**Problem Statement:** Federated Learning with Pretrained Text DNNs

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11-5-19

Federated Learning aims to train machine learning models in a distributed fashion without centralizing data but instead updating and passing model parameters from a central server to distributed entities and back to perform stochastic gradient descent. McMahan et al. propose the Federated Averaging algorithm in [Communication-efficient learning of deep networks from decentralized data.](https://arxiv.org/abs/1602.05629) This algorithm and associated experiments in the paper yield promising results but are limited to models with randomly initialized weights. We aim to address the problem of applying state-of-the-art pretrained text models like [BERT](https://arxiv.org/abs/1810.04805) (or more pruned versions, such as [ALBERT](https://arxiv.org/pdf/1909.11942.pdf)) for weight initialization in the context of the Natural Language Understanding tasks at which they excel. The use case would be to deploy these learned weights/models onto the devices of Google customers and then fine tune them on individual devices, for specific, downstream, text-based tasks that would benefit from these model architectures. For our project, we would simulate training on distributed devices.

Our goal is to conduct Federated Learning training experiments with pre-trained text models to highlight the ways in which these models could be useful, as well as their limitations, and how changes might be necessary to make them viable in the future, especially as research into pre-trained text models advances. We will do this using the Federated Averaging algorithm, leveraging existing open source code in the [Tensorflow Federated Learning API](https://www.tensorflow.org/federated). Challenges for this project include handling the size of pre-trained text models which have far more parameters than simpler models used in existing Federated Learning experiments, becoming familiar with the existing Federated Learning code in the Tensorflow API, and having access to the right computing resources and testing environment to execute these experiments.

Arjun Singh and I (Joel Stremmel) are the team members for this project. We are in the process of gathering feedback from our sponsor about our problem statement, in addition to finalizing our data source which should be a large text data source. Our sponsor has indicated that we would have access to Stack Overflow comments data, which would provide useful, conversational text information for model training and testing.