

# Collision Avoidance System for Hairpin Curves in Ghats

**Om Chaudhari, Vaibhav Hembade, Kartik Kumbhakaran, Ajay Aachat**

Department of Civil Engineering

Guru Gobind Singh Polytechnic, Nashik, Maharashtra, India

**Abstract:** *Hairpin curves in the Ghats present significant challenges for drivers due to their sharp turns, steep inclines, limited visibility, and unpredictable weather conditions. These factors contribute to a high risk of accidents, necessitating advanced safety measures. This research focuses on the development of a Collision Avoidance System designed to enhance road safety in such hazardous environments. The system integrates ultrasonic, infrared, and radar sensors to detect potential obstacles and analyze vehicle proximity in real time.*

*Through automated alerts, driver assistance mechanisms, and adaptive braking controls, the system aims to minimize collision risks. By leveraging modern sensor technology, AI-driven data analysis, and real-time monitoring, this solution enhances driver awareness and ensures safer navigation through the treacherous Ghats region.*

*This research focuses on the development of a Collision Avoidance System specifically designed for hairpin curves in mountainous terrains. The system integrates ultrasonic, infrared, and radar sensors to detect vehicles, obstacles, and environmental conditions in real time. Machine learning algorithms and AI-based data analysis enable predictive collision detection by analyzing vehicle speed, trajectory, and surrounding hazards. The system features automated alerts (visual, auditory, and haptic warnings), driver assistance mechanisms, and adaptive braking and steering controls to prevent accidents.*

**Keywords:** Ghats region