**CVI620\_Self\_Driving\_Car**

Overview

This project utilizes a convolutional neural network (CNN) to autonomously steer a simulated self-driving car. By analyzing real-time images from the car's front-facing camera, the model continuously predicts the appropriate steering angle, allowing the vehicle to navigate along a predefined track without human intervention.

Data collection and testing were conducted using the Udacity self-driving car simulator. The CNN was trained on images recorded during manual driving sessions and later tested in the simulator to assess its real-time driving performance and ability to generalize.

Dependencies

Install pip install -r package\_list.txt

Virtual Environment Setup

conda activate datascience-env

Run Model

python selfs\_driving\_training.ipynb

Run Model

pythonTestSimulation.py

Challenge Faced

The initial process we need to do is to first figure out how to process the data. There are about a total of 7000+ images, and we need to ensure that there aren’t too many outliers introduced in our training process. The first big issue we hit is the training speed. It took more than 1 hour to train only 10 epochs and we figured out it was because the values of steps in the fitting process weren't going according to our sample size, so it was introducing the same images again to the model, which will also lead to heavy overfitting. We calculate the sample size w.r.t to the epoch and we put a more proper number.

We also faced issues where validation loss is completely flat, and a sharp drop to near 0 for training loss. The numbers seemed good but it is not normal to have validation loss to not be high at first. This is a clear sign of overfitting. We found the problem to be the order of where we processed the data, and the declaration of the optimizer to use was perhaps not the right naming, and it seems it messed up the model to just go converge immediately. The learning rate was also set at 0.1 for a while and it just converged because it was too large, so it is set at 0.0001 now.

Example Image Data

* IMG/center\_2025\_04\_12\_17\_09\_49\_149.jpg



* IMG/center\_2025\_04\_12\_17\_09\_50\_882.jpg



GitHub Commit





