A Review of Blockchain Technologies for Cyber-Resilient Automotives

Prerana Cheguru Vaishnavi Rao Sharani Regonda Delicia Fernandes

Instructor: Dr. Pooria Yaghini

Abstract:

The automotive sector grapples with data, operational, and financial challenges stemming from its centralized systems prone to failure. This review of four survey delves into the promise of decentralized ledger systems in surmounting such challenges by offering a distributed, transparent, and tamper-proof data-sharing conduit within the automotive sphere. It further elucidates the melding of smart contracts into the Internet of Vehicles (IoV), showcasing their instrumental role in streamlining processes such as insurance settlements, servicing timelines, and toll remittances.

Introduction:

Blockchain is a cutting-edge technology that's seen as a game-changer in various industries, including automotive. Its key features, like transparency and security, can address modern challenges in the auto industry, especially with the rise of smart and connected vehicles. As cars become more advanced, there's a growing need for enhanced security, efficient data handling, and trust among all involved parties. Blockchain can help by creating a tamper-proof record-keeping system and enabling transparent transactions and agreements through smart contracts. In the automotive world, this technology has the potential to revolutionize everything from car manufacturing to driving experiences, making them more secure, streamlined, and trustworthy.

Summary:

This survey emphasizes how blockchain can revolutionize the automotive industry as it becomes more intertwined with the Internet of Things (IoT). Blockchain's decentralized and secure ledger system can enhance data security, traceability, and real-time access for all stakeholders, from manufacturers to consumers. This leads to more efficient operations, predictive maintenance, and new opportunities like ride-sharing. It also automates commitments through smart contracts and enhances privacy through encryption. Blockchain can address challenges throughout the automotive supply chain, from tracking vehicle records to simplifying warranties and transforming insurance. The paper also discusses real-world projects using blockchain in the Internet of Vehicles (IoV) and advanced blockchain models and IoT collaborations. Despite its potential for trust, efficiency, and security in the auto industry, challenges like scalability and system compatibility persist. The review recognizes these issues and suggests potential solutions and future research directions.

Use Cases:

Blockchain offers numerous benefits in the automotive industry. It acts as a reliable record-keeper, tracking vehicle component histories, making recalls and warranty processes faster. Smart contracts use real-time data to customize maintenance and handle insurance claims and toll payments. It also digitizes service histories, improving vehicle resale values. Additionally, blockchain supports peer-to-peer ride-sharing for secure vehicle rentals from owners. It's also useful for energy trading, smart parking, accident prevention, and managing traffic congestion. In summary, blockchain enhances trust and efficiency throughout the automotive journey.

Challenges & Future Research:

Blockchain shows great promise in the automotive sector but faces challenges in widespread adoption. These challenges include the lack of standard protocols, the energy consumption of proof-of-work algorithms, regulatory uncertainties, and threats from hardware and quantum computing attacks. However, ongoing research can help overcome these obstacles. New studies can focus on energy-efficient consensus methods and standard protocols to promote interoperability and speed up pilot projects. As distributed ledger techniques advance, blockchain has the potential to transform the automotive supply chain, create data-driven business models, and enhance cybersecurity. But unlocking its full potential requires addressing technical and operational challenges through dedicated research efforts.