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Federated Learning: Privacy-Preserving Machine Learning Across Decentralized Data Points

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Abstract: *Federated learning (FL) emerges as a revolutionary approach to train machine learning (ML) models on decentralized data sources, preserving user privacy. This paper explores the core concepts, techniques, and contributions of FL within the context of privacy-preserving ML. We discuss the limitations of traditional centralized learning and the importance of data security. We then delve into the FL framework, communication methods, and the integration of privacy-preserving techniques like differential privacy. Furthermore, we explore the applications of FL in healthcare, finance, and IoT domains, showcasing its potential across various sectors. Finally, we address current challenges and future directions for research, including enhanced security, improved scalability, and broader real-world applications.*

Keywords: Federated Learning, Privacy-preserving, Decentralized Data, Machine Learning, Data Security