Autonomous Driving using a CNN and Reinforcement Learning

-Bharath Raj M (bharathrajm97@gmail.com)

Introduction

In this project we train a car in a simulated environment to safely navigate itself. There are two approaches taken, one is to make use of a Convolutional Neural Network and the other is to make use of reinforcement learning.

Technical details

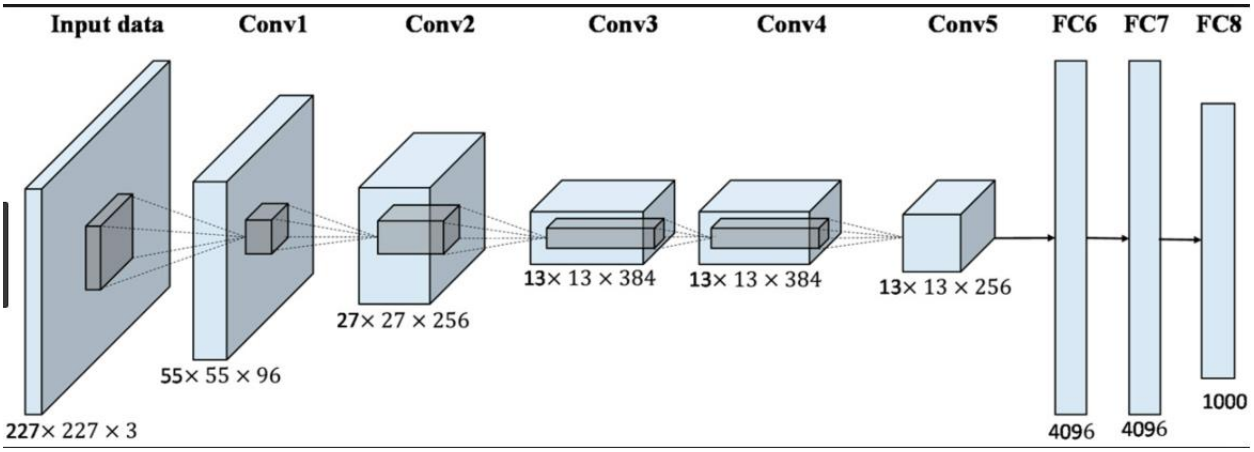
We made use of Unity3D to develop the environment and Python to write our machine learning scripts.

Using CNN

By taking instances of actions and their respective image frames we built the dataset to pass through the CNN.

The camera feed and the respective action of this frame is sent to a CNN.

By making enough number of image and action pairs we build our dataset and train on an AlexNet.



Using Reinforcement Learning

In this approach, Deep-Q-Learning is used where we make use of a neural network to come up with complex policies instead of hand written policies, where each action leads to a particular reward.

In the environment, if the car stays on track and collects blue collectibles then it's reward increases by one. This simple reward function is used and the car is given complete freedom to play around and come up with solutions to stay on track. This is a combination of Supervised and Unsupervised learning.

More work needs to done in the Reinforcement learning part

Things accomplished so far:

1) The environment is setup and completed
2) The complete approach to train on a CNN is well thought of and should only be implemented

Things to do:

1) Implement the CNN approach.
2) Figure out completely how to implement the Deep-Q-networks work and if possible find alternatives like LSTMs for performance.