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A Federated Learning Framework for Automated Decision Making with Microscopic Traffic Simulation

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***Abstract*— In recent years, exploring autonomous vehicles has become an emerging research topic due to the massive opportunities to deploy deep learning models in real-world transportation applications. Although deep learning models have been widely applied to microscopic traffic simulations (MTS), they are limited to offline prescriptive analysis or predictive analysis. However, dynamics of a traffic environment frequently change over time; little research has been focused on dynamically updating deep learning models parameters in response to real-time traffic conditions. Further, for dynamic model parameter updates, it is difficult to preserve privacy since raw data is transmitted to the server for model updating (training). In this paper, we present a federated multimodal microscopic traffic simulation (FedMMTS) framework that incorporates federated learning to**

behavior and driving patterns mostly depend on drivers' mood at that time and many other factors such as stress, fatigue, etc. [4]

In recent years, the advancement in machine learning (ML) suggests the use of deep learning (DL) in complicated situations. DL is a subfield of ML that structures algorithms in layers to create artificial neural networks. DL can capture complex patterns and works in a non-linear fashion which makes it superior to other ML algorithms [5]. Traditional rule-based systems are outdated in most cases where DL performs significantly better. As a result, recently we have seen an