Zhekai Jiang

zhekai.jiang@mail.mcgill.ca
+1 (514) 298 5085

Personal Website: https://zhekai-jiang.github.io/
LinkedIn Homepage: https://linkedin.com/in/zkjiang
GitHub Homepage: https://github.com/zhekai-jiang

Education

McGill University
Sep 2019 – May 2023 (Expected)

Bachelor of Software Engineering
Montréal, Canada

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

  Software Engineering and Computer Science: Model-Based Programming (Top Performer), Programming Languages and Paradigms, Theory of Computation, Software Requirements Engineering, Database Systems, Operating Systems (100%, Best Assignments Winner), Applied Machine Learning (Graduate), Signals and Networks

  Mathematics: Discrete Structures (100%), Probability and Statistics for Engineers

  Languages and Communication: Communication in Engineering, Beginners' French 2

  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 **Schull Yang International Experience Award, as Summer Undergraduate Research Award in Engineering (SURE Award)** for my Excellence Research Internship at the Swiss Federal Institute of Technology in Lausanne (EPFL)

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

McGill **Tomlinson Engagement Award for Mentoring (TEAM)** (4 times)

McGill **Dean's Honour List** (2 times) for ranking in the top 10% of the Faculty of Engineering in an academic year

McGill **Engineering Class of 1983 Scholarship** for my high 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

Research Experiences

Excellence Research Intern
May 2022 – Aug 2022

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

Supervisor: Prof. Christoph Koch

Supported by EPFL Excellence Research Internship Program (ERIP) and McGill Summer Undergraduate Research in Engineering (SURE) International Program

Funded by EPFL Scholarship of Excellence and McGill Schull Yang International Experience Award

- Researching on the use of iterative proportional fitting for query evaluation with partially materialized data cubes in Sudokube, an online analytical processing (OLAP) database system for data scientists with high-dimensional data cubes.

Research Assistant
May 2021 – Present

Critical Software Intensive Systems Group, McGill University
Montréal, Canada

Supervisor: Prof. Dániel Varró

- Studying about model-based software and systems engineering, including design space exploration, languages for model specification and graph query, model generation, and model visualization and simulation.
- Developing part of Refinery to visualize partial models and the process of iterative model generation in real time using React and D3, based on a novel specification language Problem, applicable to automatic test case generation, system feature modelling and selection, etc. for critical systems and cyber-physical systems.
- Developing and researching an experimental technique based on force-directed graph layout to solve and visualize models with constraints. Potentially applicable to automatic generation of test cases involving realistic graphical environments.

Teaching Experiences

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

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

- **Winter 2022 – Programming Languages and Paradigms:** Hosted weekly virtual mentoring hours via Zoom.
- **Fall 2021 – Linear Algebra and Geometry:** Wrote extra reading materials on applications and connections of linear algebra to other areas of mathematics and computer science (available on my website). Monitored the course discussion board.
- **Winter 2021 – Introduction to Software Engineering:** Monitored the course discussion board and advised students on the semester-long full-stack group project (an application 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 weekly office hours at the virtual $\overrightarrow{F}\,\mathrm{Re}(z)\,\mathrm{Ca}$ (First Year Residence Cafeteria tutorial program) via Microsoft Teams.

Student Assistant – Grader Oct 2021

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

- **Fall 2021 – Introduction to Software Engineering:** Graded design problems on user and system requirements elicitation, 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.

Other Project Highlights

À l'heure: an artificial intelligence to predict flight delays (Best AI for Commerce (Stonks), MAIS Hacks 2021, McGill Artificial Intelligence Society) Oct 2021

Links: Web Application | Devpost Presentation | GitHub Repository

Collaborators: Junjian Chen, Xichong Ling, Shichang Zhang

- Trained a decision tree model based on five parameters. Developed a frontend in HTML and CSS and a backend with Flask to store the model and process HTTP requests.
- Contributed to the ideation of the project. Developed and deployed the Flask backend and the HTML frontend onto remote servers. Conducted the oral presentation and live demonstration.

Be My Chef: a solution for La Tablée des Chefs aimed at encouraging teenagers to create and share food recipes, learn about healthy eating, and encourage food sustainability (Morgan Stanley 2021 Code to Give MTL Hackathon) Sep 2021

Link: GitHub Repository

Collaborators: Anthony Zhao, Eric Zhang, Jessica Yang, Frédéric Polletier, Jia Ming Wei, Louis Waked (Mentor)

- Analyzed requirements, identified features, designed software prototypes, developed functional components in React, and proposed recommendations on implementation and future work.
- Contributed to ideation of requirements, features, and prototypes. Developed the page displaying information of recipes and a search-by-available-ingredients feature in JavaScript using React. Helped compile texts and graphics for documentations on GitHub and the hackathon's platform. Proposed recommendations for implementation.

Exploring Solutions for Spam Filtering (Research paper assignment, Communication in Engineering) Jan 2021 – Apr 2021

- Through a literature survey, studied three methods for spam filtering: Bloom filter, support vector machine, and convolutional neural network. Analyzed and compared them in terms of complexity, accuracy, and adaptability. Proposed a solution using convolutional neural network, complemented with a Bloom filter as the initial step.

Pocket McGill: a proposal of a one-stop mobile application for McGill students to conveniently access essential services for their academic lives (Business proposal assignment, Communication in Engineering) Mar 2021 – Apr 2021

Collaborators: Justin Legrand, Mohamed Amine El Felsoufi, Ping Gu, Ramin Akhavan-Sarraf, Sébastien Cantin

- As an imaginary startup software engineering company, compiled a business proposal to McGill University in both a written document and a live presentation.
- Served as a senior software engineer in the imaginary company, addressing details on the implementation of the application, including the system architecture and project management plans.

Artizon: a full-stack software system for an imaginary art gallery transforming business online amid the COVID-19 pandemic. (Course project, Introduction to Software Engineering) Sep 2020 – Nov 2020

Link: Frontend Website | GitHub Repository

Collaborators: Wen (Amelia) Cui, Linpei (Angelina) Duan, Zheyan Tu, Tianyu Zhao

- Developed backend in Java, using Gradle and Spring Boot, with a PostgreSQL database. Developed web frontend using Vue.js and Android application in Android Studio. Deployed backend and web frontend on Heroku. Automated unit and integration testing using JUnit. Used Travis CI for continuous integration. Collaborated and managed using Git and GitHub.
- Served as a primary designer of the domain model. Implemented part of the backend business service layer and RESTful APIs with respective unit and integration testing. Implemented part of the web and Android frontends. Contributed to configurations, deployments, and bug fixing throughout the development. Organized the backlog and documentation on GitHub.

Kingdomino (Course project, Model-Based Programming) Jan 2020 – Apr 2020

Collaborators: Ricky Liu, Matthew Caccavelli, Gregory Walfish, Ezra Gomolin

- Developed a software with graphical user interface for the game Kingdomino, using object-oriented and behaviour-driven development in Java, following the model-view-controller pattern.
- Served as a primary designer of the domain model and state machine model. Developed verification functionalities and part of the graphical user interface for the main gameplay. Helped with other team members' issues and the merging of code throughout the development.

The Best Hospital (Finalist of Greater China, International Mathematical Modeling Challenge (IMMC 2018) International Contest) Mar 2018 – Apr 2018

Publication: in journal *Maths, Physics, and Chemistry for Middle School Students* (in Chinese only)

Collaborators: Ruijia Chen, Weijia Huang, Chuxiang Lin, Ziqian Li (Teacher Advisor)

- In a team of four, developed a mathematical model that uses various factors to measure the quality of hospitals and determine the best hospital. Wrote a memo that a person without much mathematical expertise or computing ability can use to choose a hospital.
- Invited for a live presentation and oral defence at the regional final of Greater China.
- Contributed to the overall design of the mathematical model. Developed all the computer programs in MATLAB and C++. Edited part of the solution paper for the contest and subsequent publication.

Education and Growth (Meritorious Winner, International Mathematical Modeling Challenge (IMMC 2018) Regional Contest of Greater China) Feb 2018

Publication: in journal *Mathematics Study and Research* (in Chinese only)

Collaborators: Ruijia Chen, Weijia Huang, Chuxiang Lin, Ziqian Li (Teacher Advisor)

- In a team of four, developed an econometric model to predict China's economic growth in the next 20 years. Evaluated the role of education in economic growth. Proposed suggestions on government policies.
- Contributed to the overall design of the mathematical model. Developed all the computer programs in MATLAB and C++. Edited part of the solution paper for the contest and subsequent publication.

Skills

Languages: English (Proficient – C1/C2), French (Basic – A1/A2), Mandarin Chinese (Native)

Programming, Scripting, and Query Languages: Java, C, Python, JavaScript, TypeScript, C++, Bash, OCaml, SQL, Cypher, Pig Latin, ARMv7-Assembly

Professional Software, Tools, and Frameworks:

Integrated Development Environments and Editors: Eclipse, IntelliJ IDEA, 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

Numeric Computing: MATLAB, Scilab

Software Modelling Tools: Umple, jUCMNav, UML Lab, Yakindu, VIATRA, Eclipse Modelling Framework

Miscellaneous: JUnit, Heroku, Apache Pig, D3, Google Cloud Platform, Docker, Cucumber

Operating Systems: macOS, Windows, Linux

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