AmirHossein **Sojoodi**

PhD Candidate · HPC Researcher · GPU Software Engineer

Kingston, ON, Canada

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Summary

As a researcher, focused on parallel algorithm design, middleware performance optimization, and application acceleration. More specifically, improving GPU-aware communication in OpenMPI and UCX/UCC libraries. As a Software Developer, working with parallel-processing platforms/tools and programming frameworks, including CUDA, OpenMP, MPI, WebGPU, etc. Possess an insatiable enthusiasm to work as a teacher in academia, and look forward to combining my passion for education with my expertise in computer science.

Education

Queen's University — *Kingston, Canada*

Ph.D. in Electrical and Computer Engineering — *Jan. 2020 - Jan. 2025*

- **Research Area**: High-performance GPU-aware communication in hybrid clusters, supervised by Dr. A. Afsahi

Shiraz University — *Shiraz, Iran*

M.S. in Software Engineering — *Sep. 2012 - Aug. 2015*

Shiraz University — *Shiraz, Iran*

B.S. in Software Engineering — *Sep. 2007 - Aug. 2012*

Professional Experience

Distributive Co. — *Kingston, Ontario*

GPU Software Engineer, part-time — *Sep. 2022 - Sep. 2024*

- Explore and develop CUDA, WebGPU, and WebAssembly solutions.
- Develop a WebGPU-based math algorithm, called LeGendre Pairs Length 117, achieving +700x speedup compared to the CPU implementation.
- Design and Develop a WebGPU microbenchmark for Distributed Compute Protocol (DCP) systems.

RE Grant Consulting Company — *Kingston, Ontario*

CUDA Developer, part-time — *Oct. 2023 - Mar. 2024*

- Design and implement a CUDA microbenchmark suite for Rockport Networks (CERIO) systems.
- The suite is a C++ CMake project including Stress and Speed tests for various transfer types, sizes, and scenarios.

Microsoft Research (MSR) — *Seattle, Washington (Remote)*

Research Intern — *Jun. 2022 - Aug. 2022*

- Enable GPU in Distributed Deep Learning (DistDL) framework utilizing CuPy.

Engineering Teaching and Learning Team (ETLT), Queen's University — *Kingston, Ontario*

Course Design and Development Specialist, part-time — *Sep. 2020 - Apr. 2022*

- Maintain and update the courses' learning objectives (CLOs).
- Edit videos and create animations for the Faculty of Engineering and Applied Science (FEAS) courses.
- Automate the courses evaluation process using Python and Queen's survey platform.

HPC Group, CSE Dept, Shiraz University — *Shiraz, Iran*

XenServer and Linux Administrator — *Sep. 2018 - Nov. 2019*

- Setup and maintain Apache Hadoop, Spark, Tez, and Ignite clusters.

Aria Hamrah Samaneh — *Shiraz, Iran*

System Administrator, Data Visualization and Java Backend Developer — *Apr. 2016 - Feb. 2017*

- Develop data visualization dashboards using Tableau.

Information and Communication Technology Center (ICTC), Shiraz University — *Shiraz, Iran*

Business Intelligence (BI) Developer — *Oct. 2015 - Apr. 2016*

- Develop BI solutions based on Microsoft Power BI.

HPC Group, CSE Dept, Shiraz University — *Shiraz, Iran*

XenServer and Linux administrator — *Oct. 2013 - Oct. 2015*

- Setup and maintain various services such as Nexus repository manager, apt cacher, squid, SVN, project manager, etc.

Skills

Programming	C, C++, Python, JavaScript, Rust, TXL, Matlab, Java, Assembly, and Shell
Platforms/APIs/Libs	CUDA, OpenMP, MPI, UCX, WebGPU, Pthreads, MapReduce, PyTorch, NumPy/CuPy, Apache Ignite
Misc. Tools	Git, Perf, Valgrind, NVIDIA Nsight Tools, Arm DDT, Auto Tools, CMake, Nexus, LaTeX
Operating Systems	Ubuntu, Debian, CentOS
Video Editing	Camtasia, Corel Video Studio, Proshow Producer, Adobe AfterEffects
Languages	Farsi (maternal), English (fluent), French (basic)

Publications

Enhancing Intra-Node GPU-to-GPU Performance in MPI + UCX through Multi-Path Communication
Amirhossein Sojoodi, Yiltan Hassan Temucin, Ahmad Afsahi
Proceedings of the International Workshop on Extreme Heterogeneity Solutions (ExHET), pp. 1–6
DOI: 10.1145/3642961.3643800 2024

Efficient Process Arrival Pattern Aware Collective Communication for Deep Learning
Pedram Alizadeh, Amirhossein Sojoodi, Yiltan Hassan Temucin, Ahmad Afsahi
Proceedings of the European MPI Users' Group Meeting (EuroMPI), pp. 68–78
DOI: 10.1145/3555819.3555857 2022

SciAI4Industry – Solving PDEs for industry-scale problems with deep learning
Philipp A. Witte, Russell J. Hewett, Kumar Saurabh, AmirHossein Sojoodi, Ranveer Chandra
arXiv (2022), pp. 1–11
DOI: 10.48550/arXiv.2211.12709 2022

Efficient Multi-Path NVLink / PCIe-Aware UCX based Collective Communication for Deep Learning
Yiltan Hassan Temucin, Amirhossein Sojoodi, Pedram Alizadeh, Ahmad Afsahi
Proceedings of the IEEE Symposium on High-Performance Interconnects (HOTI), pp. 1–10
DOI: 10.1109/HOTI52880.2021.00018 2021

Accelerating Deep Learning using Interconnect-Aware UCX Communication for MPI Collectives
Yiltan Hassan Temucin, Amirhossein Sojoodi, Pedram Alizadeh, Benjamin W Kitor, Ahmad Afsahi
IEEE Micro (2021), pp. 1–9
DOI: 10.1109/MM.2022.3148670 2021

A GPU-Enabled Extension for Apache Ignite to Facilitate Running Genetic Algorithms
Majid Salimi Beni, Amir Hossein Sojoodi, Farshad Khunjush
Proceedings of the International Symposium on Computer Architecture and Digital Systems (CADS), pp. 1–8
DOI: 10.1109/CADS50570.2020.9211857 2020

Ignite-GPU: a GPU-enabled in-memory computing architecture on clusters
Amir Hossein Sojoodi, Majid Salimi Beni, Farshad Khunjush
Journal of Supercomputing (2020), pp. 1–28
DOI: 10.1007/s11227-020-03390-z 2020

Honors & Awards

2020-09	**Parya Scholarship**, Parya Trillium Foundation	*Canada*
2019-01	**Best T.A.**, CSE Department students' poll	*Shiraz University*
2016-08	**9th Place**, National IoT Hackathon	*IUST, Tehran*
2015-02	**Silver Medal (with B. Ahmadi and M. R. Katebzadeh)**, 7th National JavaChallenge	*Sharif University*
2012-07	**Gold Medal in Team Section**, Chess Games, South of Iran Universities	*Shiraz University*
2010-07	**5th Place (with M. Asadi)**, Students Competitions (Ms Pacman Intelligent Controller)	*IEEE CIG (Online)*
2010-07	**5th Place (with S. Kazemi and M. Saeedi)**, Kashan 2nd International Programming contest (ACM)	*Kashan University*

Selected Certificates

2024-08 **Modern C++ Programming**, Compute Ontario Summer School
2022-08 **Fundamentals of Accelerated Computing with CUDA Python**, NVIDIA Deep Learning Institute (DLI)
2022-08 **Fundamentals of Deep Learning**, NVIDIA Deep Learning Institute (DLI)
2022-08 **Accelerating CUDA C++ Applications with Concurrent Streams**, NVIDIA Deep Learning Institute (DLI)
2021-08 **Debugging and Performance Tuning**, SCINET Summer Workshop
2021-07 **Summer Workshops**, PUMPS+AI at Barcelona Supercomputing Center
2021-06 **Modern C++ and Parallel Programming**, SHARCNET HPC Summer Workshop
2019-08 **Software Testing**, Udacity
2019-07 **Software Development Process**, Georgia Tech & Udacity
2019-07 **Design Patterns in Java**, Addison-Wesley, Livelessons
2014-11 **Intro to Parallel Programming with GPUs**, Udacity and NVIDIA

Teaching Experience

2024 Fall	**ELEC 278 - Fundamentals of Information Structure**, T.A. of Dr. Tom Dean	*Queen's University*
2024 Win	**ELEC 374 - Digital Systems Engineering**, T.A. of Dr. Ahmad Afsahi	*Queen's University*
2023 Fall	**ELEC 379 - Introduction to Algorithms**, T.A. of Dr. Naraig Manjikian	*Queen's University*
2023 Win	**ELEC 374 - Digital Systems Engineering**, T.A. of Dr. Ahmad Afsahi	*Queen's University*
2022 Fall	**ELEC 278 - Fundamentals of Information Structure**, T.A. of Dr. Jianbing Ni	*Queen's University*
2022 Win	**ELEC 374 - Digital Systems Engineering**, T.A. of Dr. Ryan Grant	*Queen's University*
2021 Fall	**ELEC 278 - Fundamentals of Information Structure**, T.A. of Dr. A. Elwakeel	*Queen's University*
2021 Win	**ELEC 374 - Digital Systems Engineering**, T.A. of Dr. Sean Whitehall	*Queen's University*
2020 Fall	**ELEC 278 - Fundamentals of Information Structure**, T.A. of Dr. D. Athersych	*Queen's University*
2020 Win	**ELEC 374 - Digital Systems Engineering**, T.A. of Dr. Ahmad Afsahi	*Queen's University*
2018 Fall	**GPU Programming**, T.A. of Dr. Farshad Khunjush	*Shiraz University*
2016 Win	**Introduction to Object Oriented Programming with Java**, Lecturer	*Shiraz University*
2015 Fall	**GPU Programming**, T.A. of Dr. Farshad Khunjush	*Shiraz University*
2014 Win	**Multicore Programming**, T.A. of Dr. Farshad Khunjush	*Shiraz University*
2013 Fall	**GPU Programming**, T.A. of Dr. Farshad Khunjush	*Shiraz University*
2013 Sum	**Software Engineering Lab**, Lecturer	*Shiraz University*
2012 Fall	**Operating Systems**, T.A. of Dr. Mohammadreza Moosavi	*Shiraz University*
2012 Fall	**System Programming (Assembly)**, T.A. of Dr. Gholamhossein Dastghaibifard	*Shiraz University*
2012 Sum	**Software Engineering Lab**, Lecturer	*Shiraz University*
2012 Win	**Software Engineering Lab**, Lecturer	*Shiraz University*
2012 Win	**Microprocessors**, T.A. of Dr. Farshad Tajeripour	*Shiraz University*
2011 Win	**Operating Systems**, T.A. of Dr. Sattar Hashemi	*Shiraz University*
2010 Win	**Principles of Programming (C)**, T.A. of Dr. Ali Hamzeh	*Shiraz University*
2010 Fall	**Operating Systems**, T.A. of Dr. Sattar Hashemi	*Shiraz University*
2010 Win	**System Programming (Assembly)**, T.A. of Dr. Sattar Hashemi	*Shiraz University*
2009 Fall	**System Programming (Assembly)**, T.A. of Dr. Sattar Hashemi	*Shiraz University*

Selected Presentations

Distributive Book Club Meetings

Kingston, Ontario

Presenter for LeGendre Pairs Optimizations

Aug. 2023

- Introduce the LeGendre Pairs algorithm and its implementation on GPUs.
- Discusse the challenges and optimizations for the algorithm.
- Shared memory utilizaion, coalleced memory access, warp divergence, and other optimizations.
- Slids can be obtained from here and there.

Distributive Book Club Meetings

Kingston, Ontario

Presenter for Introduction to GPUs

Oct. 2023

- Introduce the GPUs and their architecture.
- Introduce the CUDA programming model, the GPU memory hierarchy, and the memory access patterns.
- Profiling and performance tuning of GPU applications.
- Slids can be obtained from here and there.

Selected Extracurricular Activities

Graduate ECE Student Council

Queen's University

PhD Representative

2023-2024

- Graduate Electrical and Computer Engineering (GECE) student council is the governing body representing the graduate students of Electrical and Computer Engineering at Queen's University.
- I was the PhD representative for the 2023-2024 academic year.

Students' Scientific Group, CSE Department

Shiraz University

Executive Member

2011-2014

- In this group, we worked on different seminars and workshops for students.
- Also, each semester, courses and their exams scheduling was done by this group.
- I was a member of the group in 2009, 2010, 2012, and 2014, and its chair during 2011.