

Ryan Liu

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SKILLS SUMMARY

- Collaborated on enterprise web application development research and performance optimization over 3 years using Java, Python, C++, and JavaScript, working with frameworks like OpenLiberty and Spring.
- Experience over 3 years in full-stack web application development with React, Node, and Django using HTML, CSS, TypeScript, and Python, following software engineering best practices and standards.
- Designed SQL and NoSQL databases with a focus on scalability and robust analytical capabilities.
- Familiar with deployment and testing workflows using CI/CD pipelines like Jenkins and GitHub Actions, and integrating tools like JUnit for unit testing.
- Engineered and maintained scalable, secure distributed systems with REST APIs, emphasizing robust API design principles with open documentation.
- Built internal development tools in C# over 1.5 years that streamlined workflows and development cycles.
- Worked in fast-paced Agile environments using Git, delivering high quality software through cross functional teamwork across all stages of SDLC.
- Deployed and managed containerized applications on various cloud platforms (AWS, IBM Cloud, and GCP) using Docker, Helm, Kubernetes, Prometheus, and Sysdig.
- Authored well-written documentation, papers, and presentations for both technical and non-technical audiences.
- Hands-on experience with statistical analysis, AI algorithms, and machine learning techniques using TensorFlow, PyTorch, and scikit-learn to solve complex problems.
- Championed projects as a quick-learner with a result-oriented mindset by identifying bottlenecks, resolving challenges, and excellent communication with peers to drive team success.

PROFESSIONAL EXPERIENCE

Software Engineer

Sept. 2016 – Sept. 2019

Stamplus Rewards

Richmond, BC

- Led sprint planning, product documentation, database design, and backend system design for development of a mobile rewards platform for merchants in Metro Vancouver region.
- Utilized AWS cloud computing services to deploy and operate Python-based (Django) backend with RESTful API to facilitate CRUD operations in PostgreSQL DB.
- Gathered stakeholder requirements and designed auto-expiring QR codes to improve reward collection process; improved checkout efficiency by **25%**.
- Incorporated third-party features to improve user engagement by **20%**; including social media platform integration using Facebook and Google APIs and push notifications using Firebase.
- Integrated Postman for testing and Swagger for documenting APIs, improving developer onboarding and usability.
- Contributed to frontend mobile development for reward collection and redemption using TypeScript (Ionic Framework with React).

Junior Software Developer

Jan. 2017 – Aug. 2018

Archiact Interactive

Vancouver, BC

- Collaborated cross-functionally with UI/UX designers to build custom, internal development tools using C# (Unity) for Marvel: Dimension of Heroes; improved UI/UX-related development speed by **50%**.
- Converted existing codebase of non-VR/non-AR games into VR/AR compatible versions published on various platforms, titles include Waddle Home and Darknet.

PROJECTS AND PUBLICATIONS

An Adaptive Heuristic-Based Framework to Enhance JITServer Technology

<https://casweb.ef52d293.public.multi-containers.ibm.com/ibm/cas/canada/research/1166>

- Contributed to IBM-funded, open-source research projects focused on improving enterprise Java application performance in cloud computing environments using JITServer remote compilation technology.
- Spearheaded project to improve microservice web application startup time by **10%** via reducing Java container image size (by up to **50%**) automatically using Python scripts.
- Analyzed benchmark applications (Spring and OpenLiberty) using Bash, C++, and Python to identify up to **18%** of JIT compilations can be further optimized to improve Java application performance in Eclipse OpenJ9 JVM.

- Led development of a visualization tool to aid understanding of Java compilation and optimization behaviour for developers; used JavaScript (vis.js), HTML, CSS (Bootstrap).
- Published international conference papers; received the **best paper award** at CASCON 2024 as main author.

Using POMDP-based Approach to Address Uncertainty-Aware Adaptation for SPS

<https://arxiv.org/abs/2308.02134>

- Modeled state uncertainty and model parameter uncertainty within a data-driven Moving Target Defense deployment process using Reinforcement Learning and Bayesian Machine Learning techniques.
- Implemented and analyzed the approach on simulated cryptojacking scenario on distributed systems using C++ and Python; reduced compromise frequency by up to **50%** while preserving **99%** availability of protected services.

FlaKat: A Machine Learning-Based Categorization Framework for Flaky Tests

<https://arxiv.org/abs/2403.01003>

- Developed AI-based pipelines for fast and accurate flaky testing categorization of Java unit tests using Python and scikit-learn, which can be integrated into CI/CD workflows.
- Achieved F_1 scores of up to **94%** for certain categories of flaky tests.

AHA: Adaptive Hadoop in Ad-hoc Cloud Environments

<https://ieeexplore.ieee.org/document/9659512>

- Designed data-driven Resource-aware Task Scheduler (using Java) for running distributed computing within ad-hoc cloud environments; improved performance by up to **20.2%**.

EDUCATION

PhD in Computer Engineering

Sept. 2020 – May 2025 (expected)

University of Waterloo

Waterloo, ON

- Postgraduate Scholarship - Doctoral Program, Natural Sciences and Engineering Research Council of Canada
- President's Graduate Scholarship, University of Waterloo

Master of Engineering in Computer Engineering

Dec. 2019

University of Waterloo

Waterloo, ON

Bachelor of Applied Science in Computer Engineering (with Distinction)

May 2015

University of British Columbia

Vancouver, BC