for mobile applications, suitable for integration into an Android Smart City Reporter. The following five lightweight backbones have been trained and tested using identical parameters, on the same six class-balanced classes, with an 800-image count per class: convnextv2_tiny, efficientvit_b2, mambaout_tiny, hiera_tiny_224 and eva02_tiny_patch14_224. The experiments show that mambaout_tiny performed better about a compromise between classification performance and speed: its macro F1 score achieved 0.9847, its macro ROC-AUC 0.9993 and the overall test accuracy achieved 0.9848. We've now successfully exported this model into an ONNX format and can use this format as a backend in our Flutter application, which supports on-device prediction, automatically attached geographical tags, a map to see the reports submitted, persistent memory of submitted reports, among other features. Our application and approach bridges the divide between urban computer vision research, which focuses primarily on benchmark performance and pragmatic smart city citizen-facing services.

Keywords: Smart City, On-Device Inference, Image Classification, Citizen Reporting, Deep Learning, Mobile Application, ONNX.

Formula One Car Detection Using Comparative Deep Learning Models

Budi Juarto. Yulianto

ABSTRACT

Racing cars have unique features, such as team livery, complex backgrounds, varying camera angles and high speed, making recognition difficult. However, few publicly available baseline models exist. To fill this void and compare four state-of-the-art object detection models, YOLOv9s, YOLOv11s, YOLOv12s and YOLOv26s were trained and evaluated on a class-balanced dataset comprising images of Ferrari, McLaren, Mercedes and Red Bull cars, which dominate the world of Formula One. The dataset was downloaded from the Roboflow platform and balanced on the training partition through undersampling so that every class contributed exactly 1,538 bounding boxes, matching the count of the smallest class. The models were trained using the Ultralytics framework for a maximum of 50 epochs. Metrics included precision, recall, mean average precision (mAP) at 0.50 IoU and mean average precision (mAP) from 0.50 to 0.95 IoU. Our baseline provided 0.893 precision, 0.950 recall, 0.957 mAP@0.5 IoU and 0.789 mAP@0.5:0.95 IoU by leveraging YOLOv9s with its remarkable recall of 0.950. Despite YOLOv12s yielding higher precision at 0.915, its performance at other metrics remained lower and comparable with that of the other YOLO versions. The class-balanced baseline framework provides a practical solution to deployment scenarios of Formula One car detection. Additionally, it serves as a solid, easily replicable, transparent basis from which experiments related to optimized configurations, real-time speed limitations and data diversification can start.

Keywords: Formula One, object detection, vehicle recognition, YOLO, computer vision.

Comparative Analysis Between Ensemble Learning (XGBoost) and Lightweight Transformers (DistilBERT) in Detecting AI-Generated Misinformation

Dian Novianto, Indra Samsie, Sujono, Yohanes Setiawan japriadi, Lukas Tommy

ABSTRACT

The capacity of Generative AI to generate highly structured text gives rise to a novel threat of misinformation that conventional filters are ill-equipped to detect. The present study evaluates and compares the effectiveness of two distinct architectures, namely XGBoost (Ensemble Learning) and DistilBERT (Lightweight Transformers), in identifying AI-generated text. A series of computational experiments were conducted using a comparative dataset that incorporated both human written and AI generated texts. XGBoost was trained using Term Frequency-Inverse Document Frequency (TF-IDF) feature extraction to map vocabulary distribution, whereas the pre-trained DistilBERT model was fine-tuned directly on raw text. The performance of the model was evaluated using a Confusion Matrix, encompassing Accuracy, Precision, Recall, and F1-Score. It is noteworthy that both models attained an exceptional level of accuracy, with a precision rate of 99%. DistilBERT demonstrated particular proficiency in F1-Score (0.99) and Recall (0.99), thereby substantiating its aptitude for capturing latent semantic contexts. In contrast, XGBoost demonstrated remarkable efficiency, attaining maximum Precision (0.99) by exploiting the frequency of specific keywords. A trade-off exists between two factors: the depth of semantic understanding and the computational efficiency. DistilBERT is a highly recommended option for automated detection systems requiring high sensitivity, while XGBoost is ideal as a real-time filter in environments with limited resources. The findings presented herein establish a strategic foundation for the development of information security architectures in the human-AI hybrid era.

Keywords: Hoax Detection, XGBoost, DistilBERT.

HealthSlangNorm: A Domain-Specific Slang Normalization Framework for Indonesian Healthcare Social Media

Ramlah Amir Sangga, Wilem Musu, Jufri, Indra Samsie

ABSTRACT

Informal healthcare language in social media combines slang, abbreviations, healthcare shorthand, regional expressions, orthographic variation, and code-mixed forms, making normalization more challenging than conventional text standardization. Existing approaches have mainly addressed general social media normalization or healthcare concept normalization, while their intersection in Indonesian healthcare communication remains insufficiently explored. This study proposes HealthSlangNorm, a domain-specific framework that combines lexicon matching, pattern recognition, heuristic correction, linguistic categorization, and contextual validation. The framework was evaluated using publicly accessible comments from the official Instagram account of an Indonesian national health insurance provider. Two independent annotators reviewed 5,195 unique comments, of which 5,177 contained complete normalization references. After reference comparison, 5,071 annotator-agreed references were used for direct evaluation. HealthSlangNorm achieved 70.48% exact-match accuracy, with 3,574 outputs matching the annotator-agreed references. A supporting Random Forest experiment for slang identification achieved 89.99% accuracy and 93.15% F1-score. Mismatch analysis showed that healthcare-domain shorthand accounted for 1,401 of 1,497 mismatches, highlighting differences in healthcare-term representation and normalization granularity. The results indicate that Indonesian healthcare language requires domain-specific resources and context-sensitive normalization rather than general slang replacement alone.

Keywords: Healthcare social media, Indonesian informal language, slang normalization, text normalization, domain-specific natural language processing.

A Proxy-Data Proof-of-Concept for AI-Based Risk Assessment and Tamper-Evident Audit Logging in MBG-like Public Food Distribution

Eko Budi Susanto; Paminto Agung Christianto; Riski Sulistyaningsih;
Bambang Ismanto; Kassymova Gulzhaina Kuralbayevna

ABSTRACT

Large-scale public food distribution programs require timely delivery, food-quality risk control, and accountable records across stakeholders. In Indonesia's Free Nutritious Meals Program (Makan Bergizi Gratis/MBG), however, full operational data are not yet made public. This limitation means that early-stage modeling relies on public or proxy scenarios, which should be carefully considered. This paper develops a proof-of-concept framework to assess operational risks in food distribution systems similar to MBG. The system uses a mix of synthetic/proxy dataset construction, two operational risk classification tasks, model interpretation and hash-chain-based tamper-evident audit logging. The dataset includes 1,000 scenarios and 77 variables, and there are no missing values or duplicate records. On the holdout test set, Logistic Regression produced a macro-F1 of 0.8085 and a high-risk recall of 0.9206 for delivery-delay risk, whereas XGBoost produced a macro-F1 of 0.6097 and a high-risk recall of 0.8400 for proxy-based food quality risk assessment. The audit simulation produced 6,000 transactions and achieved previous-hash validity, traceability, and tamper-detection rates of 1.00 in a local prototype. These results show that AI-based risk assessment and audit logging can be connected in a preliminary pipeline for public food distribution governance. Even so, the framework remains a prototype and should not be read as an operational MBG system without field validation, sensor-based monitoring, and permissioned blockchain evaluation. To support interpretation under class imbalance, the paper also reports class prevalence, majority and stratified-random baselines, unified model comparisons, per-class precision/recall/F1, and local hash-chain profiling.

Keywords: public food distribution, MBG-like, proxy data, operational risk assessment, machine learning, explainable AI, tamper-evident audit log .

A Comparative Evaluation of YOLOv8 and Faster R-CNN for Rice Leaf Disease Detection

Taryadi; Era Yunianto; Hari Agung Budijanto; Ma. Gulzhaina K.Kassymova

ABSTRACT

Automated rice leaf disease detection can support timely disease management and field monitoring. However, direct comparisons between one-stage and two-stage object detectors under the same experimental conditions remain limited. This study compares YOLOv8 and Faster R-CNN for detecting brown spot and rice blast. From an original dataset of 5,932 images, 512 images representing the two target diseases were selected and manually annotated. The original images were divided into training, validation, and test test as a 70:15:15 ratio, and data augmentation was applied only to the training set. The models were evaluated using precision, recall, F1-score, mAP@0.5, mAP@0.5:0.95, and inference time. YOLOv8 achieved 91.71% , whereas Faster R-CNN achieved 89.92%. The findings provide an empirical comparison of detection performance and computational efficiency for potential real-time rice disease monitoring.

Keywords: rice leaf disease; convolutional neural network; classification; identification; deep learning.

Machine Learning for Detecting Cognitive Interruption and Recovery in Digital Learning Environments

Gavin Indra Artajaya, Gregory Adrianus Sugiono, Violitta Yesmaya,
Muhammad Rizki Nur Majiid

ABSTRACT

In recent years, digital learning environments frequently cause cognitive disruptions, which make individuals feel mentally fatigued and affect their academic performance. This research proposes a machine learning approach, which helps to define the attention states by classifying neuro-cognitive transitions between the two distinct stages of attention interruption and attention restoration. Utilizing Electroencephalography (EEG) signals from 20 independent subjects, spectral band power features were extracted using Multitaper Power Spectral Density methodology from the frequency range of 4 Hz and 30 Hz. To provide good generalization across subjects and eliminate subject-dependent data leakages, a strict subject-wise cross-validation partitioning strategy was applied. Three machine learning algorithms were analyzed: Support Vector Machine (SVM), Random Forest (RF), and XGBoost. The experimental results showed that the Random Forest algorithm had the highest performance results, having approximately 86.95% accuracy, as well as making all the average indicators of precision, recall, and F1-score stable at the level of 0.86-0.88. The ensemble tree architecture proved to be very effective against spatial noise and non-stationarity in contrast to more distance-based models like SVM that produced only 51.34% results due to high inter-subject deviation. Moreover, spatial feature importance analysis has effectively associated major influencers with the Pz, O1, and O2 electrodes, which serve as key neurophysiological confirmation of localized attention processing networks. Together, these findings form a robust algorithmic framework for passive Brain-Computer Interfaces (BCI) that would be designed to reduce cognitive costs associated with digital multitasking.

Keywords: Brain-Computer Interface (BCI), Cognitive Load, Electroencephalography (EEG), Machine Learning, Multitaper PSD, Random Forest.

Analysis of Skin Lesion Cancer using a Robust Deep Learning Framework

Najwa Abdulridha Abdulateef, Zakariya A. Oraibi

ABSTRACT

The necessity of developing highly accurate, non-invasive automated tool to assist dermatologists in early detecting skin cancers has risen due to the advent of melanoma. The advancements in the artificial intelligence field made it possible to develop a robust model to help doctors in early diagnosing patients with skin cancer. Since many clinics and hospitals around the world monitor and record the images of skin lesion taken from patients, many datasets are made available and can be used for research purposes. In this paper, we provide a thorough analysis of multiple baseline deep learning models utilizing a standard dataset of skin lesion generated in Argentina. This dataset was introduced in 2022 and contains various types of skin lesion taken from Argentinian patients. In total, there are 10 classes, however, only two classes are used in this paper due to the scarcity of images in some classes. The framework applied in this paper include employing powerful benchmark architectures including: EfficientNet and Vision Transformers. The best accuracy achieved was 86.67% using EfficientNetB4 architecture. Finally, we provide a table of multiple other implementations of CNN models and compare the results of the best acquired accuracy. .

Keywords: Deep Learning, Skin Cancer, Vision Transformers, EfficientNet.

Computational Evaluation of Digital Music Application Interaction in Basic Music Theory Learning: An Empirical HCI-Oriented Study

Sattriedi Wahyu Binabar, Nathanael Santoso, Nur Fadhilah, Paminto Agung Christianto

ABSTRACT

Abstract—Digital music application increasingly supports some music theory learning by interactive environments. The study examined the correlation between the Intensity of Digital Music Application Interaction and Music Theory Learning Efficacy by using the HCI-informed quantitative correlational approach. 162 active music learners were participated in this research using a 24-item five-point Likert questionnaire. Pearson correlation and simple linear regression were conducted after the validity and reliability assessment. The results showed a strong positive correlation between the application interaction intensity and learning efficacy ($r=0.839$, $(p < 0,001)$). The regression model was statistically significant ($(F(1,160) = 382.914)$, $(p < 0,001)$) and explained 70.5% of the observed variance ($(R^2 = 0.705)$). A strong statistical association indicated in these findings between the digital music application interaction and perceived music theory learning efficacy, highlighting the relevance of HCI-oriented interaction in digital music learning environments.

Keywords: Keywords—digital music applications;music theory learning; Human--Computer Interaction; educational technology;statistical modelling.

DenseNet-121 and Xception Ensemble with Grad-CAM for Explainable Breast Cancer Ultrasound Classification

Gena Darma, Aji Gautama Putrada, Khalis Sofi

ABSTRACT

Ultrasound (US) is a popular modality for breast cancer detection due to its safety and accessibility. However, although convolutional neural network (CNN)-based approaches have shown promising results, most studies still focus on a single model evaluated on a single dataset, limiting model selection and the representativeness of the evaluation. This study develops an ensemble approach combining DenseNet-121 and Xception with Grad-CAM for two-class classification of breast US images. We compare these two baseline ensemble methods with three other pre-trained architectures: MobileNetV3, EfficientNet-B3, and ResNet-50. We then evaluate them using 5-fold stratified cross-validation with a multi-dataset approach that combines the BUSI and Mendeley datasets. We also test the interpretability and explainability of the ensemble model using Grad-CAM. Finally, this study compares the proposed method with the state-of-the-art method, VGG16, on the combined BUSI and Mendeley dataset. Evaluation results on an independent test set showed that the ensemble model achieved an accuracy of 97.78%, precision of 98.21%, recall of 97.22%, F1-score of 97.66%, and AUC of 99.73%, surpassing both single models and previous ensemble methods. This method also outperformed the state-of-the-art method, VGG16, on the combined BUSI and Mendeley dataset. Grad-CAM visualization confirmed that the model's predictions were consistently influenced by the lesion area; the proposed approach not only achieved optimal accuracy but was also interpretable, supporting US-based diagnosis more objectively and reliably.

Keywords: breast cancer, ultrasound, multi-dataset, ensemble, gradient-weighted class activation mapping.

Lightweight Attention-Based YOLOv8n for Cross-Domain Low-Light Object Detection

Ichwan Kurniawan, Sutarto Wijono, Radius Tanone

ABSTRACT

Non-ideal illumination and domain shifts can degrade object detection performance on data outside the training domain. This study evaluates lightweight modifications to YOLOv8n through C2f SCINet Faster in the backbone and C2f EMA Lite in the neck to improve cross-domain robustness while maintaining computational efficiency. Testing uses COCO as the in-domain dataset and ExDark and BDD100K as cross-domain datasets, with three random seeds (42, 123, and 2024) and analysis of the mean, standard deviation, and paired t-test. C2f SCINet Faster demonstrates the best computational efficiency on COCO, with 2.85 M parameters, a latency of 0.693 ± 0.038 ms, and 1446.54 ± 78.70 FPS. C2f EMA Lite provides the highest average precision and $\text{mAP}@50-95$ in the individual configurations, as well as the highest recall on ExDark at $25.16 \pm 0.94\%$, while C2f SCINet Faster experiences a significant decrease in mAP . On BDD100K, C2f SCINet Faster achieves the highest $\text{mAP}@50$ of $4.06 \pm 0.37\%$, but is not yet significant compared with the baseline. The combination of both modules also does not produce a significant improvement. Overall, the results demonstrate a further trade-off between accuracy, cross-domain robustness, and computational efficiency are required.

Keywords: real-time object detection, YOLOv8n, lightweight attention, cross-domain, low-light.

Benchmarking Similarity Measures for Retrieve-Stage Case-Based Reasoning in Medical Tabular Classification

Eko Budi Susanto; Eko Sedyono; Ferry Fredy Karwur

ABSTRACT

Retrieval largely determines the usefulness of Case-Based Reasoning (CBR), because the selected similarity function decides which stored cases are treated as relevant to a new query. In tabular medical data, this step is complicated by mixed numerical and categorical attributes, missing values, unequal class distributions, and differences in feature scale. This paper benchmarks four classical measures—Manhattan Distance, Euclidean Distance, Mahalanobis Distance, and Cosine Similarity—within a retrieve-stage CBR pipeline using three public datasets: chronic kidney disease, Cleveland heart disease, and hepatitis. All preprocessing operations, including imputation, standardization, and one-hot encoding, were fitted inside each stratified cross-validation fold to avoid data leakage. Retrieval was reused through majority voting over the top five cases, and performance was assessed with classification and retrieval-oriented metrics. The best F1-scores were obtained by Manhattan Distance on chronic kidney disease (0.9689), and by Cosine Similarity on Cleveland heart disease (0.8317) and hepatitis (0.7274). For direct retrieval quality, the highest Precision@5 was produced by Manhattan Distance on chronic kidney disease (0.9470) and Cleveland heart disease (0.7737), while Cosine Similarity was strongest on hepatitis (0.8245). Across dataset-fold evaluations, Cosine Similarity achieved the best average rank, whereas Mahalanobis Distance ranked lowest overall. These results offer an empirical baseline for selecting classical similarity measures before developing adaptive CBR retrieval models.

Keywords: case-based reasoning; similarity measure; tabular medical data; patient retrieval; cosine similarity; explainable artificial intelligence.

Deep Transfer Learning for Multi-Class Fish Disease Classification: A Comparative Performance

Ellya Helmud, Anisah, Yuyi Andrika, Elly Yanuarti, Sujono, Supardi

ABSTRACT

Fish diseases pose a critical threat to aquaculture productivity and sustainability, necessitating rapid, accurate, and automated diagnostic solutions. This study presents a comprehensive performance evaluation of lightweight deep transfer learning architectures for multi-class fish disease classification across eight distinct categories. To address model novelty and domain adaptation, we systematically evaluate three transfer learning schemes: direct transfer learning (frozen feature extractor), partial layer unfreezing (a proposed two-phase strategy), and full end-to-end fine-tuning. Three convolutional neural network architectures EfficientNetB0, MobileNetV2, and MobileNetV3Large were trained and benchmarked. Experimental results on an unseen test dataset demonstrate that EfficientNetB0 achieved the highest diagnostic accuracy of 95.00% (loss: 0.1927). MobileNetV3Large performed competitively as a strong runner-up with 92.92% accuracy (loss: 0.2099). Furthermore, a comprehensive computational complexity analysis reveals that MobileNetV3Large achieves the lowest computational overhead (0.22 GFLOPs) and an optimal inference latency of 172.43 ms per image. These findings confirm that MobileNetV3Large provides the most balanced trade-off between diagnostic accuracy and computational efficiency, rendering it highly viable for edge computing deployment in smart aquaculture frameworks.

Keywords: Deep Transfer Learning, Fish Disease Classification, EfficientNetB0, MobileNet, Comparative Evaluation, Smart Aquaculture.

Optimization Dynamics of Boosting Ensembles Under Extreme Class Imbalance in Large-Scale Predictive Systems

Ema Utami; Suwanto Raharjo; Mohammad Diqi

ABSTRACT

Extreme class imbalance of large scale predictive systems need to maintain general accuracy and identify low frequency, consequential outcomes. It compares three funded effects of distribution shaping and hyperparameter search on five boosting ensembles that were trained using 253,680 records of the Behavioral Risk Factor Surveillance System. Gradient Boosting, AdaBoost, XGBoost, LightGBM and CatBoost were tested without sampling, with SMOTE, and with SMOTE ENN. Each randomized search and Optuna were run with 100 evaluations and their stability was tested with 10 random seeds. The overall accuracy of the unsampled XGBoost ranged the highest in Optuna (90.90 percent). LightGBM was used on SMOTE with a minority recall of 92.15 percent and internally consistent F1 score of 88.56 percent. SMOTE ENN decreased recall by 5.23 percentage points compared to SMOTE and augmenting variability across seeds. Main differences were confirmed at $p < 0.05$ by paired bootstrap tests that used 10,000 resamples. The findings demonstrate that the adaptive trajectory control offers more stable and recall balance than offensive boundary cleaning. The level of system provides useful advice regarding scalable decisions systems where minor errors have disproportional impact.

Keywords: boosting ensembles, class imbalance, hyperparameter optimization, Optuna, SMOTE, stability analysis.

Post-Training Quantization with ResNeXt-101 for Efficient and Optimum Ultrasound-Based Breast Cancer Classification

Salsabila Rahayu Putri, Aji Gautama Putrada, Khalis Sofi

ABSTRACT

State-of-the-art research in ultrasound (US)-based breast cancer detection has demonstrated improved predictive performance. However, inefficiencies in predictions from deep learning models, such as convolutional neural networks (CNNs), pose several practical challenges. This study proposes a CNN architecture that achieves optimal and efficient performance, namely ResNeXt-101 with post-training quantization (PTQ). We benchmark ResNeXt-101 against state-of-the-art models, viz., ResNet-50 and ResNet-101, and then evaluate two PTQ methods, particularly dynamic INT8 and static INT8. This study uses 895 images from the combined BUSI and Mendeley datasets through a 5-fold cross-validation scheme. We optimize the best model, with the optimal threshold determined using the G mean criterion. The FP32 baseline of ResNeXt achieves a mean AUC of 96.29% with a standard deviation of 1.02% in cross-validation, as well as an accuracy of 95.53%, an F1-score of 94.37%, an AUC of 99.09%, a model size of 331.91 MB, and a latency of 446.38 ms/img on the independent test set. In terms of PTQ efficiency, dynamic INT8 achieves the same performance as FP32 while maintaining the same model size. On the other hand, static INT8 reduces the model size to 84.71 MB, with a CR of $3.92\times$ and a latency of 172.30 ms/img, accompanied by a 1.68% decrease in accuracy and a 0.71% decrease in AUC. These results indicate that static PTQ INT8 is a US-based breast cancer method with optimum computational efficiency.

Keywords: breast cancer, ultrasound, convolutional neural network, ResNeXt-101, post-training quantization.

Comparative Analysis of Naive Bayes and SVM for Indonesian Culinary Review Sentiment Classification

Sujono, Dian Novianto, Yohanes Setiawan Japriadi, Lukas Tommy, Melati Suci Mayasari

ABSTRACT

Sentiment Analysis has gained much attention lately as technology rapidly developed. The purpose of this paper is to conduct sentiment analysis on Indonesian culinary reviews using machine learning techniques Naive Bayes and Support Vector Machine (SVM). The dataset used in this study was taken from Indonesian culinary businesses' Google Maps Reviews which contains 4,304 customer reviews. Sentiment analysis was first conducted based on user ratings which then are manually filtered into three classes: positive (rating 4 – 5), neutral (rating 3), and negative (rating 1 – 2). After excluding neutral reviews to form binary classification sentiment analysis task, there are 4,140 reviews left that contain both positive and negative classes. The data were then used for machine learning classification after text preprocessing and TF-IDF extraction methods were applied. Both models were then trained and tested using 828 reviews for testing. Based on the results obtained, SVM outperformed Naive Bayes with overall accuracy of 92.03%, precision of 93.38%, and F1-score of 94.84%. In contrast, Naive Bayes has an accuracy of 86.59%, precision of 85.60%, and F1-score of 91.83%. However, Naive Bayes has a better recall score with 99.05% compared to SVM which has a score of 96.35%. This showed that SVM produced better overall balance between precision and recall while traditional machine learning when combined with TF-IDF could still produce satisfying results in sentiment analysis on real-world data.

Keywords: Sentiment Analysis, Naive Bayes, SVM.

Machine Learning-Based Prediction of Prospective Student Re-Enrollment Using Naive Bayes and KNN

Elly Yanuarti, Rahmat Sulaiman, Ellya Helmud, Anisah, Delpiah
Wahyuningsih, Tri Sugihartono

ABSTRACT

The increasing competition among higher education institutions requires universities to implement effective strategies to maintain student enrollment through improving the re-registration rate of prospective new students. One approach that can be applied is the use of machine learning technology to predict the likelihood of prospective students completing re-registration based on historical admission data. This study aims to compare the performance of the Naive Bayes and K-Nearest Neighbor (KNN) algorithms in predicting student re-registration. The dataset used in this study was obtained from new student admission data over a 10-year period, consisting of 4,901 records. Data processing was conducted using the RapidMiner application through several stages, including data selection, data cleaning, data transformation, classification, and model evaluation using the 10-fold cross-validation method. Performance evaluation was carried out using accuracy, precision, recall, and confusion matrix parameters. The dataset exhibits moderate class imbalance (3,216 re-enrolled vs. 1,685 non re-enrolled); this distribution was considered during model evaluation using recall and precision metrics. The results showed that the Naive Bayes algorithm achieved an accuracy of 84.78%, a precision of 79.61%, and a recall of 86.63%. Meanwhile, the KNN algorithm, with its parameter optimized to $k = 7$ through a grid search, achieved an accuracy of 84.00%, a precision of 77.97%, and a recall of 81.04%. Based on the testing results, the Naive Bayes algorithm demonstrated better performance than KNN in predicting prospective student re-registration. This study proves that the application of machine learning can assist higher education institutions in supporting decision-making related to new student admission strategies and improving the effectiveness of student re-registration.

Keywords: Machine Learning, Naive Bayes, KNN, Prediction, Student Re-registration, RapidMiner.

A Comparative Machine Learning Approach for the Classification of Regional Potential in Student Admissions Using C4.5 Decision Tree and Naïve Bayes

Anisah Anisah, Elly Helmut, Delpiah Wahyuningsih, Elly Yanuarti, Melati Suci Mayasari, Harrizki Arie Pradana

ABSTRACT

Identifying regional potential in student admissions remains a significant challenge for higher education institutions in optimizing recruitment strategies and resource allocation. This study conducts a comparative analysis of two widely used machine learning algorithms, namely the C4.5 Decision Tree and Naïve Bayes, to classify regional potential based on historical student admission data aggregated at the regional level. The dataset consists of historical region-based student admission data from 2021 to 2025 obtained from a higher education institution in Indonesia. The dataset comprises 30 regions, with attributes representing the number of admitted students in 2021, 2022, 2023, 2024, and 2025. Regional potential labels were determined based on the total number of admitted students during the 2021–2025 period, namely Low for totals of fewer than 30 students, Moderate for totals ranging from 30 to 99 students, and Potential for totals of 100 students or more. The class distribution consists of 25 regions (83.33%) in the Low category, 3 regions (10.00%) in the Moderate category, and 2 regions (6.67%) in the Potential category. Given the limited number of instances, this study is positioned as a pilot study and baseline analysis to evaluate the performance of both algorithms on region-based student admission data. The experiments were conducted using the RapidMiner platform with 10-fold cross-validation to obtain a more reliable evaluation. The experimental results show that the C4.5 model achieved an accuracy of 83.33%, with a weighted mean recall of 33.33% and a weighted mean precision of 31.11%. Meanwhile, the Naïve Bayes algorithm achieved an accuracy of 80.00%, with a weighted mean recall of 32.22% and a weighted mean precision of 33.33%. The confusion matrices of both models indicate the presence of class imbalance, with the Low class dominating the dataset and causing difficulties in accurately classifying the minority classes, namely Moderate and Potential. Although C4.5 achieved higher overall accuracy, Naïve Bayes produced a slightly higher weighted mean precision. However, both models still face challenges in identifying minority classes due to the imbalanced data distribution, which reflects student admission patterns across regions. These findings highlight the trade-offs between tree-based and probabilistic classification approaches in the context of educational data mining. The findings indicate differences in the characteristics of tree-

based and probabilistic classification approaches in the context of educational data mining. The results also provide practical insights for optimizing region-based student recruitment strategies, where the classification results can serve as input for determining promotional priorities for high-potential regions, more targeted promotional strategies for moderate-potential regions, and more selective promotional approaches for low-potential regions. The findings also indicate the need for further research to address the class imbalance problem, for example, through the application of resampling techniques. This study contributes to the application of machine learning in higher education management, particularly in region-based student admission analysis.

Keywords: C4.5, Naïve Bayes, classification, student admission, machine learning.

Comparative Analysis of Random Forest and Gradient Boosting for Forecasting Vegetable Oil Export Volume and Value: A Case Study of Bangka Belitung Province, Indonesia

Tri Sugihartono, Gusti Syarifudin, Rahmat Sulaiman, Elly Yanuarti, Fitriyani,
Benny Wijaya, Eza Budi Perkasa

ABSTRACT

The vegetable oil export sector is a principal driver of the non-tin trade revenue of Bangka Belitung Province, Indonesia, where Crude Palm Oil (CPO) and its derivatives account for 51.81% of total non-tin export value. This study presents a comparative analysis of four machine learning (ML) models—Random Forest (RF), Gradient Boosting (GB), Support Vector Regression (SVR), and Linear Regression (LR)—for simultaneous dual-target forecasting of vegetable oil export volume (thousand tons) and export value (million USD) using annual data from 2014 to 2024 ($n = 11$). A sliding-window sequence construction with lookback window $w = 3$ and Leave-One-Out Cross-Validation (LOOCV) are employed to ensure statistically rigorous evaluation under small-sample constraints. RF achieves the lowest LOOCV RMSE for volume prediction (34.845, MAPE = 12.68%), while GB outperforms all models for value prediction (RMSE = 33.335, MAPE = 9.42%). Recursive five-year forecasts project export volume in the range of 231.91–259.69 thousand tons and export value between USD 197.50–227.22 million for 2025–2029, providing actionable preliminary estimates for evidence-based regional economic planning. Given the limited sample size, results are interpreted as directional forecasting evidence subject to refinement as additional annual observations become available.

Keywords: Machine Learning; Random Forest; Gradient Boosting; Time Series Forecasting; Vegetable Oil Export; Palm Oil.

Persistence Blast Radius in Declarative and Imperative Operating Systems

Rezky Yuranda, Delpiah Wahyuningsih, Devi Irawan, Parlia Romadiana

ABSTRACT

Administrative compromise can allow attackers to establish persistence and modify system configurations even when preventive security controls are bypassed. This study investigates whether operating system architecture influences the operational impact of post-compromise modifications by comparing NixOS, representing a declarative architecture, and Debian GNU/Linux, representing an imperative architecture. A lightweight Persistence Blast Radius (PBR) framework is introduced to measure four dimensions: Persistence Survivability (PS), Configuration Drift Radius (CDR), Recovery Complexity (RC), and Integrity Restoration (IR). Three controlled scenarios were evaluated: executable resolution persistence, service-level persistence, and configuration drift. Observations were performed before modification, after modification, after reboot, after update or rebuild, and after recovery. Results show that persistence remained feasible in both systems across all scenarios. However, NixOS produced lower PBR scores (6–7) than Debian (7–10), primarily because declarative configuration centralized system changes and reduced configuration drift scope. The findings indicate that declarative architecture does not eliminate post-compromise persistence, but can reduce its operational blast radius and simplify recovery.

Keywords: Declarative Operating System, NixOS, Debian, Persistence Blast Radius, Post-Compromise Security, Cyber Resilience, Configuration Drift.

Edge-Based Aggregated DEFLATE Compression for Efficient IoT Sensor Data Transmission to Cloud

Widiyono; Riski Sulistiyarningsih; Ari Putra Wibowo

ABSTRACT

The growth in the adoption of the Internet of Things (IoT) is increasing the volume of sensor data transmitted from edge devices to the cloud. Continuous JSON-based transmission results in excessive bandwidth and storage consumption. This study evaluates an edge-side data aggregation scheme combined with DEFLATE lossless compression for the transmission of IoT sensor data to the Firebase Realtime Database. The system is implemented on an ESP32 microcontroller using DHT22 and HC-SR04 sensors; data is acquired every second, aggregated into a JSON buffer, then compressed and transmitted every 10 minutes. Unlike the previous studies that reported compression effectiveness based solely on the compressor's output size, this research explicitly distinguishes between the original JSON size, the binary size resulting from DEFLATE, and the payload size actually transmitted after transport encoding. Across four aggregation sizes (60, 120, 300, and 600 records), the compression ratio increased from 1.31 to 2.98, with a compression efficiency of 66.5% at 600 records. However, hexadecimal encoding doubles the payload size, reducing the effective savings to 33.0%, whereas Base64 retains 55.3% and raw binary transmission 66.5%; at 60 records, hexadecimal encoding actually results in a payload 52.4% larger than uncompressed JSON. Overhead at the edge was measured at 18.6–154.7 ms for compression time, 24.8–76.3 KB for memory, and 10.7–88.9 mJ for energy per batch, equivalent to 0.047% of the device's duty cycle. All differences in payload size and latency are statistically significant ($p < 0.001$). These findings confirm that the benefits of edge-side compression are achieved at a negligible computational cost, but are realized only if the transport encoding layer and the cloud storage model are co-designed.

Keywords: IoT; edge computing; DEFLATE compression; sensor data aggregation; payload encoding.

An Empirical Study on the Combinatorial Effects of Traditional Preprocessing in Transformer-Recurrent Hybrid Models

Ni Luh Indri Yuni, Dandy Pramana Hostiadi, Roy Rudolf Huizen

ABSTRACT

While the increasing use of pre-trained Transformer models has drawn less focus on text preprocessing in modern NLP studies, the role of such preprocessing techniques in the Transformer-Recurrent neural network-based models remains understudied. This work presents a systematic examination of eight methods of text preprocessing that integrate stopword filtering, stemming, and lemmatization for sentiment analysis with the help of a DistilBERT-BiGRU hybrid model applied on the IMDb review dataset. The simpler the preprocessing was, the better the classification results became, with the best hybrid model accuracy of 0.885 and an AUC-ROC of 0.952 being achieved with the stopword removal-only preprocessing method. According to the Friedman Test, there were statistically significant differences between the three architectures in their classification performance ($p = 0.0046$). Further Nemenyi testing revealed a statistically significant difference between DistilBERT and BiGRU ($p = 0.0033$), but no such difference between BiGRU and the hybrid model ($p = 0.1122$) or between DistilBERT and the hybrid model ($p = 0.4237$). This paper offers a statistical analysis of the preprocessing sensitivity for Transformer-Recurrent architecture, showing that the differences are largely due to architectural differences rather than preprocessing depth itself.

Keywords: sentiment classification, text preprocessing, DistilBERT-BiGRU, contextual embeddings, IMDb movie reviews.

Multi-Layer Perceptron Approach for Body-to-Clothing Mapping in Fashion E-Commerce

Andrew Yohanson, Evan Pahan, Ivan Edbert, Samson Ndruru

ABSTRACT

The problem of size discrepancies between different fashion brands remains a huge problem in online fashion retail. This often leads to poor customer satisfaction and a high rate of product returns. In this study, a Body-to-Clothing Mapping system based on the Multi-Layer Perceptron (MLP) neural network is proposed to predict clothing size from anthropometric measurements, such as height, weight and age. The dataset is built on the Kaggle clothing size prediction dataset and several preprocessing techniques to improve data quality and model reliability. A rule-based brand calibration approach is introduced to address size variation across brands, using a manually defined weight shift heuristic that is applied to a synthetically generated dataset for different brands such as Nike, Uniqlo, Zara, H&M, GAP, and Levi's. The results show that the proposed approach achieves a test accuracy of 95.5% and a cross-validation accuracy of 96.9% using a set of basic anthropometric features, indicating strong predictive performance within the defined feature space. From the feature importance analysis, it can be seen that the most influential features to predict clothing size are body mass index (BMI), height and weight. However, this model relies solely on height, weight, and age, without direct body measurements such as waist, hip, or chest circumference. Therefore, this model is positioned as a lightweight baseline system and not as a production-ready alternative to advanced 3D body mapping or clothing customization technologies.

Keywords: Clothing Size Prediction, Neural Network, Multi-Layer Perceptron (MLP), Fashion E-Commerce, Anthropometric Measurements, Machine Learning.

Predicting Wasting Nutritional Status in Children Aged 0–24 Months Using Support Vector Machine with Kernel Optimization

Agustina Mardeka Raya, Erfan Hasmin, Rahmat Sulaiman, Detin Sofia

ABSTRACT

Wasting, defined as low weight-for-height ratio in children, remains a critical public health challenge globally, particularly in developing nations such as Indonesia. Early and accurate identification of wasting status is essential for timely nutritional interventions that can prevent severe health consequences, including stunted cognitive development and increased child mortality. This study investigates the application of Support Vector Machine (SVM) with kernel optimization for classifying wasting nutritional status among children aged 0–24 months using anthropometric data. A dataset comprising 8,683 records was utilized, containing four key features: gender, age in months, height in centimeters, and weight in kilograms. The target variable was wasting status, categorized into four classes: Risk of Overweight, Normal Weight, Underweight, and Severely Underweight. Three kernel functions were systematically evaluated—Linear, Radial Basis Function (RBF), and Polynomial—using a grid search optimization strategy with 10 fold cross-validation implemented in RapidMiner Studio. Performance was assessed using accuracy, Cohen's kappa coefficient, weighted mean precision, weighted mean recall, and F1-score. Experimental results demonstrated that the Linear SVM kernel achieved the highest performance with an accuracy of 86%, kappa of 78%, precision of 82%, recall of 78% and F1 score of 80%. The RBF kernel followed with 85%, accuracy and F1-score of 71%, while the Polynomial kernel yielded the lowest performance at 68% accuracy and F1-score of 40%. These findings suggest that the linear decision boundary is most appropriate for this anthropometric classification problem, likely due to the relatively linear relationship between weight height measurements and wasting categories. The proposed approach offers a practical, interpretable tool for healthcare professionals and community health workers to support early nutritional screening and intervention programs in resource limited settings. .

Keywords: .

PREDICTING AIRCRAFT FUELING SAFETY WITH DATA MINING

Faris Febrianto, Eka Miranda

ABSTRACT

Air transportation requires strict safety procedures, particularly during aircraft refueling operations, where operational errors may increase the risk of incidents. This study develops machine learning models to predict aircraft refueling safety using 13,197 historical refueling transaction records and the CRISP-DM framework. Five classification algorithms—Random Forest, Decision Tree, Naïve Bayes, Support Vector Machine (SVM), and XGBoost—were evaluated under original and SMOTE-balanced data conditions using 5-fold and 10-fold cross-validation. The results show that XGBoost achieved the best performance on the original dataset with 99.86% accuracy, while SVM with SMOTE and 10-fold cross-validation achieved the highest overall accuracy of 99.91%. Feature-weight analysis of the best-performing SVM model identified UWC, Bonding Cable, CWD, and Lanyard/Safety Cone as the most influential predictors. These findings demonstrate the potential of machine learning to support aircraft refueling safety monitoring and decision-making.

Keywords: Refueling, safety, predictions, data mining.

Data-Driven Insights into Death Reporting Timeliness via Clustering Algorithms

Erfan Hasmin, Nurul Aini, Sitti Aisa, Asmah Akhriana, Sriwahyuningsih Piu, Suryani

ABSTRACT

Accurate and timely vital statistics are crucial for effective governance and public policy planning in the Indonesian Population Administration System. However, administrative bottlenecks, geographical barriers, and low public awareness frequently result in significant reporting delays at regional civil registry offices. This study aims to uncover hidden, meaningful patterns within mortality registration records to transition from generalized public administration assessments to data-driven, cluster-specific policy formulations. Utilizing an unsupervised machine learning approach, the K-Means clustering algorithm was applied to a refined dataset of 5,970 death records obtained from the Makassar City Civil Registry Office. The optimal cluster threshold was rigorously evaluated using both the Elbow and Silhouette heuristics across configurations ranging from $k=2$ to $k=7$. Both validation methods confirmed that a three-cluster configuration ($k=3$) provides the most robust architecture, yielding a peak silhouette coefficient of 0.593. Cluster 0 (3,833 records) captures timely registrations or minor latencies of 1–6 months, whereas Cluster 1 (1,799 records) isolates severe reporting delays ranging from 6 to over 24 months, and Cluster 2 encompasses 338 records distributed across all values. These stratification results equip public administrators with granular insights into reporting timelines, enabling targeted interventions and optimized resource allocation tailored to specific community behaviors.

Keywords: data-driven, civil registration, death reporting, clustering, k-means.

AI Chatbot Service Quality, Guest Trust, and Revisit Intention in Hotel Front Office Operations: The Mediating Role of Guest Satisfaction

Tiurida Lily Anita, Maria Pia Adiati, Aditya Pratomo, Vanessa Yovo, and Sylvia Samuel

ABSTRACT

AI chatbots are increasingly embedded in hotel front office operations for reservation inquiries, check-in information, room-related requests, and guest assistance. Their hospitality value depends not only on efficiency but also on whether guests perceive chatbot-assisted interactions as reliable, trustworthy, and satisfying. This study examines the effects of AI Chatbot Service Quality on Guest Trust, Guest Satisfaction, and Revisit Intention. A quantitative survey of 236 hotel guests with experience using chatbot-assisted or digital front office services was analyzed using Partial Least Squares Structural Equation Modeling. AI Chatbot Service Quality positively affects Guest Trust, Guest Satisfaction, and Revisit Intention; Guest Trust positively affects Guest Satisfaction and Revisit Intention; and Guest Satisfaction positively affects Revisit Intention. Guest Satisfaction also significantly mediates the effects of AI Chatbot Service Quality and Guest Trust on Revisit Intention. The findings position chatbots as part of the guest experience system rather than merely automation tools and highlight the managerial importance of accurate, responsive, secure, and service-aligned chatbot design. The study contributes to hospitality information systems literature by explaining how AI-enabled service quality strengthens trust, satisfaction, and revisit intention within room division operations.

Keywords: AI chatbot, AI-enabled service system, hospitality information systems, guest trust, revisit intention.

Comparative Analysis of Classical Machine Learning vs Deep Learning for Stock Price Prediction in Volatile Markets

Andrey Apriliady, Ezra Mayurga, Keanu Stadeva, Bakti Amirul Jabar, Rico Halim

ABSTRACT

Unpredictability in the market and the potential for events to happen that are entirely unexpected make predicting stock price changes in financial computing a challenging problem. Prediction is often treated as a regression problem and stock is usually analyzed separately. This paper chooses a different path. Prediction problems are treated as binary classification problems where the two outcomes are Up and Down and are tested against five models: Support Vector Machine, Random Forest, XGBoost, a Recurrent Neural Network and Long Short Term Memory. This is applied to ten stock exchanges globally which include equity, commodity, currency and crypto markets. The models are trained using daily data spanning 15 years from the year 2010 to the year 2025. To keep results honest, a strict chronological 80:20 split is enforced and normalization is done exclusively on training data. The results challenge a common assumption: deep learning does not consistently outperform classical methods in highly noisy environments. While all models struggled to significantly beat a random baseline (AUC-ROC ~ 0.50) due to extreme macroeconomic shifts in the 2022-2025 testing period, XGBoost demonstrated the highest relative stability with a mean F1-Score of 0.4540 and AUC-ROC of 0.5212, compared to LSTM's 0.3608 (McNemar's test, $p = 0.0015$). The Forex sector was the most predictable, while cryptocurrency was the hardest. These findings suggest that for short-term directional prediction using technical indicators under extreme volatility, well-regularized tree-based models offer more robustness than complex sequential networks. .

Keywords: stock market prediction, binary classification, machine learning, deep learning, LSTM, XGBoost, cross-sector analysis, volatile markets.

Stimulus-Organism-Response Analysis of Augmented Reality Features in Online Cosmetic Retails: The Role of Informativeness and Personalization

Bhakti Parashar, Lianna Wijaya, Tiurida Lily Anita, Rianto Nurcahyo, Made Irma Lestari and Novan Zulkarnain

ABSTRACT

This research explores how augmented reality (AR) informativity and AR personalization can influence utilitarian value, perceived enjoyment and purchase intention for Indonesian cosmetics e-commerce users. A sample of 379 individuals who have previously purchased cosmetics using an augmented reality (AR) tool were surveyed using a quantitative method. Using Structural Equation Modelling (SEM) within SmartPLS 4.0, both the measurement and structural models were analyzed. Results from the study showed that AR informativity and personalized AR significantly increase perceived enjoyment and utilitarian value, and that perceived enjoyment is the leading consideration of purchase intention. Although utilitarian values did contribute to consumer evaluations of purchases, their impact on purchase intention was small compared to perceived enjoyment. These research findings suggest that hedonic experiences are important when purchasing cosmetics through augmented reality (AR) technology. From a practical perspective, e-commerce websites should focus on providing informative, personalized, and interactive augmented reality (AR) features to improve consumer engagement and improve conversion rates. As such, beauty-tech developers are well-positioned to maximize conversion rates by creating interactive interfaces that provide experiential solutions for consumers.

Keywords: Augmented Reality, Cosmetic E-Commerce, Purchase Intention, Utilitarian Value, Perceived Enjoyment.

Hybrid Feature Engineering for Detecting Online Sales Fraud on Facebook: A Random Forest Evaluation

Irfhan Mappasomba, Santi, Muh. Syahlan Natsir, Wilem Musu

ABSTRACT

The rapid growth of social commerce platforms has increased the risk of fraudulent online sales, particularly on Facebook Marketplace. Unlike traditional financial fraud detection, which relies on transactional data, social commerce fraud detection remains underexplored in capturing informal language patterns and behavioral anomalies. Traditional approaches often rely on isolated feature categories, limiting their ability to capture multidimensional fraud patterns. This study proposes a hybrid feature engineering framework integrated with a Random Forest classifier to address this limitation. A simulated dataset of 1,500 samples with a 55:45 distribution was constructed using three feature categories: linguistic features, account metadata, and user engagement metrics. The model was trained using an 80:20 train-test split. Experimental results show that the Random Forest classifier achieves 91.67% accuracy, 94.29% precision, 88.59% recall, and 91.35% F1-score, with an ROC-AUC of 0.9682. Feature importance analysis identifies text length and account age as important predictors. These findings demonstrate the effectiveness of the proposed multidimensional feature representation and support explainable moderation in social commerce environments.

Keywords: Fraud Detection, Random Forest, Facebook Marketplace, Hybrid Feature Engineering, Machine Learning.

Improving Multi-Class Bird's Eye Chili Ripeness Detection Using YOLOv8s Under Moderate Class Imbalance Conditions

Aldi Rifaldi Saputra; Eka Miranda;

ABSTRACT

Determining the correct ripeness level is crucial when sorting bird's eye chili peppers after harvest, especially if there are not enough samples for each ripeness level. This study examines how well YOLOv8s performs in detecting various levels of maturity in bird's eye chili peppers and tests how random oversampling focused on Class-C affects its performance. Dataset contain 812 pictures, showing five different levels of maturity labeled A to E, was gathered using smartphones under different lighting and image-taking conditions. The dataset was split into an original dataset and a Class-C oversampled dataset. The dataset was split into an original setup and a Class-C oversampled setup. The oversampling process included making copies of images that contain Class-C objects, which increased the number of Class-C objects from 512 to 1.024. Because some picture had more than one chili objects from different maturity levels, this also made the numbers of other classes that appeared together increase, despite not being the target class. Precision rose from 0.741 to 0.793, F1-Score from 0.74 to 0.76, and mAP@50 from 0.794 to 0.797, while Recall, mAP@50-95, and mean ROC-AUC fell. The greatest improvement in average precision occurred with class B rather than with class C, suggesting that the Class-B oversampling impacted classes beyond the targeted Class-C. Consequently, it is possible to improve the results for the oversampled classes by targeting and oversampling them. However, it is important to remember that this approach could affect the overall performance of the model on other classes within an agricultural dataset.

Keywords: Bird's Eye Chili, YOLOv8s, Object Detection, Ripeness Classification, Class Imbalance, Oversampling.

Hybrid Deep Autoencoder and Temporal Convolutional Network (TCN) for Anomaly Detection in Encrypted Traffic

Jahns Lewi Gerrard Naibaho, Alfi Yusrotis Zakiyyah, Ayu Maulina

ABSTRACT

Conventional intrusion detection systems (IDS) depend on deep packet inspection (DPI) to identify malicious behavior in network traffic. However, as encryption protocols such as TLS 1.3 have become standard, DPI can no longer read packet payloads, rendering this approach largely obsolete. To work around this, we combine a deep autoencoder with a temporal convolutional network (TCN) to detect anomalies in encrypted traffic without decrypting the payloads. The two parts are connected directly: the autoencoder compresses statistical flow metadata into compact latent vectors and sets an unsupervised anomaly threshold from reconstruction error, and the TCN then uses those vectors to model temporal relationships between consecutive flows and decide whether a sequence is anomalous. We evaluate the approach on the CIC-IDS2017 benchmark. Because large network datasets are computationally heavy, we train and validate on a 225,745-flow subset taken from the Friday Afternoon DDoS partition. On the held-out test set, the hybrid model reaches an F1-score of 99.42% with 99.75% recall, far above the autoencoder-only baseline at 0.00% F1 and close to a fully supervised random forest baseline at 99.92% F1. The hybrid approach, however, is more likely to generalize to unseen attack types. An average inference latency of 0.0260 ms per flow shows the architecture can run in real time.

Keywords: Encrypted Traffic, Anomaly Detection, Deep Autoencoder, Temporal Convolutional Network, Intrusion Detection System, Cybersecurity.

Early Detection of Diabetes Mellitus Using Medical Data and Lifestyle Factors via Machine Learning

Anastasia Pramono; Alexander Agung Santoso Gunawan; Rilo Chandra Pradana

ABSTRACT

Diabetes Mellitus remains a leading cause of global morbidity and long-term complications, making early and accurate prediction essential for effective clinical intervention. This study evaluates four supervised machine learning models: Random Forest, Support Vector Machine, K-Nearest Neighbors, and Logistic Regression, for a multi class task that separates non-diabetic, pre-diabetic, and diabetic individuals. The dataset comes from 253,680 survey records drawn from the 2015 Behavioral Risk Factor Surveillance System BRFSS. Because of severe class imbalance, Synthetic Minority Over-sampling Technique (SMOTE) is applied only to the training set after stratified train-test splitting, while the test set remains unchanged. The outcomes suggest Random Forest reaches the best overall accuracy, 83.12%, while Logistic Regression seems to deliver the strongest combined recall, 0.52. The results show a trade-off between overall accuracy and minority-class sensitivity, with pre-diabetic cases remaining the most difficult to classify. These findings demonstrate the potential of combining medical and lifestyle factors for diabetes risk classification while highlighting the need for further external validation.

Keywords: Diabetes Mellitus, Early Detection, Machine Learning, Multi-class Classification, Lifestyle Factors, Class Imbalance .

Machine Learning-Based Demand Forecasting for Perishable Food Distribution in Dynamic Urban Market Environments

Mas Ayoe Elhias Nst, Syahril Efendi, Sutarman, Poltak Sihombing

ABSTRACT

Demand forecasting for distribution of perishable vegetables is important. Forecasting errors can lead to stock outs, overstocking, inferior quality and greater food waste. While this is significant, there is not much data from the actual world on the effectiveness of machine learning in enhancing demand forecasting in the Indonesian urban vegetable logistics. In this paper we attempt to fill this vacuum by focusing on Medan Marelan. We developed a forecasting framework using local demand records and temporal feature engineering, and tested multiple machine learning models. We collected 1781 historical data on demand of vegetables and generated 38 prediction variables based on observation of distribution operations in Medan and Medan Marelan. Our methods used are: data cleaning, missing values and duplicates management, data exploration, creation of new calendar features, 14 lag variables, rolling-window statistics, time-based train/test data partitioning, feature scaling, hyperparameter tweaking with grid search and model evaluation. Implementation was done in Python using pandas, scikit-learn and LightGBM. The Support Vector Regression (SVR) and LightGBM were tested using the MAE, RMSE, MAPE and R2 metrics. SVR performed better MAE = 4.42, RMSE = 5.78, MAPE = 5.81% and R2 = 0.944 LightGBM: MAE = 7.55, RMSE = 9.65, MAPE = 10.26 %, R2 = 0.845. The results show that a kernel based model can perform better than a boosting model for moderate size datasets where the temporal variables capture recent demand trends. The study gives important insights for inventory planning, demand-driven distribution and reduction of food waste in urban logistics in Indonesia.

Keywords: demand forecasting, perishable food logistics, machine learning, support vector regression, LightGBM, urban logistics, Indonesia.

A Data-Driven Framework for AI-Assisted Batik Design Innovation in Indonesian SMEs

Danny Bramantyo, Albert Mahendra Hario Broto, Kevin Anggileo, Aldian Nurcahyo

ABSTRACT

Batik SMEs in Indonesia often rely on owner experience when making motif and production decisions. Historical sales records are available but are not always used systematically. This study uses 24 months of point-of-sale data from Pesona Batik Jombang, covering 1,525 transactions and 19 motif categories. The workflow combines clustering, association analysis, and a Two-Stage Hurdle Random Forest to address sparse and irregular demand. The forecasting component achieved an R^2 of 0.7559 and an MAPE of 18.24% on the test set. These forecasts were then used in a simplified Multi-Criteria Decision Analysis (MCDA) scoring process to rank production priorities and support motif exploration with Generative AI. The generated concepts were reviewed by cultural experts for consistency with relevant batik characteristics, while usability testing with SME participants produced a System Usability Scale (SUS) score of 80.41, rated as excellent. The work is an engineering implementation of an integrated decision-support workflow rather than a new algorithm. Its main contribution is the connection of market evidence, production priorities, and AI-assisted cultural design support within a single workflow, while leaving final design decisions to human users.

Keywords: business analytics, batik SMEs, predictive analytics, generative AI, decision support systems.

Random Forest-Based Detection of Phishing E-mails Using Feature-Engineered Machine Learning Attributes

Budi Triandi; Lili Tanti; Intan Dwi Rahma; Ilham Ramadan

ABSTRACT

Phishing e-mail continues to pose a significant cybersecurity threat by impersonating trusted entities to deceive users into disclosing sensitive information. This study investigates the effectiveness of a Random Forest classifier trained on feature-engineered e-mail attributes to detect phishing messages. The dataset comprised 524,846 e-mails with numerical features such as word counts, unique words, stopwords, links, domains, e-mail addresses, spelling errors, and urgency keywords; after removing duplicates, 205,052 instances remained and were split into training and testing sets at a 70:30 ratio. The model achieved an overall accuracy of 97.12 percent and an ROC-AUC score of 0.81. Analysis of the confusion matrix indicated high reliability in identifying safe e-mails, while the recall for phishing e-mails remained low due to severe class imbalance. These findings demonstrate that Random Forest offers a strong baseline for feature-based phishing detection, but further strategies to address class imbalance are required to improve phishing-class sensitivity.

Keywords: cybersecurity; phishing e-mail; machine learning; Random Forest; classification; feature engineering; imbalanced data.

Comparative Performance Analysis of JavaScript REST APIs with Prisma ORM and MariaDB in a Controlled Environment

Andrew Putra Arinardi; Evan Kimelim; Alexander Agung Santoso Gunawan;
Rilo Chandra Pradana

ABSTRACT

This research evaluates four JavaScript REST API frameworks: Express, Fastify, NestJS, and ElysiaJS, with MariaDB as the database and Prisma as the ORM. Each application was developed and run in an isolated environment. The frameworks were evaluated across latency, 95th percentile response time, and throughput under varying concurrency levels. The results showed that ElysiaJS performed the best in GET requests (301ms), followed by Fastify (305ms), Express (317ms), and NestJS (320ms). However, the difference represented only a marginal performance improvement. Out of 320.8ms, the framework only accounted for a small 5.95% (19.1ms) performance difference. Furthermore, the rankings were unstable with high variance in POST requests. The results highlighted that framework selection alone may not be the dominant factor in performance, suggesting that the database and ORM layer, rather than the framework itself, is the primary performance bottleneck.

Keywords: REST API, Prisma, MariaDB, NodeJS, performance comparison.

A Conditional Evaluation of Large Language Models for Enhancing Neural Recommender Systems in Personalized Movie Recommendation Tasks

Muhammad Akmal Fairuz, Muhamad Rifki Ramdani, Raihan Satya Natha Hamzah, Dany Eka Saputra

ABSTRACT

This paper presents a reproducible implementation for evaluating large language models (LLMs) as metadata-aware rerankers in personalized movie recommendation. The implementation trains five RecBole recommenders, namely BERT4Rec, NeuMF, LightGCN, SimpleX, and RecVAE, on positive MovieLens ml-latest-small interactions. Ratings of at least 4.0 are treated as implicit positive feedback, while the complete rating history is retained for inference-time filtering and LLM profile construction. Saved neural checkpoints generate a fixed candidate list, and an OpenAI-compatible chat-completions model reranks only those candidates through a constrained `get_movie_metadata` tool backed by TMDB metadata. The benchmark compares neural ordering and LLM ordering over the same candidate set using `Hit@10` and `NDCG@10`, with candidate recall, hit transitions, bootstrap confidence intervals, cache-aware execution, and token usage estimates recorded as experiment artifacts. Its distinctive contribution is a controlled comparison of one metadata-aware reranker across five neural architectures under a fixed protocol. Retrieval and reranking are evaluated separately, so errors from candidate generation are not mixed with the LLM's ordering behavior. In this work, LLM reranking is treated as a second-stage module, not as a replacement for collaborative retrieval.

Keywords: movie recommendation, recommender systems, large language models, neural recommender systems, reranking, RecBole, MovieLens, TMDB, candidate generation.

Aspect Count-Guided Adaptive Top-K Correction for Multi-Aspect Sentiment Analysis in Hotel Reviews

bayu yanuargi, ema utami, kusrini, arli aditya parikesit

ABSTRACT

Aspect-Based Sentiment Analysis is important for extracting fine-grained customer insights from hotel reviews, where a single review may contain multiple aspects with different sentiment polarities. Existing multi-label aspect detection methods commonly rely on calibrated probability thresholds or fixed Top-K selection, which do not explicitly use the predicted aspect count to guide inference when aspect density varies. This study proposes an Aspect Count-Guided Adaptive Top-K Correction mechanism as an inference-stage stability and fallback strategy. The framework employs a multi-task BERT-BiLSTM architecture with three prediction heads for aspect detection, aspect count prediction, and aspect-level sentiment classification. During inference, calibrated thresholding first determines the active aspect set. When the number of detected aspects is lower than the predicted count, Adaptive Top-K selectively adds the highest-probability inactive aspects until the predicted aspect density is reached. Experiments compare Threshold Only, Fixed Top-K, and Adaptive Top-K across Location, Service, Price, and Other aspects. Threshold Only and Adaptive Top-K achieve identical best performance, with micro-F1 of 0.9388, macro-F1 of 0.9382, and recall of 1.0000. Adaptive Top-K therefore does not outperform the optimized threshold baseline, but provides a count-aware fallback mechanism expected to be useful when thresholding under-detects active aspects, while avoiding the degradation observed with Fixed Top-K.

Keywords: ABSA, BERT, BiLSTM, Sentiment, Hotel.

Comparative Sentiment Analysis of BPJS KRIS Using TF-IDF, FastText, and BERT with Naive Bayes and Class Balancing

I Gede Oka Permana Putra, Gede Angga Pradipta, Roy Rudolf Huizen

ABSTRACT

The rapid expansion of social media platforms, particularly Twitter, has enabled the public to respond directly to public policies, including the implementation of Kelas Rawat Inap Standar (KRIS) by Badan Penyelenggara Jaminan Sosial (BPJS) Kesehatan. This study compares three text representation techniques, namely Term Frequency-Inverse Document Frequency (TF-IDF), FastText, and Bidirectional Encoder Representations from Transformers (BERT), for sentiment analysis of public opinion toward BPJS KRIS using the Naive Bayes classifier. The dataset consisted of 738 Indonesian tweets after preprocessing. BERT embeddings were derived from a pretrained IndoBERT model used as a fixed feature extractor, without finetuning, and classified using Gaussian Naive Bayes. The dataset was collected using Tweet Harvest, manually labelled by a linguist, and processed through text preprocessing stages. fifteen experimental configurations were evaluated by combining text representation methods, Principal Component Analysis (PCA), Synthetic Minority Oversampling Technique and Edited Nearest Neighbours (SMOTEENN) and SMOTETomek. The results indicate that the combination of TF-IDF and SMOTETomek obtained the best overall performance, with 61% accuracy, 54% macro precision, 60% macro recall and 54% macro F1-score. However, the results of SMOTEENN are relatively unstable, with severe degradation of recall for the majority class under TF-IDF. These results demonstrate the importance of resampling methods selection in the performance of sentiment classification for imbalanced Indonesian Twitter data and that simple feature-based representations are still competitive to embedding-based representations if supported with an appropriate conservative class-balancing technique.

Keywords: BPJS KRIS, Sentiment Analysis, TF-IDF, FastText, BERT, Class Imbalance.

Ball-Plate Balancing Robot With PID and FeedForward Algorithm

1st Marcellino Adhiwono, 2nd Heikal Ghazni Ibrahim, 3rd Hans Hendyanto,
4th Boby Siswanto

ABSTRACT

Abstract— Ball-Plate Balancing robots remain a challenging research topic, alongside advances in hardware and software technology. This study develops and optimizes a low-cost Ball-on-Plate Balancing Robot using PID and FeedForward control algorithms. The proposed system reduces financial overhead by using standard commercial off-the-shelf (COTS) components while applying control strategies comparable to those used in previous studies. The performance of a standard PID controller is compared with a combined FeedForward-PID method for steady balancing. Experimental results show that PID-only control produces maximum overshoots of 18.056% on the x-axis and 23.448% on the y-axis, indicating its limitations in handling the system's nonlinear dynamics. By integrating FeedForward compensation with PID control, maximum overshoot is reduced to 16.875% and 19.655% on the x- and y-axes, respectively, with steady-state errors of 3.845% and 8.147%. Despite using low-cost components, the combined FeedForward-PID controller effectively improves overall tracking performance despite these limitations.

Keywords: Keywords—PID, FeedForward, balancing robot, accuracy, sensor.

Integrating Global and Local Explainable Artificial Intelligence for Enhancing Transparency in Financial Fraud

Ivander Agung Saptono, Nararya Effendy, Prabowo Wahyu Sudarno, and
Muhammad Rizki Nur Majiid

ABSTRACT

The increasing reliance on complex black-box machine learning models for financial fraud detection in banking security has created a transparency crisis. Demonstrated by high profile cases of algorithmic bias such as the 2019 Apple Card investigation and legal challenges of meeting “right to explain” requirements under regulations like General Data Protection Regulation (GDPR). While complex models like deep learning improve the accuracy of fraud detection, the opaque nature hides their internal decision making processes, risking legal penalties and making audits more complicated. Addressing this transparency risk, this study introduces a Dual-Perspective Explainable Artificial Intelligence (XAI) framework utilizing Local Interpretable Model-agnostic Explanations (LIME) for real time local diagnostics of individual transactions and SHapley Additive exPlanations (SHAP) for establishing global validation, ensuring systemic fairness and regulatory compliance. By utilizing the Synthetic Minority Over-sampling Technique (SMOTE) to resolve data imbalances, the system realizes a substantial gain in predictive quality, elevating precision from a baseline of 0.02 to a 0.44. This strategy highlights that incorporating active transparency tools is vital for aligning sophisticated detection capabilities with the rigorous accountability standards of the contemporary financial landscape.

Keywords: Banking Security, Explainable AI (XAI), LIME, SHAP, SMOTE, Fraud Detection, Global Interpretability, Local Interpretability, Regulatory Compliance, Black-box Models.

Dynamic Range Quantization for Vision-Based Parking Detection on Resource-Constrained Edge Infrastructure

Aviel Aquino, Jayson Prasada Siswoyo, Ivan Sebastian Edbert, Samson Ndruru

ABSTRACT

Computations and memory requirements of convolutional neural network (CNN) for parking occupancy detection in edge devices with limited resources are high. This work compares the performance of model compression method on MobileNetV3-Large trained on PKLot and evaluated under sunny, overcast and rainy weather conditions using Dynamic Range Post-Training Quantization (PTQ), Quantization-Aware Training (QAT) and unstructured magnitude pruning. Dynamic Range PTQ achieved baseline accuracy (96.78% vs. 96.50%, not measurably different at the $p = 0.37$ level of significance using McNemar's exact test) while reducing model size by $3.64\times$. The latency effect was found to depend on architecture: it is $1.53\times$ slower than full precision on x86-64 with AVX-512 host architecture, but $1.28\times$ faster on ARM64. QAT achieved the highest accuracy observed (98.06%) but converged in only three of four runs, and standard TFLite export reduced it to 64.89% through double quantization. Unstructured pruning reduced neither size nor latency on either architecture, and accuracy fell to 88.56% at 50% sparsity. The benefits of compression must be demonstrated on the target instruction set, not assumed from development hardware.

Keywords: Model Compression, Post-Training Quantization, Edge Computing, Parking Occupancy Detection, Environmental Robustness, MobileNetV3.

Portfolio Optimization Models: Traditional Markowitz, Dynamic Markowitz, and Reinforcement Learning Approaches on Stock and Cryptocurrency Asset

Rachmat Prasajo, Joseandrew Chrisma Winanta, Weninggalih Ciesa Kuadrilion

ABSTRACT

Fat-tail risks and extreme volatility in cross-asset hybrid portfolios are frequently missed by conventional portfolio optimization models, such as Mean-Variance, despite their assumption of linear relationships and normal asset returns. The expansion of the digital financial ecosystem and the extreme volatility of cryptocurrency assets necessitate the use of adaptive portfolio management strategies. This study evaluates and compares three portfolio optimization models on a hybrid portfolio of significant cryptocurrency assets and Indonesian blue-chip stocks over the preceding five years using the Proximal Policy Optimization algorithm: Static Markowitz, Dynamic Markowitz, and Deep Reinforcement Learning. Model performance is evaluated using CAGR, volatility, Sharpe ratio, and Maximum Drawdown during various crisis periods between 2022 and 2024. The results show that Dynamic Markowitz is the best at lowering risk during market crashes with the lowest Maximum Drawdown, while Static Markowitz generates the highest long-term cumulative returns by avoiding overreaction to short-term volatility. However, it has been shown that the Deep Reinforcement Learning agent can make dynamic adjustments without relying on traditional statistical estimation, offering robust protection against fat-tail risk in digital assets.

Keywords: Portfolio Optimization, Dynamic Markowitz, Deep Reinforcement Learning, Proximal Policy Optimization, Crypto Assets, IDX Stocks.

Stacking Transformer Architectures for Robust Sentiment Analysis of Indonesian Financial Slang

Jerome Maxcellino Budianto, Gabriella Annabelle Antoniette, Muhamad Ilham Putra, Bakti Amirul Jabar, Rico Halim

ABSTRACT

Finance and investment are growing rapidly in Indonesia, but it is still hard to analyse the community sentiment wherein the discussion forum they like to use slang, code mixed, and informal expressions. Previous studies have been conducted, and the results are showing the sign of severe overfitting, where the training data achieved 99%, but the test only got 68%, with the 31% difference showing that the model failed to generalise financial slang. We proposed a two-tier stacking ensemble model where we use 3 different BERT models as base learners, which are IndoBERT, IndoBERTweet, and XLM-RoBERTa. For the preprocessing, we used a selective normalisation; this strategy keeps important financial slang such as "cuan", "HAKA", and "serok" and then validates using a 5-fold stratified. Our experiment result showed that we can beat the best single-based learner, which is IndoBERTweet (F1: 0.7289). When our framework result is being compared to soft voting baseline (F1: 0.7451, ± 0.0201), our ablation study showed that there's a trade off between performance and stability where meta learner XGBoost can achieve the same f1 as baseline which 0.7451, but with lower variance (± 0.0153). On the other hand, logistic regression produces a smaller overfitting gap (0.0006) with a competitive F1 score of 0.7424. This result shows that the choice of meta-learner is important during an experiment stacking ensemble. The best choice depends on what we want, whether it is predictive performance or generalisation stability.

Keywords: Sentiment Analysis, Indonesian Financial Slang, Stacking Ensemble, Transformer, IndoBERT, IndoBERTweet, XLM-RoBERTa, Selective Normalization, Meta-Learner, Natural Language Processing.

IoT-Based Automated Poultry Farm Monitoring & Control System

Adil Setiawan

ABSTRACT

The poultry industry requires effective management of temperature, humidity, ventilation, and feed to maintain poultry growth and productivity. Manual monitoring is time-consuming and can lead to delays in responding to changing conditions. This research developed an IoT-based poultry farm management system capable of monitoring environmental conditions and feed in real-time, automatically controlling parameters, storing data in the cloud, and issuing alerts when conditions exceed predefined limits. The system has been implemented and tested directly in a poultry farming environment under actual operating conditions. It measured temperature, relative humidity, ammonia concentration, and feed level, and it controlled ventilation, humidification, cooling, and feed dispensing based on predetermined values. During the measurement period, temperature ranged from 25 to 29°C, relative humidity ranged from 55 to 68%, ammonia concentration ranged from 10 to 20 ppm, and feed level ranged from 25 to 100%. The average time required for the system to detect high temperature, low relative humidity, high ammonia, and low feed level was 2, 3, 2, and 4 s, respectively. The findings show that the implementation of automated environmental and feed sensing and actuator control at the prototype stage is feasible. Unlike works focusing mainly on monitoring of environmental parameters or the implementation of just one kind of poultry farm process control, our work presents a prototype that integrates both environmental and feed parameter sensing, actuator control, cloud data logging, and user alerting for poultry farm management. However, no data on bird mortality rate, feed conversion ratio, power usage, reduction of man-hours, accuracy of sensors compared to reference instruments, and its impact on long-term production outputs were measured in the current work. Hence, assertions regarding economic savings and improved productivity should be limited to the capabilities and response performance of the proposed system.

Keywords: IoT, Poultry Farming, Smart Agriculture, Automation, Precision Livestock Farming.

Optimizing Stroke Prediction Performance using Synthetic Minority Over-sampling Technique and Grid Search Cross Validation

Catherine Averina Johan, Praya Zahwaa Ananda, Kenneth Christian Yapri and Jeffrey Junior Tedjasulaksana

ABSTRACT

Stroke is one of the leading causes of death and disability in the world and early and accurate prediction is critical for preventive healthcare. We used a healthcare dataset which consists of 5110 records and applied supervised machine learning algorithms to predict the probability of a patient having a stroke. We used robust preprocessing of data methods and tackled the significant class imbalance problem using Synthetic Minority Over-sampling Technique (SMOTE). We used four different classification models, namely Random Forest, Logistic Regression, K-Nearest Neighbors (KNN) and Support Vector Machine (SVM). Random Forest had the highest overall accuracy at 91.78% but was poor at identifying true cases of stroke. Logistic Regression was selected as the most appropriate model because of its better baseline recall of 76%, which is important to minimize life-threatening false negatives. The Logistic Regression model was further tuned using GridSearchCV with balanced class weight, achieving a cross-validation recall score of about 86% on the training set and a recall of 80% (40 out of 50 actual stroke cases detected) on the held-out test set. These metrics support the preliminary reliability of the model as an aggressive initial clinical screening tool, but formal clinical integration remains dependent on future external validation on multi-center cohorts and prospective clinical trials.

Keywords: Stroke Prediction, Machine Learning, SMOTE, Logistic Regression, Imbalanced Data, Recall Optimization.

Benchmarking Modern Object Detectors for Real-Time Traffic Density Estimation in Intelligent Traffic-Light Control

Darlyn Meinardy, Ivan Sebastian Edbert, Devi Fitriannah

ABSTRACT

Urban congestion is a major problem for today's large cities, making it important to develop smart traffic management systems that can estimate traffic density in real time. This study focuses on identifying the best models for real-time traffic density estimation, focusing on two main object detection methods, Convolutional Neural Networks (YOLOv8, YOLOv9, YOLOv12) and Vision Transformers (DINO, YOLOs). To overcome the limitations of standard detection metrics, the BoostTrack multi-object tracking algorithm is utilized, along with custom kinematic filtering and stability metrics designed for this task. Models are tested in PTV Vissim, a simulated traffic environment, with vehicle volumes of 500, 1000, and 1500, to assess the trade-off between computational efficiency (measured by FPS and latency) and density estimation. Count Stability Ratio (CSR) and Density Standard Deviation (σ) are appear as metrics to measure signal jitter. The experimental results prove that CNN models, such as YOLOv8n, are lightweight models, achieving the highest throughput (about 11.86 FPS), while YOLOv9c provides reliably stable counts ($\sigma \approx 0.55$), even during heavy traffic. In contrast, the Transformer model DINO offers strong global context reasoning, with higher computational latency (about 1.8 s). This study concluded with a full framework that connects raw perception to accurate density measurement and offers practical guidance for creating vision-based adaptive traffic control systems.

Keywords: Real-time Object Detection, YOLO, Vision Transformers, Traffic Density Estimation, Multi-Object Tracking, PTV Vissim, BoostTrack.

Comparative Deep Learning Models for Binary-Class Sickle Cell Disease from Microscopic Blood Smear Images

Heinrich; Giovan Fernandes; Alexander Agung Santoso Gunawan; Rilo Chandra Pradana

ABSTRACT

Sickle cell disease occurs when a mutation in a hemoglobin gene forces red blood cells to deform into a sickle-like structure that is crescent moon- and rod-like.[1]. Currently in the field settings the diagnosis still depends on manual microscopy review of blood smear. This process is time-consuming, laborious and suffers from high inter-examiner variability. In this study we evaluated the performance of three learning-based CNNs architectures; ResNet50, EfficientNetb0 and MobileNetV2 to determine if they could provide an alternative solution. We began with a dataset of 569 images from patients recruited in Eastern Uganda. Using augmentation techniques (flip, rotation, brightness), we expanded this dataset to over 1764 images. Ensuring a balanced dataset for training. The images were resized to 224 X 224 pixels and split into train, validation, and test subsets at ratio of 70:20:10 respectively. The models were initialized with weights pre-trained on ImageNet, and trained further on the blood smear dataset. ResNet50 showed the highest performance overall with an accuracy of 95% and a F1-score of 0.95, MobileNetV2 followed closely at 94.35% accuracy with a F1-score of 0.9434 while achieving the fastest on-device inference latency of 5.15 ms per image and a compact 15.06 MB, having less computational demand making it ideal for deployment in low powered devices. EfficientNetB0 came in last with 92% accuracy. However, it had the highest recall rate of 0.97 suggesting that it has high sensitivity in detecting SCD which could be useful in screening scenarios. Grad-CAM showed that all networks were focusing on regions of the cell that are consistent with sickled cells. This study lays the foundation for using CNNs as one possible alternative for automated sickle cell detection.

Keywords: Sickle cell disease, CNNs, ResNet50, MobileNetV2, EfficientNetB0, blood smears, Grad-CAM, Explainable AI, Medical Image Analysis.

Analysis of Hematological Parameter Contributions in Acute Myocardial Infarction Classification Using Permutation Feature Importance

Melodiel Patria Bokko, Muhammad Fadlan Hidayat

ABSTRACT

Acute Myocardial Infarction (AMI) is a critical cardiovascular condition characterised by a complex inflammatory and thrombotic response, the changes of which are reflected in hematological parameters. This study aims to analyse the contribution of hematological parameters in AMI classification using a machine learning-based approach. Three models employing different learning approaches, namely Random Forest, Logistic Regression, and Multilayer Perceptron, were constructed and evaluated using the Permutation Feature Importance (PFI) technique to analyse the contribution of each hematological parameter. The results show that NEU, PDW, MPV, EO, and HCT consistently emerged as contributing features across all three models, consistent with the clinical role of these parameters in the inflammatory and thrombotic processes underlying AMI. The consistency of these findings across different machine learning approaches reinforces the computational validity of these features. Following feature selection, the Random Forest model achieved the highest accuracy among the three models at 86%, confirming that the selected features retain good predictive capability. This study contributes a data mining perspective that computationally validates the relevance of hematological parameters to the physiological changes associated with AMI.

Keywords: Acute myocardial infarction, hematological parameters, machine learning, feature importance, data mining.

Price Forecasting of Major Forex Pairs Using ARIMA, LSTM, and Hybrid Model with Web-Based Visualization

Laurentius Brandon Vikario, Mikhael Celieano, Antony Wijaya, Reina Setiawan

ABSTRACT

This research highlights the performance of the ARIMA, LSTM, and ARIMA-LSTM hybrid model using a residual learning method to predict the prices of foreign forex indexes against Indonesian Rupiah. The data went through a complete CRISP-DM framework cycle up to deployment stage. This research found that despite the hybrid model combining the versatility of ARIMA to handle immediate data and the robustness of LSTM to handle larger data, LSTM alone achieved the highest overall performance. Furthermore, hyperparameter tuning resulted in degraded performance due to a bias-variance trade-off. The evaluation also revealed that the residual learning method was not giving satisfactory performance improvement. Finally, the deployment of the web-based visualization dashboard of this research yielded an aggregate user satisfaction score of 4.06 out of 5 from 100 respondents. This score shows the comprehensibility and usability of the dashboard.

Keywords: Forex, CRISP-DM, ARIMA, LSTM, Hybrid Models, Data Mining, Machine Learning, Deep Learning, Dashboard.

Explainable Stacking Ensemble for Mushroom Toxicity Classification with SHAP Interpretability

Lili Tanti, Santi, Budi Triandi, Leonyta Trianingrum, Khairun Dini, Romi Antoni

ABSTRACT

Mushroom toxicity categorisation is an important safety duty, miscalculation of which may lead to deadly poisoning. In this paper, we present an Explainable Stacking Ensemble by combining three heterogeneous base-learners Gaussian Naive Bayes (NB), Decision Tree (DT) and Deep Neural Network (NN) with a Logistic Regression meta-learner trained using Out-of-Fold (OOF) 5-Fold Cross-Validation. We test the system on two datasets: the UCI Mushroom 1987 benchmark (8,124 samples, 22 categorical features) and the Secondary Mushroom 2021 dataset (61,069 samples, 20 mixed features, missing values up to 94.8%). On the more realistic Dataset 2, Soft Voting fails because of the weak Naive Bayes learner (60.77% accuracy) that pushes the ensemble average down to 93.92% below the best single base learner. Stacking helps in overcoming this constraint by learning adaptive weights. The meta-learner gives low weight to NB, medium to DT and high to NN, which results in an accuracy of 99.92% and AUC of 1.0000 for Dataset 2, exceeding all baselines. We use SHAP based interpretability to make each step of the pipeline trustworthy, i.e. KernelSHAP for NB, TreeSHAP for DT, GradientSHAP for NN and LinearSHAP for the meta-learner. For each base learner on Dataset 1 the most dominant feature is the odour, but, when SHAP values are summed over models, the most consistent important features are gill-color and gill-size, and the most influential features on Dataset 2 are stem-surface and stem-width. This work indicates that stacking with full SHAP interpretability across all ensemble levels results in not only higher classification performance, but also transparent, trustworthy decision making for mushroom safety evaluation.

Keywords: mushroom toxicity classification, stacking ensemble, Naive Bayes, Decision Tree, Neural Network, SHAP, explainable AI, out-of-fold cross-validation.

Hybrid CNN–Vision Transformer for Three-Class ACL Injury Classification in Knee MRI with Attention-Guided Full-Slice Analysis

Michael Wijaya, Nikolas Aesculapius, M. Alif Rinaldi, Muhammad Fikri Hasani, Andien Dwi Novika

ABSTRACT

Anterior cruciate ligament (ACL) injuries are common knee disorders, and MRI is widely used for non-invasive assessment. Most deep learning studies focus on binary tear detection or rely on manually defined regions of interest (ROIs). This study evaluates a hybrid convolutional neural network–Vision Transformer (CNN–ViT) for three-class ACL classification (intact, partial tear, and complete rupture) and an attention-based full-slice alternative that reduces dependence on spatial ROI cropping. Experiments were conducted on the KneeMRI dataset (917 exams), followed by cross-institutional transfer evaluation on MRNet (1,370 exams). Three models were evaluated: (1) an EfficientNet-B0 CNN baseline, (2) a hybrid CNN–ViT that models inter-slice relationships using a transformer encoder, and (3) AttentionROI, which processes full MRI slices using patch-based attention without spatial ACL bounding-box cropping. On KneeMRI, the hybrid CNN–ViT achieved 80.14% accuracy and a macro F1-score of 0.5975, slightly outperforming the CNN baseline (macro F1 = 0.5903). AttentionROI achieved 76.60% accuracy and a macro F1-score of 0.4962, while its patch-token heatmaps showed qualitatively meaningful spatial responses around ACL-related regions. After fine-tuning on MRNet, the hybrid CNN–ViT achieved 82.50% accuracy, a macro F1-score of 0.8205, and an AUC-ROC of 0.8965, indicating effective cross-institutional transfer after task-specific adaptation.

Keywords: ACL, knee MRI, deep learning, CNN, Vision Transformer, attention mechanism, medical image classification.

Using Metaheuristic Algorithm to Optimize Highway Layout Based on Topographical Data

Nathaniel Abby Thamrin, Vincent Tadeo Margono, Nathan Kurniawan

ABSTRACT

The development of road infrastructure plays a key role in enhancing accessibility to remote and undeveloped regions where low connectivity is a major problem to economic development and access to public services. Nonetheless, the development of an effective road network in these areas requires complex optimization problems because of the terrain limitations and cost aspects. Traditional approaches often struggle to efficiently explore large solution spaces, making it difficult to obtain optimal routing solutions. Metaheuristic algorithms have demonstrated good results in the resolution of optimization and path-finding problems. This paper will compare the performance of the Genetic Algorithm (GA), Artificial Bee Colony (ABC), and Grey Wolf Optimizer (GWO) in the generation of optimum routes in terms of efficiency and solution quality. The same environment and performance measures were used to implement and test all algorithms. The results show that GA produces the lowest cost routes, achieving the lowest median cost of 17249.34, although it requires the longest median computation time of 59.868 seconds. GWO achieves the fastest performance with the lowest median computation time of 30.563 seconds and a competitive median cost of 17672.48, but it tends to converge earlier than GA. Meanwhile, ABC is less effective in refining optimal solutions with the highest median cost of 18404.64, and a median computation time of 51.887 seconds. These findings suggest that, in the tested cases, the highway path-finding problem benefits more from strong solution refinement than extensive exploration.

Keywords: Metaheuristic Algorithm, Highway Layout Optimization, Route Optimization, Genetic Algorithm, Artificial Bee Colony Algorithm, Grey Wolf Optimization.

Gaussian Hidden Markov Model for Detecting Liquidity-Driven Regime Shifts in Gold and Equities

Joseph Adriel Solichin and Andika Elok Amalia

ABSTRACT

Gold and equities are fundamentally inversely correlated. The bullion typically thrives in fear while equities rally in growth. However, certain economic drivers such as monetary policy, inflation expectations, or extreme fear can trigger simultaneous sell-offs. Such an extreme fear is fundamentally bullish for gold, but the excessive need for liquidity overrides strategy. This study aims to produce a descriptive Hedge Failure Index (HFI) to display the downside coupling of gold and equities. While correlation tools like Pearson Correlation Coefficient (PCC) exist, such a homoskedastic tool is inadequate for the nonlinear, regime-dependent dynamics of financial markets. After the dataset is prepared using Principal Component Analysis (PCA) and RobustScaler, the index is constructed by utilizing an unsupervised learning Gaussian Hidden Markov Model to identify latent regimes in the markets. Viterbi and Forward-Backward algorithms provide regime persistence and suppress flickering. The model successfully classified 4 latent regimes from financial markets: Hedge Failure, Hedge Active, Risk-On, Neutral/Transition. Empirical validations are done to indirectly verify the model's accuracy since unsupervised models lack ground truth. A label stability test produced 94.5% agreement in different seed initializations. Furthermore, Forward-Looking validation on Hedge Failure exhibits a decent lift and regime persistence decay that aligns with Hedge Failure having the lowest mean duration and total distribution. An event study on the Liberation Day tariff sweep confirms the index's responsiveness in acute liquidity-driven sell-offs. While the model provides significant information through its unsupervised learning, the model possesses several limitations including lack of ground truth which is an inherent problem in unsupervised models and trade-off of reactivity and timeliness caused by the smoothing mechanism. The proposed HFI is a diagnostic, historical-analysis tool rather than a live trading signal, as PCA and RobustScaler were applied across the full dataset, introducing indirect look-ahead bias that would require rolling, out-of-sample refitting for real-time deployment. Ultimately, the index serves as a descriptive thermometer signal for periods when the gold's safe-haven hedge is likely to break down or the opposite.

Keywords: regime, transition, heteroskedastic, safe-haven hedge, liquidity, gold, equities.

Log Summaries on Android Logcat Based on Big or Streaming Data Using Large Language Model

Adriel Hagai Brenta S. Meliala, Samuel Tristan Ryansah ,Early Achiril Putra,
Eric Gunawan, Andien Dwi Novika

ABSTRACT

Android has been developed and used by many people. One of the most important part of Android is the Android Logcat to detect anomalies, diagnosing system failures, improving application performance, and verifying running programs. But, Android Logcat is hard to analyze, because they contain millions of logs in a single log system. Besides, they are also in a semi structured to unstructured format. They also contain various log content from different applications. With these hard challenges to analyze Android Logcat because of their characteristics. This study proposed a way to analyze Android Logcat by making a summarization that is easily understood and readable for humans through LLaMA, a LLM that can give a summary in a structured, high accuracy, and readable format by humans. The method was proposed through a few steps, that is preprocessing data, log parsing, filtering, grouping, and summarization using LLM (LLaMA). The result was a summarization of the Android Logcat in a structured way to make it understandable and readability by humans.

Keywords: Android Logcat, Log Analysis, Log Parsing, Large Language Model, LLaMA.

Design and Implementation of IoT-Based Antenna Control System for Stabilizing Point-to-Point Radio Link in Maritime Environment

Vincentius Jonathan Liem & Adhe Lingga Dewi

ABSTRACT

Communication stability in maritime environments remains a significant challenge due to dynamic conditions such as vessel movement, antenna misalignment, and limited network infrastructure coverage. The goal of this research is to create an Internet of Things (IoT)-based antenna control system for Radio Point to point (PTP) communication to enhance network stability via real time monitoring and autonomous antenna repositioning. To maintain ideal antenna alignment, the suggested system combines a gyroscope sensor, microcontroller, actuator, web-based monitoring platform, and wireless communication system. The designed control system was used to test the system both before and after the antenna was repositioned. The network performance significantly improved once the solution was put into place, according to the results. Average latency decreased from 130.987 ms to 39.643 ms, while packet loss dropped from 35% to 0%. In addition, connectivity became more reliable and there were no timeouts during testing. Furthermore, real time network conditions and remote system monitoring were made possible using the web monitoring platform developed. The findings reveal the potential of the proposed antenna control system using IoT for enhancing network performance and stability in dynamic maritime environments.

Keywords: Internet of Things (IoT), Radio Point to point, antenna control system, maritime communication, network monitoring.

Head-to-Head Comparison of CNN Architectures on Traditional Cake Image Dataset

Ida Hastuti; Ahmad Yusuf; Kemas M. Yunus; Wahid Adi Nugroho

ABSTRACT

Traditional cakes are more than culinary delights. They represent a fragile cultural heritage that requires innovative preservation strategies in the digital age. Despite significant advances in artificial intelligence, most food recognition research has focused on large-scale international datasets. Recent technological advancements have transformed image classification. However, their effectiveness on small and domain-specific datasets remains underexplored. This study compares five CNN architectures: MobileNetV2, VGG16, ResNet50, EfficientNetB0, and a simple CNN on the traditional cake images dataset. The findings reveal that MobileNetV2 consistently achieved the best balance of accuracy and efficiency, while VGG16 confirmed the role of deeper convolutional layers for texture recognition. In contrast, ResNet50 and EfficientNetB0 struggled to converge effectively on the dataset, highlighting the limitations of deeper models without extensive fine-tuning. The simple CNN baseline captured broad visual patterns but lacked the capacity for fine-grained distinctions. The findings emphasize the importance of aligning architecture with dataset characteristics. Lightweight architecture provides an optimal balance for resource-constrained applications. Future work should expand the dataset, fine-tune deeper models, and integrate multimodal inputs to classify visually similar items better.

Keywords: CNN architectures, image classification, MobileNetV2, traditional cakes.

YOLOv8-Based River Debris Monitoring System With Meteorological Data for Flood Mitigation

kelvin alexander harli, ferdy saputra, Edi Purnomo Putra

ABSTRACT

Urban flooding remains one of the most frequent hydrometeorological disasters in Indonesia. This situation is usually triggered by heavy rains and the accumulation of floating debris that can obstruct the flow of the river. However, many current flood monitoring systems still rely on only one type of hydrological data and therefore cannot fully describe conditions on the ground. This study proposes a flood potential monitoring system that integrates precipitation data and river debris detection using deep learning. The YOLOv8 model was trained using a custom dataset of 2,249 images to detect debris on the river surface. Next, the detection results are integrated with rainfall data from BMKG using the Simple Additive Weighting (SAW) method to determine the flood risk level. The test results demonstrate that the model is able to detect debris effectively in complex aquatic environments, with a precision of 0.788, a recall of 0.773, an mAP50 of 0.789, and an mAP50-95 of 0.445. The integration of visual and meteorological data applied in this study can provide more complete information to support early flood warning systems. In addition, the integrated control panel developed provides a visualization tool that allows monitoring of potential flooding by integrating debris detection and rainfall data.

Keywords: yolov8, flood monitoring, debris detection, deep learning.

Comparative Analysis of BiLSTM and XGBoost in Predicting Top-Tier Indonesian Banking Stock Prices

Kelvin Marcelino, Evaristus Didik Madyatmadja, Mulyono

ABSTRACT

Stock price prediction has proven challenging because financial markets are highly volatile and driven by interacting nonlinear factors. This paper presents a stock-level comparison study between BiLSTM and XGBoost to predict the daily closing prices of the five largest banking stocks in the Indonesian LQ45 index (BBCA, BBRI, BMRI, BBNI, and BRIS) from August 2020 to July 2025. Both models were trained and evaluated under identical conditions, using an 80/20 chronological train-test data split and assessed based on RMSE, MAE, MAPE, and R^2 , along with a naive persistent baseline. XGBoost consistently outperformed BiLSTM and the persistent baseline across all five banks and all four metrics, achieving an average R^2 of approximately 0.981 compared to 0.885 for BiLSTM and an average MAPE of approximately 0.52% compared to 2.50%. BiLSTM did not outperform the persistent baseline model on any bank or metric, indicating significant rather than marginal limitations. The performance gap is widest for the more volatile BRIS and narrowest for the stable and strongly trending BBCA. The results show that for highly liquid, high-capitalization banking stocks, an efficient gradient-boosting model is able to capture short-term dynamics more effectively than a more complex model, at a significantly lower computational cost.

Keywords: BiLSTM, XGBoost, stock price prediction, LQ45 index, time-series forecasting, Indonesian banking stocks.

Comparative Study of Sparse and Dense Retrieval Models in Question Answering Systems

Kasmirus Derryl Odja & Joddy Setiawan

ABSTRACT

Information retrieval is the backbone of modern Q&A workflows and the current Generation Enhanced with Information Retrieval. Therefore, selecting an optimal information retrieval strategy also requires a balance between information retrieval quality and computational efficiency. This study presents a comprehensive comparative analysis method of sparse (TF-IDF, BM25, SPLADE), dense (DPR, Bi-Encoder, Contriever), and hybrid. We evaluate these retrieval models on three heterogeneous benchmark datasets: SQuAD, TriviaQA, and MSMARCO, each characterized by varying context lengths and query ambiguity. Our experiments show that the Hybrid architecture combined with Cross-Encoder re-ranking (RRF(SPLADE+BI)+CE10) gives the best results, achieving MRR@5 0.186 on SQuAD, 0.578 on TriviaQA, and 0.678 on MSMARCO. However, the dynamics of the accuracy and latency trade-off reveal a fundamental shift from previous assumptions. The dense Bi-Encoder model emerges as the undisputed efficiency champion with an average latency of ~18 ms, processing queries up to 16 times faster than BM25, which experiences unexpected latency spikes ranging from 150 ms to 293 ms. Although the best-performing reordering pipeline incurs latency of about 203 ms to 206 ms per query making it approximately 11 times slower than the standalone Bi-Encoder, it fully justifies its computational cost for maximum accuracy. Therefore, we propose a tiered recommendation strategy based on an updated accuracy-latency trade-off: Bi-Encoder is recommended for high-performance real-time applications requiring minimal latency, SPLADE give a robust standalone retrieval for complex queries (~165 ms), and the inclusion of Cross-Encoder reordering is reserved for accuracy-heavy tasks where a response time window of ~200 ms is acceptable. .

Keywords: Information Retrieval, Model Reranking, Semantic Search, Sparse Methods, Dense Methods.

Sentiment Classification of Indonesian Google Play Reviews: A Hybrid Evaluation of Random Forest, CNN, and IndoBERT

David Cahyadi, Anang Prasetyo

ABSTRACT

Mobile application reviews on the Google Play Store are a valuable source of user opinion, yet their large volume and informal Indonesian language make manual analysis impractical. Previous Indonesian sentiment-analysis studies have applied algorithms from three different families, namely classical machine learning, deep learning, and pre-trained transformer models, but they are typically evaluated on different datasets and under different conditions, which makes their results difficult to compare directly. This study therefore presents a controlled comparison of one strong representative from each family: Random Forest with TF-IDF features, a Convolutional Neural Network with pre-trained fastText embeddings, and a fine-tuned IndoBERT transformer. The dataset consists of 5,336 Indonesian Google Play reviews collected from Gojek, Tokopedia, and Shopee, weakly labeled from star ratings into 2,365 positive and 2,971 negative reviews. Preprocessing depth is adapted to each model, but all three share an identical stratified split and are assessed on the same held-out test set using accuracy, precision, recall, and macro-averaged F1-score. IndoBERT achieved the best performance (accuracy 0.9391, macro-F1 0.9382), followed by the CNN (0.9260, 0.9248) and Random Forest (0.9157, 0.9145). Beyond this ranking, we report 95% confidence intervals and McNemar tests, which show that only the gap between IndoBERT and Random Forest is statistically significant; we quantify model size and hardware requirements; we validate the weak labels against manual annotation of 496 reviews (94.2% agreement, Cohen's kappa 0.88); and we show through error analysis that negation and non-standard slang, rather than review length, are the main sources of error.

Keywords: sentiment analysis, Google Play reviews, Indonesian language, Random Forest, convolutional neural network, IndoBERT, TF-IDF.

Benchmarking Convolutional, Transformer, and YOLO Architectures for Automated Poultry Fecal Disease Screening

Budi Juarto, Mulyani Karmagatri, Dani Suandi and Arifpermana Ratum

ABSTRACT

Catching enteric and systemic poultry diseases early from images of droppings can cut flock mortality and slow the spread of zoonotic pathogens, yet manual inspection stays slow, subjective, and out of reach in smallholder settings. This paper presents a controlled benchmark of ten deep learning models for screening poultry fecal images across three categories, coccidiosis, salmonellosis, and healthy. We put eight image classifiers from the convolutional and transformer families (ResNet18, MobileNetV3-Small, EfficientNet-B0, DenseNet121, ConvNeXt-Tiny, RegNetY-008, ViT-Tiny, and Swin-Tiny) and two singlestage object detectors (YOLOv8n and YOLOv8s) through one unified, class-balanced pipeline with exact-duplicate removal and a single fixed train, validation, and test split. The strongest classifiers, ConvNeXt-Tiny and ViT-Tiny, each reach 99.66% test accuracy and 0.9966 macro F1, while a compact model such as MobileNetV3-Small stays competitive at 98.75%, which suits it to edge deployment. The detectors localize lesions at up to 0.877 mAP@0.5. To guard against scores inflated by leakage on visually homogeneous fecal data, we add a perceptual near-duplicate audit and re-test on a near-duplicate-free subset; accuracy barely moves (ConvNeXt-Tiny 99.66%→99.65%), and Grad-CAM shows the models look at the dropping rather than the background litter. Over three random seeds the results stay stable (standard deviation ≤ 0.0035), with ViT-Tiny and RegNetY-008 the most consistent at 0.9947 accuracy. A four-class extension that adds the minority Newcastle disease category under a classweighted loss keeps performance intact and reaches perfect recall on the minority class. The benchmark offers a reproducible reference point for low-cost poultry health monitoring.

Keywords: poultry disease, fecal image classification, deep learning, vision transformer, object detection, YOLO.

Deep Learning-Based Acanthosis Nigricans Detection: A Comparative Study of YOLOv11s and YOLOv8s

Vincent Yanputra, Ajeng Wulandari

ABSTRACT

People with Type 2 diabetes and insulin resistance frequently develop Acanthosis Nigricans (AN), a dermatological manifestation characterized by hyperpigmented, velvety cutaneous plaques in body creases and folds. Early and reliable detection of AN provides an accessible, non-invasive biomarker of underlying metabolic dysfunction without requiring invasive diagnostics. This study presents a comparative evaluation of the YOLOv11s and YOLOv8s architectures specifically optimized for localized AN detection. Using an 800 image dataset from Roboflow (SLIIT), we introduce a domain specific augmentation strategy combining mixup augmentation ($\alpha=0.5$), cosine learning rate scheduling, and HSV value randomization ($\alpha=0.5$), designed to overcome challenges in low resource medical imaging such as low contrast lesions and shadowing artifacts in body folds. Evaluated under a single train validation test distribution, YOLOv11s with the proposed pipeline demonstrated superior diagnostic capability over both the original SLIIT benchmark and YOLOv8s, achieving an AN precision of 90.77%, recall of 88.06%, F1 score of 0.8937, mAP50 of 0.8655, and mAP50 to 95 of 0.4987. We explicitly discuss clinical utility, architectural trade offs, and study limitations stemming from dataset size, single cohort demographics, and the absence of direct multi observer clinical validation.

Keywords: Acanthosis Nigricans, YOLOv11s, YOLOv8s, Object Detection, Diabetes Mellitus.

Ensemble Learning for Air Quality Classification Using Bagging and Boosting Methods with Feature Importance Analysis

Yan Yang Thanri, Safrizal, Lili Tanti, Juli Iriani, Luthfi Zaidi, Budi Prastyo

ABSTRACT

Daily PM2.5 classification is challenging when ground observations, satellite-derived predictors, temporal variables, and uneven city coverage are combined in one task. This study presents a comparative ensemble learning workflow for PM2.5-based air quality categories in Depok, Jakarta, Palembang, and West Sumatra (3,687 daily observations, 15 original variables). The final experiment uses 16 predictors after city encoding, temporal feature construction, dry-season coding, and one-day lag generation, with six original PM2.5 categories consolidated into four classes to reduce extreme sparsity. Random Forest and Extra Trees represent bagging methods; Gradient Boosting, XGBoost, and AdaBoost represent boosting methods. Models are evaluated with a stratified split, training-only SMOTE, RandomizedSearchCV tuning, five-fold cross-validation, macro F1, paired t-testing, confusion matrix analysis, and feature importance assessment. Extra Trees obtains the best result (0.6070 test accuracy, 0.5930 test macro F1, 0.6132 cross-validation macro F1), significantly outperforming Gradient Boosting and AdaBoost but not Random Forest or XGBoost. The findings provide a realistic benchmark for Indonesian multi-region air quality classification and show that spatial indicators, NO₂, AOD, O₃, seasonality, and temporal variables strongly influence model decisions.

Keywords: air quality classification; PM2.5; ensemble learning; bagging; boosting; SMOTE; feature importance; satellite-derived variables.

Analyzing the Impact of Cross-Model Synthetic Contamination on LLM Coding Logic and Security

Mikhael Filemon, Alexander Bagus Wijanarko, Anselmus William Putra Adjic,
Andien Dwi Novika, Muhammad Fikri Hasani

ABSTRACT

This study explores the impact of autophagic data loops on LLMs by testing the effects of synthetic contamination on code generation performance across three generations. While the target model demonstrates resilience in logical ability, recovering its HumanEval pass rate from an initial drop back to just a 0.56% delta from baseline levels by the third generation, this recovery in programming performance masks a degradation in software security. Bandit SAST scans show a 181.25% increase over baseline in medium severity vulnerabilities, with the model relying on programming shortcuts to bypass complex algorithmic challenges and pass benchmarks. These results expose a decoupling where functional optimization can lead to behavioral security degradation, showing that synthetic data in training loops can produce models that appear logically sound while generating insecure code.

Keywords: model collapse, synthetic data, software security, static application security testing (SAST), fine-tuning.

Distant Supervision for Indonesian Food Allergen NER: A Preliminary Evaluation with OCR Integration

Rafifdiya, Ahmad Daffa Hidayatullah, Jason Firenze Trianto, Bakti Amirul Jabar, Rico Halim

ABSTRACT

Abstract—Sensitive consumers face health risks when food allergens are mislabeled and this problem is worse in Indonesia where product labels are often multilingual and printed across various packaging types. This study presents an end-to-end pipeline that combines PP-OCrv5 as the Optical Character Recognition with a fine-tuned IndoBERT Named Entity Recognition model to identify allergen categories from ingredient labels of Indonesian food products. The NER model is trained using 3,500 samples which consist of 3,000 entries from the Open Food Facts database (filtered to English and Indonesian) and 500 synthetic Indonesian texts using distant supervision with a dictionary aligned with BPOM and EU FIR No. 1169/2011 regulations across eight allergen categories. On a silver-label test set, the model achieves a micro F1 value of 0.9946. However, because this test set is labeled by the same dictionary used in training, this score primarily reflects training convergence rather than semantic generalization. As the primary evaluation, we manually annotated 137 Indonesian product photographs and obtained a micro F1 of 0.7410 (macro F1 of 0.7195), with OCR producing an average Character Error Rate of 19.83% across six packaging types. Per-category recall varied substantially (KEDELAI 0.77, TELUR 0.60), suggesting that words with lots of meaning and OCR-induced token boundary errors remain key challenges. Unlike prior allergen-detection studies that rely on manually curated dictionaries or clean non Indonesian OCR data, this work is the first to unify distant-supervision labeling, a BPOM/EU aligned allergen schema, and IndoBERT-based NER within an end-to-end pipeline validated on real Indonesian packaging photographs. We position this work as a preliminary feasibility study and outline directions for improving recall in food safety contexts.

Keywords: Keywords—Food allergen detection, named entity recognition, optical character recognition, IndoBERT, distant supervision, PP-OCrv5.

Deep Autoencoder-Based Anomaly Detection with Filter-Based Feature Selection for Large-Scale Intrusion Detection Systems

Satriadi Putra Santika, Yaya Heryadi, Lili Ayu Wulandhari, Abba Suganda Girsang, Ilvico Sonata

ABSTRACT

Two major challenges that have long plagued Network Intrusion Detection Systems (NIDS) research are class imbalance and high-dimensional network traffic data. Most existing anomaly-based approaches address class imbalance through undersampling, which tends to discard useful data and produce results that do not hold up well in practice. Beyond that, redundant and irrelevant features in high-dimensional data can further hinder the model's ability to learn an accurate representation of normal behavior. Based on these problems, this study proposes a Deep Autoencoder (DAE)-based anomaly detection framework that is directly tested on the full CSE-CIC-IDS2018 dataset. Five filter-based feature selection (FS) methods are systematically employed and compared such as Correlation Based Feature Selection (CBFS), Mutual Information (MI), Gain Ratio (GR), Symmetric Uncertainty (SU) and ANOVA. Experimental results demonstrate that MI-based FS yields the best overall performance. The method reduced the feature space from 63 features to 31 features with a Recall of 0.867 and F1-score of 0.769. MI + DAE outperforms other baselines such as Isolation Forest, PCA-Based Reconstruction and previous studies using the same dataset. These results indicate that MI-based FS combined with DAE offers a more realistic and reliable anomaly detection framework for large-scale intrusion detection.

Keywords: Anomaly Detection, Deep Autoencoder, Feature Selection, Intrusion Detection System, Large-Scale Dataset.

Internet of Things based Hybrid Air Quality Index Monitoring Using Multi Sensors Arrays

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Muhammad Rizki Nur Majiid

ABSTRACT

Air quality is one of the important factors that affect human health and comfort, so a monitoring system that can provide information quickly and accurately is needed. This research developed a Hybrid Air Quality Index (AQI) Tracker, an Internet of Things (IoT)-based air quality monitoring system that integrates multi-sensors, a cloud platform, and a Telegram Bot. The system uses ESP32 as the main controller connected to particulate matter sensors (PM_{2.5} and PM₁₀) and MQ gas sensors including MQ-131 for measuring ozone (O₃), MQ-135 for measuring nitrogen dioxide (NO₂) and carbon dioxide (CO₂), MQ-136 for measuring sulfur dioxide (SO₂), and MQ-7 for measuring carbon monoxide (CO). The data acquired is calculated using the AQI breakpoint method. Furthermore, the data is automatically sent to the ThingSpeak platform for time-series storage, historical analysis, and remote monitoring. This research also implemented a user-triggered monitoring and automatic early warning system based on Telegram Bot, which provides air quality notifications based on AQI threshold values. Test results showed that the system can perform continuous readings, sending data consistently to the cloud, and providing responsive early warnings when air quality falls into the unhealthy category. Therefore, this system can be an effective solution for real-time air quality monitoring in homes, schools, laboratories, and other public areas. .

Keywords: Air Quality Index (AQI), Internet of Things (IoT), Multi-Sensor Monitoring, ESP32 Microcontroller, Early Warning System .

Optimizing Stacking Ensemble Models for Heart Disease Prediction Using Hyperparameter Tuning on Imbalanced Clinical Data

Louis Oktovianus, AndryChowanda

ABSTRACT

Heart disease is among the major causes of death in any part globally, and that is why proper and valid prediction techniques are needed. This paper suggests the best stacking ensemble model along with hyperparameter optimization to enhance heart disease prediction with unbalanced clinical data. The approach will use data preprocessing strategies, such as outlier management, feature scaling, and Synthetic Minority Over-sampling Technique (SMOTE), and then create various stacking ensemble models with various base learner and meta-learner settings. Three stacking models are compared based on classification measures like Accuracy, Precision, Recall, F1-score and Area Under the Curve (AUC). The experimental findings indicate that the proposed method works quite well to improve the predictive performance, with stacking 1 giving the highest results with an Accuracy of 0.8967, Precision of 0.8879, Recall of 0.9314, F1-score of 0.9091, and AUC of 0.9350. Competitive performance in stacking 3 (F1-score 0.8922, AUC 0.9322) is relatively high, whereas stacking 2 provides comparatively lower performance. These results suggest that both the combination of various machine learning models and optimized hyperparameters can greatly enhance classification, especially when working with an imbalanced dataset, and has a high potential to create a stable decision support system in healthcare contexts.

Keywords: Heart Disease Prediction, Stacking Ensemble, Hyperparameter Tuning, Imbalanced Data, Machine Learning.

Comparative Analysis of Original and Denoising Autoencoder-Based Feature Representations for Explainable Breast Cancer Classification Using SVM and Random Forest

Budiman Budiman, Nur Alamsyah, Muhamad Achya Arifudin, Elia Setiana, Arnold Ropen Sinaga, Imannudin Akbar

ABSTRACT

Machine learning has been widely used in breast cancer classification with quite promising results. However, the issue of feature representation remains a challenge. The objective of this study is to evaluate the impact of original features versus latent features generated by the Denoising Autoencoder (DAE) method on the Wisconsin Diagnostic Breast Cancer (WDBC) dataset, integrated through a unified framework that ensures model interpretability via SHAP. The DAE achieved a feature reduction of 73.33%, reducing 30 original features to 8 latent features. We used 10×10 stratified repeated cross-validation and the Wilcoxon Signed-Rank test to evaluate model performance. On the hold-out test set, the highest accuracy of 99.12% and ROC-AUC were achieved by the DAE+SVM combination. However, robust validation for the Original+SVM combination yielded a higher average accuracy of 97.25% compared to 96.84% for DAE+SVM, with no statistically significant difference ($p > 0.05$). Furthermore, the most influential predictors identified by SHAP were `radius_worst`, `area_worst`, `texture_worst`, and `perimeter_worst`. Although DAE was inconsistent in outperforming the performance of the original features in breast classification, it provided a more concise feature representation.

Keywords: breast cancer, denoising autoencoder, feature representation, support vector machine, SHAP.

Design of a Wideband RF Power Combiner for Passive Radar Space Debris Detection

Nikolaus Lukas Christian, Oei, Kenneth Filbert, Simon Zelotes Dimas Cor Lintrus, Livia Janice Widiapradja

ABSTRACT

The increasing accumulation of space debris poses a growing risk of collision danger in low-earth orbit, this issue highlights the desperate need for monitoring technologies that are scalable and efficient. Passive Radar became a promising solution because of its capacity to identify and track objects using the available radio frequency; making intended transmitters unnecessary. An accurate detection is achieved by combining signals from several antennas. This paper presents a four-port RF Power Combiner designed for the 45-870 MHz (VHF-UHF) band, implemented as a two-stage binary tree topology using NiZn ferrite toroidal cores (FT37-61) with bifilar windings. The design is simulated in QucsStudio using lumped-element equivalent circuit models. The Results show acceptable performance in the 45-300 MHz, with insertion loss (S_{21}) ranging from -8.13 to -9.53 dB. However, above 300 MHz, parasitic capacitance limits the high-frequency response which leads to self-resonance near 600 MHz. producing near-total signal reflection ($S_{11} \approx -0.02$ dB) and an insertion loss of -35.9 dB. These results show that the design meets its target performance only in the 45-300 MHz sub-band. The identified trade-off between low-frequency magnetizing inductance and high-frequency self-resonance explains this limitation and provides a quantitative basis for future winding optimization toward the 870 MHz bandwidth target..

Keywords: Passive Radar, RF Power Combiner, NiZn Ferrite, Toroidal Transformer, Self-Resonance, Space Debris.

Social Engineering Detection Using BERT and Graph Neural Network

Darren Aditya, Raymond Ivander, Muhamad Salman Hakim

ABSTRACT

Social engineering is one of the most threatening cybersecurity attacks today, particularly communication. Social engineering attacks such as phishing, pretexting, and BEC (Business Email Compromise) have successfully caused significant financial and security losses. Various machine learning and deep learning approaches have been developed to detect these attacks; most research focuses on binary classification and relies on text semantic analysis without modeling relational structures among email tokens. This study proposes and compares the performance of a BERT-GNN hybrid model with a BERT-CNN model in detecting social engineering attacks on a multi-class email dataset. The dataset consists of 20,000 email samples categorized as phishing, pretexting, BEC, and benign, collected from public and synthetic sources. The evaluation results show that the BERTGNN model achieved a slightly higher test accuracy of 97.93% compared to the BERT-CNN model's 97.35%. Although the numerical difference in test accuracy is small, the proposed model achieved slightly higher precision, recall, and F1-score values than the BERT-CNN model. However, when compared to state-of-the-art social engineering detection models on binary and multi-class classifications, our model's performance still falls short of those models. These findings indicate that integrating contextual representations from BERT with graph based message passing can provide competitive performance for social engineering detection on multi-class datasets.

Keywords: Social Engineering Detection, BERT, Graph Neural Network, Phishing Detection, Multi-class Classification, Cybersecurity. .

NETWORK INTRUSION DETECTION ON IMBALANCED DATASET USING OPTIMIZED MACHINE LEARNING

Reynold Setia Winanto, Timotius Dylan Lauwren, Valen Frank, Franz Adeta
Junior

ABSTRACT

This research presents an efficient machine learning method for network intrusion detection using the highly imbalanced CSE-CIC-IDS2018 dataset. A memory-safe preprocessing pipeline that retains all minority attack samples and combines row level chunking, duplicate removal, and stratified Benign class undersampling is used to solve memory limitations and class imbalance. Random Forest, XGBoost, and CatBoost are evaluated in baseline, hyperparameter-optimized (RandomizedSearchCV, macro-F1 scoring), and PCAreduced configurations. XGBoost Optimized outperforms Random Forest and CatBoost with the best overall performance (Accuracy: 91.9%, Precision Macro: 93.0%, F1 Macro: 90.1%), according to experimental results on 33,134 test records. Tree-based classifiers benefit from the full 78 feature CICFlowMeter representation without linear compression: Although improvements were not uniform across all metrics, hyperparameter modification increased macro-averaged precision, recall, and F1 score across all three models., while PCA dimensionality reduction uniformly reduced performance.

Keywords: Network Intrusion Detection, Random Forest, XGBoost, CatBoost, CIC-IDS-2018, Extreme Class Imbalance, PCA.

Uncovering Insights in Guimaras Production for Food Security using Graph Database

James Ryan B. Ga, Harya Gusdevi, Loveson C. Gallos, Divon G. Tamdang,
Alfred John G. Borreros, Rachel Gallego, Lilian Diana B. Parreño

ABSTRACT

This study explores graph database technology to uncover insights in agricultural production and support food security initiatives on Guimaras Island, where agriculture drives economic stability despite rapid regional growth. Addressing climate change, market volatility, and fragmented data systems, the research deploys Neo4j to integrate heterogeneous agricultural datasets including farmer profiles, farms, crops, providers, market trends, weather events, interventions, and harvest records. Developed through an Agile framework, the system matured via iterative cycles of data modeling, graph construction, analysis, visualization, and continuous refinement. The resulting graph database reveals complex relationships within the agricultural ecosystem, enabling efficient queries of interconnected factors that influence productivity, sustainability, and market behavior. Key findings demonstrate that graph-based modeling exposes hidden patterns in crop yields, resource dependencies, and stakeholder interactions that traditional relational databases fail to capture easily. These insights provide robust, evidence-based decision-support for policymakers, farmers, and agricultural institutions. Ultimately, this study demonstrates that graph databases offer a powerful, flexible, and scalable framework for managing agricultural data to enhance regional food security and advance digital agriculture.

Keywords: Agricultural Production, Decision Support System, Digital Agriculture, Food Security, Graph Database, Guimaras, Neo4j.

Field to Fork: Developing a Mobile Application to Connect Farmers and Consumers for Sustainable Food Systems

Adrian J. Forca, Evi Triandini, Lilian Diana B. Parreño

ABSTRACT

This study developed an Application "Field2Fork" is a market mobile application with Flutter and Firebase to provide an online platform that links farmers and buyers across Guimaras Island. Features include user registration, product listings, placing orders, delivery status update (managed by them internally), product reviews, administrative tracking and so on. Requirements were collected via interviews with 10 farmers and 10 customers selected based on purposive sampling as they were producers, sellers or buyers of local farm and seafood products within Guimaras. Development was done using an iterative software development life cycle model with tools such as Flutter, Dart, Firebase, Xcode, Android Studio, Visual Studio Code, and Git. One of the changes was the farmer's ability to add their produce based on the user feedback. The research did not have technical performance criteria so data about response time, throughput compatibility, reliability, or security testing was not included in this paper. Assessment of software quality was made by a panel of 10 IT professionals and 30 consumers (15 farmers and 15 consumers) via a survey based on ISO/IEC 25010:2011. IT experts gave an aggregate score of 4.60 (SD=0.26) whereas end users' total was 4.52 (SD=0.17). Both scores were seen as a very good achievement. Though, the data does not prove measured technical performance; it does not also lead to higher income for farmers, lesser food waste, or better environmental performance. .

Keywords: agricultural e-commerce, direct-to-consumer platform, farmers, mobile application.

Development and Evaluation of a Web-Based Transportation Management System for University Fleet Operations

Rachel Gallego, Anggit Suryoprato, James Ryan Ga, Adrian J. Forca,
Desiree G. Morales, Jerico E. Galila, Loveson C. Gallos

ABSTRACT

Most of the time, University Transportation Offices have to handle all these matters which the vehicle request, checking if the vehicle request is approved, making the trip ticket, fuel consumption recording and passenger feedbacks. Unfortunately, the source organization only had separate paper forms for each activity and kept logs manually. Previous studies related to the management of fleets have mostly highlighted the telemetry aspect, the optimization of routes and the transport policies. Yet, the workflow from the institution's specific request to reporting has remained under explored by them. A roledbased University Transportation Management System(UTMS) was designed, developed and pilot-validateddd for the University Transport department at the Guimaras State University through this study. An iterated project lifecycle included requirements gathering by talking to stakeholders and planning the project, the development phase which backed up by the analysis, design as well as the implementation phase, System Testing (unit, integration) and pilot evaluation as phases of the overall project cyle. A web-based application was created using HTML, CSS, Bootstrap, JavaScript, PHP nad MySQL to handle various features like passenger requests, administrative approval, automatic generation of trip tickets, driver fuel receipts entry, capturing feedbacks and preparing reports. A total of 60 (52 passengers, 5 drivers and 3 administrators) pilot users assessed five quality factors using a scale ranging from 1 to 5 points. Average reported factor scores were ranged from 4.58 to 4.80 wherein the mean overall score was 4.67 (Excellent). Because of this, these results clearly demonstrate that in the pilot setting a high level of product quality perception was found but since the data did not include a benchmark or response-time metrics, a pre-implementation baseline or an independent security audit, these data do not indicate that the processing time and security improved. The main takeaway from this research is an implementation of an integrated, role-based campus transport workflow and clear documentation of the pilot evaluation process.

Keywords: campus transportation, fleet workflow, iterative development, software quality evaluation, web application.

A Lightweight MobileNetV2 with Dual-Level Feature Fusion for Fruit and Vegetables Freshness Classification

Kevin Reynald, Herlinda Angelica Tanjaya, Ribby Aulia Barlie, Irene Anindaputri Iswanto, Arya Krisna Putra

ABSTRACT

Abstract—Automated produce freshness classification can help in reducing the dependency on manual inspection in quality control. The majority of lightweight CNNs use only the final backbone representations for classification while ignoring mid level texture representations related to produce degradation. In this paper, we present MobileNetV2-Fusion that fuses an intermediate representation generated by the block_13_project_BN layer with the final out_relu representation of the MobileNetV2 architecture. For testing our approach, five different architectures, namely, VGG16, EfficientNetB0, MobileNetV2, MobileNetV2-Fusion, and MobileViT-XS, were evaluated through a matched two-stage transfer learning protocol using the balanced class weights. MobileNetV2-Fusion, which consists of 2,653,022 parameters (+2.09% more than MobileNetV2), achieved the best test accuracy (99.19%), the lowest test loss (0.0297), and the highest Weighted-F1 (0.9919), whereas EfficientNetB0 got the highest Macro-F1 (0.9854).

Keywords: Keywords—produce freshness classification, MobileNetV2, dual-level feature fusion, lightweight convolutional neural network, transfer learning.

Spatial and Forest Disturbance Tracking in Guimaras through Remote Sensing and Deep Learning

John Rey B. Galon, Stenly Richard Pungus, Seoj Clyde Mainar Galila, Jerald O. Cascara, Keith Gabriel Ymalay, G.Loveson C. Gallos, Rachel Gallego

ABSTRACT

The preservation of Guimaras Province's forest ecosystems requires automated frameworks to mitigate rapid land-use conversion and canopy degradation. Traditional manual monitoring suffers from delayed detection, preventing the rapid response necessary for effective environmental governance. In response, this research presents Project G.U.A.R.D.I.A.N., an automated early warning and decision-support system engineered to track spatial and temporal forest disturbance. Utilizing the CRISP-DM framework, the multimodal architecture fuses Sentinel-1 SAR and Sentinel-2 optical imagery into a 29-band hyperstack, bypassing monsoon interference for uninterrupted monitoring. This telemetry is contextualized against an elevenyear historical baseline generated via the LandTrendr algorithm, effectively isolating anthropogenic damage from natural seasonal phenology. The core engine employs a dual-stage machine learning topology: a ConvNeXt-Nano U-Net model executes semantic segmentation of canopy anomalies, while an Extreme Gradient Boosting classifier evaluates these boundaries to verify overall forest disturbance. The segmentation achieved a 64.35% Intersection over Union, ensuring precise geometric conformity to actual canopy damage. To rigorously assess the classifier, particularly for low-frequency events, metrics utilized raw predicted occurrences rather than relative percentages. This strict methodology validated the system's reliability, achieving 98.00% overall accuracy, 96.81% precision, 98.99% recall, and zero false positives. Ultimately, this architecture securely routes verified ecological intelligence to a dual-tier web dashboard, equipping authorities with tactical data while fostering public transparency.

Keywords: Deep Learning Segmentation, Extreme Gradient Boosting, Forest Disturbance Detection, Geographic Information Systems, Multimodal Artificial Intelligence, Remote Sensing.

Design and Evaluation of a Web-Based Research Management Information System Using ISO/IEC 25010

James Ryan B. Ga, Sandy Kosasi, Rachel Gallego, Divon G. Tamdang, Alfred John G. Borreros, Loveson C. Gallos, Lilian Diana B. Parreño

ABSTRACT

Guimaras State University research administration was hampered by the scattered, paper-based system of records, which was a nightmare for project tracking, archival retrieving and generating reports. It was a single-institution case study, which resulted in and a subsequent evaluation of a web-based Research Management Information System aimed at centralizing several research-related activities and communications, namely proposal submission and review, funding records, progress monitoring, publication tracking, system-generated forms, notifications and development followed an iterative, software development life cycle. The evaluation involved 25 technical evaluators and 75 end-users and applied the eight product-quality characteristics of ISO/IEC 25010:2011 on a five-point scale, limited to describing the analysis of aggregate means. It is a rather high score of 4.56 that can be described as the scale descriptor Excellent. Security received the highest mean (4.68), followed by usability (4.64) and functional suitability (4.60). The lowest mean is performance efficiency (4.48), it is the descriptor Very Satisfactory. These source records did not contain a description of the sampling method used, the justification of the sample size, the evidence for validity of the instrument used, the reliability coefficients, the amount of response variance, or any data on respondents. It is very likely that the result of these studies were good perception ratings but cannot represent all and it is not an inference at the population level nor any objective statements about system efficiency or security.

Keywords: information systems, ISO/IEC 25010, research administration, software quality.

Paper ID #449

A Design Science Framework for Bounded Accessibility Reporting in Early-Stage Municipal-Service Applications

Deo Genisan, Reymart Carmelo, Jhosua Logronio, Mary Rose Artagame,
James Ryan Ga, Rachel Gallego

ABSTRACT

This paper presents a Design Science method, called a Bounded Reporting Structure, for presenting evidence of the accessibility of early municipal-service applications. It will also be shown through a case study with Care Card, which is a Flutter/Firebase mobile and web app (prototype). The app is expected to handle beneficiary signup, MSWDO verification through the web portal, a municipality-verified in-app profile, incident reporting, and announcement features and displayadjustment controls for the elderly and people with disabilities. Since the preserved project records have neither end-user study, dynamic assistive-technology testing, security benchmark nor measured service baseline, this study is set up to only the prototype evidence observable to us is presented separately from the claims that cannot be verified. One author-rater mapped ten checks of usability issues to WCAG 2.2 criteria: four were fully supported; three partially supported; and three couldn't be verified. Supportive checks were taken as evidence of full performance, whereas partially supportive checks were considered as an interval of uncertainty; this calculation produced a lower bound of 0.40, an upper bound of 0.70 and the unverified part 0.30. With a mid-weight of 0.50, the final index is 0.55; the change in partial-credit weight of 0.30 to 0.70, for example, gives a range of 0.49 to 0.61. These summaries obtained in a deterministic way are neither conformance percentages, confidence intervals of WCAG nor user performance scores. These deterministic summaries demonstrate just how a single-case reporting structure of this kind can openly present the current level of accessibility evidence for early-stage prototypes without making overly general empirical claims.

Keywords: accessibility evaluation, evidence-bounded reporting, municipal-service applications, prototype evaluation, Web Content Accessibility Guidelines.

Time-Series Split for Efficient SHAP-Based Occupancy Rate Forecasting in Smart Parking

Dinda Salma Septriani, Aji Gautama Putrada, Nur Ghaniaviyanto Ramadhan

ABSTRACT

Previous studies have shown that a significant portion of urban traffic congestion is caused by drivers searching for vacant parking spaces. Although various studies have proposed smart parking systems, no predictive solution yet accounts for the recurrent behavior crucial to improving occupancy rate forecasting performance. This study aims to design an explainable forecasting framework for smart parking occupancy rate prediction using Shapley Additive Explanations (SHAP) and applying time series splitting to understand recurrent behavior in occupancy rate forecasting. The novelty of this research lies in the simultaneous integration of SHAP, occupancy rate forecasting, and time-series split to capture recurring behavior. The dataset used in this study is Parking Birmingham. The preprocessing methods applied include missing value analysis, duplicate removal, and temporal feature engineering to extract the features hour, day, month, weekday, and is weekend. The parking occupancy rate prediction model was built using decision-tree regression and compared with linear regression, K-nearest neighbors (KNN), and support vector regression (SVR). Test results showed that decision tree regression was the most accurate and robust model, with an average R-squared of 0.9606, the smallest standard deviation of 0.0033, and an MSE of 0.0028, outperforming linear regression, KNN, and SVR. SHAP analysis found that parking occupancy rates are strongly correlated with temporal information. The capacity feature was the most influential, followed by hour, is weekend, weekday, month, and day. These results indicate that parking occupancy trends can be analyzed and explained using SHAP, providing actionable insights for parking managers in optimizing capacity management based on temporal patterns.

Keywords: smart parking, Shapley additive explanation, forecasting, time series, occupancy rate.

Explainable Machine Learning for Child Development Detection Using Imbalanced Data

Ammara Ananti, Farah Qothrunnada, Tasya Pricilia Harianja, Mediana Aryuni

ABSTRACT

Early detection of child developmental difficulties is important for timely intervention, but imbalanced data can limit machine learning (ML) model performance, especially for minority developmental classes. This study evaluates classification of child development using 154 records from the SDIDTK program at Puskesmas Sawah Besar with five developmental attributes: age, gross motor skills, fine motor skills, speaking/language, and socialization. The Random Forest, XGBoost and LightGBM were evaluated using stratified five-fold cross-validation under three data conditions, namely, the original imbalanced dataset, OOSI and ADASYN. The performance was evaluated based on Accuracy, F1-Macro, F1-Weighted, Precision, Recall, ROC-AUC, and PR-AUC. SHAP was used to interpret the selected model. The highest observed mean F1-Macro (0.6813 ± 0.1574) and Accuracy (0.9677 ± 0.0323) were obtained by ADASYN + LightGBM. However, the Friedman test did not show any statistically significant difference between the evaluated configurations ($p=0.5396$). Based on the highest observed F1-Macro, we selected ADASYN + LightGBM for further interpretation. For the out-of-fold data, the SHAP analysis found the most important features to be Gross Motor Skills and Fine Motor Skills. These findings suggest that adaptive oversampling with explainable ML has the potential to aid child-development classification. However, due to the small dataset and extremely limited Abnormal class, further validation with larger and more diverse datasets is necessary.

Keywords: Child Development, Imbalanced Data, ADASYN, OOSI, Machine Learning, LightGBM, Explainable AI, SHAP.

A Laravel-Based Web Back-Office for Village Attendance Governance: A Case Study of Blahkiuh Village

Putu Adi Guna Permana, I Putu Ramayasa, A.A Ayu Meitridwiastiti

ABSTRACT

Abstract—This paper presents the design, implementation, and single-site evaluation of a Laravel-based web back-office system integrated with an existing Flutter mobile attendance application for Blahkiuh Village Government, Bali, Indonesia. Prior Laravel-based attendance systems have targeted corporate settings with generic role models, and prior Flutter-based systems have targeted educational institutions as standalone mobile applications; neither line of work has produced a validated design for translating the structural, cultural, and regulatory specifics of Indonesian village governance (Law No. 6/2014; Government Regulation No. 43/2014) into an integrated mobile-web architecture. Using a Design Science Research approach with a Waterfall development process, we propose three design artifacts not jointly addressed by the reviewed literature: (1) a village-hierarchy role-based access control (RBAC) model mapped to the statutory village organisational structure; (2) a rule-based holiday-reconciliation engine integrating national public holidays with Balinese Hindu religious observances (Galungan, Kuningan, Nyepi); and (3) a governance-analytics dashboard whose indicators are derived from village accountability reporting obligations. The artifacts were implemented as a ten-module production system and evaluated through a single-site case study at Blahkiuh Village with 15 User Acceptance Testing (UAT) respondents, 50 black-box test cases, and JMeter load testing at up to 50 concurrent users. The system achieved a 96% initial black-box pass rate (100% after correcting two concurrency defects), a mean UAT score of 4.35/5.00 (87.6%), and near-real-time synchronisation (dashboard reflects mobile check-ins within ≤ 5 minutes). Attendance recapitulation time was reduced from approximately four hours to under ten minutes per reporting period. These findings support the feasibility of the proposed design within a single village context; transferability to other villages remains a direction for future multi-site validation.

Keywords: Laravel; Flutter; web back-office; village e-government; geofencing; RBAC; attendance system; Design Science Research; smart village.

Selective Model Retraining: Balancing Predictive Robustness and Operational Efficiency under Concept Drift

Anas Wicaksono, Gede Putra Kusuma

ABSTRACT

Concept drift, the change in data distributions that degrades prediction accuracy, is a regular occurrence in machine learning algorithms used in production. Conventional retraining practices, whether periodic or triggered by distributional change detectors such as the Population Stability Index (PSI), are costly and do not always correspond to actual performance degradation. This paper presents a systematic empirical study of selective, performance-driven retraining strategies for supervised learning on tabular data. We evaluate five strategies, namely no-retraining, continuous retraining, and selective retraining with three memory mechanisms (cumulative, sliding window, and exponential decay), across three datasets: a real-world electricity market stream and two synthetic variants with controlled gradual and abrupt concept drift. We further compare performance-based and PSI-based retraining triggers to isolate the effect of trigger mechanism from memory strategy. Results show that selective retraining with exponential decay or sliding window memory outperforms both the static baseline and continuous retraining across the evaluated dataset-model pairs, achieving a mean accuracy of 0.864 compared to 0.826 for the static model, while substantially reducing retraining cost. Performance-based triggering required fewer retraining events (23.3 on average) and consumed less retraining data (209K records) than PSI-based triggering (38.3 events, 716K records), while achieving comparable predictive accuracy (0.871 vs. 0.868). These findings provide practical guidance for designing efficient model maintenance pipelines under non-stationary conditions.

Keywords: concept drift, selective retraining, performance degradation, model maintenance, non-stationary data.

Performance and Limitation Analysis of YOLOv11 for Multi-Object Waste Detection

Luis Wang Ciputro; Edward Kenjiro Tan; Chrisvian Purnama Rahardjo; Adele B L Mailangkay

ABSTRACT

Artificial intelligence has fundamentally changed modern waste management through the automation of the previously manual sorting process. Although previous research has shown high detection accuracy under ideal conditions for a single object, empirical testing in dense and obstructed environments is still very limited. This study examines the performance limits and structural limitations of the YOLOv11 model when detecting multi-object waste matrices under complex visual conditions. Using a dataset of 3,573 images reflecting various physical characteristics of the waste, the model evaluation revealed a significant performance gap between the validation set and the test set. The system managed to achieve a precision score of 72.0% and recall of 38.0% during validation, but those metrics dropped sharply to 41.4% precision and 29.5% recall during final testing. This decrease in performance is related to the failure of the regression bounding box layer in handling highly stacked materials and transparent plastics. These findings present a systematic empirical mapping of detector limitations in random environments, while proving that visual data augmentation techniques alone are not able to solve the problem of local spatial occlusion without mechanical pre-sorting intervention.

Keywords: YOLOv11, Waste Detection, Performance Analysis, Computer Vision, Object Density, Visual Occlusion.

Light-Resilient CIELAB-Driven Random Forest for Computer Vision-Based Banana Ripening Classification

Jonathan Adriel Emmanuel Sujadi, Takka Wahyu Imam Najib, Muhammad Rizki Nur Majiid, Prabowo Wahyu Sudarno

ABSTRACT

Due to the misclassification of the bananas that are caused by non-uniform ambient illumination the postharvest handlers undergo variety of issues in evaluating the fruit maturity, quality, and safety. Many established computer vision pipelines critically depend on standard RGB representations that fail sharply with illumination intensity and shadow artifacts. The RF algorithm was successful in accurately classifying banana ripeness, with the machine learning model achieving a validated accuracy rate of 94.8%. The CIELAB-RF model was evaluated on an experimental benchmark set with 1,061 banana images taken at different ripening stages. The test set also included 318 images taken under very low-light and uneven lighting conditions. The model achieved a testing accuracy of 89.28% and low Log Loss of 0.314 significantly outperforming the RGB-based baseline which had an accuracy of 80.49% and Log Loss 0.548. Under poor lighting conditions, the accuracy showed that CIELAB maintained an accuracy of 84.91% while RGB 77.36%. Thus, CIELAB showed illumination resilience more than RGB. These findings indicate that uncombining luminance from chromaticity promotes feature learning for automatic postharvest grading and non-destructive quality control.

Keywords: Banana Ripeness, CIELAB Color Space, Computer Vision, Lighting Robustness, Machine Learning, Postharvest Grading, Random Forest.

Classification of Biodegradable and Non-Biodegradable Waste using Convolutional Neural Network Method with ResNet152V2 Architecture

Evi Dewi Sri Mulyani, Shinta Siti Sundari, Teuku Mufizar, Cepi Rahmat
Hidayat, Dede Syahrul Anwar, Rosi Maelani

ABSTRACT

Waste classification can be made easier with automated systems. This can help people who sort waste by hand. A study was done to see how well a certain type of classifier works. This classifier is called ResNet152V2. It is used to sort waste into two groups: biodegradable waste and non-biodegradable waste. The study did not try to come up with a way of doing things. Instead it looked at how the classifier works in different situations. The study used a set of pictures to test the classifier. There were 4,257 pictures in total. 1,808 Of these pictures were of waste and 2,449 were of non-biodegradable waste. The classifier was trained to look at these pictures and sort them into the groups. The study found that the classifier worked well when it was trained with 80% of the pictures and tested with the other 20%. It got 97% of the pictures right. It was also very good at finding the waste and the non-biodegradable waste. The study also looked at how the classifier worked with pictures it had not seen before. It got 19 out of 20 pictures right. Other classifiers, like MobileNetV2 and EfficientNet-B0 are smaller. Use less memory. So even though the ResNet152V2 classifier is very good it might not be the choice for all situations. We need to look at how it works on different types of computers and devices before we can say it is the best choice. Waste classification is a thing and we need to make sure we are using the best tools to do it. The ResNet152V2 classifier is a tool but we need to do more research to see how well it works in different situations. The study of waste classification and the use of ResNet152V2 is ongoing. We will learn more, about it as time goes on.

Keywords: Biodegradable, Classification, Computer Vision, CNN, ResNet152V2.

EEG Session Screening for Subject-Specific Motor Imagery Classification Using EMOTIV Insight

Yamin Thwe, Dechrit Maneetham, Padma Nyoman Crisnapati

ABSTRACT

This research investigates the effect of EEG recording time on the quality of dataset used for motor imagery classification using the EMOTIV Insight headset. This study focusses individual recording sessions as candidate datasets. It asks whether session-specific signal separability can screen EEG recordings before subject-specific model training. Across sessions, the participant, headset, experimental protocol, preprocessing pipeline, feature set, and classifier pool remained unchanged, yet four-class MI and ME performance varied substantially. EEG recordings were done from one participant during several recording times using five channels such as AF3, T7, Pz, T8, and AF4. Preprocessing involved notch filtering, band-pass filtering, windowing, and extraction of statistical, spectral and asymmetry features. Machine learning techniques involving several classifiers were applied to classify EEG features. The highest performance of the four-class Motor Imagery classification algorithm was obtained at 13:25:42 utilizing Random Forest, with 84.52% accuracy and 84.59% weighted F1-score. The highest performance of the four-class Motor Execution classification algorithm was obtained at 13:41:49 utilizing Gaussian Naive Bayes, with 89.29% accuracy and 88.95% weighted. This research indicates that the quality of the EEG data set is influenced not only by the device used and the feature extraction technique but also by the timing of the data collection process. While this research is restricted to one subject, it is possible to claim that time-dependent acquisition of EEG data could increase the effectiveness of the BCI models for subjects.

Keywords: motor imagery; wearable BCI; session variability; signal separability; spectral band power; subject-specific modeling.

From CNNs to LightGBM: Optimizing Urban Environmental Sound Classification for Resource-Constrained Deployment

Karina Wardoyo, Samuel Setiawan, Nidya Tjokroseputro and Muhammad Majiid

ABSTRACT

This study evaluates seven machine learning models – Convolutional Neural Network (CNN), Multi-Layer Perceptron (MLP), XGBoost, Random Forest, Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), and LightGBM – for urban environmental sound classification using the UrbanSound8K dataset. The dataset consists of 8,732 labeled audio clips from 10 urban sound categories. The models are presented with two different feature representations (mel-spectrograms) in CNN and 88-dimensional MFCC in all the other models. The results show that the CNN achieves the best accuracy with 95.76% classification accuracy and F1 score of 95.76% and the MLP shows a competitive performance of 94.45% and only 166 times fewer parameters and 0.80 MB size but without a corresponding reduction. The best accuracy-efficiency trade-off is in LightGBM with 94.16% accuracy and 0.11 ms inference latency which is the best model for real-time. The recurrent models record the lowest accuracy, at 71.27% for LSTM and 72.93% for GRU, which means that recurrent modeling of MFCC features is not beneficial to this classification task. These results suggest that the model selection for urban sound classification should consider both classification performance and computational efficiency, since traditional ensemble methods can achieve deep learning accuracy or even close to it at a fraction of the inference cost.

Keywords: urban sound classification, deep learning, gradient boosting, inference latency, MFCC, UrbanSound8K .

Design And Implementation Of A Real Time Emotion Recognition Interoperability System Based On Lab Streaming Layer Using Eeg Dataset Simulation

Rama Ngurah Putera Pinatih, I Made Agus Wirawan, I Nyoman Saputra
Wahyu Wijaya

ABSTRACT

Electroencephalogram (EEG) based emotion recognition has attracted increasing attention for its potential application in real-time Brain-Computer Interface (BCI) systems. However, deploying such systems in real-time environments remains challenging due to network latency, data synchronization requirements, and computational constraints. This study proposes an end-to-end interoperability architecture for real-time EEG-based emotion recognition using the Lab Streaming Layer (LSL) protocol to support reliable streaming and synchronization of EEG data. The proposed framework was evaluated through streaming simulations based on the AMIGOS dataset using two participants as a proof-of-concept evaluation. A 3-second sliding window buffer was employed to reduce transient filtering artifacts while maintaining the quality of Differential Entropy (DE) features. Furthermore, a spatial temporal Convolutional Neural Network (CNN) model was converted into the Open Neural Network Exchange (ONNX) format to improve inference efficiency in the deployment environment. Experimental results showed that the proposed architecture achieved zero packet loss with strict temporal alignment while preserving real-time processing. The ONNXbased inference engine achieved processing times of 6.00–12.00 ms, with end-to-end latency remaining stable within 135–200 ms. In addition, the system maintained low network jitter (<22 ms) and no packet loss during transmission. The communication infrastructure performed reliably, but classification performance was limited by severe class imbalance and static ground-truth annotations. The latter may not capture temporal changes in emotional response and could contribute to emotion carryover. These results support the architecture as a proof of concept for real-time EEG emotion recognition, although validation with more subjects is needed to assess model generalizability. .

Keywords: Brain-Computer Interface, Emotion Recognition, Lab Streaming Layer, ONNX, Real-Time Processing.

An Ablation Study of Attention Mechanism and Deep Supervision in Swin UNETR for Brain Tumor Segmentation under Limited Computational Resources

Jolin Tiomar, Dani Suandi

ABSTRACT

Brain tumors carry high mortality rates, shown by a mortality-to-incidence ratio (MIR) of 0.77 according to GLOBOCAN 2022, making precise segmentation of tumor subregions crucial. Swin UNETR, a hybrid architecture that demonstrated superior performance at BraTS 2021, but the effectiveness of feature-enhancing modules such as Attention Gates (AG), Squeeze-and-Excitation (SE), and Deep Supervision (DS) that proved beneficial in conventional CNN architectures has not been systematically evaluated in Swin UNETR under limited computational conditions, nor has their evaluation typically been accompanied by formal statistical testing. Our research conducts an ablation study to assess the contributions of AG, SE, and DS to Swin UNETR, both individually and in combination. We trained five model variants on the BraTS 2021 dataset with identical hyperparameters for 150 epochs using an NVIDIA Tesla T4 GPU, then evaluated them on 126 subjects in the test set using the Dice Similarity Coefficient (DSC) and 95% Hausdorff Distance (HD95). Each comparison was tested on a per-patient basis using the Bonferroni-corrected Wilcoxon Signed-Rank test, Cohen's d effect size, and a 95% confidence interval based on 10,000 bootstrap resamplings. Results showed that all variants achieved an average DSC above 0.91, but none of the 24 comparisons reached statistical significance after correction, and all effect sizes were classified as negligible. We conclude that the addition of AG, SE, and DS is proven to be computationally efficient, however it does not result in a statistically significant improvement in performance.

Keywords: brain tumor segmentation, Swin UNETR, attention gates, squeeze and excitation, deep supervision.

Prototype GIS Mobile Platform for Local Pasalubong Commerce with Reproducible Haversine Verification

Ariana Kaye Mola, Faisal Amir Harahap, Hanz Maveric Naldoza, Justine Galea, Angelica Siodena, James Ryan Ga, Rachel Gallego

ABSTRACT

Local pasalubong businesses in provinces and islands usually handle orders, product information, and courier availability in completely different ways. This paper proposes DAHO, a geoinformation-system mobile prototype built with Flutter and Firebase, which connects customers, pasalubong-center owners and local couriers. We provide a domain-specific systems description and explain a way of verifying procedures which can be repeated rather than inventing a new routing algorithm. The methods specify the workflow of the four participants, set the rule of a courier-proximity preselection with Haversine distance, and test how 50 synthetic locations of couriers generated from 5-km range of a fixed pickup point by seed 20260805 perform. Based on the equation and an independent geopy 2.4.1 implementation, the same nearest courier was chosen and the order ranked for all 50 cases exactly the same; the biggest distance difference was about km. To find out which requirements can be covered, six functions exposed on the interfaces were determined, while three other functions were marked as ones needing to be independently functionally or security tested, leaving one unmentioned as the multi-stop optimizer which should be done. The synthetic test checks the mathematical accuracy while the inventory lists the available workflow evidence. None of the two is proof of the DAHO app being able to perform its tasks properly, or of it being street-network optimal, delivery-time reducing, user-friendly dependable secure, or business-enhancing.

Keywords: courier preselection, geographic information system, Haversine distance, local commerce, mobile application, prototype verification, synthetic testing.

Basic Commodity Price Prediction using SARIMA Algorithm

Princess Hiponia, Shem Patrick Cantara, Catlane John Talagon, Rey Constantino Gonzaga, James Ryan Ga, Rachel Gallego

ABSTRACT

Municipal commodity price forecasting suffers from a lack of reliable local data and limited access to reproducible decision-support tools. This work introduces Seasonal Autoregressive Integrated Moving Average (SARIMA) workflow and application for two representative commodities Bareta (360 g) and Lucky BT (1 kg) by utilizing history price data collected from the Department of Trade and Industry and also selected retail establishments in Jordan, Guimaras that encompasses the year 2023 to mid-2025. The workflow contains time-index alignment, data-quality checks, Augmented Dickey - Fuller (ADF) testing, seasonal diagnostics, model choice and temporally ordered validation. Per ADF it was found that Bareta needs differencing while Lucky BT is stationary in levels. The source experiment log does not reveal split-level forecast errors or provide baseline comparison that is the reason why this paper does not attempt to present forecast accuracy or SARIMA supremacy of results. The paper offers an open, local forecasting and deployment system that is subject to further confirmation of comparative performance based on full experiment outputs alone.

Keywords: Augmented Dickey–Fuller test, commodity prices, forecast evaluation, Jordan Guimaras, SARIMA, time-series forecasting.

Knowledge Distillation for Lightweight Food Image Classification on UECFOOD256: Optimizing EfficientNet-B0 Toward Full-Model Performance

Stella Budi Sugianto, Sisilia Annabel Aileen, Vincent Christian Atmadjaya,
Arya Krisna Putra, Irene Anindaputri Iswanto

ABSTRACT

Knowledge distillation is normally applied with a teacher that outperforms its student, and its benefit is often attributed loosely to “soft targets” without isolating what the teacher actually contributes. We test both assumptions on UECFOOD256, a 256-category food benchmark, under a parameter-efficient transfer setting in which only the final convolutional block and the classifier head of an ImageNet-pretrained network are trained. In this setting EfficientNet-B3 does not dominate EfficientNet-B0: the larger network reaches 52.74% Top-1 accuracy against 56.25% for the smaller one, because compound scaling cannot be exploited through a frozen backbone and B3 is evaluated below its native input resolution. Distilling B3's temperature-scaled soft labels into B0 nevertheless raises the student to 57.46% Top-1 and 84.48% Top-5, an improvement on every metric, while leaving the student's 5.3 M parameters and inference latency unchanged. Two controls isolate the mechanism: label smoothing ($\epsilon = 0.1$), which supplies soft targets without a teacher, lowers accuracy to 54.35%, and FitNets-style feature distillation reaches 55.94%, also below the hard-label baseline. Only logit-level transfer from an actual teacher helps. Because B3 and B0 are the same architecture under different compound-scaling coefficients, their logits occupy a comparable representational space, and we argue that what transfers is the teacher's ordering over visually adjacent food categories rather than its top-1 competence. On this evidence distillation does not require a stronger teacher; it requires a teacher whose class structure the student can read.

Keywords: food image classification, knowledge distillation, intra-family distillation, EfficientNet, parameter-efficient transfer, UECFOOD256.

Association Rule Mining for Consumer Purchase Pattern Analysis at PT Kids Automotive Indonesia

Ratih Puspasari, Muhammad Rivaldy Daulay

ABSTRACT

The rapid expansion of retail transaction data in the automotive sector has created significant challenges in extracting actionable business intelligence. Traditional descriptive reporting methods are insufficient to uncover hidden relationships among purchased items. This study proposes an Association Rule Mining approach using the Apriori algorithm to analyze purchasing patterns at PT Kids Automotive Indonesia. The research adopts a quantitative data mining framework following a Waterfall development model consisting of problem definition, data collection, preprocessing, exploratory data analysis, model implementation, and evaluation. A total of 20,507 transaction records were utilized as the dataset. Association rules were generated and evaluated using support, confidence, and lift ratio to measure the strength and relevance of item relationships. The results indicate that multiple strong association rules exist among frequently purchased product combinations. These patterns provide evidence of meaningful cross-selling opportunities and product bundling strategies. Furthermore, the preprocessing stage significantly improves data quality, leading to more reliable and interpretable association rules. The findings demonstrate that Association Rule Mining effectively transforms raw transactional data into strategic business intelligence that supports decision-making in marketing optimization, inventory management, and product placement strategies within retail automotive environments .

Keywords: Apriori algorithm, association rule mining, consumer purchase pattern, data mining, electric bike retail, market basket analysis .

Iterative Prototyping and Internal Traceability Audit for a Web-Based Agricultural Insurance System

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Faith Jornadal, Marnie Lester Jornadal

ABSTRACT

Following the concept of digitized and integrated crop and livestock insurance management, a web-based centralized system came to life. The goal was to convert and unite the entire operation processes, paper-based registration, incident reporting, administrative review communication, summary reporting and certificate generation into a single system. In system development, the development team followed a traditional model of six stages: Planning, Analysis, Design, Implementation, Testing and Maintenance. For the retrospective evaluation they conducted themselves the development team compared six preimplementation functional requirements to the final system architecture, the user interface and the artifacts of the completed system. They found that all six requirements were met through tangible and verifiable artifacts. Because of this, the coverage ratio was 100% (6/6) in the nominal terms. Still, this metric should not be considered inferential it reflects the functional scope coverage solely. This does not in any way guarantee the system would run correctly or improve performance. This internal review missed all user samples, baseline metrics for task time, validated usability instruments, error-rate analysis, system reliability testing, security audits or independent interrater evaluations. The main contributions of this work are the development of a functionally integrated prototype system, setting up a transparent internal way to trace requirements and drawing up evidence boundaries of the baseline to guide future empirical field testing.

Keywords: Agricultural Insurance, artifact, crop insurance, functional prototyping, requirement traceability, systems integration.

Efficiency–Performance Trade-off of Lightweight and Transformer-based Models for Disaster Tweet Classification

Marvell Winanto, Anggit Adhikary, Louiza Tanaya, Meiliana, Fiqri Ramadhan Tambunan

ABSTRACT

Disaster-related tweets provide important real-time information during emergency situations, making automated disaster tweet classification an important task for emergency response systems. Both accuracy and speed of predictions are needed in this situation. This study investigates the efficiency–performance trade-off between lightweight and transformer-based models for disaster tweet classification. Three lightweight models, namely TF-IDF + Logistic Regression, TF-IDF + Multinomial Naive Bayes, and Word2Vec + Logistic Regression, were compared against two transformer-based models, BERT and DistilBERT, using the Disaster Tweets dataset from Kaggle. All models were evaluated under identical experimental setup using Google Colab with NVIDIA Tesla T4 GPU acceleration to ensure a fair comparison. Results showed that BERT achieved the highest classification performance with the highest F1-score of 0.77, with DistilBERT following closely with an F1-score of 0.76. However lightweight models demonstrated substantially better computational efficiency, requiring less than one second for both training and inference. Among all the tested lightweight models, TF-IDF + Logistic Regression demonstrated the most balanced efficiency–performance trade-off by achieving a competitive classification performance with significantly lower computational cost.

Keywords: Disaster Tweet Classification, Lightweight Models, Transformer Models, Computational Efficiency, Natural Language Processing.

Measuring and Quantifying Feature Contribution Inequality in Machine Learning Models: A Case Study on Fraud Detection

Brian Filbert, Farrel Gionovan Surbakti, Reinert Yosua Rumagit, Reina Setiawan

ABSTRACT

While the predictive performance of a model is the most common and dynamic aspect that we all emphasize, the appropriate distribution of the contributions of each feature of the models is critical for providing interpretability of the models especially in high-stakes domains (e.g., detecting fraudulent transactions, financial analysis). This study employs the fraud detection data which are heavily imbalanced to analyze the provision of inequality of features contribution using machine learning models namely Random Forest and XGBoost. We analyze feature importances with the Gini coefficient and entropy to quantify concentration or distribution of contributions through features extracted from the models. Moreover, the evaluations were based on the effect of SMOTE (Synthetic Minority Oversampling Technique) in alteration the feature contribution behavior. Also, it has an opposite impact for the two models: for Random Forest, SMOTE increases inequality while it decreases concentration in XGBoost. These results indicate that trend of feature contribution behaviour by data balancing is model architecture-dependent. This suggests the relevance of measuring feature contribution distribution instead of using solely predictive performance metrics. Besides feature contribution inequality, predictive performance was assessed in terms of Precision, Recall F1-score and ROC-AUC. As experimental results prove, SMOTE exhibited a better recall and ROC-AUC for both models but affected the distribution of feature contributions differently in different model architectures.

Keywords: Feature Contribution Inequality; Feature Importance Distribution; Imbalanced Data; Random Forest; XGBoost.

Optimizing Cardiovascular Diagnostics: A Performance Evaluation of Ensemble and Standard Classifiers

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Tedjasulaksana

ABSTRACT

Abstract—Cardiovascular disease remains one of the leading causes of death worldwide, making early and accurate diagnosis essential for reducing mortality and treatment costs. In recent years, numerous studies have leveraged machine learning techniques such as Random Forest and XGBoost to detect heart disease from clinical data with promising results. However, many studies concentrate on a narrow range of algorithms or use inconsistent preprocessing steps, leaving classifiers such as SVM and KNN largely unexplored within the same framework. This study compares five classification models—Decision Tree (DT), Random Forest (RF), Extreme Gradient Boosting (XGBoost), Support Vector Machine (SVM), and K-Nearest Neighbors (KNN) for the early prediction of heart disease. The evaluation utilizes the Cardiovascular Disease Dataset, which consists of 1,000 patient records and 12 clinical features. The pipeline includes Data Collection, Data Cleaning, Data Preprocessing, EDA, Train Test Split, Modelling, and Model Evaluation. Performance was evaluated based on accuracy, precision, recall, and F1-score. The results indicate that XGBoost delivered the best performance, reaching an accuracy of 98%, followed by Random Forest at 97%, SVM at 96.5%, and both Decision Tree and KNN at 95%. These results are comparable to, and in several cases exceed, accuracy figures reported in prior studies, although direct comparison should be interpreted with caution due to differences in datasets used across studies.

Keywords: Heart disease prediction, machine learning, comparative analysis, classification, healthcare analytics.

Benchmarking ResNet Backbones in RT-DETR: Impact of Depth and Regularization under environmental conditions

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Guterres and Ricardo B. Grando

ABSTRACT

Image detection is essential in robotics, where environmental changes can directly affect real-time detection performance. The literature on transformer-based detectors provides limited information about how backbone size and environmental conditions affect model performance. This work presents a comparative evaluation of RT-DETR for ball detection across different lighting and background scenarios, as well as robotics-relevant hyperparameters. We compare the four ResNet backbones (ResNet-18, ResNet-34, ResNet-50, and ResNet-101) with different dropout rates to analyze the effect of dropout on confidence and accuracy. All models were trained with the same configuration and tested under different lighting and background contrast. Environmental conditions are the main factor affecting prediction confidence. However, the classification accuracy is mostly high with 1.00. Two distinct performance patterns were identified. To handle the lighting variations, ResNet-50 provides the best trade-off of high accuracy with a negligible margin of error, confidence values of up to 0.869 and a latency of 0.058-0.059 ms. For background variations, ResNet-34 performs the most balanced with high accuracy and high confidence values up to approximately 0.887. These results show that the best architecture depends on the type of environmental variation, with intermediate-depth models offering the best balance between performance and efficiency.

Keywords: Computer Vision, Object Detection, RT-DETR, ResNet, Inference Time, Regularization, and Lighting Conditions.

A Feature-Level Attention BiLSTM Network with Huber Loss for Daily Rainfall Forecasting and Rice Planting Calendar Estimation

Fandi Presly Simamora, Juliana Damayanti Manurung

ABSTRACT

In rain-fed farm districts such as Tanjung Morawa, Deli Serdang, North Sumatra, Indonesia, where 43.90% of paddy fields depend solely on natural rainfall, climate change and changing precipitation patterns have led to a decline in the reliability of conventional rice planting calendars. Existing deep learning-based rainfall forecasting architectures mainly use temporal attention mechanisms that treat spatially heterogeneous meteorological inputs in the same way, and standard Mean Squared Error (MSE) training objectives are not appropriate for the right-skewed, zero-inflated distributions typical of daily tropical precipitation. This paper proposes the Feature-Level Attention Bidirectional LSTM (Att-BiLSTM) network trained with the Huber loss function ($\delta=0.05$) for the daily rainfall forecasting in Tanjung Morawa. A 1.0 mm/day threshold preprocessing pipeline is applied to a 10-year (2016–2025) NASA POWER MERRA-2 dataset from four cardinal direction grid points to correct for systematic drizzle effect artifacts and restore the zero-inflated distribution. The feature attention module adaptively recalibrates each meteorological channel in each time step and is stabilized via a residual skip connection. Experimental results indicate that the proposed model reaches the Mean Absolute Error of 4.1495mm and Mean Absolute Percentage Error of 68.53% on the test set, which outperforms all the three ablation baselines in MAE and MAPE. A five-seed sensitivity analysis confirms robustness with a mean MAE of 4.220 ± 0.042 mm, the lowest and most stable of all models. All improvements over all baselines are statistically significant (Wilcoxon signed rank, $p<0.05$). As a downstream proof-of-concept, forecasts were translated into decadal planting-window estimates consistent with the Indonesian Integrated Planting Calendar (Katam), and this initial application achieved partial agreement with observation-derived windows (F1-score 0.222), exemplifying both the potential and the present limitations of forecast-driven planting recommendations.

Keywords: bidirectional lstm, feature-level attention, huber loss, rainfall forecasting, rice planting calendar.

SecBERT-Enhanced Multi-Label Vulnerability Detection for FHEVM Smart Contracts

Mario Benedict, Michael Kevin Pratama, Franz Adeta Junior and Andry Chowanda

ABSTRACT

Fully homomorphic encryption lets a program compute on encrypted data without decrypting it, and the FHEVM framework brings that capability to Ethereum smart contracts through encrypted types, per-ciphertext access control, and asynchronous decryption. The same features open failure modes that ordinary Solidity analyzers cannot see: encrypted branches cannot revert, each ciphertext handle carries its own permissions, and decryption spans two transactions. Existing learned detectors score well on conventional Solidity bugs but assume plaintext execution, and no labeled FHEVM dataset exists to retrain them. We address both gaps. We define three confidentiality aware vulnerability classes grounded in the OWASP Smart Contract Top 10, namely ACL misconfiguration, arithmetic overflow or underflow, and callback replay, and we build a synthetic corpus of 1,022 compilable contracts that spans fifteen application categories and every combination of the three. We enlarge the training partition with four semantic-preserving code transformations, represent each contract by fusing TF-IDF, Word2Vec, and SecBERT views of its opcodes, and feed them to four recurrent multi-label classifiers: an LSTM, a Bi-LSTM, a Bi GRU, and a Bi-LSTM with attention. On 150 held-out contracts every model behaves alike. Callback replay is detected perfectly, arithmetic faults almost as well, and macro-F1 sits between 0.83 and 0.85, but ACL misconfiguration is capped near 0.55 to 0.63. Augmentation barely changes this, and nearly every error is an ACL misread, which places the limit in the opcode representation rather than the model and points to argument-level features as the way forward.

Keywords: fully homomorphic encryption, FHEVM, smart contract security, multi-label classification, vulnerability detection, SecBERT.

Comparative Analysis of Hybrid GARCH-LSTM and LSTM-Transformer Models for Stock Price Prediction

Jazlyn Phylisia, Rooney Soon, Zephania Widjaja, and Abram Setyo Prabowo

ABSTRACT

Increased volatility in the Indonesian Stock Exchange (IDX) due to High Frequency Trading (HFT) and global crises like the COVID-19 pandemic has made traditional stock forecasting method outworn. To keep up with these market shifts, researchers have turned towards hybrid artificial intelligence models that combine deep learning with financial mathematics. Additionally, full deep learning models have also become a powerful alternative. This study evaluates and compares two fully optimized hybrid deep learning models: the traditional statistical hybrid GARCH-LSTM model and the pure artificial intelligence LSTM-Transformer model. Historical stock prices from a 10-year dataset of major Indonesian banks (BBCA, BBRI, and BBNI) were normalized using min-max scaling, and their performance was evaluated using Directional Accuracy (DA) and Mean Absolute Percentage Error (MAPE) across several lookback windows. The results show that the GARCH-LSTM model delivers better overall prediction accuracy, achieving its highest performance on BBNI stock with a Directional Accuracy (DA) of 63.08% and a MAPE of 1.52% using a 250-day window. In contrast, the LSTM-Transformer model outperformed only for BBCA stock, achieving a DA of 58.25% and a MAPE of 1.06% over a 250-day window. Overall, the use of these hybrid models significantly improves their ability to track volatility in the current stock market.

Keywords: Stock Market; GARCH; Transformer; Long-Short Term Memory.

Feasibility of Using a 1-Bit Language Model as a Lightweight Decision Engine

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ABSTRACT

Rapid growth of IoT, edge computing, and embedded systems have driven the need for AI components that can operate with a limited number of resources. The development of large language models (LLMs), more interest poured in using artificial intelligence (AI)-driven inference in resource-constrained environments. This paper explores the use of one-bit LLM, BitNet-b1.58-2B-4T, with weights $\{-1, 0, +1\}$, as a lightweight decision engine for simple rule-based classification. 120 CPU usage samples of four classes (LOW, NORMAL, HIGH, CRITICAL) are simulated and each sample is evaluated three times on a limited virtual machine (2 CPU cores, 2GB RAM) running bitnet.cpp on Ubuntu 24.04 without GPU. With 360 observations, the model predicts an overall accuracy of 39.17%, with excellent performance for NORMAL (93.33%), but failure on LOW (0%), and CRITICAL (0%). Predictive consistency is 100% across all 120 samples and predictions are deterministic at temperature = 0. The average decision time to make a decision is 19,015.51 ms, and the average peak process RSS was 9.66 MB at the wrapper level, whereas direct profiling of the inference engine showed about 1.27 GB PSS (Proportional Set Size), dominated by the 1,132.8 MB model file. These results provide a new empirical baseline for evaluating 1-bit LLMs as structured decision components.

Keywords: 1-bit LLM, BitNet, edge AI, decision engine, CPU inference, quantization, classification.

On the Effect of Input Resolution on Backdoor Attacks and Defenses in Traffic Sign Classification

Pamela G. Barboza and Ashneet Khandpur Singh

ABSTRACT

Traffic sign recognition models are trained with third-party data and pretrained weights, which increases exposure to training-time backdoor poisoning. This work evaluates how input resolution affects backdoor attack effectiveness and defense behavior in traffic sign classification. A ResNet18 classifier is trained on a balanced subset of the German Traffic Sign Recognition Benchmark using two input resolutions, 32×32 and 64×64 . Two attack families are considered: a dirty-label raindrop trigger and a clean-label sinusoidal trigger. The raindrop attack is evaluated in terms of poisoning rates and mask thresholds, and the sinusoidal attack is evaluated in terms of trigger frequencies with fixed amplitude parameters. We evaluate three defenses under the same protocol, Fine Pruning, De Pois and PiDAn. Results show that high resolution improves clean accuracy, but does not guarantee low attack success. Instead, vulnerability depends on the interaction between resolution, trigger structure, and attack parameters. Fine Pruning provides the most stable mitigation across attacks and resolutions, while De Pois and PiDAn are more sensitive to detected class, CPV, threshold, and frequency settings.

Keywords: Poisoning-Data, Defenses, Trigger, Backdoor, Resnet18.

An Experimental Evaluation of YOLOv8n for Real-Time Safety Helmet Detection in High-Density Urban Traffic

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ABSTRACT

Monitoring helmet use manually is difficult, especially in areas with heavy motorcycle traffic. Although lightweight object detection models such as YOLOv5n and YOLOv6n have been used for this task, their performance may still be limited under certain conditions. This study evaluates YOLOv8n for real-time helmet detection in Electronic Traffic Law Enforcement (ETLE) systems using a dataset of 1,533 images. The model achieved a precision of 0.796, recall of 0.773, mAP@0.5 of 0.790, mAP@0.5:0.95 of 0.443, and an F1- score of 0.784. Compared with YOLOv6n, which produced higher recall but lower precision, YOLOv8n generated fewer false positives and showed a better balance between detection metrics. In terms of computational efficiency, YOLOv8n recorded an inference latency of 8.95 ms (111.73 FPS), with RAM utilization of 45.3% and CPU usage of only 3.0%. These results show that YOLOv8n is a strong candidate for real-time helmet detection in ETLE systems, particularly on edge devices with limited computing resources.

Keywords: Data Augmentation, Deep Learning, Edge Computing, ETLE, Helmet Detection, Object Detection, Real-Time Inference, Traffic Surveillance, YOLOv8n.

Optimizing Data Acquisition to Achieve Sufficient Confidence in Predicting Football Player Value

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ABSTRACT

Existing approaches to football player market-value prediction may use multiple input variables, increasing the effort required to acquire and maintain the associated data. This study investigates whether the number of required input features can be reduced while retaining most of the model's predictive performance. To identify a reduced set of input features, Recursive Feature Elimination was applied with XGBoost and Random Forest models using Transfermarkt data. The peak combined cross-validated R2 was 0.6385. Using a predefined retention threshold of 95% of this value, the selected seven-feature model achieved a combined R2 of 0.6222, equivalent to approximately 97.5% of the peak score. This reduced the number of model input features from 13 to 7. These seven engineered features were derived from six source data columns. Under the tested dataset, preprocessing procedure, model configurations, and cross-validation design, these results indicate that a smaller engineered feature set can preserve most of the observed cross-validated performance. The study does not directly measure data-acquisition costs or establish performance on future or independent datasets.

Keywords: Machine Learning, Recursive Feature Elimination, XGBoost, Football Analytics, Feature Selection, Data Acquisition Optimization.

Zero-Shot Benchmarking of Open-Source LLMs for Indonesian Domain-Specific Question Answering: A Case Study on University Information Services

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ABSTRACT

Deploying a domain-specific question answering (QA) system typically begins with an expensive fine-tuning effort, yet it is rarely known in advance whether an off-the-shelf open-source model would already suffice. Existing Indonesian LLM benchmarks do not answer this, evaluating multiple-choice exam items rather than free-form QA and reporting point estimates without testing their reliability. This paper addresses that gap with a zero-shot benchmark of five open-source models on 52 curated question-context-answer triples about Universitas Perjuangan: one fine-tuned extractive model (IndoBERTQA) against four generative LLMs evaluated strictly zero-shot (Merak-7B-v4, SeaLLM-7B-v2.5, BLOOMZ-7B1, Llama-3.1-8BInstruct), all served locally via 4-bit quantized GGUF weights. Performance is measured with Exact Match (EM), token-level F1, and embedding-based Semantic Similarity, complemented by bootstrap confidence intervals, McNemar's test, and paired bootstrap tests. Llama-3.1-8B-Instruct attains the highest point estimates (EM = 0.404, Semantic Similarity = 0.778) and IndoBERT-QA the highest F1 (0.616), but the top three models are statistically indistinguishable ($p > 0.05$), while SeaLLM-7Bv2.5 is consistently worse than every other model ($p < 0.001$) and Merak-7B-v4 is weaker than the best multilingual models. Category-wise analysis shows no model dominates all question types: BLOOMZ-7B1 excels on numeric questions, Llama-3.1-8BInstruct on official-name extraction, and all models fail on yes/no questions for lexical and structural rather than semantic reasons. These results indicate strong general-purpose multilingual models are competitive zero-shot baselines for Indonesian institutional QA, deferring fine-tuning investment, and that language-specific specialization confers no advantage when the answer is supplied in context. .

Keywords: question answering, large language model, zero-shot learning, Indonesian natural language processing, IndoBERT, benchmark evaluation.

Evaluating Face Verification Accuracy of ArcFace vs FaceNet Under Varying Lighting Conditions

Florencia Olga, Michelle Angela Pang, Shania Priccilia, Diana

ABSTRACT

This study combines and analyzes the face verification accuracy of ArcFace and FaceNet under different illumination conditions on Extended Yale B (Cropped) dataset. Images of 28 subjects under 64 illumination conditions were divided into four lighting severity subsets, depending on the elevation angle. The total number of 12K pairs (6K genuine and 6K impostor) were tested with the cosine similarity metric, where the thresholds were determined through the Best F1-score criterion. ArcFace achieved an overall accuracy of 95.89%, precision of 98.92%, recall of 92.80%, FAR of 1.02%, and FRR of 7.20%. FaceNet achieved an accuracy of 80.46%, precision of 80.06%, recall of 81.12%, FAR of 20.20%, and FRR of 18.88%. In each of the subsets, ArcFace consistently produces high performance in all lighting situations, whereas FaceNet is more sensitive to the extreme lighting situations. The results indicate that ArcFace is better at face verification when the light conditions are not controllable.

Keywords: face verification, ArcFace, FaceNet, illumination variation, Extended Yale B (Cropped), cosine similarity.

Quantifying Data Quality Sensitivity in Tabular Machine Learning Pipelines

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ABSTRACT

In real-world tabular data sets, it is rare to find data that is completely clean. Missing data, noise, outliers, mislabeling, and duplicates show up constantly in practice. Although their influence on classification performance has already been investigated, little is known about how the same corruption affects model calibration and the consistency of feature importance rankings. In this research, we fill in the aforementioned knowledge gap. Specifically, we design a framework for testing four popular algorithms for classification—Logistic Regression, Random Forest, XGBoost, and Multi-layer Perceptron classifier against five types of data corruption in five different severity levels on two public datasets. In addition to accuracy, we measure area under the receiver operating characteristic curve (AUC), expected calibration error (ECE), Brier score, and Spearman correlation coefficient between feature importance vectors of each corruption level. Finally, we propose an aggregated degradation measure called Area Under the Degradation Curve (AUDC) that enables normalized comparison of models' robustness against any type of corruption across all tested severities using a single metric. From the results obtained, label noise results to the greatest AUDC (1.0741) followed by outliers (0.9085) while Gaussian noise (0.0118) and duplicate insertion (0.0061) result to the least effects on the tested scenarios. On the other hand, the Random Forest method performs with the smallest mean AUDC of 0.2132 while Logistic Regression exhibits high sensitivity of 0.6668. Moreover, the statistical tests carried out indicate that the robustness depends on the metric used where there is significant difference between the models in AUC, ECE, and feature importance stability but not in Accuracy or Brier score.

Keywords: machine learning, data quality, tabular data, robustness, calibration, feature importance, AUDC.

Assessing SHAP Explanation Reliability Across Tree-Based Ensemble Models for Credit Risk Prediction

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ABSTRACT

Although the machine learning models produced show comparable predictive performance, the factors identified as influencing borrower risk by the models can differ. This study was carried out with the aim of assessing the consistency of a number of machine learning models in the prediction of credit risk. Explanatory consistency was determined by comparing the SHAP results across five tree-based machine learning models—CatBoost, XGBoost, LightGBM, Random Forest, and Extra Trees—and was measured using Jaccard Similarity, Spearman's Rank Correlation, and Kendall's Tau, which were then combined into a Reliability Index (RI) to give an overall measure of the consistency of the explanations across the models. The evaluation results indicate that the ROC-AUC values vary between 0.8693 and 0.8889, showing that the models have rather similar performance. However, the global RI values were found to differ significantly, ranging from 0.2489 to 0.8212. This means that even though the models generally perform similarly, the degree of consistency in their explanations varies, with the pair consisting of XGBoost and LightGBM showing the greatest similarity in consistency. Furthermore, SHAP consistency was also examined locally using 500 stratified held-out observations. The findings from this study's evaluation reveal that consistency in explanations at the global level is not always the same as the consistency observed for each individual prediction. .

Keywords: Credit Risk Prediction, Explainable Artificial Intelligence, SHAP, Tree-Based Ensemble Learning, Model Reliability.

SMOTE Variants Analysis for Imbalanced Stroke Prediction Dataset

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Franz Adeta Junior

ABSTRACT

Class imbalance is a major challenge in stroke prediction on tabular data, as the number of stroke patients is far smaller than that of healthy patients, causing standard classification models to be biased toward the majority class and less sensitive in detecting stroke cases. This study compares several SMOTE variants for addressing this problem, grouped into hybrid approaches (SMOTETomek and SMOTE+RUS) and ensemble approaches (SMOTEBagging and SMOTEBoost), with the no-balancing condition serving as the baseline. Each technique is evaluated on the highly imbalanced Stroke Prediction Dataset from Kaggle using three classification algorithms: Random Forest, XGBoost, and Support Vector Machine. Oversampling is applied exclusively to the training data to prevent data leakage, and each model is optimized with the Optuna framework to ensure evaluation at its best configuration. The results show that without tuning, the models fail to detect the minority class despite their high accuracy, with recall close to zero. After tuning, the gap between the hybrid and ensemble approaches becomes thin and neither category surpasses a well-tuned baseline. The best overall performance is achieved by XGBoost without oversampling, with an F1-Score of 0.340 and a recall of 0.640, while the highest recall of 0.800 comes from the tuned baseline SVM at the cost of lower specificity. Significance testing over 50 repeated cross-validation folds confirms that the tuned baseline outperforms all twelve oversampling configurations, while hybrid and ensemble variants sharing a base learner cannot be separated. A cost analysis shows the ensembles to be the most expensive configurations tested, at roughly twenty-two times the baseline training time with no gain. These findings indicate that on a highly imbalanced tabular stroke dataset, model tuning and class weighting contribute at least as much as the choice of oversampling technique.

Keywords: imbalanced data, SMOTE, ensemble learning, stroke prediction, Optuna.

Optimizing R&D Decisions via Data Analytics: A Guimaras State University Case Study

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ABSTRACT

Guimaras State University has problems with managing its Research and Development (R&D) projects which grow increasingly larger. Manual decentralized use of spreadsheet for tracking R&D activities has led to poor information management and decision-making that reacts to a situation. To counter these problems, a web-based data analytics decision-support system was developed, deployed and tested in this research to enhance the governing practices of an academic institution with research and development as its major areas of activities. This system uses an Agile software development life cycle model and consists of a decoupled three-tier architecture with a Reactbuilt GUI and an asynchronous Python/FastAPI backend. The tool integrates high-level analytics engines using Scikit-Learn to perform performance clustering of instructors and predictive risk modelling, and SciPy linear programming solvers for optimal budget prescription. Ingestion of continuous data pipelines is protected by Write-Ahead Logging which ensures integrity of databases and strict validation of data models. System testing performed automatically yielded 100% success rate for security, data integrity, and analytic modules. External assessment to ISO/IEC 25010:2015 resulted in average scores of 4.60 from IT Experts and 4.53 from End-Users representing the Excellent rating across all major characteristics. The authors argue that shifting from an administrative guessing approach to one that is driven by data analysis can really be a game changer for an academic institution that aims to deliver research, development and teaching excellence.

Keywords: Data analytics, Decision-support system, ISO/IEC 25010, Linear programming, Machine learning, R&D management.

Evaluating and Analyzing Performance Degradation of Intelligent Systems Models against AWGN in Tabular Data using Performance Decay Rate (PDR)

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ABSTRACT

The development of intelligent methods in those areas where they can be applied in a highly effective way, for example, in clinical diagnostics and financial forecasting, demonstrated an essential deficiency in the fact that the models are evaluated solely on ideal data, thus creating a gap in the knowledge of their structural resistance to real data distortions. In this work, we conduct a detailed analysis of the sensitivity of four ML models: Multi-Layer Perceptron, Random Forest, XGBoost, and Support Vector Machine to the addition of increasing amounts of AWGN to the numerical features of the UCI Heart Disease Dataset. AWGN was chosen as a degradation model since it can efficiently imitate the continuous random inaccuracies of faulty physical sensors and environmental interferences. Two conditions were considered in the experiment: one simulating the situation of deployment when data is noisy and another simulating the situation when the model was trained and tested on noisy data. The evaluation was conducted using such metrics as F1-Score, MCC, AUC-ROC and the newly proposed metric of Performance Decay Rate (PDR). In contrast to traditional metrics that measure only absolute accuracy, the PDR provides a more precise understanding of the algorithmic fragility by isolating the structural degradation of a model independently of its performance level. XGBoost demonstrated the highest decline in the efficiency with a 17.03% drop of MCC, while RF proved to be the most balanced one, having the minimum value of PDR and 12.12% decline of MCC.

Keywords: Data Degradation, Machine Learning Robustness, Performance Degradation, Intelligent Systems, Additive White Gaussian Noise (AWGN), Performance Decay Rate (PDR).

Comparative Models for Food Security Index Prediction Using Food Prices and Socioeconomic Indicators in Indonesia

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Tedjasulaksana, Stefanus Benhard.

ABSTRACT

Food security plays an important role in supporting sustainable development and socioeconomic stability in Indonesia. However, existing studies have generally examined food security indicators, food prices, and socioeconomic factors separately, with limited integration of these dimensions for Food Security Index (FSI) prediction in Indonesia. This study proposes a machine learning framework for predicting the FSI by integrating food commodity price data from the World Bank Real-Time Prices (RTP) database with Food Security Index data from the Food Security and Vulnerability Atlas (FSVA) and socioeconomic indicators from Statistics Indonesia (BPS). The final dataset contains 204 province-year observations from 2020 to 2025 and 12 predictor variables. Six regression-based machine learning models were evaluated, including Linear Regression, LASSO Regression, Random Forest Regressor, Support Vector Regressor (SVR), XGBoost Regressor, and Voting Ensemble Regressor. Experimental results show that the Voting Ensemble model achieved the best performance with an MAE of 4.783, RMSE of 6.019, and R^2 of 0.670. Feature importance analysis identified onion price, poverty rate, and rice price as the most influential variables associated with FSI variation. Using the best-performing model and the latest available 2025 predictor values carried forward under a persistence assumption, the average Food Security Index for 2026 was forecasted at 70.55. This forecast provides a baseline estimate that can support food security monitoring and planning when observed 2026 indicators are not yet available. The findings demonstrate the potential of integrating food price and socioeconomic indicators within a machine learning framework to support food security monitoring and forecasting in Indonesia.

Keywords: Forecasting, Food Price, Food Security Index, Machine Learning, Socioeconomic, Voting Ensemble.

Experimentation on Various Loss Function Configurations Effects on Liver Tumor Segmentation Performance of TransUNet

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Iswanto, Arya Krisna Putra

ABSTRACT

Liver tumor segmentation by CT scan is an incredibly challenging issue because of tumor variance and class imbalance between tumor and background pixels. Hence, we decided on experimenting on different loss function configurations on TransUNet, trained using LiTS dataset to determine which combination has the best balance between volumetric overlap and boundary accuracy. More precisely, we will experiment on combinations of Dice Loss, Focal Tversky Loss, and Cross-Entropy Loss. The model was trained on 7,114 CT slices with 85% training and 15% validation split. Evaluation uses Dice Similarity Coefficient (DSC) for volumetric overlap and 95th-percentile Hausdorff Distance (HD95) for boundary accuracy. Results uncover the importance of loss function selection, as well as the trade-offs between overlap accuracy and boundary accuracy. FTL + CE Loss achieved the highest and most stable DSC (0.7199 ± 0.0035), while Dice + FTL + CE Loss achieved the best HD95 (3.4513 ± 0.1031). From these findings, we hope to provide revelation that may help future improvements in liver tumor segmentation. We conclude that the combination of all three loss functions is the most robust.

Keywords: liver tumor segmentation, TransUNet, Focal Tversky Loss, Dice Loss, Cross-Entropy Loss, class imbalance, CT scan, medical image segmentation.

Architectural Enhancement of BERT-base-uncased Model for Cross-Lingual Sentiment Analysis on Indonesian Reviews

Johanna Angel Wudianto; Sandy Agatha Indra Lim; Irene Anindaputri Iswanto

ABSTRACT

Most pretrained language models rely heavily on language-specific corpora, limiting their effectiveness in cross-lingual sentiment analysis for low-resource languages. Although multilingual pretrained models have achieved strong performance, it remains unclear whether architectural enhancement alone can improve the cross-lingual transfer capability of an English-pretrained BERT model under language mismatch conditions. To address this gap, this study integrates BiLSTM and CNN with BERT-base-uncased to improve cross-lingual sentiment analysis. The primary dataset consists of 4,465 Indonesian-language reviews collected from 10 educational applications on the Google Play Store. A multi-stage labeling strategy combining lexicon-based sentiment analysis, rating-based labeling, and manual validation was applied, followed by synonym-based data augmentation to address class imbalance. Additional experiments were conducted on Tagalog and Malay sentiment datasets to evaluate cross-lingual generalization across related Austronesian languages. Experimental results show that mBERT achieved the best overall performance among the five evaluated models, with 86.27\% accuracy, 86.12\% Weighted F1-score, and 85.99\% precision. Among the English-pretrained models, BERT+BiLSTM achieved the strongest performance, with 81.94\% accuracy, 81.74\% Weighted F1-score, and 81.59\% precision. Although mBERT achieved higher overall performance, the results demonstrate that architectural enhancement can provide competitive performance under language mismatch conditions, with BERT+BiLSTM outperforming the other English-pretrained model.

Keywords: Sentiment Analysis; BERT; BiLSTM; IndoBERT; Language Mismatch; Architectural Enhancement;

Decoding Neural Representations: CAV-Based Activation Engineering for Explainable Brain Tumor Segmentation across Multiple Architectures

Brian Nicholas Tedjo, Sabrina Arfanindia Devi, Kristian Novan, Arya Krisn Putra, Irene Anindaputri Iswanto

ABSTRACT

Brain tumor segmentation using deep learning has achieved remarkable progress. However, the lack of transparency in neural representations remains a challenge for developing trustworthy AI systems. While Concept Activation Vector (CAV)-based methods have been widely studied for model interpretability in classification tasks, their role as latent intervention mechanisms for medical image segmentation remains underexplored. This study proposes a cross-architecture latent steering framework using CAVs to investigate whether tumor-related concepts can improve segmentation performance without model retraining. The proposed method extracts concept directions from bottleneck representations using Logistic Regression and applies latent space intervention during inference. Experiments on four lightweight segmentation architectures, including Reduced MobileNetV4, UNet-Small, DeepLabV3-Lite, and UNet++ Small, achieve baseline Dice scores ranging from 80.36% to 83.92%. A fixed steering coefficient ($\alpha = 1.0$) was adopted for cross-architecture comparison to provide a unified intervention strength, while architecture-specific sensitivity was examined through an alpha sweep. Under this unified setting, CAV-based intervention provides consistent improvements in overall Dice scores (0.04%–0.22%), with statistically significant improvement observed in DeepLabV3-Lite ($p = 0.023$). Subgroup analysis suggests a potential benefit for larger tumor regions ($\geq 5\%$ area), with significant improvements observed in MobileNetV4 ($p = 0.008$, Cohen's $d = 0.74$) and UNet++ Small ($p = 0.006$, Cohen's $d = 0.48$); however, this finding should be interpreted cautiously because the large-tumor subgroup contains only 13 test samples. Ablation experiments further show that the Logistic Regression-based CAV provides more consistent improvements than random latent perturbations. These findings suggest that CAV-based latent intervention can be used as a plug-and-play mechanism to influence segmentation behavior without retraining. However, its effectiveness still depends on the architecture, steering strength, and tumor characteristics.

Keywords: brain tumor segmentation, concept activation vectors, latent steering, explainable AI, medical image analysis, deep learning.

Development of an Artificial Intelligence-Based Automated Short Answer Assessment System Using Sentence-BERT to Improve the Efficiency of Academic Evaluation

Jeanette Hauw Chandra, Katarina Hilary Chandra and Abram Setyo Prabowo

ABSTRACT

The growing number of students in higher education has significantly increased the workload of instructors, especially when it comes to grading essays and short answers. Manual evaluation is time-consuming and may delay feedback, which potentially has a negative impact on the learning process itself. To improve the effectiveness and uniformity of academic evaluation, this study proposes the development of artificial intelligence-based automated short answer grading systems. The proposed system integrates a content assessment model to evaluate semantic correctness. For content assessment, Sentence-BERT (SBERT) is used to extract sentence-level semantic embeddings from student answers and reference answers provided by the instructors. Cosine similarity is used to determine the semantic similarity between answer pairs, which is subsequently converted to numerical scores using a supervised regression model. This system is then evaluated using the expanded Texas dataset by Mohler, with performance assessed using Pearson correlation, Mean Absolute Error (MAE), and Quadratic Weighted Kappa (QWK).

Keywords: NLP, Deep Learning, Sentence-BERT, Automated Short Answer Scoring, Automated Assessment System.

Enhanced Skin Lesion Classification for Melanoma Detection Using EfficientNet-B3 and Convolutional Block Attention Module (CBAM) with Explainable AI

Nadya Salsabila, Aaron Nikolas Tondosaputro, Justin Lysander Setiawan, Irene Anindaputri Iswanto and Arya Krisna Putra

ABSTRACT

Melanoma is the most dangerous form of skin cancer, and the five-year survival rate if it is not found early is less than 10%. While deep learning models built on convolutional neural networks (CNNs) have reported classification accuracies exceeding the 84% accuracy of dermatologists, most of these are black-box systems that offer no explanation of how they arrived at the prediction, hindering clinical trust and adoption. To fill this gap, this work combines the EfficientNet-B3 model with the Convolutional Block Attention Module (CBAM) added at two strategic positions of the backbone and the Gradient-weighted Class Activation Mapping (Grad-CAM) for visual explainability. We trained the model on the HAM10000 dermoscopy dataset using a two-stage strategy with a strict split-first, oversample-training-only protocol to prevent data leakage: frozen backbone (10 epochs) then full fine-tuning (up to 45 epochs) with Mixup regularization and label smoothing. The primary B3+CBAM model achieved 82.97% overall accuracy, macro-average F1 of 0.744, AUC-ROC of 0.970, melanoma recall of 0.778, and BCC recall of 0.896. For all false-negative cancer cases, the Grad-CAM analysis revealed that the model correctly spatially attended the lesion, reducing the residual errors to feature-level ambiguity, rather than attentional failure. Our results show that we can convert a high accuracy classifier into a verifiable tool for aiding diagnoses by adding only a 2.7% overhead in parameters, while still maintaining meaningful clinical transparency. .

Keywords: Keywords: skin lesion classification, melanoma, XAI, CBAM, HAM10000 .

YOLOv11-Based Non-Destructive Detection of Calcium Carbide Ripening Agents in Mangoes

Andrea Duspar, Vergel Gonzales, Daven Labordo, Adrian J. Frca

ABSTRACT

This study introduces a non-destructive visual-screening method for calcium-carbide (CaC₂) ripening of mangoes based on the YOLOv11 detection setup implemented in AgriScan mobile application developed using the Flutter system. Firstly, the main achievement is a mathematical description of the YOLOv11 screening workflow; However, the mobile aspects of AgriScan like capturing alarming reporting, and administrative review are its applied contributions. The way was carried out per the CRISP-DM structure. The data kept in the study comprises a 1,500-image development dataset and a confusion matrix of 81 instances with 55 CaC-treated, 25 naturally ripened, and one background instance. Besides, from the confusion matrix, there is 97.53% accuracy (95% Wilson CI: 91.44% - 99.32%) and Cohen's $\kappa = 0.9443$, whereas the final training epoch shows precision = 0.989, recall = 0.991, mAP50 = 0.988, and mAP50, 95 = 0.769. Since the background class has only a single support instance, its class-wise and three-class macro-level estimates have no inferential value and are only descriptive (Table III). These results confirm that AgriScan acts as a screening and reporting platform rather than confirming chemical analysis through lab tests. And, deployment is contingent on a balanced, laboratory-truthed external validation together with a measurable mobile latency.

Keywords: calcium carbide, confidence interval, mango, non-destructive detection, object detection, performance metrics, YOLOv11.

Multi-Class Emotion Classification in Short Indonesian-Language Movie Reviews

Talethia Hayfa Syukur, Nicholas Widagdo, Orsino Jerrell Bruinier, Kartika Purwandari

ABSTRACT

Social media has transformed its ways of how individuals express opinions and emotions in digital environments. With X being the most popular social media platform in Indonesia to share opinions and reactions making it the most reliable source of raw and diverse emotional expressions are found for emotion classification, However Indonesian-language emotion classification has its obstacles due to informal writing styles, contextual ambiguity, and scarce annotated datasets. Therefore, this study aims to implement transformer-based deep learning techniques to classify emotion into multiple classes from short Indonesian-language movie reviews on X. This study consists of datasets of Indonesian-language movie review texts labeled into multiple emotion classes, text preprocessing techniques including text normalization, lowercasing, removing URLs, and user mentions prior to training. This study utilizes three classification models such as Support Vector Machine (SVM), Logistic Regression (LR), and IndoBERT. The evaluation results show that the IndoBERT model achieved the best result with the highest accuracy of 85% and a macro F1-score of 84.8% outperforming both SVM and Logistic Regression. The findings indicate that transformer-based models are more effective in capturing contextual information and emotional expression, while traditional machine learning models remain competitive for applications that focus on computational efficiency.

Keywords: Emotion Classification; Indonesian Movie Reviews; Natural Language Processing.

Mapping Student Reliance Profiles Using a KNN-Based Approach

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ABSTRACT

Generative Artificial Intelligence (AI) tools are increasingly used by university students, but institutions still need transparent, ethically appropriate, and reproducible ways to summarize student AI-use profiles. This study positions K-Nearest Neighbors (KNN) as a simple baseline rather than a novel or state-of-the-art classifier. The dataset contains 800 student responses and six normalized variables: basic motivation, usage intensity, intrinsic motivation, perceived usefulness, ethical perception, and GPA. The class labels are constructed from questionnaire thresholds: High Dependency ≥ 4.00 , Moderate Dependency = 3.00-3.99, and Low Dependency < 3.00 . These names align the direction of the labels with their interpretation: a lower score indicates greater dependency risk, while a higher score indicates more responsible and reflective AI use. Therefore, the reported performance is interpreted as rubric-reproduction performance rather than independent behavioral prediction accuracy. Using Euclidean distance, the best KNN setting was obtained at $k = 9$, with 94.17% accuracy, 96.19% precision, 82.21% recall, and 87.07% F1-score. To improve transparency and practical interpretability, this research includes prototype dashboard visualizations for data collection structure, class distribution, confusion-matrix auditing, and study-program monitoring. The study explicitly acknowledges label circularity, class imbalance, the absence of fold-level cross-validation, the absence of comparative classifier experiments, and the lack of real-world deployment validation. The contribution is a reproducible screening-oriented KNN baseline, a transparent discussion of validity threats, and a responsible institutional use scenario rather than a methodological breakthrough.

Keywords: Artificial Intelligence, AI-use profile, Student Reliance, K-Nearest Neighbors, Higher Education, Survey Classification, ChatGPT, Class Imbalance.

MobileNetV2-Based Lightweight CNN for Classifying Can and Styrofoam Waste Based on Physical Condition

Shinta Siti Sundari, Teuku Mufizar, Ruuhwan, Aso Sudiarjo, Rudi Hartono,
Tyo Nur Hakim

ABSTRACT

The issue of inorganic waste in Indonesia continues to escalate, reaching 68.5 million tons annually according to 2025 SIPSN data; consequently, there is a need for an efficient automated sorting system, particularly for cans and Styrofoam, whose recycling value heavily depends on their physical condition (intact versus damaged). This study aims to design a lightweight Convolutional Neural Network (CNN) model based on MobileNetV2 capable of classifying cans and Styrofoam waste according to their physical condition via simulations on Google Colab. The study adopts a quantitative experimental method utilizing of 400 self taken real world pictures divided into four classes, the dataset was partitioned at 70:20:10 ratio and further augmented offline (15x) resulting in 4,480 training images. The model was created using a two step transfer learning method, which include feature extraction and fine tuning and it kept the total number of parameter under 5 million, to meet the lightweight requirement. Test results indicate that the model utilizing augmentation (Model 2, best epoch 6) achieved a test accuracy of 81.25%, with a macro-average precision of 0.82, recall of 0.81, and an F1-score of 0.81 on 80 separates test images, surpassing the non augmented model (Model 1) in every evaluation metrics. These results indicate that the integration of MobileNetV2 based transfer learning with offline data augmentation significantly improves classification outcomes with a small dataset, and the resulting model show promise for incorporation into automated waste sorting systems at the community level.

Keywords: CNN, Lightweight, MobileNetv2, Transfer Learning, Waste Classification.

URL-Based Phishing Website Detection Using Machine Learning: A Comparative Study of URL Feature Extraction and XGBoost Optimization

I Gede Suka Yasa, Roy Rudolf Huizen, Dandy Pramana Hostiadi

ABSTRACT

Phishing remains a persistent cybersecurity threat because malicious URLs can be changed rapidly to evade blacklist- and rule-based defenses. This paper evaluates a lightweight phishing detection pipeline that operates only on information derived from the URL string. Experiments use the PhiUSIIL dataset with 235,795 records (134,850 phishing and 100,945 legitimate). After cleaning, 18 lexical, structural, and security-related URL features were extracted automatically and ranked using tree-based feature importance; a predefined top-15 subset was retained for the comparative experiment. Decision Tree, Random Forest, Linear Support Vector Machine, and XGBoost were evaluated on the same 80:20 holdout split. The initial XGBoost model achieved the best test performance: 99.508% accuracy (reported as 99.51%), 99.285% precision, 99.859% recall, 99.571% F1-score, and a 0.961% false positive rate. Grid-search optimization produced a best cross-validation score of 0.995383, but its holdout accuracy (99.493%) was slightly lower than that of the initial model; therefore, the initial XGBoost configuration was retained for deployment. The resulting model was integrated into a URL-input prototype using the same saved feature definitions and feature order. The results support URL-only machine learning as a fast first-level screening mechanism, while also showing that dataset-specific feature importance and single-dataset validation limit claims of generalization.

Keywords: Phishing detection, URL feature extraction, Machine learning, XGBoost, Cybersecurity.

PlateRush: Real-Time Hand Gesture-Based Nutrition Education Game Using MediaPipe Tasks Vision

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ABSTRACT

Nutrition education for children aged 5–10 is a critical long-term investment in public health, yet conventional methods remain passive and less effective at sustaining engagement. Existing technology-based educational games mostly rely on keyboard or touchscreen interfaces that lack meaningful physical feedback. This study contributes a browser-based gesture workflow requiring no installation, a validated pinch-gesture interaction model tailored for children aged 5–10, and an integrated technical–usability–pedagogical evaluation. PlateRush is a web-based nutrition education game built with React, TypeScript, and TanStack that integrates real-time hand gesture recognition via MediaPipe Tasks Vision entirely within the browser. Children pinch (bringing landmark 4 and landmark 8 together) to select and sort food items into five nutritional categories: carbohydrates, proteins, fruits, vegetables, and whole grains. Evaluation with 15 children aged 5–10 showed gesture recognition accuracy of 93.83%, precision of 93.02%, and recall of 92.36%, with an average detection latency of 42 ms at 27 FPS. The system achieved a SUS score of 78.25 ("Good"), and pre-/post-test results showed an 83.86% average improvement in nutritional knowledge. These findings support MediaPipe Tasks Vision-based web games as an effective, accessible approach to nutrition literacy among children.

Keywords: Computer Vision, MediaPipe Tasks Vision, Hand Gesture Recognition, Nutrition Education, Educational Game, Real-Time Interaction, ADDIE Model, Pinch Gesture.

An Empirical Comparison of Individual and Random-Choice Ensemble Data Augmentation Strategies for Corruption Robustness on CIFAR-10/CIFAR-10-C

Matthew Sutiono; Winko Winko; Juan Sebastian; Irene Anindaputri Iswanto;
Arya Krisna Putra.

ABSTRACT

High accuracy on clean images does not necessarily translate to robustness against common image corruptions. This paper presents a controlled study of nine training approaches, including no augmentation, baseline augmentation, three individual augmentation methods, and four random-choice ensembles, using ResNet-18 on CIFAR-10 and CIFAR-10-C. Models are evaluated using clean accuracy, macro precision, macro recall, macro F1-score, mean Corruption Error (mCE), corruption-wise, and severity-wise performance. The results show that clean-data accuracy and corruption robustness are not directly aligned. StyleAugment + Fourier achieves the highest clean accuracy at 95.30%, while PRIME-based strategies provide stronger corruption robustness. PRIME + StyleAugment achieves the lowest mCE at 11.66%, whereas PRIME + StyleAugment + Fourier achieves the highest CIFAR-10-C accuracy at 88.83%. These findings show that clean-data accuracy alone is insufficient for selecting robust augmentation strategies and highlight the importance of corruption-based evaluation.

Keywords: Corruption Robustness, Distribution Shift, Data Augmentation, Augmentation Ensemble, CIFAR-10, CIFAR-10-C, ResNet-18, PRIME, StyleAugment, Fourier-based Augmentation

An Empirical Comparison of Validation Strategies for Machine Learning Models in Imbalanced Credit Card Fraud Detection

Darrell Geraldo Santoso, Jericho Gleneus Teneddy, Stefanus Benhard, Derwin Suhartono

ABSTRACT

Credit card fraud detection is challenging because fraudulent transactions usually represent only a very small portion of total transaction data. This severe class imbalance can make model evaluation misleading, especially when accuracy is used as the main metric. This study compares Logistic Regression, Random Forest, and XGBoost across five validation strategies namely 70:30 split, 80:20 split, 5-fold cross-validation, 10-fold cross-validation, and repeated 10-fold cross-validation. The experiments use the ULB Credit Card Fraud Dataset and a stratified sample of the PaySim Synthetic Mobile Money Dataset. The models are evaluated using precision, recall, F1-score, runtime, and validation stability. The results show that Random Forest achieved the strongest overall performance, with an F1-score of 0.8500 on ULB and 0.8398 on PaySim. The findings also show that validation strategy affects reported model performance, stability, and computational cost. Therefore, fraud detection studies should report both model results and validation strategy clearly, especially when working with highly imbalanced datasets. The main contribution of this study is showing how validation strategy affects model performance, stability, and runtime while the models, data, and preprocessing remain the same.

Keywords: credit card fraud detection, imbalanced classification, validation stability, cross-validation, computational cost, F1-score.

Time – Series Anomaly Detection in ESP32 Based Environmental Sensor Data Using LSTM Autoencoder

Yericho Lim, Yudhistira Adi Nugroho, Adhe Lingga Dewi, Muhammad Rizki Nur Majiid

ABSTRACT

This work describes the concept of anomaly detection of environmental sensor data with ESP32 microcontroller with the help of Long Short-Term Memory (LSTM) Autoencoder. The system will be configured to measure temperature and humidity by using DHT11 sensor, and BMP280 sensor will be used as a stable point, therefore, allowing to detect a drift or the deviation of the measurement results compared to the regular state. The data are gathered in realtime and transmitted to Supabase database where they are analyzed. To extract the temporal dependency, pre-processing process is carried out with sliding window technique, whereas training of LSTM model is performed with healthy data to forecast normal sensor behavior. The calculation of reconstruction errors with dynamic threshold mechanism is used to identify anomalies, i.e. Mean + 3STD to detect short-term spike and Rolling Moving Average (RMA) to detect long-term drift. The results of the experiments indicate that the LSTM architecture with the following configuration: 64 neuron units, ReLU activation function and dropout 0.2 can detect 111 transient anomalies with MSE threshold values of 0.029061 with DHT11 and 0.026800 with BMP280. These results verify that low-cost sensors combined with deep learning models can be efficiently employed to assist predictive maintenance systems in the environment of Industry 4.0 and offer an affordable solution to environmental monitoring and health of the devices. .

Keywords: ESP32, DHT11, BMP280, LSTM Autoencoder, anomaly detection.

Data-Driven Supervision Prioritization of Inactive Taxpayers Using K-Means Clustering and Cluster Validation: Evidence from the Matraman Tax Office

Hikmahtiar Aryojuno, Jane Angel Brilian Natasya, Meta Amalya Dewi

ABSTRACT

Taxpayers whose administrative status is inactive are commonly assumed to have ceased economic activity, yet third-party records indicate otherwise. This study profiles the transaction patterns of inactive taxpayers registered at KPP Pratama Jakarta Matraman for the 2022-2024 fiscal period using K-Means clustering. The dataset consists of 11,261 taxpayer-year observations, each row represents one taxpayer's document frequency and value of input VAT invoices and withholding tax documents for Income Tax Articles 21, 22, 23, and final Article 4(2). The contribution study is not making a new algorithm but providing an operational workflow that turns third-party transaction records into supervision priority profiles by combining Z-score outlier screening, K-Means clustering, statistical cluster evaluation, and consultation with the Head of Supervision Section I, whose role is to keep the resulting profiles tied to actions Account Representatives can implement. The Analysis followed the Knowledge Discovery in Databases framework in Altair AI Studio. Z-score screening isolated an outlier group of 201 individual and 7 corporate taxpayers, examined separately. Three clusters were selected for each category evaluated by statistical validation and taxpayer supervision regulation explained by Head of Supervision Section I. Among individual taxpayers the clusters point to trading or service transactions, employment or professional income, and passive income. The cluster indicate to active trading enterprise, construction enterprise or other final-tax transactions, and service base or rental enterprise operation among corporate taxpayers. The clusters are then ranked across four levels of supervision by exposure to transactions and the strength of the dominant tax attribute to signal a mismatch self-assessment obligation. The largest cluster by value is in the lowest tier as its tax is already withheld at source. These are signs of transaction-based supervision, not proof of non-compliance.

Keywords: Inactive Taxpayers, K-Means Clustering, Cluster Validation, Taxpayer Supervision, Transaction-Based Risk Profiling. .

EcoGrid-Agent A Digital Twin and Cognitive AI Smart Grid Controller for Microgrid Decarbonization

Dedi Rosadi

ABSTRACT

decarbonization requires more than just static mathematical rules. In this study, we propose EcoGridAgent—a cyber-physical framework merging a digital twin simulator with a cognitive AI controller. Our setup tracks the real-time electricity exchange across solar arrays, battery storage, diesel generators, and the main PLN utility grid. Instead of relying on conventional predictive control, we handed the dispatch logic over to DeepSeek, a Large Language Model (LLM). By prompting the model to use Chain-of-Thought reasoning, it learns to weigh the immediate financial costs against carbon output, even when weather and load demands shift unexpectedly. Tests run on commercial load profiles revealed striking results: the LLMdriven approach secured up to a 94.8% cost optimization efficiency while slicing carbon emissions by 85.2% compared to standard grid-only operations. Beyond real-time control, we also built an AI Solar Planner into the system to help users quickly figure out the right solar capacity, battery size, and financial payback period based on their monthly bills.

Keywords: Smart Grid, Digital Twin, DeepSeek, AI Controller, Battery Storage, Microgrid.

EcoGrid-Agent A Digital Twin and Cognitive AI Smart Grid Controller for Microgrid Decarbonization

Dedi Rosadi, Edi Supriyadi, Hadiantio, Ahsani Takwim, Regina Sukma, Dewi Mulyasari

ABSTRACT

Managing microgrid energy flows while actively pushing for decarbonization requires more than just static mathematical rules. In this study, we propose EcoGridAgent—a cyber-physical framework merging a digital twin simulator with a cognitive AI controller. Our setup tracks the real-time electricity exchange across solar arrays, battery storage, diesel generators, and the main PLN utility grid. Instead of relying on conventional predictive control, we handed the dispatch logic over to DeepSeek, a LargeLanguage Model (LLM). By prompting the model to useChain-of-Thought reasoning, it learns to weigh the immediate financial costs against carbon output, even when weather and load demands shift unexpectedly. Tests run on commercial load profiles revealed striking results: the LLMdriven approach secured up to a 94.8% cost optimization efficiency while slicing carbon emissions by 85.2% compared to standard grid-only operations. Beyond real-time control, we also built an AI Solar Planner into the system to help users quickly figure out the right solar capacity, battery size, and financial payback period based on their monthly bills.

Keywords: Smart Grid, Digital Twin, LLM, AI Controller, Battery Storage, Decarbonization, ROI.

Comparative Analysis of LDA and BERTopic for Topic Modeling of Indonesian Fiscal Policy Discourse on X

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ABSTRACT

Social media has become an important platform for public engagement with government policy. It produces large amounts of informal and unstructured text that expresses citizens' concerns and priorities. Fiscal policy developments in Indonesia have always been accompanied by intense public discussion on Twitter/X, which allows for a systematic analysis of public opinion at scale. This research compares the performance of LDA (Latent Dirichlet Allocation) and BERTopic on approximately 12,000 tweets with fiscal policy keywords for the Indonesian public space from May 1 to June 6, 2026. Preprocessing was performed to handle informal and noisy Indonesian social media text, including slang, abbreviations, and code-switching. We evaluated the models using coherence scores (c_v and u_{mass}) and qualitative interpretability. LDA achieved a higher c_v coherence score (0.4775) than BERTopic (0.3840), but BERTopic achieved better document-level semantic coherence ($u_{mass} = -4.6605$ vs. -13.0312) and discovered two discourse niches that were not present in the output of LDA. According to LDA, six dominant topics emerge on exchange rate depreciation, fiscal governance, framing of global economic crisis, rural socioeconomic impact, commodity price pressures, and public market anxiety. BERTopic found four topics. The largest topic aggregated the broader macroeconomic discussion on rupiah depreciation. These results suggest that LDA and BERTopic serve complementary analytical objectives: LDA for full thematic decomposition and BERTopic for semantic-specific niche discourse detection in multilingual informal text. This study adds to the growing body of research in computational social science on low-resource languages of Southeast Asia, and offers practical insights for policymakers interested in using social media as a real-time window into public concerns.

Keywords: topic modeling, latent dirichlet allocation, BERTopic, fiscal policy, Indonesian social media, public discourse.

Water Incident Reporting and Management System with GIS and Poisson Regression Forecasting

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ABSTRACT

Water districts are usually notified of water-related problems through call-ins, text messages, in-person visits, and social media posts, which very rarely come with consistent structured location data. This paper presents the results of a study carried out to develop and assess a system for reporting and managing water incidents called WIRMS for Buenavista Water District that, besides a mobile reporting application made by Flutter, incorporates Firebase-enabled backend, a GIS display and lastly, separate Poisson regression models of leak-water and non-water incidents. Application development was based on the agile software philosophy while the predictive model was a product of design science research methods. Incident log was divided into classes and then summed for the prediction of both 4-week and 3-month time spans. The leakage incidence RMSE prediction was 4.56 versus 8.28 for the no-water model. Horizonspecific MAE figures were leakage = 2.25 and 10.00 vs no-water = 4.25 and 16.00 respectively for the 4-week and 3-month outputs. These figures clearly demonstrate a lower error for the shorter horizon as well as for leakage incidents. The interface shows that the system has been successfully implemented about GPS location tracking of problem reports, map view of the problem reports, tracking and management of problem reports, and the display of forecasts; on its own, it doesn't prove a faster rate of dispatch or better rate of delivery. Since the source evaluation doesn't give information about the number of records, splitting of the data based on time, baseline models used, dispersion diagnostic results, uncertainty intervals, and a field usability study, the predicting results cannot be taken as final evidence. As a result, WIRMS has only produced an integrated decision-support system prototype; it has to be prospectively validated before claiming that it can be widely used and that it effectively changes behavior.

Keywords: GIS, Machine Learning, Mobile Application, Predictive Analytics, Water Incident Management.

An Indonesian Lip Reading Dataset for Deaf Communication Using Controlled Vocabulary

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ABSTRACT

Visual Speech Recognition (VSR) has emerged as a promising assistive technology to support verbal communication for deaf and hard-of-hearing (DHH) individuals. However, the development of VSR systems for the Indonesian language remains constrained due to the scarcity of standardized datasets tailored to functional communication needs. This paper presents an Indonesian visual speech dataset comprising 736 Full HD video recordings across 46 core vocabulary classes curated from specialized deaf education curricula. Data were collected from five native Indonesian speakers under controlled studio lighting and fixed eye-level camera positioning. A standardized, reproducible preprocessing framework is implemented, encompassing facial landmark detection via MediaPipe Face Mesh (478 3D landmarks), mouth Region of Interest (ROI) extraction with dynamic margin scaling, spatial resizing to 96×96 pixels, grayscale conversion, pixel normalization, and temporal sequence alignment fixed at a uniform length of 55 frames. To establish an empirical benchmark, a lightweight baseline 3D Convolutional Neural Network (3D-CNN) was trained and evaluated on the normalized spatio-temporal tensors. The baseline model achieved a test accuracy of 68.47%, macro precision of 70.79%, macro recall of 68.84%, and macro F1-score of 65.84%, while highlighting critical articulatory patterns and homopheme ambiguities. This work provides an open-access benchmark and an end-to-end processing pipeline to facilitate future deep learning research in Indonesian assistive VSR technologies. .

Keywords: Lip Reading, Dataset, Visual Speech Recognition, Indonesian Language, Deaf Communication.

Eye Fatigue Detection Using Convolutional Neural Networks Based on PERCLOS and Blink Rate Analysis

Frederica Sharon Sastradi , Adhe Lingga Dewi

ABSTRACT

Eye fatigue is a growing health issue caused by the heavy usage of digital devices and long duration of visual tasks. Decreased visual performance due to symptoms such as dry eyes, blurred vision, headaches and other symptoms can impact productivity and wellbeing. Traditional eye fatigue detection methods mainly use a single parameter, like blink rate or Percentage of Eyelid Closure (PERCLOS), which may not be well suited to describe the complexity of fatigue states. This research proposes a real-time eye-fatigue detection framework which combines CNN-based eye-state classification with temporal feature based on PERCLOS and blink-rate measurements. The MRL Eye Dataset was used for both model evaluation and training, and includes labeled eye images of open and closed eyes. The proposed system includes eye detection, eye-state classification, blink detection, PERCLOS calculation and determining fatigue level. The contribution of each indicator is assessed by two model configurations CNN, and MobileNetV2. The system performance is evaluated using the F1-score, recall, accuracy, and precision. With an accuracy of 97.8%, precision of 97.8%, recall of 98.8%, and F1-score of 98.7%, the experimental findings demonstrated that CNN performed better than MobileNetV2 on all evaluation measures. It is likely that the proposed hybrid method will enhance fatigue detection reliability by combining spatial and temporal eye-behaviour data. These results help to build intelligent fatigue monitoring systems in healthcare, education and workplace settings.

Keywords: Eye Fatigue, Convolutional Neural Network, PERCLOS, Blink Rate, Computer Vision, Deep Learning.

Development of a Web-Based Contract Management System Integrated with a Document Chatbot

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ABSTRACT

Contract document management poses a challenge for many organizations since contractual information is often complicated and scattered across various documents and sources, making important information difficult to access quickly. This paper describes a contract administration system in a web-based environment connected with a document chatbot to manage, retrieve and interpret contract information. The system includes centralized storage for contracts, role-based access management, PDF processing, knowledge base construction, and document-based question answering. The system was developed utilizing Research and Development method with a prototype strategy in System Development Life Cycle . Uploaded PDF contracts are analyzed by text extraction or Optical Character Recognition (OCR), followed by document summary, text chunking, and knowledge base creation. Upon receiving a question from a user, the chatbot uses keyword-based Top-K retrieval to locate relevant document fragments. The recovered chunks are used as supporting context for a Large Language Model to generate responses based on the content of the selected contract document. Functional testing was performed to assess the functionality of the developed functionalities, including document management, access control, document processing, and chatbot interaction. The results show that the created system may provide document-grounded information retrieval by employing current contract papers as the source context for chatbot responses. The study provides an integrated strategy that integrates contract administration capabilities with a document chatbot workflow to enable more efficient access to contract information.

Keywords: Contract Management System, Document Chatbot, Large Language Model, Retrieval Top-K, Web-based System.

Evaluating Open-Source Large Language Models for Emerging Threat Intelligence in Dark Web Forums

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ABSTRACT

Dark web forums provide early warning of emerging cyber attacks, yet their discussions are large, noisy, and full with slang, which makes manual analysis difficult to scale. This study investigates if open-source large language models can extract threat intelligence from such text without specialized training. Three open-source models in the 32-billion-parameter class, namely Qwen3-32B, Gemma 4 31B-it, and GLM-4-32B-0414, were evaluated on the extraction of four types of aspect from forum posts, covering vulnerabilities, organizations, countries, and cyber threats. The corpus came from 31,085 threads collected from the DarkForums platform, which were cleaned prior to extraction. Each model was given an identical prompt incorporating worked examples and a constrained output format, and every extracted entity was normalized to a canonical form and, where an established reference exists, aligned with standards such as MITRE CWE, MITRE ATT&CK, and ISO country codes. Model outputs were benchmarked against a reference generated by GPT-5.4 nano and assessed using Entity F1 and complementary metrics. Gemma achieved the most reliable overall performance across all four aspect types, with country proving the easiest aspect to extract and cyber threats the most challenging. These findings offer security practitioners practical guidance for selecting an open-source model for threat intelligence workflows.

Keywords: dark web forums, open-source models, large language models, cyber threat intelligence, entity extraction.

Impact of Text Pre-processing Techniques on Sentiment Analysis Model Performance for Low-Resource Sundanese Language

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Muhammad Fikri Hasani, Andien Dwi Novika

ABSTRACT

NLP still under-represents regional languages such as Sundanese. Sundanese is an agglutinative language with a rich morphology of affixes, which are important in the meaning of the language. Empirical effects of text pre-processing for Transformer models are not well known. We fine-tuned IndoBERT using four pre-processing configurations for each of them on a Sundanese Twitter emotion dataset, and conducted ten times each with different random seeds. All four use the same character normalisation, and only vary in which tokens are removed. The configuration without token removal performs best (macro F1 = 0.9502 $\pm$ 0.0112), with all three configurations of token removal being significantly worse (Holm-adjusted $p \leq \mathbf{0.010}$). It is the fear class that suffers from the degradation and is not caused by grammatical stopword removal, since at a matched removal volume, discarding rare words is more costly in terms of fear F1 ($p = 0.028$), while discarding function words is not ($p = 0.002$). The margin of the Transformer over a classical baseline is modest, with a linear support vector machine achieving the score of $\mathbf{0.9367}$. Reductive pre-processing is found to be detrimental for IndoBERT in the study of low-resource agglutinative languages. These are not noise removal models, but token removal, as they are naturally tuned for informal text. This means that developers will need to perform an empirical audit of the language pre-processing pipelines in the region before deployment.

Keywords: BERT, Emotion classification, Natural language processing, Text mining, Sentiment analysis, Data pre-processing.

Robust-Phish: Enhancing Network Security Against URL Phishing via Gated Recurrent Unit (GRU) Architectures

Farrel Hakim Amran Rosadha, Prabowo Wahyu Sudarno, Fredy Purnomo

ABSTRACT

This study introduces Robust-Phish, a network security framework for phishing detection based on URLs using the Bidirectional Gated Recurrent Unit (BiGRU). Phishing attacks continue to grow because perpetrators can impersonate official websites so that it is difficult to detect them by basic defenses. Robust-Phish performs URL character analysis directly without manual feature extraction. The model is trained using legitimate and malicious URLs from Mendeley Data, and then processed with character tokenization and fixed-length padding. This method lowers processing time when compared to manual feature engineering and web crawling. Evaluation uses precision, recall, F1-score, accuracy, AUC, inference time, and parameter count. In the test set, BiGRU achieved an accuracy of 98.44%, a macro F1-score of 0.9840, and an AUC of 99.85%, with an average inference time of 0.0602 ms per URL, thus driving real-time phishing detection.

Keywords: deep learning, network security, gated recurrent unit, bidirectional GRU, character tokenization, phishing detection.

Adaptive Texture-Guided Fragile Watermarking for Image Authentication and Self-Recovery (ATSRW)

Indrawan Ady Saputro, Ina Sholihah Widiati, Riyan Abdul Aziz, Ahmad Muhariya, Iwan Ady Prabowo, Sri Widiyanti

ABSTRACT

Digital images are widely used in digital forensics, medical imaging, surveillance systems, and document authentication. However, advances in image editing technologies have increased the risk of image manipulation, creating the need for reliable image authentication and self-recovery mechanisms. Existing fragile watermarking methods generally employ fixed payload allocation and uniform embedding strategies, resulting in inefficient payload utilization and suboptimal recovery performance. This study proposes Adaptive Texture-Guided Fragile Watermarking for Image Authentication and Self-Recovery (ATSRW), which integrates adaptive texture classification, dynamic singular value selection, adaptive payload allocation, block-dependent chaotic encryption, and risk-aware cross-block mapping. Experimental evaluation was conducted on 100 benchmark images under six tampering scenarios, comprising 600 independent experiments. The proposed method achieved high watermark imperceptibility with an average PSNR of 44.11 dB, SSIM of 0.9760, and MSE of 2.5240, while providing accurate tamper localization and effective self-recovery, particularly for object removal and cropping attacks. These results demonstrate that ATSRW is an adaptive and efficient fragile watermarking framework that improves payload utilization, image authentication, and self-recovery performance for digital image integrity verification.

Keywords: Fragile Watermarking, Image Authentication, Self-Recovery, Adaptive Texture Analysis, Singular Value Decomposition.

Directional Multi-Relational GNNs for Fake Account Detection: A Robustness and Interpretability Study

Vincent Fernandes, Nikita Putri Alexia, Andry Chowanda, Franz Adeta Junior

ABSTRACT

Fake account detection on online social networks is usually framed as node classification over a multi-relational graph using relational Graph Neural Networks (GNNs), though which components actually drive their accuracy is often unclear. We run a controlled comparison on MGTAB (10,199 annotated Twitter accounts, seven relation types, 1.7M edges) across bot and stance detection, using one shared protocol, five seeds, and paired significance tests. Directional relational aggregation, keeping separate transformations for incoming and outgoing edges of each relation, gives the largest single gain: our Directional R-GCN reaches the best macro F1 on both tasks (87.18% bot, 88.21% stance), significantly beating MLP, GCN, GraphSAGE, and GAT everywhere, and plain RGCN significantly on stance (borderline, $p = 0.055$, on bot). A heterophily-aware edge confidence gate sounds like the right answer to relation camouflage, but on these mostly homophilous graphs it is not, costing 0.7–1.4 macro F1 points across every configuration we tried, with gate values, meaning the model’s own readable account of which relations it trusts, that stay near one and show no reliable per-relation pattern across seeds. Finally, on robustness we report a methodological result rather than a measurement: the natural way to stress-test these models, namely injecting cross-class camouflage edges, silently leaks labels on a transductive graph, turning an attack into a hint, so we give a leakage-free protocol and a structure-free control that detects the failure whenever it recurs.

Keywords: Graph Neural Networks, fake account detection, multi-relational graphs, directional message passing, heterophily, adversarial robustness.

AI-Driven Hybrid Recommendation for SDG 4-Aligned Final Project Topic Selection in Indonesian D3 Information Systems Education

Evi Lestari Pratiwi; Ramadhani Noor Pratama; Inayatul Ulya Ahyati; Paula Dewanti; Muhammad Ihza Alhafiz

ABSTRACT

Students in Indonesian D3 vocational Information Systems programs typically select their final project topics through informal consultations with advisors. This practice often neglects crucial factors like academic performance records, curriculum learning outcomes, current industry skill demands, and alignment with SDG 4 indicators. We developed HybriRec-TA, a hybrid recommendation system incorporating five scoring elements weighted via AHP: Content-Based Filtering, Knowledge-Based Filtering, Historical Similarity, Industry Alignment, and SDG 4 mapping. Simulations using 300 synthetic topic records showed Precision@5=0.73, Recall@5=0.67, and NDCG@5=0.78—outperforming CBF-only, rule-based, and popularity-based baselines. Content validation by five IS faculty members yielded Aiken's V=0.750 and CVI=0.875.

Keywords: hybrid recommendation system; vocational education; Design Science Research; final project topic selection; Analytic Hierarchy Process; SDG 4; Aiken's V.

An Innovative Approach to Data Modelling: Exploring the Components of a Context- Awareness Framework

Stenly Richard Pungus, Debby Erce Sondakh, George Tangka, Jamaiah
Yahaya, Bahari Idrus

ABSTRACT

Traditional techniques for data modeling are inherently static and thus cannot keep pace with changes in business processes or working environments. Standard methods assume that the input data has a consistent structure and do not consider the context in which data objects are found, which in the long run reduces the efficiency of data management. Although a great deal of research has been carried out on context-aware computing in IoT and pervasive systems, there has still been no empirically validated list of the specific elements that constitute a context-aware data modelling framework. Methods — A qualitative, multi-stage research approach was employed. The process started with an examination of the domain in order to establish the initial set of framework components. The Framework for Data Modelling based on Context Awareness then received a structured expert review, during which five experts in the field of software engineering—each with at least five years of professional experience—assessed the various framework components on a 4-point agreement scale. Findings — The analysis identified nine key components of a context-aware data modelling framework, namely: Data Modelling Inputs, People and Skills, Guidelines – Rules and Procedures, Factors in Data Modelling Processes in Data Modelling, Context Awareness, Output in Data Modelling, Techniques and Tools, and Methods in Data Modelling. These components were organised in an INPUT → PROCESS → OUTPUT sequence, with the Guidelines and Factors affecting the Inputs component, while Context Awareness, Techniques, Methods, and Processes regulate the Process layer before giving rise to the Modelling Output. The expert validation produced average agreement scores ranging from 3.13 to 3.77, the highest score being for Factors in Data Modelling (3.77), followed by People and Skills (3.66) and Guidelines – Rules and Procedures (3.6), and the lowest score being for Techniques and Tools (3.13). A case study has demonstrated that the framework is both applicable and practical for use in real-world organisations.

Keywords: Data modelling, context awareness, framework components, Ontology, Big Data.

Dynamic Modeling of Servo-Assisted Gyroscopic Roll Stabilization Under Wave-Like Disturbances

Hongyu Huang; Padma Nyoman Crisnapati; Dechrit Maneetham

ABSTRACT

In this paper, the assessment of the effectiveness of the servo-actuated gyroscopic roll stabilization using simulations is carried out. This study involves a combination of hull roll dynamic model, fast spinning flywheel actuated by brushless DC motor, a servo-controlled cradle used to induce precession, and a controller to provide cradle angle command signal in response to the roll error. Two kinds of control systems are investigated - a classic PID controller and a Fuzzy-PID controller with gain scheduling functionality. Simulations for the condition where there is no gyroscopic torque have also been performed in order to estimate the contribution of the mechanical gyroscope. With the help of the parameters of a typical setup, which include flywheel inertia of $5.28 \times 10^{-5} \text{ kg} \cdot \text{m}^2$ and flywheel angular momentum of about $0.0193 \text{ kg} \cdot \text{m}^2/\text{s}$, it has been found out that the roll oscillation with the biggest Root Mean Square Error (RMSE) equals 24.57° and occurs in the absence of gyroscopic effect. Activation of servo-assisted gyroscopic stabilization reduced the RMSE to 16.73° with PID and 15.22° with gain-scheduled Fuzzy-PID, corresponding to reductions of 31.89% and 38.02%, respectively.

Keywords: gyroscopic stabilization, roll motion, PID control, fuzzy PID control, wave disturbance simulation.

Angle Tracking and Safety Evaluation of a PID-Controlled CPM Knee Rehabilitation Device

Feiteng Wei, Padma Nyoman Crisnapati, Dechrit Maneetham

ABSTRACT

The main objective of this study is to analyze the angle tracking ability and the safety response of the CPM knee rehabilitation machine controlled by the PID controller via simulation. The subject based CPM simulation model has been designed with ten subjects' characteristics such as the height, weight, maximum angle of the knee, PWM response, force response, and duration of rehabilitation session. The simulation model comprised of simplified lower limb linkage system, linear actuator movement, PID-based slider control, PWM calibration and threshold force-based safety system. Unlike conventional PID-only evaluations, the contribution is an integrated subject-specific simulation framework that jointly evaluates angle tracking, calibrated actuator demand, and two-level force safety behavior before hardware testing. The simulation results revealed that the knee rehabilitation machine could track the desired flexion-extension angles of the knee joint with an angle RMSE of $2.51 \pm 0.17^\circ$. The maximum knee angle varied between 46.94° to 49.02° in the simulation. The PWM response has been effectively calibrated with the average and maximum PWM response which were 156.3 and 195.3 respectively. The maximum force recorded during the simulation was 3.7 kg, resulting in the occurrence of force warnings in two participants, without any occurrence of emergency stop situations. From these results, it can be inferred that the use of PID controller will be able to create stable CPM movement for the knee joint while keeping the force values below the stop level.

Keywords: flexion–extension trajectory, range-of-motion estimation, actuator kinematics, pwm calibration, force-threshold monitoring, subject-specific modeling.

UWB-EKF Localization and Pick-and-Place Control of a Differential-Drive Mobile Robotic Manipulator

Jingyuan Liu, Padma Nyoman Crisnapati, Dechrit Maneetham

ABSTRACT

Abstract— In this paper, a simulation-based investigation is conducted on an indoor mobile robotic manipulator system that consists of a differential drive mobile base, a planar two degrees-of-freedom manipulator, UWB range sensing, and EKF localization in order to accomplish pick and place mission. The architecture of the developed framework consists of 6.0 m $\times$ 4.5 m indoor environment model, four fixed UWB anchors, a mobile base controller, a 2-link inverse kinematics arm controller, and finite-state mission planner which covers navigation, reach, grasp, transfer, release, and complete states. In addition, UWB range sensing data were generated using Gaussian noise distribution and fused with noisy odometry using EKF in order to localize the robot. The simulation was performed for 40 seconds with sampling time equal to 0.05 seconds. The outcomes revealed that the mission was successfully accomplished, the object was located at the target drop point, and EKF localization technique provided an average position error of 0.021 m, RMSE value of 0.024 m, and maximal position error of 0.075 m. Therefore, the developed digital simulation will enable researchers to validate the ESP32 and UWB based mobile robotic manipulator systems prior to hardware implementation.

Keywords: mobile robotic manipulator, UWB localization, extended Kalman filter, pick-and-place, differential-drive robot, digital twin simulation.

Simulation-Based Safety Analysis of a Virtual-Sensor Hydrogen Generator Framework

Honghui Shi; Padma Nyoman Crisnapati; Dechrit Maneetham

ABSTRACT

The objective of the paper is to investigate a simulation-based IoT monitoring and safety classification system for a hydrogen generator in order to conduct risk analysis at the initial stage prior to developing a prototype. A numerical simulation using Python was constructed in which the process of hydrogen generation was based on electrolysis. The simplified thermal model, the pressure model, the water consumption model and the hydrogen concentration model were utilized along with added sensor noise. Six scenarios were simulated, including normal operation, high current, low water, overtemperature, pressure increase and hydrogen leakage risk for 3600 seconds with a time step of 1 second. The sensor data generated by simulation was classified using rule-based safety labeling as well as Random Forest algorithm. The simulation created 21606 samples, with the overtemperature scenario having the maximum temperature 111.93°C and the maximum risk index 30.82 and the leakage risk scenario having the maximum hydrogen concentration 13275.06 ppm. The Random Forest classifier demonstrated the best test accuracy in classification of normal, warning and danger scenarios. Nonetheless, one should note that this performance should be regarded not as real-life diagnostic performance but rather separability of simulated data. The specific contribution is a unified pre-prototype assessment framework combining electrolysis-based numerical modeling, virtual sensor streams, abnormal-condition simulation, a weighted safety risk index, deterministic safety labeling, and Random Forest-based separability assessment. No physical sensors, communication protocol, or edge/cloud deployment was implemented.

Keywords: hydrogen leakage risk, scenario-based safety simulation, electrolysis monitoring system, rule-based safety classification, random forest fault classification.

A Silhouette-Guided Pseudo-Label Generation Framework for Indonesian Depression-Related Text Classification Using Contextual IndoBERT Embeddings

Joy Nasten Sinaga, Caroline and Yuni Marlina Saragih

ABSTRACT

Abstract—Early identification of mental health risks through social media depression detection has become increasingly important. Most transformer-based methods depend on manually labeled data, resulting in high costs and limited scalability, particularly for low-resource languages such as Indonesian. To address these challenges, this study introduces a silhouette-guided pseudo-label generation framework. The proposed approach leverages contextual sentence embeddings and a fine-tuned IndoBERT model for depression-related text classification. Social media text is preprocessed and transformed into contextual embeddings using a pretrained IndoBERT model. The Silhouette Coefficient is employed to determine the optimal number of clusters, followed by K-Means clustering to generate pseudo-labels automatically. These pseudo-labels are then used to fine-tune the IndoBERT classifier, reducing the need for extensive manual annotation. Evaluation on a held-out pseudo-labeled test subset demonstrates that the framework achieves 96.71% accuracy, 95.91% macro precision, 94.14% macro recall, 94.99% macro F1-score, and 99.53% ROC-AUC. These findings indicate that silhouette-guided pseudo-label generation provides consistent supervisory signals for transformer fine-tuning and can substantially reduce the need for sample-level manual annotation. However, the evaluation reflects agreement with the generated pseudo-label structure rather than independently validated clinical or human-annotated ground truth.

Keywords: Depression, IndoBERT, Pseudo-Labeling, Silhouette, Embeddings.

Google Colab-Based Interactive Joint-Space Modeling of a 6-DOF Robotic Hand

Dingli Wan, Padma Nyoman Crisnapati, Dechrit Maneetham

ABSTRACT

Abstract— In this work, a lightweight web-based dynamic simulator for a 6-DOF robotic hand/manipulator is designed for early assessment of joint motion, actuator torque requirements, and the pose of the end-effector without the need for a local installation of robotics simulation tools. The simulator was implemented in Google Colab using the Denavit-Hartenberg forward kinematics, positive definite joint space inertial model, gravitational load on the leading pitch joints, viscous damping, and Proportional-Derivative control along with torque saturation. Joint-angle error, overshoot, settling time, peak torque, and the final end-effector position have been calculated for three representative target poses and one controller gain sweep. In the selected stable case (gain scaling of $K_p = 0.5$, sampling time = 0.02 s, simulation time = 3 s), the final root mean square joint errors for all posed targets were less than 0.001 deg, with 2-deg settling times ranging from 0.68-0.94 s and a maximum peak torque of 31.45 N m. It is clear from the gain sweep analysis that adding both P and D gains does not automatically increase tracking performance because of torque saturation and underdamping problems. The experiment reveals that Colab can be used to make an easy-to-use digital twin simulation for robotic-hand learning and control algorithm testing. But still, this simulation is a simple numerical model and needs to be expanded with inertial parameters and hardware-in-the-loop testing to become more realistic.

Keywords: denavit-hartenberg parameters, gravity compensation, PD control, torque saturation, browser visualization, manipulator dynamics.

An Integrated Fuzzy-BWM-MARCOS Decision Framework for Optimizing Social Media Platform Selection in Higher Education Marketing

Edson Yahuda Putra & Ibrena Reghuella Chrisanti

ABSTRACT

This study addresses the lack of structured, data-driven approaches for selecting social media platforms in higher education marketing, focusing on Universitas Klabat. Although platforms such as Instagram, Facebook, WhatsApp, TikTok, and YouTube reach millions of Generation Z users in Indonesia, decisions about which platforms to prioritize are often intuitive rather than based on measurable criteria. To overcome this, a hybrid fuzzy multi-criteria decision-making model combining Fuzzy-Best Worst Method (Fuzzy-BWM) and Fuzzy-MARCOS is proposed. Three marketing experts evaluated five platforms against five criteria: Engagement, Target Audience, Send/Receive Message, Content Richness, and Cost, using linguistic terms converted into triangular fuzzy numbers. Fuzzy-BWM was used to derive criteria weights with a Consistency Ratio below 0.025; the defuzzified weights show Engagement as the most influential criterion (0.362), followed by Target Audience, Send/Receive Message, and Content Richness (0.182 each), while Cost is least important (0.092). Fuzzy-MARCOS then normalized, weighted, and aggregated platform performances to compute utility scores. The final crisp utilities indicate that Instagram and Facebook are the best platforms (1.2045), followed by WhatsApp (1.0906), with TikTok (0.9778) and YouTube (0.9689) ranking lowest. The model offers a reusable, transparent decision-support tool for university digital marketing.

Keywords: Fuzzy-BWM; Fuzzy-MARCOS; Social Media Platform Selection; Higher Education Marketing .

Evaluating Real-World QR Code Scanner in Detecting Quishing (QR Code Phishing): A Comparative Empirical Security Study

Yasin Taryaquil Aghyar, Sebastian Chang, Athallah , Muhammad Fikri Hasani,
Nathasa Bintang Kayesa, Andien Dwi Novika

ABSTRACT

QR codes have become a daily utility for payments, menus, and information sharing. Consequently, they have also become an attractive target for a growing threat known as quishing (QR code phishing). Unlike traditional web links, a QR code's destination is visually unreadable before scanning. Attackers take advantage of this blind spot, making it easy to trick users into visiting malicious sites without raising immediate suspicion. Although previous research has focused on the development of machine learning models using controlled laboratory datasets, a critical gap remains: no systematic empirical study has evaluated the real-world detection capability of QR code scanners most used by the public. This paper presents a comparative empirical security evaluation of six widely deployed QR scanners, four native device scanners (Google Lens, iPhone Camera, Samsung Camera, and Redmi Camera) and two third-party applications. The assessment is conducted against a curated dataset of 1,000 URLs, including 850 active phishing links and 150 safe links, obtained from real-time threat collection website (PhishStats and OpenPhish). Employing a black-box methodology, we evaluated each scanner using a standard confusion matrix framework (Precision, Recall, F1-Score, Specificity, Accuracy, False Positive Rate, and Critical Miss Rate). Results reveal that the mid-range Redmi scanner (Recall: 70.12%, F1: 82.21%) outperformed flagship devices from iPhone (Recall: 31.53%, F1: 47.94%) and Samsung (Recall: 42.84%, F1: 59.79%), while the dedicated third-party Android scanner achieves the highest Recall at 88.94% with an F1-score of 90.11%. All blacklist-dependent scanners demonstrate critical vulnerability to zero-day quishing attacks, consistent with the documented 16-hour average lag between a phishing URL's first victim and its blacklist registration. This study is limited to a single collection window evaluated under controlled scanning conditions.

Keywords: QR code phishing; quishing; mobile scanner evaluation; zero-day phishing; black-box security testing; empirical cybersecurity study.

IndoFinBERT: Empirical Benchmarking of Domain-Adapted BERT and Multilingual Models for Indonesian Financial Sentiment Classification

Jeremy Sean Sitranata, Stevan Pohan, Hans Christian Soebroto, Violitta Yesmaya

ABSTRACT

Automated sentiment analysis is becoming increasingly relevant alongside the rapid growth of financial news coverage in Indonesia, however pre-trained language models tailored to this specific domain scarce. Therefore, this study proposes IndoFinBERT, an IndoBERT variant adapted through Domain-Adaptive Pre-Training (DAPT) on a corpus of 81,759 LQ45 financial news articles drawn from Kontan.co.id and Bisnis.com (2020–2026). Its performance was benchmarked against narrow-domain DAPT models, multilingual encoders, non-adapted IndoBERT variants, and classical machine learning baselines using PhraseBank-ID, an out-of-domain sentiment classification dataset, with statistical significance determined through Holm-corrected paired t-tests across five random seeds. Proposed model attains an average Macro-F1 score of (0.9784), outperforming IndoBERT-base (0.9695) though not significantly ($p=0.8659$), while significantly outperforming narrow-domain banking DAPT variants ($p=0.0425$, $p=0.0220$). IndoBERT-large attains the highest overall Macro-F1 (0.9818), with IndoFinBERT and XLM-R-base (0.9726) forming a statistically indistinguishable top tier; IndoFinBERT further achieves the lowest Expected Calibration Error among all nine models (0.0144). These findings indicate that coverage and diversity of the DAPT corpus have a greater impact on downstream task performance than the mere ability to adapt to a specific domain. Other findings also demonstrate that domain-adapted, non-adapted, and multilingual approaches can yield relatively competitive performance with no significant differences among them for Indonesian financial sentiment classification.

Keywords: domain-adaptive pre-training, sentiment analysis, natural language processing, BERT, transfer learning, multilingual models, financial news.

Multi-Attribute Performance Profiling of Family Planning Cadres via K-Means Clustering

Radhinal Muchtar, Jufri, Erfan Hasmin

ABSTRACT

Conventional linear performance evaluations frequently fail to uncover specific operational constraints and mask skill trade-off phenomena at the field-worker level. This study aims to evaluate and map the performance heterogeneity of Family Planning Cadres in Makassar City utilizing the K-Means clustering algorithm based on eight multi-attribute criteria derived from the Makassar City Mayoral Regulation (Perwali) No. 4 of 2022. A transactional dataset comprising 22,809 reporting records from the 2024–2026 period was structurally transformed using unmelting and one-hot encoding techniques to generate a valid matrix representation. Partitioning scenario configurations were evaluated through a hybrid approach using the Elbow method and the Silhouette Coefficient, which established $k=7$ as the most optimal model architecture, achieving a Silhouette score of 0.621. The extraction of the centroid matrix in this model successfully and precisely isolated various typologies of the cadres operational competence. These profiles span from high-performing groups that exceed Long-Acting Contraceptive Method (MKJP) targets, to Administrative Cadres who comply with digital reporting but yield zero field achievements, and Specialist Cadres exhibiting significant imbalances in attaining mass non-MKJP targets. This knowledge discovery framework provides a strategic foundation for relevant institutions to abandon the conventional one-size-fits-all guidance approach. The findings recommend a targeted, data-driven human resource governance design to facilitate accountable local incentive distribution and the formulation of specific cross-training modules to optimize the resilience of regional population programs.

Keywords: K-Means Clustering, Performance Evaluation, Family Planning Cadres, Multi-Attribute, Data-Driven Policy.

K-Means Clustering for Skincare Price Segmentation in Digital Marketplaces

Abdurrohman Abdurrohman, Edi Supriyadi, Muhamad Sabar, Gunawan
Gunawan, Yasri Yasri and Ari Hadhiwibowo

ABSTRACT

This study addresses the lack of quantitative, data-driven pricing models in the Indonesian e-commerce skincare market by segmenting consumer purchasing behavior based on actual transaction records. This research uses business intelligence methodology to create a map of price segmentation and consumer behavior based on demographics, paying specific attention to high growth categories such as Men's and Baby & Child skincare. Following the Knowledge Discovery in Databases approach, transactional data were collected via Tokopedia by means of web scraping. The cleaned dataset contained 36 records after removing any categorical misclassifications and price outliers. Prior to performing K-Means clustering, the dataset was normalized using Min-Max Scaling procedure for four predictor variables: Price, 30-Day Sales Volume, 30-Day Revenue, and Rating. The optimal number of clusters in this case is three (Elbow Method). Cross-tabulation allows us to reveal different types of market behavior. The Baby & Child category skincare products belong mostly to Cluster 0, which has low average price and high sales volumes the result of parents' price sensitivity and product popularity, respectively. Cluster 1, which contains mostly Men's skincare, is the highest value premium one. Although the monthly sales volume for this demographic is lower, it generates the highest average revenue, suggesting greater price involvement among male consumers, although further research is needed. Cluster 2 is balanced mid-tiers segment. The main limitation of this study is its small cross-sectional sample and uniformly perfect platform ratings, which limit definitive causal claims about demographic purchasing mechanisms. Ultimately, the clustering model provides operational metrics for cosmetic MSMEs to develop demographic-specific pricing strategies based on actual digital market behavior rather than assumptions.

Keywords: K-Means Clustering, Price Segmentation, E-commerce, Data Mining, Business Intelligence.

Characterizing Request Patterns of Web Crawlers on a Regional News Website Using Browser Fingerprinting

Dedi Julyan Sukawanto, Jufri, Erfan Hasmin

ABSTRACT

The rapid proliferation of AI powered web crawlers has created significant challenges for regional news websites by consuming server resources and distorting audience analytics. This study characterizes crawler request patterns on sinjai.info using browser fingerprinting signals. From 3241 raw fingerprint records, preprocessing retained 2609 valid records consisting of 1104 AI Crawler requests, 265 Search Engine Crawler requests, and 1240 Human User requests. Six fingerprints derived and behavioral features were analyzed: CPU Concurrency, Device Memory, Inter Request Time, Fingerprint Uniqueness Ratio, Device Anomaly Index, and Page Type Distribution. The results show that AI Crawlers have higher hardware resource profiles, lower fingerprint diversity, and greater access to tag and category pages than Human Users. Human User traffic shows high touchscreen prevalence, greater Canvas fingerprint diversity, and predominantly Indonesian locale settings. The Canvas Fingerprint Uniqueness Ratio for Human Users was approximately 26.7 times higher than that of AI Crawlers, while the Device Anomaly Index flagged 94.2 percent of AI Crawler requests and no Human User requests. These findings indicate that browser fingerprinting provides interpretable device level and behavioral indicators for characterizing automated and human traffic. The proposed metrics support crawler auditing, traffic segmentation, analytics filtering, and adaptive rate limiting for regional news website environments.

Keywords: AI-powered web crawlers, Browser fingerprinting, Request pattern analysis, News website, Bot detection.

Multi-Sensor Based Vehicle Temperature Anomaly Detection Using IoT and Cloud Architecture

Jack Febrian Rusdi, Muhammad Shahmi Hafizin Nor Hisham, Vicente Aquino Pitogo, Zurina Sa'aya, Rina Indrayani, Ari Hadhiwibowo

ABSTRACT

Vehicle cabin and engine overheating pose significant safety risks, yet traditional monitoring systems often lack real-time remote accessibility and comprehensive multi-zone detection. This paper presents an early warning and vehicle temperature anomaly detection system utilizing Internet of Things (IoT) and cloud architecture. The proposed system integrates an ESP32 microcontroller with DHT11 and DHT22 sensors to continuously monitor cabin and engine temperatures. To validate the system's logic and communication reliability, a laboratory-scale simulation was conducted. Sensor data is processed locally to classify the thermal status into SAFE, CAUTION, or CRITICAL levels based on predefined thresholds. The processed data is then transmitted via HTTP REST API to a Supabase cloud database, enabling real-time visualization and alert notifications through a web-based dashboard. The laboratory simulation results demonstrate that the prototype successfully detects temperature anomalies and triggers appropriate condition alerts with minimal latency. This proof-of-concept establishes a reliable foundation for future field testing and integration into actual vehicle environments.

Keywords: Anomaly Detection, Automation, Early Warning System, Internet of Things (IoT), Multi-Sensor Integration.

CDB-AF: System Architecture and Risk Assessment Engine for Children's Digital Behavior Monitoring

Arlinda Rusmartiana, Jack Febrian Rusdi, Muchammad Naseer, Ruth E. Sanchez, Danny Aidil Rismayadi, Mohammad Kchouri

ABSTRACT

The pervasive integration of digital devices in children's upbringing raises significant concerns about its impact on behavioral development, particularly negative behavioral cues such as tantrums. While prior research has predominantly focused on quantitative screen time metrics, a comprehensive analytical approach encompassing qualitative and contextual dimensions remains limited. This study proposes the Children's Digital Behavior-Analysis Framework (CDB-AF), a novel conceptual framework developed through a systematic literature review of 28 empirical articles. The CDB-AF integrates three key behavioral dimensions—quantitative (duration, frequency), qualitative (content type, stimulation intensity), and contextual (parental supervision, reason for use)—into a structured four-layer architecture: an input layer for data collection, an analytical engine for multi-dimensional integration, a risk assessment layer for risk categorization (green, yellow, red), and an output layer generating specific recommendations. By providing a holistic and structured analytical tool, the CDB-AF contributes to Human-Computer Interaction and Digital Health fields, enabling more nuanced risk assessment and evidence-based intervention design. It serves as a foundational model for developing intelligent parental control tools and promoting sustainable, data-driven digital parenting practices.

Keywords: Children's Digital Behavior-Analysis Framework (CDB-AF), Digital Behavior, Screen Time, Multidimensional Analysis, Digital Parenting, Behavioral Analytics.

Development of an E-Commerce Platform and Implementation of the Apriori Algorithm for a Product Recommendation Feature

Ahmad Zaenal Muttaqin, Ajri Muhammad Sidiq, Nova Agustina, Wilem Musu,
Danny Aidil Rismayadi

ABSTRACT

The rapid growth of e-commerce has encouraged businesses to adopt independent digital sales platforms; however, many existing studies on product recommendation using association rule mining focus either on standalone transaction analysis or recommendation feature implementation without systematically evaluating parameter sensitivity, recommendation performance, and user acceptance within an operational e-commerce platform. This study develops an independent e-commerce platform for PT Curug Lestari Maju (Jirifarm) by integrating an Apriori-based product recommendation module, digital payment processing, and automatic shipping cost calculation. Apriori was selected because its association rules provide interpretable relationships between complementary products and can be directly utilized for cross-selling recommendations. The system was developed using the Extreme Programming methodology. A transaction dataset containing 15,947 transactions and 308 product variants was analyzed, and parameter sensitivity experiments were conducted to determine appropriate minimum support and confidence thresholds. The selected configuration used a minimum support of 0.001 (0.1%), minimum confidence of 0.30 (30%), and lift greater than 1. The recommendation module was evaluated against FP-Growth using Precision@5, Recall@5, F1-score, computational runtime, and generated association rules. FP-Growth achieved slightly higher recommendation performance and faster computation, while Apriori produced comparable association patterns that could be directly integrated into the developed platform. Functional testing confirmed that all major system functions operated successfully, while Technology Acceptance Model evaluation involving 102 respondents yielded an overall acceptance score of 82.89%. The main contribution of this study is an empirical evaluation of an interpretable association-rule-based recommendation approach within an operational independent e-commerce platform, including parameter sensitivity, baseline comparison, and user acceptance evaluation.

Keywords: E-commerce, Apriori Algorithm, Market Basket Analysis, Recommendation System, Technology Acceptance Model Introduction.

Risk-Aware Flood Route Recommendation System in Jakarta Using BPBD-Calibrated Labels and Corridor Projection Algorithm

Multi Nadeak

ABSTRACT

Abstract—Urban flooding in Jakarta causes recurring socio-economic disruption. This paper presents RAFRRS, a decision-support prototype that combines flood-risk classification with an $O(N)$ Corridor Projection spatial filter. The BPBD-Calibrated Labels used are probabilistic proxy labels derived from aggregated flood frequency by subdistrict, seasonal patterns, and La Niña factors; they do not represent daily observations of BPBD flood events. Using 33,894 subdistrict-day records with a temporal split between 2021–2023 and 2024, Logistic Regression achieved an AUC of 0.684, Recall of 0.675, Precision of 0.057, and F1 of 0.104 at the operational threshold $t^* = 0.480$. This configuration detected 199 of 295 positive proxy labels but generated 3,321 false positives (Specificity = 59.0%), creating a risk of alert fatigue. Gradient Boosting provided a more conservative alternative (Recall = 0.553; Specificity = 0.749; F1 = 0.108). Feature importance indicated that rain_14day (25.5%) was the dominant predictor. The Corridor Projection only filters subdistricts adjacent to the origin–destination line and is not a road-network route-finding algorithm. Since the results have not been validated against observed daily flood events and road-segment observations, they should be regarded as an internal prototype evaluation rather than evidence of deployment readiness.

Keywords: Keywords—urban flood prediction; BPBD-calibrated proxy labels; subdistrict spatial filter; logistic regression; operational threshold; alert fatigue; Jakarta; SDG 11; SDG 13.

Mobile Application For Video-To-Text Sign Language Translation Based On Deep Learning Using Bidirectional Gru

Aridwan, M Dimas Daniswara Putra, Nova Agustina, Jufri, Danny Aidil
Rismayadi, Eka Hidayat

ABSTRACT

The learning process of inclusive education is still not easy in the process of communication between lecturers and students who use Indonesian Sign Language (BISINDO) in learning not all lecturers can sign. Moreover, most Sign Language Recognition (SLR) studies employ the traditional data splitting methods which are not suitable to evaluate the performance of a model to recognize an unseen user. In this work, the aim was to develop a mobile app that can transcribe sign language videos to text based on a Bidirectional Gated Recurrent Unit (BiGRU) model and to investigate the generalization ability using the Leave-One-Subject-Out (LOSO) method. This research was done by using a quantitative approach. The machine learning model was created by following the Machine Learning Life Cycle (MLLC) and the mobile application was built using Extreme Programming (XP). The body and hand landmarks were extracted using MediaPipe Pose and Hands, and then features for position and velocity were extracted to train the Bidirectional GRU model. The performance of the model was tested using LOSO while the application was tested through User Acceptance Testing (UAT) and Perceived Usefulness evaluation. The results indicate that the SIGNA application has been successfully developed and the user feedback to the application is positive in terms of design, usability, efficiency, and usefulness as a communication support tool in inclusive learning. Furthermore, the Bidirectional GRU model recorded an average LOSO accuracy of 88.61%, indicating its good generalization ability in unseen user recognition.

Keywords: BISINDO, Bidirectional GRU, Deep Learning, Leave-One-Subject-Out, MediaPipe, Mobile Application.

Identification of Determinant Factors and Prediction of High-Value Waste Prices Using Long Short-Term Memory (LSTM)

Andi Irmayana; Nurul Aini, Ramla, Muhammad Husnul Yaqin, Zalsabila S

ABSTRACT

High-value waste prices in waste banks fluctuate substantially due to shifts in recycling commodity markets, making it difficult for managers to set fair purchasing prices and design effective operational strategies. This study identifies key determinants of high-value waste prices and develops a Long Short-Term Memory (LSTM)-based forecasting model using historical transaction data from waste banks in Makassar City, Indonesia (January 2023–December 2025; 63,734 transactions across 46 waste categories). Preprocessing included duplicate removal, outlier detection, Min-Max normalization, and temporal feature engineering using lag variables and moving averages. Pearson and Spearman correlation analyses, along with Random Forest feature importance, were used to identify influential predictors. The LSTM model was optimized via Grid Search and benchmarked against ARIMA using MAE, RMSE, MAPE, and R^2 metrics. Historical price features—particularly the three-month moving average (MA3), Lag-1, and Lag-12—emerged as the dominant determinants of waste prices. However, ARIMA consistently outperformed LSTM across all evaluated categories, indicating that deep learning effectiveness is constrained by the limited number of monthly observations available. These findings suggest classical statistical models remain more suitable for short time series, while LSTM may offer greater advantages with longer, denser datasets. The proposed approach provides practical insights for data-driven waste price forecasting and supports community-based circular economy decision-making.

Keywords: Waste Bank, Waste Price, Forecasting, Long Short-Term Memory, ARIMA.

Leakage-Aware Optimization of Regularized Logistic Regression for Prediabetes Prediction from Hourly Wearable Biomarkers

Muhammad Zakariyah, Sutarman, Indrayanti, Moh. Ali Romli, Umar Zaky, Vivianti

ABSTRACT

Physical inactivity can trigger prediabetes, while the specific relationship between continuous glucose monitoring and accelerometry to prediabetes for participants-level remains unclear. This study aims to evaluate these biomarkers in prediabetes detection using leakage-aware nested optimization framework. The sample consisted of 16 participants with 3,183 windows, aggregated into a single vector per participant. A regularized logistic regression algorithm was employed to build classification models. Validation involved 64 combinations of an outer leave-one-positive/negative-out approach. Time Above Range (TAR) and circadian glucose range were higher in the prediabetes group and correlated with HbA1c levels. Evaluation metrics show that the standard model (CGM-only) produces ROC-AUC by 0.609 to 0.703 after optimization, while the Brier score decreased from 0.296 to 0.223. An accelerometry-only model shows 0.469, whereas the early fusion model achieved 0.656 in ROC-AUC. Framework to reduce the risk of model overfitting was built by reproducing participant data using a small cohort. As the results indicate, this framework does not significantly improve accuracy but yields a more credible and conservative evaluation. This framework represents methodological proof-of-concept rather than a validation of clinical diagnosis, therefore external validation in a larger and more diverse prospective cohort is required.

Keywords: continuous glucose monitoring, accelerometry, early fusion, model optimization, prediabetes.

A Hybrid AHP–SAW Framework for KPI-Based Employee Performance Evaluation

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ABSTRACT

Employee performance evaluation based on Key Performance Indicators (KPIs) may remain subjective when the relative importance of multiple assessment criteria is not systematically determined. This study proposes a hybrid Analytical Hierarchy Process–Simple Additive Weighting (AHP–SAW) framework for KPI-based employee performance evaluation in a plastic injection molding manufacturing environment in Cikarang, Bekasi, West Java, Indonesia. The study context comprised approximately 100 employees in the molding division, from which 32 employees in the Design Department were selected as the study sample using purposive sampling. HRD staff and direct supervisors served as evaluators, while 10 employees were selected from the 32 sampled employees as decision alternatives based on the availability and completeness of performance data. Seven organization-specific KPI criteria were considered: discipline, cooperation, loyalty and honesty, motivation, perseverance, customer service, and responsibility. AHP was applied to determine criterion priorities and assess the consistency of pairwise judgments, while the resulting AHP weights were directly incorporated into SAW to normalize employee performance values and generate the final ranking. The results identified discipline as the dominant criterion with a weight of 0.379, followed by cooperation at 0.237. The Consistency Ratio was 0.020, indicating acceptable judgment consistency. The integrated SAW calculation ranked A8 first with a preference score of 0.9541, followed by A7 with 0.9041 and A1 with 0.8425. These findings indicate that discipline and cooperation should receive greater managerial attention in employee performance improvement and development programs within the molding division. The contribution of this study lies in applying a sequential AHP–SAW framework with a manufacturing-specific KPI set tailored to the plastic injection molding context, providing a structured, transparent, and measurable basis for employee performance evaluation.

Keywords: Analytical Hierarchy Process (AHP), Simple Additive Weighting (SAW), Key Performance Indicator (KPI), employee performance evaluation, multi-criteria decision making.

Fog Deployment of a Compressed Occupancy-Aware Spatio-Temporal Graph Model for Multi-Building Energy Forecasting.

Benedictus Herry Suharto, Sri Hartati Wijono, Mawar Hardiyanti, Maria Karmelia Fajarlestari, Deni Lukmanul Hakim

ABSTRACT

We examined where a compact building-energy forecaster loses accuracy and whether its smaller model file reduces inference time. The study uses 493 electricity-meter nodes at 11 BDG2 sites and 4,789,039 test targets per model. Nine teacher–student variants were trained with three seeds, giving 27 fits. The full LSTM–GraphSAGE teacher and GRU graph student achieved macro RMSE of 17.557 ± 0.163 and 30.690 ± 0.247 kWh. Removing the student’s two fixed propagation steps reduced RMSE to 19.163 ± 0.129 kWh: a 37.55% mean paired reduction at unchanged parameter count. Nominal 80% interval coverage increased from 54.22% to 77.00%. Replacing the recurrent encoder or removing the bottleneck had little effect; removing distillation mainly widened the intervals. The no-occupancy control showed no mean RMSE penalty, although ECO-derived probabilities remain unvalidated as human presence in BDG2. Deployment tests used the original FP32 model pair, with a 6.14-fold difference in ONNX storage. Teacher and student p95 latency on the same workstation was 9.972 and 9.821 ms; ratios across repetitions ranged from 0.751 to 1.226. The fourdevice measurements and denominator audit complement these tests. Removing propagation was the largest tested forecasting improvement, whereas smaller storage did not yield consistent acceleration. The deployment results concern local inference, not a networked control pipeline.

Keywords: Building energy forecasting, fog computing, GraphSAGE, occupancy proxy, knowledge distillation, ablation study, ONNX.

Feature-Engineered Support Vector Machine for Barangay Justice Case Classification in the Philippines

Las Johansen B. Caluza, Raphy Dalan, Cesar M. Celestial, Jr., Rico V. Combinido

ABSTRACT

The Katarungang Pam barangay is the community justice system of the Philippines. It handles disputes at the grassroots level. Still, the record cases that it generates are still mainly paperbound, and hardly have they been studied in total. This study presents and tests the performance of a featureengineered Support Vector Machine combined with Stochastic Gradient Descent (FE-SVM+SGD) classifier to categorize barangay case records. The dataset comes from 341 blotter papers of six pilot barangays in the Municipality of Palo Leyte Eastern Visayas. KDD, the process of discovery of patterns in large databases, led data selection preprocessing feature extraction, model induction, and assessment. Five algorithms: Nave Bayes, Decision Tree, Logistic Regression, a basic Support Vector Machine, and the suggested FE-SVM+SGD were all put to the test. The FE-SVM+SGD model was successful with an accuracy of 90. 32%, precision of 89. 14%, recall of 90. 32%, and F1-score of 89. 02%, which is about 2. 08 better than the baseline SVM in accuracy. In the descriptive statistics 196 out of 341 records (57.5%) were reported as Non-KP cases. The KP-identified offense categories include 145 records, which are further divided equally into 42. 5%. The results of validation performance reveal that the level of accuracy in detecting different types of cases is highest with criminal ones, while the lowest is for civil cases (0. 87). These outcomes suggest that with the current features, civil disputes are grouped and characterized less accurately compared to other types of cases. The model so is a promising first step leading to case screening, profiling, and referral in barangay justice administration. .

Keywords: Barangay Justice System, Katarungang Pambarangay, feature engineering, support vector machine, stochastic gradient descent, case classification.

Predictive Public Safety: An AutoML Framework for Forecasting Barangay Justice System Blotter Volumes

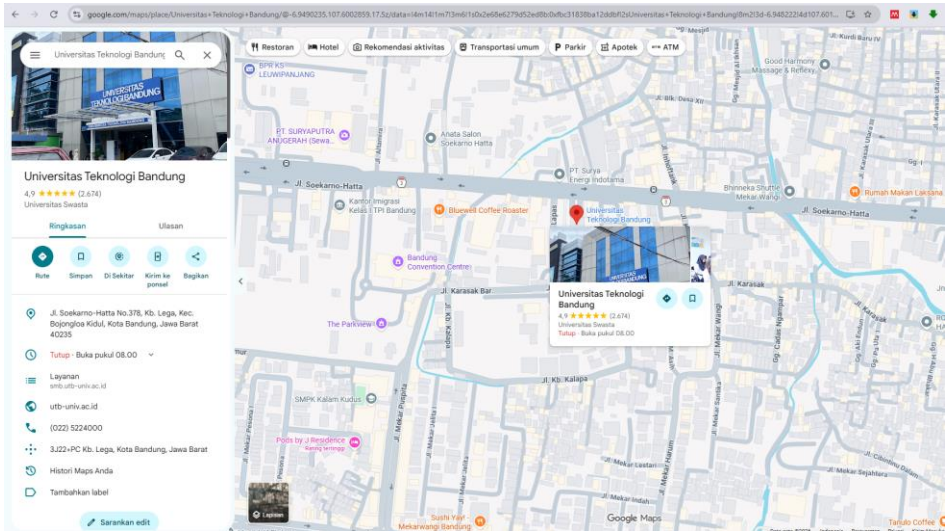
Las Johansen B. Caluza, Raphy Dalan, Cesar M. Celestial, Jr., Rico V. Combinido

ABSTRACT

Katarungang Pambarangay (Barangay Justice System) in the Philippines is a significant device for local dispute resolution and court decongestion. However, existing management paradigms rely on manual tracking or basic descriptive automation, lacking proactive analytical capabilities. This study presents an AI-driven forecasting framework utilizing the Knowledge Discovery in Databases (KDD) process to predict localized blotter incident volumes. Using historical incident data (2021–2025) across multiple barangays in Palo, Leyte, we implemented an Automated Machine Learning (AutoML) pipeline to evaluate five time-series paradigms: Poisson Regression, Tweedie Regression, Holt-Winters Exponential Smoothing, XGBoost, and SARIMAX. The SARIMAX model demonstrated superior mathematical modeling of underlying seasonality and localized trends, achieving a Mean Absolute Error (MAE) of 0.23, a Root Mean Squared Error (RMSE) of 0.26, and a Symmetric Mean Absolute Percentage Error (SMAPE) of 22.9%. These results demonstrate that localized, automated time-series modeling can provide sound, reliable projections to optimize municipal resource allocation and law enforcement interventions.

Keywords: Katarungang Pambarangay, Time-Series Forecasting, SARIMAX, AutoML, Public Sector Analytics, Decongestion.

SITEMAP



Picture 1. Universitas Teknologi Bandung