

# Mohanna Shahrads

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## EDUCATION

### McGill University, Montreal, Canada

Bachelor of Science in Computer Science

Sep 2020 – May 2024

3.93/4.00 GPA

### University of British Columbia, Vancouver, Canada

Exchange Semester as a Computer Science Visiting Student

Sep 2023 – Now

### Sharif University of Technology, Tehran, Iran

Bachelor of Science in Computer Engineering

Sep 2019 – June 2020

19.21/20.00 GPA

## RESEARCH EXPERIENCE

### Research Intern

Dependable Systems Lab, University of British Columbia, Supervisor: Prof. Karthik Pattabiraman

Sep 2023 – Dec 2023

Vancouver, BC

- Proposed a dynamic and real-time privacy enforcement method in IoT using **lattice-based privacy labeling** and **information flow tracking** techniques.
- Prototyped the proposed solution on **SmartThings** applications with physical and virtual IoT devices.
- Designed an automated framework for visualizing and querying provenance data in **PROV-JSON** format with **Neo4j**.

### NSERC USRA Research Assistant

Distributed Information Systems Lab, McGill University, Supervisor: Prof. Bettina Kemme

May 2023 – Aug 2023

Montreal, QC

- Contributed to designing a middleware on top of **Neo4j**, to support view declaration and usage over graph queries.
- Extended the **Cypher** query language with **ANTLR** to support view management in Neo4j.
- Created a benchmark of graph queries with a variety of patterns to show applications of our proposed language.
- Conducted experiments to evaluate the performance of view creation and materialization.

### Undergraduate Research Assistant

Advanced Networking Research Lab, McGill University, Supervisor: Prof. Muthucumaru Maheswaran

Jan 2023 – May 2023

Montreal, QC

- Designed a **distributed digital twin model** within physical environments.
- From device-to-device WiFi communications, proposed distributed protocols for automated vehicular navigation.
- Developed a simulator to translate theoretical protocols into practical algorithms.
- Ported the protocols to **ESP32** microcontrollers with the **JamScript** language showing real-world applicability.

### Volunteer Research Contributor

UBC CIRRU Lab, University of British Columbia

Sep 2022 – May 2023

Vancouver, BC

- Contributed to the UnFaaSener project, a framework designed to help serverless developers reduce expenses by offloading serverless functions to non-serverless resources.
- Ported and evaluated various benchmarks on existing services such as **AWS Step Functions** and **GCP Workflows**, comparing their performance against UnFaaSener.
- Further assessed UnFaaSener's performance against **AWS Lambda functions** glued with **AWS SNS** and **Google Cloud functions** glued with **Google Pub/Sub**.

### Research Volunteer

The Prometheus Lab, McGill University

May 2022 – Aug 2022

Montreal, QC

- Studied security vulnerabilities, challenges, and requirements of **multi-agent systems** (MAS).
- Developed a security model for MAS with **PKI**-based authentication and **RBAC** for authorization.
- Utilized **Mobile Ad Hoc Networks** in the proposed model to enhance communication reliability in remote areas.

## PUBLICATIONS

- Ghazal Sadeghian, Mohamed Elsakhawy, **Mohanna Shahrads**, Joe Hattori, and Mohammad Shahrads. "UnFaaSener: Latency and Cost Aware Offloading of Functions from Serverless Platforms". In 2023 USENIX Annual Technical Conference (ATC '23).
- Mohanna Shahrads**, Yu Ting Gu, Yunjia Zheng, and Bettina Kemme. "Towards View Management in Graph Databases". Submitted to Search, Exploration, and Analysis in Heterogeneous Datastores Graph Edition (SEAGraph'24) Workshop at ICDE'24 .

## INDUSTRY EXPERIENCE

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### Software Development Engineering Intern

*AWS IoT FreeRTOS Team, Amazon*

June 2022 – Sep 2022

*Vancouver, British Columbia*

- Developed and open-sourced templates for automated IoT data ingestion and visualization from edge devices into **AWS IoT Core** benefiting **AWS IoT ExpressLink** customers, and adaptable to various IoT devices.
- Used **AWS CloudFormation** and services such as **Timestream**, **Kinesis**, and **OpenSearch** to implement real-time visualizations on intuitive dashboards like **Grafana** and **Amazon Quicksight**.

### Data Engineering Intern

*DataLake Team, Canadian National Railway (CN)*

May 2021 – Aug 2021

*Montreal, Quebec*

- Implemented an internal knowledge-sharing platform for the team using **Java**, **Docker**, and **Para** backends.
- Developed real-time **Microsoft Power BI** dashboards showcasing data from **Azure Data Lake** for team insights.

### Research & Development Intern

*Affinity RCM Team, Harris Computer Corporation*

Feb 2021 – May 2021

*Ottawa, Ontario*

- Developed an automated quality assurance (QA) framework using **Selenium WebDriver** and **C#** to support efficient web-based application testing.

## TEACHING EXPERIENCE

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### Undergraduate Teaching Assistant

*School of Computer Science, McGill University*

Sep 2022 – Dec 2022

*Montreal, QC*

- Operating Systems Course (Comp 310), Instructor: Professor Muthucumaru Maheswaran.

## HONORS AND AWARDS

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| 2023 | Mobility Bursary for Exchanges, McGill University  |  |
| 2023 | Fonds de recherche du Québec – Nature et technologies (FRQNT) (Quebec Research Funding)  |  |
| 2023 | NSERC Undergraduate Student Research Award, Natural Sciences and Engineering Research Council of Canada, McGill University   |  |
| 2022 | Québec Perspective Scholarship (PBPQ), Government of Quebec  |  |
| 2021 | Member of the Golden Key International Honour Society, Dean of Students at McGill University   |  |
| 2021 | McGill Faculty of Science Scholarship, Faculty of Science Scholarships Committee, McGill University  |  |
| 2021 | Member of the McGill Dean's Honour List, McGill University   |  |
| 2021 | Excellence Scholarship in Computer Science, Computer Engineering and Computer Construction, and Electrical, Electronic and Communications Engineering, Ministère de l'Enseignement supérieur |  |
| 2021 | McGill Perseverance Award, Scholarships and Student Aid Office, McGill University  |  |
| 2021 | Selected for Google CS Research Mentorship Program (CSRMP)   |  |
| 2019 | Ranked 68th among +164,000 participants, Iranian University Entrance Exam  |  |

## PROJECTS

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| UnFaaSener: Latency and Cost Aware Offloading of Functions from Serverless Platforms                     | <a href="#">Source Code</a> <a href="#">Paper</a>  |
| CloudFormation Templates for IoT Data Ingestion and Visualization in the Cloud                           | <a href="#">Source Code</a>                        |
| 2D Unified Particle Solver for Fluid and Fluid-Solid Coupling Simulation                                 | <a href="#">Source Code</a> <a href="#">Report</a> |
| Design and Implementation of a Load-Balanced Elastic Cloud Infrastructure                                | <a href="#">Source Code</a>                        |
| Implementing a PID Controller for Inverted Pendulum Stabilization using Image Tracking and Kalman Filter | <a href="#">Source Code</a>                        |
| Microsoft Azure Quantum-Inspired Optimization (QIO) Solver for the Traveling Salesman Problem            | <a href="#">Source Code</a>                        |
| Multi-Label Image Classification with CNNs using MobileNetV2, ResNet50, and SESEMI                       | <a href="#">Source Code</a>                        |
| AI-Driven Environmental Solutions: Predictive Tree Planting to Combat Deforestation and Climate Change   | <a href="#">Source Code</a>                        |
| Python-based AI Agent for Colosseum Survival Game  | <a href="#">Source Code</a>                        |
| Simple Brick Breaker in x86 assembly language, OpenGL and GLSL   | <a href="#">Source Code</a>                        |
| Analyzing COVID-19 Discussions in Canadian Social Media: A Focus on Vaccine Hesitancy                    | <a href="#">Source Code</a>                        |

## TECHNICAL SKILLS

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**Programming** Proficient: Python, Java, JavaScript, C/C++, Bash, SQL, Cypher - Intermediate: C#, x86 Assembly, CUDA, R, OCaml, KQL

**Tools** Git, Docker, Power Bi, AWS CDK, Selenium, PyTorch, Flask, ZooKeeper, ANTLR, Neo4j

**Cloud Comp.** **Microsoft Azure:** {VMs, Data Factory, Databricks, App Service, Container Instances, Data Lake Storage, Azure DevOps, Azure Quantum}, **AWS** {Lambda, S3, EC2, EFS, ECR, VPC, SNS, Step Functions, Glue, Kinesis, OpenSearch, QuickSight, Timestream, IoT Core}, **GCP:** {VMs, Storage, Cloud Functions, Pub/Sub, Workflows, Cloud Composer}

## COURSEWORK

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**Graduate-Level** Distributed Systems, Cloud Computing, Applied Machine Learning, Cryptography & Data Security, Fundamentals of Computer Animation

**Undergraduate-Level** Algorithms & Data Structures, Software Design, Intro. to Computer Systems, Theory of Computation, Algorithm Design, Programming Lang & Paradigms, Operating Systems, Artificial Intelligence, Intro. Robotics & Intelligent Systems, Parallel Computing, Database Systems

## VOLUNTEER WORK

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2023 Student Volunteer, Very Large Data Bases Conference (VLDB 2023)

2021 McGill University Head Delegate, Canadian University Software Engineering Conference 2022 (CUSEC)

2021 Mentor at New Student Mentorship Program (NSMP), McGill Campus Life and Engagement

2021 Co-president, Girls Who Code McGill Student Club

2020 Vice President of Internal Affairs, Through Their Eyes Student Club, Students' Society of McGill University

2019 Executive Staff, International Collegiate Programming Contest (ICPC), Sharif University of Technology