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MSC DATASCIENCE &AI

SELF-DRIVING CAR

Exploring Autonomous Driving through Udacity's Unity-Based Simulation Environment

AIM :

- The aim of this presentation is to explore and demonstrate the capabilities of the Unity-based Self-Driving Car Simulation Software provided by Udacity.
- Specifically, the presentation will highlight how this simulation environment serves as a critical tool for understanding and developing autonomous driving technologies.
- It will showcase the practical applications of the software in testing algorithms, simulating real-world driving scenarios, and enhancing the learning experience for those pursuing expertise in the field of autonomous vehicles.

DATA COLLECTION

- Simulating self driving car on a video game .Initially user runs through the road using his/her mouse and collects two kinds of data :
- IMAGE(shot from camera mounted on car)
- Steering Angle

DATA COLLECTION DETAILS

- **Input Data:** The car's camera takes a picture of the road every second.
- **Labeled Data:** The steering angle, which is a number between -10 and +10, is saved in a CSV file every second.

Steering Angle = 0: The car is going straight.

Negative Steering Angle: The car is turning left. A larger negative number means a sharper turn.

Positive Steering Angle: The car is turning right. A larger positive number means a sharper turn.

LEFT :

STRAIGHT :

RIGHT :

MODEL :

- Developed a self-driving car model using a Convolutional Neural Network (CNN), inspired by the NVIDIA architecture.
- Data collection involved capturing images from the car's center, left, and right cameras, paired with corresponding steering angles.
- Applied data augmentation techniques including zooming, shifting, brightness adjustment, and horizontal flipping to enhance model generalization.
- Preprocessing steps included cropping, resizing, and normalizing images to maintain consistency.
- CNN architecture featured multiple convolutional layers for feature extraction, followed by fully connected layers to map features to steering angles.
- Trained the model using the Adam optimizer, aiming to minimize mean squared error between predicted and actual steering angles.
- Conducted training over multiple epochs with batch processing to enable effective learning and accurate steering predictions.

THANK YOU