EPFL-Inria
INTERNATIONAL LAB

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Inria
INVENTEURS DU MONDE NUMÉRIQUE

Workshop EPFL-Inria
January 20 & 21, 2022 -Lausanne

"PDSGD: Projected decentralized stochastic gradient descent"

Othmane Safsafi
EPFL

Abstract

In decentralized machine learning we train a model over a graph of connected servers or nodes. This enables faster convergence as each node only deals with a small subset of the data set. However, this type of learning suffers from performance degradation if the underlying network is not dense enough. On the other hand, dense networks lead to a bottleneck in the learning phase created by the heavy load of communication. This problem is even more present in the context of heterogeneous data partitioning. In this paper, we propose a new way of significantly enhancing the performance of decentralized learning through stochastic gradient descent. We do that by adding a projection step during the gradient descent, this projection ensures that our vectors of parameters stays small enough. This in turn ensures that the consensus distance of the network stays small and thus that there is no loss in performance compared to a centralized server. We prove that in theory, under mild conditions, our new algorithm PDSGD converges to an optimum and using previous results we assert that the convergence rate of the algorithm is similar to that of a centralized server. We then test our theoretical results on various experimental settings.