

2025 IEEE AFRICON

Polokwane, South Africa
10-12 December 2025

IEEE Catalog Number:
ISBN:

CFP25AFR-POD
979-8-3315-6519-0



Copyright © 2025, IEEE

All Rights Reserved

Copyright and Reprint Permissions:

Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP25AFR-POD
ISBN (Print-On-Demand):	979-8-3315-6519-0
ISBN (Online):	979-8-3315-6518-3
ISSN:	2153-0025

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA

Phone:	(845) 758-0400
Fax:	(845) 758-2633
E-mail:	curran@proceedings.com
Web:	www.proceedings.com

TABLE OF CONTENTS

Review of Optimal Dispatch Techniques for the Integration of Renewable System on a Power Distribution Network	1
<i>Mothupi Rakgetse, Olawale Popoola, Akintunde Samson Alayande</i>	
Revolutionizing Cloud Security through Federated Learning for Next-Gen Healthcare Systems in South Africa	6
<i>Ramahlapane Lerato Moila, Mthulisi Velempini</i>	
Pipeline for Efficient Quantization of Large Language Models for Resource-Constrained Deployment	13
<i>Tapiwa M. Chiwewe, Adeiza Onumanyi</i>	
Design of a Solar-Based Virtual Clinic for Austere Environments	19
<i>Abby Blocker, Prosper Magara, Ahmed Biyabani, Mohammed Ishaaq Datay, Joyce Mwangama Bessie Malila</i>	
Classification of Individual Participation Rate in an Online Group Discussion	27
<i>Tlou Ramabu, Robert Hans</i>	
Coordinated Industrial Automation with Multi-Agent Reinforcement Learning in AIoT Systems	33
<i>Mfanasibili Ngwenya</i>	
Uplift Pricing for Inertia and Reserve via ML-Based Frequency-Constrained Unit Commitment	39
<i>Azeez O. Olasoji, David T. O Oyedokun, Mohammad Rajabdorri, Juan Esteban Sierra-Aguillar Mkhutazi Mditshwa, Chukwuemeka E. Okafor, Best Khoza, Komla A. Folly</i>	
An Improved Simulation Model of DMD-Based Programmable Aperture for Digital Holographic Microscopy	45
<i>Nicolai Kuschke, Johan Schoeman</i>	
AnoDoc: Robust Anomaly-Based Document Forgery Detection	51
<i>Aboudramane Diarra, Tegawendé F. Bissyande, Pasteur Poda</i>	
High-Performance Software-Defined Radio Spectrometer: A GPU Implementation for Multi-GHz Radio Astronomical Signal Processing	57
<i>Lwando Gomomo, Yunus Abdul Gaffar, Simon Winberg</i>	
A Machine Vision Approach for Litter Detection in Environmental Monitoring	63
<i>Ujeafahmed Nisarahmed Qureshi, Reolyn Heymann, Serestina Viriri, Japie Greeff</i>	
A Distributed Denial Service Attack Intrusion Detection System for 5G Networks in Internet of Things using a Hybrid Deep Learning Model	69
<i>Miyelani Silence Madiba, Mthulisi Velempini</i>	
Bias and Explainability in Facial Emotion Recognition Across Gender	77
<i>Rogerant Tshibangu, Jules R. Tapamo</i>	
Techno-Economic Evaluation of Solar PV Generation Plant-UNISA Case Study	83
<i>Lehlohonolo Mojaki, Nhlanhla Mbuli</i>	
Signalling and Waveform Design for Visible Light Communications	89
<i>Tilahun Zerihun Gutema, Wasiu O. Popoola</i>	

Fault Classification and Localization for Advanced Distribution Management Systems Using Sobol Sequence Data Generation	95
<i>J. S. Mahlalela, G. Mosaico, M. Saviozzi</i>	
Integrating High-Cardinality Categorical Features and Graph Neural Networks for Customs Fraud Detection with Label Scarcity	101
<i>Haddon Mwila, Vaibhav Khatavkar</i>	
Human Fall Detection Using An Ensemble Deep Learning Integrated With a Social Robot	107
<i>Eric Otieno Onyango, Eunice Njeri Mwangi, Waweru Mwangi</i>	
Radar-based Vehicle Detection for Traffic Monitoring with High-Resolution Data	115
<i>Ché Habib, Mohammed Yunus Abdul Gaffar</i>	
Indoor Deployment and Characterization of Low-Cost Open-Source SDR-based Private 4G LTE Network	121
<i>Arthobelly Kiasilua Lubuaku, Grace Botoko Imeka, Marie-Line Lufua Binda, Pierre Sedi Nzakuna, Vincenzo Paciello, Angelo Kuti Lusala</i>	
Session-Persistent Traffic Scheduler for Multipath Backhaul Optimizations in 5G Networks and Beyond: An Experimental Evaluation	127
<i>Jonas Dommes, Elena-Ramona Modroiu, Bjoern Riemer, Marius Corici, Thomas Magedanz</i>	
Towards Differential Privacy Analysis in Healthcare AI	133
<i>Taofik Olajobi, Muhammad Taimoor KHan</i>	
Underrepresented in Foundation Model Pretraining Data? A One-Shot Probe	139
<i>Chris Vorster, Mayug Maniparambil, Noel E. O'Connor, Noel Murphy, Derek Molloy</i>	
Large-scale integration of renewable energy sources to power networks: A brief overview of stability and flexibility perspectives	145
<i>Olawale Popoola, Moshood Akanni Alao, Khuthadzo Kgopana</i>	
KG-Rank-Plus: Enhancing LLM-Based Medical Question Answering with Multi-Hop Knowledge Graph Traversal and Ranking Techniques	152
<i>Ahmed Tahiru Issah, Idaya Seidu, Emmanuel Amankwaa Adjei, Mona Aman, Azizuddin Ahmed Biyabani</i>	
Toward Autonomous Bird Hazard Control System: Artificial Intelligence-Driven Multi-Drones for Swarm Bird Detection and Tracking in Aerodromes and their Vicinity	158
<i>Jacques K. Tshipanga, Kyandoghere Kyamakya, Choug dali Sallami, Balouki Youssef</i>	
Optimized Design of a Two-Stage Fully-Integrated Class-E Amplifier with a Hybrid Combination of High-Voltage and standard NMOS	164
<i>Roberto Cancelli, Gianfranco Avitabile, Antonello Florio</i>	
Structural Preservation in Efficient Pharmacovigilance Summarization : A Causal Graph-Based Evaluation Framework	171
<i>Samuel Matia Kangoni, Obed Tshimanga Tshipata, Jean-Gilbert Mbula Mboma, Pierre Sedi Nzakuna, Vincenzo Paciello, Witesyavwirwa Vianney Kambale, Kyandoghere Kyamakya</i>	
Multi-level Dynamic Pricing for Electric Vehicles Charging to Balance Load in Distribution Networks Using Reinforcement Learning	177
<i>Leloko J. Lepolesa, Kayode E. Adetunji, Khmaies Ouahada, Zhenqing Liu, Ling Cheng</i>	

Implications of Higher Voltage Levels for Electric Vehicle Traction	183
<i>Michael Gleissner, Mark-M. Bakran</i>	
AI for learner-centric education in Mathematics and professional training	189
<i>Gafari Lukumon, Ebenezer Esenogho, Modisane Cameron</i>	
RTDD-EfficientNetB3: Rail Track Defect Detection Using Image Processing and Deep Learning	195
<i>Ezekiel Mensah Martey, Obed Appiah, Issaka Yakubu, Kwabena Adu, Sitti Mensah</i>	
IsiNdebele monolingual language model using custom NguniTokenizer	204
<i>Promise Tshepiso Malatji, Thihe Isaiah Modipa</i>	
Exploring Embedding Effectiveness in Course Recommendation: TF-IDF, Word2Vec, BERT, and Ensemble Learning	210
<i>Yves Matanga, Chunling Du, Etienne Van Wyk</i>	
Multi-Level IP Shedding Defense Mechanism for Dynamic Denial of Service Attack Mitigation	215
<i>Richard W. Kiundi, Vitalis G. Ozianyi</i>	
Optimizing Data-Driven Solutions for Power Quality Management in Africa: Addressing Unbalanced Datasets with Machine Learning	221
<i>Lavenda Shipichira, Opondo Broono</i>	
Analysis of Privacy-Preserving Federated Learning's Resilience against Adverse Attack in Internet of Things Systems	227
<i>Reorapetse Molose, Bassey Isong, Adnan Abu-Mahfouz, Nosipho Dladlu</i>	
A Data-Driven Approach to Wind Turbine Fault Detection Utilizing Isolation Forest and Artificial Neural Networks	235
<i>Simion Chiutsi, Lutendo Muremi, Vikash Rameshar</i>	
A Low-Complexity Quick-Look Processor for ISAR Imaging of Sea Vessels	241
<i>Tristyn Ferreiro, Mohammed Yunus Abdul Gaffar</i>	
An ISAR Time Window Selection Processor for Focused Maritime Vessel Imaging	247
<i>Azhar Ebrahim, Mohammed Yunus Abdul Gaffar</i>	
A Comparative Study of Backbone Architectures for Document Analysis with DINO	253
<i>Liyakhanya Tabata, Clement N. Nyirenda</i>	
Efficient and Rule-Compliant Edge Forecasting with Discrete Cellular Neural Networks and Answer Set Programming	259
<i>Kyandoghere Kyamakya, Henri Kasongo Shabani, Jean-Pierre Mugisha Muhire, Mohamed El Bahnasawi Witesyavwirwa Vianney Kambale, Selain Kasereka Kabunga</i>	
Exploring Emotion Recognition in Informal, User-Generated Social Media Text	265
<i>Mathews Tladi, Madimetja Jonas Manamela</i>	
Comparative Study of Large Language Models for Neural Architecture Search in Federated Learning with PSO	271
<i>Hloniphani Maluleke, Clement N. Nyirenda</i>	
Benchmarking Machine Learning Models for Cloud Resource Forecasting: LSTM vs. SVR, Random Forest, XGBoost, and Prophet	277
<i>Lusani Mamushiane, Mduduzi C. Hlophe, Hlabishi Kobo, Albert A. Lysko, Joyce Mwangama</i>	

Evaluating the Performance of LSTM, GRU, and Temporal Fusion Transformers in Stock Market Time Series Predictions	285
<i>Ronewa Mavhunga, Joseph Tlouyamma, Sello Mokwena</i>	
Scalable Short-Term Solar PV Forecasting Using Hybrid Transformer-ELM Models under Heterogeneous Data Conditions	291
<i>Seyyed Kasra Mortazavi, Witesyavwirwa Vianney Kambale, Hussein Ahmad Ahmad Kyandoghere Kyamakya</i>	
Integration of Wireless Sensor Network with a CubeSat Satellite System for Enhanced Agricultural Monitoring	297
<i>Mayamiko Msonkho, Arno Barnard</i>	
How State Space Machines can help African Speech Language Identification	303
<i>Howard Prioleau, Saurav K. Aryal, Jeremy Blackstone</i>	
Greedy Algorithm for Building Sparse Linear Regression Models	310
<i>Nuru Nabuuso, Vladimir Estivill-Castro</i>	
Automated and Accessible Leukemia Detection from Microscopic Blood Films Using YOLO and Vision Transformers	316
<i>Andrew Blayama Stephen, Miracle James Olotuche, Mona Aman, Azizuddin Ahmed Biyabani</i>	
An Overview of Load Frequency Control in Modern Power Systems: Current Challenges and Evolving Directions	322
<i>Khuthadzo Kgopana, Olawale Popoola, Akintunde Samson Alayande</i>	
A Novel Polarity-Switching Charge-Pump 5-Level Bipolar Pulser for Portable Ultrasound Imaging	328
<i>Marco Rossano, Gianfranco Avitabile, Antonello Florio</i>	
Synthetic Nutritional Data Generation for Vulnerable Populations with Interpretable Attention Mechanisms	334
<i>Zvinodashe Revesai, Okuthe P. Kogeda</i>	
Experimental Comparison of CW Radar Modules for Estimating Soccer Ball Speed	341
<i>Ahmed Vanker, Mohammed Yunus Abdul Gaffar, Simon Winberg, Benjamin Barsch</i>	
Design and Demonstration of Wideband CW Ultrasonic Radar for Spectrogram-based Motion Analysis	347
<i>Joachim Gengan, Mohammed Yunus Abdul Gaffar</i>	
Post-Incident Analysis of UAV Control Surface Failures Using Cubature and Unscented Kalman Filters	353
<i>Makhosazana E. Moyo, Jimoh O. Pedro</i>	
Improved Power Transformer Fault Diagnosis Through Optimized Feature Selection in DGA Using SVM and KNN Techniques	359
<i>Given Sipho Malesa, Lutendo Muremi, Vikash Rameshar</i>	
Effects of Grid Impedance and Load on Transformer Frequency Response via in situ Measurement	365
<i>Stevan Engelbrecht, Johannes Cornelius Bekker, Fredrick Mukundi Mwaniki</i>	
Example Guided Prompt Tuning for Sentiment Analysis of African Languages on Llama	370
<i>Amir Ince, Howard Prioleau, Saurav K. Aryal</i>	

Optimized Shoot-Through Pulse Generation in High Voltage Boost Z-Source Inverters: A Performance-Based PWM Technique Comparison	377
<i>Sweta Kumari, Rajib Kumar Mandal, SP Daniel Chowdhury</i>	
Enhancing Phishing Detection through Visual Similarity using Convolutional Neural Networks	383
<i>Walter Kiprono, Dennis Njagi, Isaac Nyabisa Oteyo</i>	
Technical and Operational Evaluation of High-Penetration Solar PV Integration in Power Networks	389
<i>Nomihla W Ndlela, Katleho Moloi, Musasa Kabeya</i>	
Financial Benefit of Interchangeability of Power Transformers on the Eskom Standard Plinth	395
<i>Malusi Mathonsi, William Lehobye</i>	
An IoT-Based System for Early Detection of Soil Health	400
<i>Kabelo Moroke, Tiou Ramabu, Khuliso Sigama</i>	
Gabor Filtering Meets ASP-Constrained Binary Discrete Cellular Neural Networks (BD-CeNN) for Explainable, High-Fidelity Clinical Images	407
<i>Jean-Pierre Mugisha Muhire, Christian Kutabuna Kubakisa, Witesyavwirwa Vianney Kambale Hima Deepthi Vankayalapati, Selain Kasereka Kabunga, Kyandoghere Kyamakya</i>	
Review of Application and Performance of Recurrent Neural Networks in Microgrid Management and Protection	413
<i>Hastings M. K. Banda, Sunetra Chowdhury</i>	
Evaluating Blockchain Performance Metrics for Fog Computing Using Empirical Blockchain Data	419
<i>Pfarelo Raliphada, Micheal O. Olusanya, Seun. Olukanmi</i>	
Evaluating the Need for forecasting the solar irradiance of grid connected solar plant in South Africa: CRSES Case study	425
<i>Malusi Mathonsi, Nhlanhla Mbuli, Sibonelo Motepe</i>	
Framework for Enhancing Crop Yield Prediction using Statistically Downscaled Environmental Data	433
<i>Liam Flóid, Temitope Odedeyi, Izzat Darwazeh</i>	
Enhancing Fraud Detection in Financial Transactions through a Hybrid Machine Learning Model	439
<i>Mashao Andre Mokoele, Sello Mokwena</i>	
Design of a Triple Band-Notched UWB MIMO Antenna with Mutual Coupling Reduction Using H-Shaped DGS	446
<i>Elijah Joseph, Pradeep Kumar, Thomas J.O Afullo</i>	
Noisy Pixels, Credible Decisions – A Robust, Edge-Ready Neuro-Symbolic Architecture for Rural (African) Clinics	452
<i>Christian Kutabuna Kubakisa, Kyandoghere Kyamakya, Witesyavwirwa Vianney Kambale Isaac Lukusa Kayembe, Divin Kayeye Kabeya, Hima Deepthi Vankayalapati</i>	
Hybrid Botnet Detection in Internet of Things Using Genetic Algorithms and Light Gradient Boosting Machine Technique	458
<i>Spencer Kanjera, Sindiso Mpenyu Nleya, Mthulisi Velempini, Wellington Mapenduka</i>	
Emulation of LCC HVDC Systems in ETAP for Control Interaction Studies between PSS and HVDC Modulation Damping Controllers	468
<i>Righteous Vengesai, John Van Coller, Chandima Gomes</i>	

Real-Time Classification of Human Motion Using PIR Sensors and Deep Learning on Resource Constrained Hardware	474
<i>Rohan Van Zyl, Johan Schoeman</i>	
Assessing Microgrid and E-Mobility Integration in Rural South Africa: Case Study and IMERI Index	480
<i>Brandon Davoren, Edem Foli, Vukile Mnyande</i>	
AI and Wanjiku*: Using AI to Bridge Budget Transparency and Civic Engagement in Kenya in Taita Taveta and Kwale counties	486
<i>Candy Maingi, Njeri Ngaruiya, Daniel Ndirangu, James Muraguri, Mike Ngaira, Vincent Marsh Hillary Liech</i>	
Condition Monitoring of Synchronous Reluctance Motors Using Random Forest Classification	494
<i>Lutendo Muremi, Elsie Swana</i>	
Comparative Evaluation of Measurement Methods for Supraharmonic Emissions	500
<i>Gerrit Christiaan Oosthuizen, Fredrick Mukundi Mwaniki</i>	
Embedding ResNet50 for Mobile-Based Tuberculosis and Pneumonia Screening in CXRs	506
<i>Reuben Kiguta Wachira, Annette Waithira Irungu, Stephen Kimani, Isaac Nyabisa Oteyo</i>	
An AI/ML Framework for Proactive Cyber Threat Detection in Uncrewed Aerial Vehicles	512
<i>Oludolapo. E Ogunfowora, Aarti Panday</i>	
Uplink User Association and Resource Allocation in Integrated Terrestrial and Non-Terrestrial Networks	517
<i>Denise Joanitah Birabwa, Sunday O. Oladejo, Godfrey Kibalya</i>	
AI in the Antenna Design Life Cycle: An AI-Assisted Systematic Review	523
<i>Ike Mafa, Simon Winberg</i>	
Ranking of Electrical Substation Sites using Simple Multi-Attribute Rating Technique (SMART)	529
<i>Thandeka Lerato Mbundu, Nhlanhla Mbuli</i>	
Forecasting for the Future: AI-enhanced Emissions Modeling in the Built Environment	535
<i>Kelsi Naidoo, Simon Lucas Winberg, Mogamat Yaaseen Martin</i>	
KBViT: Efficient Hybrid Vision Transformer via Stochastic Depthwise Attention and Kernel Fusion	541
<i>Vincent Aduvuku, Nakayiza H. Raudha, Kennedy Edemacu</i>	
Data-Driven ML-Based xApp for Dynamic Resource Scheduling for 5G Networks in O-RAN	547
<i>Shivendaren Naidoo, Nokwanda Shezi, Mvikeli Joseph Dlamini, Bakhe Nleya</i>	
Fostering Inclusive Recruitment Processes for Neurodiverse Talent Using Adaptive Artificial Intelligence (AI) Assessments	553
<i>Ogechi Smart Ekejiuba, Olayinka Anthony Ojo, Celestine Iwendi, Ruth Chikodi Chime, Negin Aboutorabi Afeez Akande</i>	
Enhanced Mobile Broadband Validation over a Slice-Aware 5G Testbed for EdTech Applications	560
<i>Lusani Mamushiane, Thoriso Makhosa, Steve Motsotso, Hlabi Kobo</i>	
Using Artificial intelligence for accurate pothole detection on urban roads : Case study Botswana	567
<i>Kumbirayi Nyachionjeka, Nametsegang Monei, Likuni King, Sajid M. Sheikh, Monageng Kgwadi</i>	

Reused Lead-Acid Battery State of Health Monitoring through Multisine Spectroscopy	575
<i>Kim Long Tran, Minh Trieu Huynh, Quoc Dung Phan, Pascal Maussion</i>	
Online Condition Monitoring vs. Preventative Maintenance: Economic Evaluation of Power Transformers	581
<i>Thabang Motau, Nhlanhla Mbuli</i>	
Determination of the Frequency-Dependent Impedance of a Three-phase System	589
<i>André Leonard de Kock, Fredrick Mukundi Mwaniki</i>	
Addressing Data Scarcity and Interpretability in PV Fault Detection: A Hybrid AI Framework for African Energy Systems	595
<i>Katlego Ratsheola, Ditiro Setlhaolo, Akhtar Rasool</i>	
Chaotic Time Series Prediction of Impulsive PLC Noise based on Artificial Neural Networks over In-door Low-Voltage Networks	601
<i>Steven O. Awino, Bakhe Nleya</i>	
Redefining Intrusion Detection with CNN and the Law of Unity and Struggle of Opposites	607
<i>Motlatso S. Mokoetele, Sello N. Mokwena</i>	
Data-Driven Predictive Maintenance Using Fuzzy Clustering Approaches for Oil Temperature Forecasting in 8E Electrical Locomotives	616
<i>Rofhiwa C. Mufamadi, Stephen O. Oladipo, Udochukwu B. Akuru</i>	
Bowley Variation Pairing in an Uplink PD-NOMA Network	623
<i>Andrew Macharia, Tom Walingo</i>	
Prediction of Sleep Efficiency Using Observable Sleep and Lifestyle Variables	629
<i>Tiou Ramabu, Sidney Sdiela, Vianney Kambale</i>	
Optimizing Deep CNNs for Multiclass Apple Leaf Disease Diagnosis: A Comparative Study	635
<i>Nur Amantay, Khaled Mohamad, Amani Ibraheem</i>	
A Hybrid CNN-BiGRU with Attention Model for Robust Intrusion Detection in IoT Networks	642
<i>Kuburat Oyeranti Adefemi, Murimo Bethel Mutanga</i>	
Wind Power Potential Assessment of A Roof Mounted Wind Turbine	648
<i>Thetso Azael Motjamela, Nhlanhla Mbuli</i>	
Low Voltage DC Distribution Networks for Modern Power Systems: A Comprehensive Review	654
<i>Laetitia Elizabeth Theron, Fredrick Mukundi Mwaniki</i>	
Analysis of Harmonics in a Distribution Network Integrated with Solar Photovoltaic Plants, Electric Vehicles and Battery Energy Storage System	660
<i>Chukwuemeka E. Okafor, Azeez O. Olasoji, Mkhutazi Mditshwa, Best Khoza, Komla A. Folly</i>	
<i>David T. O. Oyedokun</i>	
Practical easy to use state of charge estimators for lead-acid and lithium batteries	666
<i>Jean-Marie Beya Kamba, Christine Rhusimane Bashige, Paul Mbuyi Balowe, Renny Sadala Kabieto</i>	
Spectrum Sharing in PD-SCMA Cognitive Radio Networks	671
<i>Gilbert Machani, Simon Chege, Tom Walingo</i>	

Machine Learning based fault detection and classification in series compensated transmission line with Renewable energy intergration	677
<i>N. Mazibuko, K. T. Akindeji, K Moloji</i>	
Vehicle Speed Estimation and Classification Using a Low-Cost Continuous-Wave Doppler Radar	684
<i>Dylan Kuming, Mohammed Yunus Abdul Gaffar, Lawrence Stanton</i>	
Repurposing Shielded Twisted-Pair Cables as Broadband Single-Wire Transmission Lines	690
<i>Faiza Nusrat Mowla, Heinrich Edgar Arnold Laue</i>	
A High-Fidelity Internet Protocol Camera Network Emulation	695
<i>Wandile T. Mnyandu, Alfredo Terzoli, Hlabishi I. Kobo</i>	