Zhekai Jiang

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Education

McGill University
Sep 2019 – May 2024 (Expected)

Bachelor of Software Engineering (BSE), Engineering Internship Program (EIP)
Montréal, Québec, Canada

- **Cumulative Grade Point Average:** 4.00 / 4.00
- **Course highlights:**

  Software engineering and computer science theories: Model-Based Programming (Top performer), Software Validation (Top performer), Software Requirements Engineering, Programming Languages and Paradigms, Theory of Computation

  Computer systems: Database Systems, Parallel Computing, Operating Systems (100%, Top 3 best projects winner)

  Artificial intelligence and computer graphics: Applied Machine Learning (Graduate), Computer Graphics (Graduate, 100%)

  Languages and communication: Communication in Engineering, Elementary French

  Other personal interdisciplinary interests: Physics of Music, Introduction to Psychology (Advanced Placement)

The University of Hong Kong (HKU)
Jul 2018 – Aug 2018

Visiting
Hong Kong, China

- **Course:** Mathematical Laboratory and Modeling, **Grade:** A+, 4.30 / 4.30

Honours and Awards

McGill **Dean's Honour List** for ranking in the top 10% of the Faculty of Engineering

McGill **Hatch Scholarship in Engineering** for my academic merit

McGill **Schull–Yang International Experience Award / Summer Undergraduate Research Award in Engineering (SURE International Award)** for my visit at EPFL (Swiss Federal Institute of Technology in Lausanne) for research internship

EPFL **Scholarship of Excellence** for participating in the Excellence Research Internship Program (ERIP)

McGill **Tomlinson Engagement Award for Mentoring (TEAM)** for mentoring in courses

McGill **Engineering Class of 1983 Scholarship** for my academic standing and overall contribution to university life

McGill **John V. Galley Scholarship** for my distinguished academic standing

McGill **Rio Tinto – Richard Evans International Exchange Award** for my academic achievements, as well as leadership values of personal responsibility, integrity, accountability, and mutual respect

HKU **Award of Excellence** for achieving distinction in the undergraduate-level course during my visit during high school

Research Experiences

Research Intern — Open-source corporate architecture solutions and services
Jan 2023 – Aug 2023

Oracle Labs
Zürich, Zürich, Switzerland

Excellence Research Intern — Database systems and data management
May 2022 – Aug 2022

Data Analysis Theory and Applications (DATA) Laboratory, EPFL (Swiss Federal Institute of Technology in Lausanne)
Lausanne, Vaud, Switzerland

Supervisor: Prof. Christoph Koch

Sudokube: an online analytical processing (OLAP) database system based on high-dimensional data cubes

- Researched on algorithms based on probabilistic graphical models for marginal problems with maximum-entropy constraint optimization, for the core query engine to efficiently approximate results of analytic queries using partially materialized pre-computed data cubes
- Extending from the existing system and solvers, implemented new solvers in Scala based on existing literature
- Designed an object-oriented class hierarchy model for solvers generalizable to current and potentially future graphical-model-based solvers
- Proposed and implemented in Scala new heuristic methods to balance model complexity and approximation accuracy
- Developed automated tests, experiments, and demos in Scala; executed experiments on remote Linux servers with realistic data sets; plotted diagrams with Python scripts; and compared and analyzed performance in terms of accuracy and efficiency of approximation among all solvers

Research Assistant **Model-based software and systems engineering** May 2020 – Apr 2022

Critical Software-Intensive Systems Group, McGill University Montréal, Québec, Canada

Supervisor: Prof. Dániel Varró

Refinery: an efficient graph solver as a service to generate consistent, well-formed models based on partial models

- Based on a novel specification language Problem, developing the online service to visualize partial models and the process of model generation in real time, using React, D3, and Xtext web editor supports, in TypeScript and Java
- Potentially applicable to automated synthesis of test data, feature modelling, and design tool certification for critical and cyber-physical systems

Applying force-directed graph layout to solve and visualize models with constraints

- Implemented a force-directed layout algorithm in Python to solve models with constraints and generate models of test cases involving objects in the surrounding environment in the context of autonomous driving
- Potentially applicable to automatic generation of test cases for systems involving similar realistic graphical environments

Public transit hub connection planning by design space exploration

- Identified problem and designed meta model of the problem domain using Ecore in the Eclipse Modeling Framework (EMF)
- Specified constraints, objectives, and transformations as graph model patterns using the VIATRA Query Language (VQL)
- Generated code from models, implemented setup process, specified search strategies, and executed design space exploration in Java with the VIATRA Design Space Exploration (VIATRA-DSE) Framework

Teaching Experiences

Tomlinson Engagement Awardee for Mentoring (TEAM Mentor) Sep 2020 – Dec 2022

Tomlinson Project in University-Level Science Education (T-Pulse), McGill University Montréal, Québec, Canada

- **Fall 2022 – Linear Algebra and Geometry**: Hosted in-person office hours at the SciLearn Peer Collaboration
- **Winter 2022 – Programming Languages and Paradigms**: Hosted virtual office hours via Zoom
- **Fall 2021 – Linear Algebra and Geometry**: Authored reading materials on applications of linear algebra in other areas of mathematics and computer science (available on my personal website); monitored course discussion board
- **Winter 2021 – Introduction to Software Engineering**: Monitored course discussion board and advised students on the semester-long full-stack group project (a software system for an imaginary auto repair shop, including a backend, a website, and an Android application) and general course materials
- **Fall 2020 – Linear Algebra and Geometry**: Hosted office hours at the virtual $\overrightarrow{F}\,\mathrm{Re}(z)\,\mathrm{Ca}$ (First Year Residence Cafeteria tutorial program) via Microsoft Teams

Teaching Assistant – Grader Oct 2021

Department of Electrical and Computer Engineering, McGill University Montréal, Québec, Canada

- **Fall 2021 – Introduction to Software Engineering**: Graded design problems on user and system requirements analysis and specification, use case and activity modelling, domain modelling, relational database design, and object-relational mapping, in an online midterm exam; resulted in zero complaints or regrading requests

Services

McGill International Experience Awards (MIEA) Ambassador Oct 2022 – Present

McGill International Experience Awards (MIEA), McGill University Montréal, Québec, Canada

- Shared my international experience with the McGill community and perspective Excellence Research Interns of EPFL
- Endorsing and promoting international experiences to inspire the future cohort of McGill International Experience Awardees
- Presented my international experience as well as relevant thoughts as part of a video presented for the topic of experiential learning opportunities (at local, national, and international levels) during the McGill Annual Joint Board-Senate Meeting

Organization Affiliations

Student member, **Association for Computing Machinery (ACM)**

Student member, **Institute of Electrical and Electronics Engineers (IEEE)**

Lifetime member, **Golden Key International Honour Society**

Skills

Languages: English (Proficient – C1/C2), French (Elementary – A2), Mandarin Chinese (Native), German (Beginner)

Programming, scripting, and query languages: Java, Scala, C, C++, Python, JavaScript, TypeScript, OCaml, Bash, SQL, Cypher Query Language, Pig Latin, ARMv7-Assembly

Professional software, tools, and frameworks:

Integrated development environments and editors: Eclipse, IntelliJ IDEA, Xcode, Android Studio, Visual Studio Code, Vim

Version control, collaboration, and continuous integration: Git, GitHub, GitLab, Travis CI

Frameworks: Gradle, Spring Boot, Vue.js, React, Node.js, Express.js, Flask

Database systems: PostgreSQL, IBM DB2, Neo4j, MongoDB

Software testing, static analysis, and formal verification: JUnit, SonarQube, Infer, GraphWalker, UPPAAL

Big data and cloud computing: Heroku, Apache Pig, Google Cloud Platform

Software, systems, requirements, domain, and behaviour modelling: Umple, jUCMNav, UML Lab, Yakindu, VIATRA, Eclipse Modelling Framework, Cucumber

Numeric computing: MATLAB, Scilab

Graphics and visualization: OpenGL, Data-Driven Documents (D3)

Operating systems: macOS, Windows, Linux, Unix

Software engineering practice: Object-oriented development, Model-based engineering, Behaviour-driven development, Test-driven development, Agile project management