UTKAL UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

DEEP LEARNING BASED SELF DRIVING CARS USING COMPUTER VISION

A PROTOTYPE OF AUTONOMOUS VEHICLE WITHIN LIMITED RESOUCES

Under the guidance of :
Dr. Lalatendu Muduli
Asst. Professor, Department of Computer Science and Applications, Utkal University

Prepared By :
Rudranarayan Sahu
Prabin Kumar Sahoo
Soumya Ranjan Panda

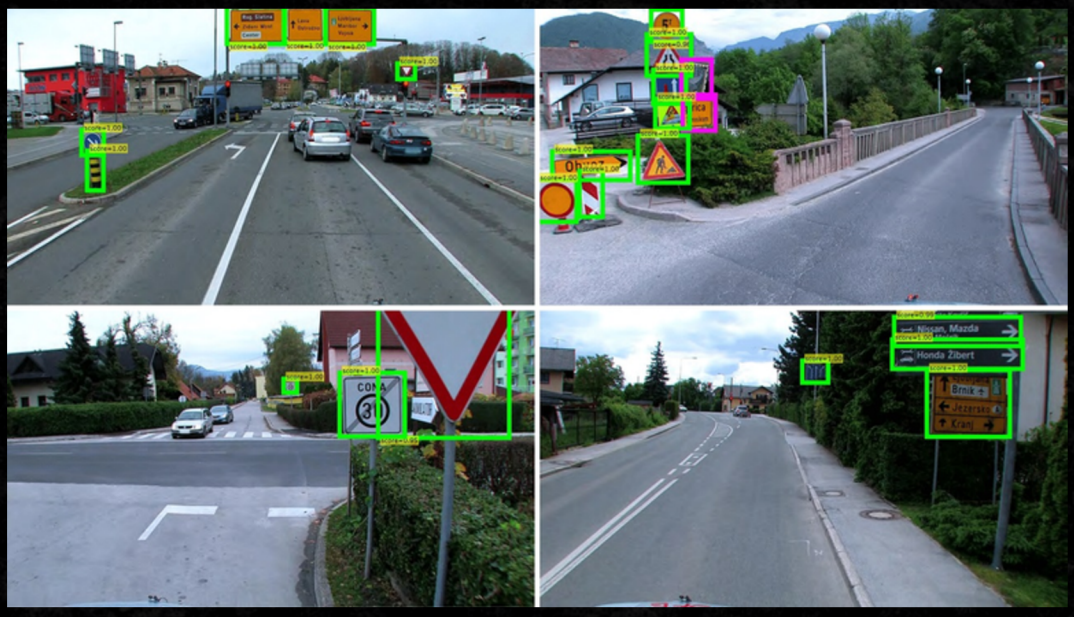
TRAFFIC SIGN RECOGNITION MODEL

Trained a YOLOv5s model on the GTSRB dataset for real-time, efficient traffic sign detection on edge devices.

Model Evaluation Results:

Classes : 43
Epochs : 500
Accuracy : 97.4 %
mAP 0.5 : 91.75%
mAP 0.5:0.95 : 74.08%

Real-time detection upto 45 FPS



Integrating this traffic sign detection model on Raspberry Pi or Jetson Nano enables real-time sign recognition, triggering actuators and sending data to IoT platforms for efficient traffic management.

LANE DETECTION

Real-time lane detection uses computer vision to identify lane markings in video feeds, enabling autonomous vehicles to stay within lanes, enhancing navigation, safety, and control in dynamic driving conditions.

Steps involved in real-time detection:

- Capture real-time frame from camera
- Convert the image frame into grayscale
- Reduce Noise by applying Gaussian blur
- Apply canny edge detection
- Mark the lane by ignoring noise

Original Image frame

Grayscale

Blurred Image
to Reduce Noise

Edges Detection

Ignore unwanted
areas and draw lines

DRIVER DROWSINESS DETECTION

Driver drowsiness detection monitors facial features and eye movement using a camera to assess alertness. Integrated with Raspberry Pi, it provides real-time alerts when fatigue is detected. This enhances driver safety and reduces accident risks.

Steps involved in real-time detection using dlib face encodings:

- Eye Detection using dlibs pretrained model
- Calculate Eye Aspect Ratio (EAR)
- Set Drowsiness Thresholds (0.25)
- Alert System Implementation

OBSTACLE DETECTION

In our self-driving vehicle (SVD) project, an ultrasonic sensor is used to detect nearby obstacles using HC-04 Ultrasonic sensor, enhancing safety and navigation. It provides real-time distance measurement to help avoid collisions, especially at low speeds or in blind spots.

- Detects objects using sound wave reflection (RX and TX)
- Measures distance in real-time (Threshold 30 cm)
- Helps prevent collisions in close-range scenarios