Samuel Danquah Ankapong

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Research Interests

Surgical Robotics & Computer-Assisted Surgery, Rehabilitation Robotics, Sensing & Wearable Devices

Education

University of Ghana Oct 2021 – Sep 2025
BSc Biomedical Engineering, Second Class Upper (Honours); GPA: 3.49/4.0 Accra, Ghana
Relevant Coursework: Bioinstrumentation, Signal & Image Processing, Telemetry & Telemedicine, Bioelectronics, Medical Imaging, Bioinformatics, Programming for Engineers

Publications

Peer-Reviewed Workshop Publications

[C1] Akinmuleya, O.I., Akano, O.S., **Ankapong, S.D.**, Lawal, O., & Musah, T. "Evaluating the Generalization of Neuroimaging Foundation Models to African Clinical MRI." In *Proceedings of the AFRICAI Workshop at the 29th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2026).* (Accepted for Oral Presentation)

Manuscripts

[C2] Balapangu, S.S., **Ankapong, S.D.**, Yawuliga, D.B., Asiamah, R., Aidoo, E., Gakpo, H.S., Opoku-Boateng, A.T., & Kyei, J.J.A. "Design of a Deep Learning EEG Filter Using GAN-Based Synthetic Data for Simultaneous Removal of EOG and EMG Artifacts." Presented at the *11th IEEE International Conference on Adaptive Science & Technology (ICAST 2026)*, Accra, Ghana, 22 October 2026. (Proceedings publication pending)

Research Experience

Evaluating the Generalization of Neuroimaging Foundation Models to African Clinical MRI [C1] June 2026 – Aug 2026
Machine Learning & Model Training

- Implemented and trained the full machine learning pipeline evaluating four neuroimaging foundation models (BrainIAC, NeuroJEPA, NeuroVFM, Primus) via linear probing for three-way diagnostic classification (Control, Dementia, Parkinson's disease) on a 79–80 subject Nigerian clinical brain MRI cohort.
- Trained and benchmarked four modality configurations (T1w, T2w, T1w+T2w, FLAIR) under 5-fold subject-level cross-validation against an end-to-end 3D Vision Transformer (ViT3D) baseline.
- Demonstrated that all four frozen backbones collapsed to majority-class prediction (MCC ≈ 0), while ViT3D reached up to 53.4% accuracy (MCC = 0.27), and it was the only model with non-trivial recall across all three diagnostic classes.

Design of a Deep Learning EEG Filter Using GAN-Based Synthetic Data for Simultaneous Removal of EOG and EMG Artifacts [C2] Dec 2024 – Sep 2025

Undergraduate Researcher

Advisor: Dr. Srinivasan Shankar Balapangu

- Trained a Conditional Wasserstein GAN with Gradient Penalty (cWGAN-GP) on the EEGdenoiseNet dataset to synthesize 8,840 realistic noisy–clean EEG signal pairs, addressing clean-data scarcity.
- Developed MulSepEEGDenoiser, a multi-branch U-Net with dedicated EMG and EOG processing paths, Squeeze-and-Excitation attention, and adaptive indicator conditioning for simultaneous artifact removal.
- Achieved a 4.75 dB SNR improvement and 0.746 RRMSE; outperformed the Deep Separator baseline by 13.3% in RRMSE and 30.5% in correlation, with strongest performance in the alpha band (correlation 0.708).

An Ankle-Mounted, Edge-Enhanced Step Counter for Remote Rehabilitation Monitoring June 2025 – Sep 2025

Undergraduate Researcher

Advisor: Dr. Srinivasan Shankar Balapangu

- Designed and built an ankle-mounted wearable using a Raspberry Pi 5 and MPU6050 IMU for real-time gait monitoring in post-stroke and post-surgical patients.
- Implemented a 100 Hz on-device signal pipeline (gravity removal, 2nd-order low-pass filtering) and a weighted multi-feature step detector using spectral entropy, dominant frequency, peak-to-peak amplitude, and regularity variance.
- Developed a four-tier telemetry architecture (device → connectivity → cloud → application) with TLS-encrypted WiFi and BLE fallback, plus a real-time clinician dashboard.
- Validated against manual ground truth: 43% overcounting at slow gait and 26% at normal gait; analyzed error sources and proposed refractory, feature-weighting, and stationary-gating refinements.

BCPRED: A Web-Based Breast Tumour Classifier Using Machine Learning Sept 2023 – Nov 2023

Undergraduate Researcher

- Reduced the 30-feature Wisconsin Breast Cancer Database (569 samples) to 16 features via correlation heatmaps, swarm plots, and violin plots, cutting multicollinearity and improving model efficiency and interpretability.
- Benchmarked Logistic Regression, Random Forest, and XGBoost on the reduced feature set; XGBoost achieved 0.97 accuracy, 0.96 precision, and 0.97 F1-score.
- Built the deployment web application in Streamlit, enabling clinicians to input FNA cell-nuclei parameters and receive benign/malignant predictions with a model confidence score.

Projects

EMGrec: Real-Time Wireless EMG Acquisition System Apr 2026

github.com/sammydamz/emg-app

- Wrote ESP32 C++ firmware streaming muscle-sensor data at 1,000 samples/second over Bluetooth Low Energy, with sensor sampling and Bluetooth communication handled on separate processor cores for reliable real-time operation.
- Built the companion React Native app for live signal viewing, recording, and export; added remote start/stop/reset control from the phone.

Presentations & Posters

Ankapong, S.D., Aidoo, E., Nketia, G., Opoku-Boateng, A.T., Asamoah, S.O., Oppong, J.K., & Yabia, M.M. "Developing a Robust Web-Based Breast Tumour Classifier Using Machine Learning." Presented at the *1st Annual Engineering Conference, School of Engineering Sciences, University of*

Ghana, Legon, November 2023.

Honors & Awards

Best Paper Award, AFRICAI Workshop, MICCAI 2026 Sep 2026
Advancing African Medical AI through Global Integration (AFRICAI), MICCAI 2026 Satellite Event, Strasbourg, France
Awarded for "Evaluating the Generalization of Neuroimaging Foundation Models to African Clinical MRI" [C1].

Head of Department Recognition Award Aug 2025
Department of Biomedical Engineering, University of Ghana
Awarded to students and staff for outstanding contributions to the department.

2nd Runner-Up, Texpo Hackathon '24 April 2024
Techten Planet LBG, Ghana
Co-designed and built a vehicle heat-stroke prevention device using temperature, humidity, and CO_2 sensors on a Raspberry Pi with a 3D-printed enclosure; presented as Team SASEK.

Leadership & Service

President, Vispad Community Research 2022 – 2024
Vispad Institute of Technology, Accra

- Led a student research community at the University of Ghana, training members in research fundamentals (literature review, scientific writing) and computational skills (programming, machine learning, computational tools).

Investment Fellow July 2025 – June 2026
ReachSci

- Supported startups in building comprehensive data rooms, refining business models, and preparing fundraising materials for investment readiness.

Public Relations Officer Aug 2023 – Aug 2024
Ghana Society of Biomedical Engineers, UG Local (GSBE-UG)

- Represented the society to university administration and external stakeholders.
- Coordinated inter-chapter programming with other GSBE-UG locals across Ghana.

Editorial Board Member Feb 2024 – Apr 2024
School of Engineering Sciences, University of Ghana

- Collaborated with the team on the development and publication of newsletters and other media items.

Teaching & Mentorship Experience

Teaching Assistant, Bioinformatics Oct 2025 – April 2026
Department of Biomedical Engineering, University of Ghana Accra, Ghana

- Assist in delivering lectures and organize tutorial sessions for undergraduates enrolled in the Bioinformatics course.
- Guide students in using computational tools and Python IDEs for practical sessions (e.g., ML-based drug target prediction).

Lead Organizer & Tutor, AI Essentials for Engineers Workshop July 2025
Engineering Students Association, University of Ghana Accra, Ghana

- Designed the curriculum and led delivery of a 5-week workshop covering AI fundamentals, prompt engineering, and an introduction to AI agents for engineering undergraduates.

Technical Skills

Programming · C/C++ (ESP32 FreeRTOS firmware, BLE peripherals), Python, JavaScript, SQL, Bash
Machine Learning & Deep Learning · PyTorch, scikit-learn, XGBoost, Wasserstein GANs (cGAN-GP), U-Net architectures, Hugging Face Transformers
Biomedical Signal & Image Processing · EEG/EOG/EMG artifact removal, digital filtering, IMU-based gait analysis, medical image analysis
Embedded & IoT Systems · ESP32, Raspberry Pi, MPU6050 IMU & sensor integration, edge computing, 3D printing
Web, Data & Tools · Streamlit, FastAPI, React/Next.js, Supabase, MySQL, NumPy, Pandas, Matplotlib, Seaborn, Git/GitHub, Linux, LaTeX