Felix Zhang

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Education

Honours Bachelor of Science, University of Toronto Sept. 2021 – May 2025
Specialist in Computer Science, Major in Mathematics *3.95/4.0 cGPA*

Technical Skills

Languages	Python, C, C++, Rust, Java
Frameworks	PyTorch, TensorFlow, scikit-learn, NumPy, Pandas, SciPy, Matplotlib, MuJoCo, Eigen3
Tools	Git, shell, ssh, Unix, CMake, Anaconda, Google Colab, QEMU, Jupyter, WSL, Slurm

Experience

Research Assistant; PRISM Lab, Bloorview Research Institute June 2024 – Present
Supervisors: Erica Floreani and Prof. Tom Chau; Funded by: FUSRP

- Curated deep-learning models from the literature on denoising electroencephalogram (EEG) data in a team of 4 and benchmarked them on the `EEGDenoiseNet` dataset
- Investigated the applicability of end-to-end transformer models to denoise EEG signals and the impact of using signals' time-frequency representation as input

ML Runtime Engineer; Cerebras Systems May 2024 – Present

- Implemented a runtime virtual memory system in **C++** which pre-emptively loads data immediately before it is accessed, enabling off-chip memory to be used for the first time with only a **%10** performance penalty
- Triaged and addressed **20+** failing tests within a high-priority test suite which is run nightly
- Developed a test variant which enabled performance testing of a single runtime node for the first time and decreased testing overhead by avoiding the generation of unnecessary input tensors

Research Assistant; University of Toronto May 2024 – Present
Supervisor: Prof. Jack Sun

- Worked on a team of 11 to implement a pedagogical kernel *KidneyOS* in **Rust** to be used in an introductory operating systems course with **500+** students annually
- Built the process control system and integrated the user thread handling into our context switching module
- Implemented kernel/user thread differentiation and the `exit`, `fork`, `read`, `write`, and `waitpid` system calls

Machine Learning Researcher; BMO Lab, University of Toronto July 2023 – May 2024
Supervisor: Prof. David Rokeby

- Applied forward dynamics in real-time on motion-capture data using **MuJoCo**, providing joint-level control of the model and the option to extract physical data using inverse dynamics
- Used imitation learning to enable humanoid models to copy movements from motion capture suits in real-time

Research Assistant; Biological Physics Group, University of Toronto May 2023 – May 2024
Supervisor: Prof. Anton Zilman

- Reimplemented a data pre-processing pipeline which processes raw cytokine data and extracts integral features
- Built a feed-forward network in **PyTorch** that predicts the cytokine dynamics of T cells in response to antigens
- With a team of 4, showed two variables are sufficient to determine cytokine concentrations because our model predicted the correct output concentration with **0.01%** error using a bottleneck with 2 dimensions

Research Assistant; Physics Education Group, University of Toronto May 2022 – Sept. 2022
Supervisor: Prof. Carolyn Sealfon

- Created a dataset of ~**11 000** sentences from student feedback which labels whether they contain suggestions
- Compared the effectiveness of statistical and deep-learning classifiers at identifying suggestions using **scikit-learn** and **TensorFlow** respectively
- Demonstrated the efficacy of a BERT classifier at addressing this problem with it achieving an F_1 score of **0.823**

Projects

Image Domain Adaption Sept. 2023 – Dec. 2023

- Worked with Joaquin Sanchez-Garcia on applying the theory of optimal transport to domain adaption within the context of image classification
- Used **Python Optimal Transport** to compute various functions which transform the `EMNIST` dataset of handwritten digits such that its distribution and priors match those of the `MNIST` dataset
- Found that the accuracy of a fully-connected feed-forward classifier trained on the `MNIST` dataset was improved from *17%* to *73%* on the `EMNIST` dataset, demonstrating its usefulness

Student Response Classifier Mar. 2023 – Apr. 2023

- Developed a 3-parameter logistic item response theory classifier in **PyTorch**, using alternating gradient descent for training, to predict the correctness of student answers to multiple-choice questions
- Obtained an accuracy of **72%** on the *NeurIPS 2020 Education Challenge* dataset (within 5% of the best solution)

Image Classifier Dec. 2022 – Jan. 2023

- Implemented a softmax classifier with stochastic gradient descent (SGD) from scratch in **C++** using only the linear algebra library **Eigen3**
- Achieved **92%** accuracy on the `MNIST` dataset of handwritten digits (within 2% of the top classifier using SGD)
- Built in the ability to save trained weights, perform batch training, and track the training error in real-time

Image Restoration with Convolutional Neural Networks Sept. 2020 – June 2021

- Combined the models RIDNet and DeepDeblur using **PyTorch** to determine the ability of convolutional neural networks to deblur and denoise images
- Artificially generated a dataset of ~**5 000** noisy, blurred images using a Poisson-Gaussian noise model
- Discovered that integrating the two models offers marginal improvements over their individual performance

Student Leadership

Director of Internal Relations; Computer Science Student Union, University of Toronto Apr. 2023 – Apr. 2024

- Organized orientation for the ~**500** undergraduate students entering the computer science stream
- Planned **20+** events in collaboration with various partners in industry (such as AMD and Google) and student organizations (such as UTMIST and WiCS)
- Hosted **5+** talks with professors in the Department of Computer Science at the University of Toronto

First-Year Academic Officer; Math Union, University of Toronto Sept. 2021 – Apr. 2022

- Facilitated discussions between **20** mentor-mentee pairs in the *First-Year Mentorship Program* by providing guidance to the upper-year mentors
- Organized "Coffee and Chat" events which allowed for informal discussions between students and math professors

Registered Study Group Leader; Sidney Smith Commons, University of Toronto Sept. 2021 – April 2022

- Led study groups for *Foundations of Computer Science I* and *Enriched Introduction to the Theory of Computation*
- Headed weekly meetings for first-years students that reviewed content covered in the previous week's lecture
- Developed example problems to clarify and reinforce important concepts through group discussion

Awards & Scholarships

Fields Undergraduate Summer Research Program (FUSRP), University of Toronto June 2024 – Present

Louis Savlov Scholarships in Sciences And Humanities ($500), University of Toronto Nov. 2023

Dean's List Scholar, University of Toronto Sept. 2021 – Present

Second Malcom Wallace Scholarship ($4 500), University of Toronto Sept. 2021 – Present

University of Toronto Scholar ($7 500), University of Toronto Sept. 2021

B.C. Achievement Scholarship ($1 250), Government of British Columbia Aug. 2021

District/Authority Scholarship ($1 250), Government of British Columbia Aug. 2021

Selected Coursework

Code	Title	Term
CSC443	Database System Technology	Fall 2024
CSC2221*	Introduction to the Theory of Distributed Computing	Fall 2024
CSC324	Principles of Programming Languages	Winter 2024
CSC412†	Probabilistic Learning and Reasoning	Winter 2024
CSC413†	Neural Networks and Deep Learning	Winter 2024
CSC473	Advanced Algorithm Design	Winter 2024
MAT357	Real Analysis I	Winter 2024
APM462	Nonlinear Optimization	Fall 2023
CSC369	Operating Systems	Fall 2023
CSC420	Introduction to Image Understanding	Fall 2023
MAT354	Complex Analysis I	Fall 2023
MAT377	Mathematical Probability	Fall 2023
CSC373	Algorithm Design, Analysis and Complexity	Winter 2023
CSC384	Introduction to Artificial Intelligence	Winter 2023
CSC438	Computability and Logic	Winter 2023
CSC463	Computational Complexity and Computability	Fall 2022

*Graduate course
†Cross-listed graduate course