Chapter 5
Cloud-Based Data Analytics for Autonomous Vehicle Performance Using Neural Networks

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ABSTRACT

By utilizing powerful analytical tools and remote computing capabilities, cloud-based data analytics significantly improve the operational efficiency of autonomous cars. Under this model, sensor readings, position data, and system diagnostics among the massive volumes of data produced by autonomous vehicles are sent to a cloud network for immediate analysis. This makes it possible to extract insightful information and trends that improve efficiency, safety, and performance of vehicles. Cloud-based methodology provides scalability, which enables smooth management of substantial datasets, and fosters cooperative endeavours in optimizing algorithms and models for self-governing systems. Analysis of information, machine learning algorithms, and communication are important components of this architecture that work together to enable the ongoing development and enhancement of autonomous vehicle capabilities. In the end, this cutting-edge method enables self-driving cars to negotiate intricate situations with improved decision-making skills, resulting in safer and more dependable driving.

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INTRODUCTION

The advent of autonomous cars has caused a paradigm change in the automobile industry in recent years. For real-time navigation and decision-making, these vehicles depend on an intricate interplay of sensors, actuators, and sophisticated algorithms. The efficient use of data analytics is one of the primary facilitators of the best possible autonomous car performance, and cloud-based solutions have shown to be helpful in this respect. Throughout their operation, autonomous cars produce enormous amounts of data, including sensor readings, navigational data, and vehicle diagnostics. Real-time data analysis like this makes it possible to foresee maintenance needs, monitor vehicle performance continuously, and improve overall efficiency and safety (Muraidhara, P. et al., 2013). A scalable and adaptable platform for processing and gaining insights from this massive quantity of data is offered by cloud-based data analytics, which offers a dynamic method of enhancing autonomous vehicle capabilities. In the fields of transport and automotive technology, the incorporation of stored in the cloud statistical analysis into autonomous vehicle systems represents a revolutionary development (Sriram, I et al., 2010). Advanced data analytics are essential to improving the efficiency, safety, and performance of autonomous cars as the motor vehicle sector transitions to an autonomous mode. Cloud-based solutions provide a dynamic and scalable platform for real-time processing, analysis, and extraction of actionable insights from the massive volumes of data produced by autonomous cars (Muraidhara, P. et al., 2017). These analytics platforms facilitate smooth communication and cooperation between vehicles, infrastructure, and centralized control systems by harnessing the power of cloud computing (K. Lakshmi Narayanan et al., 2023). Predictive maintenance, in-the-moment decision-making, and ongoing improvement of autonomous vehicle operations are made possible by this integrated ecosystem. The combination of autonomous car technology and cloud-based data analytics improves performance and opens the door to a more intelligent, safe, and effective mode of transportation in the future. GANs have demonstrated to be a powerful way to deal with producing constant information, like pictures. Nonetheless, involving GANs for creating discrete information or attack groupings, for example, XSS and SQLI attack payloads, is testing. The justification for this this inherent limitation is that generation starts with random sampling, trailed by a deterministic change on the model boundaries. GANs are utilized for impersonation learning and inverse reinforcement learning. This could be applied to concentrating on the manner in which people drive and either mimicking human drivers precisely or surmising the objectives that human drivers have and learning arrangements that achieve similar objectives better. Figuring out how to mirror human drivers utilizing GANs can be preferable over figuring out how to utilize human drivers with customary managed learning on the grounds that GANs can deal with circumstances where there are different right activities. GANs can figure out how to re-render a scene from an alternate perspective, which could be valuable for making self-driving vehicles that can work with a wide assortment of camera setups, and so on. There are presumably a ton of different things you could do with GANs for self-driving vehicles. I have close to zero familiarity with self-driving vehicles and am simply rehashing thoughts that others have examined freely at meetings, and so forth.

LITERATURE REVIEW

In the transportation sector, cloud-based autonomous cars have come to light as a game-changer that will transform the way people and commodities move and drive mobility in the future (M. G.