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Decentralized Batch Effect Correction in Multi-Center Biomedical Studies: Introducing FedComBat, a Federated Learning Approach

Batch effect correction is a pivotal challenge in biological data analysis, affecting fields such as genomics, transcriptomics, and proteomics. Traditional correction methods like `limma::removeBatchEffect` and `ComBat` require centralization of data from various institutions, which can be problematic due to privacy and data governance concerns. Our innovative approach, named FedComBat, circumvents this issue by utilizing federated learning techniques. Unlike conventional methods, FedComBat allows for decentralized batch effect correction, enabling data to remain at their respective institutes while still achieving comparable analysis results. This approach not only maintains data privacy but also paves the way for efficient multi-center biomedical studies.

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1,2,3,4

Keywords

Batch Effect Correction, Federated Learning, FedComBat, Data Privacy, Decentralized Analysis

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