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Consumer electronics play a crucial role in the automotive sector by providing the essential hardware infrastructure necessary for developing autonomous vehicles. These vehicles significantly enhance driving comfort and accessibility, particularly benefiting specific populations such as the elderly and individuals with disabilities. Researchers utilize federated learning, employing homomorphic encryption and differential privacy techniques; however, these methods can impede efficiency. Traditional centralized federated learning presents a risk of single points of failure. To address this issue, we propose an authentication protocol for federated learning, integrated with blockchain technology, within consumer electronics-supported autonomous driving environments. This protocol enhances vehicle authentication efficiency while prioritizing data security and user privacy. Formal analysis verifies the integrity of the protocol. Experimental results demonstrate that the communication overhead of our protocol is reduced by 40.3% compared to existing similar authentication protocols.

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Secure Artificial Intelligence for Precise Vehicle Behavior Prediction in 6G Consumer Electronics

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Abstract

In the context of Secure Artificial Intelligence for 6G Consumer Electronics, accurately predicting vehicle behavior in dynamic traffic scenarios is a significant challenge in intelligent transportation. To avoid sending all raw data to a centralized cloud server, this study presents an artificial intelligence (AI) based distributed machine learning framework (AICEML) that can run on local edge devices. This method protects user privacy while minimizing transmission and processing delays. Accurate predictions are maintained despite the presence of many cars because to AICEML's use of the model on edge devices, which incorporates edge-enhanced attention and graph convolutional neural network features to swiftly collect and transmit vehicle interaction information. Each edge device can adapt its neural network type and scale based on its computing capabilities, accommodating various application scenarios. Experimental results using the NGGSIM dataset demonstrate AICEML's superiority, achieving precision, recall, and F1 scores of 0.9391, 0.9557, and 0.9473, respectively. With a 1-second prediction horizon, it maintains 91.21% accuracy and low time complexity even as the number of vehicles increases. This framework holds promise for enhancing intelligent transportation systems in the 6G era while prioritizing security and efficiency. © 1975-2011 IEEE.

Author keywords

6G consumer electronics; communication efficiency; edge computing; Secure artificial intelligence; vehicle behavior prediction

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An Authentication Protocol for Federated Learning With Blockchain in Consumer Electronic Assisted Autonomous Driving Environments

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Abstract

Consumer electronics play a crucial role in the automotive sector by providing the essential hardware infrastructure necessary for developing autonomous vehicles. These vehicles significantly enhance driving comfort and accessibility, particularly benefiting specific populations such as the elderly and individuals with disabilities. Researchers utilize federated learning, employing homomorphic encryption and differential privacy techniques; however, these methods can impede efficiency. Traditional centralized federated learning presents a risk of single points of failure. To address this issue, we propose an authentication protocol for federated learning, integrated with blockchain technology, within consumer electronics-supported autonomous driving environments. This protocol enhances vehicle authentication efficiency while prioritizing data security and user privacy. Formal analysis verifies the integrity of the protocol. Experimental results demonstrate that the communication overhead of our protocol is reduced by 40.3% compared to existing similar authentication protocols. © 1975-2011 IEEE.

Author keywords

Autonomous Driving; Blockchain; Consumer Electronic; Federated Learning; Vehicles

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