Ryan Liu

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Skills Summary

- Collaborated on enterprise web application development research and 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 using Bootstrap, React, Node.js, Django, HTML, CSS, Python, and TypeScript, following software engineering best practices.
- 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 integrating tools like JUnit for unit testing.
- Engineered and maintained scalable, secure distributed systems with RESTful 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 quality software through cross functional teamwork.
- 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 over 3 years 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 constructive communication with peers to drive team success.

Professional Experience

Research Collaborator **Jan. 2020 – Present**

IBM - Centre for Advanced Studies Canada *Markham, ON (Remote)*

- Contributed to IBM-funded, cutting-edge 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.
- Developed hands-on labs and documentation for an award-winning course on self-adaptive software, with practical exercises using OpenLiberty, MongoDB, Docker, Kubernetes, Prometheus, GCP, and IBM Cloud Observability.

Software Engineer **Sept. 2016 – Sept. 2019**

Stamplus Rewards *Richmond, BC*

- Led sprint planning, product documentation, database design, and overall system design for backend 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, Darknet, and Slots in De Nile.

Projects and Publications

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 – Present**
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*