Yongkang Cheng

chengyongkang.me | 437-663-2855 | github.com/Ken-2511 | iwmain@outlook.com | linkedin.com/in/chengyongkang

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

EXPERIENCE

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

- Verified a hybrid 2-PPM + 8-PSK TX chip pre-tapeout; built Python/Simulink pipelines for 2 ns symbol sync and carrier recovery under discontinuous 4 GHz.
- Built pulse-position detection and K-means timing/phase calibration for constellation stabilization and PPM demodulation.
- Achieved zero-BER demodulation across 2,500 symbols under $\geq 13\,\mathrm{dB}$ SNR (AWGN) and $\pi/16$ phase jitter.
- Presented at Undergraduate Engineering Research Day with a poster and an interactive demo site.

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

- Designed a resonant 13.56 MHz wireless power transfer coil pair enabling reliable power delivery to a brain-computer interface implant across a 20 mm separation.
- Ran HFSS sweeps (turns, trace width, TX diameter) to optimize coupling ($k > 0.01$) and quality factor ($Q > 28$).
- Performed electromagnetic field simulations and resonant frequency tuning to improve link efficiency under load.
- Designed PCB layouts incorporating capacitive tuning networks; fabricated and tested 3 TX and 11 RX prototype boards to validate coupling efficiency.

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.

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

- Built a C++ mapping engine parsing **2GB** OpenStreetMap data with QuadTree indexing at 60 FPS.
- Implemented A*/Dijkstra pathfinding and delivery optimization (Simulated Annealing, ACO) for **250+** packages.

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 High School Project

Personal Project, Arduino, Python, Tkinter

- Designed and built 10 laser-based speed measurement units with 7-segment displays for 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.
- Implemented precise timing circuits with crystal oscillators and interrupt-driven measurement algorithms.
- 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 300+ students.
- **Dean's List Scholar** Sep 2023 - Apr 2025
  Awarded for top academic standing (average >80%) for 4 consecutive semesters.