FEBRUARY 2025

CMU RESEARCH CLUB

Research Club at CMU-Africa

NEWSLETTER

Inside this Issue

FEBRUARY 2025 EVENTS

PhD Application Series Begins!

In February 2025, the CMU-Africa Research Club launched its PhD Application Series to guide students through the application process. For Part 1, we hosted **Hadiza Yusuf, MSEAI Class of 2024,** who is currently pursuing her PhD at the University of Michigan-Dearborn. She shared key steps for PhD applications, her journey from CMU-Africa to securing full funding, and the resources she used. Hadiza also highlighted how students can leverage their CMU experience to access global PhD opportunities.

The session recording with Hadiza is available here, and the template she shared can be accessed here.

PhD Research Chat with Ozioma Paul

Ozioma Paul, MSIT Class of 2021 and a final-year PhD student at Alliance Manchester Business School, recently visited Kigali and engaged in a thought-provoking discussion with the CMU-Africa Research Club. She shared her inspiring journey from CMU-Africa to a PhD program, offering valuable insights into the challenges, opportunities, and key lessons she encountered along the way. Ozioma also provided a deep dive into her ongoing research and highlighted the exciting industry opportunities she secured during her PhD, shedding light on how CMU-Africa students can navigate similar paths. You can download the slides here and watch the recording of the session by clicking here.

STUDENT RESEARCHERS SPOTLIGHT

Diane Mugunga, MSIT'2025

Research Topic: Deep Learning-Based Lesion Segmentation for Early Liver Tumor Detection in Rwanda
Supervised by: Prof. Ahmed Biyabani
Course: Project in AI for Healthcare.
Email: dmugunga@andrew.cmu.edu

Diane Mugunga, MSIT Class of 2025, is conducting research on Deep Learning-Based Lesion Segmentation for Early Liver Tumor Detection in Rwanda.

Because traditional medical imaging techniques often struggle with accuracy and consistency in detecting liver lesions, leading to delayed diagnoses and treatment. Diane and her project colleague, Damilare Olatunji, under the guidance of Professor Ahmed Biyabani, developed a model that leverages ResNet34 for lesion detection and U-Net architecture for segmentation. Their model demonstrated exceptional performance, significantly improving precision and segmentation quality compared to existing approaches, making it a promising tool for clinical applications.

This research is particularly relevant to Rwanda's healthcare system, as it explores the integration of AI-driven models into web-based and mobile applications. By enhancing radiologists' efficiency, this innovation could enable faster, more reliable diagnoses and better monitoring of liver lesions, ultimately helping to reduce the burden of liver cancer in the region.

By applying deep learning to medical imaging, Diane's work bridges the gap between early diagnosis and timely treatment, offering a scalable solution that could transform AI-driven healthcare innovations in Africa. If you want to know more about this research, you can reach Diane on her email address.

Have a research you want us to feature on our newsletter? Reach us today !!!

Stephen Tipa, MSIT'2025

Stephen Tipa Augustine, MSIT Class of 2025, recently presented his research on Forecasting Rwanda's Rainfall Patterns using Agglomerative Clustering, SARIMA, and Hidden Markov Models with Gaussian Mixture Emissions.

With Rwanda's rainfall patterns becoming increasingly unpredictable, understanding these changes is essential for farmers to plan their planting and harvesting seasons effectively and for policymakers to make informed decisions that support optimal agricultural productivity. Recognizing this challenge, Stephen took on the research as part of his MSIT practicum, under the supervision of Prof. Edwin Mugume and Prof. Tim Brown.

By leveraging advanced machine learning algorithms, he developed a highly accurate model for predicting rainfall patterns. This ongoing research holds significant potential for addressing climate-related agricultural challenges in Rwanda. We encourage MSIT students to explore similar opportunities to work on impactful research that addresses pressing issues across Africa. If you want to know more about this research, you can reach Stephen on his email address.

Research Topic: Forecasting Rwanda's Rainfall Pattern Using Agglomerative Clustering, SARIMA, and Hidden Markov Models with Gaussian Mixture Emissions
Advised by: Prof. Edwin Mugume & Prof. Tim Brown
Email: stipa@andrew.cmu.edu

RESEARCH OPPORTUNITIES AT CMU-AFRICA

At CMU-Africa, every student engages in research through assignments, course projects, reports, and more. In essence, we are all researchers. Here are some resources and opportunities to help you get started and excel in research:

1. Research Methods in Engineering Course: Your journey begins with this foundational course, offered in both Fall and Spring semesters.
2. Join Research Groups: Explore opportunities to volunteer or intern with various research groups during the summer. These experiences provide hands-on exposure to cutting-edge projects.
3. Research Track for MSIT Students: IT students can opt for a dedicated research track designed for students interested in pursuing a research career or a Ph.D. after their program.
4. Independent Study or Engineering Research Project: Students can also undertake independent study or research project which offers a way to engage in research while earning course units. Reach out to the academic advisor for guidance on this option.
5. The Department of Electrical and Computer Engineering CMU-Pittsburgh also has open research opportunities for students. More information here.
6. CMU Africa, Libraries Research Guide here.
7. Learn more about CMU Africa research here.

For more opportunities, reach out to the Research Club officials.

Available

Digital Foundations for Sustainable Transportation

WE WILL GAUGE THE APPLICABILITY OF VARIOUS INTELLIGENT TRANSPORT / E-MOBILITY SYSTEMS IN DIFFERENT SOCIO-ECONOMIC CONTEXTS.

PROJECT DETAILS →

Available

Digital Malaria Control for the Developing World

THE PROJECT EMPLOYS MACHINE-LEARNING CLASSIFICATION METHODS ON MICROSCOPIC IMAGES OF BLOOD SMEARS TO DETECT MALARIA PARASITES AND MIXED INFECTIONS.

PROJECT DETAILS →

Available

Enhanced CVD Discovery in Medically Underserved Communities via AI-assisted Stethoscopy

THIS RESEARCH AIMS TO ENHANCE THE DIAGNOSTIC CAPABILITIES OF ELECTRONIC STETHOSCOPES.

PROJECT DETAILS →

Available

Enhancing Parents' Reporting and Prediction of Adverse Effects following Maternal and Child Immunization in Rwanda through Mobile Application

THIS PROJECT WILL STRENGTHEN VACCINE SAFETY MONITORING AND IMPROVE PUBLIC HEALTH OUTCOMES IN RWANDA.

PROJECT DETAILS →

Available

Evading AI-based Radar Detection

MACHINE LEARNING METHODS HAVE BEEN USED TO DETECT OBJECTS BEHIND WALLS. CAN WE DEVELOP A METHOD THAT WOULD EVADE AI DETECTION?

PROJECT DETAILS →

Available

Leveraging Large Language Models for Enhancing Public Healthcare

WHEN IS IT USEFUL TO USE LLMS TO ADDRESS CRITICAL HEALTHCARE CHALLENGES IN UNDERSERVED COMMUNITIES?

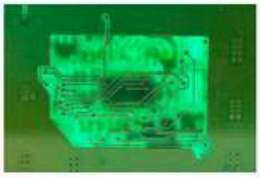
PROJECT DETAILS →

Available

LLMs for Maternal Health Question-Answering and Complications Detection

THE HIGH RATES OF MATERNAL MORTALITY IN AFRICA CAN BE ADDRESSED BY IMPROVING MATERNAL KNOWLEDGE ON OBSTETRIC DANGER SIGNS.

PROJECT DETAILS →



Available

ML-accelerated Prediction of Thermoelectric Semiconductors from Locally Sourced Wolframite

THIS PROJECT WILL MAXIMIZE THE THERMOELECTRIC EFFICIENCY OF WOLFRAMITE MATERIALS AWO(4) USING ML-ACCELERATED ATOMISTIC SIMULATIONS

PROJECT DETAILS →

FACULTY RESEARCHER SPOTLIGHT

Professor Edith Luhanga

Prof. Edith Luhanga is an Assistant Research Professor at Carnegie Mellon University Africa (CMU-Africa). She joined CMU-Africa as a postdoctoral researcher in 2021 before advancing to her current role in 2022. She holds a Ph.D. in Information Science from the Nara Institute of Science and Technology, Japan, as well as an MSc in Advanced Computing Science and a BEng (Hons) in Electronic and Computer Engineering from the University of Nottingham, UK. Prof. Luhanga teaches Applications of AI in Africa and the ICT Entrepreneurship Seminar, focusing on leveraging technology for real-world impact.

Chat with Prof. Luhanga - Overview

In February 2025, the CMU-Africa Research Club had the opportunity to speak with Prof. Edith Luhanga. She shared insights into her research, current projects, and valuable advice for students interested in research and innovation.

What advice do you have for students without prior experience who want to venture into research?

Start by exploring faculty pages, Google Scholar, and ongoing research at CMU-Africa. Reach out to faculty members to learn about their work and opportunities and how to get involved. You can start by volunteering, applying for research assistant positions, joining summer internships, or taking in-class research-focused courses that may lead to publications.

Tell us about your research interests, current projects, and how students can get involved?

My research focuses on identifying how to effectively use artificial intelligence and games to help people set and achieve behavior change goals. I am running studies on using social features and conversational interfaces to improve maternal health, using explainable AI and gamification to improve diagnosis and therapies for autistic children, and using collaborative games to improve children's cybersecurity. I post research opportunities on the student recruitment portal and welcome student volunteers, summer interns, and I also advise capstone projects.

When selecting students for your lab, what qualities do you look for?

Technical knowledge is always important, especially in data analysis and programming skills. Additionally, while domain knowledge is appreciated, it is not always required. However, students need to be passionate about the research, and be flexible in solving problems encountered during research by demonstrating fast and critical thinking abilities to provide effective solutions. Ultimately, this is a very crucial skill.

How can research help students interested in startups and industry rather than a PhD?

Product design, for example, requires understanding users and why a product stands out from others to create exponential value and attract users. Research skills, such as literature reviews, identifying gaps, questioning evidence, and embracing the wealth of data about Africa, are essential. You will be able to engage your analytical skills, e.g., content analysis of apps. Structured methods for identifying gaps are very important for any innovator. Research helps you think ahead 5 to 10 years to stay ahead of the innovation market, using emerging techniques that lead to game-changing innovation and make your products stand out. Read this short article to understand how this helps.

How can students ensure their research has a tangible impact on society, particularly Africa?

First, recognize that you can contribute, just as past CMU-Africa students have done research to solve problems in Africa. Shift your mindset from limitations to possibilities. Focus on what African people needs and innovate by building affordable and accessible solutions. Instead of questioning what is possible, think about what is valuable and cost-effective. This approach will lead to making impactful innovation for Africa

Ask a Professor

How can students apply their knowledge from mathematical courses to build or develop better machine learning models?

Like any research process, improving ML models starts with identifying a clear problem—often when existing models fail despite tuning. The key step is diagnosing the mathematical issue at its core rather than relying on high-level model adjustments. A well-defined problem leads to deeper insights, allowing students to refine assumptions, optimize learning strategies, and develop more effective solutions that enhance model performance and reliability at the fundamental level.

- Prof. Moise Busiogi

PhD Opportunities for Fall 2025

Are you a recent graduate of CMU-Africa, or you are in the second year looking for PhD opportunities?.
Here are some of the best fully funded opportunities for you to pursue PhD in the US and Europe.

1. PhD position in Shape Visual Serving of Deformable Objects Robust to Model Uncertainties - link (Deadline - Until position is filled)
2. Fully funded PhD in Artificial Intelligence & Analytics for Software Engineering at University College London - link - (Deadline for cycle 1 - Feb 7, 2025 | Deadline for cycle 2 - Apr 11, 2025)
3. PhD project at University of Sheffield - Joining the Dots between AI, Machine Learning and Materials Advances in Green Technologies - link (Deadline - Rolling deadline)
4. PhD project at University of Bath - Enhancing 3D Control of Robotic Limbs Using Brain-Computer Interfaces with Reinforcement Learning - link (Deadline - March 09, 2025)
5. Second call for PhD in Computer Science at the University of Birmingham - link (Deadline - March 6, 2025)
6. Australia Awards Multiple Mphil/PhD Scholarships - link (Deadline - 30 April, 2025)
7. PhD in Transport Engineering and Planning at the University of Edinburgh - link (Deadline - May 31, 2025)
8. President's PhD Scholarships at Imperial College London - link (Deadline - March 10, 2025)

March 2025 - Upcoming Events

PhD Application Series - Part 2

Crafting a Strong SOP, CV, and Finding PhD Supervisors

Join us for an insightful and exciting event where you'll learn how to craft a compelling Statement of Purpose (SOP), build a standout CV, and find the right PhD supervisor. Our speaker secured admission into the PhD program at CMU LTI while still writing his undergraduate final exams—so you won't want to miss this!
If you missed the first event in this series, now is your chance to catch up. Come prepared with your questions and get ready for a mind-blowing session!

Research Poster Workshop

Creating a Research Poster

Join us for a hands-on workshop on designing a compelling research poster! This session will equip you with essential skills to visually communicate your research, making it clear, engaging, and impactful. Whether you're preparing for a conference or simply want to showcase your work effectively, this workshop is for you. Don't miss this opportunity to enhance your presentation skills and make your research stand out!

Alumni Corner - Ozioma, Class of 2021

Ozioma Paul's Work on Inclusive School Bus Routing

At CMU-Africa Research Club, we proudly celebrate our alumni who are driving impactful change through research and innovation. This month, we spotlight **Ozioma Paul, MSIT, Class of 2021** who is leading groundbreaking research on Large-Scale School Bus Routing, Inclusive of Special Needs Students and Heterogeneous Fleets in North West England.
Since graduating from CMU-Africa, Ozioma has worked at the World Bank, secured prestigious fellowships, and contributed to transformative projects. Now, she is at the forefront of research aimed at optimizing school transportation systems for students with disabilities, ensuring equitable access, efficiency, and improved mobility for all. Her work is paving the way for more inclusive and sustainable transport solutions.

Your research focuses on optimizing school bus routing for inclusivity for children with special needs.. What inspired you to take on this research in your PhD program?

I am passionate about solving transportation challenges, having personally experienced long hours of traffic congestion while living in Lagos. During my time at CMU-Africa, I conducted research supervised by Prof. Patrick McSharry on demand forecasting for the Lagos Bus Rapid Transit (BRT) system, analyzing commuter trends to improve efficiency. This experience inspired me to apply for this PhD project, as it aligns with my research interests and commitment to enhancing urban mobility.

What real-world impact do you hope your work will have at the end of you PhD research?

In England, many parents of disabled students are forced to hire taxis to get their children to school, as it is often easier than using public buses or cabs. As a result, these students are unable to travel with their peers, further isolating them in an already challenging social environment. This separation negatively impacts their social experience, reinforcing feelings of being different. The greatest achievement of my PhD would be not only publishing academic papers but also producing policy briefs and materials that help non-technical audiences, such as local councils, make informed decisions. My goal is to reduce the isolation experienced by people with special needs, and seeing my work implemented in real-world policies would be deeply fulfilling.

You've balanced roles at the World Bank, won fellowships, and worked at different institutions during your PhD. How do you manage these commitments & how has your PhD shaped your journey?

I am deeply interested in industry and the practical application of research beyond academia. My focus is on industry applications with a clear end goal, understanding the roles and opportunities I want to pursue. This perspective has reinforced my decision to gain experience in data-related roles, ensuring I stay updated on industry standards. This motivation helps me stay balanced and focused. Another key factor in my journey has been time management. I see every role, opportunity, and research project as a chance to make an impact. My PhD has not only made me a better researcher but has also strengthened my professional skills. Likewise, my industry experience has enhanced my research capabilities. Through my time in the industry, I have developed skills in people management, data collection, relationship management, self-motivation, and delivering high-quality results—skills that continue to shape my approach to both research and practice.

What advice would you give to CMU-Africa students aspiring to make a similar impact?

To succeed, it is crucial to start with the end in mind by defining your career goals early, whether in industry or research. Managing your time and energy effectively is essential, as you cannot be everywhere at once. Align your course selection with your aspirations and build strong relationships with your professors, as they can provide guidance and opportunities. My early engagement in research during my time at CMU-Africa allows ample time for data gathering and progress. Be active in class to ensure professors know you, and seek opportunities by inquiring about their projects. Strong networks lead to valuable references and hidden opportunities, making time management a key factor in success.

Have you followed us on our social Media?

The research club has opened our official pages where you will get information about research, opportunities and very insightful contents. Kindly follow us on our LinkedIn page by clicking on the icon below and engage our posts.

Call for Research Cluster registration

Do you want to join our research clusters?.

Primary Target - Course based research

The research clusters are open to provide a supportive community of fellow student researchers like you, who will track progress, address challenges, and work towards publishing your research project.

Scan the QR code to register for a cluster or fill the form here

Feedback for Research Club

Do you have feedback for us?

- As a student researcher, do you want to share your research?
- Do you have any opportunities you want to showcase on this newsletter?
- Ask a Professor - Do you have a question for faculty you want us to feature on the next newsletter?
- Do you have an Alumni, doing amazing works, you want us to feature?
- Any other suggestions

Scan this QR code or fill the form here

Your feedback is highly appreciated

Thank you for reading

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