A Feasibility Study For the Implementation of Machine Learning Models using Edge Federated Learning in Healthcare Domain

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University of Dublin, Trinity College, 2022

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The usage of smart monitoring devices has increased drastically. It has been instrumental in generating rich data to enable the use of Artificial Intelligence and Data Science in healthcare. The data generated is sensitive in nature. Federated Learning(FL) has been gaining considerable attention, since it could train machine learning models without uploading data onto a cloud, keeping in mind the privacy of users especially the patients in healthcare. The Federated Averaging algorithm proposed for aggregation in Federated Learning, could add a significant overhead with the presence of large number of devices in the network. A novel paradigm, Edge Federated Learning(EdgeFed) was introduced with Edge Computing as an inspiration to better adapt for the upcoming future of AI and networking. This work details the usage of Edge Federated Learning, for the training of two different models, a linear model - Logistic Regression and a Neural Network model, using the diabetes data. Data was manipulated to simulate a real-world scenario and distributed to clients for training. The evaluation of the trained models are discussed in detail which proves that it is feasible to use Edge Federated Learning in healthcare. The results portray comparable results with conventional Federated Learning and conventional central training of ML models. Finally, it also establishes that Edge Federated learning can significantly reduce the number of global communication compared to Federated Learning.

Keywords: Federated Learning, Edge Computing, Edge Federated Learning, Flower Framework, Machine Learning.