
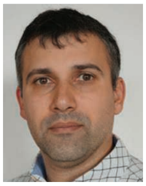



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Artificial Intelligence for Autonomous Vehicular Communication Networks

With advances in sensing, communication, and networking, autonomous vehicles and unmanned aerial vehicles (UAVs) are expected to play a vital role in a variety of areas, including health care, Industry 4.0, smart farming and agriculture, logistics, transportation, and public safety. Together with the upcoming 5G/6G technologies, connected vehicular systems will become more ubiquitous and practical. Artificial intelligence (AI) and machine learning (ML) can provide significant benefits toward automating the tasks of sensing, computing, and communicating in vehicular communication networks. By leveraging traces of numerous operations, AI can optimize network decisions that are reflected in resource utilization and service enhancement.

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To achieve real-time perception and autonomous control, computing and communications in AI-enabled vehicular communication networks will be more complex and heterogeneous than before. For example, resource management will be extremely challenging due to certain characteristics of these complex systems (the high-mobility of nodes and unreliable link connectivity) combined with battery-constrained end devices and heterogeneous networking. In addition, distributed ML algorithms are essential in vehicular communication networks with multiple self-organizing vehicles for control that is scalable and has low latency.

The objective of this special issue is to bring together state-of-the-art innovations and research activities (from academia and industry) to explore AI-based autonomous vehicular communication network technologies. After a rigorous peer review process, three articles were selected, for an acceptance rate of less than 25%. They address various AI-based technologies designed to help autonomous vehicular communication networks, including UAV-assisted mobile edge computing (MEC), frameworks for UAV arrangement, and networked autonomous driving.

In "Deep Reinforcement Learning-Based Resource Management for Flexible Mobile Edge Computing: Architectures, Applications, and Research Issues," Wang et al. develop deep reinforcement learning (DRL)-based solutions for autonomous vehicle-assisted MEC. The article provides an interesting discussion of how to apply DRL for trajectory control and resource allocation in an autonomous vehicle-assisted MEC environment that includes unmanned ground vehicles (UGVs) and UAVs. According to simulation results, multiagent DRL can improve cooperation among UAVs and UGVs, increasing resource utilization.

"An Energy-Efficient Intelligent Framework of UAV-Enhanced Vehicular Networks: Open Problems and a Case Study," by Fu et al., proposes an energy-efficient intelligent framework for UAV arrangement in vehicular networks (VNs). The authors discuss fundamental tradeoffs between the arrangement delay and energy consumption involved in UAV flying and hovering. Through a case study, they also verify that flexible-rearrangeable UAVs can improve VN performance.

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THE AUTHORS DISCUSS FUNDAMENTAL TRADEOFFS BETWEEN THE ARRANGEMENT DELAY AND ENERGY CONSUMPTION INVOLVED IN UAV FLYING AND HOVERING.

The final article, "Collaborative Driving: Learning-Aided Joint Topology Formulation and Beamforming," is by Zhang et al. and proposes a collaborative autonomous driving scheme that jointly controls the driving topology and formulates VNs in millimeter-wave (mm-wave) and terahertz bands. It leverages graph neural networks to learn important features of vehicle-to-vehicle communication and predict the best mm-wave/terahertz beamformer, which improves computation efficiency. The article also discusses open problems in collaborative autonomous driving.

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