KRISH CHHAJER

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EDUCATION

University of Toronto   **Sep. 2023 – May 2028**
Bachelor of Applied Science in Computer Engineering + Professional Experience Year (PEY) Co-op   *Toronto, ON*
- **Awards:** University of Toronto Engineering International Scholar Award (**\$128K**), Dean's List (**3.82 CGPA**), **Top 30** out of 300+ First Year ECE students
- **Relevant Coursework:** Software Design and Communication, Deep Learning Fundamentals, Digital Systems (Verilog), Computer Architecture (RISC V/ Assembly), Computer Hardware, Operating Systems, Data Structures and Algorithms, Control Systems, Systems Programming

SKILLS

Programming Languages: Python, C/C++, Java, HTML5, CSS3, JavaScript, TypeScript, Verilog, Assembly (ARM, RISC-V)
Frameworks: PyTorch, TensorFlow, scikit-learn, OpenCV, Matplotlib, Pandas, NumPy, React, Django, Next.js, Flask, FastAPI
Developer Tools: Git, GitHub, PostgreSQL, Intel Quartus Prime, ModelSim, Vivado/Vitis (FPGAs), Arduino, MATLAB, YOLO

WORK EXPERIENCE

Student Researcher   **February 2025 - May 2025**
RBC Borealis
- Developed a **Reinforcement Learning Agent with Proximal Policy Optimization (PPO)** using **Stable Baselines3** for real-time **Microgrid Management** for Rye and Lac-Mégantic Microgrids.
- Developed comprehensive **OpenAI Gym** Environments for training, achieving robust performance: **100% of all user load met**, with **Island Mode (Grid Disconnected) over 70% of time** for Rye Microgrid Dataset.
- Developed S.O.T.A **Transformer Architecture Models** for forecasting Renewable Energy production, integrated into real-time Dashboard built using FastAPI, simulating **100K+** hourly timestamps for smarter energy decisions.

Machine Learning Researcher   **October 2024 - February 2025**
Neural Engineering Lab
- Developed and evaluated **Random Forest**, **Decision Tree** and **Linear Regression** models to predict Systolic and Diastolic Blood Pressure using Electro-Vascular Gram Signals (EVG).
- Applied Window Sampling and Feature Extraction using **catch22** library, consistently achieving over **80% of predictions within 5 mmHg**, in alignment with British Health Society Standards.
- Optimized legacy Random Forest model, reducing number of trees **from 240 to 1**, improving computational efficiency and identifying **top 3** key EVG Features through extensive analysis and tuning.

PROJECTS

AIM: Artificially Intelligent Maps   **April 2025**
C++, Python, ezgl, LangChain, Flask
- Developed a comprehensive Mapping Application utilizing **C++ for backend** processing and **GTK** for GUI, integrating **OpenStreetMap** data for real-time navigation and route-planning for **19** cities globally.
- Implemented a **LLM-powered agent using LangChain**, **OpenAI GPT 4o** and **Flask Server** for semantic information retrieval for points of interest and route-planning.
- Designed and implemented a route optimization algorithm for solving the **Traveling Salesman Problem with Vehicle Routing Problem (VRP)** constraints using Greedy Regret Insertion and multi-threaded 2-opt, 3-opt, and 4-opt local search.

Fall Detection and Gait Patterns Analysis using Deep Learning   **August 2024**
Python, PyTorch, TensorFlow, Matplotlib, Pandas, Numpy, SciPy
- Developed a **CNN-LSTM Model in PyTorch** analyzing tri-axial IMU sensor data from iOS/Android Devices to **detect Human Falls** from **15 Fall** Types and **20 ADL** Types of Samples, improving accuracy by **30%**.
- Developed a Preprocessing Pipeline using **2s window sampling with 50% overlap**, extracting **56 statistical and spectral features** using Pandas, Numpy and SciPy.
- Conducted **20+** architecture and hyperparameter searches, achieving **99%** training accuracy on SisFall samples, alongside a validation accuracy of over **80%** from personal phone collected data and **92% test accuracy on the MobiFall and MobiAct Datasets**.

Pacman on FPGA   **November 2024**
Verilog, Intel Quartus Prime, ModelSim
- Designed and implemented an interactive **Pacman game in Verilog on the DE1-SoC** using Digital System Fundamentals.
- Incorporated external I/O features such as **60Hz VGA Adapter** for display, **Keyboard** for controlling the Pacman in **4 directions** and **Speakers** for audio feedback.
- Engineering a core game logic using a **Finite State Machines and sequential logic** to control Pacman and **2 Ghosts** in a maze, incorporating live video, audio and controls.