A user selection and resource allocation method for hierarchical tree-structure federated learning

1. Scenarios & Problems



Components:

Root node: gNB or Server Internal node: VMR, edge, UAV Leaf node: cell phone, iPad

Process:

Node#31 uploads its model -- w_{31}^t to Node#24, Node#24 does aggregation with its local mode w_{24}^t , and gets its aggregated model -- $w_{24}^{t+1/2}$ Node#24 uploads its aggregated model -- $w_{24}^{t+1/2}$ to Node#14,

Problem:

...

How to choose nodes and allocate resources?

2. Solutions

- 1. choose nodes with large data size
- 2. choose nodes with more child nodes, e.g. choose node#12 instead of node#13
- 3. choose nodes with more layers (deeper), e.g., choose node#14 instead of node#13
- 4. choose nodes with more significant datas, etc..

3. Standard impact:

- 1. TR22.876: Study on AI/ML Model Transfer-Phase 2
- 2. 3GPP R19 WID "Study on AI/ML Model Transfer Phase 2" (S1-221225), SP-220439 "Distributed AI training/inference based on direct device connection".
- The objectives are to study new use cases and potential service and performance requirements to support efficient AI/ML operations using direct device connection, including:
- -Distributed AI training/inference based on direct device connection, e.g. traffic KPIs, different QoS and functional requirements on slidelink transmission.

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- -Charging and security aspects.
- Considering in the hierachical federated learning, the connection between layers are via sidelink.