

Yongkang Cheng

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EDUCATION

University of Toronto (St. George Campus), Toronto, ON Sep 2023 - May 2028 (expected)
Bachelor of Applied Science in Computer Engineering + PEY Co-op (cGPA: 3.87/4.0)
Relevant Courses: Applied Fundamentals of Deep Learning, Software Design and Communication

TECHNICAL SKILLS

- **Programming:** Python, C/C++, Node.js, Java, Verilog, Assembly (RISC-V)
 - **AI & Data:** PyTorch, LangChain, NumPy, Pandas, Matplotlib
 - **Web & Backend:** React, FastAPI, Node.js, Nginx, Docker, SQL/NoSQL
 - **Hardware & Tools:** Git, SSH, Arduino, Raspberry Pi, FPGA, LTSpice, Quartus, ModelSim, STM32
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EXPERIENCE

Research Assistant, Ultra-Wideband Receiver Design May 2025 - Jul 2025
Research Intern, X-Lab, University of Toronto Toronto, ON

- Verified hybrid PPM+PSK TX chip pre tape-out; built Python/Simulink pipelines for 2ns symbol sync and carrier recovery under discontinuous 4GHz.
- Built pulse-position detection and K-means cluster calibration to mitigate cross-modulation 100ps timing shifts.
- Presented at Undergraduate Engineering Research Day with an interactive hybrid-modulation demo site.

Research Assistant, Wireless Power Transfer Coil Design Jul 2025 - Aug 2025
Research Intern, X-Lab, University of Toronto Toronto, ON

- Designed 13.56MHz WPT coils for a BCI implant (3mm×8mm RX, 20mm link).
- Ran HFSS sweeps (turns, trace size, TX diameter) to quantify impacts on coupling (k) and quality factor (Q).
- Produced PCB layouts with tuning plan; distilled design rules and prepared prototypes for validation.

Frontend Manager, Voluntrack.org React, Figma, MS Project May 2024 - Present
Volunteer, Non-profit Organization Voluntrack.org Remote

- Led a 4-person team to redesign the web interface using React.js, improving user engagement by 20%.
 - Designed UI in Figma and managed tasks with GitHub Project.
 - Integrated Firebase for secure volunteer data storage and real-time search, allowing fuzzy search and filtering.
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PROJECTS

Project Lead, Handwritten Text Recognition Jun 2024 - Aug 2024
Course Project, University of Toronto

- Led a remote team to develop a PyTorch-based CRNN model for handwritten text recognition.
- Achieved 87% word-level and 95% character-level accuracy on the test set with 10,000+ samples.
- Deployed connected-pixel algorithms for word positioning and word segmentation, processing 1024×1024 images in less than 4 seconds.

Core AI Developer, Wrong-Tree Unity Game May 2025

- Designed 9-state finite state machine (Idle, Wander, Share, Steal, Flee) for intelligent NPC behaviors in Unity.
- Implemented AI decision-making algorithms with proximity detection and dynamic reputation scoring for realistic social interactions.
- Created multi-NPC interaction framework supporting simultaneous share/steal operations with visual feedback animations.
- Built modular utility systems including random walk algorithms and distance-based targeting for scalable codebase.

Project Manager, Wellness Room Expansion Jan 2024 - Apr 2024
Course Project, University of Toronto

- Led a cross-functional team of 6 students to redesign and prototype a wellness room, endorsed by the client.

- Streamlined task management using Microsoft Project, tracking over 100+ tasks to completion on schedule.
- Incorporating client feedback, generated 100+ initial ideas and finalized 3 proposed designs.
- Designed and visualized proposals using Rhino and Blender 3D models, reducing client feedback iterations and improving decision-making efficiency.
- Conducted research on noise isolation, light intensity, and light temperature to deliver optimal design solutions.

Wildfire Disaster Communication System

Jan 2025

Backend Developer, University of Toronto Engineering Competition (UTEK)

- **Top 8 Finalist** in University of Toronto Engineering Competition among all competing teams.
- Built real-time communication platform with Python, Streamlit, and Flask for wildfire emergency response coordination.
- Implemented interactive map interface using Folium for visualizing fire incidents and location-based alerts.
- Developed bidirectional communication system between residents and rescue teams with photo upload capabilities.
- Created severity classification system with automated risk assessment for intelligent resource allocation.
- Designed secure authentication portal for authorized rescue personnel with role-based access control.

FPGA Polyphonic Synthesizer (DE1-SoC)

Mar 2025

Course Project, University of Toronto

- Implemented a 20-voice digital synthesizer in C for a Nios-V soft-core, streaming **8 kHz Q15 audio** through the on-chip Audio FIFO.
- Replaced all floating-point math with **32-bit phase accumulators** and fixed-point kernels for sine, square, triangle, and sawtooth waves, enabling real-time mixing and envelope processing.
- Designed an **ADSR envelope engine** driven by slide-switch “knobs” and pushbuttons; state changes are visualized on a double-buffered 320 × 240 VGA UI.
- Integrated PS/2 keyboard interrupts for sub-μs latency note-on/off events; on-screen piano keys light up in sync with hardware playback.
- Built modular drawing primitives (Bresenham, bitmap blits) to render live waveforms and icons; architecture supports future effects or MIDI input with minimal refactor.

City Mapify – Interactive City Mapping Application (University of Toronto)

Jan 2025 - Apr 2025

Course Project, University of Toronto

- Developed a high-performance mapping engine in C++ to process OpenStreetMap data and render city maps.
- Designed efficient spatial data structures (**quadtrees**) for dynamic querying and smooth zoom-based rendering.
- Implemented advanced pathfinding algorithms (**Dijkstra, A*, Simulated Annealing, Ant Colony Optimization**) for route planning and delivery optimization.
- Integrated real-time features like day/night mode, weather data, and AI-powered route descriptions.
- Enhanced performance with multithreading (OpenMP) and RESTful API integration (libcurl).

Diary with AI Feedback

Sep 2023 – On Going

Personal Project, React.js, FastAPI, OpenAI API

- Designed and implemented a journaling program integrated with OpenAI’s GPT API, generating insightful feedback and suggestions for over 750 diary entries.
- Developed a diary sorting algorithm to retrieve contextually similar past entries by vector search, enhancing user experience and maintaining API costs below 0.2\$ per call.
- Optimized data-sorting pipelines and API request processes, reducing average diary load time from 10s to 0.5s, enabling seamless daily use.

Verilog Pac-Man Game (DE1-SoC)

Nov 2024

Course Project, University of Toronto

- Created a Pac-Man-style FPGA game using Verilog supporting PS/2 keyboard input and VGA output.
- Debugged signal synchronization issues and state-machine logic, boosting overall stability and playability.
- Automated image conversion using Python + OpenCV for seamless integration of game graphics.
- Prototyped the game using Pygame, ensuring accurate emulation of the FPGA version for agile development.

WillPower | Time Management & Monitoring

Jan 2025 - Present

Personal Project, Raspberry Pi, FastAPI, Azure Face API

- Built a modular system with Raspberry Pi capturing images and sending them to a Windows host for local storage and analysis.
- Deployed Nginx, FastAPI, and libcurl for data transfer, facilitating real-time user monitoring and minimal downtime.

- Currently exploring Azure Face APIs and transfer learning for user-behavior analysis on a dataset of over 180,000 images.

Self-Clone Chatbot with Diary Database

Oct 2024 - Present

Personal Project, React.js, FastAPI, OpenAI API

- Built a self-hosted AI-powered chatbot that replicates personal interaction styles, deployed using React.js, FastAPI, and Nginx on a Raspberry Pi.
- Integrated OpenAI API and a NoSQL database for real-time Q&A functionality with personal diary data.
- Ensured secure and seamless remote access by implementing TLS encryption, DDNS, and optimizing for daily traffic from personal networks.

Photogate Speed Measurement System

July 2023 - Aug 2023

Personal Project, Arduino, Python, Tkinter

- Designed and built 10 laser-based speed measurement units with 7-segment displays for high school physics education.
- Achieved sub-150us measurement precision using Arduino microcontrollers and custom PCB design.
- Developed custom infrared communication protocol supporting 32-byte data transmission for wireless control.
- Created Python GUI using Tkinter for experiment control, real-time monitoring, and data export capabilities.
- Integrated 3D printed components and aluminum framework for durable classroom-ready construction.

Acorn Course Timetable Monitor Crawler

Aug 2025

Personal Project, Python, BeautifulSoup, SQLite

- Built automated Python web crawler to monitor University of Toronto's Acorn course timetable system for real-time changes.
- Implemented intelligent change detection algorithms with robust error handling and automatic recovery mechanisms.
- Developed notification system for course availability updates, helping students secure spots in full courses.
- Created comprehensive logging system for tracking enrollment patterns and course schedule modifications.

AWARDS

- **University of Toronto Excellence Award (UTEA)** Apr 2025
\$7,500 scholarship for 6 students among 2nd to 4th ECE for research potential.
- **ECE Awards** Sep 2024
Awarded to top 30 students in the first-year ECE program out of 200+ students.
- **Dean's List Scholar** Sep 2023 - Apr 2025
Awarded for top academic standing (average >80%) for 4 consecutive semesters.