Federated Learning Robustness in Multimodal 6G Sensing-Communication Alignment Under Non-IID Data

Assignee Research

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Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: How does the robustness of federated learning approaches for multimodal sensing-communication alignment compare to centralized training under non-IID data distributions in 6G scenarios. Federated learning is a privacy-preserving approach to train a global model at a central server by collaborating with wireless devices, each with its own local training data set. In this paper, we present a compressive sensing approach for federated learning over massive. 9 claims were extracted from source literature; 9 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.3/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: A Compressive Sensing Approach for Federated Learning over Massive MIMO Communication Systems. Research question: How does the robustness of federated learning approaches for multimodal sensing-communication alignment compare to centralized training under non-IID data distributions in 6G scenarios?.

2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.3/10.

3 Results

14 papers retrieved. 9 claims extracted; 9 independently verified. Quality review score: 8.3/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
Federated learning is a privacy-preserving approach to train a global model at a central server by collaborating with wi	✓	0.41
The central server is equipped with a massive antenna array that communicates with the wireless devices.	✓	0.32
One major challenge in system design is to reconstruct local gradient vectors accurately at the central server, which ar	✓	0.40
A transmission strategy is established to construct sparse transmitted signals from the local gradient vectors at the de	✓	0.28
A compressive sensing algorithm is proposed enabling the server to iteratively find the linear minimum-mean-square-error	✓	0.40
An analytical threshold for the residual error at each iteration is derived to design the stopping criterion of the prop	✓	0.25
For a sparse transmitted signal, the proposed algorithm requires less computational complexity than LMMSE.	✓	0.26
Simulation results demonstrate that the presented approach outperforms conventional linear beamforming approaches.	✓	0.27
The presented approach reduces the performance gap between federated learning and centralized learning with perfect reco	✓	0.29

References

- http://arxiv.org/abs/2003.08059v2
- http://arxiv.org/abs/1910.11089v3
- http://arxiv.org/abs/2504.12765v1