Felix Zhang

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EDUCATION

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

RESEARCH EXPERIENCE

Research Assistant; Far Data Lab, University of Toronto　　　　　　　　　Sept. 2024 – Present
Supervisor: Prof. Qizhen Zhang

- Investigated the applicability of offloading data processing onto data processing units within data centers
- Implemented the *Monodepth2* depth estimation model in **C++** from scratch
- Parallelized the execution of *Monodepth2* in **Python** and **C++** with the latter achieving linear performance scaling with the number of threads

Research Assistant; University of Toronto ⬏　　　　　　　　　　　　　　March 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
- Enabled thread creation and destruction, multi-threading, pre-emptive scheduling within the thread system
- Led a team of 3 to implement POSIX-compatible syscalls and add support running user-space executables

Research Assistant; PRISM Lab, Bloorview Research Institute　　　　　　　June 2024 – Aug. 2024
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 on model performance

Machine Learning Researcher; BMO Lab, University of Toronto ⬏　　　　　July 2023 – May 2024
Supervisor: Prof. David Rokeby; Funded by: Work Study Program

- 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; Funded by: Work Study Program

- Implemented 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
- On 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 layer with 2 neurons

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**

INDUSTRY EXPERIENCE

ML Runtime Engineer; Cerebras Systems　　　　　　　　　　　　　　　　May 2024 – Present

- Implemented a runtime virtual memory system in **C++** with a team of 3 which pre-emptively loads data before it is accessed, allowing off-chip memory to be used for the first time with a **10%** performance penalty
- Added support for network storage in the paging system with remote direct memory access, providing **100** GB/s read and write speeds with **10** μs latency to multiple remote servers
- Benchmarked multiple new server configurations under various expected workloads, informing current infrastructure designs

Awards & Scholarships

Fields Undergraduate Summer Research Program ($3 800), Fields Institute — June – Aug. 2024

Louis Savlov Scholarships in Sciences And Humanities ($1 000), University of Toronto — Nov. 2023 – Jan. 2025

Dean's List Scholar, University of Toronto — Jan. 2022 – Present

Second Malcom Wallace Scholarship ($5 000), 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

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) or 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-year students that reviewed content covered in the previous week's lecture
- Developed example problems to clarify and reinforce important concepts through group discussion

Projects

Image Domain Adaption ⬈ — Sept. 2023 – Dec. 2023
- 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

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

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

SELECTED COURSEWORK

Code	Title	Term
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
MAT327	Introduction to Topology	Summer 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
MAT344	Introduction to Combinatorics	Summer 2022

*Graduate course
†Cross-listed graduate course