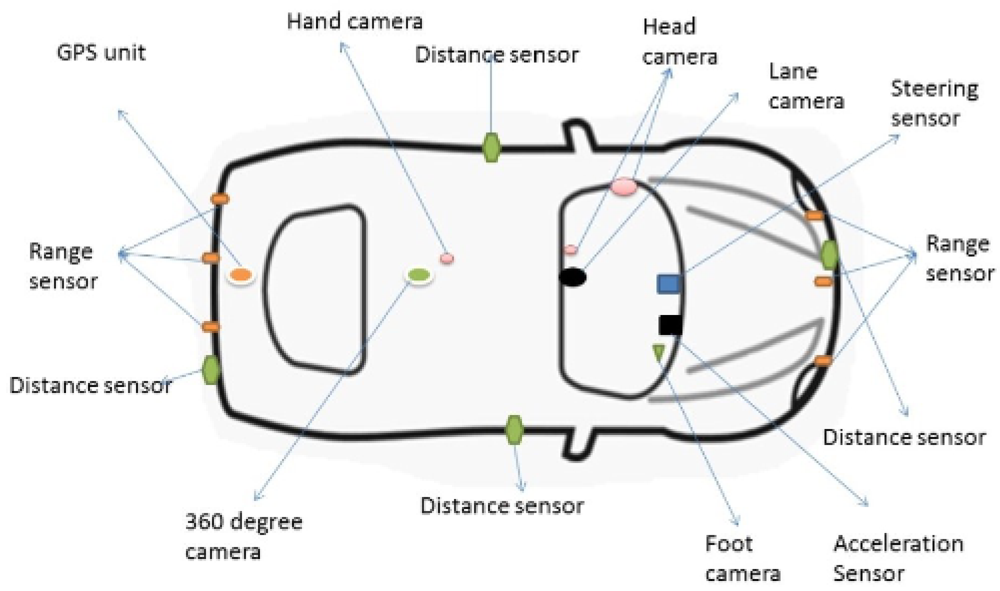
Experiment-1

Aim : Case Study on AI applications

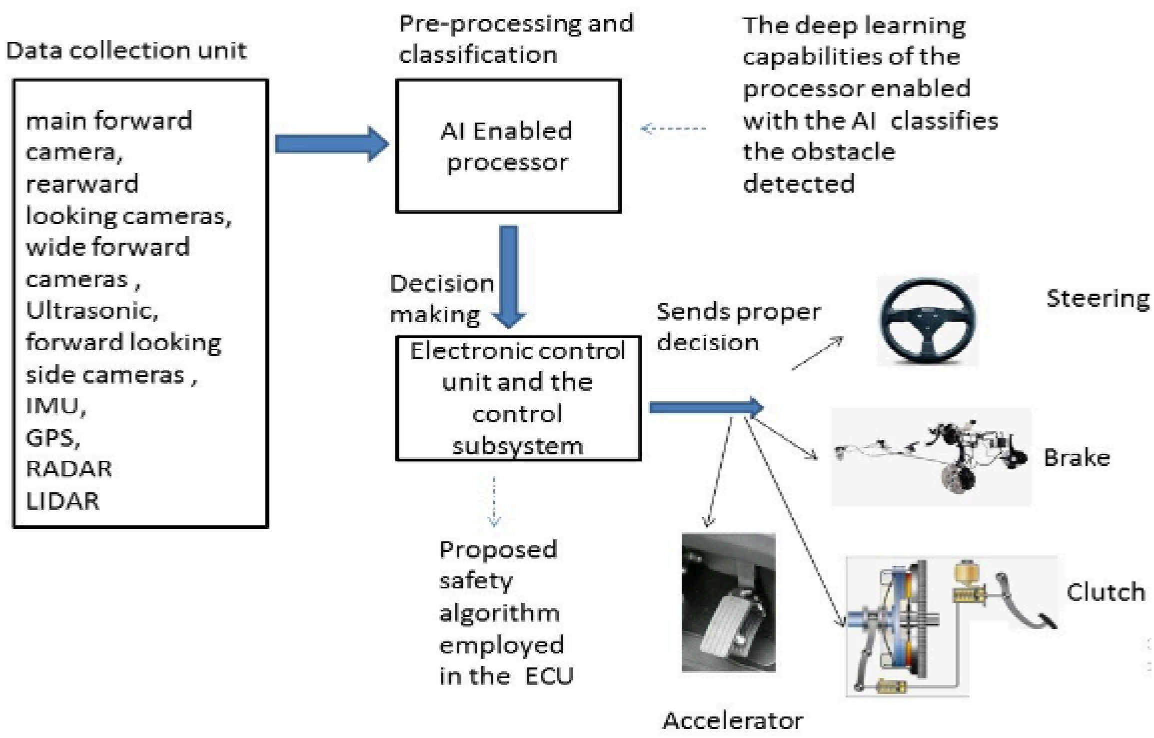
In this study, autonomous cars with self-driving capabilities are characterized as smart technology. According to Stilgoe, the self-driving nature of these vehicles is not entirely autonomous; instead, they are driven by a social process involving goal selection, machine learning, governance use, and interactions with the surrounding world. Despite their potential to enhance transportation efficiency, these self-driving vehicles need meticulous planning, decision-making, motion planning, and vehicle control when navigating roads shared with human-driven or assisted vehicles, as well as pedestrians.

The paper introduces an algorithm aimed at improving on-road safety for self-driving cars equipped with artificial intelligence-enabled processors. This algorithm focuses on proper motion and path planning, as well as effective vehicle control. The study emphasizes the importance of vehicle identification and environmental awareness for autonomous cars, achieved through VANET technology. Utilizing roadside units and vehicles as nodes, VANETs gather information about high-speed vehicles, road congestion, traffic light status, sudden brake applications, and lane changes by nearby vehicles. The integration of an artificial intelligence-enabled processor, specifically the 2nd generation XEON scalable processor, ensures efficient data collection in self-driving cars, enabling quick deployment and high-performance capabilities in terms of application, control, packet processing, and signal processing.



Architecture of the Self-Driving Car

driverless cars, also known as self-driving cars, which operate autonomously without human intervention in steering or pedaling. These vehicles exhibit an advanced capability to perceive their surroundings, encompassing the presence of other vehicles, pedestrians, traffic light signals, potholes, contours, and potential road disasters. The essential features facilitating the functioning of self-driving cars include computer vision, incorporating various cameras (forward, rearward, wide forward), ultrasonic sensors, forward-looking side cameras, RADAR, and LIDAR. These sensors collectively gather data to interpret the environment around the vehicle.



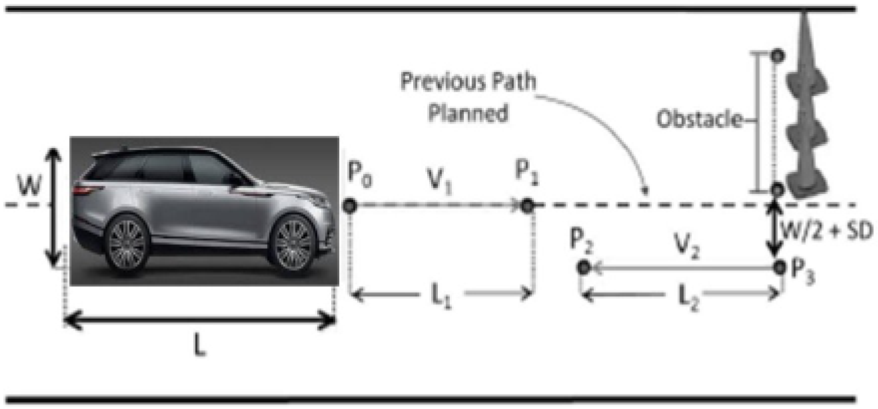
Working of the Self Driving Cars

A systematic workflow is shown through the block diagram in the above Figure , illustrating the functioning of a self-driving car enabled with an AI processor. The core components include computer vision, which acts as the eyes of the self-driving car, utilizing mono, stereo cameras, RADAR, and LIDAR. This sensory information is fused, preprocessed, and classified using the 2nd generation XEON scalable processor equipped with deep learning processes.

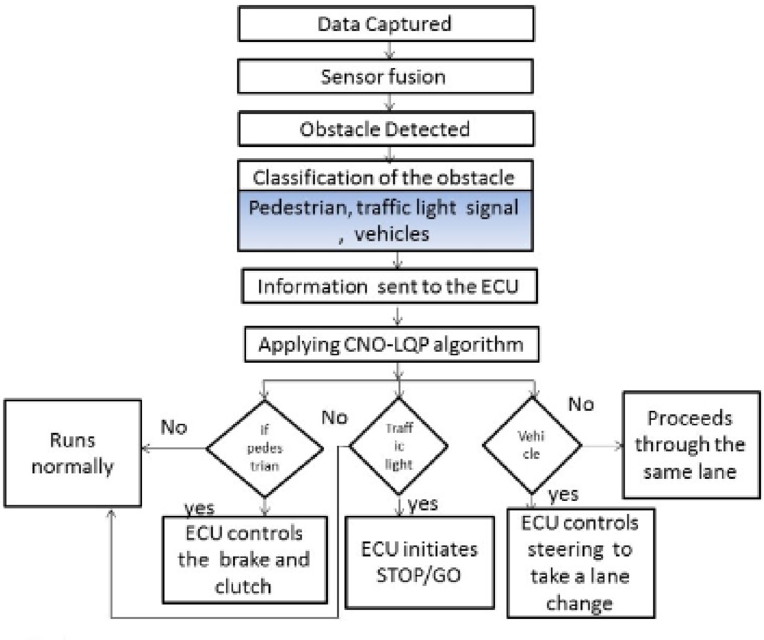
The classified information is then transmitted to the Electronic Control Unit (ECU) and the control subsystem, governing crucial automotive units such as the engine, brakes, doors, windows, clutch, and accelerator.

The proposed algorithm for trajectory adjustment aims to enhance the safety of self-driving cars by focusing on precise trajectory planning to avoid collisions with obstacles. The algorithm addresses decision-making scenarios, such as encountering pedestrians or responding to traffic light signals or some other object. Utilizing distance sensors within the cars, the algorithm identifies the distances between vehicles sharing the road with self-driving cars, contributing to a comprehensive safety strategy.

This method integrates two optimization techniques: conjugate nonlinear optimization (CNO) and Linear–Quadratic Gaussian propagation (LQP) .CNO ensures a smooth interpolation of available paths, facilitating optimal trajectory planning. Meanwhile, LQP handles vehicle control upon obstacle detection, initiating proper motion planning.T. This algorithmic approach, combining advanced optimization methods, exemplifies a robust solution for ensuring road safety in autonomous vehicles.

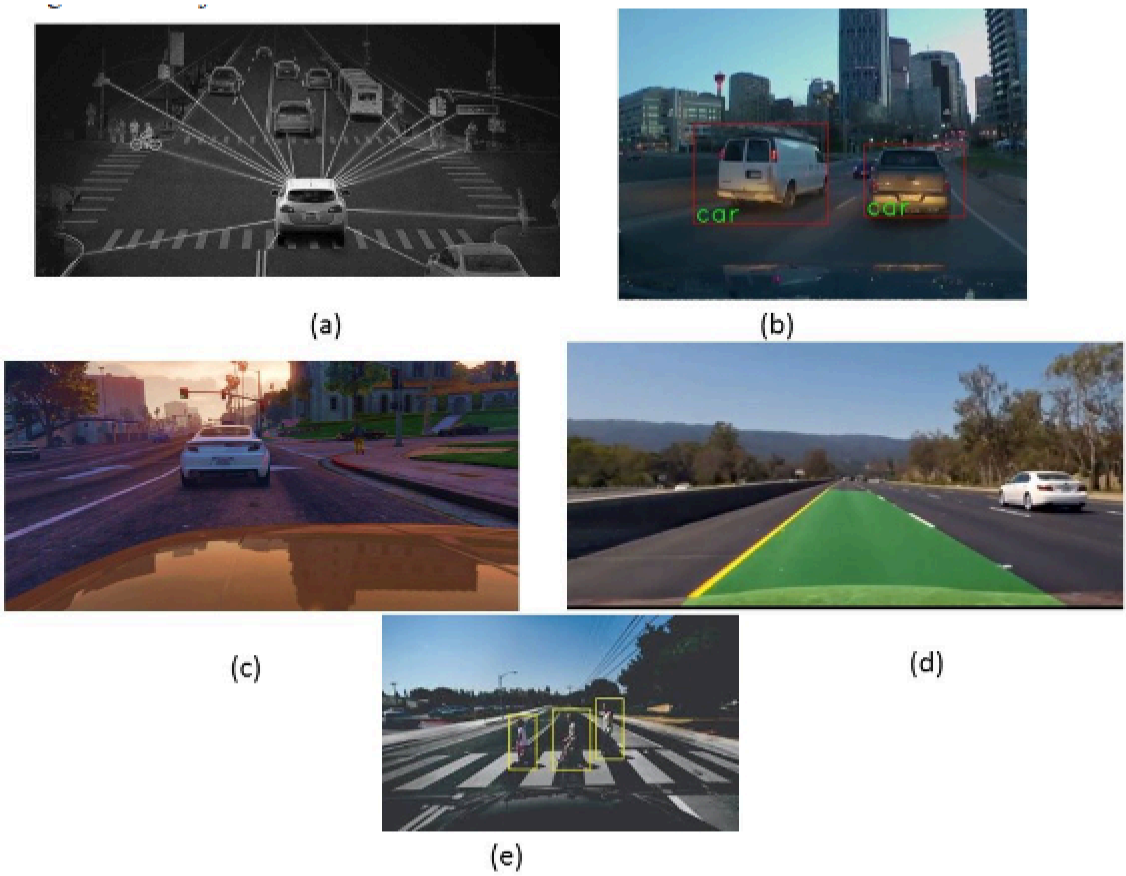


The obstacle avoidance capability of the self-driving car is visualized in above Figure , depicting its ability to navigate and make decisions in real-time scenarios



the subsequent flow chart in above Figure illustrates the path planning and control process initiated by the self-driving car when detecting an obstacle

The Evaluation of the Proposed in the Real Time Scenario (a) capturing of



information, (b) classification of the obstacle detected (c) Response of the self-driving car for the traffic signal (d) Trajectory planning (e) Response to the pedestrians

Looking ahead, future work could focus on refining and optimizing the safety algorithms, incorporating real-world testing and continuous improvements. Additionally, addressing regulatory considerations will be essential for the widespread acceptance and integration of self-driving cars into our daily lives.The safety algorithm discussed ensures informed decision-making for self-driving cars in motion planning, path planning, and vehicle control. By providing an accurate trajectory adjustment and timely responses to detected obstacles, these algorithms contribute to a highly efficient and safer driving experience.

In conclusion, self-driving cars present a transformative shift in transportation, driven by advanced safety algorithms showcased in this study. These algorithms play a crucial role in significantly reducing fatalities, enhancing safety. The independence from human intervention not only streamlines traffic flow but also allows for increased productivity, self-parking capabilities, and the potential for higher speed limits.