Henry Yu

henry.yu094@gmail.com | hyu448@wisc.edu

auroraarc.github.io | linkedin.com/in/henry-yu09

Education

Bachelor of Science - Computer Science — **Expected Graduation: May 2027**

University of Wisconsin - Madison — *Madison, WI*

Skills

Languages Python | Java | C/C++

Developer Tools Git | Fork | Docker | Kubernetes | VS Code | Tableau | Qiskit | AWS

Libraries Pandas | NumPy | Matplotlib | Seaborn | Scikit-learn | Pytorch

Experience

Computational Chemistry Research Intern — **Jun 2024 - Aug 2024**

St. Jude Children's Research Hospital — *Memphis, TN*

- Gained comprehensive introduction to computational chemistry, focusing on Density Functional Theory (DFT) and its applications in molecular systems.
- Explored the integration of ML, DL, and QC techniques into traditional computational chemistry methods.
- Studied the potential of quantum algorithms to overcome limitations in classical approaches for quantum systems.

Quantum Computing Research — **Sep 2023 - May 2024**

Indiana University — *Bloomington, IN*

- Conducted in-depth analysis of qubit coherence times and gate fidelities using IBM's Qiskit, primarily correlating T1/T2 times with single and two-qubit gate error rates.
- Employed advanced data analysis techniques, including regression modeling and covariance visualizations.
- Developed innovative technical solutions, such as a quantum classifier and artificial noise models.

Notable Projects

Quantum Computing and ML for DFT Calculations in Proteins — **Jun 2024 - present**

Computational Chemistry Research Intern | Qiskit, Pytorch, Schrodinger, PySCF — *Memphis, TN*

- Proposed a novel hybrid quantum-classical architecture integrating quantum computing with a graph CNN-like model for enhancing DFT calculations in large molecular systems.
- Developed a point cloud representation for atomic structures, offering flexible geometric representation suited for atomic data and efficient handling of various molecular geometries.
- Conceptualized a Quantum Circuit Born Machine (QCBM) to replace the output layer, aiming to produce electronic density distributions leveraging quantum computing power.
- Explored the potential of this approach to overcome limitations in current density calculation methods, particularly for large protein systems.

Improving QML Models Using Noise — **Jan 2024 - May 2024**

Quantum Computing Research | Qiskit, Matplotlib, Scikit-learn — *Bloomington, IN*

- Conducted comprehensive analysis on the effects of controlled noise introduction on quantum machine learning model performance.
- Engineered multiple artificial noise models and visualized their impact on a quantum variational classifier, benchmarking results against a classical support vector classifier for comparative analysis.
- Discovered a potential performance enhancement through the addition of amplitude dampening error, highlighting areas for further investigation.

Influence of Qubit Features on Error Rates — **Sep 2023 - Dec 2023**

Quantum Computing Research | Qiskit, Matplotlib, Scikit-learn — *Bloomington, IN*

- Performed in-depth time series analysis and regression modeling on 7-qubit and 127-qubit quantum systems using IBM's Qiskit SDK.
- Examined key qubit features including decoherence time, gate errors, and readout errors to predict error probabilities.
- Achieved an average R-squared score of 0.105 for predictions on the 127-qubit system, demonstrating the complexity of quantum error prediction.
- Received recognition for outstanding research presentation, earning a nomination for one of the top posters in the end-of-semester event.

Publications

- Lou Zhou, Henry Yu, Amar Kanakamedala, Jeffrey Liu, and Evan Wu, "Breaking the Cycle: Reducing Recidivism in Iowa State Prisons," *2023.2 ARCH*, Education and Research Section of the Society of Actuaries.