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Patent Search

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Abstract:

ABSTRACT A SYSTEM AND A METHOD TO ENABLE FEDERATED LEARNING WITH ADAPTIVE CLIENT PRIORITIZATION IN HETEROGENEOUS NETWORKS The current disclosure pertains generally to a system and method for enabling federated learning with adaptive client prioritization in heterogeneous networks. The invention comprises a federated learning server, and a plurality of client devices with differing computational and network capabilities. A client profiling module collects and assesses real time metric quality, compute power, and network latency, among others. A client prioritization engine creates a client selection score according to a multi-factor optimization function, and allows for dynamic client selection for every training round. A semi-synchronous update handler combines lagged updates with similarity-based decay. A communication optimization module selects a transmission methodology based on bandwidth utilization. A secured audit log maintains a cryptographically hashed, tamper-evident log of client participation. The method and system described improves model convergence, fairness and communication efficiency in a non-uniform environment. Thus, the federated learning system and method of the disclosure offers a solution to scalable and robust real-world federated learning, across heterogeneous edge devices and network infrastructure, intelligently adapting to client conditions while enabling privacy-preserving collaboration. Fig. 3.

[Complete Specification](#)

Description: TECHNICAL FIELD

[0001] The present disclosure describes a system and method for optimization of cooperative learning in distributed settings. More particularly, it describes a system and method for optimization of cooperative learning in distributed settings. More particularly, it describes a system and method for optimization of cooperative learning in distributed settings, consisting of client devices which differ in data quality, computational capacity, and communication quality. The invention incorporates dynamic profiling, multi-criteria selection and optimal selection strategies to enhance training performance, model convergence, and system resilience for privacy preserving distributed learning.

BACKGROUND

[0002] Federated Learning (FL) has emerged with some of the most powerful applications of the fast-changing field of machine learning, or the sub-field of artificial intelligence. FL has the future potential to resulting collaborative training of machine learning models to be centrally managed and jointly and remotely trained on edge devices without needing to have direct or centralized access to the raw data. Therefore, federated learning is built upon the concept of user privacy, while also accepting reduced communications, while also complying with copyright and other data governance. Federated learning is exceptionally suited and becoming robust in personal sensitive distributed domains such as health care, banking and finance, smart cities, and deployments of edge IoT environments. But on the other side of practice there are a real challenges of disparate operational environments demonstrating heterogeneous networks with devices that will differ considerably in regard to resource allocation of quality of data between devices, all of which can insubordinate to uneven data distribution within heterogeneous networks. The factors of heterogeneity will culminate into limitations of scalability of the system, while meanwhile effecting model convergence and training performance.

[0003] In previously identified existing federated learning systems, i.e. FedAvg, FedProx, and variants of said systems are not designed to aggregate federated asynchronous

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