Relaxed Contrastive Learning for Robust Federated Models with Noisy Labels and Limited Clients

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Abstract—Federated Learning enables collaborative model training across distributed clients without sharing raw data, making it suitable for privacy-sensitive applications. However, FL faces significant challenges due to noisy labels, which can degrade model performance, especially in non-IID environments. In this paper, we propose a robust federated learning method that combines symmetric cross-entropy loss with a modified relaxed contrastive loss to address noisy labels and improve the diversity of learned feature representations. We evaluate our approach on Fashion-MNIST, SVHN, and CIFAR-10 datasets under both symmetric and asymmetric noise settings. The results demonstrate that our method consistently outperforms multiple baselines, including FedAvg, FedProx, FedMixup, and FedLSR. Notably, our method shows strong performance even with low client participation rates, making it highly effective for scenarios where communication cost is a concern. This robustness and efficiency make our approach a valuable contribution to noise-robust federated learning.

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