**Federated Knowledge Distillation for Privacy-Preserving Driver Drowsiness Detection**

125015058 – Jeevanand K

125015077 – Nithish S V

125015056 – Jayapradeepkumar P

**Abstract:**  
Driver drowsiness significantly impairs a driver’s sensory, cognitive, and motor abilities, posing a serious threat to road safety. Detecting driver drowsiness is vital for reducing traffic accidents. Federated Learning (FL) addresses the challenge of insufficient driver facial data by aggregating data from multiple entities while preserving privacy. However, FL systems face challenges such as privacy concerns, high communication costs, and maintaining model performance in resource-constrained environments. To address these challenges, we propose a novel framework combining Federated Learning with Knowledge Distillation (FL-KD) for driver drowsiness detection. Our approach uses MobileNet enhanced with a capsule module as the global model to effectively capture spatial and hierarchical relationships in facial features. A custom drowsy driver dataset is utilized to improve model robustness and accuracy. Knowledge distillation is employed to create lightweight student models, optimized for deployment on edge devices, while retaining the knowledge of the global model. Furthermore, a privacy-preserving protocol ensures secure parameter exchange, protecting driver data privacy. Experimental results demonstrate that our FL-KD framework, trained on the custom dataset, achieves superior accuracy, reduced communication costs, and enhanced efficiency compared to traditional FL methods. This framework offers a scalable, privacy-preserving, and high-performance solution for real-world drowsiness detection applications in industrial scenarios.

References:

[1] Privacy-Preserving Federated Transfer Learning for Driver Drowsiness Detection - Linlin Zhang

Guide Name: Uma Maheswari D