

Umar Rajguru

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EDUCATION

McMaster University

B.A.Sc Honours Computer Science

Hamilton, ON

Sept. 2021 – April 2026

EXPERIENCE

Machine Learning Research Engineer

May 2024 – Apr 2025

Huawei Noah's Ark Lab — Autonomous Driving Planning Team

Markham, ON

- Enhanced motion planner to **recognize rare pedestrian signals and gestures** (<1% of data) using machine learning with **PyTorch**, enabling the vehicle to stop or slow down when needed.
- Developed CAPS (Context-Aware Priority Sampling)**, a novel method addressing dataset imbalance in imitation learning for rare driving scenarios. **Contributed findings to a paper** “CAPS: Context-Aware Priority Sampling for Enhanced Imitation Learning in Autonomous Driving,” under review for ICRA 2026.
- Achieved **Driving Score of 66.76** and **Success Rate of 52.87** on Bench2Drive sensor-input scenarios by applying **CAPS** (Context-Aware Priority Sampling), **outperforming prior baselines**.
- Improved traffic light detection** by fine-tuning a pre-trained model on 100,000 simulation images, **boosting accuracy to over 93%** even in harsh weather and low-light conditions.
- Developed a vision-based trajectory prediction system using **LLMs and VLMs** finetuned with **supervised fine-tuning** and **reinforcement learning** algorithms to predict **future vehicle trajectories** including turns and other dynamics.
- Parallelized route evaluation** in the CARLA simulator using **Docker** instances with auto-restart on crashes, aggregating results and enabling faster and more reliable **data collection**.
- Refined motion planner architecture for **safe and rule-abiding navigation**. Helping secure **1st place** on the CARLA Leaderboard through fast-paced **research and development**.

McMaster Battery Challenge Team

Nov 2023 – May 2024

McMaster University – Software Team

Hamilton, ON

- Competing against 12 universities in the Battery Workforce Challenge where we build, test, and integrate a cutting-edge EV battery pack made from scratch into a Stellantis vehicle.
- Researched state-of-charge estimation methods, focusing on Kalman filter-based approaches to assess their effectiveness for accurate battery monitoring.

PAPERS

- Mirkhani, H., Khamidehi, B., Ahmadi, E., Arasteh, F., Elmahgiubi, M., Zhang, W., **Rajguru, U.**, Rezaee, K. (2025). *CAPS: Context-Aware Priority Sampling for Enhanced Imitation Learning in Autonomous Driving*. Preprint at [arXiv:2503.01650](https://arxiv.org/abs/2503.01650)

PROJECTS

Project Pythia: K_p Index Prediction | Python, TensorFlow, JavaScript, ThreeJS

Oct 2023

- Selected to represent the city of Hamilton as a global nominee** in the NASA Space Apps Challenge hackathon for creating a machine learning model that predicts geomagnetic storms using spectral data from the DSCOVR satellite.
- Employed convolutional neural networks and recurrent neural networks using TensorFlow and Keras, utilizing a 2D CNN for spatial data, a 1D CNN for sequential data, and an RNN for capturing temporal dependencies.
- Crafted an aesthetically engaging web application with a ThreeJS-powered globe visualization, enabling users to interact with a time-slider for intuitive exploration of forecasted K_p index variations in electromagnetic storm forecasts.
- Co-authored a technical report on our combined CNN and RNN approach for K_p index prediction, illustrating our methods to construct the model.

TECHNICAL SKILLS

Languages: Python, C/C++, x86/x64 Assembly, Haskell, Lua, Java, JavaScript, HTML/CSS, SQL, \LaTeX

Libraries/Frameworks: PyTorch, OpenCV, React, ThreeJS, OpenGL, NumPy, Pandas, Matplotlib

Developer Tools: Git, GNU/Linux, Visual Studio, Docker, GDB, SSH, NASM (x86 Assembler)