Enhancing Vehicle-to-Vehicle Communication Using Machine Learning Algorithms: A Novel Approach for Intelligent Transportation Systems

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Abstract:

Vehicle-to-Vehicle (V2V) communication plays a crucial role in the advancement of Intelligent Transportation Systems (ITS), enabling vehicles to share vital information in real-time for improved safety, traffic management, and driving efficiency. However, current V2V communication networks face significant challenges, including network congestion, high latency, and the need for efficient data processing. This paper introduces an innovative approach that integrates machine learning (ML) algorithms to optimize V2V communication in ITS. By employing techniques such as deep learning, reinforcement learning, and decision-tree algorithms, the proposed system enhances the accuracy of data exchange, optimizes message prioritization, and improves vehicle coordination. The use of ML enables real-time adaptation to fluctuating traffic conditions, allowing for smarter hazard prediction, route optimization, and collaborative driving strategies. Furthermore, the proposed approach leverages data from a variety of sources, including onboard sensors, infrastructure systems, and environmental factors, to enhance communication performance. Experimental results reveal the ability of this method to reduce communication delays, increase data throughput, and improve safety outcomes in real-world traffic scenarios. This work presents a novel, data-driven framework for V2V communication that contributes to the development of more efficient, responsive, and safer ITS.

Keywords:

Intelligent Transportation Systems (ITS), Predictive Analytics, Internet of Vehicles (IoV), Data-Driven Traffic Management, Automated Traffic Systems, Reinforcement Learning.