3/12

Goal: We need to find out five substantially different FL algorithms that are designed for tolerating dynamic networks, stragglers and/or faulty node behaviors and integrate them with flower framework with FVC on CloudLab.

Progress: I read this paper (FedDebug: Systematic Debugging for Federated Learning Applications) and tried to integrate this FrdDebug algorithm in flower framework with FVC on CloudLab. After integrating, we have checked results e.g., global accuracy, FedDebug Localization Accuracy and checked different behavior of this FedDebug algorithm on our framework.

Detail report: FedDebug is a novel debugging framework designed to introduce interactive debugging and automated fault localization. It operates without requiring access to client’s data or labeled test sets by which it remains privacy-preserving. It uses record-and-replay techniques to simulate an FL environment for debugging and identifies faulty clients without requiring labeled test data by leveraging differential testing based on neuron activations rather than output labels.

After integrating this FedDebug algorithm to our Flower based FVC framework on CloudLab platform, we have investigated different experiments which are given below:

1. FedDebug performance at neuron activation threshold on 30 clients:

From figure we found that FedDebug performed better at lower neural activation thresholds.

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1. Detecting Multiple Faulty Clients: (Total client used = 50, Device select = CPU)

The localization time increases as we increased the number of faults from 2 to 7.

|  |  |
| --- | --- |
| Number of faulty clients | localization time (seconds) |
| 02 | 81.23 |
| 03 | 81.49 |
| 04 | 81.62 |
| 05 | 82.25 |
| 06 | 83.41 |
| 07 | 84.07 |

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1. Table 2: FedDubug’s fault localization with multiple faulty clients, ranging from two to seven:

|  |  |  |  |
| --- | --- | --- | --- |
| Faulty Clients | Total Clients | Architecture | FedDebug Localization Accuracy % |
| 2 | 30 | SimpleCNN | 100 |
| 3 | 30 | SimpleCNN | 100 |
| 4 | 30 | SimpleCNN | 100 |
| 5 | 30 | SimpleCNN | 100 |
| 6 | 30 | SimpleCNN | 100 |
| 7 | 30 | SimpleCNN | 100 |

1. Global model prediction accuracy in the presence of a faulty client with different noise rates:

The global accuracy decrease rate is slower till noise rate 0.4. After that the degrade rate increases.

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