# Aditya Routh

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## Technical Skills

**Programming Languages**: Python, C++, SQL
**Frameworks:** Pandas, Numpy, Matplotlib, MySQL, MediaPipe, Scikit-learn, OpenCV, NiceGUI

## Certification

**Applied Machine Learning in Python | University of Michigan, Coursera** **November 2023 - January 2024**

## Projects

**Analyzing RL Agents for Game Planning | RL, Deep RL** **May 2025 - Present**

- Developing and analyzing two reinforcement learning agents (Q-learning and DQN) on a Mega Tic-Tac-Toe board by tuning hyperparameters (learning rate, discount factor), aiming to achieve a consistent 80% win + draw rate.
- Designing 2 training environments, with 2 opponents in each - a 3×3 Tic-Tac-Toe board for initial testing, and a 9×9 Mega Tic-Tac-Toe board for scaling the agent to a higher state-action space. Training agent against both non-deterministic and Minimax opponents, integrating ε-greedy exploration for adaptive difficulty adjustment.
- Demonstrating the limitations of Q-learning as the model is scaled from a state-space of 19683 to $4 \times 10^{38}$, causing the need for the implementation of Deep Q-learning network with a minimum expected accuracy of 90%.

**ASL Translator with Data Collection Pipeline | OpenCV, Mediapipe, Scikit-learn** **April 2024 - June 2024**

- Developed a data collection pipeline using OpenCV to capture and label 5200 hand gesture images across 26 ASL letters, then train a Random Forest model on MediaPipe-extracted 21 landmark coordinates per hand.
- Programmed a real-time translation system, processing webcam input at 10 FPS by performing simultaneous frame capture and sign prediction, while improving model accuracy by ~20% by changing the classification algorithm from k-NN to Random Forest Classifier.
- Delivered an accuracy score of ~80% and identified CNNs as a potential upgrade path. Uploaded full project to GitHub: https://github.com/iamadro/sign_language_translator/

**Autonomous Drone for Precision Agriculture | Embedded Systems** **August 2024 - April 2025**

- Co-led a cross-departmental team to develop an autonomous agricultural drone to bring innovation in the field of precision agriculture and implemented a disease classification model achieving accuracy of 92%.
- Achieved optimum flight stability by calibrating 7+ devices, and integrating 2 embedded systems (Pixhawk 4.2.8 and Raspberry 4B). Utilized UART protocol to establish low-latency serial communication between Raspberry Pi and Pixhawk flight controller, enhancing automation and reducing manual intervention by at least 50%.
- Created and executed a 10-week development roadmap, delivering key milestones such as autonomous flying and disease detection, 1 week before schedule.

## Co-curricular Activities

**Smart India Hackathon, 2024** **September 2024 - November 2024**

- Secured selection for the national-level round by developing an innovative solution to minimize traffic congestion using a weighted fair queuing analogy from computer networks, dynamically assigning road priorities based on real-time vehicle density detected via YOLO ML algorithm.
- Designed and implemented the core algorithm for dynamic traffic light allocation, leveraging YOLO ML-derived data to optimize green light timing and significantly minimize urban congestion.

**Debater, Public-Speaker & Chess Player** **April 2017 - April 2022**

- Competed in and judged over 10 inter-house debating, public speaking, and chess events for over 5 years.

**Student Event Coordinator, Robotics Club** **October 2023 - September 2024**

- Planned and executed a robotics workshop for 70+ students while mentoring my successor to transition leadership, establishing best practices for event logistics, team management, and sustainable club operations.

## Education

**VIT Bhopal University, Bhopal** **2022 – 2026**
B. Tech in Computer Science (spec. in AI and ML) 8.92 CGPA