Hibah Agha

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Education

New York Institute of Technology — Old Westbury, NY
Bachelors of Science in Computer Science GPA 3.7/4.0 — *Sept 2019 – May 2023*

Experience

SULI Research Intern — Jan 2024 – Dec 2024
Brookhaven National Laboratory — *Upton, NY*

- Conducted research in Quantum Machine Learning Neural Architecture to experiment with DUNE (Deep Underground Neutrino Experiment) data under the supervision of Dr. Shinjae Yoo and Dr. Huan-Hsin Tseng.
- Researched autoencoders in classical machine learning to be implemented onto quantum machine learning algorithms to detect anomalies with Xanadu's Pennylane library.
- Implemented optimizing genetic algorithms among quantum autoencoders to select the highest-performing autoencoder to cluster DUNE data.
- Studied quantum mechanics to gain a deeper understanding of the principles behind quantum systems.

FBSEP Teaching Assistant — Jun 2023 – Aug 2023
Brookhaven National Laboratory — *Upton, NY*

- Assisted scientist instructors with lesson plans for early undergraduate students from underrepresented and underserved groups in STEM for the Summer program.
- Actively engaged with students to foster a passion for Particle Physics and neutrino simulations, AI/ML, and Quantum Computing.
- Provided students coaching on using Wolfram Mathematica, Google Colab, and IBM Qiskit.

Software Developer- Project Manager — Jun 2021 – May 2023
New York Institute of Technology — *Old Westbury, NY*

- Created software prototypes from NASA patents under a government contract in an Agile environment.
- Designed engagement programs for E.R.R.S.E.L.A, NYIT's proprietary robotic program.
- Scheduled biweekly meetings with team members to address the status of the patent. Created goals on when functionalities of the project were to be completed.

Projects

Intelligent Neural Networks — May 2023
Python, Keras, NumPy, Pandas, Tkinter

- Programmed a software prototype for NASA integrating both heuristic and autonomous neural networks to mitigate biases when recognizing numbers drawn by users.

Stock Market Analysis & Prediction — May 2023
Python, Scikit-learn, TensorFlow Keras, Prophet, Django, API

- Designed a software program with a friendly user interface that receives a ticker symbol with a start and end date as data to create predictions for a stock with Long Short Term Memory neural networks.

XPRESSASSIST 2.0 — Apr 2023
C#, ASP.NET, Microsoft SQL Server, Raspberry Pi

- Engineered a management system to aid managers in moderating neurodiverse employees in an industrial setting gleaning data from each employee formed in a report to the manager.

Trajectory Impact — Jan 2023
Python, C#, .NET, Adafruit, Raspberry Pi, REST API

- Built a program for NASA that collects strike zone magnitude from a metal sheet to send calculated coordinates to a web portal.

Crime Prediction Program — Dec 2022
Python, Scikit-learn, Numpy, Pandas, Matplotlib, SeaBorn

- Created a machine learning program that predicts crime occurring in different wards of Chicago.

HeartBeatID Sept 2022

Java, Microsoft Excel

- Developed a software program as a biometric authentication system for NASA utilizing an individual's heartbeat measurement and time from EKG data.

Technical Skills

Programming: Java, Python, HTML, CSS, JavaScript, C#, C++, PHP, and SQL.

Libraries: Pennylane, Qiskit, PyTorch, cuQuantum, TensorFlow, Pandas, NumPy, Scikit-learn, Matplotlib, SciPy, Cirq, and ReactJS.

Databases: Microsoft SQL Server and MySQL.

Operating Systems: Windows, MacOS, and Linux.

Leadership: Project Management, Personnel Management, Technical Training, Technical Documentation.

Honors and Awards

B.S. in Computer Science Dean's Award May 2023

- Awarded to a graduating student with a high academic average in the Bachelor of Science in Computer Science.

Presidential Honor List Sept 2019 – May 2023

- Maintained a GPA of 3.7 or higher.

Dean's Honor List Sept 2022 – May 2022

- Maintained a GPA of 3.5 or higher.

Theodore K. Steele Memorial Scholarship Sept 2019 – May 2023

- Awarded to incoming freshmen enrolled at New York Tech maintaining a GPA of 3.7 or higher.

Volunteer

LSAMP Northeast Workshop Oct 2024

- Presented research done at Brookhaven National Laboratory, discussing my application of quantum neural architect search used for clustering particle data.
- Engaged undergraduate students from the University of Connecticut and partnering institutes by explaining complex quantum computing concepts in an accessible manner, fostering a deeper understanding of the research process.
- Delved into the significance of quantum computing in particle physics with students, encouraging them to consider research opportunities in the field.

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Higher education for me was always a long shot. I grew up poor, and where many of my peers had SAT tutors, my family could barely afford to pay the medical bills, let alone afford prep courses. When I was very young, my sister was diagnosed with severe autism, and therapies for her were financially out of reach. I experienced firsthand the importance of equitable opportunities for individuals with disabilities and those from low-income backgrounds. I also became acutely aware of the role education plays, not only for myself but for those in similar situations. With my family's resources stretched thin, I had to find a way to chart my own path.

I ultimately had the privilege of attending NYIT, where I graduated in 2023 with my BS in computer science. In 2023 through the New York State Industries for the Disabled (NYSID) Cultivating Resources for Employment with Assistive TEchnology (CREATE) competition, I partnered with Spectrum Designs, an embroidery company in Port Washington, NY, that makes a focused effort to hire neurodiverse employees, particularly those on the autism spectrum. Through this partnership, I developed software to help employees with disabilities better track their timecards and communicate more effectively with their managers, verbally or otherwise. Specifically, our software helps employees communicate with their managers by providing direct messages or reports deviations from their schedules. Individuals with autism typically adhere strictly to routine, so the manager is promptly informed if there is an unexpected change. Unlike general data analysis software, ours creates routine-sensitive individualized forecasts for each employee, which allows managers to provide proactive support. This project was deeply personal, as I was used to seeing people treat my sister as "different". Having the opportunity to support people seen as marginalized and misunderstood was a formative moment in my career.

My academic path and personal experiences have driven me towards fields where I can make a meaningful societal impact. Specifically, I want to join a community where I can not only leverage cutting-edge technology, but also continue to help open doors for those from marginalized backgrounds. This has led me to quantum computing and machine learning, fields where I could tackle grand challenges. My journey in quantum machine learning specifically started with a desire to make sense of the interplay between the strangeness of quantum mechanics and the unique power of machine learning.

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At Brookhaven National Laboratory, I evaluated hybrid quantum-classical neural networks through genetic algorithms that were then utilized to cluster particle data originating from the Deep Underground Neutrino Experiment (DUNE).

The potential of making major technological breakthroughs, and the opportunity to open doors and create opportunities for those facing systematic barriers, are the primary motivators for me pursuing a PhD. Columbia University's cutting-edge research in quantum computing, particularly the Columbia Quantum Initiative, makes it a perfect environment for my doctoral studies. The interdisciplinary nature of a lab bridging computer science and quantum physics is an ideal fit for me to develop novel quantum algorithms. I am excited about the prospect of working with Dr. Henry Yuen in particular, whose work in quantum computing aligns with my research goals. Dr. Yuen's work utilizing the Uhlmann transformation to mitigate the noise within quantum cryptography is groundbreaking, and it would be a privilege to be a part of it. I am also enthusiastic about the prospect of working with Dr. Alexandr Andoni, whose expertise in theoretical machine learning aligns closely with my research interests. Dr. Andoni's work on robust hashing, which dynamically adjusts hashing functions to group similar data points even under worst-case scenarios, leading to faster, error-resilient similarity searches, is inspiring, and it would be rewarding to contribute. Pursuing a PhD at Columbia would allow me to give back as a mentor and researcher, working towards breakthroughs in technology and science and empowering people from all walks of life.