Hongbin Liu

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EDUCATION

Rensselaer Polytechnic Institute, Troy, NY

Bachelor of Science, Computer Science   May 2023

Overall GPA: *3.8/4.0*

Courses: *Parallel Programming, Database Systems, Network Programming, Operating Systems, Software Design & Documentation, Programming Language, Algorithms, Data Structures, Principles of Software etc.*

PhD, Biomedical Engineering   August 2024 - Present

HONOR

Institutional Honor: *Magna Cum Laude*

  Dean's Honor List: *Fall 2020, Spring 2021, Summer 2021, Fall 2022, Spring 2023*

      Dean's List: *Fall 2021*

RESEARCH

Rensselaer Polytechnic Institute, Troy, NY   July 2023-May 2024

<u>Research Engineer</u> in **Modeling and Analysis of Uncertainty**

Supervisor: Uwe Kruger, RPI

Led team in developing applications for data analysis & neural network training/testing.

- *Implemented multilayer perceptron training/testing pipelines featuring the ADAM optimizer.*
- *Enhanced computational efficiency by utilizing CPU multithreading for parallel computing, optimizing matrix operations & neural network training, such as batch parallel training.*
- *Developed a console application that trains MLP for regression and multi-classification task.*

Rensselaer Polytechnic Institute, Troy, NY   July 2023-October 2023

<u>Research Assistant</u> in **Cable Detection & Segmentation**

Supervisor: Santiago Paternain, RPI

Utilized the YOLO architecture for cable segmentation; Curated/Annotated a cable dataset.

- *Applied image augmentation technique to enrich training data.*
- *Leveraged transfer learning on a pre-trained model to enhance performance.*

Rensselaer Polytechnic Institute, Troy, NY   Summer 2021-Fall 2022

<u>Research Engineer</u> in **"Cure Quest" -- Mt. Sinai Clinical Translational Therapeutics Game**

Supervisor: Benjamin Chia-Ming Chang, RPI

Researched and Developed application to teach drug development for medical school.

- *Designed and developed the pitching and dialogue system for the game using Unity.*
- *Implemented functionality that enables distance detection to trigger nearby conversation.*

Rensselaer Polytechnic Institute, Troy, NY   Summer 2022-Fall 2022

<u>Research Assistant</u> in **Security Analysis of Algorand Blockchain Protocol**

Supervisor: Oshani Seneviratne, RPI

Conducted an in-depth review of Algorand's decentralized Byzantine agreement protocol.

- *Designed tests for evaluating Algorand's ability to manage collusion attacks.*
- *Investigated the consensus mechanism's ability to defend against attacks, such as undecidable messages, during the block proposal and voting phase.*

PROJECT

Massively Parallel Matrix Multiplication System   Spring 2023
- Designed and implemented a matrix multiplication algorithm leveraging both Message Passing Interface (MPI) and CUDA for optimized performance on the AiMOS supercomputer.
- Developed parallel I/O mechanism via MPI to ensure efficient data handling.
- Conducted performance analyses on sequential vs. parallel systems to quantify speedup.
- Tested the scalability of the system; evaluating performance against increasing MPI ranks.

Intelligent Contact Search Application   Summer 2021-Fall 2021
- Collaborated with the team to design, document, and achieve a contact search application.
- Configured a PostgreSQL database; designed schema; and wrote database test code.
- Employed MVC, Adapter, and Singleton design pattern.

SimpleKad Distributed Hash Table (DHT)   Fall 2021
- Implemented a DHT similar to Kademlia in Python using gRPC.
- Developed parallel, asynchronous queries to avoid timeout delays from failed nodes.
- Exploited peer-to-peer technology; Configured to route through low-latency paths.
- Simplified and automated the process of transferring configuration message.

INTERNSHIP

Shenzhen Kingdom Sci-Tech Co., Shenzhen, China (Remote)   June 2023- December 2023
C/C++ Development Engineer, Co-op Program
Contributed to enhancing an advanced trading system; improved performance and scalability.
- *Developed high-performance DAO module to reduce latency and improve throughput.*
- *Optimized network protocol communication to enhance data transmission and reliability.*
- *Streamlined interactions with SQL Server, creating efficient queries and stored procedures.*

ACTIVITY

Mentor | Software Design & Documentation   Summer 2022, Spring 2023
- Facilitated students to build their software applications utilizing the Agile approach.
- Improve students' ability to apply software system design methodologies to applications.

Mentor | Computer Science I   Fall 2022
- Guided students to design algorithms and programs to solve computational problems.
- Improve students' ability to write, test, and debug small-scale programs.

W2SZ Amateur Radio Club   Spring 2023
- Build a complete working radio set, including Morse code keys and antennas.
- Weekly simplex net.

RPISEC | Computer Security Club at RPI   Fall 2019-Spring 2023
- Obtained a wide variety of practical computer security skills.
- Participated in casual computer security CTFs (Capture the Flag).

SKILL

Amateur Radio: *Technician Class License*

Programming: *C++/ C/ C# (Unity)/ Java/ Python/ JavaScript/ Prolog/ Haskell/ PostgreSQL/ PyTorch/ OpenCV/ CUDA/ Numpy/ Git*