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## Machine Learning-Oriented Predictive Maintenance (PdM) Framework for Autonomous Vehicles (AVs): Adopting Blockchain for PdM Solution

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# Machine Learning-Oriented Predictive Maintenance (PdM) Framework for Autonomous Vehicles (AVs): Adopting Blockchain for PdM Solution

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**Abstract**— Autonomous Vehicles (AVs) refers to smart, connected and multimedia cars with technological megatrends of the fourth industrial revolution (Industry 4.0) and have gained huge stride in today's world. AVs adopt automated driving systems (ADS) technique that permits the vehicle to manage and control driving points without human drivers by utilizing advanced equipment including a combination of sensors, controllers, onboard computers, actuators, algorithms, and advanced software embedded in the different parts of the vehicle. These advanced sensors provide unique inputs to the ADS to generate a path from point A to point B. Ensuring the safety of sensors by limiting maintenance costs has become a major challenge for AVs community. The predictive maintenance (PdM) approach has the potential to address the AVs failures. In this paper, we propose a novel, conceptual, and high-level domain-specific software architecture for the machine learning-oriented predictive maintenance (PdM) framework that shall enable predicting early malfunctioning, quality, safety, and performance deficiencies of AVs. The novel framework collects the data from sensors and major equipment and stores the collected data in immutable and transparent blockchain technology. Collected data shall be validated, extracted, and classified by adopting machine learning (ML) techniques. ML module shall predict the possible malfunctioning of the sensors while providing potential solutions from the stored data in the blockchain network. In this paper, our effort was to conduct a feasibility study, elicit and specify all the requirements for the proposed framework. In future research, we aim to extend the conceptual work and implement a prototype in real-world scenarios.

**Index Terms**— *Autonomous Vehicles (AVs), Predictive Maintenance (PdM), Machine Learning, Blockchain Technology*