JANUARY 2025

CMU RESEARCH CLUB

Research Club at CMU-Africa

NEWSLETTER

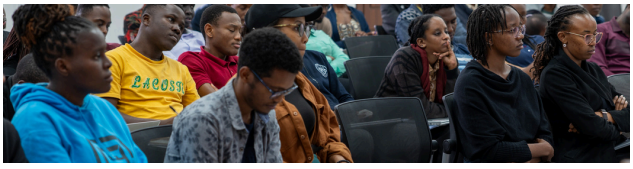
Inside this Issue

Research Club Welcomes New Executives

The CMU-Africa Research Club conducted elections on the 23rd of November 2024 and proudly introduces its newly elected leadership team: Edward Ajayi as President, Stephen Oduh as Vice President, Angelique Uwamahoro as Strategist, and Joel Adebayo as Community Engagement Officer.

This team envisions boosting student participation in research while fostering strong collaborations among students, faculty, and external partners. They are committed to creating a vibrant research community and encourage active student involvement to drive exponential growth in research at CMU-Africa.

January Events



Research Club - Meet and Greet

On 21st of January, the first meeting of the year happened where we had an insightful session with Prof. Okeyo on how to take advantage of research opportunities at CMU in 2025.

Research Clusters Formed

The Research Club has successfully established major clusters to enhance collaboration and support for members. These clusters are organized based on key research areas, including Computer Vision, Deep Learning, Mobile Big Data, Humanoid Robotics, and Capstone Projects. Each cluster will be led by a designated head responsible for overseeing activities, aligning with members' research work, and ensuring consistent communication. Sub-clusters, comprising groups working on specific projects, will register with the club to be part of this system

STUDENT RESEARCHERS SPOTLIGHT

Kipngeno Koech, MSEAI'26

Research Topic:
Improving SSVEP BCI Spellers With Data Augmentation and Language Models
Supervised by:
Bhiksha Ramakrishnan and Rita Singh
Course:
Introduction to Deep Learning

CMU-Africa student Kipngeno Koech, MSEAI Class of 2026, collaborated with three other students from Carnegie Mellon University's Pittsburgh campus on a project titled Improving SSVEP BCI Spellers With Data Augmentation and Language Models. This work was part of their 11875 Introduction to Deep Learning course, taught by Prof. Bhiksha Ramakrishnan and Prof. Rita Singh.

Inspired by a vision where technology seamlessly integrates with human thought—enabling intuitive interactions like controlling devices with brain signals or curating playlists based on mood—the team focused on advancing brain-computer interfaces (BCIs). They improved SSVEP-based BCI spellers by leveraging data augmentation and language models to enhance accuracy and reliability.

Normally, these spellers rely only on brain signals to guess letters, but they added knowledge about how letters commonly follow each other in a language like English. For example, if someone spells "H," the system knows "I" is likely next, improving accuracy even when brain signals are unclear.

Following their successful class project, the team published a preprint of their findings here, showcasing the exceptional quality of work at CMU. This achievement serves as inspiration for students to strive for excellence and share impactful research with the broader community.

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

Chisom Ogbogu MSIT'26

Research Topic:
Simulation of PEM Electrolyzer Power Management with Renewable Generation in Owerri, Nigeria
Advised by:
Prof. Jesse Thornburg

Chisom Ogbogu, a MSECE-AD student, class of 2026 at CMU-Africa, co-authored a research paper titled Simulation of PEM Electrolyzer Power Management with Renewable Generation in Owerri, Nigeria. Advised by Prof. Jesse Thornburg, the study which can be found here developed a Wind-Solar-Grid-Electrolyzer model using Matlab to optimize hydrogen production while addressing renewable energy intermittency. By integrating hybrid energy sources, the model ensured stable and efficient operations during fluctuating climatic conditions.

The research also explored advancements in green hydrogen technologies, focusing on reducing the cost of Proton Exchange Membrane (PEM) Electrolyzers through alternative materials to replace rare-earth metals. These innovations aim to make PEM systems more affordable and scalable.

This work addresses energy poverty in sub-Saharan Africa by proposing a sustainable energy solution that combines renewable energy with hydrogen systems to provide reliable power. The findings underscore the importance of integrating advanced electrolyzer technologies with renewable energy to accelerate the transition to a hydrogen-based economy in underserved regions.

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.

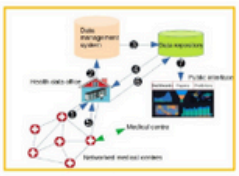
For more opportunities, reach out to the Research Club officials.

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.

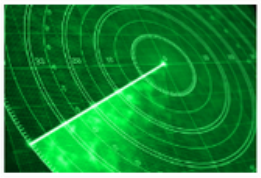
PROJECT DETAILS →

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?

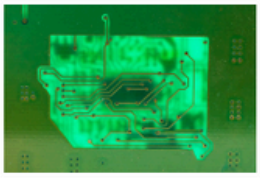
PROJECT DETAILS →

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 Ismaila Dabo

Professor Ismaila Dabo is a faculty member in the Department of Materials Science and Engineering at Carnegie Mellon University (CMU), with a joint appointment at CMU-Africa. He also serves as Director of Strategic Graduate Initiatives in the department.

Professor Dabo earned his Ph.D. in Materials Science and Engineering from the Massachusetts Institute of Technology (MIT) and he recently won the Presidential Early Career Award for Scientists and Engineers (PECASE), the highest honor bestowed by the U.S. government on outstanding scientists and engineers early in their careers.

Chat with Prof. Dabo - Overview

In January, we had a conversation with Professor Ismaila Dabo about his role at CMU, his research, and his advice for students and upcoming researchers at CMU-Africa.

Congratulations on your recent award. How do you feel about the recognition?

I am deeply honored to be nominated by the National Science Foundation and grateful for this award. My heartfelt thanks to my students, colleagues, mentors, wife, children, friends, everyone from Guinea and France, and my parents, who instilled in me the work ethic in whatever I undertake. I am also happy to share this achievement with the CMU-Africa community

What research projects are you working on currently working on?

My research focuses on predictive simulation of materials, using machine learning to accelerate material discovery. This enables advancements in solar cells, fuel cells, batteries, and quantum computing. I am currently working on sustainable electrochemical metal extraction for mining, with important benefits for Africa's economic development

How can students train themselves to think critically and ask meaningful research questions?

Research often starts with discussions, and a crucial step in the process is engaging with experts in your area of interest. For instance, Prof. Vernon's talk with the research club last year provides valuable insights, and his Beginner's Guide to Research offers a detailed explanation of the research process. It serves as a helpful resource for students. At CMU, taking courses like Research Methods for Engineers is a great way to build a solid foundation in research. This course introduces students to essential research practices and methodologies, equipping them with the tools necessary for successful research endeavors

How can students build connections within the research community?

CMU-Africa offers seminars and talks that provide opportunities to engage with speakers and build connections. Engaging with speakers during or after their presentations helps foster connections. Students can also reach out to professors and participate in the Exchange Program in Pittsburgh, which offers research activities and collaboration. Summer internships further support networking and growth. Building connections requires time, persistence, and consistent communication with experts.

What advice do you have for CMU-Africa students venturing into research?

Striving for excellence is critical, as the skills developed in coursework are essential for tackling complex research problems. To be innovative and create groundbreaking solutions, technical knowledge, and perseverance are key. Everything learned in your courses prepares you to solve challenges, and demonstrating commitment to your coursework is vital. These attributes are the keys that will open the doors of research.

Ask a Professor

What do faculty look out for when accepting student researchers in their Lab?

There is no one-size-fits-all answer to this question, but some essential qualities for a student include:

- **The ability to read and analyze literature critically and identify research gaps. This is crucial for advancing knowledge in any field.**
- **Excellent writing skills, as they enable you to present your work effectively. Poor writing is not a good attribute of a researcher. Take courses in technical writing to develop strong writing skills.**
- **Strong presentation skills. Ensure you can communicate your ideas clearly, even to a non-technical audience, so they understand your work**

- Prof George Okeyo at Research Club event, January 2025

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 Servoing of Deformable Objects Robust to Model Uncertainties - link (Deadline: Until position is filled)
2. PhD scholarship at UCD School of Computer Science for Fall 2025 - link (Deadline: Feb 10, 2025)
3. 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)
4. PhD project at University of Sheffield - Joining the Dots between AI, Machine Learning and Materials Advances in Green Technologies - link (Deadline: Rolling deadline)
5. PhD project at University of Bath - Enhancing 3D Control of Robotic Limbs Using Brain-Computer Interfaces with Reinforcement Learning - link (Deadline - March 09, 2025)
6. National Industry PhD Program Scholarship at the University of Adelaide - link
7. Second call for PhD in Computer Science at the University of Birmingham - link (Deadline - March 6, 2025)

Australia Awards Multiple Mphil/PhD Scholarships - link (Deadline - 30 April, 2025)

Introducing - PhD Application Series

The Research Club at CMU-Africa will be holding the PhD Application series this Spring 2025 semester. Do you have an Idea how and when to start, what you need to apply for a PhD program in the coming application season.
Don't worry, we have got you covered. The PhD application series will be starting this month and the date will be advised via email. Ensure you attend so we can help you discover how to secure the PhD program of your dreams

February 2025 - Upcoming Events

PhD Application Series - Part 1

Week 2:

Overview and preliminary steps for PhD applications

This session will cover the essential information you need to prepare for a PhD application. Topics include: Key documents to prepare, How to find PhD opportunities and Important steps.

- Do you have any questions about what you need to apply for a PhD?
- Do you have doubts you need clarification on concerning the PhD application process?

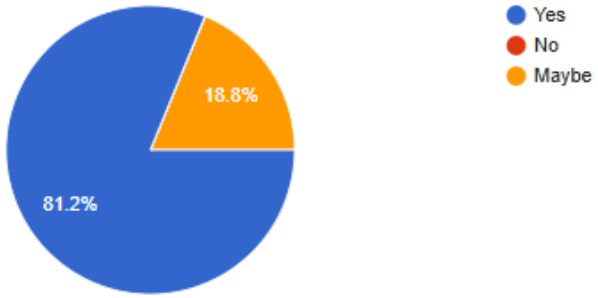
Plan to attend!

CMU-Africa Students Outlook on Research

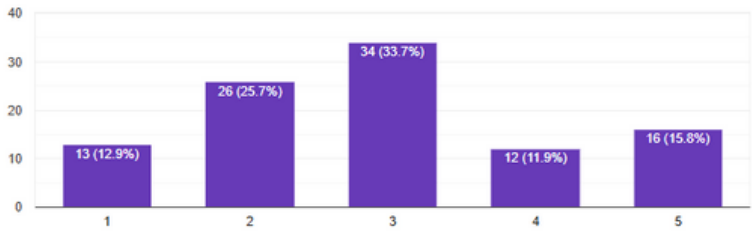
In January 2025, the CMU-Africa Research Club conducted a comprehensive survey to gain insights into the diverse demographics and research interests of our student community. This initiative was aimed at understanding where students' passions lie and identifying ways to create more tailored opportunities to support their academic and professional growth. Please see feedback from over 100 respondents.

WHAT ARE THE FINDINGS?

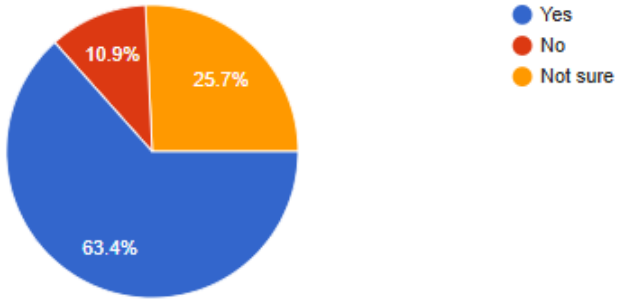
Are you interested in research?



How many hours can you devote to research in a week?



Are you interested in pursuing a PhD? after CMU



Independent Study or Collaborative Research?

Insights from Survey

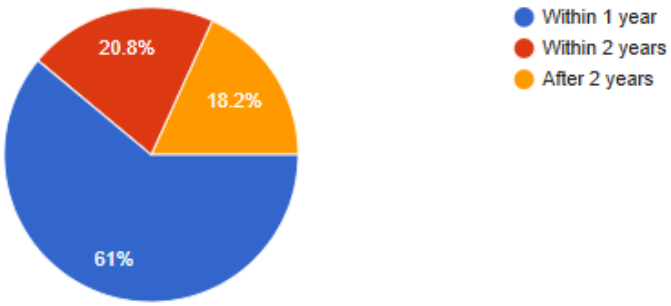
The recent student survey reveals a strong positive inclination toward research among the majority of students, while others remain undecided about their stance on research. This indicates that research holds significant interest within the CMU-Africa student community. Notably, a substantial percentage of students interested in research expressed a desire to pursue a PhD after CMU, with 61% planning to apply in Fall 2025.

When it comes to research preferences, about half of the respondents are open to engaging in both individual and collaborative research, while around 40% prefer to focus solely on collaborative efforts. Additionally, over 86% of students are willing to dedicate a minimum of 2 hours per week to research activities.

As we move into 2025, the Research Club at CMU-Africa is committed to accommodating the diverse interests and aspirations of our students. Building on this feedback, the Research Club has introduced research clusters to provide structured opportunities for collaboration and innovation. These clusters aim to nurture a generation of future tech leaders in Africa by fostering research-driven innovation.

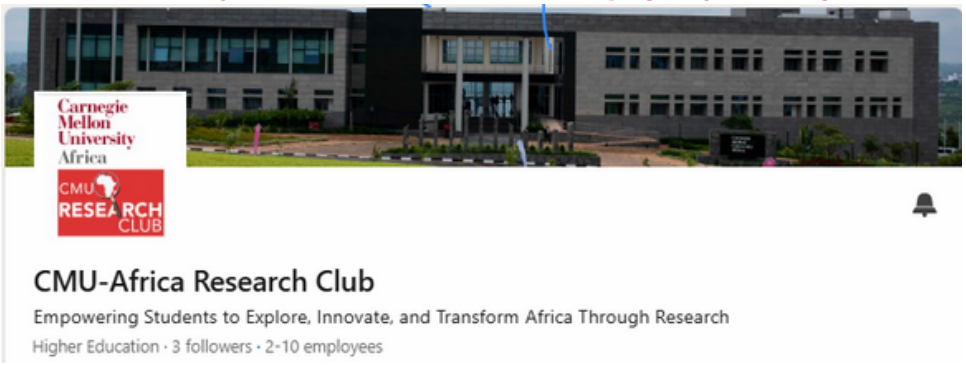
We encourage students to take full advantage of the details provided on the Research Opportunities page and to actively engage within the research clusters. The Research Club also seeks the invaluable support of our esteemed faculty in guiding students to develop outstanding research publications, particularly by leveraging their course projects as a foundation.

When do you plan to apply for the PhD?



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!



Call for Research Cluster registration

Do you want to join our research clusters?. We start this February.

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?
- 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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