

Ryan Liu

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TECHNICAL SKILLS

Technical Languages: Java, Python, C#, C++, Bash, JavaScript, TypeScript, HTML, CSS, XML
Tools/Frameworks: Git, Kubernetes, OpenShift, Docker, Prometheus, sysdig, Django, DRF, Unity3D, Hadoop, Spark, RabbitMQ, Postman, Ionic, Node, JUnit, Open Liberty, Spring
Libraries: PyTorch, NumPy, pandas, scikit-learn, TensorFlow, vis.js, higher, Stable-Baselines3, Gymnasium, matplotlib
Databases/Caches: PostgreSQL, MySQL, MongoDB, Memcached, Redis
Cloud Platforms : AWS, IBM Cloud, GCP
CI/CD : Jenkins, GitHub Actions
Operating Systems: Linux-based systems, Ubuntu, RHEL

WORK EXPERIENCE

Software Engineer

Sept. 2016 – Sept. 2019

Stamplus Rewards

Richmond, BC

- Led sprint planning, product documentation, database design, and API design of a mobile rewards platform for merchants in Metro Vancouver region; ideation to production in 6 months.
- Utilized AWS cloud computing (EC2 and S3) services to deploy and operate Python-based (Django) backend with RESTful API to facilitate CRUD operations in PostgreSQL DB.
- Slashed rewards collection time during checkout by **25%** by gathering stakeholder feedback and designing auto-expiring QR codes.
- Improved user engagement by **20%** by incorporating third-party features, including social media platform integration using Facebook and Google APIs and push notifications using Firebase.
- Worked on a responsive mobile frontend for reward collection and redemption using TypeScript, Ionic, and React, which streamlined and improved checkout efficiency.

Junior Software Developer

Jan. 2017 – Aug. 2018

Archiaet 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>

- Spearheaded experiments to improve microservice application (Spring and OpenLiberty) startup time by **10%** via reducing Java container image size (by up to **22%**) automatically using Python scripts.
- Analyzed benchmark applications (Spring and OpenLiberty) and identified up to **18%** of JIT compilations may be further optimized to improve Java application performance; added custom tracepoints to JVM using C++.
- 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.

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

Lin, S., Liu, R., Tahvildari, L. (2024). <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.

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

Liu, R., Tahvildari, L. (2023). <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.

AHA: Adaptive Hadoop in Ad-hoc Cloud Environments

Liu, R., Lin, S., Tahvildari, L. (2021). <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%**.

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