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2025 EIGHTH INTERNATIONAL CONFERENCE ON  
VOCATIONAL EDUCATION AND ELECTRICAL  
ENGINEERING (ICVEE)

## PROGRAM BOOK

*Shaping a Sustainable Future with Green  
Innovation and Industry Collaboration for  
Education and Intelligent Technology  
Advancements*

*September 24-25, 2025*





**2025 Eighth International Conference On  
Vocational Education And Electrical Engineering (ICVEE)**

**”Shaping a Sustainable Future with Green Innovation and Industry Collaboration for  
Education and Intelligent Technology Advancements”**

**PROGRAM BOOK**

**Universitas Negeri Surabaya, Surabaya, Indonesia  
(Hybrid Conference)  
24-25 September 2025**

**IEEE Conference Number : 66651  
IEEE Catalog Number : CFP25X27-USB  
ISBN : 979-8-3315-8551-8**

**Sponsor:**



## WELCOME MESSAGE FROM THE GENERAL CHAIR

Distinguished guests, keynote speakers, presenters, and participants,

It is with great honour and sincere pleasure that I welcome you to the **2025 Eighth International Conference on Vocational Education and Electrical Engineering (ICVEE)**, held on **24–25 September 2025** in a hybrid format. This year's theme,

**“Shaping a Sustainable Future with Green Innovation and Industry Collaboration for Education and Intelligent Technology Advancements,”**

reflects our shared commitment to advancing knowledge, fostering innovation, and strengthening the synergy between academia and industry in addressing the pressing challenges of our time.

As a **joint collaboration between the Department of Electrical Engineering and the Department of Informatics Engineering, Universitas Negeri Surabaya (UNESA)**, ICVEE 2025 continues to serve as a platform for researchers, educators, practitioners, and industry partners from across the globe. Here, we gather not only to share research findings and technological developments but also to build meaningful connections that will inspire sustainable solutions and intelligent advancements for the future.

We are privileged to host an outstanding lineup of keynote speakers and contributors whose expertise will enrich our perspectives. I extend my deepest appreciation to all authors, reviewers, participants, and sponsors, as well as to the dedicated organizing committee, for their invaluable contributions to the success of this conference.

This conference is a celebration of knowledge, collaboration, and innovation. It is also a reminder that **we are all remarkable individuals — people of excellence — whose collective efforts can shape a sustainable and intelligent future.**

I warmly invite all of you to actively engage in the discussions, exchange ideas, and foster collaborations that will extend far beyond this event. May ICVEE 2025 be an inspiring and rewarding experience for each of you.

Welcome, and let us together shape a sustainable and intelligent future.

Warm regards,  
Ervin Yohannes  
**General Chair, ICVEE 2025**

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- Yuita Arum Sari, M.Kom., Okayama University, Japan
- Mr. Achmad Rizal, Telkom University, Indonesia

## Conference Schedule



**2025 EIGHTH INTERNATIONAL CONFERENCE ON VOCATIONAL EDUCATION AND ELECTRICAL ENGINEERING  
(ICVEE 2025)  
Hybrid, Surabaya, Indonesia**

Day/date	Time	Agenda	Venue
<b>September 24<sup>th</sup> 2025</b>	07.30 – 08.30	Registration	Auditorium FIKK Building Third Floor
	08.30 – 08.40	Opening by MC <b>MC : Sueb S.Pd., M. Pd.</b>  Indonesia National and Mars Unesa Anthem	Auditorium FIKK Building Third Floor
	08.40 – 08.45	Praying moment <b>Rifqi Firmansyah, S.T., M.T., Ph.D.</b>	Auditorium FIKK Building Third Floor
	08.45 – 08.50	Welcome speech from Chariman of FORTEI, SNTE, and ICVEE by <b>Dr. Ir. Lusia Rachmawati, S.T., M.T.</b>	Auditorium FIKK Building Third Floor
	08.50 – 08.55	Foreword by Head of Forum Teknik Elektro Indonesia (FORTEI) <b>Prof. Dr.Eng. Ir. Arief Udhiarto, ST., MT., IPU</b>	Auditorium FIKK Building Third Floor
	08.55 – 09.00	Foreword by Vice Rector 3 <b>Dr. Bambang Sigit Widodo, M.Pd.</b>	Auditorium FIKK Building Third Floor
	09.00 – 09.30	Coffee break	Auditorium FIKK Building Third Floor
	09.30 – 10.15	Keynote Speech 1 <b>Prof. Ahmed Abu-Siada, Curtin University</b>  Keynote Speech Tittle : "The critical importance of reliable power transformer condition monitoring and advanced fault diagnostic techniques" (Moderator: Pradini Puspitaningayu, S.T., M.T., Ph.D)	Auditorium FIKK Building Third Floor
	10.15 – 11.00	Keynote Speech 2 <b>Prof. Dr. Ing. Wahyudi Hasbi</b> Badan Riset dan Inovasi Nasional (BRIN)  Keynote Speech Title: "Green Space Systems: Small Satellite Innovation and Multi-Application Research for Intelligent and Sustainable Futures" (Moderator: Pradini Puspitaningayu, S.T., M.T., Ph.D)	Auditorium FIKK Building Third Floor
11.00 – 11.45	Invited Speech <b>Prof. Dr. Lilik Anifah, M.T.</b> Fakultas Teknik, Universitas Negeri Surabaya	Auditorium FIKK Building Third Floor	

<b>Day/date</b>	<b>Time</b>	<b>Agenda</b>	<b>Venue</b>
		Keynote Speech Title: Development of Artificial Intelligence and Image Processing in the Energy Sector  (Moderator: Pradini Puspitaningayu, S.T., M.T., Ph.D.)	
	11.45 – 13.00	Lunch Break	Auditorium FIKK Building Second Floor
	13.00 – 15.00	Parallel Session 1	FIKK Building
	15.00 – 15.30	Coffee Break	Room U4.03.01
	15.30 – 17.00	Parallel Session 2	Room U4.03.02

## Moderator Schedule

### Keynote Speaker Moderator

Speaker	Moderator
Prof. Ahmed Abu-Siada	Pradini Puspitaningayu, S.T., M.T., Ph.D
Prof. Wahyudi Hasbi	Pradini Puspitaningayu, S.T., M.T., Ph.D
Prof. Lilik Anifah, M.T	Pradini Puspitaningayu, S.T., M.T., Ph.D

### Parallel Session Moderator

Room	Moderator Onsite	Moderator OnLine Breakout Room
Room 1	Dr. Raden Roro Hapsari Peni Agustin Tjahyaningtjas, S.Si., M.T.	Rifqi Abdillah, S.ST., M.Kom
Room 2		Farhanna Mar'i, S.Kom., M.Kom
Room 3		Ghea Sekar Palupi, S.Kom., M.I.M

## Paralel Session Schedule

**Wednesday, September 24<sup>th</sup> 2025**

### **Onsite Faculty of Sports and Health Science**

No	Time slot	Room 1 <b>Moderator</b> : Hapsari Peni
1	13.00 - 13.10	Empowering Sustainable Education Through Competency Pattern Mining in Instructional Website Design <b>Author:</b> Yeni Anistyasari; Shintami Chusnul Hidayati; Ekohariadi Ekohariadi
2	13.10 - 13.20	Prediction of Cognitive and Non-Cognitive Factors on Academic Achievement Using Elastic-Net <b>Author:</b> Atik Wintarti; Riskyana Dewi Intan Puspitasari; Hasanuddin Al Habib; Fadhilah Qalbi Annisa
3	13.20 - 13.30	Analyzing Student Self-Development Pattern Through Sensor-Based Attendance in HyLab Activity <b>Author:</b> Nina Lestari; Dewi Tresnawati; Azizah Zakiah; Mervin Hutabarat; Ivany Sarief; Ary Setijadi

No	Time slot	<b>Room 1</b> <b>Moderator :</b> Hapsari Peni
4	13.30 - 13.40	Flexwing: Gamification Technology to Increase Student Motivation and Engagement in Flexbox CSS Learning at State Vocational High School 10 Surabaya  <b>Author:</b> Ramadhan Cakra Wibawa; Ahmad Zulkifli Baihaqi; Yudha Bima Herlambang; Nur Kholis Wakhid; Bambang Sujatmiko; I Kadek Dwi Nuryana; Martini Dwi Endah Susanti; Rindu Wibawa; I Gusti Lanang Putra Eka Prisma; Harun Al Rosyid
5	13.40 - 13.50	Machine Learning Approach for Sentiment and Topic Analysis on Social Media X: Case Study of Corruption Handling by the East Java Government  <b>Author :</b> Aries Indriyanti; Eko Sedyono; Rahmat Gernowo
6	13.50 – 14.00	Impact of Optimizer and Learning Rate on U-Net for IHC Breast Cancer Image Segmentation  <b>Author:</b> Laras Suciningtyas; Reza Fuad Rachmadi; I Ketut Purnama
7	14.10 - 14.20	Implementing Optuna and Ensemble Learning on Boosting Models for Credit Default Risk Prediction

No	Time slot	<b>Room 1</b> <b>Moderator :</b> Hapsari Peni
		<b>Author:</b> Yuni Yamasari; Abdul Kahar; Ricky Eka Putra; I Made Suartana Suartana; Paramitha Nerisafitra; Anita Qoiriah
8	14.20 - 14.30	Exploring Ensemble Classifiers and Filter-Based Feature Selection for Predicting on-Time Graduation Using Multidimensional Student Data  <b>Author:</b> Wiyli Yustanti; Ricky Eka Putra; I. G. P. Asto Buditjahjanto; Andi Iwan Nurhidayat
9	14.30 – 14.40	Dual Vision Transformer Integration for Race and Gender Recognition Based on Facial Images  <b>Author :</b> Rezky Arisanti Putri; Lilik Anifah; Ricky Eka Putra; Yuni Yamasari; Rafy Aulia Akbar
10	14.40 – 14.50	BERT-Based Transfer Learning for Two-Class Sentiment Detection in Indonesian X Apps Comments  <b>Author :</b> Muhammad 'Aamir Nashrullah; Pradini Puspitaningayu; Hapsari Peni Agustin Tjahyaningtijas
11	14.50 – 15.00	Forecasting Stock Prices with Sequential Deep Learning: a Long Short-Term Memory Approach

No	Time slot	<b>Room 1</b> <b>Moderator :</b> Hapsari Peni
		<b>Author :</b> Ervin Yohannes; Aldin Febriansyah; Suparji; Agus Wiyono; Aries Indriyanti; Fitri Utamingrum; Kahlil Muchtar; Avirmed Enkhat; Nisa Dwi Septiyanti; Chih-Yang Lin
12	15.00 – 15.10	Design and Synthesis of a Four-Element Linear Antenna Array for Ku-Band Applications  <b>Author :</b> Muhammad Athallah Adriansyah; Aditya Inzani; Catur Apriono
13	15.10 – 15.20	Effect of Modulation and Noise Level on ESBM-Based Energy Consumption for Data Transmission on Wireless Sensor Networks Using the Nelder Mead Simplex Method  <b>Author :</b> Miftahur Rohman; Titiek Suryani; Lusia Rakhmawati; Hesti Khuzaimah Nurul Yusufiyah; Nicolaus Andra Saputra; Thimoty Manuel Zefa Hutabarat; Estuarine Wahyu Lintang Pratiwi
14	15.10 – 15.30	TinyML-Based Object Detection on Smart Blind Stick for Visually Impaired Person  Author : Parama Diptya Widayaka; Pradini Puspitaningayu; Sayyidul Aulia Alamsyah; Endryansyah Endryansyah; Lusia Rakhmawati; Paramitha Nerisafitra; Rifqi Abdillah; Akbar Wildhanata; Haikal Alif Eyrlangga

# Saturday, September 24<sup>th</sup> 2025

## OnLine Breakout Room by Zoom Meeting

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
1	13.00 - 13.10	Educational App for Traffic Sign Recognition Using Convolutional Neural Networks  <b>Author :</b> Ritchell S. Villafuerte; Ma. Windie C. Velarde; Eric O. Sta. Singh; Raymond M Daylo; Kerr Micko D. Lanante; John Michael E. Revilla; Jonathan Andrei B. Fabi	EffNet-RAM: Enhancing Feature Discriminability with Hybrid CNN-Based Channel-Aware Residual Attention Modules for Fine-Grained Mangrove Species Classification  <b>Author :</b> Jasten Keneth D Treceñe; Arnel C. Fajardo	Software Defined Radio-Based Approach for Decoding the LoRa Signals in IoT Application  <b>Author :</b> Alfan Andika; Wahyu Pamungkas; Khoirun Ni'amah
2	13.10 - 13.20	A Study of Slide Annotation Generating System from Online Presentations	A Proposal of Performance Enhancement of SEMAR IoT Server Platform Using Kubernetes	Assessing Quality of Service (QoS) Through Attenuation Variations at Splitter Ports in an FTTH System

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
		<b>Author :</b> Amma Liesvarastranta Haz; Nobuo Funabiki; Htoo Htoo Sandi Kyaw; Evianita Dewi Fajrianti; Sri trusta Sukaridhoto	<b>Author :</b> Noprianto Noprianto; Nobuo Funabiki; Htoo Htoo Sandi Kyaw; Komang Candra Brata; I Nyoman Darma Kotama; Yan Watequlis Syaifudin; Alfiandi Aulia Rahmadani	<b>Author :</b> B. Berlian Surya Wicaksana; Irdina Rusyda Kamila Arsil; M. Suhendy Martondi Nasution; Malvin Samuel Martino; Catur Apriono
3	13.20 - 13.30	An Intelligent Digital Resource Library of Eastern Visayas State University-Graduate School  <b>Author :</b> Ritchell S. Villafuerte; Vanissa Catindoy	ML-Classify: a Dual-Classification Approach for Learning Material Categorization  <b>Author :</b> Marlon Juhn Marsado Timogan; Maureen M Villamor	Evaluation of Cooperative Cognitive Radio System for White Spectral Space Detection Using the Covariance Detector  <b>Author :</b> Rafael Ramírez; Mateo I. Luna; Marcelo Molina Silva; Jussif Junior Abularach Arnez; Luiz da Silva Mello; Carlos Rodriguez Ron; Leonardo Henrique Gonsioroski

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
4	13.30 - 13.40	<p>An Implementation of Integrated Introductory Problems for Cross-Platform Flutter Programming Self-Studies</p> <p><b>Author :</b> Safira Adine Kinari; Nobuo Funabiki; Soe Thandar Aung; Htoo Htoo Sandi Kyaw; Mustika Mentari</p>	<p>Machine Learning-Based Time Series Forecasting of Cauayan City Water Consumption</p> <p><b>Author :</b> Aljon L. Abines</p>	<p>Intelligent Battery Health Monitoring System for Optimizing Uninterruptible Power Supply</p> <p><b>Author :</b> Safira Firdaus Mujiyanti; Amelia Rizqi Nur Aida; Akhmad Ibnu Hija; I Putu Eka Widya Pratama; Murry Raditya; Yus Putri Arum Segar</p>
5	13.40 - 13.50	<p>Digitized Document Tracking System Using QR Code Technology and Graphic Draw (GD) Integration</p> <p><b>Author :</b> Jude Allan A Urmeneta; Joleco C Agullo</p>	<p>Hypersensitif: a Mobile-Based Application for Hypertension Prediction and Diet Plans Using K-Nearest Neighbor Algorithm</p> <p><b>Author :</b> Reymon Manuel Santiañez; Drake R. Carcellar; Michelle D. Almen;</p>	<p>Development and Validation of Smart Multi-Parameter Anthropometric Device for Infant Growth Monitoring</p> <p><b>Author :</b> Ahmad Fauzan Adziimaa; Ashar Prastowo; Safira Firdaus Mujiyanti</p>

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
			Karen M Gervacio; Hannah Joy O. Hotricano	
6	13.50 – 14.00	<p>An Introduction of Test Code-Based Approach in Algorithms and Data Structures Course with Java Programming</p> <p><b>Author :</b> Mustika Mentari; Nobuo Funabiki; Perwira Annissa Dyah Permatasari; Htoo Htoo Sandi Kyaw; Vivi Nur Wijayaningrum; Triana Fatmawati; Yan Watequlis Syaifudin</p>	<p>Development of Cloud-Based Structured Query Language Injection (SQLi) Detection Using Deep Learning and FastAPI</p> <p><b>Author :</b> Carlo Jude P Abuda; Ariel Roy L Reyes</p>	<p>Design a Fractional-Order Tilt Integral Controller for Congestion Control in TCP/AQM Network</p> <p><b>Author :</b> Layla Hattim Abood; Russul H. Hadi; Marwa F Jassim</p>
7	14.10 - 14.20	<p>Aligning Educational Outcomes with Industry Demands: an Automated Competency Assessment Tool Based on the</p>	<p>Automated Identification and Quality Assessment of Philippine Banana Varieties Using Convolutional Neural Networks</p>	<p>Interactive HMI Visualization for a Real-Time Flow Control System Using Variable Speed Drive and Electromagnetic Flowmeter with HART-Based Calibration</p>

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
		PSF-AAI Framework for Analytics and AI Careers <b>Author :</b> Kent Claire Apple Joy M Pallomina; Deborah G Brosas	<b>Author :</b> Deborah G Brosas; Lyra K. Nuevas; Ritchell S. Villafuerte; Jessie R. Paragas; Dindo C. Obediencia; Neil Morfe Pascual	<b>Author :</b> Safira Firdaus Mujiyanti; Ahmad Fauzan Adziimaa; Dafa Hasan Cramajaya; Tepy Lindia Nanta; Salwa Dzanur Royana; Ishmatu Aulia Rizky Kirana
8	14.20 - 14.30	Development of a Web-Based Adaptive Virtual Learning System to Strengthen Programming Self-Efficacy in the Mechatronics Course for Vocational Students  <b>Author :</b> Marsono Marsono; Tuwoso Tuwoso; Dianna Ratnawati; Yuli Panca Asmara; Fitria Khasanah; Rama Adi Wijayanto; Sunia Maulidia Zahra	Earthquake Magnitude Prediction: Comparative Study of Machine Learning and Deep Learning Methods  <b>Author :</b> Aulya Sri Utami Ilham; Stefani Tasya Hallatu; Ratih Nur Esti Nur Esti Anggraini	Smart Processing of Organic Waste into Liquid Fertilizer: Automation, Sensor Validation, and System Performance Assessment  <b>Author :</b> Sukma Nur 'Aden; Ahmad Fauzan Adziimaa; Putri Y Aisyah

<b>No</b>	<b>Time Slot</b>	<b>Breakout room 1 Moderator : Rifqi Abdillah</b>	<b>Breakout room 2 Moderator : Farhanna Mar'i</b>	<b>Breakout room 3 Moderator : Ghea Sekar Palupi</b>
9	14.30 – 14.40	<p>Enhancing Practical Competency in Vocational Electronics Education: a User Experience and ISO 25010 Evaluation of a 3D Virtual Laboratory</p> <p><b>Author :</b> Mustofa Abi Hamid; Gunadi Gunadi; Affero Ismail; Dedi Setiawan; Irwanto Irwanto; Muhamad Afzamiman Bin Aripin; Syafrizal Arif Rahman; Muhammad Hakiki; Muhammad Nurtanto</p>	<p>Hybrid Encryption Algorithm Based on Feistel Network and Vigenère Cipher</p> <p><b>Author :</b> Estelito R Medallada, Jr; Jessie R. Paragas</p>	<p>Response of Solar Panel Module Under Partial Shading Using MPPT with P&amp;O Algorithm and Modified P&amp;O to Improve System Stability</p> <p><b>Author :</b> Aya Shofia Mufti; Sujito Sujito; Zainal Abidin; Muhammad Andhika Yudapratama; Abdullah Iskandar Syah; Moh. Zainul Falah</p>
10	14.40 – 14.50	<p>A Proposal of SQL Query Description Problem in SQL Programming Learning Assistant System</p>		<p>Energy Efficiency and Application Potential of Permanent Magnet Synchronous Generator (PMSG</p>

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
		<p><b>Author :</b> Ni Wayan Wardani; Nobuo Funabiki; Htoo Htoo Sandi Kyaw; Putu Sugiartawan; I Nyoman Agus Suarya Putra</p>		<p>12S8P) in Modern Generating Systems</p> <p><b>Author :</b> Muhammad Nurtanto; Priangga Pratama Putra Haryanto; Bayun Matsuany; Mustofa Abi Hamid; Rabiman Rabiman; Alias Masek</p>
11	14.50 – 15.00			<p>Adaptive Continuous-Anomaly Hybrid LSTM-Transformer for Sustainable Smart-Grid Load Energy Forecasting</p> <p><b>Author :</b> Stefanus Benhard; Satriadi Putra Santika; Yulyani Arifin</p>
15.00 - 15.30		BREAK		

No	Time Slot	Breakout room 1 Moderator : Rifqi Abdillah	Breakout room 2 Moderator : Farhanna Mar'i	Breakout room 3 Moderator : Ghea Sekar Palupi
12	15.30 – 15.40			<p data-bbox="1134 232 1501 370">Modeling the Impact of Photovoltaic Penetration on Load Curve Dynamics for Distribution Transformer Lifetime Estimation</p> <p data-bbox="1134 423 1517 710"><b>Author :</b> Rohmanita Duanaputri; Rahman Azis Prasajo; Khusnul Islamia; Bustani Wijaya; Muhammad Fahmi Hakim; Hanifiyah Darna Fidya Amaral; Galuh Prawestri Citra Handani; Harrij K; Rachmat Sutjipto; Rahma Nur Amalia</p>

## KEYNOTE SPEAKER 1



### **Prof. Ahmed Abu-Siada**

Full Professor and Head of Electrical Engineering Discipline  
Curtin University  
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#### **“Frequency Response Analysis for Power Transformer Condition Monitoring”**

Abstract - Power transformers are critical components in electrical grids, and their reliable operation is essential for uninterrupted power delivery. To prevent failures and minimise revenue loss, effective condition monitoring is crucial. Frequency Response Analysis (FRA) is a non-intrusive, high-precision comparison-based technique capable of detecting a range of transformer faults. However, current industry practice for measuring and interpreting FRA signatures remain a challenge due to the offline nature of the measurements and the absence of standardised interpretation codes.

This presentation will cover the following aspects:

The critical importance of reliable power transformer condition monitoring and advanced fault diagnostic techniques.

Current industry practices for assessing transformer mechanical integrity.

Limitations of existing measurement and methods and interpretation approaches.

Emerging research directions and future trends in transformer condition assessment.

## KEYNOTE SPEAKER 2



### **Prof. Wahyudi Hasbi**

Head of Satellite Technology Research Center, Aeronautics and Space Research Organization  
National Research and Innovation Board (BRIN)  
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### **“Green Space Systems: Small Satellite Innovation and Multi-Application Research for Intelligent and Sustainable Futures”**

Abstract - Indonesia’s advancements in small satellite technology demonstrate how compact, cost-efficient platforms can drive green innovation and intelligent systems to support sustainable development. Through missions such as LAPAN-A1, LAPAN-A2, and LAPAN-A3, and the development of next-generation platforms like NEO-1 and the Nusantara-Sat constellation, these systems have enabled applications ranging from maritime surveillance and environmental monitoring to precision agriculture, disaster mitigation, oil spill detection, and earth magnetic field studies.

This keynote will showcase Indonesia’s national satellite roadmap, the engineering and operational strategies driving these missions, and the academic-industry collaborations that enhance research capacity and talent development. Student-driven projects such as Surya Satellite-1, RIDU-sat 1, exemplify how education and innovation intersect to prepare the next generation of aerospace engineers and data scientists. Looking ahead, the session explores emerging frontiers in AI-enabled constellations, low-latency equatorial networks, and green payload technologies, positioning Indonesia as both a regional leader and global contributor to sustainable and intelligent space systems.

### **KEYNOTE SPEAKER 3**



#### **Prof. Lilik Anifah**

Professor of Electrical Engineering Department  
Universitas Negeri Surabaya  
Indonesia

#### **“Development of Artificial Intelligence and Image Processing in the Energy Sect”**

Technology has developed rapidly and is sometimes integrated with various scientific fields. One example is the implementation and development of AI and machine learning in the fields of energy and food security. The use of AI, machine learning, and deep learning in the energy sector helps understand and improve resource extraction, distribution, and energy consumption. Sometimes this use of AI also requires image processing, including preprocessing, morphology, and other processes. One example is determining energy efficiency when noise is present on the surface of a solar cell. To determine efficiency, modeling the relationship between noise on the solar cell surface, the noise area, and the variables involved is required. Furthermore, image processing is needed to determine each noise level, combined with the implementation of machine learning (using various methods) or deep learning. The results indicate that a hybrid process is needed to determine the energy efficiency of a solar cell when noise is present on the surface.

# Enhancing Practical Competency in Vocational Electronics Education: a User Experience and ISO 25010 Evaluation of a 3D Virtual Laboratory

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**Abstract** - Practical learning in vocational universities has many challenges, especially in providing hands-on practical experience. This chapter presents the development of a virtual laboratory for practicum in basic electronics courses and the feasibility level of the virtual laboratory according to ISO 25010 standards by considering four aspects: functional suitability, compatibility, usability, and performance efficiency. In addition, this chapter also describes the response of virtual laboratory users as part of the experience of implementing this virtual laboratory. This study used the R&D (Research and Development) method with a linear sequential model (waterfall model), which included four stages: analysis, design, code, and testing. There were 53 students from the Department of Electrical Engineering Vocational Education as respondents for usability testing and four experts for functional suitability testing. The results of this study showed that this Virtual Laboratory is a medium used for virtual practicum with 3D simulation features with graphic audio and visual effects resembling practicum tools and materials in real conditions (hands-on). This virtual laboratory meets ISO 25010 standards in terms of functional suitability, compatibility, usability, and performance efficiency, so that it can provide practical experience in basic electronics courses and enhance competence in these courses.

**Keyword** - virtual laboratory; basic electronics course; vocational higher education; waterfall model; ISO 25010; performance efficiency

# Energy Efficiency and Application Potential of Permanent Magnet Synchronous Generator (PMSG 12S8P) in Modern Generating Systems

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**Abstract** - The global shift toward renewable energy demands highly efficient generation systems, yet practical performance data for Permanent Magnet Synchronous Generators (PMSGs) under real-world load and speed variations remain scarce. This study investigates the electromagnetic performance of a 12S8P PMSG by integrating Finite Element Method (FEM) simulations with experimental validation to fill that gap. The objective is to optimize rotor and stator design for improved energy conversion efficiency and reduced cogging torque at low wind equivalent speeds. Methods include numerical modeling in MagNet Infolytica to predict flux distribution, back EMF constant, input and output power, torque, and efficiency across resistive loads (10-50  $\Omega$ ) and speeds (1,000-5,000 RPM), followed by laboratory tests under controlled loading to verify the simulation results. Key findings show near-linear increases in input and output power and torque with RPM, a peak efficiency of approximately 92 percent at 5,000 RPM under 10  $\Omega$  load, and a back EMF constant  $K_e$  of about 0.018 V/rpm. The 30  $\Omega$  configuration produces the highest torque (around 12.5 kW) and output power (around 10.5 kW) at maximum speed. This integrative approach confirms simulation accuracy, identifies optimal operating regions, and provides an evidence-based design framework for small to medium-scale wind-energy PMSG applications.

**Keyword** - Permanent Magnet Synchronous Generator; Finite Element Method; energy conversion efficiency; cogging torque; back EMF constant

# Integrating Skills Competency Assessment and Academic Performance for Career Pathway Mapping in Analytics and AI

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**Abstract** - The growing demand for professionals in artificial intelligence (AI) and data analytics has highlighted the persistent challenge of education-to-employment mismatches, particularly in the Philippines, where many graduates lack structured guidance to align their competencies with industry needs. To address this, the Philippine Skills Framework for Analytics and Artificial Intelligence (PSF-AAI) was introduced, though its integration into higher education career services remains limited. This study presents a data-driven career guidance platform that combines a PSF-AAI-aligned skills competency assessment with academic performance to generate personalized career recommendations. The system employs three main algorithms: a skills competency assessment that evaluates student proficiency across 33 items mapped to PSF-AAI domains, a career pathway mapping algorithm that computes readiness against role-specific requirements, and a job-matching algorithm that integrates Grade Point Average (GPA) with competency scores using a weighted scoring model. Results from 165 graduating students revealed that most participants demonstrated intermediate proficiency (46.06%), while fewer achieved advanced (29.70%) and expert (4.85%) levels. The integration of GPA ensured a holistic evaluation, producing realistic and actionable career recommendations. The system frequently recommended entry-level roles, such as Associate Data Analyst, while advanced roles like Machine Learning Engineer and Data Engineer were matched to a smaller pool of qualified students. The findings demonstrate that the platform effectively provides evidence-based career guidance, reduces job-skills mismatch, and supports targeted upskilling. Although currently limited to multiple-choice assessments and AI-related career pathways, the system establishes a scalable foundation for competency-based guidance in higher education, with potential for expansion to broader domains and assessment formats.

**Keyword** - Skills competency assessment, career recommendation, Philippine Skills Framework for Analytics and Artificial Intelligence (PSF-AAI), education-to-employment mismatch, data-driven platform, academic performance integration.

# Automated Identification and Quality Assessment of Philippine Banana Varieties Using Convolutional Neural Networks

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**Abstract** - This study developed a mobile application utilizing image processing and machine learning to enhance banana identification and quality assessment in the Philippines, a major global fruit exporter. The application aims to address the limitations of traditional, subjective inspection methods. The system employs an Android phone's camera to capture images, which are then processed to identify banana varieties (Saba, Lakatan, Baloy) and assess quality parameters. The machine learning model demonstrated promising results in variety identification, with average accuracies of 75.53% for Saba, 83.10% for Lakatan, and 66.10% for Baloy. However, quality assessment, specifically the classification of low-quality/reject and export quality bananas, showed moderate average accuracies (77.6% and 75.1%, respectively) but with greater performance variability. These findings suggest the potential of the developed application for real-time banana classification, while also highlighting the need for future work to improve the accuracy and robustness of the system, particularly in identifying certain varieties and consistently assessing quality.

**Keyword** - Machine Learning, Banana Variety Identification, Quality Assessment, Image Processing, Mobile Application, Philippines

# Digitized Document Tracking System Using QR Code Technology and Graphic Draw (GD) Integration

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**Abstract** – The Document Tracking System (DTS) for Eastern Visayas State University is designed to modernize and streamline document management. The existing manual process is slow, error-prone, and limits accessibility, causing delays and inefficiencies. The DTS integrates QR code technology for secure tracking, categorization, and real-time monitoring of documents. It consists of a web-based application and a mobile QR code and graphic draw functions. The web system, developed using HTML, CSS, Bootstrap, PHP, and MySQL, manages operations and databases. At the same time, the Android Studio–based mobile app enables users to scan QR codes for instant access to document status. The Graphic Draw (GD) function digitizes physical documents, improving classification, storage, and retrieval. This centralized platform enhances productivity, reduces paper-based errors, strengthens security, and promotes sustainability by minimizing paper usage and storage needs. Overall, the DTS is a secure, scalable solution that improves efficiency and can be adapted to other departments and institutions.

**Keywords** — Document Tracking, QR Code, Digital Transformation, Document Security, Graphics Draw (GD) function

# Design and Synthesis of a Four-Element Linear Antenna Array for Ku-Band Applications

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**Abstract** — Providing array elements for dynamic beamforming techniques in a phased array system can support the development of more adaptive wireless systems. This paper focuses on antenna synthesis by determining array configuration elements to evaluate beam-steering capabilities. Using a four-element rectangular patch microstrip antenna, this study achieves beam steering and sidelobe-level suppression through the grey wolf optimizer with Nelder-Mead simplex refinement (GWO-NM) algorithm's amplitude distribution. The results show effective main beam steering, with GWO-NM optimization significantly lowering sidelobe levels. However, grating lobes are present at an angle of  $30^\circ$ , which could pose interference risks. The mutual coupling indicators, S21, S31, and S41, remain consistently below  $-20$  dB. Future work should include phase shifter components to accurately measure radiation characteristics during beam steering.

**Keyword** — Antenna, Ku band, Microstrip, Synthesis

# Assessing Quality of Service (QoS) Through Attenuation Variations at Splitter Ports in an FTTH System

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**Abstract**—This research evaluates the effect of passive component losses, particularly interport variations in 1:8 splitters, on the optical power budget and quality of service (QoS) in a Gigabit Passive Optical Network (GPON)-based Fiber-to-the-Home (FTTH) network. Through power measurements from the optical line terminal (OLT) to the optical network terminal (ONT), it is found that the entire path remains within the limits of International Telecommunication Union (ITU-T) G.984 specifications, with sufficient power margin to maintain system performance. QoS probes over Wi-Fi demonstrated consistently low one-way delays (1.8 to 2.5 ms) and stable throughput (232 to 301 B / s) regardless of the additional optical attenuation from each port of the splitters. The results indicate that attenuation variations at splitter ports slightly affect throughput and packet delivery efficiency, while having minimal impact on delay. Maintaining low attenuation within the optical budget is therefore critical to ensuring stable QoS in GPON-FTTH networks. These findings also show that passive optical variations within reasonable limits do not significantly impact end-user experience and emphasize the importance of characterizing passive elements during initial installation to maintain network reliability and readiness for future expansion.

**Index Terms**—FTTH, GPON, Attenuation, Quality of Service (QoS)

# A Proposal of SQL Query Description Problem in SQL Programming Learning Assistant System

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**Abstract**—Nowadays, SQL (Structured Query Language) is widely taught in universities and professional schools world- wide. SQL is a powerful domain-specific language designed for managing and querying relational databases. Previously, we have developed the Programming Learning Assistant System (PLAS) to support self-study of popular programming languages by novice students. PLAS offers various exercises at different learning levels, including the Grammar-Concept Understanding Problem (GUP), the Comment Insertion Problem (CIP), and the SQL Syntax Description Problem (SSDP). In this paper, we introduce a new exercise called the SQL Query Description Problem (SDP) for studying basic SQL queries in database programming. An SDP instance consists of a series of questions and a database table, where each question requires a simple SQL query based on the table. Any student answer is checked through string matching with the correct one. For evaluations, we prepared 19 SDP instances on fundamental SQL queries, and assigned them to 32 undergraduate students at the Indonesian Institute of Business and Technology (INSTIKI) enrolled in the database programming course. Their solution results and System Usability Scale (SUS) scores from the usability questionnaire confirmed the effectiveness of the proposed approach.

**Keyword**—database programming, SQL query descrip- tion problem (SDP), self-study, programming learning assistant system (PLAS)

# Modeling the Impact of Photovoltaic Penetration on Load Curve Dynamics for Distribution Transformer Lifetime Estimation

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**Abstract** - The increasing adoption of rooftop solar photovoltaic (PV) systems has a significant impact on the performance and lifespan of distribution transformers. One of the main concerns is overloading, which causes a rise in transformer operating temperature, accelerating insulation degradation and reducing service life. This study aims to analyze the impact of rooftop solar PV penetration on the estimated lifetime of distribution transformers through load curve modeling and accelerated thermal aging analysis. The methodology uses actual current data from a 160 kVA transformer under various PV penetration levels (0%–100%). The load curves are converted into hotspot temperature profiles using IEC 60076-7, and Loss of Life (LOL) is calculated according to IEEE C57.91. Results show that under 20% PV penetration, LOL decreases from 0.00612% to 0.00510% per day, increasing the transformer lifespan from 45 to 53.6 years. However, higher PV penetration levels above 60% can lead to sharp load fluctuations that cause thermal cycling and reduce insulation reliability. This study demonstrates the potential of moderate PV integration to extend transformer life and provides a quantitative foundation for optimizing PV penetration in distribution networks.

**Keywords**— Distribution Transformer, Solar PV, Loading Curve, Lifetime, Hotspot Temperature, and Loss of Life

# An Intelligent Digital Resource Library of Eastern Visayas State University-Graduate School

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**Abstract**— A library plays a vital role in modern society, it provides information to scientific knowledge, such as results of research that influences the participation of users in scientific improvement. With technological advancement, traditional libraries are now adapting to become digital libraries. These digital libraries address the limitations of traditional libraries by providing efficient access to a growing collection of theses and dissertations. This study proposed the development of a web-based intelligent digital library system for the Eastern Visayas State University Graduate School and the integration of an intelligent recommender system to enhance user experience and discoverability. The technique used in this study is to integrate a keyword-based Vector Space Model which computes the least distance of vectors of a document, utilizing as well the use of cosine similarity index. In developing the software, the iterative model was adopted, which involves breaking down a project into multiple iterations or smaller cycles. Software tools such as VS Code, CSS, JavaScript and PHP were used. The datasets used in this study are from the corpus collected in the data gathering. A total of 84 combined thesis and dissertations was collected. Out of these, 67 academic papers were set as trained set and 17 were set as testing set. Further, the system also incorporated a copy protection technology to safeguard intellectual property. The output result is a system secured from unauthorized access and a useful resource for academic and creative professionals.

**Keywords**— Digital Library, Thesis/Dissertation Repository, Recommender System, Keyword-Based Search, Vector Space Model

# Development and Validation of Smart Multi-Parameter Anthropometric Device for Infant Growth Monitoring

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**Abstract**— Anthropometric measurements in newborns are essential for early detection of abnormal growth patterns, which are closely associated with infant morbidity and mortality, particularly in relation to gestational age. In Indonesia, the implementation of growth assessments for toddlers has not been optimally conducted due to limited healthcare infrastructure and inadequate measurement tools in primary healthcare centers (PUSKESMAS). To address this gap, a smart infant growth monitoring device has been developed, integrating advanced sensor technologies to support standardized anthropometric assessments. The system utilizes four sliding TF-Mini LiDAR sensors to measure body length and head circumference, a load cell for body weight measurement, and an MLX90614 infrared sensor for non-contact body temperature assessment. Mechanical components such as dual sliders and an adjustable mount for the temperature sensor have been incorporated to enhance accuracy and usability. The device was validated using calibrated commercial sensors to ensure measurement reliability and performance accuracy. Deployed at PUSKESMAS, the Smartbox-Multiple Measurement device enables automated measurement and recording of anthropometric data in alignment with WHO guidelines. It demonstrated high measurement accuracy with values of 99.08% for weight, 99.23% for body length, 99.60% for head circumference, and 99.56% for body temperature. Measurement data can be accessed through a web-based interface, allowing healthcare workers to comprehensively monitor infant growth and development. The scientific contribution of this study lies in the development of a novel anthropometric measurement device capable of delivering fast and precise assessments, thus enhancing the speed and accuracy of healthcare services in early childhood growth monitoring.

**Keywords**— Anthropometry, Baby, Measurement, Health

# Educational App for Traffic Sign Recognition Using Convolutional Neural Networks

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**Abstract**—Recognizing traffic signs is vital for the safety of both drivers and pedestrians navigating Philippine roads. Despite the implementation of traffic regulations, insufficient public education has led to significant knowledge gaps regarding these crucial indicators, consequently elevating the risk of road accidents. This research addresses this critical issue by presenting a user-friendly Android application designed to empower individuals with the ability to instantly identify unfamiliar traffic signs through the convenience of smartphone scanning. This application implements the power of deep learning algorithms, specifically convolutional neural networks (CNNs), to achieve accurate and rapid identification of road signs. The system's efficacy is rooted in a comprehensive dataset of traffic signs sourced directly from the Filipino Driver's Manual, published by the Land Transportation Office. To optimize the data for the CNN models, the collected images underwent a rigorous preprocessing stage utilizing OpenCV, involving grayscale conversion and precise cropping. The researchers employed Google Colab as the platform for training various state-of-the-art CNN models, including MobileNetV2, EfficientNet Lite, and ResNet50. This strategic selection of models aimed to evaluate different architectures for optimal performance in terms of accuracy and efficiency. The successful development and execution of the application yielded practical and positive results, demonstrating its potential as a valuable tool for enhancing road safety awareness and promoting a better understanding of traffic signs among the Filipino public. The findings of this study underscore the significant role that accessible technology can play in bridging educational gaps and fostering safer road environments.

**Keywords**— Traffic Sign Recognition, CNN, MobileNetV2, EfficientNet Lite, ResNet 50

# Prediction of Cognitive and Non-Cognitive Factors on Academic Achievement Using Elastic-Net

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**Abstract**—Student learning evaluations in the Department of Data Science at Universitas Negeri Surabaya (Unesa) have shown that student academic achievement results can be further improved. It is based on students' average scores on quiz courses, Midterm Exams, and Final Exams. To enhance students' future academic achievement, it is essential to assess their learning abilities by considering a range of cognitive and non-cognitive factors. Data collection was conducted among students in the Unesa Data Science Undergraduate Study Program, cohort 2022. The questionnaire was prepared using Google Forms to make it easier to create and fill out, as well as to process the data. The data were then processed using a Python program, and analysis was carried out using regression method i.e. Elastic Net. The results of the research show the factors that influence learning achievements are non-cognitive, such as the mother's educational background, the marital status of the biological parents, the time spent on social media and studying, past experiences with trauma and suicide attempts, knowledge of the data science major, monthly expenses, participation in competitions and research, and where students typically studied. The findings can be used to design further lecture activities that aim to overcome or mitigate factors negatively impacting academic achievement, for example reduce social media activities, focus on data science major, and often follow competition and research.

**Keywords**— learning ability, cognitive factors, non-cognitive factors, academic achievement, Elastic-Net

# Development of Cloud-Based Structured Query Language Injection (SQLi) Detection using Deep Learning and FastAPI

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**Abstract—** Abstract—Structured Query Language Injection (SQLi) attacks continue to pose a serious threat to web applications, especially those hosted in cloud-based environments. Traditional detection methods, such as signature-based and rule-based systems, often fail to detect obfuscated or evolving injection patterns. Despite the increasing use of deep learning techniques for SQLi detection, which are particularly effective in recognizing complex, obfuscated, and evolving SQL injection patterns. However, most studies remain limited to offline experiments without real-time system deployment. This research addresses that gap by developing and operationalizing a deep learning-based SQLi detection model integrated with FastAPI. The study aimed to design a classification model capable of distinguishing malicious from safe SQL queries using numerically encoded inputs. Following the Evolutionary Prototyping Model, the system was developed through data preprocessing, model training using TensorFlow-Keras, and deployment as an API. A total of 30,919 SQL queries were used, and the model achieved 97% training accuracy and 94.5% validation accuracy, supported by strong precision, recall, and F1-scores above 93%. Findings confirm the model's high reliability and real-time responsiveness, with an average detection response under 50 milliseconds. The research demonstrates that integrating deep learning with lightweight API frameworks can result in a scalable and accurate solution suitable for web security systems. These results suggest practical implications for deploying intelligent cybersecurity tools in real-world cloud applications.

**Keywords—** Cloud Computing, Cybersecurity, Deep Learning, FastAPI, SQL Injection Detection, Threat Mitigation, Web Security

# ML-Classify: A Dual-Classification Approach for Learning Material Categorization

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**Abstract**—The increasing volume and complexity of digital learning materials have challenged traditional manual classification methods, highlighting the need for scalable and efficient automated solutions. This study introduces ML-Classify, a dual-classification system categorizing educational materials by topic and difficulty. Leveraging natural language processing and machine learning techniques, the system integrates a fine-tuned DistilBERT model for topic classification and a pipeline combining SentenceTransformer embeddings with a Multilayer Perceptron (MLP) for difficulty prediction. The models were trained and evaluated using a balanced dataset of PDF materials sourced from Open Educational Resources (OERs), achieving 95% accuracy for topic classification and 61% for difficulty classification. Deployed via Hugging Face Spaces and integrated into a FastAPI-powered web interface, the system supports real-time, page-level inference. Results demonstrated high topic classification precision and moderate success in difficulty prediction, particularly distinguishing easy and hard texts. Future work includes expanding datasets, incorporating human-annotated labels, and refining linguistic features to enhance performance and usability. This research emphasizes the potential of dual-label machine learning systems in improving content accessibility, personalization, and instructional design in educational environments.

**Keywords**—Machine Learning, Learning Material Classification, Topic Modeling, Difficulty Prediction, Educational Technology

# Response of Solar Panel Module Under Partial Shading Using MPPT with P&O Algorithm and Modified P&O to Improve System Stability

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**Abstract**— This discussion aims to analyze and evaluate the performance of the MPPT algorithm, especially the P&O and MP&O algorithms, in optimizing the PV power output from five partial shadow scenarios. By modifying the P&O algorithm by adding adaptive parameters such as delta D and the X factor to accelerate the system response and reduce power ripple during steady-state conditions. From the results of the simulation test, the first is without shadow with PV module irradiation of 1000 W/m<sup>2</sup>, the second is shadow condition with irradiation of 900 and 800 W/m<sup>2</sup>, the third is shadow condition with irradiation of 1000 and 500 W/m<sup>2</sup>, the fourth is shadow condition with irradiation of 750 and 250 W/m<sup>2</sup>, and the fifth is shadow with irradiation of 500 and 100 W/m<sup>2</sup>. The test was carried out with two PV modules arranged in series, showing that MP&O has a faster settling time and high- power efficiency compared to P&O and produces a smaller ripple value. So that the resulting power output can approach the maximum point more stably. The analysis also includes the calculation of power efficiency, peak power, minimum value, and identifying MPP by observing the PV characteristic curve (voltage- current and power-voltage). Based on the test results, it was found that the MP&O algorithm provides an effective solution to overcome power oscillation and response delay in MPP tracking, especially in shaded conditions.

**Keywords**— Array PV, MP&O, Stability, Respon

# Hypersensifit: A Mobile-based Application for Hypertension Prediction and Diet Plans using K-Nearest Neighbor Algorithm

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**Abstract**— The rapid advancement of digital tools and applications has accelerated the growth of health information technology, which plays a vital role in addressing global health challenges. In the Philippines, hypertension remains one of the leading causes of death, highlighting the need for accessible and innovative solutions to support prevention and management. This study aimed to develop HyperSensiFit, a mobile application designed to predict the risk of hypertension and provide dietary guidance. The application collects and analyzes key health indicators, including age, blood pressure, cholesterol, and other medical attributes. To build its predictive model, the dataset was preprocessed through training, balancing, and the removal of null values to enhance accuracy. The prediction model employs the K-Nearest Neighbor (KNN) algorithm, a simple yet effective classification method widely used in medical predictions. Through experimentation, the optimal K-value was determined to be 13 using the elbow method, achieving an accuracy rate of 85.76% with a balanced trade-off between accuracy and recall. Findings demonstrate that HyperSensiFit offers a reliable tool for assessing hypertension risk. The application has the potential to assist both patients and healthcare professionals by supporting early intervention, guiding lifestyle adjustments, and improving the overall management of hypertension.

**Keywords**— machine learning, mobile application, prediction, algorithm, hypertension, data mining

# Design a Fractional-Order Tilt Integral Controller for Congestion Control in TCP/AQM Network

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**Abstract**— The rising demand for efficient data flow and traffic management has become an increasingly important issue. To ensure a best Quality of Service (QoS) like no loss in packets sent and without noticeable delay, an advanced resource management approach is required. Active Queue Management (AQM) has emerged as a practical technique for monitoring network queues during data transmission while preventing congestion. In this paper, a novel Fractional Order Tilt Integral (FOTI $\lambda$ ) controller, it is an enhanced controller which is improve system response using fractional calculus is introduced to develop a robust AQM method, enhanced by the Intelligent Gorilla Troops Optimization (GTO) algorithm to refine system performance. To evaluate its effectiveness, the proposed controller (FOTI $\lambda$ ) is compared with conventional controllers which reflect its superiority in reaching a stable response in fast settling time and a small overshoot value. Numerical simulations of the TCP/AQM system are conducted using MATLAB, with results showing optimal robustness in adapting to session number variations ( $\pm 20\%$ ) and queue size fluctuations over time. the simulation results emphasis controller robustness when changing parameters of AQM model and gaining a stable desired response.

**Keywords**— traffic flow. Congestion control. Active Queue Management (AQM). Fractional order. Gorilla Troops Optimization.

# Development of a Web-Based Adaptive Virtual Learning System to Strengthen Programming Self-Efficacy in the Mechatronics Course for Vocational Students

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**Abstract**—The low self-efficacy of vocational students in programming within the mechatronics course hinders competency achievement. Therefore, an adaptive learning solution is needed to personalize materials according to individual needs. This study aims to develop a web-based adaptive learning system to enhance the programming self- efficacy of vocational students in the mechatronics course. This study employs a Research and Development (R&D) approach, utilizing the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). Expert validation involved media, content, and programming specialists, while trials were conducted on vocational students enrolled in the mechatronics course. The results of this study indicate that the developed system can be easily used by students for mechatronics programming, with difficulty levels tailored to users' abilities. The system also provides features such as instant feedback, discussion, progress tracking, and interactive exercises. Effectiveness testing shows a significant increase in programming self- efficacy and positive student responses (89% satisfaction). It can be concluded that the web-based adaptive learning system is proven effective in strengthening vocational students' programming self-efficacy, supporting self-directed learning, and can be integrated into the mechatronics curriculum.

**Keywords**—adaptive

programming; mechatronics; vocational education; web-based learning

# Smart Processing of Organic Waste into Liquid Fertilizer: Automation, Sensor Validation and System Performance Assessment

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**Abstract**—Organic waste accounts for 57.25% of total solid waste in East Surabaya, posing both an environmental challenge and an opportunity for resource recovery. This research addresses the problem by developing an automated system for processing organic waste into Liquid Organic Fertilizer (LOF), ensuring consistent quality and efficiency. The proposed solution involves the design of an instrumentation system for an LOF production plant, comprising raw material chopping, bioactivator mixing, and fermentation. Sensor validation and hardware testing were conducted to verify system reliability. Results showed that the pH sensor achieved 97.76% accuracy and the DS18B20 temperature sensor achieved 99.12% accuracy. Temperature control at 35°C, combined with higher bioactivator concentrations, accelerated fermentation and improved microbial activity. The system also integrates a Graphical User Interface (GUI) to support real-time data monitoring locally and remotely. The system has potential applications in standardizing LOF production for small to medium-scale agricultural operations.

**Keywords**— Organic Fertilizer, Chopper, Bioactivator, Fermentation, Graphical User Interface.

# Empowering Sustainable Education Through Competency Pattern Mining in Instructional Website Design

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**Abstract**— This study explores student competency patterns in instructional website design to support sustainable educational practices. Employing a mixed-methods approach, data were gathered from 98 undergraduate students enrolled in educational technology courses at a university in Indonesia. Competencies were evaluated through Likert-scale questionnaires addressing pedagogical, technological, managerial, and ethical aspects, supplemented by open-ended reflective questions. Hierarchical clustering analysis revealed three distinct competency groups: low, moderate, and high. Additionally, students' reflective writings were assessed based on their relevance, completeness, and elaboration. Findings demonstrated that students in the high-competency group produced richer and more thoughtful reflections compared to their peers. However, correlational analyses indicated only a weak relationship between self-perceived competencies and reflective skills. These results suggest varying levels of readiness among students. Lecturers are therefore encouraged to tailor instructional strategies accordingly, while institutions can leverage these insights to design targeted student development programs. Overall, the study offers essential groundwork for fostering adaptive, data-informed, and sustainable education practices.

**Keywords**—competency pattern mining, educational technology, hierarchical clustering, instructional website design, student competency analysis.

# Impact of Optimizer and Learning Rate on U-Net for IHC Breast Cancer Image Segmentation

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**Abstract**—Advances in machine learning and digital pathology have enhanced automated cancer diagnostic tools, but accurately extracting molecular-level information from histopathological images remains challenging. Immunohistochemistry (IHC) imaging is critical for detecting biomarkers like Ki-67, important in breast cancer diagnosis and prognosis. To support this, a large dataset of 500 IHC images labeled with validated Ki-67 expressions was curated to facilitate segmentation and visual analysis tasks. Using U-Net architecture, semantic segmentation of breast cancer regions was performed. The impact of various training hyperparameters was evaluated by comparing three optimization algorithms ADAM, SGD, and RMSProp alongside learning rates of 0.1, 0.01, and 0.001. The 0.001 learning rate with ADAM optimizer produced the optimal performance, attaining an IoU of 0.85, Recall is 0.84, 0.81 for Precision and for F1-Score, accuracy is 0.99. The segmentation results exhibited a high degree of alignment with the ground truth annotations, confirming the model's efficiency in medical image segmentation. These findings underscore the necessity of hyperparameter optimization to enhance deep learning model performance in medical imaging applications.

**Keywords**—Breast Cancer, IoU, Learning Rate, Optimizer, U-Net

# BERT-based Transfer Learning for Two-Class Sentiment Detection in Indonesian X apps Comments

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**Abstract**—This study develops a binary sentiment detection framework for Indonesian slang-rich X (Twitter) comments using BERT-based transfer learning. The informal nature of Indonesian digital discourse, characterized by context-dependent slang (e.g., “santuy” [chill] masking sarcasm or “jayus” [failed humor] implying negativity), challenges conventional sentiment analysis tools. The proposed method fine-tunes the pre-trained “indobert-base-uncased” model on a heterogeneous dataset of Indonesian X comments covering three topics: East Java governor performance, cellular service providers, and movie reviews. Preprocessing includes slang normalization via a custom dictionary, stopword removal (combining NLTK and Sastrawi), and Sastrawi-based stemming. The model achieved 90% validation accuracy and 91% test accuracy, with word clouds identifying key sentiment indicators like “mantap” (positive) and “lebay” (negative). Contextual analysis revealed BERT’s capacity to disambiguate slang, such as distinguishing sarcastic versus genuine uses of “woles” (relaxed). The results underscore transfer learning’s efficacy in adapting global NLP architectures to low-resource languages like Indonesian, where slang dominates digital communication. This work provides a scalable solution for real-time sentiment monitoring without manual lexicon updates, addressing the limitations of rule-based approaches. It highlights BERT’s potential to navigate linguistic fluidity in socio-culturally dynamic environments, offering actionable insights for businesses and researchers aiming to decode public sentiment in Indonesia’s evolving social media landscape.

**Index Terms**—NLTK, Sentiment analysis, Transformers, BERT, Indonesian.

# Hybrid Encryption Algorithm Based on Feistel Network and Vigenère Cipher

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**Abstract** — This paper introduces a hybrid encryption algorithm that addresses the predictable key patterns, limited character support, and low diffusion inherent in the classical Vigenère cipher. To overcome these issues, an Extended Vigenère cipher (mod 256) is embedded as the round function within a 16-round Feistel network. The design operates on 128-bit plaintext blocks using a 128-bit master key and incorporates a layered permutation stage using constants derived from Euler's number ( $e$ ) and a novel key scheduling mechanism based on pi ( $\pi$ ) to enhance confusion and diffusion. Security was evaluated using avalanche effect measurements and selected NIST statistical tests. The hybrid algorithm achieved an average avalanche effect of 52.41%, significantly outperforming the Extended Vigenère cipher baseline (1.45%), and passed all applied randomness tests. The algorithm is well-suited for lightweight cryptographic applications such as IoT, with future work planned to assess runtime efficiency and resource usage.

**Keywords**—cybersecurity, Vigenère cipher, Feistel network, permutation techniques, key scheduling, avalanche effect, cryptography

# Machine Learning-Based Time Series Forecasting of Cauayan City Water Consumption

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**Abstract** — Amid rapid urbanization and rising water demand, this study addresses the urgent need for predictive and data-driven water resource management in Cauayan City, Philippines. Leveraging monthly consumption data from 2016 to 2021, four machine learning models: Feedforward Neural Network, FB Prophet, Long Short-Term Memory (LSTM), and Transformer were implemented to forecast urban water usage. Each model was trained and evaluated for its capacity to capture temporal dynamics and seasonal trends. Among the models, LSTM achieved the lowest prediction error with a MAPE of 6.94%, corresponding to a relative forecasting accuracy of 97.85%, effectively modeling both short-term variability and long-term patterns. The Transformer and FB Prophet models followed with accuracies of 95.12% and 93.28%, respectively, while the Feedforward Neural Network yielded 91.37%. This multi-model framework offers municipal planners a tool for informed decision-making and sustainable water management. The study's methodology and findings serve as a scalable reference for other urban centers facing similar infrastructure and forecasting challenges. Future work should consider incorporating exogenous variables, model ensembling, and real-time deployment to enhance predictive performance and policy relevance.

**Keywords:** Time Series Forecasting, Water Consumption, Neural Network, Machine Learning, Data mining.

# Interactive HMI Visualization for a Real-Time Flow Control System Using Variable Speed Drive and Electromagnetic Flowmeter with HART-Based Calibration

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**Abstract**— Current industrial flow control systems face challenges in achieving both high precision and fast response. This research presents the development of an interactive human machine interface (HMI) for a real-time flow rate monitoring and control system. The system integrates an electromagnetic flowmeter and a variable speed drive (VSD) to adjust the pump speed based on input. The electromagnetic flowmeter, which has been calibrated using a HART communicator, ensured measurement reliability and showed high measurement accuracy of 97.5% in measuring the system flow rate. The pump responded linearly to frequency inputs ranging from 0 to 50 Hz and successfully controlled flow rates in the range of 18 - 108 L/min. Real-time data on flow rate and motor frequency are effectively visualized through the HMI, allowing for precise manual adjustments. In addition, the HMI can store historical data and display trend visualization. This recorded data can be used to analyze system performance and identify potential errors.

**Keywords**—Flow rate control, human machine interface (HMI), electromagnetic flowmeter, variable speed drive, HART Communication.

# Intelligent Battery Health Monitoring System for Optimizing Uninterruptible Power Supply

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**Abstract**— Sudden power outages can damage electronic devices and disrupt operations. To mitigate this, an Uninterruptible Power Supply (UPS) system is commonly used to provide backup power. However, the health and performance of the UPS battery can degrade without proper monitoring and control. This study presents the development of an intelligent battery health monitoring system integrated with the Internet of Things (IoT) to optimize UPS performance. The system monitors real-time battery parameters including voltage, current, temperature, State of Charge (SoC), and State of Health (SoH), while also performing automatic control during charging and discharging processes. SoC estimation is conducted using a combination of Open Circuit Voltage (OCV) and Coulomb Counting methods. The system is built using INA219 current sensors, a DS18B20 temperature sensor, an Arduino Uno, and ESP32 for wireless data transmission to a smartphone application. Data is also stored in Firebase for remote access and record-keeping. Experimental results show the system functions effectively with sensor accuracies above 97%. The battery, rated at 7.5 Ah, sustained a 5 W load for 23 hours and 30 minutes from 90% to 20% SoC, and required 2 hours and 47 minutes to recharge from 35.84% to 90% SoC. The calculated SoH of 95% indicates that the battery remains in excellent condition, ensuring UPS reliability and efficiency.

**Keywords**— Battery Health Monitoring, Uninterruptible Power Supply (UPS), Internet of Things (IoT), State of Charge (SoC), State of Health (SoH).

# EffNet-RAM: Enhancing Feature Discriminability with Hybrid CNN-Based Channel-Aware Residual Attention Modules for Fine-Grained Mangrove Species Classification

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**Abstract**— Accurate mangrove species classification is essential for biodiversity monitoring and coastal ecosystem conservation; however, it remains challenging due to the high morphological similarities between species. This study proposed EffNet-RAM, a novel architecture that enhances EfficientNet-B0 by integrating Residual Attention Modules (RAM) into its deeper convolutional layers. Each RAM block combines residual skip connections and Squeeze-and-Excitation attention to improve gradient flow, convergence, and class-discriminative feature learning. The model was trained on an augmented ground-truth mangrove image dataset consisting of three species. Experimental results showed that EffNet-RAM achieved superior performance, with an accuracy (Acc) of 98.89% and a silhouette score (SS) of 0.712, outperforming other residual-based models such as ResNet-50 (Acc: 93.61%, SS: 0.544), MobileNetV2 (Acc: 90.28%, SS: 0.486), and DenseNet-121 (Acc: 95.56%, SS: 0.602). Additionally, EffNet-RAM also outperformed other attention-based models with ViT-Small (Acc: 89.20%), Swin-Tiny (Acc: 90.85%), and EfficientNet-CBAM (Acc: 95.11%). The proposed method offers an efficient and scalable solution for fine-grained ecological image classification and environmental monitoring tasks.

**Keywords**— deep learning, EfficientNet-B0, feature extraction, mangrove species classification, residual connections

# Forecasting Stock Prices with Sequential Deep Learning: A Long Short-Term Memory Approach

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**Abstract**—Investors often face significant challenges in predicting fluctuating stock price movements, which can lead to uncertainty and suboptimal investment decisions. This study aims to evaluate the performance of the Long Short-Term Memory (LSTM) deep learning model in forecasting stock prices. The dataset utilized is derived from the Pakistan Stock Exchange (KSE 100), and the model's performance is assessed using evaluation metrics including Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE). The experimental results demonstrate that the LSTM model achieves strong predictive performance, with the lowest recorded MSE of 0.0004, RMSE of 0.0210, MAE of 0.0141, and MAPE of 0.0209, corresponding to an accuracy rate of 97.91%. These findings highlight the effectiveness of the LSTM model in stock price prediction and provide valuable insights for investors seeking to enhance decision-making through data-driven forecasting approaches.

**Index Terms**—deep learning, forecasting, stock prices, sequential, long short-term memory

# Earthquake Magnitude Prediction : Comparative Study of Machine Learning and Deep Learning Methods

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**Abstract**—Earthquakes are natural disasters that cause significant damage to infrastructure and pose serious risks to human life, particularly in seismically active regions such as Indonesia. Accurate earthquake magnitude prediction is therefore an important component of early warning and disaster mitigation systems. This study investigates the use of machine learning and deep learning approaches for predicting earthquake magnitudes based on Indonesian earthquake data from 2000 to 2025, comprising 59,571 recorded events. Two experimental scenarios were explored: models trained with all available features and models trained on reduced-dimensional data using Principal Component Analysis (PCA). The evaluated methods include Backpropagation, Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), Feedforward Neural Networks (FNN), Extreme Gradient Boosting (XGBoost), and hybrid combinations such as FNN + XGBoost. Model performance was assessed using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE), and R<sup>2</sup>. Results show that boosting-based approaches, particularly XGBoost and FNN + XGBoost, consistently delivered the best performance, achieving the lowest MAE (0.1426) and highest R<sup>2</sup> (0.7534) when using the full feature set. PCA-based models exhibited a modest accuracy decline of around 8–10% but offered substantial computational gains, with reduced training time and memory usage. These findings highlight a trade-off between predictive accuracy and efficiency, suggesting that feature-rich models are more suitable for high-precision seismic risk analysis, while PCA-reduced models are more practical for real-time operational deployment in earthquake early warning systems.

**Keywords**—Machine Learning, Deep Learning, Earthquake, Prediction

# Adaptive Continuous-Anomaly Hybrid LSTM–Transformer for Sustainable Smart-Grid Load Energy Forecasting

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**Abstract**—As global energy demand continues to rise, accurate forecasting and anomaly detection becomes priority to support United Nations Sustainable Development Goals especially SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities) and, SDG 13 (Climate Action). Accurate prediction and identification of anomaly are essential for optimizing energy usage, ensuring stability of modern power system and reducing unnecessary energy usage that can impact environment in long term. This study proposes a novel anomaly-aware forecasting framework that integrates a hybrid LSTM-Transformer autoencoder for anomaly detection and incorporates anomaly information directly into the forecasting model. Two anomaly representations are assessed: (1) traditional binary anomaly indicators and (2) a continuous anomaly feature derived from Reconstruction Error (RE). Experimental analysis clarified that binary anomaly inputs not only fail to improve forecasting, but slightly degrade predictive accuracy MSE 0.00210, MAE 0.02611 and R2 0.930, indicate that categorical anomaly signals possibly add noise rather than meaningful information. In addition, the proposed RE feature consistently enhances model performance, achieving lower errors and highly explained variance MSE 0.00201, MAE 0.02230 and R2 0.933. Statistical significance using the Wilcoxon signed-rank test with p-value = 0.000 confirms that these differences are not due to random chance. In conclusion, this research proves that integrate continuous anomaly value into forecasting pipelines provides benefits than binary anomaly indicators, which lead to more accurate prediction, and adaptation for short-term energy forecasting in smart grid environments.

**Keywords**—Energy Reconstruction Error, Transformer, Smart Grid, Feature Engineering.

# An Implementation of Integrated Introductory Problems for Cross-Platform Flutter Programming Self-Studies

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**Abstract**—Nowadays, Flutter with Dart programming language has increased popularity as a cross-platform framework that can simplify mobile application development. Due to curriculum limitations in universities, an efficient tool for its self-study is essential to cultivate Flutter/Dart engineers. Previously, we have developed Flutter Programming Learning Assistant System (FPLAS) to meet this demand by offering two types of exercise problems where any answer is marked automatically. However, it was found that students can solve these problems without understanding important features or concepts of Flutter/Dart as a latest cross-platform environment for developing user interfaces, if they have knowledge of Java or JavaScript. This can be a serious defect as a self-study tool for comprehensive study of Flutter/Dart with the goal of freely writing programs. In this paper, we implement an introductory problem for starting Flutter/Dart programming study that integrates a guide document, a set of Grammar- Concept Understanding Problem (GUP) and Element Fill-in- Blank Problem (EFP) questions, and an interface screenshot to study one concept into one problem instance. This problem is called Introductory Problem (INT) for convenience. For evaluations, we generated 16 INT instances for basic topics and assigned them to 23 master students at Okayama University, Japan, who had no prior experience on Flutter/Dart. Their solution results were very high, but the usability results by the System Usability Scale (SUS) analysis were moderate, suggesting some rooms for further improvements.

**Index Terms**—Flutter, Dart, cross-platform, introductory problem, FPLAS

# A Study of Slide Annotation Generating System from Online Presentations

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**Abstract**—Nowadays, online presentations and meetings have been common with advancements of information communication technologies. People often attend a lot of meetings without moving to the venues. As a result, it becomes hard for them to keep concentrations to fully understand them and catch the points from vocal explanations by presenters. In this paper, we study a system that automatically generates annotations at slide pages from the recorded video in an online presentation. It integrates audio-to-text conversion, LLMs for keyword extraction, and optical character recognition (OCR). It proposes a new method for direct annotation-to-slide alignment, by producing annotations that relate keywords from spoken text to specific slide contents through semantic similarity and their corresponding bounding box coordinates. For preliminary evaluations, we conducted a controlled test using a single presentation video. The proposal successfully generated coherent annotations with relevant keyword extraction. However, the annotations-slide text alignments received subpar performance, and the video processing stage consumed approximately 83.6% of the total execution time of 712 seconds.

**Index Terms**—slide annotation, LLMs, online presentation, audio-to-text conversion, keyword extraction, OCR, semantic similarity

# An Introduction of Test Code-Based Approach in Algorithms and Data Structures Course with Java Programming

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**Abstract**—Nowadays, Java remains a fundamental programming language in computer science educations including Algorithms and Data Structures course that emphasizes programming logic and problem-solving. Current assignments in this course cause challenges to both teachers and students. Manual grading of answer codes is time-consuming for teachers, and can be prone to human errors and inconsistent. Code writing by students tend to use inconsistent identifier names and incorrect code structures due to a lack of implementation specifications, which adds further difficulties in grading. Previously, we have developed a web-based Java Programming Learning Assistant System (JPLAS). In JPLAS, Code Writing Problem (CWP) allows students to write codes that are automatically verified using JUnit-based test codes. Test codes can give implementation specifications. In this paper, we introduce a test code-based approach into Algorithms and Data Structures course with Java in the Information Technology Department at the State Polytechnic of Malang, Indonesia. To avoid implementations of different algorithms for sorting, intermediate states of variables are also tested. For evaluations, we created 12 assignments covering key topics and assigned them to 35 first-year students. The results show that it significantly reduced workloads of teachers and offered implementation guidance to students.

**Index Terms**—Java, JPLAS, algorithms and data structures, test code, JUnit, grading.

# A Proposal of Performance Enhancement of SEMAR IoT Server Platform Using Kubernetes

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**Abstract**—Currently, we are developing SEMAR server platform for fast deployments of IoT application systems. However, when many requests simultaneously arrive to SEMAR, it can experience significant performance degradations. Kubernetes is an open-source container orchestration platform designed to manage distributed applications with the essential feature called Horizontal Pod Autoscaler (HPA). It enables dynamical resource adjustment based on resource utilization metrics. In this paper, we propose a performance enhancement of SEMAR using Kubernetes by allowing dynamical scaling pods during load surges and accelerating the recovery time of affected pods. To monitor resource metrics, we use JMeter for traffic loads and Prometheus and Grafana for RAM and CPU usage, as well as processing time in handling requests. In addition, pod downtime and recovery time are measured. The experiment results of the proposal confirmed improved performances with reliable recoveries from failures or disruptions.

**Index Terms**—Kubernetes, high availability, Horizontal Pod Autoscale, IoT application systems, server, resource monitoring

# Software Defined Radio-Based Approach for Decoding The LoRa Signals in IoT Application

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**Abstract**— Long Range (LoRa) technology is widely used in IoT applications due to its long-range coverage and low power consumption. However, conventional LoRa setups limit data access to direct serial interfaces or LoRaWAN gateways, restricting external monitoring and analysis. Additionally, the lack of payload encryption in LoRa transmissions raises security concerns, making the system vulnerable to eavesdropping and unauthorized access. This research presents the development and evaluation of a LoRa signal decoding system using Software Defined Radio (SDR), specifically RTL-SDR and GNU Radio, to capture and analyze LoRa transmissions without relying on conventional LoRa infrastructure. The system was tested in an outdoor Line of Sight (LoS) environment with distances ranging from 1 to 50 meters. Key performance metrics include decode percentage, signal power intensity, and RSSI. The results show optimal decoding performance at close to medium distances to the LoRa transmitter, with the highest complete decode rate at 30 meters of 3.9%, and the highest amount of complete decodes at 10 meters of 22 data. The signal power intensity decreased from -11.2 dB to -55.7 dB, and the RSSI decreased from -45 dBm to -63 dBm as the distance increased. These findings confirm that decoding performance is affected by transmission range and signal quality. The proposed system demonstrates the feasibility of using SDRs for real-time LoRa signal decoding and offers a flexible and low-cost platform for IoT communication analysis.

**Keywords**—LoRa, Software Defined Radio (SDR), RTL-SDR, IoT, Signal Decoding.

# TinyML-Based Object Detection on Smart Blind Stick for Visually Impaired Person

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**Abstract**—In our daily life, we often find people with certain disabilities or certain physical limitations, such as visually impaired people. People with visual impairment often require assistance from others to perform daily activities. We have seen people with visual impairment using walking sticks to help them walk on the street or pedestrian. With the development of technologies, many studies have been conducted to create disability aids or assistive technology for people with disabilities, especially smart blind sticks with function to detect objects in front of people with limited vision, where the smart blind stick is equipped with a sensor to detect the presence of an obstacle in front of them. However, these aids are still limited to detect the presence of an object by identifying the type of the object. In this study, a smart blind stick system was created by implementing artificial intelligence to detect objects in front of people with visual impairment, where this system applies Tiny-ML that can be implemented on edge devices such as microcontrollers. In the results of this study, the system works well to recognize objects such as cars, motorcycles, road separators, and tactile guides in front of people with visual impairment by an F1 score of 78.1 percent. This object detection also gives a good result from hardware implementation with inferencing time 1368ms, 119.4K peak ram usage, and 90.2K flash usage.

**Index Terms**—disabilities, visual impairment, artificial intelligence, Tiny-ML, edge device

# Implementing Optuna and Ensemble Learning on Boosting Models for Credit Default Risk Prediction

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**Abstract**—Credit card default risk prediction is becoming increasingly important in the financial industry to minimize losses and improve risk management. This study proposes the development of a credit card default risk prediction model by implementing hyperparameter tuning using Optuna and applying ensemble learning to boosting algorithms such as XGBoost, LightGBM, and CatBoost. The research stages begin with data preprocessing, which includes removing irrelevant features, handling missing data, outlier processing, encoding categorical features, creating new features, splitting data, balancing classes, and selecting features. The hyperparameter tuning process is carried out using manual search and Optuna, followed by the application of ensemble learning using stacking and voting methods to improve model performance. The results show that the ensemble model with voting using a combination of XGBoost, CatBoost, and LightGBM optimized with Optuna gives the best results with an AUC of 0.9763. After retraining with new data, model performance increased significantly, with an AUC reaching 0.9933. The resulting model is able to predict credit card default risk with high accuracy and can be used for continuous prediction of new data.

**Keywords**— Credit default, machine learning, boosting, ensemble learning, optuna.

# Machine Learning Approach for Sentiment and Topic Analysis on Social Media X: Case Study of Corruption Handling by the East Java Government

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**Abstract**— Corruption in Indonesia, especially at the East Java provincial government level, is a critical issue that is eroding bureaucratic integrity and public trust. Based on the 2024 Corruption Perception Index (CPI), Indonesia's score (37/100) which lags behind other ASEAN countries reflects the urgency of more serious handling, including at the regional level. This study analyzes public perception of corruption cases in the East Java Provincial Government by utilizing public opinion data on the X platform. Using the Natural Language Processing (NLP) approach, two main methods are applied: (1) BERT model-based sentiment analysis to classify opinions into positive, negative, and neutral, and (2) LDA (Latent Dirichlet Allocation) topic modeling to identify dominant themes related to corruption in East Java. The integration of these two methods is a novelty in the study to present a holistic analysis that combines public emotional attitudes with substantive issues in the spotlight. The results of the study show the dominance of negative public sentiment towards the anti-corruption performance of local governments, with main topics such as procurement of goods/services, budget transparency, and law enforcement. These findings are expected to be the basis for data-based policy recommendations for the East Java Provincial Government to strengthen accountability and encourage active community participation in supervision. This study also emphasizes the role of social media as an effective governance monitoring tool in the digital era.

**Keywords**—BERT Analysis Sentiment, LDA Topic Modeling, Corruption, X, East Java

# Exploring Ensemble Classifiers and Filter-Based Feature Selection for Predicting On-Time Graduation Using Multidimensional Student Data

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**Abstract**—Timely graduation is a key performance indicator in higher education and a critical goal for students, institutions, and policymakers. This study investigates the effectiveness of various machine learning algorithms in predicting students' graduation timeliness using multidimensional data, which includes both academic and non-academic attributes. A comparative analysis was conducted using classification models, including Random Forest, XGBoost, LightGBM, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Naive Bayes, Logistic Regression, and ensemble methods such as Bagging, Voting, and Stacking. To handle class imbalance and enhance model robustness, class weighting, SMOTE (Synthetic Minority Oversampling Technique), and hyperparameter tuning were applied. The experimental results show that LightGBM consistently outperformed all other models, achieving the highest test accuracy (0.72), ROC AUC (0.71), and macro-average F1-score (0.64). This indicates LightGBM's ability to effectively balance precision and recall for both the on-time graduation and not on-time graduation classes. Other ensemble methods, such as Random Forest and Stacked Models, also demonstrated competitive results. In contrast, traditional models like Naive Bayes and Logistic Regression underperformed, particularly in identifying students at risk of delayed graduation. These findings confirm the potential of LightGBM as a reliable model for predicting graduation outcomes and highlight the importance of integrating both academic and socioeconomic factors in educational data analytics.

**Keywords**—Timely Graduation Prediction, LightGBM, Ensemble Learning, Educational Data Mining, Academic and Socioeconomic Features

# Analyzing Student Self-Development Pattern through Sensor-based Attendance in HyLab Activity

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**Abstract**—This study investigates student learning behaviors in an online environment by analyzing temporal metrics derived from Learning Management System (LMS) logs and camera-based attendance systems. Three primary time features, frequency of activity ( $f$ ), duration of activity ( $D$ ), and gap to deadline ( $G$ ) were used to cluster students and map their behaviors to affective domain levels which reflect a learner's ability to regulate behavior, set personal goals, and engage in continuous, self-directed growth. Hierarchical clustering revealed three distinct groups corresponding to the Receiving, Responding, Valuing, and Organizing levels of affective outcome. While  $f$  and  $D$  effectively contributed to behavioral differentiation, the feature  $G$  had limited impact due to its uniform distribution where  $G$  ranges narrowly between  $-0.36$  and  $-0.80$ , indicating a common tendency for last-minute task completion. No students reached the Internalizing level, suggesting a need for improved time management strategies. These findings highlight the potential of temporal analytics to inform targeted and personalized interventions in smart learning environments. Future work will focus on incorporating additional features and building predictive models to identify learning patterns and support adaptive and personalized on hybrid laboratory activity.

**Index Terms**—clustering, learning analytics, sensor-based attendance, smart learning system

# Dual Vision Transformer Integration for Race and Gender Recognition Based on Facial Images

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**Abstract**—Race and gender recognition based on facial images is a part of soft biometrics that has wide applications in identification systems. However, challenges such as dataset bias, variation in expression, pose, and inconsistent race definition remain major obstacles. In this study, the authors propose the integration of two Vision Transformer (ViT) models to improve the accuracy of race and gender classification. The first model, ViT-Face, is trained on the VGGFace2 dataset to extract static facial structure features, while the second model, ViT-Emotion, is trained on the FER-2013 dataset to capture dynamic features of facial expressions. Features from both models are combined and classified using Support Vector Machine (SVM) with parameter optimization through grid search. The dataset used is DemogPairs with 10,800 face images in six balanced classes. The experimental results show that the combination of features from ViT-Face and ViT-Emotion gives the best performance with an accuracy of 0.92, a precision of 0.92, a recall of 0.92, an F1-Score of 0.92, and an ROC AUC of 0.9948. This multi-domain feature integration has proven to be more effective than using a single feature. This approach opens up opportunities for developing smarter, fairer, and more inclusive face-based identification systems. In addition to accuracy, this study also highlights fairness across demographic subgroups and discusses ethical implications of AI-driven demographic classification, ensuring the system is more inclusive and responsible.

**Keywords**—Vision Transformer, soft biometrics, race recognition, gender recognition, SVM, deep learning

# Evaluation of Cooperative Cognitive Radio System for White Spectral Space Detection using the Covariance Detector

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**Abstract**—Wireless spectrum is increasingly scarce, which motivates the need for robust methods to detect unused bands—especially under challenging conditions like low SNR and fading. This study proposes integrating Spectral Covariance Sensing (SCS) into a cooperative cognitive radio framework, leveraging hard-decision fusion schemes (AND, OR, Majority) to enhance detection stability. Using real Advanced Television Systems Committee(ATSC) signal data, the detection performance was evaluated across various SNR levels. The results show that cooperative sensing significantly improves detection probability under low SNR, with the OR rule achieving the highest detection rate (e.g.,  $\approx 90\%$  at  $-30$  dB) and the majority rule providing the best overall trade-off between reliability and false alarms. These findings demonstrate the practical value of cooperative SCS systems in dynamic spectrum environments.

**Index Terms**—Cognitive radio, spectral covariance, cooperative spectrum sensing, HARD fusion rules.

# Flexwing: Gamification Technology to Increase Student Motivation and Engagement in Flexbox CSS Learning at State Vocational High School 10 Surabaya

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**Abstract**— Education in the digital era of the 21st century faces increasingly complex challenges. One of these challenges is how to maintain student motivation and engagement in the learning process, especially in the context of technology-based education. Flexwing as a web-based interactive learning media with the concept of students being asked to move shoes to a place that has been provided using the CSS flexbox concept. This research is a research that uses research and development with the ADDIE development model consisting of the stages of analysis, design, development, implementation, and evaluation. During the evaluation, the researcher used two types of questionnaires. The first questionnaire uses ISO 25010 parameters aimed at experts. The second questionnaire uses the Technology Acceptance Model (TAM) parameters. The questionnaire will be distributed to 35 students majoring in Software and Game Engineering at SMK Negeri 10 Surabaya. In general, experts state that Flexwing is a very suitable media to use because it gets a percentage of 82.3%. The results of students' responses to Flexwing media in increasing student learning motivation are good. This can be seen from the overall percentage which reached 81.06%.

**Keywords**—Gamification, Student Motivation, Vocational High School, ADDIE

# Effect Of Modulation And Noise Level On ESBM- Based Energy Consumption For Data Transmission On Wireless Sensor Networks Using The Nelder Mead Simplex Method

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**Abstract**— Energy efficiency is a crucial aspect in the design of wireless sensor networks (WSNs), especially for applications that require long-term operation with limited power. This study examines the influence of digital modulation type and noise level on Energy per Successful Bit Metric (ESBM)-based energy consumption in the data transmission process in WSN. The modulation schemes tested included BPSK, QPSK, 8-PSK, 16-PSK, 4-QAM, and 16-QAM, while noise was simulated at various levels with AWGN channel and path loss approaches. The ESBM value is calculated based on the probability of transmission success and the total energy used per data packet. The simulation results showed that the increase in noise level had a significant impact on the increase in ESBM values in all types of modulation, with high-order modulations such as 16-QAM and 4-QAM showing better energy efficiency than BPSK and QPSK under high noise conditions. To optimize the combination of system parameters that minimize ESBM, the Nelder-Mead Simplex heuristic method is used. This approach successfully identifies the optimal modulation and transmission power configurations, which significantly lowers the energy consumption per successfully received bit. This research provides a solid basis for the application of energy-efficient communication optimization strategies in channel-based adaptive WSN.

**Keywords**—WSN, Energy Efficient, Modulation, Channel Noise, ESBM