2025 INTERNATIONAL CONFERENCE ON CONVERGENT AND SMART SYSTEMS

(ICCSS 2025)

PIONEER INTERNATIONAL UNIVERSITY, NAIROBI, KENYA, JUNE 25 - 28, 2025

Final Program

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Conference Schedule

Wednesday (June 25)		
08:00~	Registration	Session Chair
08:50~9:00	Opening Remarks	Dr. Kiho Lim
9:00~10:30	Session 1	Dr. Kiho Lim
10:30~12:00	Session 2	Dr. Soonja Yeom
12:00~13:00	Lunch Break	
13:00~15:00	Session 3	Dr. Kyungbaek Kim
15:00~17:00	Session 4	Dr. HyunJung Park
Thursday (June 26)		
8:30~10:00	Session 5	Dr. Kiho Lim
10::00~10:15	Coffee Break	
10:15~12:00	Session 6	Dr. Peter Akuon
12:00~13:00	Lunch Time	
13:00~14:30	Keynote Session I & II	Prof. Patrick M. Ntonja
14:30~15:00	Coffee Break	
15:00~16:30	Session 7	Dr. Collins Oduor Ondiek
16:30~18:00	Session 8	Dr. HyunJung Park
Friday (June 27)		
9:00~11:00	Session 9	Prof. George Owino
11:00~12:00	Networking Break	
12:00~14:00	Lunch Time	
14:00~15::00	Closing Remarks	Prof. Patrick M. Ntonja
Saturday (June 28)		
10:00~11:30	Future ICCSS Meeting	
Conference Ends at 12:30		

*Opening Remarks Location: Elysian Hotel / Online
*Closing Remarks Location: Elysian Hotel

Preface

With the rapid advancement of the Internet and cutting-edge information technology, reliable and convergent computing continues to garner significant interest from both academia and industry. Addressing these critical developments, the 2025 International Conference on Convergent and Smart Systems (ICCSS 2025) offers a distinguished platform for exchanging highly original ideas concerning a vital category of computing systems. ICCSS 2025 is dedicated to researchers with expertise in reliable and convergent computing systems, actively engaged in designing and implementing innovative computing applications.

ICCSS 2025 will convene at Pioneer International University, Nairobi, Kenya, from June 25 - 28, 2025. This year's conference saw a strong response, with 61 papers selected for presentation and publication in the proceedings of the conference after a rigorous peer-review process conducted by the Technical Program Committee members.

The conference aims to bring together engineers and scientists from various communities who share a common interest in practical computing technologies. It will create an environment conducive to discussing and reporting experimental results, novel designs, work-in-progress, experiences, case studies, and pioneering ideas. The conference will encompass a broad spectrum of topics, reflecting both ongoing interests and emerging trends, including key areas in computing. The selected papers cover a wide range of topics, including Artificial Intelligence (AI), Machine Learning, Data Science, Cybersecurity, Network Computing, System Software, Smart Systems, and other relevant areas.

The ICCSS 2025 Technical Program Committee was led by two Program Chairs: Dr. Kiho Lim and Dr. Edna Gitau. We wish to extend our deepest gratitude to the TPC members for their invaluable time and technical input, which were instrumental in creating an outstanding program. Without their dedication and contributions, this conference would not have been possible. We would also like to thank the Organizing Committee for their tremendous effort. We extend special thanks to our Conference Chairs, Dr. Pankoo Kim and Dr. Gideon Maina. We also thank all other committee members, including the Technical Program Committee, Program Chairs, Organizing Committee, Publicity, Publications, Treasurer, Local Arrangements, Poster, Tutorial, Web, International Advisory, and Steering Committees, for their invaluable dedication and hard work in making ICCSS 2025 a success.

We are grateful for the generous support provided by Pioneer International University, Kenya. Finally, we extend our thanks to all the authors who contributed to this volume and to all the attendees of ICCSS 2025.

June 2025

Dr. Kiho Lim and Dr. Edna Gitau
Conference Chairs, ICCSS 2025

ICCSS 2025, PIONEER INTERNATIONAL UNIVERSITY, NAIROBI, KENYA, JUNE 25 - 28, 2025

Keynote Speaker I (Thursday, June 26)

Session Chair
Prof. Patrick M. Ntonja

Title
Quantum Machine Learning for Anomaly Detection in Network

Speaker
Dr. Christian Esposito
University of Salerno, Italy

Abstract
Intrusion Detection Systems (IDS) are vital for securing modern networks, but traditional machine learning-based anomaly detection methods often struggle with high-dimensional and imbalanced data. Although classical GANs help improve data generation, they are computationally intensive and limited in scalability. Quantum GANs (QGANs) present a promising alternative, but existing approaches are tested only in simulations. Instead, using real devices presents challenges not only because of the impact of quantum noise but, more significantly, due to usage restrictions imposed by their high cost. To cope with this, we propose a lightweight but effective hybrid QGAN for network intrusion detection, adopting a hybrid training approach by switching between an IBM real quantum device and its noisy simulator version, balancing computational feasibility and relevance in the real world. The results show that our model performs consistently, with minimal performance loss on real hardware.

Keynote Speaker II (Thursday, June 26)

Session Chair
Prof. Patrick M. Ntonja

Title
TBA

Speaker

John Paul Okwiri, OGW, MBA, MCIPS
Chief Executive Officer, Konza Technopolis Development Authority

Abstract

TBA
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Wednesday (June 25)

(S.1) (Online) Session 1   Wednesday   09:00~10:30

Session Chair : *Dr. Kiho Lim*

1. *Computing with Words: A Fuzzy Approach to Risk Assessment of Ferry Transport in Likoni Channel,*
   Juliet Wangui Wamugi, Gokhan Camliyurt, Youngsoo Park and Daewon Kim

2. *Artificial Intelligence in Smart Agriculture: Enhancing Precision, Sustainability, and Food Security,*
   Christopher Sikuyuba

3. *Effects of Multi-Stage Gradient Guided Recalibration for DNNs,*
   Naim Reza and Ho Yub Jung

4. *Implementation of a Multilingual Emotion Recognition and Visualization System Using MFCC-LSTM,*
   Park Minsu, Hwanghyeon Cha and Gwangmi Choi

5. *Machine Learning-Based Detection of PHP Web Shells: A Comparative Analysis of Regex and LLM-Based Methods,*
   Bibek Neupane, Cyril Ku and Kiho Lim

6. *Context-Aware, Multilingual Phishing Detection Model for Social Media Platforms Using Contextualized NLP Techniques,*
   Vincent Mwania, Pankoo Kim and Hyoung-Ju Kim

(S.2) (Online) Session 2   Wednesday   10:30~12:00

Session Chair : *Dr. Soonja Yeom*

1. *Fingerprint Image Recognition, Pattern Reconstruction and Evaluation Framework,*
   Birir Sospeter Kipchirchir, Hyoungju Kim, Kyongho Yu and Pankoo Kim

2. *Lack of Explicit Density Representation in Generative Adversarial Networks: Approaches to Density Estimation And Inference,*
   Teddy Okatch, Kyungho Yu and Pankoo Kim

3. *CAUSALGANs AND THE EVOLUTION OF COUNTERFACTUAL IMAGE GENERATION,*
   Joshua Nyaberi, Kyongho Yu and Pankoo Kim

4. *Recommender System Bias Analysis : Issues Across Various Domains and Their Impact,*
   Hyeon Kyeong Jeong and Pan Koo Kim

5. *Research on Lightweighting Deep Learning Models for Object Recognition,*
   Xinyao Wang, Kyungho Yu and Pankoo Kim

6. *A Trend Analysis of Clean-Label Backdoor Attacks on Autoencoding Models,*
   Seunghan Kim, Changhoon Lim and Hyunil Kim

(S.3) (Online) Session 3   Wednesday   13:00~15:00

Session Chair : *Dr. Kyungbaek Kim*
1. From Pretraining to Fine-Tuning Unlocking the Full Potential of Language Models for Sentiment Analysis,
   Abdul Hai Karimi, Seungwon Lee and Chang Choi

2. AR-Enhanced Mobile Healthcare Platform for Hand Tremor Monitoring and Remote Diagnosis,
   Renta Kuzuyama, Jun-Ho Choi, Duk Shin and Yousun Kang

3. Deserted 3D Gaussian Splatting: Scale-Aware Compact Representations for High-Fidelity Neural Rendering,
   Jeongwoo Ahn, Yeonbi Jeong and Wonyeol Kim

4. A Development of Versatile FACVD Reactor,
   Jeongheon Lee, Himchan Kang and Jae B. Kwak

5. Exposing axis-wise estimation bias in WiFi CSI-based human pose recognition system: A case study with CNNs,
   Iftikhar Ahmad and Wooyeol Choi

6. Anatomy-Aware SSM-Attention Hybrid Network with Boundary Enhancement for Skin Lesion Segmentation,
   Muhammad Afnan Ghafoor and Bumshik Lee

7. Cloud-Enabled Adaptive Learning System for Scalable Education in Developing Regions: Comparative Studies,
   Israel Dziwornu Fianyi, Soonja Yeom and Ju-Hyun Shin

8. Mobile Edge Computing in Agriculture: A Survey, Iftekharul Islam Shovon and Seokjoo Shin

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(S.4) (Online) Session 4   Wednesday   15:00~17:00

Session Chair : *Dr. HyunJung Park*
1.Multi-Branch Attention and Temporal Convolutional Network for Enhanced EMG-Based Hand Gesture Recognition,
   Abu Saleh Musa Miah, Won Pil Kim, Md Mahbubur Rahman Tusher, Najmul Hassan and Jungpil Shin

2. Post-processing Strategies for Speaker Verification: A Comparative Study of PLDA and Score Normalization,
   Hanseul Kim, Hyeonwoo Park and Chanjun Chun

3. Implementation of a Facial Expression Analysis and Counseling Chatbot System Using CNN and GPT,
   Min-Won Kim, Seung-Ryong Han, Hee-Jeoung Moon and Gwang-Mi Choi

4. Synthetic Data Generation for Cybersecurity Applications: An Exploratory Study of GAN Models,
   Ricky B. Steinel, Kiho Lim and Cyril S. Ku

5. Crack segmentation using U-Net and Transformer combined model,
   Juyeon Noh, Junyoung Jang and Heedeok Yang

6. Multimodal Knowledge Graph and RAG for Automated CTI and Vulnerability Evolution Analysis,
   Hyoungju Kim, Jeongin Kim and Junho Choi

7. Comparative Studies: Cloud-Enabled Adaptive Learning System for Scalable Education in Sub-Saharan,
   Israel Fianyi, Soonja Yeom and Ju-Hyun Shin

Thursday (June 26)

(S.5) Session 5	Thursday	08:30~10:00

Session Chair : Dr. Kiho Lim

1. *A MODEL FOR PATIENT DRUG EFFECTIVENESS FEEDBACK REPORTING SYSTEM: A CASE STUDY OF KISUMU, MOMBASA AND NAIROBI CITY COUNTIES,*
   Collins Oduor Ondiek

2. *Application of K-Nearest Neighbors (KNN) Algorithm for Polycystic Kidney Disease (PKD) Prediction In Nairobi Kenya,*
   Patience Gichuhi, John Kariuki, Emmanuel Waleo and Wilfred Odoyo

3. *Quantum inspired Breast cancer Detection using convolutional neural networks and MATLAB in Nairobi Kenya,*
   Patience Gichuhi, Joan Kiptoo, Loyce Hamba and Wilfred Odoyo

4. *Bridging the Gap: A Critical Review of Kenya's Legal and Policy Frameworks on Artificial Intelligence,*
   Alex Kimotho Kanyi Kimotho, John Wambui and Wilfred Odoyo

5. *Combating AI-Generated Disinformation: Strategies to Curb Fake Visual Content on Social Media in Kenya,*
   Alex Kanyi and Wilfred Odoyo

6. *Geospatial AI for Circular Economy: Mapping Organic Waste and Resource Flows in Kenya's Food Value Chain,*
   John Kariuki Wambui, Kang'Ethe Brian, Wilfred Odoyo and Maxwell Owiti

(S.6) Session 6	Thursday	10:15~12:00

Session Chair : Dr. Peter Akuon

1. *Predictive Analytics for Urban Temperature Dynamics in Uganda Using Smart Models: An ARIMAX-LSTM and Damped Local Trend Approaches,*
   Lekia Nkpordee, Michael Adelani Adewusi and Muhammed Ngoma

2. *Automated Detection Genomic Correlation of Congenital Cysts Using Convolutional Neural Networks (CNN) Algorithm to identify Embryonic Developmental Anomalies in Nairobi Kenya,*
   Patience Gichuhi, Deogratious Muruga, Maxwell Owiti and Wilfred Odoyo

3. *Automated Token Filling System for Prepaid Electricity Meters: A Case Study of Kenya Power and Lighting Company (KPLC),*
   Deogratius Muruga, Wilfred Odoyo and Patience Wangui

4. *FarmBuddy: An AI-Powered Assistant for Sustainable Farming,*
   Yanet Niguse Tesfay and Muna Numan

5. *Quantum GAN-Powered Vision Systems for Robotic Diagnostics in Precision Healthcare,*
   Patience Gichuhi, Brinner Chepng'Eno, Bruce Omari and Wilfred Odoyo

6. *AI-Driven IoT-Based Waste Management System,*
   Meshack Cheboi, Wilfred Odoyo, Brian Muchiri and Maxwel Owiti

7. *DESIGN OF A SMART HELMET FOR UNDERGROUND MINES,*
   Lewis Maraga and John Ng'Ang'A

(S.7) Session 7   Thursday   15:00~16:30

Session Chair : Dr. Collins Oduor Ondiek
1. *Kenya's Policy Dilemma in Balancing Data Localization Mandates with the WTO E-Commerce Commitments,*
   Emmanuel Bwemba, Wilfred Odoyo and Loyce Hamba

2. *Enhancing E-commerce with Collaborative AR: Multi-User Immersive Visualization,*
   Bruce Omari, Maxwell Noo and Patience Wangui

3. *A LIGHTWEIGHT HOMOMORPHIC ENCRYPTION-BASED INTRUSION DETECTION SYSTEM,*
   John Kariuki Wambui, Laura Akinyi and Patience Wangui

4. *Deepfake Influence on Intrastate Conflict Dynamics: A Case Study of Burkina Faso, Loyce Hamba,*
   Vincent Omurwa, Natariana Kilonzo and Emmanuel Bwemba

5. *Quantum-resistant data fusion for smart transportation: a survey of challenges and emerging solutions,*
   Laura Akinyi, Wilfred Odoyo and John Kariuki Wambui

6. *Personalized Rag with Dynamic User Embeddings for Adaptive Language Models,*
   Brinner Chepngeno and Wilfred Odoyo

(S.8) Session 8   Thursday   16:30~18:00

Session Chair : Dr. HyunJung Park
1. *Self-Supervised Learning with Synthetic Data: Reducing Annotation Overhead in Computer Vision,*
   Maxwell Noo, and Patience Gichuhi

2. *A New Technology of Vehicle Information Recognition using Embedding-based Multi-Object Tracking Algorithm,*
   Kyuman Jeong and Jonghun Lee

3. *Beyond Vaccine Diplomacy: A Pan-African Sovereignty Framework for Equitable Global Health Governance,*
   Vincent Okangi

4. *GAMIFYING COMPUTER SCIENCE CURRICULUM TO ENHANCE TEACHING AND LEARNING IN KENYAN*
   UNIVERSITIES,
   Dr Collins Oduor Ondie

5. *Research on U-Net-Based Restoration of DIC Images,*
   Kyungho Yu, Hyunbin Nam and Pankoo Kim

6. *Building a Transformative Framework for Higher Education Resource Sharing and Student Mobility,*
   Wilfred Odoyo, George Owino and Gideon Maina J.K

Friday (June 27)

(S.9) Session 9   Friday   09:00~11:15
Session Chair : Prof. George Owino

1. *Decoding Kenya's Sheng: An AI-Enabled Translator & Insights Platform,*
   Wilfred Odoyo, John Kariuki, Brian Kangethe and Patience Wangui

2. *Corporate Governance Practices and Financial Performance of NGOs in Kenya,*
   Edwin Sitienei and Dominic Ochoi

3. *Real-Time Fine-Grained Visual Classification Based on the YOLOv11 Object Detection Framework,*
   Oh Joo-Hee and Lee Sang-Woong

4. *Zero-Knowledge Proof Integration for Privacy-Preserving Supply Chain Authentication,*
   Dorothy Mutua

5. *The Role of Convergent Media in Amplify Climate Change Narratives,*
   Joan Kiptoo, Sharlyne Omate, Wilfred Odoyo, Maxwell Owiti and Patience Wangui

6. *Recent Advances in Silicon Anode Technology for High-Capacity and Long-Life All-Solid-State Batteries,*
   Hyunjung Park

7. *Experimentation of the Solar Dryer with Parabolic Trough: Drying of Okra,*
   B. Magloire Pakouzou, P. W. Germain Ouédraogo, Vinci B. Bokoyo, Moctar Ousman, O. Auguste Mackpayen,
   B. Kaboré, S. Kam and Laura Akinyi

8. *Use smart processing to reduce cyanide levels in Cassava Derivative Products in some villages of Central African Republic,*
   Lucie Aba-Toumnou, Ephrem Kosh-Komba, Innocent Zinga, Odilon Nguerepande, Silla Semballa and Laura Akinyi

9. *An AI-Driven, Agent-Guided, and Simulation-Integrated LMS for Competency-Based STCW Training in Kenya,*
   Daniel Too and Patrick M. Ntonja