#10 Accelerate Cross-Device Federated Learning With Semi-Reliable Model Multicast Over The Air

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Background and Motivation

• In emerging scenarios like unmanned aerial vehicles and self-driving cars, a lot of devices might conduct Federated Learning (FL) iteratively over shared wireless channels.

• For the one-to-many model delivery involved in training, a promising optimization is to employ existing PHY-aided L2 wireless multicast techniques for help.
Background and Motivation

• Existing PHY-aided Layer 2 multicast techniques provide either totally unreliable or reliable delivery service, mismatching with the fact that FL tasks in practice generally tolerate loss-bounded model/gradient transmissions.

• By exploring this type of tolerance, there is a large room for the optimization of model multicast performance.
Preliminary Findings

We propose SRMP, a novel protocol to achieve semi-reliable model multicast for cross-device FL over shared wireless channels.

Unreliable transmission does bring benefits in some cases; however, it also leads to slow convergence.

1. How to find the sweet spot?
2. How to achieve loss-bounded delivery more effectively?

(a) Impact of $\gamma$ on the performed rounds
(b) Impact of $\gamma$ on the total communication time
Conclusion and Future Work

• We show that semi-reliable model multicasting is a promising optimization for the acceleration of FL over the shared wireless channel, and preliminarily propose SRMP to explore the design.

• Future work:
  • More thoughtful retransmission designs for SRMP;
  • Methods to configure the protocol parameters respecting the characteristics of both the trained FL model and underlying network environments;
  • Comprehensive performance study.
Thank You!