FEDERATED LEARNING *IN HEALTHCARE*

A Brief Review of Foundations, Applications, Challenges, and Opportunities

Wednesday, February 19, 2025

3:15 - 3:45 pm CST

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Abstract:

Federated Learning (FL) is transforming artificial intelligence by enabling decentralized model training across institutions without requiring direct data sharing. This talk will begin with a brief review of FL's foundational principles, structural components, and key methodologies, emphasizing its role as a privacy- preserving machine learning paradigm. Some key applications of FL in healthcare will be explored, including real-time patient monitoring, personalized treatment, broader medical research, and AI-driven drug discovery. Current implementations and studies demonstrate FL's ability to enable multi-institutional collaboration while maintaining data privacy, allowing for improved model generalization, greater resource efficiency, and enhanced decision-making in clinical practice and research. We will also review some of the challenges FL must overcome to maximize its benefits to health systems, such as data heterogeneity, model convergence issues, communication overhead, generalization limitations, bias, and computational costs, which further complicate clinical adoption. As research advances and these challenges are addressed, FL has the potential to revolutionize collaborative AI in medicine, driving secure, data-driven healthcare innovation while safeguarding patient privacy.

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A machine learning expert, Dr. Markopoulos is a Margie and Bill Klesse Endowed Associate Professor in the Departments of Electrical & Computer Engineering and Computer Science at The University of Texas at San Antonio (UTSA), where he directs the MILO Laboratory and co-leads Trustworthy AI at the MATRIX AI Consortium. His research focuses on efficient and robust learning from challenging data, multimodal deep learning, federated learning, and quantum machine learning. His work has significant applications in remote sensing, wireless communications, and healthcare. He has authored over 80 publications and secured substantial funding from NSF and AFOSR, including the YIP award. Among other projects, he is currently conducting research for the NIH/AIM-AHEAD project MATCH: The MATRIX AI/ML Concierge for Healthcare, which aims to develop an open AI/ML platform for clinicians in Texas and internationally, providing tools and training for the interpretation of diverse biomedicaland healthcare data.