Youssef Elmougy

PH.D. STUDENT · GRADUATE RESEARCH ASSISTANT

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Summary

Motivated and talented PhD student seeking to leverage fluency in **C++**, **Python**, and **CUDA** to projects involving **runtime systems**, **distributed systems**, **parallel systems**, **high performance computing**, **deep learning / machine learning workflows**, **generative AI**, **graph algorithm optimization**, **cloud computing**, **GPU programming**, and **virtualized environments**.

Education

Ph.D. in Computer Science — *Atlanta, GA*
GEORGIA INSTITUTE OF TECHNOLOGY — *Aug 2022 - PRESENT*
- Research concentrated in HPC, Systems, and AI/DL.
- Working at the Habanero Extreme Scale Software Research Lab.
- Advisor: Vivek Sarkar.

M.S. in Computer Science — *Atlanta, GA*
GEORGIA INSTITUTE OF TECHNOLOGY — *Jan 2022 - Dec 2022*
- Specialization in High Performance Computing.
- GPA: 3.6/4.0, IEEE-HKN Student Member.

B.S. in Computer Science — *Atlanta, GA*
GEORGIA INSTITUTE OF TECHNOLOGY — *Aug 2020 - Dec 2021*
- Specialization in Artificial Intelligence and Computer Modelling.
- GPA: 3.8/4.0, IEEE-HKN Student Member.
- Graduated with Highest Honors.

B.S. in Computer Science — *Hempstead, NY*
HOFSTRA UNIVERSITY — *2017–2020*
- Concentration in Leadership and Innovation in Computing, Minor in Mathematics, GPA: 4.0/4.0, transferred to Georgia Tech.
- Presidential Scholarship Recipient, Provost Scholar, IEEE-HKN Student Member, Phi Beta Kappa's Chapter Book Award.

Research Experience

Graduate Research Assistant — *Atlanta, GA*
HABANERO EXTREME SCALE SOFTWARE RESEARCH LAB, GEORGIA TECH — *May 2022 - PRESENT*
- Increasing resiliency and performance of the HClib Actor-based runtime system by extending automatic communication termination protocols, distributed graph generation, and multithread execution.
- Building large-scale distributed graph algorithms, including triangle centrality, approx. triangle counting, jaccard index, and page rank.
- Developing zero-shot and few-shot classification models for tabular/numerical data using large language models (LLMs).
- Exploiting auto-regressive generative LLMs to generate realistic and accurate synthetic tabular/numerical data.
- Implemented a distributed and parallel Actor-based runtime system for cloud computing, allowing for HPC on the Cloud.
- Contributed in designing a distributed and asynchronous graph neural network (GNN) training system for large-scale graphs.
- Mentor: Vivek Sarkar.

Graduate Research Assistant — *San Francisco, CA*
LAWRENCE BERKELEY NATIONAL LAB — *May 2023 - Aug 2023*
- Worked within the Performance and Algorithms Research Lab on hybrid communication techniques and increasing fault tolerance of distributed learning for deep learning workflows.
- Built a hybrid AllReduce and Parameter Server approach to parameter distribution/update and collective communication for distributed training using PyTorch DDP and RPC.
- Provided a proof of concept for the effectiveness of elastic queues with heterogeneous resources on HPC supercomputers/clusters.
- Mentor: Khaled Ibrahim.

Research Assistant — *Atlanta, GA*
AUTOMATED ALGORITHM DESIGN, GT — *Aug 2020 - Dec 2021*
- Worked within Stocks subteam of AAD to alter the use of machine learning techniques in developing hybrid algorithms for stock price prediction.
- Programmed stock trading related primitives, objective functions, and genetic programming frameworks built on top of EMADE.
- Mentor: Jason Zutty.

Research Assistant — *Hempstead, NY*
HOFSTRA UNIVERSITY — *May 2019 - May 2020*
- Worked on systems and cloud infrastructure research.
- Research on diagnosing and optimizing the performance interference caused by CPU sharing in multi-tenant GPU clouds.
- Presented at ASPiRe Symposium '19, published paper in IPCCC '21.
- Mentor: Jianchen Shan.

Publications

2023 — *Elmougy, Youssef, Akihiro Hayashi, Jun Shirako, and Vivek Sarkar.* "***Asynchronous Distributed Actor-based Approach to Jaccard Similarity for Genome Comparisons***", (under submission at IPDPS), 2023.

2023 — *Elmougy, Youssef, and Ling Liu.* "***Demystifying Fraudulent Transactions and Illicit Nodes in the Bitcoin Network for Financial Forensics***", ACM SIGKDD, 2023.

2023 — *Elmougy, Youssef, Akihiro Hayashi, and Vivek Sarkar.* "***Highly Scalable Large-Scale Asynchronous Graph Processing using Actors***", IEEE/ACM CCGRID, 2023.

2023 — *Paul, Sri Raj, Akihiro Hayashi, Kun Chen, Youssef Elmougy, and Vivek Sarkar.* "***A Fine-grained Asynchronous Bulk Synchronous Parallelism Model for PGAS Applications***", Journal of Computational Science, 2023.

2021 — *Elmougy, Youssef, Weiwei Jia, Xiaoning Ding, and Jianchen Shan.* "***Diagnosing the Interference on CPU-GPU Synchronization Caused by CPU Sharing in Multi-Tenant GPU Clouds***", IEEE IPCCC, 2021.

2021 — *Elmougy, Youssef, and Oliver Manzi.* "***Anomaly Detection on Bitcoin, Ethereum Networks Using GPU-accelerated Machine Learning Methods***", IEEE ICCTA, 2021.

Other Experience

Robotics Teaching Assistant — *Atlanta, GA*
Georgia Institute of Technology — *Aug 2021 - May 2022*

- TA for the class CS 3630 - Introduction to Perception and Robotics.
- Engaged with students on topics of robotics planning, control and localization through weekly office hours.
- Prepared Cozmo and Vector robots for Labs.

Webmaster — *Hempstead, NY*
Theta Tau Omega Beta — *Nov 2019 - May 2020*

- Lead development and deployment of the chapter website.
- Front-end: Handled updating member profiles and developing user design features.
- Back-end: Handled the full website refactoring, website optimization and scaling, and documenting the code for future use.

SEAS IT Technician — *Hempstead, NY*
EdTech, Hofstra University — *May 2019 - May 2020*

- Provide technical support to faculty members in the DeMatteis School of Engineering and Applied Science.
- Primary support includes specialized software installation and configuration, hardware setup, and classroom technology support.

Data Analytics and Web Developer Intern — *Irvine, CA*
FORKAIA — *Jan 2019 - May 2019*

- Gathered specifications based on technical needs. Defined a data analysis process, and identified patterns and trends in datasets.
- Worked on the apps: Namebeat, Heirgraphics, Aura App.

Technology Analyst Intern — *New York, NY*
Goldman Sachs — *May 2018 - Aug 2018*

- Joined the Investment Banking and Engineering Division to build and deploy innovations in banking services workflow.
- Followed an Agile SDLC using JIRA to receive performance feedback from the division.
- Enhanced an internal banking application by 20% (measured by weekly work output) through using Elastic Search and RESTful API design in Java.

Reviewer

Reviewer — *2022, 2023*
ACM Transactions on Internet Technology

Reviewer — *2021*
IEEE Cloud Summit 2021

Awards

- Inspiration Award at the 2023 Monte Jade Innovation Competition for the "Streaming Digital Innovation into Services with Blockchain" project.
- IDEaS Cloud Hub Microsoft Azure Grant for $8,500 in 2023.
- IEEE TCSC (Technical Committee on Scalable Computing) International Scalable Computing Challenge (SCALE 2023) at the CCGrid Conference 2023.
- Phi Beta Kappa Book Award from the Phi Beta Kappa Association of New York in 2019.
- Hofstra University Presidential Scholarship recipient 2017-2020.

Relevant Graduate Coursework

- CS 6210: Advanced Operating Systems
- CS 7210: Distributed Computing
- CSE 6220: High Performance Computing
- CS 6290: High Performance Computing Architecture
- CS 7641: Machine Learning
- CS 7643: Deep Learning
- CS 7637: Knowledge-Based Artificial Intelligence
- CS 6390: Foundations of Programming Languages
- CS 6515: Graduate Algorithms
- CS 6454: Qualitative Methods in Human-Computer Interaction

Skills

Programming	Python, Java/JavaFX, C/C++/C#, CUDA, GPU, FLEXSIM, MATLAB, HTML/CSS, ROS, Coq, GIT
Libraries	MPI, OpenSHMEM, UPC, Conveyors, Slurm
ML Frameworks	PyTorch, TensorFlow, HuggingFace, Scikit Learn
Virtualization	Docker, Singularity, KVM, Linux
Cloud	AWS, GCP, Azure
Languages	English, Arabic, French

Extra-Curricular Interests

Music	Saxophone, Clarinet, Piano
Sports	Soccer, Swimming, Tennis
Outdoor	Hiking, Museums
Clubs	Supercomputing @ GT, Data Science @GT, Arab Student Association @ GT