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

- Investigated the applicability of offloading data proccessing onto data processing units within data centers
- Parallelized the execution of the *Monodepth2* depth estimation model, achieving a **10**x speedup over the single-threaded implementation

ML Runtime Engineer; Cerebras Systems May 2024 – Present

- Implemented a runtime virtual memory system in **C++** on 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
- Benchmarked multiple new server configurations under expected worklods, informing current infrastructure designs

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
- Enabled multi-threading and pre-emptive scheduling within the thread system
- Led a team of three to implement POSIX-compatible syscalls and support running user 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

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
- 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**

Awards & Scholarships

Fields Undergraduate Summer Research Program ($3 800), Fields Institute — June – Aug. 2024
Louis Savlov Scholarships in Sciences And Humanities ($500), University of Toronto — Nov. 2023
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) 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

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