Efficient Federated Learning with Parameterized Quantization

Keywords

Federated Learning, Deep Learning, Quantization (compression).

Description

Machine/Deep learning approaches offer great potential for solving highly complex problems. The presence of a large amount of data is the cornerstone of machine learning. The need to combine all data, on the other hand, can be a concern in terms of privacy and communication bandwidth. Federated Learning, as a promising distributed learning scheme, can learn a model by only exchanging locally trained models instead of privacy-sensitive data.

A large neural network size may be required to learn complex tasks, and the frequent communication of the model (necessary in federated learning) may be too cost-intensive. Advanced quantization methods may be needed to reduce the size of a model while keeping the learning accurate.

Goal

The goal of this thesis is to:

- Confirm that the assumptions of the advanced quantization method still hold in federated learning.

- If the assumption does not hold, then try to understand the underlying reason and adapt the method in federated learning.

- If it already holds or after adaptation, then explore different properties of applying it in federated learning (impact on the learning performance, advantages on saving transmission energy for example).

Requirements

- Solid Python programming skills

- Basic knowledge in deep learning.

- Some experience with Numpy and PyTorch.

- Motivation to learn new material and work efficiently.

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