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## Inside the Mind of a Self-Driving Car: Engineering Intelligence on Wheels

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### Abstract

Self-driving cars combine cameras, sensors, and intelligent computer programs to move safely without human help. These systems are designed to see the road, understand what is happening, and make quick driving decisions. This paper explains how self-driving cars work step by step — starting with computer vision and deep learning for lane detection, traffic sign recognition, behavior cloning, and object tracking. It also covers sensor fusion, localization, and control techniques such as Kalman filters and PID controllers that help the car know its position and move smoothly. The paper further explains path planning, system integration, and safety methods that allow all components to work together. Finally, it discusses the challenges, current progress, and future direction of autonomous driving. The goal is to help readers clearly understand how modern cars think, plan, and act intelligently on the road.