



## Goal

- ❑ Develop a vehicular AI Agent that can **intelligently** interact with drivers, providing real-time information and alerts.
- ❑ Create realistic traffic simulations using CARLA Simulator to **mimic real-world** traffic scenarios and test vehicular AI agent.

## Background and Motivation

- ❑ Recent advances in vehicular sensing have led to the development of various systems focused on improving vehicle safety, driver comfort, and human-vehicle interactions.
- ❑ Building these systems requires abundant data and rigorous assessment. Simulators analyze driving behavior, vehicle performance, and safety in controlled settings effectively.

## CARLA



- ❑ An open-source autonomous driving simulator.
- ❑ Has multiple maps, vehicles, and obstacles that can be used to simulate real-life driving scenarios.
- ❑ Scenario Runner is a module that allows the creation and execution of traffic scenarios through a Python interface.

## Acknowledgements

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## Objectives

- ❑ Develop a speech agent that can be later incorporated with **reinforcement learning** to turn into an **intelligent agent**.
- ❑ Design **repeatable experiments** using Carla Scenario Runner to run tests and simulate traffic scenarios.
- ❑ Design and implement scenarios incorporating multimodal data of **egocentric** and **allocentric** car views.

## System Overview



Our integrated vehicular sensing system combines a driving simulator (CARLA), eye gaze tracking glasses, a steering wheel and pedals system, and a physiological wristband.

## Testing Methodology

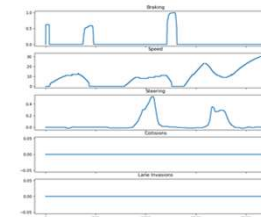
- ❑ Every subject is given instructions to follow the map and to obey traffic laws, but otherwise is not given further information about the scenario.
- ❑ Out of the subjects, some are chosen randomly to use the voice agent, while the others do not use the voice agent.
- ❑ Data is collected to determine how well the subject followed the route, and to see their reaction to a sudden obstacle.

## Scenarios

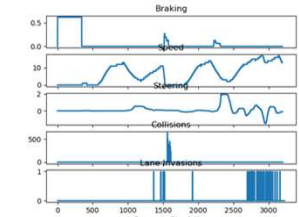
- ❑ Coded in **Python**
- ❑ If all criteria are met, the scenario is considered a success.
- ❑ No rendering mode map highlights the route needed to be taken by the user.
- ❑ Data such as speed, braking, and steering can be collected and graphed to show objective data.



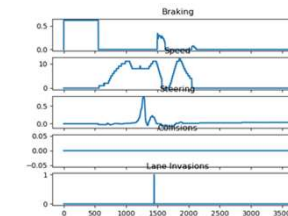
## Results



"Perfect run"



Run without voice agent



Run with voice agent

With the voice agent, people tend to be able to avoid a collision with the cyclist, seen with the straight line for the collision graph. (4th one down)

## Future Plans

- ❑ Make AI Agent with the voice agent that was developed.
- ❑ Gather more data with complex scenarios to increase consistency.