Leveraging Artificial Intelligence for Enhancing Resilience in Ghana

Working lunch Session (lunch will be provided). 12:30-13:30

This session will deliver priority challenges and opportunities in Ghana's Savannah region, aligning around the three core strategic pillars: **Nature-based Solutions**; **Indigenous knowledge systems**; and **Responsible AI**. The IGCF group will participate in the Resilient Renewable Summit (RRS) 2026 to further explore resilience topics and collaboration mechanisms with other institutions and stakeholders.

The session will host four speakers, followed by a Q&A session.

12:30—12:45 | Professor Sandow Mark Yidana

Provost of the College of Basic and Applied Sciences, University of Ghana

Climate change adaptation in the northern savannah of Ghana: Is groundwater a reliable alternative for resilient agriculture?

Abstract: Erratic rainfall patterns, high temperatures, and high evapotranspiration rates, arising from the changing climate, have had a devastating impact on agriculture in the northern savannah of Ghana and other parts of sub-Saharan Africa. Reduction in crop yield due to insufficient rainfall, livestock deaths arising from diseases associated with dehydration and extreme heat, rapid deterioration of harvested crops, are among the challenges emanating from the impacts of climate change in the area. On the other hand, analysis of available hydrogeological data suggests that groundwater may hold significant potential for climate resilient agricultural sector in the area. It has been noted from processed GRACE (Gravity Recovery and Climate Experiment) satellite data, supported by ground observations that groundwater storage increased by 30 cm, representing approximately 120 km3 of groundwater over the period in the basin from 2002 to 2022. This translates into approximately 15 mm/year of groundwater storage increase, suggesting significant potential for developing the resources for climate resilient socioeconomic activities. Sustainable groundwater resources management in the area, however, hinges on effective environmental governance, and the development of appropriate infrastructure to facilitate access to the resource for multiple uses.

Biography: Prof. Sandow Mark Yidana is the current provost of the College of Basic and Applied Sciences, University of Ghana. He has previously served as Dean of the School of Physical and Mathematical Sciences, Head of the Department of Earth Science, and School Examinations Officer under the College of Basic and Applied Sciences. He is a Professor of Hydrogeology with concentration in applied numerical groundwater flow and solute transport modelling. He holds a Bachelor of Science degree in Geology from the University of Ghana and a PhD in Environmental Management from the Montclair State University in New Jersey, USA. He was appointed as a Lecturer in the University of Ghana in August 2009 and promoted to the rank of Senior Lecturer in 2011. He was then promoted to Associate Professor and Professor in November 2013 and February 2017 respectively. Prior to joining the University of Ghana, Prof. Yidana worked as a Project Geologist at the Utah Department of Natural Resources in Salt Lake City.

He has also undertaken pioneering research on the application of advanced statistical techniques to the study of the sources of variation in groundwater hydrochemistry. He has published over 100 peer reviewed journal articles and other documents in international outlets and has been copiously cited by his peers all over the world. Prof. Yidana has attracted research grants and contributed to the mobilization of research support equipment and software valued over $50 million over the years. He has supervised over a dozen PhDs and more than 40 MPhil/MSc theses/dissertations. Prof. Yidana's current research is on groundwater resources development to improve adaptation of vulnerable communities in the savannah zone, to climate change and related environmental factors. In this regard, his research centers on improving community participation in resource governance and sustainable management and the integration of traditional knowledge systems and norms to enhance resilience. He has also been focused on the application of other nature-based solutions such as managed aquifer recharge, floodwater harvesting and storage, and riverbank restoration to augment the capacity of natural systems to support community resilience.

12:45—12:55 | Dr Justice Owusu Agyemang

Lecturer, Department of Telecommunication Engineering, Kwame Nkrumah University of Science and Technology (KNUST)

Designing AI Security That Holds When the Cloud Doesn't

Abstract: Most AI-driven cybersecurity tools share a hidden assumption: that the systems they protect have reliable connectivity, abundant compute, and adversaries who look like the ones in benchmark datasets. In much of the world, none of those conditions hold. Critical infrastructure operates on commodity hardware behind intermittent links, under threat models that reflect local adversaries, not enterprise incident databases compiled elsewhere. The question is not whether AI can improve security under ideal conditions — it is whether the guarantees survive when you take the cloud away. This talk presents a framework for resilient AI-driven security: systems designed from the start to degrade gracefully rather than fail silently. Drawing on an active research programme spanning evaluation, detection, remediation, and governance, it offers four concrete findings. First, the way you measure an LLM security tool can reverse the model you would choose to deploy — interaction-mode sensitivity is not a benchmarking curiosity; it is a deployment hazard that current evaluation practice ignores. Second, attack-graph-based network hardening achieves substantially higher risk reduction than severity-score ranking because it reasons about actual attack paths rather than vulnerabilities in isolation. Third, policy enforcement placed between model intent and tool execution reduces unsafe autonomous actions by over 70% while retaining more than 90% of task utility — and the enforcement layer itself runs on deterministic rules with no model dependency, making it viable on edge hardware. Fourth, across the stack, the architecture supports a measured fallback from full-scale models through quantised surrogates to rule-only baselines, each step trading capability for resilience along a published curve rather than a hidden cliff. The talk closes with a research agenda grounded in deployment contexts where these questions are sharpest: rapidly digitizing economies where infrastructure is expanding quickly, local threat landscapes are distinct, and resource constraints are not a hypothetical exercise but the operating reality. The argument is not that AI security should retreat from ambition. It is that ambition, to be honest, must account for where and how the systems will actually run.

Biography: Dr. Justice Owusu Agyemang is a Lecturer in the Department of Telecommunication Engineering, Faculty of Electrical and Com-puter Engineering, at Kwame Nkrumah University of Science and Technology (KNUST), Ghana. His research spans IoT net-work and application security, applied AI, applied cryptography, blockchain security, reverse engineering, and quantum comput-ing. His current work focuses on the security of large language model systems — building reproducible tools for LLM evalua-tion, autonomous vulnerability detection, network hardening, and policy-constrained agentic systems that remain trustworthy under real-world, resource-constrained deployment conditions.

12:55—13:05 | Dr Kwame Oteng Gyasi

Senior lecturer in Robotics, RF and Microwave Engineering, and IoT systems, Kwame Nkrumah University of Science and Technology (KNUST)

Robots for Resilience: Tailoring Smart Agriculture and Flood Response for Ghana

Abstract: Agriculture and flooding remain major challenges affecting food security, livelihoods, and infrastructure in Ghana. Existing technological solutions are often expensive, imported, and poorly suited to local conditions, creating the need for affordable and practical indigenous robotic systems. This talk explores the development of robotics and intelligent systems for smart agriculture and flood response in resource-constrained environments. Applications such as drone-based crop monitoring, automated irrigation systems, flood detection sensors, and robotic platforms for emergency assessment and disaster response are highlighted. These technologies can improve agricultural efficiency, strengthen disaster preparedness, and reduce

operational risks. The talk argues that robotic systems designed for Ghanaian conditions must prioritize affordability, resilience, and adaptability to local infrastructure limitations. By focusing on practical and context-aware innovation, robotics can provide sustainable solutions to critical national challenges in agriculture and disaster management.

Biography: Kwame Oteng Gyasi is a senior lecturer and researcher in Robotics, RF and Microwave Engineering, and IoT systems at KNUST. His work focuses on developing practical technology solutions for agriculture, education, and sustainable development in Africa. As a member of the Ghana Robotics Academy Foundation, he is also actively involved in robotics education and innovation, with a strong interest in nurturing young learners to become future creators of indigenous robotic technologies for Ghana and beyond.

13:05—13:15 | Elliot Amponsah

Elliot Amponsah
Research Assistant with the Quantum Computing and Assistive Technologies Lab, Kwame Nkrumah University of Science and Technology (KNUST)

Quantum Communication and the Future of Secure Networks

Abstract: The world is becoming more connected by the day, and with that connectivity comes a growing responsibility to keep our communication networks safe and secure. Most of the security that protects our phone calls, internet traffic, financial transactions, and government communications today relies on mathematical encryption. However, the rise of quantum computing threatens to break these encryption systems, putting critical infrastructure at risk to attacks that current technology cannot protect against. Quantum communication offers a promising response to this threat. By using the principles of quantum mechanics to transmit and secure information, it becomes physically impossible for a third party to intercept a message without being detected. The most practical application of this today is Quantum Key Distribution (QKD), a method of sharing encryption keys between two parties with security that is guaranteed not by mathematics, but by the laws of physics. As governments and industries around the world rapidly expand their digital infrastructure, including mobile networks, e-government platforms, and financial systems, they face the real risk of building on foundations that quantum-capable adversaries could one day compromise. This talk examines how quantum communication works, where it stands today, and what opportunities and barriers exist for its adoption across different contexts. We must all engage with this technology now, not as passive observers, but as active participants in shaping a secure quantum future.

Biography: Elliot Amponsah is a Research Assistant with the Quantum Computing and Assistive Technologies Lab, KNUST, Ghana. He holds a BSc in Telecommunication Engineering from KNUST and his research sits at the intersection of artificial intelligence, quantum computing, and next-generation networks. He is particularly interested in how these technologies can be combined to build networks that are smarter, more secure, and capable of detecting and recovering from faults on their own. His work is driven by a broader vision of communication infrastructure that is not just fast and connected, but truly resilient.

13:15—13:30 | Q&A