CS747: Programming Assignment 3 Report
Optimal Driving Control

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Introduction

The task was to design an agent that can drive efficiently on multiple tracks using local environmental observations and two continuous controls: acceleration and steering.

Environment and Setup

The provided environment simulates a car navigating a racetrack. The car receives a local observation in the form of a binary matrix 13×13 with the ones representing the centers of the lanes. The car is controlled using two continuous inputs: acceleration and steering, which are mapped to $[-5, 5]$ units/s^2 and $[-\pi/4, \pi/4]$ respectively.

All runs were performed in a Python 3.12.0 virtual environment using only the libraries listed in `requirements.txt`.

Agent Design

Features Used

Policy Structure

Experiments and Results

Evaluation Setup

Results

Challenges and Observations

Conclusion

References

- CMA-ES: https://en.wikipedia.org/wiki/CMA-ES

- CMS Evaluation Theory: https://arxiv.org/pdf/1604.00772

- HighwayEnv: `https://github.com/Farama-Foundation/HighwayEnv`

- Policy Search: `https://www.cse.iitb.ac.in/~shivaram/teaching/cs747-s2025/lectures/cs747a2022l19.pdf`