Paper Title : FedAdapter: Efficient Federated Learning for Modern NLP

Paper Link : https://arxiv.org/abs/2205.10162

1.Summary

1.1 Motivation:

The paper addresses inefficiencies in federated natural language processing (FedNLP) which due to the high computation and communication cost is very difficult to apply on modern mobile devices.

1.2 Contribution:

The authors propose FedAdapter a framework for enhancing FedNLP through adapter-based optimization and caching techniques to reduce both computation and network overheads.
The key contributions of this work are as follows:

- Transformer adaptation to federated learning using efficient adapters.
- A dynamic and progressive adapter configuration system is proposed.
- Showing significant time-to-accuracy and resource cost reductions on such demonstrations.

1.3 Methodology:

FedAdapter is based on two key designs:

- **Dynamic Adapter Configuration:** The adapter complexity is increased gradually during training by progressively deepening or widening the adapters.

- **Activation Caching:** Reuse pre-computed activations for fixed layers across rounds, reducing redundant computation.

In the system, adapter configurations are automated using sideline trials.

1.4 Conclusion:

Experiments show that FedAdapter reduces the training time of FedNLP tasks by up to 155× compared to baseline methods while maintaining high model accuracy. It significantly lowers computational, network and energy costs. Hence making FedNLP feasible for commodity mobile devices.

2. Limitations

2.1 First Limitation:

The performance of FedAdapter depends on adapter design and specific configurations. Poor configurations or assumptions may hurt the improvements in performance.

2.2 Second Limitation:

It is assumed that the system will have enough numbers of eligible client devices available, which may not always be the case with sparse device participation.

3. Synthesis:

FedAdapter significantly enhances the practicality of federated learning for NLP tasks, extending its scalability to mobile and IoT devices. This may enable a wider adoption of private and distributed NLP models by reducing the training time and resource demands. However, the dependency on adapter configuration and device availability hints that more research is needed in order to generalize the approach across diverse tasks and resource constraints.