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, Signal Processing, Linear Algebra, Statistics

TECHNICAL SKILLS

- **Machine Learning:** PyTorch, TensorFlow, Scikit-learn, OpenCV, CRNN, CNN, RNN, Transfer Learning
- **AI & Data:** LangChain, OpenAI API, NumPy, Pandas, Matplotlib, Vector Search, NLP
- **Programming:** Python, C/C++, MATLAB/Simulink, R, SQL
- **Cloud & Tools:** Azure Face APIs, Docker, Git, Jupyter, Google Colab, Linux

EXPERIENCE

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

- Built Python/Simulink pipelines for 2ns symbol sync and carrier recovery under discontinuous 4GHz signals.
- Implemented K-means clustering algorithms for calibration to mitigate cross-modulation 100ps timing shifts.
- Developed signal processing algorithms for pulse-position detection with sub-nanosecond precision.
- Presented at Undergraduate Engineering Research Day with an interactive machine learning demo site.

PROJECTS

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

- 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.
- Implemented data augmentation techniques and regularization strategies to improve model generalization.
- Deployed connected-pixel algorithms for word positioning and word segmentation, processing 1024×1024 images in less than 4 seconds.
- Optimized model architecture with attention mechanisms and bidirectional LSTM layers for sequence modeling.

WillPower | Time Management & Monitoring Jan 2025 - Present

- Built a modular system with Raspberry Pi capturing images and sending them to a Windows host for local storage and analysis.
- Deployed computer vision pipelines for real-time user monitoring and behavior analysis.
- Currently exploring Azure Face APIs and transfer learning for user-behavior analysis on a dataset of over 180,000 images.
- Implemented data preprocessing pipelines and feature extraction algorithms for behavioral pattern recognition.
- Developed automated data labeling systems and active learning strategies to improve model performance iteratively.

Diary with AI Feedback Sep 2023 – On Going

- Designed and implemented a journaling program integrated with OpenAI's GPT API, generating insightful feedback for over 750 diary entries.
- Developed a diary sorting algorithm to retrieve contextually similar past entries by vector search, maintaining API costs below $0.2 per call.
- Implemented semantic similarity search using embeddings and cosine similarity for content recommendation.
- Optimized data-sorting pipelines and API request processes, reducing average diary load time from 10s to 0.5s.
- Built natural language processing workflows for sentiment analysis and topic modeling of diary content.

Self-Clone Chatbot with Diary Database Oct 2024 - Present

- Built a self-hosted AI-powered chatbot that replicates personal interaction styles using fine-tuned language models.
- Integrated OpenAI API and a NoSQL database for real-time Q&A functionality with personal diary data.

- Implemented retrieval-augmented generation (RAG) architecture for contextually relevant responses.
- Developed custom tokenization and embedding strategies for personal writing style mimicry.
- Created evaluation metrics and A/B testing frameworks to measure chatbot response quality and user satisfaction.

Fourier Epicycle Drawing Visualization System May 2025

- Built an interactive Python/Pygame app to draw strokes and visualize their Fourier decomposition as animated epicycles.
- Implemented stroke preprocessing (merging, equidistant resampling) for accurate Fourier analysis.
- Developed mathematical algorithms for discrete Fourier transform and complex number manipulation.
- Created real-time visualization of mathematical concepts with interactive parameter adjustment.
- Designed modular utilities for signal processing, mathematical visualization, and educational demonstrations.

UTEK Wildfire Disaster Communication System Jan 2025

- **Top 8 Finalist** in University of Toronto Engineering Competition (UTEK) among all competing teams.
- Created severity classification system with automated risk assessment using machine learning algorithms.
- Implemented geospatial analysis and clustering algorithms for intelligent resource allocation.
- Built predictive models for wildfire spread patterns using historical data and environmental factors.
- Developed image recognition systems for automated fire detection from uploaded photos.

Core AI Developer, Wrong-Tree Unity Game Dec 2024 - Jan 2025

- Designed 9-state finite state machine (Idle, Wander, Share, Steal, Flee) for intelligent NPC behaviors.
- Implemented reinforcement learning algorithms with proximity detection and dynamic reputation scoring.
- Created multi-agent systems supporting simultaneous interactions with emergent social behaviors.
- Built utility-based AI systems with decision trees and behavior trees for complex NPC decision-making.
- Developed machine learning models for adaptive NPC behavior based on player interaction patterns.

City Mapify – Interactive City Mapping Application (University of Toronto) Jan 2025 - Apr 2025

- Implemented advanced pathfinding algorithms (**Dijkstra, A*, Simulated Annealing, Ant Colony Optimization**) for route optimization.
- Developed machine learning models for traffic pattern prediction and dynamic route recommendation.
- Built optimization algorithms using genetic algorithms and swarm intelligence for delivery route planning.
- Created data visualization systems for real-time traffic analysis and route performance metrics.

Computer Vision for Medical Image Analysis Academic Project

- Developed CNN architectures for medical image segmentation and classification tasks.
- Implemented data augmentation strategies and transfer learning from pre-trained models.
- Achieved 92% accuracy on medical image classification using ResNet and DenseNet architectures.
- Built automated preprocessing pipelines for DICOM image standardization and normalization.

AWARDS & ACCOMPLISHMENTS

University of Toronto Excellence Award (UTEA) Apr 2025

- Awarded UTEA for top academic performance and research potential in machine learning applications.
- Completed a 14-week full-time research project with faculty supervision focusing on AI/ML systems.
- Received $7,500 scholarship for research excellence and inclusion.

ECE Awards & Dean's List Scholar (UofT) Sep 2024

- Recognized for outstanding academic performance in machine learning and data science courses.