Finding Steering Angle and self-braking using Deep Learning.

**Introduction**

Information technology serves many purpose but most importantly minimizing human efforts. Although, today’s vehicle is semi-autonomous including emergency brake system and integration of other software (iot) is also another populated idea. But still none of it serves the main goal i.e. reducing human effort a.k.a driverless vehicle.

Here comes Artificial Intelligence research, which is being highly invested by scientists, to introduce an operator that can drive the vehicle safely without any human interaction.

Autonomous car system is basically a combination of different technologies like intelligent GPS system, object detection technology (to reduce accidents), sensors to detect motion, behavior analysis system, cameras, neural networks to predict steering angle and other sensors to create one intelligent system. This study only is concerned with the basic requirement for an autonomous system that is prediction of steering angles and self-brake system. Dataset is being downloaded for this study which contains images captured.

## **Purpose**

### **Prediction of Steering Angle**

With the dataset downloaded, neural network will be used to calculate steering angle, based on images provided in data set.

### **Self-Brake Detection**

In this part, motion and object detection mechanism would be applied to detect traffic signs, signals, and object on road.

# **Project Requirements:**

In order to build this project we need to divide it in 2 parts

1. **Software** (use of sensors & input data to algorithmically generate driving instructions)
   1. **CUDA**
      1. Parallel computing platform
      2. Gives access to any CUDA enabled GPU
   2. **Tensor Flow**
      1. Computational library
   3. **Dataset**
      1. For designing Neural Network
      2. 40 GB in size
      3. contains different images collected by the car under different and challenging weather, roads and illumination conditions
      4. Asynchronous and Synchronous events
   4. **Simulator**
      1. Test our Neural Network
2. **Hardware** (executing the instructions)
   1. **GPU** 
      1. Used for parallel computation.
      2. Contains more than 1000 cores
      3. Real time computations
      4. Optimize Neural Networks

# **Experimental Setup:**

1. **Building Artificial Neural Network (GPU based)**
   1. Using TensorFlow implementation of NVIDIA’s system on Github
2. **Training Neural Network ( by using TensorFlow & Horovod library )**
   1. **detection of lane lines**
      1. Detecting lane lines
      2. Training our car to stay in between them.
   2. **Constructing steering Model**
      1. Showing the computer a bunch of images
      2. Assigning a numeric value to each image
      3. Asking the computer to figure out how the pixels of the images relate to the numeric values
      4. Using this relation to predict the numeric value assigned to other images.(steering angle)
   3. **Building pedal system (self-brake)**
      1. Reassigning each image a numeric value i.e. braking amount
      2. Determining relationship between pixel and numeric value
3. **Testing Neural Network (Udacity simulator**)
   1. Calculating loss.
   2. To calculate Loss, the true steering angle is compared with the steering angle predicted by the model.
   3. For brake same method is used to calculate loss value.

# **Result:**

As the project is going on, we still work on the project to get the accurate results.