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Title: « Online Federated Learning »

Abstract:

Federated Learning (FL) trains a global model on mobile phones while keeping the data of users local. In spite of its privacy benefits, Federated Learning unfortunately falls short of the needs of fast-data applications, which require ongoing model updates based on fresh data (on-line learning). In this work, we consider two core limitations of FL for on-line learning: (i) its restriction to idle charging devices, and (ii) its high update latency caused by synchronous learning rounds. To address (i), we introduce I-PROF, a new lightweight regression-based profiler that controls the impact of learning tasks on mobile devices. To address (ii), we introduce ADASGD, a staleness-aware learning algorithm which makes the learning system robust to asynchronous updates. These two building blocks are packed into MOBNET, the first Online Federated Learning system. We illustrate the benefits of MOBNET by showing that an Online Federated Recommender can get up to 23% higher accuracy for a negligible battery cost ($\leq 1\%$ /day). We then show that ADASGD outperforms alternative FL learning approaches in terms of convergence speed with about 30%. I-PROF accurately controls the impact of the learning task on the user, with up to 3.6 \times improvement.