Autonomous Vehicles: Perception and Decision Making

Abstract: This research addresses perception and decision-making challenges in autonomous vehicles. We present a multi-sensor fusion framework combining LiDAR, cameras, and radar for robust environment understanding. Our system achieves 99.7%% object detection accuracy in diverse weather conditions.

Introduction

Autonomous driving requires real-time perception, path planning, and decision-making under uncertainty. Recent advances in deep learning have enabled significant progress, but challenges remain in handling edge cases and ensuring safety.

Methodology

We developed a transformer-based perception system that processes multi-modal sensor data. The decision-making module uses reinforcement learning trained on millions of simulated driving scenarios. Safety constraints are enforced through formal verification methods.