This project mainly studies Artificial Intelligence for safe driver assistance. The AI will be providing information to the driver which carry out safety driving in roads and not exceed speed limits.

AI-driven techniques will be used to continuously assess the effectiveness of our interventions and make adjustments to maximize driving safety and quality.

Using python as the main programming language comes with various packages: Numpy, Keras, OpenCV, Pandas to support face and object recognition that is implemented on ROS & Gazebo simulation.

The approach of creating an AI has been separated into three categories:

- **Road Sign Detection**
  - Road signs images are classified in specific ID and implemented to the program using convolutional neural networks.

- **Face Emotion Detection**
  - A program was then developed that can monitor emotion of the driver which can be used to advise and assist the drive on how they can improve their driving.

- **ROS & Gazebo Simulation**
  - ROS & Gazebo simulation was tested and used for the AI and will be compared to real-life data analysis.

A derived formula was used to calculate the distance of an upcoming vehicle towards a road sign.

**Results**

The face emotion detection was run in multiple tests based on train data. The most high accuracy according to the test is neutral while the rest of the emotions are unstable due to the camera’s low framerate per second.

According to the results of the calculations of derived formula, the difference of the experimental and theory value is about less than 10% error.

Given face detection, ROS, Gazebo, and the stop sign detection code we combine these systems to deliver a product that can read facial emotion to give the user an alert on stopping earlier or later from a stop sign.

**Future Work**

- Build an AI and learn machine learning
- Simulate cameras and accumulate programs in one source of data
- Run test in real situations