

# AmirHossein Sojoodi

PHD CANDIDATE · HPC RESEARCHER · GPU SOFTWARE ENGINEER

Kingston, ON, Canada

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## Summary

As a researcher, involved in various areas mainly focused on performance optimizations in MPI and UCX. More specifically, improving GPU-aware communications in CUDA-enabled OpenMPI and UCX libraries, for both point-to-point and collective communications including message matching engine. As a Software Developer, work with parallel-processing platforms and programming models (such as MPI) and have extensive knowledge in various programming languages and frameworks like C/C++, CUDA, OpenMP, WebGPU, etc.

## 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
- GPA: **4.0/4.0**

### Shiraz University

Shiraz, Iran

M.S. IN SOFTWARE ENGINEERING

Sep. 2012 - Aug. 2015

- **Ranked 3rd** among students with GPA **17.66/20**
- **Thesis:** Design and Evaluation of a Large-Scale Data Processing Framework for Modern GPUs, supervised by Dr. F. Khunjush

### Shiraz University

Shiraz, Iran

B.S. IN SOFTWARE ENGINEERING

Sep. 2007 - Aug. 2012

- **Final Project:** Intelligent controller of Miss PacMan agent; supervised by Dr. Zohreh Azimifar

## 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, Pthreads, MapReduce, PyTorch, NumPy/CuPy, Apache Ignite
<b>Misc. Tools</b>	Git, Perf, Valgrind, NVIDIA Nsight Tools, Arm DDT, Auto Tools, CMake, Nexus, ʘʘʘ
<b>Operating Systems</b>	Ubuntu, Debian, CentOS
<b>Video Editing</b>	Camtasia, Corel Video Studio, Proshow Producer, Adobe AfterEffects
<b>Languages</b>	Farsi (maternal), English (fluent), French (basic)

## 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

SYSTEM ADMINISTRATOR, DATA VISUALIZATION AND JAVA BACKEND DEVELOPER

- Develop data visualization dashboards using Tableau.

Shiraz, Iran

Apr. 2016 - Feb. 2017

## Information and Communication Technology Center (ICTC), Shiraz University

BUSINESS INTELLIGENCE (BI) DEVELOPER

- Develop BI solutions based on Microsoft Power BI.

Shiraz, Iran

Oct. 2015 - Apr. 2016

## HPC Group, CSE Dept, Shiraz University

XENSERVER AND LINUX ADMINISTRATOR

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

Shiraz, Iran

Oct. 2013 - Oct. 2015

## Teaching Experience

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

## Publications

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Enhancing Intra-Node GPU-to-GPU Performance in MPI + UCX through Multi-Path Communication Amirhossein Sojoodi, Yiltan Hassan Temucin, Ahmad Afsahi <i>Proceedings of the International Workshop on Extreme Heterogeneity Solutions (ExHET)</i> , 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 <i>Proceedings of the European MPI Users' Group Meeting (EuroMPI)</i> , 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 <i>arXiv (2022)</i> , 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 <i>Proceedings of the IEEE Symposium on High-Performance Interconnects (HOTI)</i> , 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 <i>IEEE Micro (2021)</i> , pp. 1–9	

## 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

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2020-09	<b>Parya Scholarship</b> , Parya Trillium Foundation	Canada
2019-01	<b>Best T.A.</b> , CSE Department students' poll	Shiraz University
2016-08	<b>9th Place</b> , National IoT Hackathon	IUST, Tehran
2015-02	<b>Silver Medal (with B. Ahmadi and M. R. Katebzadeh)</b> , 7th National JavaChallenge	Sharif University
2012-07	<b>Gold Medal in Team Section</b> , Chess Games, South of Iran Universities	Shiraz University
2010-07	<b>5th Place (with M. Asadi)</b> , Students Competitions (Ms Pacman Intelligent Controller)	IEEE CIG (Online)
2010-07	<b>5th Place (with S. Kazemi and M. Saeedi)</b> , Kashan 2nd International Programming contest (ACM)	Kashan University
2006	<b>Silver Medal in Individual Section</b> , Chess Games, High School Students	Tehran, District 1
2006	<b>Gold Medal in Team Section</b> , Chess Games, High School Students	Tehran, District 1
2005	<b>Gold Medal in Team Section</b> , Chess Games, High School Students	Tehran, District 1
2004	<b>Gold Medal in Team Section</b> , Chess Games, High School Students	Tehran, District 1

## Certificates and Related Education

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2024-08	<b>Modern C++ Programming</b> , Compute Ontario Summer School
2024-08	<b>Using Containers: Aptainer</b> , Compute Ontario Summer School
2022-08	<b>Fundamentals of Accelerated Computing with CUDA Python</b> , NVIDIA Deep Learning Institute (DLI)
2022-08	<b>Fundamentals of Deep Learning</b> , NVIDIA Deep Learning Institute (DLI)
2022-08	<b>Accelerating CUDA C++ Applications with Concurrent Streams</b> , NVIDIA Deep Learning Institute (DLI)
2021-08	<b>Debugging and Performance Tuning</b> , SCINET Summer Workshop
2021-07	<b>Summer Workshops</b> , PUMPS+AI at Barcelona Supercomputing Center
2021-06	<b>Modern C++ and Parallel Programming</b> , SHARCNET HPC Summer Workshop
2019-08	<b>Software Testing</b> , Udacity
2019-08	<b>Intro to DevOps</b> , Udacity
2019-07	<b>Software Development Process</b> , Georgia Tech & Udacity
2019-07	<b>Design Patterns in Java</b> , Addison-Wesley, Livelessons
2018-12	<b>Java, Python, C, C++, HTML and SQL</b> , SoloLearn App online courses
2018-11	<b>Introduction to Hadoop and MapReduce</b> , Udacity
2018-10	<b>Configure Linux Webservers</b> , Udacity
2015-11	<b>Intro to Big Data with Apache Spark</b> , Berkeley and edX
2014-11	<b>Intro to Parallel Programming with GPUs</b> , Udacity and NVIDIA

## Presentations

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### Book Club Meetings

Kingston, Ontario

WORKSHOP PRESENTER

Oct. 2023

- Introduce the importance of documentation in everyday life and sciences. Slides can be obtained from [here](#).
- Introduce the best practices and tools for writing and maintaining documentation.

### Distributive Book Club Meetings

Kingston, Ontario

PRESENTER FOR LEGENDRE PAIRS OPTIMIZATIONS

Aug. 2023

- Introduce the LeLegendre Pairs algorithm and its implementation on GPUs.
- Discuss the challenges and optimizations for the algorithm.
- Shared memory utilization, coalesced memory access, warp divergence, and other optimizations.
- Slides 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](#).

## CSE Talks

Shiraz University

PRESENTER FOR START A GOOD CAREER

Fall 2019

- Introduce the importance of starting a good career and the best practices for it.
- Introduce the best practices for writing a resume and preparing for an interview.
- Slides can be obtained from [here](#).

## CSE Talks

Shiraz University

PRESENTER FOR INTRODUCTION TO SOFTWARE ENGINEERING

Fall 2016

- Introduce the software engineering and its importance in the software industry.
- Introduce the best practices for software development and the software development life cycle.

## CSE Talks

Shiraz University

PRESENTER FOR ART OF GOOGLING

Spring 2011

- Introduce the best practices for searching the web and finding the right information. Co-presented with Saeed Kazemi.

## CSE Talks

Shiraz University

PRESENTER FOR COMPILERS VS. INTERPRETERS

Spring 2011

- Introduce the difference between compilers and interpreters and their importance in software development. Co-presented with Saeed Kazemi.

## Extracurricular Activity

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### Google Dawn

Distributive Co.

OPEN SOURCE CONTRIBUTOR

2023-2024

- Google Dawn is an open-source and cross-platform implementation of the WebGPU standard.
- My contributions include fixing building issues on Linux using CMake.

### 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.

### Global Education Conference

Queen's University

PANELIST

November 2023

- I was a panelist in a session titled: Invitation not assimilation: Inclusive listening to expand academic spaces and connect to global knowledge.
- The conference was held by Queen's University International Center (QUIC) and Students Academic Success Services (SASS).

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

Queen's University

PODCAST EDITOR AND GUEST

Summer 2022

- International Voices at Queen's University is a supportive listening space for members of the Queen's University community, developed in partnership between SASS and the QUIC.
- Episodes include topics about culture shock, developing your authorial voice, and navigating housing in Canada.
- I was the podcast editor for season 2, and I was also a guest in one of the episodes.

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

Queen's University

PODCAST HOST

Summer 2021

- International Voices at Queen's University is a supportive listening space for members of the Queen's University community, developed in partnership between SASS and the QUIC.
- Episodes include topics about culture shock, developing your authorial voice, and navigating housing in Canada.
- I was the podcast host for season 1, including 8 episodes.

### Graduate ECE Student Council

Queen's University

CONTENT CREATOR

2020-2021

- 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.

### Tolu Group

Shiraz University

CORE MEMBER AND CO-FOUNDER

2012-2016

- Tolu was a group of almost 15 members that used to meet every week. We had seminars and talks about various subjects, including psychology, philosophy, history and sociology.

## Break Time in University (BTIU) Symposium

Shiraz University

EXECUTIVE MEMBER

2009-2019

- BTIU is a conference/symposium that has been held annually since 2006 every summer for high school students (on average 400 students) who can participate in this program and enjoy various creative classes and workshops.
- The conference objectives are: introducing university environment to high school students, improving their creativeness, and team work skills, as well as improving staff's skills, including communication, management, responsibility, etc.
- BTIU has almost 20 different committees. In 2009, I was a member of the budget and sponsor committee, and the catering committee chair.
- In 2010, I was the chair of budget and sponsor committee, and opening-closing ceremonies
- From 2011 to 2013, I was a member of the opening-closing ceremonies committee, consultant, photographer, and video editor.
- In 2014, I was the chair of the documentary committee, a member of the film and clip committee, and the keynote speaker.
- In 2015, I was a member of the scientific committee, and one of the ceremonies keynote speakers.
- In 2016 and 2017, I was a workshop evaluator, and consultant.
- In 2018, I was a workshop evaluator, and an instructor for the workshop "Illusion of Decision", inspired by Dan Ariely.

## Entekhab-e-Bartar

Shiraz University

EXECUTIVE MEMBER

2014

- Entekhab-e-Bartar was a group with almost 10 staff and 15 consultants that held workshops and classes for high school students about college majors and fields.
- We tried to help them to choose a better way in their future by informing them about what's going on in each field.
- In order to help them to realize what they actually like, we had different tests, including psychology tests, sociology tests, IQ tests, and face-to-face talks for each student.

## 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.

## 16th CSI International Symposiums on Computer Architecture & Digital Systems and Artificial Intelligence & Signal Processing

Shiraz University

EXECUTIVE MEMBER

Spring 2012

- I was the Opening-Closing Ceremonies Chair, and film/clip editor

## Harekat Fest

Shiraz University

EXECUTIVE MEMBER

Spring 2011

- Harekat Fest was a festival for Students Scientific Groups of Shiraz University and their achievements in one year of efforts.
- I was the chair of the Opening-Closing Ceremonies Committee and film/clip editor.

## CSE Network Administration Group

Shiraz University

SPECIALIST

2011-2012

- I was a member of the CSE Network Administration Group, in charge of the CSE network and workstations.

## Programming Contests (ACM ICPC) Group

Shiraz University

EXECUTIVE MEMBER

2008-2010

- I was a member of the Programming Contests (ACM ICPC) group, in charge of holding programming contests for students.

## References

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- Dr. Ahmad Afsahi** ahmad [dot] afsahi [at] queensu [dot] ca
- Dr. Ryan Grant** ryan [dot] grant [at] queensu [dot] ca
- Dr. Dan Desjardins** dan [at] distributive [dot] network
- Dr. Farshad Khunjush** fkhunjush [at] gmail [dot] com
- Dr. Philipp Witte** pwitte [at] microsoft [dot] com
- Dr. Ali Etemad** ali [dot] Etemad [at] queensu [dot] ca