Mercy Amankwah, PhD

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Summary

PhD in Applied Mathematics with expertise in quantum algorithms, Bayesian modeling and predictive analytics. Developed quantum-classical hybrid models and data encoding techniques, achieving 97% recovery fidelity in quantum image processing. Optimized gradient computations by 99%, with 6 publications cited 55 times.

Experience

Outlier.ai – Mathematics Expert, AI Prompt Engineering *Jun 2024 – Present*
- Designed and evaluated complex mathematical prompts to train and assess large language models (LLMs).
- Provided structured feedback to improve model accuracy in mathematical reasoning.

Case Western Reserve University — Instructor & Graduate Researcher *Aug 2019 – May 2024*
- Developed Bayesian tools for motor control research, leading to 2 published papers.
- Designed 4 muscle recruitment models quantifying uncertainty up to 90%, enhancing clinical decision-making.

IONQ — Quantum Applications Scientist Intern *Jun 2023 – Aug 2023*
- Built machine learning models for hybrid quantum-classical computing, optimizing gradient computations by 99%.
- Developed scalable pipelines to improve computational efficiency in quantum-assisted learning tasks.

Berkeley National Laboratory — Quantum Algorithms Intern *Jun 2021 – Aug 2022*
- Designed quantum image compression algorithms, reducing data storage by 90%.
- Developed adaptive calibration routines, achieving 97% recovery fidelity in quantum state encoding.
- Conducted benchmarking on IBM, IonQ, and Quantinuum QPUs for quantum data processing.
- Co-authored 4 quantum computing publications on quantum encoding frameworks and visualization.

Selected Publications

- Quantum Pixel Representations and Compression for N-Dimensional Images (Nature Scientific Reports)
- Quantum-parallel vectorized data encodings and computations on trapped-ion and transmon QPUs (Nature Scientific Reports)
- Quantum Computing and Visualization: A Disruptive Technological Change Ahead (IEEE Computer Graphics & Applications)
- EHands: Quantum Protocol for Polynomial Computation on Real-Valued Encoded States (arXiv preprint)
- Exploring muscle recruitment by Bayesian methods during motion (Chaos, Solitions & Fractals)

Selected Projects

MYOBOLICA: Used Bayesian analysis and uncertainty quantification to model how humans walk through muscle forces.
Food Environment Atlas: Predicted U.S. County diabetes rates using advanced regression models.
Quantum Data Encoding for NISQ Hardware
- Developed quantum encoding frameworks, achieving 97% recovery fidelity with error mitigation techniques.
- Demonstrated quantum DNA pattern matching and Hamming weight computation on real QPUs.

QPIXL: Quantum Pixel Representations for Image Processing
- Designed advanced quantum compression algorithms, reducing data storage by 90%.
- Implemented publicly available software (QPIXL++) for quantum image processing research.

Skills

Quantum Algorithms: Quantum Data encoding, Hybrid Quantum-Classical Methods
Machine Learning & Statistics: Quantum ML, Bayesian inference, uncertainty quantification, predictive modeling
Programming: Python, SQL, MATLAB
Soft skills: Clear communication, Cross-functional collaboration, Leadership, Adaptability

Education

Case Western Reserve University, **PhD Applied Mathematics** Aug 2019 – May 2024
Kwame Nkrumah University of Science and Technology, **MPhil Scientific Computing** Sep 2016 – Jul 2018
Kwame Nkrumah University of Science and Technology, **BSc Mathematics** Sep 2012 – May 2016

Selected Leadership Roles

Vice President, Graduate Council of Arts and Sciences Aug 2022 – May 2023

- Led Professional Development Week with 17 alumni-led events, launched a mentor-protégé program connecting 14 students, and raised $5,358 in funding through strategic outreach and resource management.

Founding President, Society of Industrial and Applied Mathematics Students Chapter Jan 2022 – May 2023

- Expanded the chapter from 1 to 68 fostering cross-disciplinary collaboration.