

# Developing and Testing a Vehicular AI Agent

Advisors and Mentors: Professor Jorge Ortiz and Navid Salami Pargoo  
Team: William Ching, Romany Ebrhem, Haejin Song, Eddie Ward, Donald Yubeaton, Vibodh Singh, Aditya Kaushik Jonnavittula

# Team



Haejin Song



William Ching



Donald Yubeaton



Romany Ebrhem



Vibodh Singh



Aditya Kaushik Jonnavittula




Eddie Ward

# Motivation: Exploring Interactions

- **Develop** an AI agent that can interact and communicate with drivers in real-time
- **Test** AI Agent by creating realistic simulation environments using the CARLA Simulator to replicate **real-world traffic scenarios**

View instructions



At the **end** of the video, is it a safe time to talk to the driver?

Definitely NO  Maybe NO  Unsure  Maybe YES  Definitely YES

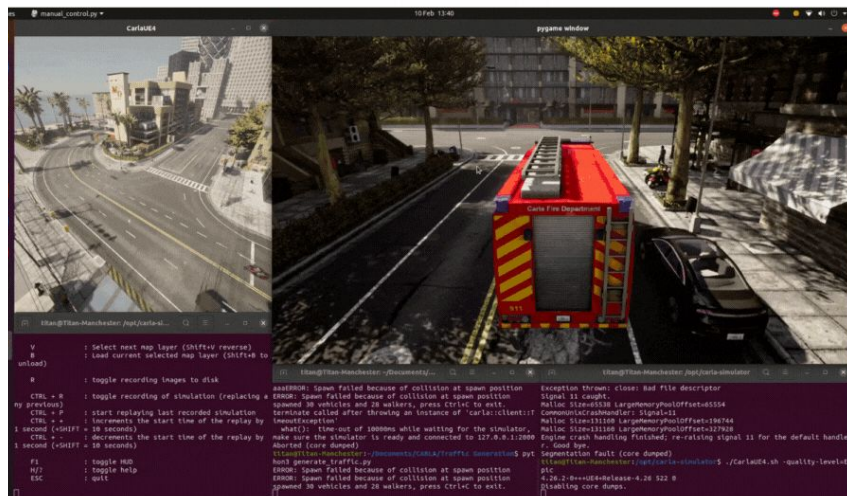
What contributed to your decision?

Driver state  Road state  Both

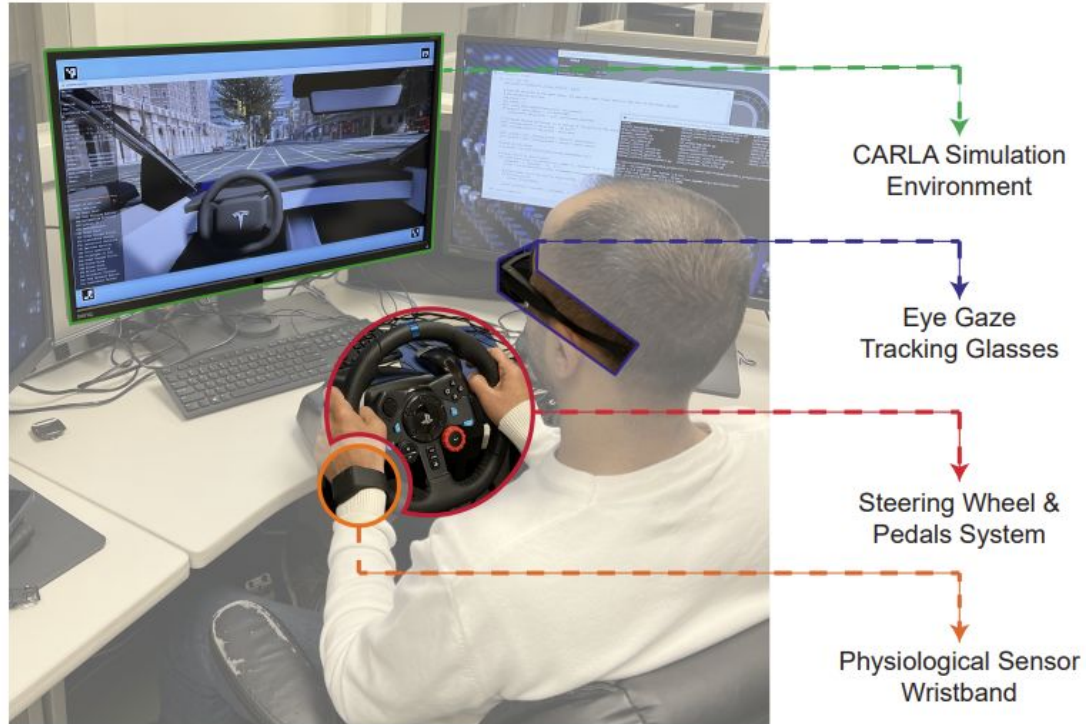
Submit

# What is CARLA?

- An open-source platform for autonomous driving and research development that uses Python.
- Supports various sensors and enables interaction with the simulation programmatically.

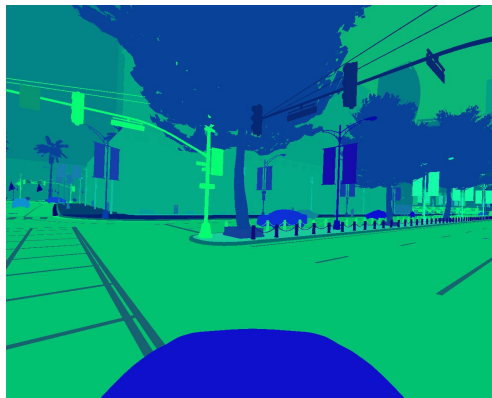


# Carla PazNet





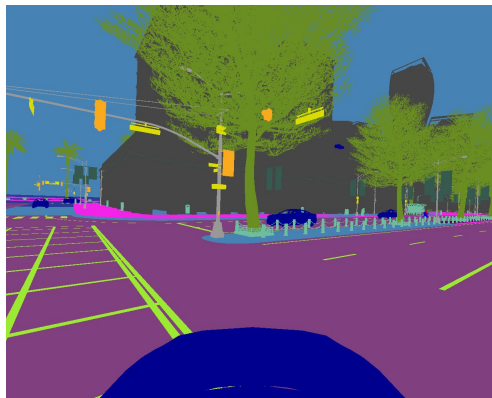
Depth



Instance Segmentation



RGB



Semantic Segmentation

# Sensor Data

# Scenario Runner



# Town 12

- Vast map that spans 10x10 km<sup>2</sup> (compared to the standard map which was 1.2 km<sup>2</sup>).
- Consists of various sections such as a downtown area, farmland, woods, city, suburbs, and highways.
- Great to run larger experiments.
- Obstacles:
  - FPS
  - Storage



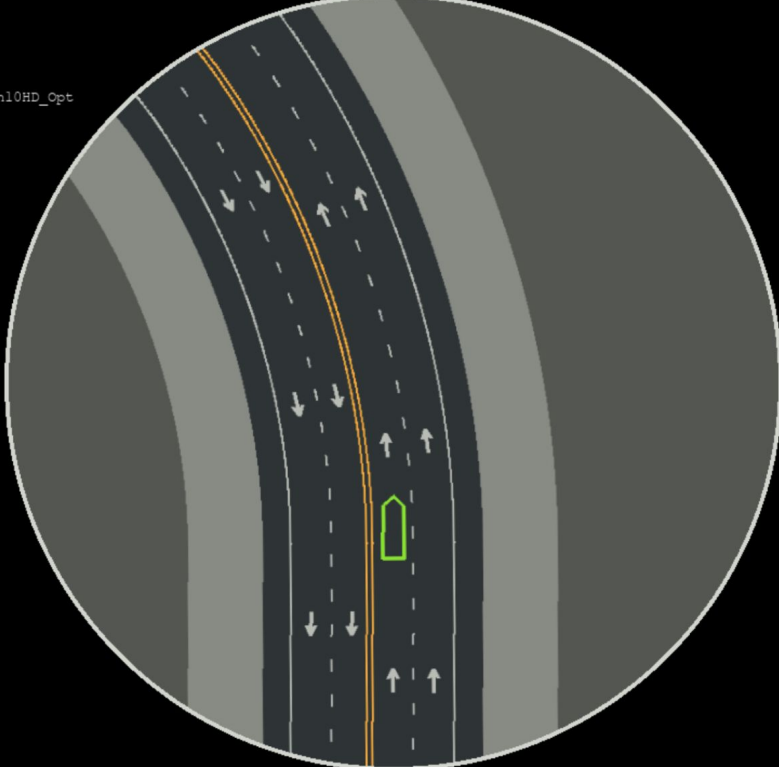


# GPS Map

```
WORLD
Server:          109 FPS
Client:          62 FPS
Simulation Time: 0:27:02
Map Name:        Carla/Maps/Town10HD_Opt

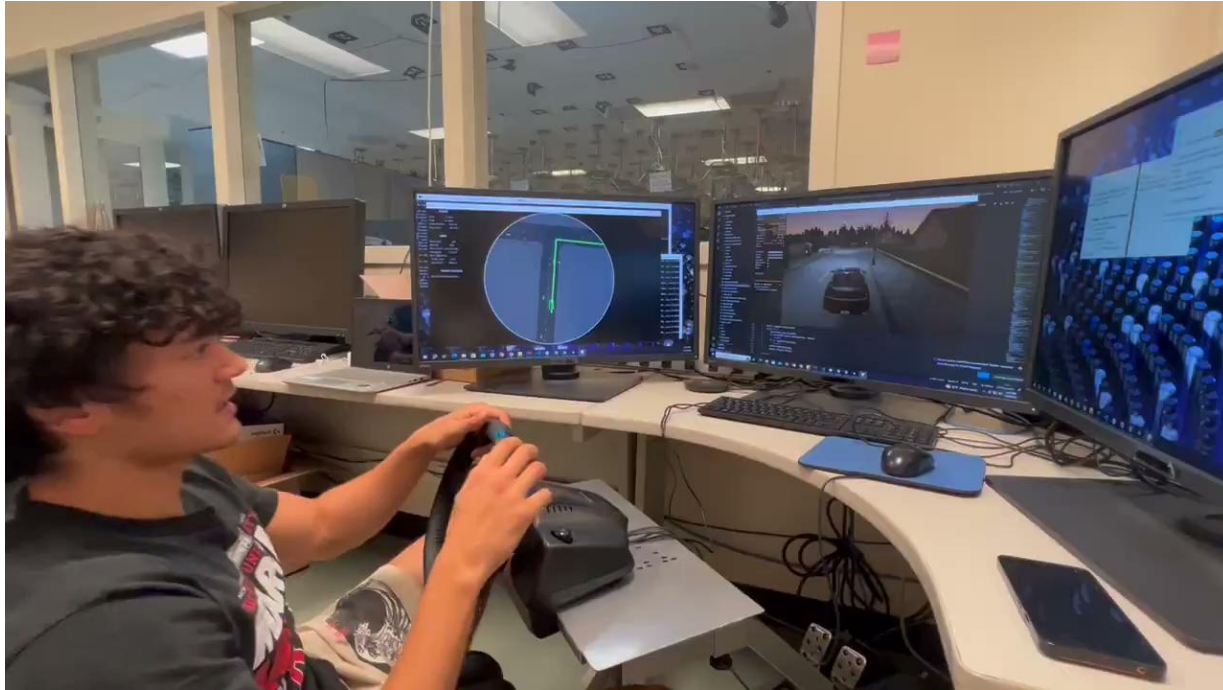
HERO
Hero Mode:      ON
Hero ID:        55
Hero Vehicle:   Ford Crown
Hero Speed:     0 km/h
Hero Affected by:
Traffic Light:  None
Speed Limit:   30 km/h

NEARBY VEHICLES
29 Lincoln Mkz 2017
51 Ford Ambulance
26 Toyota Prius
36 Citroen C3
27 Kawasaki Ninja
44 Mini Cooper S
45 Tesla Cybertruck
31 Dodge Charger Police
43 Carlamotors Firetruck
50 Ford Crown
53 Ford Crown
52 Diamondback Century
30 Mini Cooper S
54 Audi A2
28 Gazelle Omafiets
40 Jeep Wrangler Rubicon
```



The image displays a circular GPS map view from a simulation. The map shows a road with a double yellow line in the center and dashed white lines for lane boundaries. Arrows on the road indicate traffic flow: two arrows pointing left in the left lane and two arrows pointing right in the right lane. A green bounding box highlights a vehicle in the right lane. The background of the map is a dark gray with lighter gray curved bands representing terrain or map boundaries.

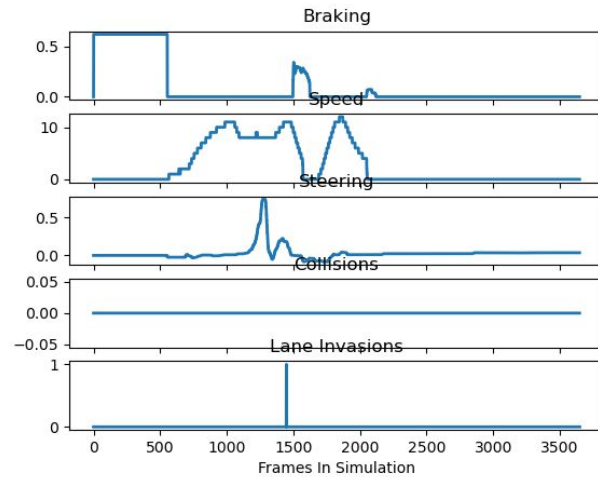
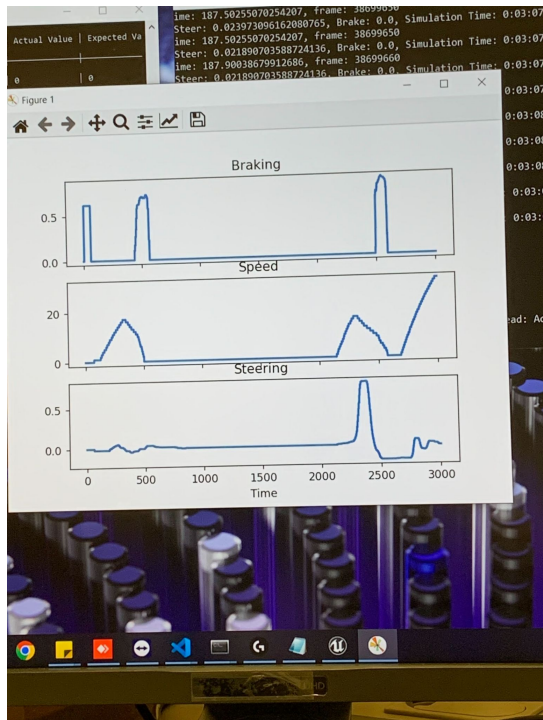
# Map, Route, and Voice Agent Demonstration



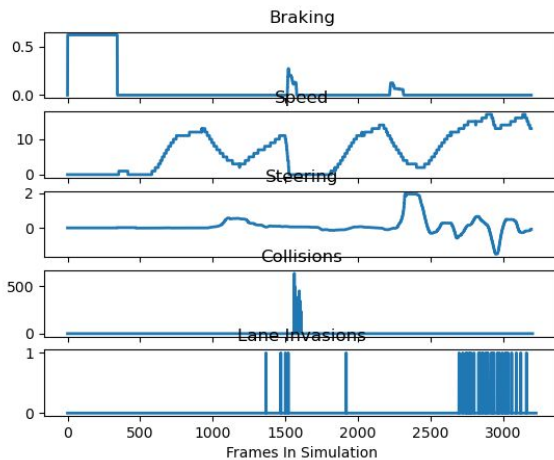
# Data Collection

- Question: How do we decide what is a “good” run or not?
- Need to collect two types of data: Voice agent vs. no voice agent

# Results



Without voice agent



With voice agent

# Future Plans

- Loading the Town-12 and having more scenarios in it for large-scale testing with the help of better hardware support.
- Integrating the Carla PazNet model and training the model using the data collected from scenarios.

# Acknowledgements

Thank you to Noreen DeCarlo, Jenny Shane, and Ivan Seskar for the wonderful experience and opportunity at WINLAB.

Thank you to our project mentor Navid Salami Pargoo and our advisor Professor Jorge Ortiz for their invaluable guidance and support throughout the internship.

**Thank you :)**

