Alex Zhang

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EDUCATION

Bachelor of Applied Science in Computer Engineering　　　　　　　　　　Sep 2023 – May 2028
University of Toronto　　　　　　　　　　　　　　　　　　　　　　　　　　　　*Toronto, ON*
- Intended Minors: **AI Engineering & Engineering Business**
- 3rd Year Student: **3.88** CPGA, **88.0%** Cumulative Average, **Dean's Honour List** (2023 Fall - 2025 Winter)
- Relevant Courses: Computer Organization (**RISC-V Assembly**, **C**), Digital Systems (**Verilog**, **FPGA**)
- Upcoming Courses: Operating Systems (**Linux**, **C**), Computer Hardware (**STM32**)

SKILLS

Languages: Verilog, C, C++, Python, Java
Developer Tools: KiCad, LTSpice, Quartus Prime, ModelSim, DESim, Git, Docker, VS Code, Cursor
Professional Skills: Leadership, Communication, Initiative, Independent Self-Direction, Critical Thinking, Adaptability

EXPERIENCE

Electrical Team Member　　　　　　　　　　　　　　　　　　　　　　　　Sep 2024 – Mar 2025
Robotics for Space Exploration (RSX) - University of Toronto　　　　　　　　　　　　*Toronto, ON*
- Designed and built a custom **single-layer LED PCB** in **KiCAD** to display rover subsystem signals, owning schematic/layout design and signal mapping.
- Developed a **PyQt GUI** to generate and send mock signals to the PCB, enabling functional testing and accelerating validation of the **Arduino shield interface**.
- Soldered and tested boards using **voltmeter** and **oscilloscope**, conducted **battery load tests**, and collaborated with new members to assemble units, with one successfully integrated on the rover.

PROJECTS

Waveform Synthesizer | *C, RISC-V, FPGA (DE1-SoC)*　　　　　　　　　　　　　Mar 2025 – Apr 2025
ECE243 Digital Systems
- Developed a real-time **waveform synthesis engine** in **C** on a **RISC-V** soft-core mapped to the **DE1-SoC** FPGA, enabling polyphonic generation of **sine**, **square**, **sawtooth**, and **triangle** tones with **additive** and **subtractive synthesis**.
- Implemented **ADSR envelopes** with point-wise **exponential amplitude modulation**, giving users realistic instrument-like expressiveness through dynamic **attack**, **decay**, **sustain**, and **release** control.
- Integrated a **PS/2 keyboard** as a **MIDI controller** using **machine interrupts**, enabling responsive note input and real-time patch creation without polling overhead.
- Built an on-board **oscilloscope interface** with **VGA output** and **hardware button interrupts**, providing real-time visual feedback and intuitive control of sound parameters.

Autonomous Sensor-Guided Robot Car | *Arduino, Embedded Systems, Breadboard Prototyping*　　Feb 2025
UTRA Hacks
- Built an autonomous robot car to navigate color-coded obstacle courses without human input, achieving reliable **self-driving** behavior using **embedded sensors** and **real-time controls**.
- Connected **ultrasonic distance sensors**, **color sensors**, and **DC motors** to an **Arduino microcontroller**, enabling environmental awareness and motion control through **sensor-actuator integration**.
- Programmed **Arduino firmware** to interpret **sensor data**, detect **colored track markers**, and control motor output logic, allowing the robot to make real-time navigation decisions like **lane following**, **turning**, and **obstacle avoidance**.

Sequence Memorization Game | *Verilog, FPGA (DE1-SoC), Quartus Prime, ModelSim*　　Nov 2024 – Dec 2024
ECE241 Digital Systems
- Implemented game logic in **Verilog** on the **DE1-SoC FPGA** using **finite state machines (FSMs)**, integrating **external inputs**, **VGA output**, and **on-chip memory modules** to create a functional sequence memorization game.
- Leveraged **on-chip ROM modules** to generate graphics for the **VGA display**, enabling visual feedback and enhancing the user experience during gameplay.
- Verified correctness through **ModelSim simulations** and hardware testing, debugging timing issues and validating module interactions before synthesis.