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# Enhancing Central Model Performance: Leveraging Federated Learning Across Virtual Machine Networks for Distributed Training and Synchronization

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**Abstract***: This project takes a closer look at federated learning as a way of achieving superior machine learning models in a distributed manner while preserving privacy in the datasets that contribute. We have modelled a network of cooperating virtual machines working collectively without explicit sharing of data. Rather than distributing the complete big dataset to each system, we have split it into chunks of 10,000, 5,000, 40,000, 5,000 entries. These systems would then work on their data with learning rates of their model's making and in the decision-making processes to modify their settings, so that the data that systems would work on could allow for building their respective models by them. What this means is that the high point in the project is the combination of these models into one overarching model. The overarching model then gets better because of the small models learning from it without having to access the data associated with the models in a direct sense. This way, a better model can be built, which will intimately understand the data and thereby predict more accurately. Taken as a whole, we have shown how federated learning can improve the models of machine learning in a significantly private manner, and thus the methodology is positively postured with respect to future related work*

**Keywords:** Federated Learning, Privacy Preservation, Virtual Machine Networks, Data Partitioning, Machine Learning Algorithms, Hyperparameter Optimization, Decentralized Learning, Centralized Model Integration, Data Diversity, Model Performance Enhancement

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