Zhekai Jiang

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Education

McGill University
Montréal, Québec, Canada

Bachelor of Software Engineering (BSE), Engineering Internship Program (EIP)   Sep 2019 – May 2024 (Expected)

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

The University of Hong Kong (HKU)
Hong Kong, China

Visiting   Jul 2018 – Aug 2018

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

Research and Development Experiences

Oracle Labs
Zürich, Zürich, Switzerland

Research and Development Intern Open-source corporate architecture   Jan 2023 – Aug 2023

Testimonial by Oracle

Statistics analytics feature for the GraalVM Download Service

- Communicated with stakeholders, analyzed requirements, and composed proposals of requirements, design, and test specifications
- Implemented statistics visualization with a zoomable chart and paginated load-more-on-scroll tables, supporting flexible filtering and grouping criteria
- Specified and implemented REST API endpoints in Java using Dropwizard, designed SQL query templates with JDBI, implemented frontend components in TypeScript using Oracle JET, built application using Maven, deployed as Docker containers to Oracle Cloud Infrastructure (OCI)
- Followed Kanban-based agile development process, using Git and Atlassian suite (Jira, Confluence, Bitbucket)

Other tasks

- Gave a 1-hour tech talk at Oracle's Morocco Development Center (MADC) on the motivations, features, architecture design, and future work of the project, with a live demo of major use cases
- Configured, enabled, and optimized automated testing in continuous integration builds on the Oracle Cloud Infrastructure
- Authored and enhanced customer documentations, project contribution guidelines, and onboarding guides for new hires

EPFL (Swiss Federal Institute of Technology in Lausanne)
Lausanne, Vaud, Switzerland

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

Supervisor: Prof. Christoph Koch, Data Analysis Theory and Applications (DATA) Laboratory

Sudokube: an online analytical processing (OLAP) data cube engine for the aggregation and exploration of high-dimensional data

GitHub repository

- Extending from existing system, implemented new query solvers in Scala based on algorithms of probabilistic graphical models for marginal problems with maximum-entropy constraint optimization to approximate results using partially materialized data cubes
- Proposed and implemented in Scala new heuristic methods to balance model complexity and approximation accuracy
- Developed automated tests, experiments, and demos in Scala for the new solvers; executed experiments on remote Linux servers with realistic data sets; plotted diagrams using Python; compared and analyzed performance across all solvers

Freelance Researcher and Developer Data management application development   Mar 2023 – Jun 2023

Followup work: web-based data management application development and demo at SIGMOD '23

Publication with video at ACM Digital Library | GitHub repository

- Proposed, designed, and implemented a React-based web frontend interface for users to interact with the system and visualize results and metrics
- Designed and specified interfaces of remote procedural calls between the Scala backend and React frontend using gRPC
- Demonstrated major use cases of the application at SIGMOD '23 both as a video and in person during the conference

McGill University   Montréal, Québec, Canada

Freelance Researcher **Model-based software and systems engineering**   May 2020 – Apr 2022

Supervisor: Prof. Dániel Varró, Critical Software-Intensive Systems Group

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, developed part of 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
- Applicable to automated test data synthesis, 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
- Applicable to automatic generation of test cases for systems involving similar realistic graphical environments

Public transit hub connection planning by search-based 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

Publication

Aggregation and Exploration of High-Dimensional Data Using the Sudokube Data Cube Engine   Jun 2023

SIGMOD '23: Companion of the 2023 International Conference on Management of Data   Seattle, Washington, USA

Co-author with Sachin Basil John, Peter Lindner, and Christoph Koch, at EPFL.

Publication with video at ACM Digital Library

Teaching Experiences

McGill University   Montréal, Québec, Canada

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

- **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 and answered questions on the discussion board
- **Winter 2021 – Introduction to Software Engineering**: Monitored discussion board and advised students on a semester-long group project (full-stack software for an auto repair shop, including backend, web frontend, and Android application) and general materials
- **Fall 2020 – Linear Algebra and Geometry**: Hosted office hours at the virtual $\vec{F}\,\mathrm{Re}(z)\,\mathrm{Ca}$ (First Year Residence Cafeteria tutorial program) via Microsoft Teams

Teaching Assistant – Grader   Oct 2021

- **Fall 2021 – Introduction to Software Engineering**: Graded design problems on 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

Honours and Awards

McGill **Dean's Honour List** for ranking in the top 10% of the Faculty of Engineering   Jul 2020, Jul 2021, Jul 2022, Sep 2023

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

Dec 2020, Apr 2021, Dec 2021, Apr 2022, Dec 2022

EPFL **Scholarship of Excellence** for participating in the Excellence Research Internship Program (ERIP)   May–Aug 2022

McGill **Hatch Scholarship in Engineering** for my academic merit   Jul 2022

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   May 2022

McGill **Engineering Class of 1983 Scholarship** for my academic standing and overall contribution to university life   Jul 2021

McGill **John V. Galley Scholarship** for my distinguished academic standing   Jul 2020

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   Jul 2020

HKU **Award of Excellence** for achieving distinction in the undergraduate-level course during my visit during high school   Sep 2018

Services

McGill University   Montréal, Québec, Canada

McGill International Experience Awards (MIEA) Ambassador   Oct 2022 – Present
- 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, **ACM Special Interest Group on Management of Data (SIGMOD)**

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, Jira, Confluence, Bitbucket, GitLab, Travis CI

    Build Tools and platforms: Gradle, Maven, Docker

    Frameworks: Spring Boot, Dropwizard, React, Vue, Angular, Oracle JET, Node.js, Express.js, Flask

    Database systems: PostgreSQL, Oracle, 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 (scrum, kanban)