
EDUCATION

PhD, Queen's University

Expected April 2024

*Computing, Field of Study in Artificial Intelligence; GPA 4.25/4.3***MSc, Trent University**

Graduated Sept 2020

*Applied Modeling and Quantitative Methods; GPA 4.15/4.3***BSc, Cornell University**

Graduated May 2020

Independent Major (Engineering Physics and Astronomy)

SKILLS

Languages: Python, SQL, Java, R, MATLAB, C**Technologies:** PyTorch, PyTorch Lightning, PyTorch-Geometric, TensorFlow, Keras, scikit-learn, Git

RESEARCH PROJECTS

RNA Velocity Analysis of Single Cell Genomics Data

Sept 2022 - Ongoing

PhD research; PyTorch, velocity, scVelo

- Developing a deep learning pipeline for clustering cell data, using PyTorch and the DeepVelo library.
- Analyzing RNA velocity for endometrial cancer cell lines using single cell RNA sequencing data.
- Collaborating with a research team of biologists to better understand the genomic pathways leading to this type of cancer.

Sparsity in Neural Networks

May 2022 - Ongoing

PhD research; PyTorch, Weights and Biases

- Exploring the effect of initialization and pruning for promoting sparsity in neural networks, with a focus on computer vision architectures such as ResNet.
- Designing algorithms using the lottery ticket hypothesis to identify subnetworks with high performance.
- Built a pipeline for training hundreds of sparse neural networks and tracking the experiments using Weights and Biases.

Transferring Knowledge Across Neural Networks

Sept 2021 - Apr 2022

PhD research; PyTorch, PyTorch Lightning

rzhou.ca/projects/neuron-embedding

- Explored the use of indirect encoding, a neuroevolution technique, to improve transfer learning in neural networks with a focus on computer vision models.
- Proposed and implemented a novel method for representing deep feedforward and convolutional neural networks, which improved information transfer between models and reduced their overall size.
- Published the findings at EvoStar 2022, the leading European conference on bio-inspired computation.

Traffic Forecasting using Graph Neural Networks

Sept 2019 - May 2020

MSc research; PyTorch, Pandas

rzhou.ca/projects/gm-lstm

- Led a project aimed at modeling citywide car and bike traffic flow, utilizing graph neural networks and the PyTorch Geometric framework.
- Implemented and tested various models on seven empirical datasets and one synthetic dataset, evaluating their ability to accurately predict traffic patterns
- Identified a limitation in existing methods for time series forecasting using graph neural networks, and developed a new method that addressed this limitation, outperforming the existing state-of-the-art techniques.

Time Series Forecasting for Energy Demand

Sept 2018 - May 2019

MSc research; PyTorch, TensorFlow, scikit-learn, Pandas

- Developed machine learning models to predict energy demand based on previous hourly data.
- Evaluated the performance of classical time series models, such as ARIMA, and deep learning models, such as LSTM and GRU, on benchmark datasets, and selected a forecasting model for implementation at Lowfoot Inc.
- Implemented and compared methods of quantifying uncertainty for machine learning and deep learning predictions. Work led to two conference presentations and one journal article.

PERSONAL PROJECTS

Semantic Image Search for Discord

Jan 2023

- Developed a semantic image search bot to find images from a Discord channel based on a text description.
- Used the Discord API to scrape data and monitor channels for new messages, and the CLIP deep learning model to perform semantic search.

WORK EXPERIENCE

Instructor, Trent University

Jan 2020 - Apr 2020

- Developed, taught and administered university-level curriculum in applied math and statistics
- Used digital education tools such as Kahoot to engage students and reinforce learning with spaced repetition, and created video lectures and online content after transition to online learning.

Teaching Assistant, Queen's University and Trent University

Sep 2017 - May 2022

- As head TA, coordinated grading for a team of 7 TAs and responded to student grade inquiries.
- Led seminars and gave lectures on neural networks, physics, calculus and other math topics.
- Developed, administered and graded weekly quizzes; graded assignments and exams.

LEADERSHIP EXPERIENCE

Officer, Graduate Computing Society

Sep 2020 - Ongoing

- Organized workshops and guest speakers from Vector Institute, AMII and Nextria.
- Planned community events and maintained website, social media and resources for new students.

PhD Community Initiative, Queen's University

Sep 2021 - June 2022

- Collaborated with Little Forest Kingston to develop a data collection toolkit for youth to evaluate the climate resilience of their local neighbourhood.
- Work was presented at the Ontario Ecology, Ethology, and Evolution Colloquium 2022.

HONOURS AND AWARDS

- Ontario Graduate Scholarship 2022-2023 (\$15,000)
- Ontario Graduate Scholarship 2021-2022 (\$15,000)
- Best Paper Award, 35th International Conference on Computers and Their Applications

SELECTED CONFERENCES AND PUBLICATIONS

Zhou, Muise, and Hu. "Permutation-Invariant Representation of Neural Networks with Neuron Embeddings." Presented at EvoStar 2022.

Zhou, Ryan. Time Series Algorithms in Machine Learning: A Graph Approach to Multivariate Forecasting. MSc thesis. Trent University (Canada), 2020.

Zhou, Ryan. "Uncertainty in Machine Learning for Energy Forecasting." Presented at AMMCS 2019 Minisymposium: Data Analytics and Optimization (SS-DASO).

Selim, **Zhou**, et al. Estimating Energy Forecasting Uncertainty for Reliable AI Autonomous Smart Grid Design. Energies 14.1 (2021): 247.

Selim, **Zhou**, et al. "Reducing error propagation for long term energy forecasting using multivariate prediction." Proceedings of the 35th International Conference on Computers and Their Applications, vol 69 (2020): 161-169.

Morgan, **Zhou**, and Feng. "Prediction Intervals of Machine Learning Models for Taxi Trip Length." AMMCS 2019 Proceedings, Springer.