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Enhancing computational performance in healthcare through federated learning approach

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Chapter 7

Enhancing computational performance in healthcare through federated learning approach

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Abstract



With the proliferation of digital health records and medical imaging data, the healthcare sector stands at the cusp of a data-driven transformation. However, leveraging this wealth of information for computational analysis poses significant challenges, primarily concerning privacy, security, and computational performance. Federated learning has emerged as a promising solution, allowing collaborative model training across distributed healthcare institutions while preserving data privacy. This study explores the rapidly developing topic of healthcare federated learning applications with an emphasis on improving computational performance. We introduce federated learning and its relevance within healthcare contexts, particularly privacy and security challenges inherent in healthcare data sharing. Further, we explore studies involving the application of federated learning in maintaining privacy while improving model performance and assess performance benchmarks of federated learning models utilizing the healthcare datasets. Some other discussed issues include optimization techniques specific to federated learning in healthcare, such as federated averaging and differential privacy, scalability challenges and strategies for resource-efficient utilization within federated learning setups, and recent studies demonstrating the effectiveness of federated learning in various healthcare tasks purpose is to clarify metrics for performance improvement including model precision, convergence rate, resource consumption, resilience to changes in data distribution, and privacy protection. By combining numerous study findings, this chapter provides a comprehensive overview of the crucial role that federated learning plays in improving computer performance in healthcare analytics while preserving data security and privacy.



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