

# JACK (XUN) CAI

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## Education

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### University of Toronto

*BASC. in Engineering Science with PEY co-op*

2020 - 2025

*cGPA 3.86 (90.4/100)*

### University of Pennsylvania

*Engineering Summary Academy at Penn - Biotechnology*

2019

*GPA 4.0*

### Relevant Coursework

- Ordinary Differential Equation 100%
- Computer Algorithms and Data Structure 97%
- Vector Calculus & Fluid Mechanics 96%
- Digital & Computer System
- Machine Learning (Online, Coursera)
- Deep Learning (Online, deeplearning.ai)
- Natural Language Processing (Online, deeplearning.ai)

## Technical Skills

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**Languages:** Python, Java, C/C++, MATLAB, Verilog, LaTeX

**Tools/Frameworks:** Linux, Git/GitHub, Docker, PostgreSQL, PyTorch, Tensorflow, Keras, Django, CI/CD, FPGA

## Experience

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### Intelligent Sensory Microsystem Lab

*Undergraduate Researcher – deep learning accelerators*

January 2021 – Present

*ECE, University of Toronto*

- **First authored** HyperLock, hardware security paper based on ReRAM crossbar neural network, on **IEEE International Symposium on Circuit and Systems 2022**, the flagship conference of the IEEE Circuits and Systems Society.
- **Co-authored** paper on **brain graph learning with ReRAM crossbar hardware accelerator**.
- **Developed** circuit level memristor crossbar simulation framework with **PyTorch** for **graph convolutional neural network** and **graph convolutional neural ODE** to realistically simulate graph learning algorithms on ASIC.
- **Derived and presented** vectorized adjoint sensitivity method for **graph convolutional neural ODE** on memristor crossbar, available *here*.

### University of Toronto Machine Intelligence Student Team

*President (June '22 - Present)*

September 2020 – Present

*University of Toronto*

- Leading the *largest undergraduate machine learning society* in the University of Toronto.

*Project Director (June '21 - June '22)*

- **Directed** a team of **undergraduate and graduate** developers on the WallStreetBots project, try it *here*.
- **Lead the development** of an **online machine learning trading sandbox** with **Django** and **PostgreSQL**.
- **Prototyped and evaluated** natural language processing **transformer models** with **PyTorch**.
- Integrated Monte-Carlo portfolio balancing strategies with machine learning model outputs.

*Project developer (Aug '20 - May '21)*

- Assisted the development of the **Humerus Bot project (AI to play Cards Against Humanity)** in web scraping and NLP. Try the game *here* and view documentation *here*.
- Applied transformer models to train sentence embeddings and classified them with deep neural network in **Tensorflow**.

### University of Toronto Auto Drive Team

*Simulation Team Member*

August 2021 – February 2022

*University of Toronto*

- Researched noise modeling in self driving cars to achieve realistic simulations and implemented classical non-ML approaches and ML approaches
- Re-implemented CycleGAN to self driving car simulation by transfer learning on new dataset.

## Other Projects

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**Roots: Decentralized Crowd-funding** | *GCP, JavaScript, radar.io, React-Native, BlockStack*

April 2020

- **UC Berkeley Hack:Now winner** for *Puma Browser* and *MLH: Best use of Blockstack*. For more detail visit *here*.
- **Built user micro-transactions functionality** and **users authentication** through **Blockstack**.

**Solar System Rocket Simulator** | *C++, OpenGL*

December 2019

- Rocket physics simulator based on Newtonian mechanic; try it *here*.
- Independently written in **C++** and rendered in **OpenGL**.

## Leadership / Extracurricular / Award and Honours

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### **NSERC USRA**

*Canadian National Research scholarship awarded to outstanding undergraduate students*

**May 2022 – August 2022**

*University of Toronto*

### **ESROP-UofT**

*Summer Research scholarship awarded to outstanding undergraduate students in Engineering Science*

**May 2021 – August 2021**

*University of Toronto*

### **Computer Science Club**

*President*

**September 2019 – June 2020**

*Oakville Trafalgar High School*