James Zhu

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Education

- **University of Toronto** Sept. 2023 - Aug. 2025
  MASc: Electrical and Computer Engineering
  Supervised by Dr. Frank R. Kschischang

- **Queen's University** Sept. 2018 - April 2022
  BASc: Mathematics and Engineering - Computing and Communication (First Class Honours)
  Capstone Project: *Optimization of Meal Delivery Using Centralized Reinforcement Learning Algorithms (Supervised by Dr. Serdar Yuksel)*

Teaching Experience

Teaching Assistantship

Queen's University Faculty of Engineering and Applied Science Kingston, Ontario
Sept. 2020 - April 2022

Selected responsibilities:
Taught the fundamentals of mathematical proofs through hands-on examples and explanations, provided additional support and guidance to students through regular email communication, led tutorials virtually through Zoom and in-person

Courses:

APSC174 - *Introduction To Linear Algebra*: Winter 2022, Winter 2021

APSC171 - *Calculus I*: Fall 2021, Fall 2020

Outreach

Arthur B. McDonald Canadian Astroparticle Physics Research Institute Kingston, Ontario
Outreach Fellow (Full-Time Internship) *May 2021 - Aug. 2021*

- Developed and led McDonald Institute's Summer of Science camp for middle and high school students
- Taught programming (Python), introductory probability, and astrophysics
- Mentored a group of 6 high school students in research and scientific concepts

Curriculum Development

Queen's University Faculty of Engineering and Applied Science Kingston, Ontario
APSC100 Module 1 Program Development Lead (Full-Time Internship) *May 2020 - Aug. 2020*

- Developed and led the Fall term engineering design project for the class of 2024, which included over 1100 students
- Contributed to the development of content for APSC100 - Engineering Practices I course
- Pioneered the design of the first fully remote engineering design project from scratch
- Acquired skills in course design, documentation writing, and implementation of the engineering design process
- Developed professional skills including communication (oral and written), project management, and time management.

Queen's University Micro-Electro-Mechanical Systems Lab Kingston, Ontario
Project Assistant, worked under Dr. Yong-Jun Lai *June 2019 - Aug. 2019*

- Assisted in developing lab material for MECH423 class
- Applied engineering design process to various projects
- Acquired knowledge of Arduino Uno and 3D printing technology
- Collaborated with graduate students on research projects

Research Experience

- **Fields Institute for Research in Mathematical Sciences** — Toronto, Ontario
  Summer Student Researcher (Full-Time Internship) — *June 2023 - Aug. 2023*
  - Developed deep neural networks in Python (PyTorch) for real-time extraction of physiological features from facial videos
  - Applied machine learning techniques to accurately extract mean heart rates from facial videos, achieving an RMSE of 11 BPM (private data) and 4.6 BPM (public data)
  - Designed and implemented state-of-the-art Convolutional and Recurrent Neural Networks (PyTorch) to process complex video data
  - Preprocessed video data using OpenCV and advanced computer vision tools, including noise reduction, motion stabilization, and colour magnification
  - Actively monitored and integrated the latest advancements in computer vision and neural network methodologies
  - Collaborated effectively in a cross-functional team of three, working closely with Dr. Huaxiong Huang and Dr. Shixin Xu
  - Conducted comprehensive research on prominent image classification architectures such as AlexNet, VGG, and ResNet
  - Regularly presented progress updates in weekly meetings and shared insights and results at the program's final conference, effectively communicating technical findings to diverse audiences
- **Arthur B. McDonald Canadian Astroparticle Physics Research Institute** — Kingston, Ontario
  Research Assistant (Full-Time Internship) — *May 2021 - Aug. 2021*
  - Analyzed Gaia data under Dr. Lawrence Widrow to study possible constraints on dark matter
  - Utilized mathematical physics, including Lagrangian and Hamiltonian mechanics, to study galactic dynamics and advanced astrophysics
  - Rewrote and analyzed the Collisionless Boltzmann Equation in non-inertial frames using Python and analytic calculations
  - Investigated bending modes of a disc galaxy in an oscillating frame of reference

Professional Experience

- **Pulsenics Inc.** — Toronto, Ontario
  Embedded Software Developer (Full-Time) — *May 2022 - May 2023*
  - Utilized advanced programming skills in Python and embedded C to develop and implement innovative solutions for industrial measurement devices at Pulsenics Inc.
  - Developed the first instance of the Modbus industrial protocol for use in Electrochemical Impedance Spectroscopy (EIS) measuring devices
  - Implemented a time domain controller to measure low-frequency samples using embedded C
  - Developed the front and back end for a locally hosted web application with Python, HTML, and CSS
  - Developed an EEPROM emulator with embedded C to store calibration data
  - Programmed and tested inter-device communication for Ethernet-based device bootloader using Python and C
  - Developed an automated calibration process for Pulsenics' Probes, resulting in 100s of hours saved
  - Programmed a Python simulation to generate a physics-based model for electrochemical fuel cells
  - Experience with development on STM32 and TI C2000 microcontroller units
  - Established new company processes to optimize the bringing up, testing, and updating of devices
  - Managed and organized logistics for client deployments to ensure accurate deliveries
  - Organized and maintained Git repositories
  - Wrote detailed and clear documentation to help train the team on developed projects and tools

Fellowship and Grants

- **NSERC Canadian Graduate Scholarship - Master's: $17,500** *2023*
  - *Offered by the University of Toronto*
- **NSERC Canadian Graduate Scholarship - Master's: $17,500 (Declined)** *2022*
  - *Offered by the University of British Columbia*

Honors and Awards

- **Medal in Mathematics and Engineering** *2022*
- **Nellie & Ralph Jeffery Award in Mathematics: $1,200** *2021*
- **James H. Rattray Memorial Scholarship in Applied Science: $3,500** *2021*
- **Annie Bentley Lillie Prize in First-Year Calculus: $100** *2019*
- **Robert and Eva (Bertram) Cole Bursary: $55,600** *2018-22*