AmirHossein **Sojoodi**

PHD CANDIDATE · HPC RESEARCHER · GPU SOFTWARE ENGINEER

Kingston, Ontario, Canada

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Summary

As a researcher, interested in parallel algorithm design, middleware performance optimization, and application acceleration. Focused on improving GPU-aware communication in OpenMPI and UCX/UCC libraries. As an instructor, with 25+ courses TA'ed and taught, skilled in course design, development, and delivery, with a strong commitment to student success. As a software engineer, experienced in parallel-processing platforms/tools and programming frameworks, including CUDA, OpenMP, MPI, Pthreads, etc. Enthusiastic to work as a scholar, and eager to combine 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.SC. IN SOFTWARE ENGINEERING   *Sep. 2012 - Aug. 2015*

- **Ranked 3rd** among students.
- **Thesis**: Design and Evaluation of a Large-Scale Data Processing Framework for Modern GPUs, supervised by Dr. F. Khunjush

Shiraz University   *Shiraz, Iran*

B.SC. IN SOFTWARE ENGINEERING   *Sep. 2007 - Aug. 2012*

Skills

Programming	C, C++, Python, JavaScript, Rust, TXL, Matlab, Java, Assembly, and Shell
Platforms/APIs/Libs	CUDA, OpenMP, MPI, UCX, WebGPU, WGSL, 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
Languages	Farsi (maternal), English (fluent), French (basic)

Research Experience

Graduate Research Fellow   *Kingston, Canada*

QUEEN'S UNIVERSITY   *Jan. 2020 - Present*

- Collaborate with the Parallel Processing Research Laboratory (PPRL), led by Dr. A. Afsahi, resulting in 6 publications.
- Mentor and support junior graduate students in their research projects, debugging, profiling, and code reviews.
- Organize and maintain the group's ongoing projects repository and documentation.

Research Intern   *Seattle, US (Remote)*

MICROSOFT RESEARCH (MSR)   *Jun. 2022 - Aug. 2022*

- Performed a comparative study on the methods to utilize GPU in Numpy-based python frameworks.
- Profiled and analyzed model-parallelism Deep Learning framework named Distributed Deep Learning (DistDL).
- Accelerated DistDL utilizing CuPy and Numba libraries to get over 2x performance improvement.

Research Assistant and System Administrator   *Shiraz, Iran*

HPC GROUP, CSE DEPT, SHIRAZ UNIVERSITY   *Sep. 2018 - Nov. 2019*

- Designed and implemented a GPU-aware big-data processing framework based on Apache Ignite.
- Demonstrated a 200x speedup in Genetic Algorithm (GA) optimization using the GPU-based Apache Ignite.
- Mentored and supported undergraduate/graduate members of the group.
- Setup, organized, and maintained group's GPU cluster, with services like Apache Hadoop, Spark, Tez, and Ignite.

Graduate Research Fellow and System Administrator   *Shiraz, Iran*

SHIRAZ UNIVERSITY   *Sep. 2012 - Aug. 2015*

- Designed and implemented a GPU-enabled framework based on Apache Tez (MapReduce-based task graph), with a speedup of 4x.
- Performed a comparative study on GPU processing frameworks and libraries in Java programming language.
- Managed and administered the HPC group's GPU servers and XenServer virtual machines.
- Setup and maintained various services such as Nexus repository manager, Apt Cacher, Squid, etc.

Developer and Research Assistant   *Shiraz, Iran*
INFORMATION AND COMMUNICATION TECHNOLOGY CENTER (ICTC), SHIRAZ UNIVERSITY   *Oct. 2015 - Apr. 2016*
- Studied and developed Business Intelligence (BI) solutions for Shiraz University IT center.
- Developed and localized BI solutions based on Microsoft Power BI.

Teaching Experience

COURSE INSTRUCTOR

2016	**Introduction to Object Oriented Programming with Java**, Instructor	*Shiraz University*
2013	**Software Engineering Lab,** Instructor	*Shiraz University*
2012	**Software Engineering Lab,** Instructor	*Shiraz University*
2012	**Software Engineering Lab,** Instructor	*Shiraz University*

TEACHING ASSISTANT

2024	**ELEC 278 - Fundamentals of Information Structure**, TA of Dr. Tom Dean	*Queen's University*
2024	**ELEC 374 - Digital Systems Engineering**, TA of Dr. Ahmad Afsahi	*Queen's University*
2023	**ELEC 379 - Introduction to Algorithms**, TA of Dr. Naraig Manjikian	*Queen's University*
2023	**ELEC 374 - Digital Systems Engineering**, TA of Dr. Ahmad Afsahi	*Queen's University*
2022	**ELEC 278 - Fundamentals of Information Structure**, TA of Dr. Jianbing Ni	*Queen's University*
2022	**ELEC 374 - Digital Systems Engineering**, TA of Dr. Ryan Grant	*Queen's University*
2021	**ELEC 278 - Fundamentals of Information Structure**, TA of Dr. A. Elwakeel	*Queen's University*
2021	**ELEC 374 - Digital Systems Engineering**, TA of Dr. Sean Whitehall	*Queen's University*
2020	**ELEC 278 - Fundamentals of Information Structure**, TA of Dr. D. Athersych	*Queen's University*
2020	**ELEC 374 - Digital Systems Engineering**, TA of Dr. Ahmad Afsahi	*Queen's University*
2018	**GPU Programming**, TA of Dr. Farshad Khunjush	*Shiraz University*
2015	**GPU Programming**, TA of Dr. Farshad Khunjush	*Shiraz University*
2014	**Multicore Programming**, TA of Dr. Farshad Khunjush	*Shiraz University*
2013	**GPU Programming**, TA of Dr. Farshad Khunjush	*Shiraz University*
2012	**Operating Systems**, TA of Dr. Mohammadreza Moosavi	*Shiraz University*
2012	**System Programming (Assembly)**, TA of Dr. Gholamhossein Dastghaibifard	*Shiraz University*
2012	**Microprocessors**, TA of Dr. Farshad Tajeripour	*Shiraz University*
2011	**Operating Systems**, TA of Dr. Sattar Hashemi	*Shiraz University*
2010	**Principles of Programming (C)**, TA of Dr. Ali Hamzeh	*Shiraz University*
2010	**Operating Systems**, TA of Dr. Sattar Hashemi	*Shiraz University*
2010	**System Programming (Assembly)**, TA of Dr. Sattar Hashemi	*Shiraz University*
2009	**System Programming (Assembly)**, TA of Dr. Sattar Hashemi	*Shiraz University*

Professional Experience

CUDA Developer, part-time   *Kingston, Canada*
RE GRANT CONSULTING COMPANY   *Oct. 2024 - Present*
- Extend the Rockport Networks Inc. (CERIO) CUDA microbenchmark suite to provide more insights into the performance of their systems.
- Maintain and update this C++ CMake project to adhere with new use cases and requirements, such as Windows development environments.
- Utilize NVIDIA management library (NVML) to monitor the GPU performance and power utilization.

GPU Software Engineer, part-time   *Kingston, Canada*
DISTRIBUTIVE CO.   *Sep. 2022 - Sep. 2024*
- Researched and developed CUDA, WebGPU, and WebAssembly solutions for the Distributed Compute Protocol.
- Achieved a +700x speedup in a WebGPU-based combinatorial math problem (LeGendre Pairs) compared to the CPU implementation.
- Designed and developed a WebGPU microbenchmark for Distributed Compute Protocol (DCP) systems.
- Prepared and delivered technical presentations and reports for demos to potential investors.

CUDA Developer, part-time   *Kingston, Canada*
RE GRANT CONSULTING COMPANY   *Oct. 2023 - Mar. 2024*
- Designed and implemented a CUDA microbenchmark suite to analyze the performance of Rockport Networks Inc. (CERIO) systems.
- Developed a comprehensive C++ CMake project incorporating stress and speed tests for various data transfer types, sizes, and scenarios.
- Consistently met project deadlines and delivered high-quality code under tight schedules.

Course Design and Development Specialist, part-time
ENGINEERING TEACHING AND LEARNING TEAM, QUEEN'S UNIVERSITY

Kingston, Canada

Sep. 2020 - Apr. 2022

- Produced and edited videos, and created animations to enhance virtual lectures for the Faculty of Engineering and Applied Science courses.
- Automated the course evaluation process using Python and Queen's survey platform, streamlining the compilation of evaluations.
- Updated and ported the Courses' Learning Objectives (CLOs) to meet the latest requirements.

System Administrator and Java Backend Developer, full-time
ARIA HAMRAH SAMANEH

Shiraz, Iran

Apr. 2016 - Feb. 2017

- Developed and maintained interactive data visualization dashboards using Tableau, enhancing decision-making processes.
- Configured and managed the company's Tableau server for Shiraz City Hall offices, ensuring high availability and performance.
- Implemented robust Java-based backend services to support various company projects.

Publications

[1] Hamed Sharifian, Amirhossein Sojoodi, Ahmad Afsahi, "A Topology- and Load-Aware Design for Neighborhood Allgather", *Proceedings of the IEEE International Conference on Cluster Computing (CLUSTER)*, pp. 1–12, DOI: `10.1109/CLUSTER59578.2024.00019` — 2024

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

[3] Yıltan Hassan Temucin, Whit Schonbein, Scott Levy, Amirhossein Sojoodi, Ryan E Grant, Ahmad Afsahi, "Design and Implementation of MPI-Native GPU-Initiated MPI Partitioned Communication", *Proceedings of the workshops of the International Conference on High Performance Computing, Network, Storage, and Analysis (SC-W)*, pp. 1–12, DOI: `10.1109/SCW63240.2024.00065` — 2024

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

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

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

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

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

[9] Amirhossein Sojoodi, Majid Salimi Beni, Farshad Khunjush, "Ignite-GPU: a GPU-enabled in-memory computing architecture on clusters", *Journal of Supercomputing* (2020), pp. 1–28, DOI: `10.1007/s11227-020-03390-z` — 2020

Honors & Awards

2024	**Best Paper Award,** International Workshop on Extreme Heterogeneity Solutions (ExHET)	*Edinburgh, UK*
2020	**Parya Scholarship,** Parya Trillium Foundation	*Canada*
2019	**Best T.A.,** CSE Department students' poll	*Shiraz University*
2016	**9th Place,** National IoT Hackathon	*IUST, Tehran*
2015	**Silver Medal (with B. Ahmadi and M. R. Katebzadeh),** 7th National JavaChallenge	*Sharif University*
2012	**Gold Medal in Team Section,** Chess Games, South of Iran Universities	*Shiraz University*
2010	**5th Place (with M. Asadi),** Students Competitions (Ms Pacman Intelligent Controller)	*IEEE CIG (Online)*
2010	**5th Place (with S. Kazemi and M. Saeedi),** Kashan 2nd International Programming contest (ACM)	*Kashan University*

Presentations

Workshop Presenter
BOOK CLUB MEETINGS

Kingston, Canada

Oct. 2023

- Presented **"Documentation"** and its importance in everyday life and sciences.
- Provided the best practices and tools for writing and maintaining documentation.
- Presented to 10 graduate students and postdocs for 2 hours. (Slides.)

Workshop Presenter
DISTRIBUTIVE BOOK CLUB MEETINGS

Kingston, Canada

Aug. 2023

- Presented **"Application Optimization Techniques"** for the LeGendre Pairs algorithm on GPUs.
- Discussed the challenges and optimizations, including shared-memory utilizaion, coalesced memory access, warp divergence, etc.
- Presented to Distributive Co. employees for 1 hour. (Slides I & Slides II)

Workshop Presenter *Kingston, Canada*

DISTRIBUTIVE BOOK CLUB MEETINGS *Oct. 2023*

- Presented **"Introduction to GPUs"**, their architecture, their memory hierarchy, and their memory access patterns.
- Covered the CUDA programming model, code profiling and performance tuning of the GPU applications.
- Presented to Distributive Co. employees for 1 hour. (Slides I & Slides II)

Seminar Presenter *Shiraz University*

CSE TALKS *Nov. 2019*

- Presented **"Career Building"**, personal branding, and networking.
- Covered the best practices of writing resumes and preparing for interviews.
- Presented to 40+ students from the School of Engineering for 2 hours. (Slides.)

Seminar Presenter *Shiraz University*

CSE TALKS *Oct. 2016*

- Introduced the **"Software engineering"** major and software industry.
- Presented the best practices for software development and its life cycle.
- Presented to 60+ students from the Electrical and Computer Engineering Department for 1 hour.

Keynote Speaker *Shiraz University*

8TH BREAK TIME IN UNIVERSITY (BTIU) SYMPOSIUM *Aug. 2014*

- Presented **"Time Management"** and its best practices for 400+ high school students for 30 minutes.

Keynote Speaker *Shiraz University*

1ST ENTEKHAB-E-BARTAR CONFERENCE *Aug. 2014*

- Presented **"Future Eduction"**, industry trends, and how to prepare for them to 200+ high school students for 30 minutes.

Keynote Speaker *Shiraz University*

7TH BREAK TIME IN UNIVERSITY (BTIU) SYMPOSIUM *Aug. 2013*

- Presented **"Climate Change"** and its impact on the environment to 350+ high school students for 30 minutes.

Seminar Presenter *Shiraz University*

CSE TALKS *Mar. 2011*

- Co-presented **"Art of Googling"** and best practices for finding information to 50+ engineering students for 1.5 hours.

Seminar Presenter *Shiraz University*

CSE TALKS *Mar. 2011*

- Co-presented **"Compilers vs. Interpreters"** to 50+ students from the School of Engineering for 1.5 hour.

Related Volunteer Experience

Author and Developer *amirsojoodi.github.io/posts*

TECHNICAL BLOG/REPORTS *2015 - Present*

- Author technical posts/reports about my research, projects, and experiences to share my knowledge with the community.
- Published over 70 posts so far, covering various topics in computer science and software engineering.

Member *Queen's University*

MPI FORUM *2022 - Present*

- Participated in the MPI Forum meetings to discuss the updates of the MPI standard.
- Contributed to the discussions in bi-weekly MPI hybrid working group meetings.

Open Source Contributor *Distributive Co.*

GOOGLE *2023 - 2024*

- Contributed to Google Dawn, an open-source and cross-platform implementation of the WebGPU standard, used in Google Chrome.
- My contributions included fixing building issues on Linux using CMake.

PhD Representative *Queen's University*

GRADUATE ECE STUDENT COUNCIL *2023 - 2024*

- Liaised graduate students concerns to the Electrical and Computer Engineering department during departmental monthly meetings.

Chair and Executive Member *Shiraz University*

STUDENTS' SCIENTIFIC GROUP, CSE DEPARTMENT *2011 - 2014*

- Held more than 10 technical seminars and workshops for students.
- Scheduled courses and their exams for each semester, in coordination with the Computer Science and Engineering department.

Network Specialist
Shiraz University

CSE Network Administration Group
2011 - 2012

- Supported and maintained the CSE department's network infrastructure, which included more than 60 workstations and 4 servers.
- Fixed and troubleshooted network and workstation software/hardware issues for students and faculty.

Executive Member
Shiraz University

Programming Contests (ACM ICPC) Group
2008 - 2010

- Organized and conducted monthly programming contests for university students.
- Participated in local ACM ICPC contests, contributing to team strategy and problem-solving.

Selected Certificates and Related Education

Technical 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
2019-08	**Software Testing**, Udacity
2019-07	**Software Development Process**, Georgia Tech & Udacity
2019-07	**Design Patterns in Java**, Addison-Wesley, Livelessons
2018-11	**Introduction to Hadoop and MapReduce**, Udacity
2014-11	**Intro to Parallel Programming with GPUs**, Udacity and NVIDIA

Non-Technical Certificates

2021-08	**Academic Connections Certificate**, SASS at Queen's University
2020-03	**Inter-cultural Awareness**, QUIC at Queen's University
2020-02	**Commercialization Opportunities**, SGSPA at Queen's University
2020-01	**Effective Communication with Scholars**, SGSPA at Queen's University

Extracurricular Activity

Panelist
Queen's University

Global Education Conference
Nov. 2023

- Participated as a panelist in the session titled "Invitation not Assimilation: Inclusive Listening to Expand Academic Spaces."

Podcast Editor and Guest
Queen's University

International Voices at Queen's University (IV@Q) Podcast, Season 2
2022

- Edited and produced episodes for the second season of the podcast.
- Discussed topics such as academic challenges and supervisory relationships, as a guest in one of the episodes.
- Collaborated with team members to ensure high-quality audio content and engaging discussions.

Podcast Host
Queen's University

International Voices at Queen's University (IV@Q) Podcast, Season 1
2021

- Hosted the first season of the International Voices at Queen's University podcast, a collaborative initiative between SASS and QUIC.
- Covered topics such as culture shock, developing an authorial voice, and navigating housing in Canada.
- Successfully hosted and produced 8 episodes, interviewing guests, and providing a supportive listening space for the Queen's University community.

Executive Member
Queen's University

Graduate ECE Student Council
2020 - 2021

- Participated in the council's meetings and events, contributing to the organization and planning of activities.
- Created media content for the council's social media platforms, including Instagram and Facebook.

Co-founder and Member
Shiraz University

Tolu Group
2012 - 2016

- Co-created and managed a study group for students to discuss various topics and share knowledge.
- Organized weekly meetings, seminars, and talks on psychology, philosophy, history, and sociology.

Executive Member *Shiraz University*

Break Time in University (BTIU) Symposium *2009 - 2019*

- BTIU is an annual symposium for high school students, held since 2006, attracting around 400 participants each summer. It offers various creative classes and workshops.
- BTIU aims to introduce high school students to the university environment and enhance their creativity and teamwork skills through its 20+ committees.
- In 2018, I served as a workshop evaluator and instructor for the "Illusion of Decision" workshop, inspired by Dan Ariely.
- In 2016 and 2017, I worked as a workshop evaluator and consultant.
- In 2015, I was a member of the scientific committee and one of the keynote speakers.
- In 2014, I chaired the documentary committee, was a member of the film and clip committee, and served as a keynote speaker.
- From 2011 to 2013, I contributed as a member of the opening-closing ceremonies committee, consultant, photographer, and video editor.
- In 2010, I chaired the budget and sponsor committee and the opening-closing ceremonies.
- In 2009, I was a member of the budget and sponsor committee and chaired the catering committee.

Executive Member *Shiraz University*

Entekhab-e-Bartar *2014*

- Collaborated with a team of 25 members to organize workshops for highschool students, focusing on college majors and career paths.
- Provided guidance to students to help them make informed decisions about their future academic and career choices.
- Conducted various assessments, as well as one-on-one consultations, to help students identify their interests and strengths.

Executive Member and Opening-Closing Ceremony Chair *Shiraz University*

16th CSI International Symposiums on Computer Architecture & Digital Systems *2012*

- Served as the Opening-Closing Ceremonies Chair, overseeing the planning and execution of the ceremonies.
- Edited and produced films and clips for the symposium, ensuring high-quality visual content.

Executive Member and Opening-Closing Ceremony Chair *Shiraz University*

Harekat Festival *2011*

- Harekat Festival showcased the achievements of Students' Scientific Groups at Shiraz University over the course of a year.
- Chaired the Opening-Closing Ceremonies Committee and edited films and clips for the event.

References

Available upon Requests.