

SELF-DRIVING CAR CHALLENGE



For Registration & Information

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Challenge Objective

- ◆ Detect highway lane lines on a video stream.
- ◆ Use OpenCV image analysis techniques to identify lines, including Hough Transforms and Canny edge detection.
- ◆ Build and train a deep neural network to classify traffic signs, using TensorFlow.
- ◆ Experiment with different network architectures.
- ◆ Perform image pre-processing and validation to guard against overfitting.
- ◆ Build and train a convolutional neural network for end-to-end driving in a simulator, using TensorFlow and Keras.
- ◆ Use optimization techniques such as regularization and dropout to generalize the network for driving on multiple tracks.
- ◆ Build an advanced lane-finding algorithm using distortion correction, image rectification, color transforms, and gradient thresholding.
- ◆ Identify lane curvature and vehicle displacement.
- ◆ Overcome environmental challenges such as shadows and pavement changes.
- ◆ Create a vehicle detection and tracking pipeline with OpenCV, histogram of oriented gradients (HOG), and support vector machines (SVM).
- ◆ Implement the same pipeline using a deep network to perform detection.
- ◆ Optimize and evaluate the model on video data from an automotive camera taken during highway driving.
- ◆ Implement the extended Kalman filter in C++.

Challenge Elements (Projects)

This challenge consists of 6 Projects. Teams are expected to complete all the projects.

Project Id	Project Name
1	Lane Finding Basic
2	Traffic Sign Classifier
3	Behavioral Cloning
4	Advanced Lane Finding
5	Vehicle Detection
6	Extended Kalman Filter

- Lane Finding Basic:** The goal of this first project was to create a simple pipeline to detect road lines in a frame taken from a roof-mounted camera.
- Traffic Sign Classifier:** The goal of this project was to build a CNN in TensorFlow to classify traffic sign images from the Traffic Sign Dataset.
- Behavioral Cloning:** The goal of the project was to train a Deep Network to replicate the human steering behavior while driving, thus being able to drive autonomously on a simulator provided by SAEISS. To this purpose, the network takes as input the frame of the frontal camera (say, a roof-mounted camera) and predicts the steering direction at each instant.
- Advanced Lane Finding:** The goals / steps of this project are the following:
 - Compute the camera calibration matrix and distortion coefficients given a set of chessboard images.
 - Apply a distortion correction to raw images.
 - Use color transforms, gradients, etc., to create a thresholded binary image.
 - Apply a perspective transform to rectify binary image ("birds-eye view").
 - Detect lane pixels and fit to find the lane boundary.
 - Determine the curvature of the lane and vehicle position with respect to center.
 - Warp the detected lane boundaries back onto the original image.
 - Output visual display of the lane boundaries and numerical estimation of lane curvature and vehicle position.
- Vehicle Detection:** The goal of the project was to develop a pipeline to reliably detect cars given a video from a roof-mounted camera.
- Extended Kalman Filter:** This goal is to implement the extended Kalman filter in C++. We are providing simulated lidar and radar measurements detecting a bicycle that travels around your vehicle. You will use a Kalman filter, lidar measurements and radar measurements to track the bicycle's position and velocity.

Duration of the Project

1. The total duration for the Self Driving Car Challenge will be 9 months.
2. 3 Workshops will be conducted in the first three months
3. The duration for each project is 1 month. Total duration to complete the 6project is 6 months.

Event Calendar

	From	To
Team Registration	01-09-2021	30-09-2021
Workshop / Machine Learning for Engineers_SL01	01-10-2021	15-10-2021
Workshop / Machine Learning for Engineers_SL02	16-10-2021	31-10-2021
Workshop / Machine Learning for Engineers_SL03	01-11-2021	15-11-2021
Project #01 Review	15-12-2021	18-12-2021
Project #02 Review	15-01-2022	18-01-2022
Project #03 Review	15-02-2022	18-02-2022
Project #04 Review	15-03-2022	18-03-2022
Project #05 Review	15-04-2022	18-04-2022
Project #06 Review	15-05-2022	18-05-2022
Final Event	20-05-2022	31-05-2022

Team Registration Fee

- ◆ Rs 94400(Inclusive of 18 % GST)

Prize Money

- ◆ Rs 100,000 First Prize
- ◆ Rs 75,000 Second Prize
- ◆ Rs 50,000 Third Prize

Team Size

- ◆ 10 Students from 2nd, 3rd Year and 4th Year BTEch
- ◆ Students from Mechanical, Electrical & Electronics are preferred
- ◆ Every student must have approximately 1000 hours for this Challenge

Prerequisite

- ◆ Mathematics
- ◆ Data Engineering
- ◆ Programming
- ◆ Algorithms
- ◆ Frameworks & Library

Event Delivery

- ◆ The entire event will be conducted online.
- ◆ The following Programs / Projects / Events / Activities will be conducted Online:
- ◆ Three workshops
- ◆ Project Briefing meetings
- ◆ Project Review Meetings
- ◆ Final Event