# **CS 690: Second Mini (group) Project: CARLA Automation and Training.**

Posted: February 17/ 2025; Due: March 7/2025

Late submission date: March 7/2025 (10% percent off per day)

Duration: 3 weeks

Points possible: 10 + 2 (extra credit)

This is a group project, for this project, the group size can be 3, 4, or 5.

**Objective:** This project aims to familiarize you with Carla and Matlab RoadRunner and their use to study driving automation. You will create a simple map with Matlab RoadRunner. You will then use deep learning to train a car to run in a small loop. This will be more of a technical paper compared to the previous assignment.

**How to begin:**

1. Download the CARLA server on one of your machines ([https://carla.readthedocs.io/en/latest/start\_quickstart/#carla-installation](https://nam11.safelinks.protection.outlook.com/?url=https%3A%2F%2Fcarla.readthedocs.io%2Fen%2Flatest%2Fstart_quickstart%2F%23carla-installation&data=05%7C01%7Czduric%40gmu.edu%7C5561808eb0af43a5333108dafd948609%7C9e857255df574c47a0c00546460380cb%7C0%7C0%7C638101111595226176%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=Y4ColqQa%2BU4Be0Pe026Fw2%2Bml63k38xhdXSfFQE5gmQ%3D&reserved=0), May require linking your Github Account with Epic Games and Joining their team EpicGames/developers).
2. Create a simple map with Matlab Road Runner <https://www.mathworks.com/products/roadrunner.html> (Should have access via Mason IT). At minimum: A road with a 4-way intersection and a cul-de-sac.
3. Add traffic simulation (Sumo not needed). Cars can be identical to make training easier.
4. Train a vehicle. <https://www.youtube.com/watch?v=J1F32aVSYaU&list=PLQVvvaa0QuDeI12McNQdnTlWz9XlCa0uo>. At minimum: The route for the car must go from the end of the road to the intersection and back to the starting point.

**Your Experiment:**

1. Train and test self-driving cars on a simple map. How was the reinforcement learning configured and structured? Any interesting results or behaviors? (Max training time is about 1 day).
2. EXTRA CREDIT:
   1. Create a second map and test the car on it. What were the results? Did it fail to drive or follow rules of the road?

## **What to turn in:**

1. Code to set up the training and testing simulation.
2. A technical section explaining how the car was trained and how the model (generally) worked.
3. A write-up of your conclusions, including answers to questions listed under the “Your Experiment” section.