Article Review

SplitFed: When Federated Learning Meets Split Learning

Summary

The paper presents SplitFed, a novel distributed collaborative machine learning framework that leverages the benefits of federated learning and split learning. Unlike federated learning, SplitFed can operate on edge devices with limited resources, while also providing robust privacy protection similar to split learning. Moreover, SplitFed accelerates the model training process compared to split learning by utilizing federated learning's aggregation mechanisms for model synchronization on the client side. Experimental results on different datasets and model architectures demonstrate that SplitFed achieves comparable performance to split learning and federated learning while preserving their unique advantages.

Strength and Weakness

Strength:

1. The paper proposes a promising approach for combining two distributed collaborative learning frameworks while retaining their respective benefits.
2. The paper presents a rudimentary analysis of the training time and communication cost of each distributed collaborative learning framework.
3. The paper conducts an empirical study of all distributed collaborative learning frameworks, utilizing diverse datasets and models.

Weakness:

1. The paper could be improved by conducting important experiments that include comparing each learning framework's single-epoch and overall training time, as well as assessing the level of privacy protection with and without DP and PixelDP.
2. Further emphasis should be placed on highlighting SplitFed's contribution to accelerating the model training process in comparison to conventional split learning.
3. A crucial aspect of distributed collaborative learning is the impact of data distribution among clients on accuracy; however, the paper lacks a discussion on this topic.

Questions

1. The paper's analysis of training time appears to be incorrect as the forward and backward propagation times (T) for each framework differ. Given that federated learning, SFLV1, and SFLV2 utilize parallel client updates, shouldn't they have an advantage?
2. If split Learning and SplitFed attain comparable accuracy, and SplitFed does not offer a significant speed advantage over split learning, what is the motivation for using SplitFed?

Conclusion

The paper proposes a novel approach by combining split learning and federated learning to enhance their respective advantages while mitigating their disadvantages. However, despite the experimental results showing similar levels of accuracy among all frameworks, the advantages of SplitFed are not clearly demonstrated.