

# Zeshan Fayyaz

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## EDUCATION

### University of Waterloo

Master of Mathematics, Computer Science

September 2022 - June 2025

Waterloo, ON

### Toronto Metropolitan University

Bachelor of Engineering, Computer Engineering

September 2016 - April 2022

Toronto, ON

## SKILLS

**Programming Languages & Tools:** Python, SQL, C, Java, Bash, Git, LaTeX

**Machine Learning & MLOps:** Federated learning, LLMs, model evaluation, PyTorch, TensorFlow, Scikit-learn, MLflow, Jupyter

**Data Engineering & Infrastructure:** Airflow, ETL/ELT pipelines, data validation, Spark, PostgreSQL

**Cloud & DevOps:** AWS (S3, EC2, Lambda, Redshift), Azure, Docker, Kubernetes, CI/CD, GitHub Actions

## WORK EXPERIENCE

### Graduate Research Assistant | Python, PyTorch, EC2

Sep 2022 – June 2025

University of Waterloo

Waterloo, ON

- Designed and implemented a scalable federated learning framework using Q-learning to dynamically optimize encryption parameters, reducing model convergence time by 24% across 1,000+ clients.
- Built a Python-based training pipeline integrating real-world compute and network traces, improving model utility by 17% under non-IID data conditions.
- Optimized security-performance trade-offs using adaptive homomorphic encryption (CKKS), improving convergence efficiency by 30% while maintaining 256-bit security guarantees.

### Teaching Assistant | Python, SQL, Algorithms

Sep 2022 – June 2023

University of Waterloo

Waterloo, ON

- Led tutorials for CS114, CS115, and CS135 focused on Python, SQL, and functional programming for over 300 students.
- Designed and delivered learning modules on model evaluation, algorithmic optimization, and data preprocessing best practices.

### Machine Learning Researcher | Python, TensorFlow, NumPy, EC2

Jan 2020 – Sep 2022

Toronto Metropolitan University

Toronto, ON

- Designed and implemented scalable machine learning pipelines for real-time predictive modeling on 100GB+ image datasets.
- Developed and optimized deep learning models for stripe noise removal using TensorFlow and BiGRU architectures, achieving 22.99% PSNR and 3.79% SSIM improvements over prior state-of-the-art.
- Deployed and maintained distributed training workflows on AWS EC2, reducing training time by 35% through efficient model tuning, batching, and resource-aware configuration.

### Business Insights and Analytics Intern | Python, Tableau, SQL

June 2022 – Aug 2022

TD Canada Trust

Toronto, ON

- Developed and maintained Python-based ETL pipelines for risk modeling and analytics, reducing pipeline latency by 60 percent.
- Performed extensive data validation and feature engineering to enhance model training datasets for credit risk analysis.
- Built Tableau dashboards for monitoring model outputs and KPIs, accelerating stakeholder reporting cycles by 50 percent.

### Software Engineering Fellowship | Python, Docker, OAuth

Jan 2022 – June 2022

Royal Bank of Canada

Toronto, ON

- Integrated model monitoring and evaluation checkpoints into CI/CD pipelines with GitHub Actions and Docker.
- Refactored ML pipeline architecture for reproducibility and scalable model experiment tracking across cloud environments.
- Built automated feature engineering scripts for time-series and tabular data, reducing data prep time by 70 percent.

## RELEVANT PROJECTS AND PUBLICATIONS

### HERL: Tiered Federated Learning with Adaptive Homomorphic Encryption using Reinforcement Learning

The 7th IEEE International Conference on Trust, Privacy and Security in Intelligent Systems (TPS), 2025

- Developed a tiered **federated learning framework** using **adaptive homomorphic encryption** and **Q-learning** to address stragglers and client heterogeneity, achieving a 20% increase in model accuracy and 30% reduction in communication overhead.

### Towards Taming the Resource and Data Heterogeneity in Federated Learning

2019 USENIX Conference on Operational Machine Learning (USENIX OPML'19)

- Investigated **resource and data heterogeneity** in **federated learning**, using **AWS EC2** simulations with 20 clients and achieving 40% reduction in per-epoch training time, optimizing model quality in non-homogeneous environments.

### Bolt: Towards a Scalable Docker Registry via Hyperconvergence

IEEE International Conference on Cloud Computing (IEEE CLOUD'19), 2019

- Engineered a scalable **Docker registry** architecture leveraging **hyperconvergence** to support high-volume user requests with minimal redundant storage, utilizing distributed storage and caching strategies to enhance container deployment efficiency.