Lane and Obstacle Detection for Autonomous Vehicles

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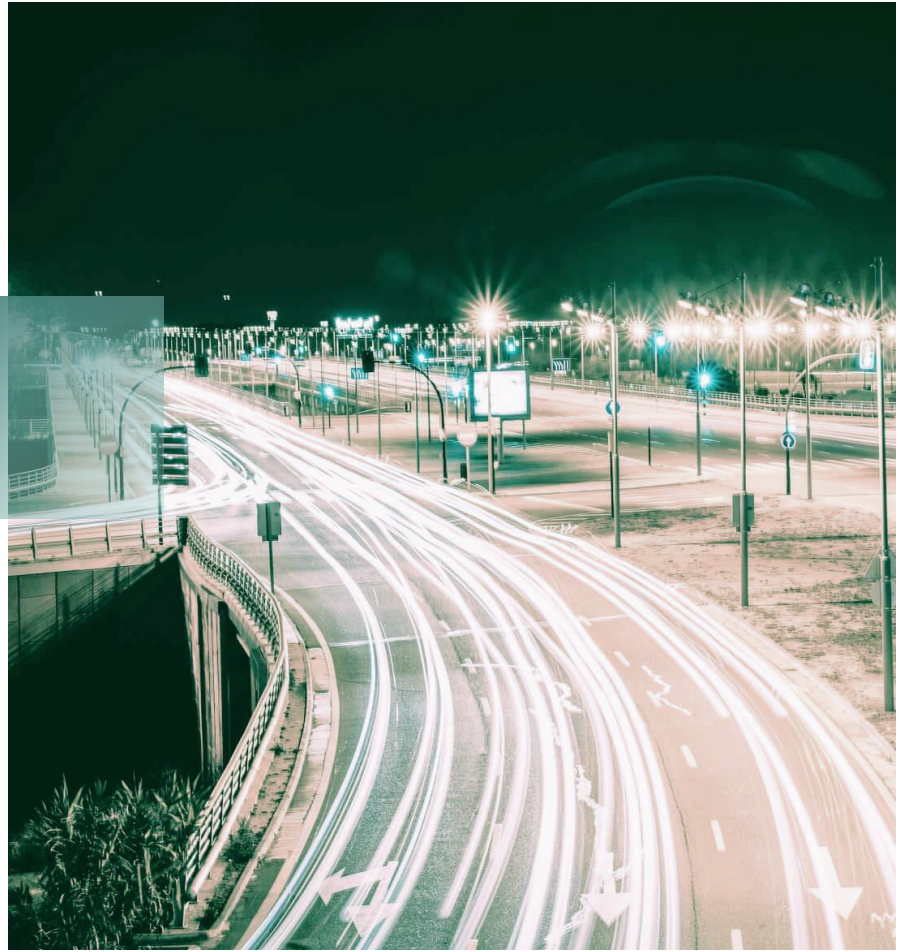
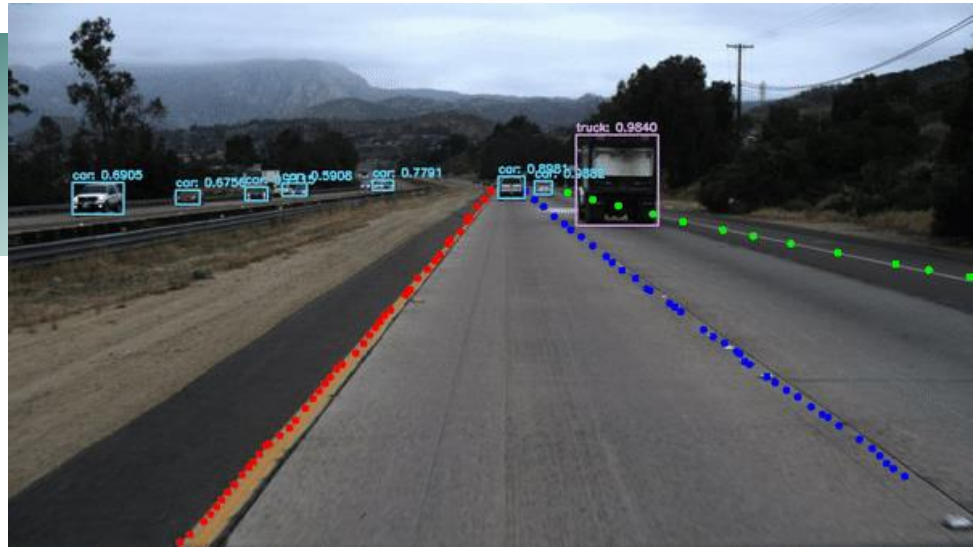


PROBLEM STATEMENT

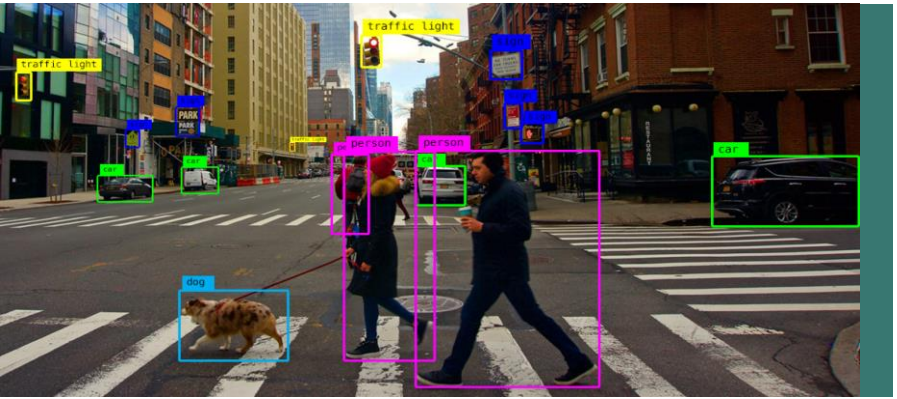
Reducing the risks of an accident due to autonomous vehicles, assisting them with decision making regarding lane detection and speed maintenance.



SOLUTION

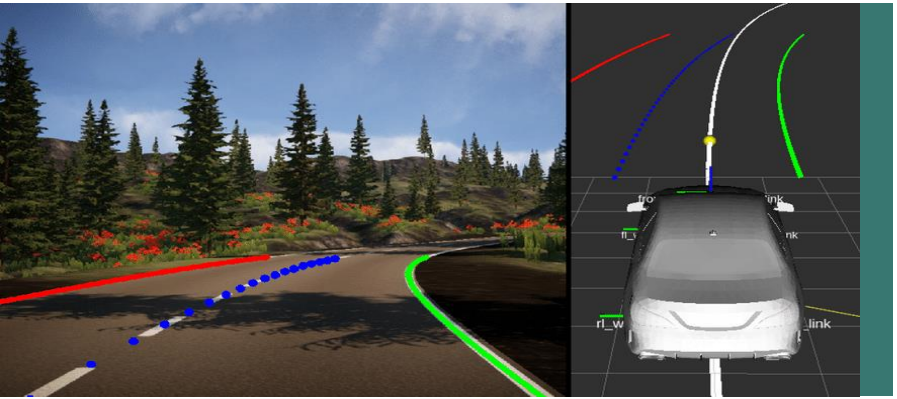
Lane and Obstacle Detection are the two essential components of the perception system that helps the vehicle to navigate accordingly and prevent danger. The proposed system uses a camera-based approach for lane and obstacle detection.

PROJECT GOALS



GOAL 1

Obstacle detection will help a moving object in the lane to detect the obstacles in its path. . Object detection involves the task of detecting/classifying objects in the image as well as localizing them



GOAL 2

The lane detection method assists in detecting lanes on the road with the help of a combination of color and edge detection techniques.

ARCHITECTURE OF YOLOv4

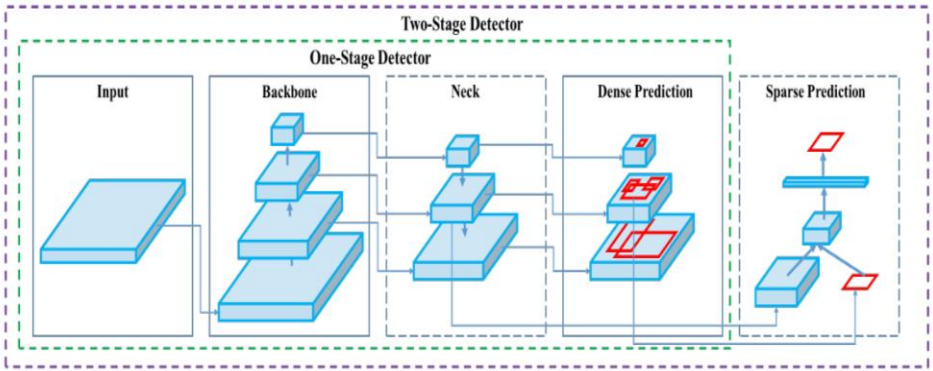
YOLOv4 is a state-of-the-art object detection algorithm that stands for "You Only Look Once Version 4". It is based on a deep convolutional neural network architecture that is designed to detect objects in real-time with high accuracy.

The YOLOv4 architecture consists of a backbone network, a neck network, and a head network.

- The backbone network – CSPDarknet53
- The neck network – FPN, PANet
- The head network –

  Dense Prediction: YOLO v3

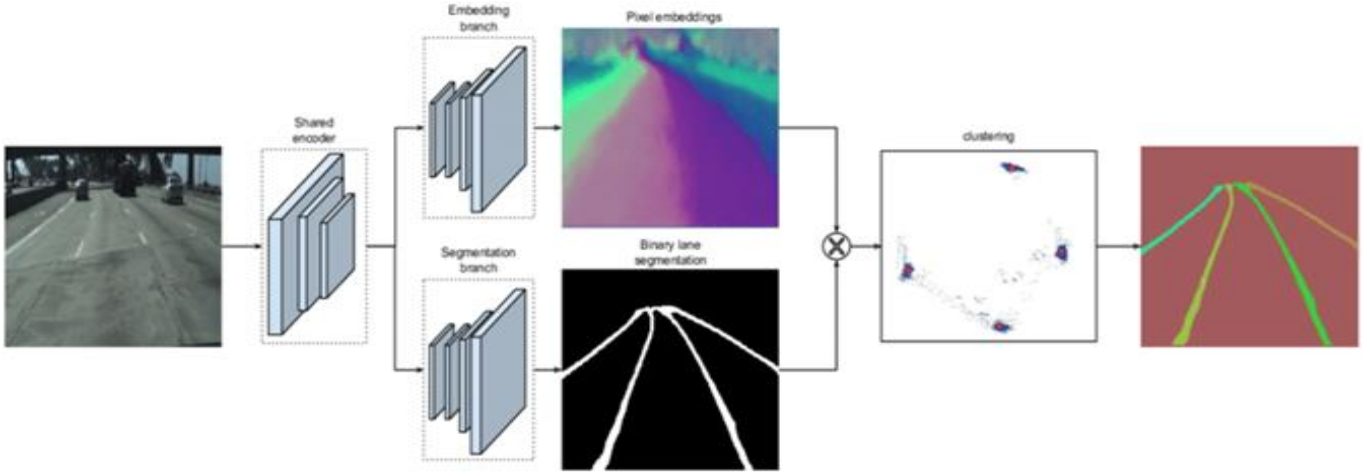
  Sparse prediction: Faster RCNN



Architecture of LaneNet and H-Net

A) LaneNet:
   1. Branch 1: Binary Lane Segmentation
   2. Branch 2: Lane Instance Embedding
   3. Clustering
   4. Network Archiecture

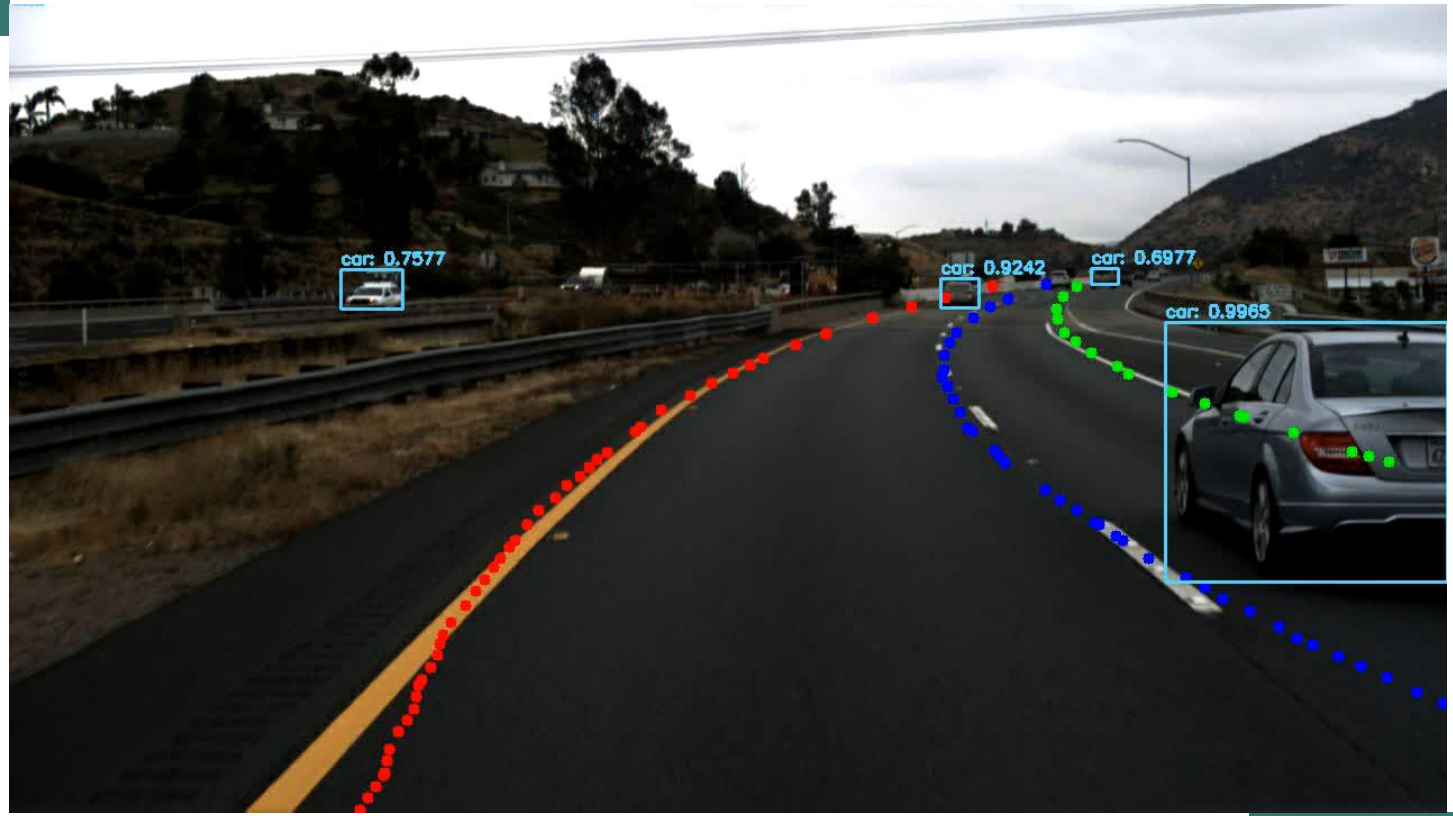
B) Curve Fitting using H-Net



TuSimple Dataset and Implementation

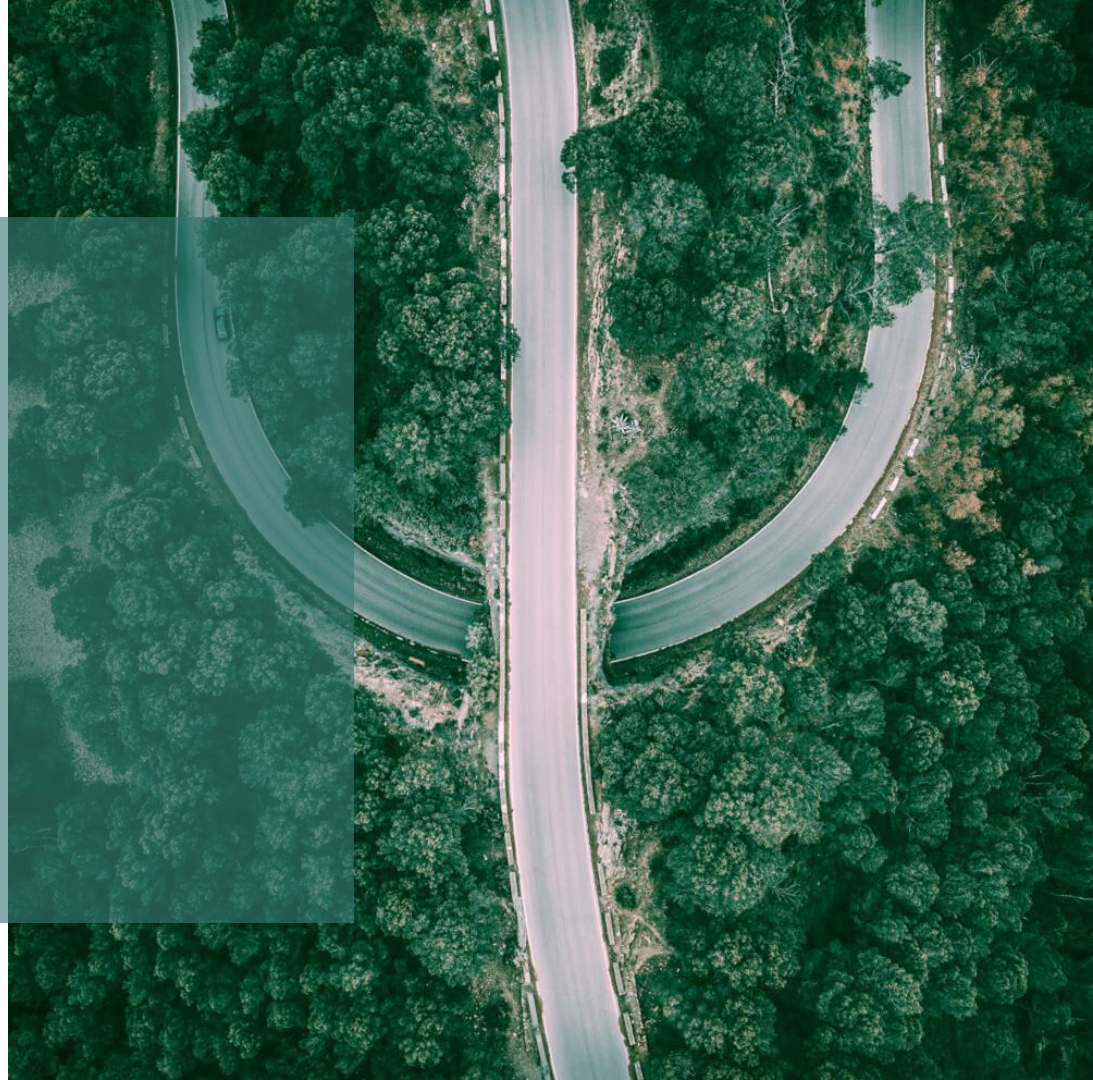
- Combined implementation of Land and Obstacle Detection Algorithms
- TuSimple Dataset
- Programming Approach

DEMO



LIMITATIONS AND FUTURE WORK

- Application
  - Driver Assistance Technology
  - Improved Safety and Efficiency
  - Faster Lanes
- Limitations:
  - Curved Lanes/ Split Lanes
  - Different Camera Angle

THANK YOU

Questions?