

Hongbin Liu

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Summary

PhD student in Biomedical Engineering at Rensselaer Polytechnic Institute with a B.S. in Computer Science and research experience in developing machine learning, statistical modeling, and optimization methods for biomedical omics and healthcare data analysis.

Education

Rensselaer Polytechnic Institute

Troy, NY

Ph.D. in Biomedical Engineering

August 2028 (Expected)

B.S. in Computer Science

May 2023

Skills

Programming

Python, MATLAB, C/C++, SQL, SAS, Bash, Git

Libraries

NumPy, pandas, scikit-learn, PyTorch, Hugging Face, Qiskit

Professional

Technical communication and research presentations; Scientific and R&D writing; Cross-functional collaboration; Agile/Scrum workflows

Experience

Rensselaer Polytechnic Institute

Troy, NY

Graduate Research Assistant (Advisor: Dr. Juergen Hahn)

August 2024-Present

Feature Selection for Biomedical Data

- Formulated a novel Quadratic Unconstrained Binary Optimization objective for combinatorial feature selection in metabolomic data, improved mean classification accuracy by more than 5% over conventional mutual information objectives.
- Implemented Quantum Approximate Optimization Algorithm, Bias-Field Digitized Bias-Field Digitized Counterdiabatic Quantum Optimization, and Iterative Tabu Search, achieved solution quality comparable to classical exhaustive search with up to a 55x runtime speedup.

Quantum Kernel SVM for Biomedical Classification

- Developed feature encoded quantum kernel SVM for ASD blood biomarkers, achieved 94.3% accuracy under LOOCV on IBM quantum gate computer.
- Evaluated quantum feature maps, hardware noise sensitivity, and performance against classical baselines.

Additional Contributions

- Developed SAS workflows to clean and extract Medicaid claims, identify event-related procedure codes.
- Collaborate with biochemists to develop models examining associations between microbial metabolites and severity of ASD.

Research Assistant (Supervisor: Dr. Uwe Kruger)

August 2023-May 2024

- Led development of a C++ machine learning application for training and evaluating multilayer perceptron models on regression and multi-class classification tasks.
- Implemented ADAM optimizer and model training through CPU multithreading and batch parallelization.

Publication & Presentation

- **Hongbin Liu**, ..., Juergen Hahn. Quantum Machine Learning for Biomedical Classification Problems: A Feasibility Study on Real Quantum Hardware. *Annals of Biomedical Engineering* 2026
- Christina K Flynn, ..., Juergen Hahn, **Hongbin Liu**, ..., James B Adams, Sarah Kadzielski. Elevated microbially-derived metabolites in autism: a possible diagnostic screening test for a distinct ASD phenotype. *Molecular Psychiatry* 2026
- (Accepted Poster) BMES 2026 on "Classification of ASD involving Metabolites and QFS"