Youssef Elmougy

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811 Juniper St. NE, Atlanta, GA 30308, United States

Education

- **Ph.D. in Computer Science** *Aug 2022 - PRESENT*

  Georgia Institute of Technology Atlanta, GA
  - Research concentrated in HPC, Systems, and AI/DL. Working in the Habanero Extreme Scale Software Research Lab. Advisor: Vivek Sarkar. Expected Graduation: Summer 2025.
  - Thesis: Scalable Asynchronous Actor-based Approaches for Distributed-Memory Parallel Applications.

- **M.S. in Computer Science** *Jan 2022 - Dec 2022*

  Georgia Institute of Technology Atlanta, GA
  - Specialization in High Performance Computing. GPA: 3.6/4.0. IEEE-HKN Student Member.

- **B.S. in Computer Science** *Aug 2017 - Dec 2021*

  Georgia Institute of Technology Atlanta, GA
  - Specialization in Artificial Intelligence and Computer Modelling. GPA: 3.8/4.0. IEEE-HKN Student Member. Graduated with Highest Honors.
  - Transferred from Hofstra University (attended Aug 2017 - May 2020) with 4.0/4.0 GPA as a Presidential Scholarship Recipient.

Research Experience

- **Graduate Research Assistant** *May 2022 - PRESENT*

  Habanero Extreme Scale Software Research Lab, Georgia Institute of Technology Atlanta, GA
  - 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, jaccard index, page rank, pattern matching, genome comparisons, internet network topology analysis, deep learning, and GNN.
  - Implementing a distributed and shared-memory parallel Actor-based runtime system for cloud computing, allowing for HPC on the Cloud.
  - Optimizing and fine tuning the runtime system using an architecture-aware approach, such as evaluating intra-node core, socket, NUMA, and software-level buffer bindings.

- **Graduate Research Intern** *May 2024 - Aug 2024*

  NVIDIA - NV Research Santa Clara, CA
  - Worked within the Programming Systems and Applications Research Group to analyze the performance limitations of NVIDIA's state-of-the-art libraries for graph analytics. Mentor: Michael Garland.
  - Designed and implemented new scalable algorithmic approaches to improve performance and reduce code complexity of these graph libraries using the CUDASTF task-based programming system.
  - Collaborated with NVIDIA product teams to guide research & development of algorithms and software.

- **Graduate Research Intern** *May 2023 - Aug 2023*

  Lawrence Berkeley National Lab San Francisco, CA
  - Worked within the Performance and Algorithms Research Lab on hybrid communication techniques and increasing fault tolerance of distributed learning for deep learning workflows. Mentor: Khaled Ibrahim.
  - Built a hybrid AllReduce and Parameter Server approach to parameter distribution/update and collective communication for distributed training using PyTorch DDP and RPC.

- **Research Assistant** *Aug 2020 - Dec 2021*

  Automated Algorithm Design, Georgia Institute of Technology Atlanta, GA
  - Worked within Stocks subteam of AAD to alter the use of machine learning techniques in developing hybrid algorithms for stock price prediction. Mentor: Jason Zutty.
  - Programmed stock trading related primitives, objective functions, and genetic programming frameworks built on top of EMADE.

- **Research Assistant** *May 2019 - May 2020*
  Hofstra University Hempstead, NY
  - Worked on systems and cloud infrastructure research. Mentor: Jianchen Shan.
  - 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.

PUBLICATIONS [🎓]

C=CONFERENCE, J=JOURNAL, P=POSTER, S=UNDER SUBMISSION, =GITHUB, =AWARD

[S.1] Youssef Elmougy, Akihiro Hayashi, Vivek Sarkar. (2024). **HybridFusion: A Parameter Update Framework for Scalable and Efficient Distributed Deep Learning**. Under submission.

[C.1] Aniruddha Mysore, Youssef Elmougy, Akihiro Hayashi. (2024). **On the Cloud We Can't Wait: Asynchronous Actors Perform Even Better on the Cloud**. In *VIVEKFEST Symposium at SPLASH*.

[C.2] Akihiro Hayashi, Shubhendra Singhal, Youssef Elmougy, Jiawei Yang. (2024). **Enabling User-level Asynchronous Tasking in the FA-BSP Model - Case Study: Distributed Triangle Counting**. In *VIVEKFEST Symposium at SPLASH*.

[C.3 |] Youssef Elmougy, Akihiro Hayashi, Vivek Sarkar. (2024). **Asynchronous Distributed Actor-based Approach to Jaccard Similarity for Genome Comparisons**. In *ISC HPC*.

[C.4 |] Youssef Elmougy, Akihiro Hayashi, Vivek Sarkar. (2024). **A Distributed, Asynchronous Algorithm for Large-Scale Internet Network Topology Analysis**. In *IEEE/ACM CCGRID*. **Winner of TCSC SCALE Award**.

[C.5 |] Youssef Elmougy, Ling Liu. (2023). **Demystifying Fraudulent Transactions and Illicit Nodes in the Bitcoin Network for Financial Forensics**. In *ACM SIGKDD*.

[C.6 |] Youssef Elmougy, Akihiro Hayashi, Vivek Sarkar. (2023). **Highly Scalable Large-Scale Asynchronous Graph Processing using Actors**. In *IEEE/ACM CCGRID*. **Winner of TCSC SCALE Award**.

[C.7] Youssef Elmougy, Weiwei Jia, Xiaoning Ding, Jianchen Shan. (2021). **Diagnosing the Interference on CPU-GPU Synchronization Caused by CPU Sharing in Multi-Tenant GPU Clouds**. In *IEEE IPCCC*.

[C.8] Youssef Elmougy, Oliver Manzi. (2021). **Anomaly Detection on Bitcoin, Ethereum Networks Using GPU-accelerated Machine Learning Methods**. In *IEEE ICCTA*.

[J.1 |] Sri Raj Paul, Akihiro Hayashi, Kun Chen, Youssef Elmougy, Vivek Sarkar. (2023). **A Fine-grained Asynchronous Bulk Synchronous Parallelism Model for PGAS Applications**. In *Journal of Computational Science*.

[P.1] Aniruddha Mysore, Kaushik Ravichandran, Youssef Elmougy, Akihiro Hayashi, Vivek Sarkar. (2023). **Accelerating Actor-based Distributed Triangle Counting**. In *SC*.

PROFESSIONAL EXPERIENCE

- **HPC Teaching Assistant** *Jan 2024 - May 2024*
  Georgia Institute of Technology Atlanta, GA
  - TA for CSE 6220 - Introduction to High Performance Computing.
  - Engaged with students on topics of theoretical complexities, parallel and distributed computing, and communication efficient algorithms through weekly office hours. Prepared MPI-based HPC projects.
- **Robotics Teaching Assistant** *Aug 2021 - May 2022*
  Georgia Institute of Technology Atlanta, GA
  - TA for 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.
- **SEAS IT Technician** *May 2019 - May 2020*
  EdTech, Hofstra University Hempstead, NY
  - 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** *Jan 2019 - May 2019*
  FORKaiA Irvine, CA
  - 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.

REVIEWER AND CONTRIBUTOR

- **OpenSHMEM Application Programming Interface, Version 1.6** (contributor) *2024*
- **IEEE Transactions on Knowledge and Data Engineering** (reviewer) *2024*
- **ACM Transactions on Internet Technology** (reviewer) *2022 - 2023*
- **IEEE Cloud Summit 2021** (reviewer) *2021*

Honors and Awards

- **International Scalable Computing Challenge Award (SCALE 2024) [🏆]** *2024*
  IEEE TCSC (Technical Committee on Scalable Computing) at the IEEE/ACM CCGrid Conference
- **Innovative Use of High Performance Computing Award [🏆]** *2023*
  The National Energy Research Scientific Computing Center (NERSC) and the U.S. Department of Energy (DOE) Office of Science
- **Inspiration Award** *2023*
  At the 2023 Monte Jade Innovation Competition for the "Streaming Digital Innovation into Services with Blockchain" project
- **International Scalable Computing Challenge Award (SCALE 2023) [🏆]** *2023*
  IEEE TCSC (Technical Committee on Scalable Computing) at the IEEE/ACM CCGrid Conference
- **Microsoft Azure Grant for $10,500** *2023*
  IDEaS Cloud Hub at Georgia Tech
- **Phi Beta Kappa Book Award** *2019*
  Phi Beta Kappa Association of New York
- **Presidential Scholarship recipient** *2017 - 2020*
  Hofstra University

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