A Feasibility Study to implement Next Word Prediction Model using Federated Learning on Raspberry Pi

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Federated Learning (FL) is a distributed form of machine learning where models are trained on the local data available on edge/mobile devices without collecting user-sensitive data on the server. However, implementing FL on edge devices such as a Raspberry Pi has been challenging due to the limited computational resources available on these devices. This dissertation demonstrates the feasibility of implementing a next word prediction model using FL on resource-constrained Raspberry Pi devices. Long-Short Term Memory (LSTM), a variant of Recurrent Neural Network (RNN) is designed to predict the next word on the Reddit dataset. Cross entropy loss and accuracy of the trained model are evaluated. During the federated training, the performance metrics of the Raspberry Pi devices including memory usage, training time, and temperature were measured to establish the practicality of the designed solution. It was observed that next-word prediction LSTM model could be trained in a federated setting on real edge devices (Raspberry Pi). However, there is a need to scale the system to atleast 50 to 100 clients to get state-of-the-art results.