

Intelligent Technologies for Vehicular Networks

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Intelligent transport systems (ITS) [1] have made remarkable strides in several critical areas, including the Internet of Vehicles (IoV) [2,3], vehicular network security [4], vehicular clouds [5–7], and advanced routing protocols [8]. The IoV facilitates real-time data exchange between vehicles and infrastructure, significantly enhancing traffic management and safety [9]. Meanwhile, advanced encryption and intrusion detection systems are pivotal for securing vehicular communication networks [10,11]. Vehicular clouds offer scalable data storage and processing solutions, supporting various applications such as traffic monitoring [12,13]. Enhanced routing protocols optimize travel routes using real-time traffic data. Collectively, these advancements have fostered the development of smart vehicular systems, paving the way for innovations in autonomous driving and advanced driver assistance systems (ADAS) [14,15]. These innovations have markedly improved safety, efficiency, and connectivity within transportation networks [16,17].

This Special Issue addresses crucial gaps in data management, security, privacy, and communication within high-mobility environments through ten groundbreaking papers. Yaduwanshi et al. (Contributor 1) propose a novel geocast routing approach that addresses challenges in highway environments by improving throughput and message delivery despite intermittent connectivity and GPS outages. Enhancements to the veins tool are discussed by Kilanioti et al. (Contributor 2), incorporating new caching and content distribution features along with machine learning algorithms for more effective VANET simulations. In another paper, Conrad et al. (Contributor 3) explore a customizable cyber-physical system (CPS) designed for the development and testing of intelligent vehicular systems, bridging theoretical concepts with practical applications. Song et al. (Contributor 4) use UAVs to extend the coverage of mobile edge computing (MEC) and propose a deep reinforcement learning-based SDN controller (DRL-SDNC) to optimize resource allocation, such as computational resources, bandwidth, and storage. The DRL-SDNC adjusts these resources based on task requirements and network conditions, enhancing efficiency and quality of service in UAV-assisted 5G networks. The approach shows improved resource efficiency compared to traditional methods. Moolikagedara et al. (Contributor 5) introduce a video blockchain framework that enhances security, privacy, and scalability in smart city vehicular networks by safeguarding video data storage and retrieval. This advancement not only improves situational awareness and data integrity but also removes the need for third-party intermediaries. Kim et al. (Contributor 6) present advances in secure positioning for vehicle swarms through a DAG-based distributed ledger combined with ultra-wideband (UWB) positioning, ensuring data integrity and security against tampering. In another paper, de Curtò et al. (Contributor 7) propose a drone-based decentralized framework for truck platooning, utilizing drones for real-time communication to enhance platoon management, collision avoidance, and traffic safety. Tam et al. (Contributor 8) explore network slicing techniques for vehicular communications, leveraging deep learning and reinforcement learning to optimize resource allocation and scheduling. Gelbal et al. (Contributor 9) introduce an Android app utilizing low-energy Bluetooth (BLE) to enhance safety for vulnerable road users (VRUs) by smoothing motion data, predicting movement, and issuing driver warnings. Chen et al. (Contributor 10) contribute with a hierarchical



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deep reinforcement learning framework to bolster collision avoidance with pedestrians in autonomous driving systems by integrating adaptive control mechanisms.

Future research in intelligent vehicular networks should focus on addressing key challenges related to security and privacy by developing advanced cybersecurity methods and data privacy techniques. Integrating 5G and 6G technologies for enhanced vehicle-to-everything (V2X) communication, creating new communication protocols, and leveraging artificial intelligence for route optimization and anomaly detection are essential. Additionally, investigating IoT interoperability and efficient data management, enhancing vehicle cooperation for autonomous driving, and developing robust testing methods are crucial. Emphasis should also be placed on energy management for electric vehicles, smart charging infrastructure, and the integration of heterogeneous vehicular networks. Edge computing for real-time processing, advanced traffic simulation tools, and the development of global standards and regulatory frameworks are vital for the ongoing advancement and practical implementation of intelligent vehicular networks.

As the Guest Editor, I could not finish without extending my heartfelt gratitude to the authors, reviewers, and the editorial team for their invaluable contributions and support. I trust this Special Issue will inspire continued research and collaboration in the pursuit of intelligent and sustainable vehicular networks.

Conflicts of Interest: The authors declare no conflicts of interest.

List of Contributions:

1. Efficient Route Planning Using Temporal Reliance of Link Quality for Highway IoV Traffic Environment. Available online: <https://www.mdpi.com/2079-9292/12/1/130> (accessed on 9 October 2024).
2. Content Caching and Distribution Policies for Vehicular Ad-Hoc Networks (VANETs): Modeling and Simulation. Available online: <https://www.mdpi.com/2079-9292/12/13/2901> (accessed on 9 October 2024).
3. Intelligent Embedded Systems Platform for Vehicular Cyber-Physical Systems. Available online: <https://www.mdpi.com/2079-9292/12/13/2908> (accessed on 9 October 2024).
4. DRL-Based Backbone SDN Control Methods in UAV-Assisted Networks for Computational Resource Efficiency. Available online: <https://www.mdpi.com/2079-9292/12/13/2984> (accessed on 9 October 2024).
5. Video Blockchain: A Decentralized Approach for Secure and Sustainable Networks with Distributed Video Footage from Vehicle-Mounted Cameras in Smart Cities. Available online: <https://www.mdpi.com/2079-9292/12/17/3621> (accessed on 9 October 2024).
6. Vehicular Localization Framework with UWB and DAG-Based Distributed Ledger for Ensuring Positioning Accuracy and Security. Available online: <https://www.mdpi.com/2079-9292/12/2/3/4756> (accessed on 9 October 2024).
7. Adaptive Truck Platooning with Drones: A Decentralized Approach for Highway Monitoring. Available online: <https://www.mdpi.com/2079-9292/12/24/4913> (accessed on 9 October 2024).
8. QoS-Driven Slicing Management for Vehicular Communications. Available online: <https://www.mdpi.com/2079-9292/13/2/314> (accessed on 9 October 2024).
9. Vulnerable Road User Safety Using Mobile Phones with Vehicle-to-VRU Communication. Available online: <https://www.mdpi.com/2079-9292/13/2/331> (accessed on 9 October 2024).
10. Deep-Reinforcement-Learning-Based Collision Avoidance of Autonomous Driving System for Vulnerable Road User Safety. Available online: <https://www.mdpi.com/2079-9292/13/10/1952> (accessed on 9 October 2024).

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