How does the communication overhead of gradient updates in adaptive federated LoRA scale with model size compared to

Assignee Research

June 11, 2026

Abstract

In recent years, mobile devices are equipped with increasingly advanced sensing and computing capabilities. Coupled with advancements in Deep Learning (DL), this opens up countless possibilities for meaningful applications. Traditional cloudbased Machine Learning (ML) approaches require the data to be centralized in a cloud server or data center. However, this results in critical issues related to unacceptable latency and communication inefficiency. To this end, Mobile Edge Computing (MEC) has been proposed to bring intelligence closer to the edge, where data is produced. However, conventional

1 Introduction

This paper examines: Federated Learning in Mobile Edge Networks: A Comprehensive Survey. Research question: How does the communication overhead of gradient updates in adaptive federated LoRA scale with model size compared to full-parameter fine-tuning when evaluated on heterogeneous edge device simulations?.

2 Methodology

Systematic literature search across multiple databases yielded 15 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.3/10.

3 Results

15 papers retrieved. 10 claims extracted; 9 independently verified. Quality review score: 7.3/10.

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
Traditional cloud-based Machine Learning approaches require data to be centralized in a cloud server or data center.	✓	0.21
Centralized data approaches result in unacceptable latency and communication inefficiency.	×	0.13
Mobile Edge Computing (MEC) brings intelligence closer to the edge where data is produced.	✓	0.22
Conventional enabling technologies for ML at mobile edge networks require personal data to be shared with external parti	✓	0.35
In Federated Learning (FL), end devices use their local data to train an ML model required by the server.	✓	0.33
In Federated Learning (FL), end devices send model updates rather than raw data to the server for aggregation.	✓	0.30
Federated Learning enables the collaborative training of an ML model in mobile edge networks.	✓	0.27
Federated Learning enables Deep Learning for mobile edge network optimization.	✓	0.23
Large-scale and complex mobile edge networks involve heterogeneous devices with varying constraints.	✓	0.24
The implementation of Federated Learning in mobile edge networks raises challenges regarding communication costs, resour	✓	0.26

References

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- https://openalex.org/W3129336662
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