Performance Comparison of Different Federated Learning Aggregation algorithms

How does the performance of different federated learning aggregation algorithms compare to each other?

1. Background

1. **Federated Learning** - is where a centralized global model is aggregated by the use of multiple local models.
2. I compared the aggregation algorithms of FedAvg, FedProx, q-FedAvg, FedYogi and FedMedian.

2. Methodology

1. The algorithms were compared on:
   - A. Seven different scenarios
   - B. MNIST [1] and kinase inhibition data set [2]
2. The model used was a neural network
3. The global accuracies of the models were compared

3. Results

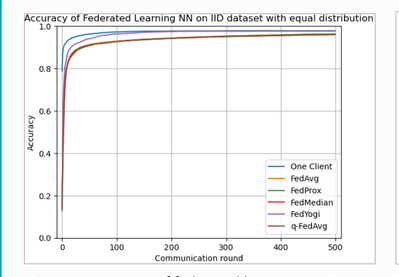

Figure 1: Accuracy of federated learning on IID and equal distribution MNIST

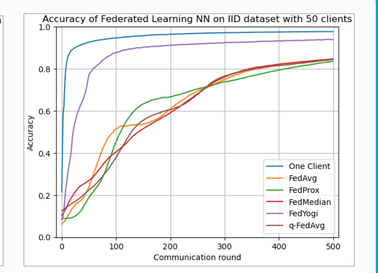

Figure 3: Accuracy of federated learning on IID MNIST with 50 clients

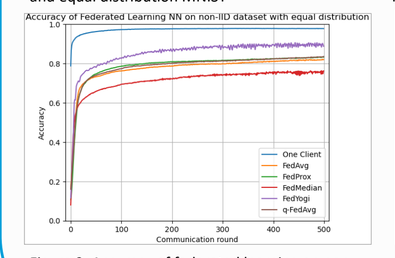

Figure 2: Accuracy of federated learning on non-IID and equal distribution MNIST

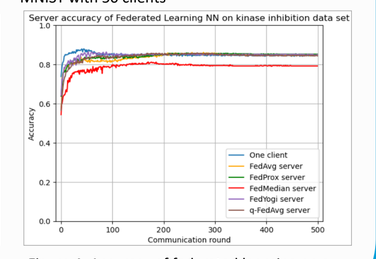

Figure 4: Accuracy of federated learning on a kinase inhibition data set

References:

1. Li Deng. The mnist database of handwritten digit images for machine learning research. IEEE Signal Processing Magazine, 29(6):141–142, 2012.
2. Benjamin Merget, Samo Turk, Sameh Eid, Friedrich Rippmann, and Simone Fulle. Profiling prediction of kinase inhibitors: Toward the virtual assay. Journal of

4. Future Work

- A. Additional aggregation algorithms
- B. Additional data sets
- C. Additional machine learning models
- D. Additional data distributions

5. Conclusion

1. FedYogi achieved the highest accuracy
2. Followed by FedProx, q-FedAvg and FedAvg
3. Lastly FedMedian achieved the lowest accuracy
4. There can be other goals, other than lowest accuracy

Author: Roy Katz
Email: r.katz-1@student.tudelft.nl

Professor: Marcel Reinders
Email: m.j.t.reinders@tudelft.nl

Supervisor: Swier Garst
Email: S.J.F.Garst@tudelft.nl