

# 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

<b>Programming</b>	C, C++, Python, JavaScript, Rust, TXL, Matlab, Java, Assembly, and Shell
<b>Platforms/APIs/Libs</b>	CUDA, OpenMP, MPI, UCX, WebGPU, WGSL, Pthreads, MapReduce, PyTorch, NumPy/CuPy, Apache Ignite
<b>Misc. Tools</b>	Git, Perf, Docker, Valgrind, NVIDIA Nsight Tools, Arm DDT, Auto Tools, CMake, Nexus, $\LaTeX$
<b>Operating Systems</b>	Ubuntu, Debian, CentOS
<b>Languages</b>	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.

- 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	<b>Introduction to Object Oriented Programming with Java</b> , Instructor	Shiraz University
2013	<b>Software Engineering Lab</b> , Instructor	Shiraz University
2012	<b>Software Engineering Lab</b> , Instructor	Shiraz University
2012	<b>Software Engineering Lab</b> , Instructor	Shiraz University

### TEACHING ASSISTANT

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

Kingston, Canada

ENGINEERING TEACHING AND LEARNING TEAM, QUEEN'S UNIVERSITY

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

Shiraz, Iran

ARIA HAMRAH SAMANEH

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", <i>Proceedings of the IEEE International Conference on Cluster Computing (CLUSTER)</i> , 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", <i>Proceedings of the International Workshop on Extreme Heterogeneity Solutions (ExHET)</i> , pp. 1–6, doi: 10.1145/3642961.3643800   | 2024 |
| [3] | Yiltan Hassan Temucin, Whit Schonbein, Scott Levy, Amirhossein Sojoodi, Ryan E Grant, Ahmad Afsahi, "Design and Implementation of MPI-Native GPU-Initiated MPI Partitioned Communication", <i>Proceedings of the workshops of the International Conference on High Performance Computing, Network, Storage, and Analysis (SC-W)</i> , 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", <i>Proceedings of the European MPI Users' Group Meeting (EuroMPI)</i> , 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", <i>arXiv</i> (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", <i>Proceedings of the IEEE Symposium on High-Performance Interconnects (HOTI)</i> , 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", <i>IEEE Micro</i> (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", <i>Proceedings of the International Symposium on Computer Architecture and Digital Systems (CADS)</i> , 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", <i>Journal of Supercomputing</i> (2020), pp. 1–28, doi: 10.1007/s11227-020-03390-z   | 2020 |

## Honors & Awards

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

## Presentations

### Workshop Presenter

Kingston, Canada

BOOK CLUB MEETINGS

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

Kingston, Canada

DISTRIBUTIVE BOOK CLUB MEETINGS

Aug. 2023

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

## Workshop Presenter

DISTRIBUTIVE BOOK CLUB MEETINGS

- 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](#))

*Kingston, Canada*

*Oct. 2023*

## Seminar Presenter

CSE TALKS

- 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.](#))

*Shiraz University*

*Nov. 2019*

## Seminar Presenter

CSE TALKS

- 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.

*Shiraz University*

*Oct. 2016*

## Keynote Speaker

8TH BREAK TIME IN UNIVERSITY (BTIU) SYMPOSIUM

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

*Shiraz University*

*Aug. 2014*

## Keynote Speaker

1ST ENTEKHAB-E-BARTAR CONFERENCE

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

*Shiraz University*

*Aug. 2014*

## Keynote Speaker

7TH BREAK TIME IN UNIVERSITY (BTIU) SYMPOSIUM

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

*Shiraz University*

*Aug. 2013*

## Seminar Presenter

CSE TALKS

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

*Shiraz University*

*Mar. 2011*

## Seminar Presenter

CSE TALKS

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

*Shiraz University*

*Mar. 2011*

# Related Volunteer Experience

## Author and Developer

TECHNICAL BLOG/REPORTS

- 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.

*[amirsojoodi.github.io/posts](https://amirsojoodi.github.io/posts)*

*2015 - Present*

## Member

MPI FORUM

- 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.

*Queen's University*

*2022 - Present*

## Open Source Contributor

GOOGLE

- 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.

*Distributive Co.*

*2023 - 2024*

## PhD Representative

GRADUATE ECE STUDENT COUNCIL

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

*Queen's University*

*2023 - 2024*

## Chair and Executive Member

STUDENTS' SCIENTIFIC GROUP, CSE DEPARTMENT

- 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.

*Shiraz University*

*2011 - 2014*

## 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

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Available upon Requests.