ICML 2019

Poster #20

Bayesian Nonparametric Federated Learning of Neural Networks

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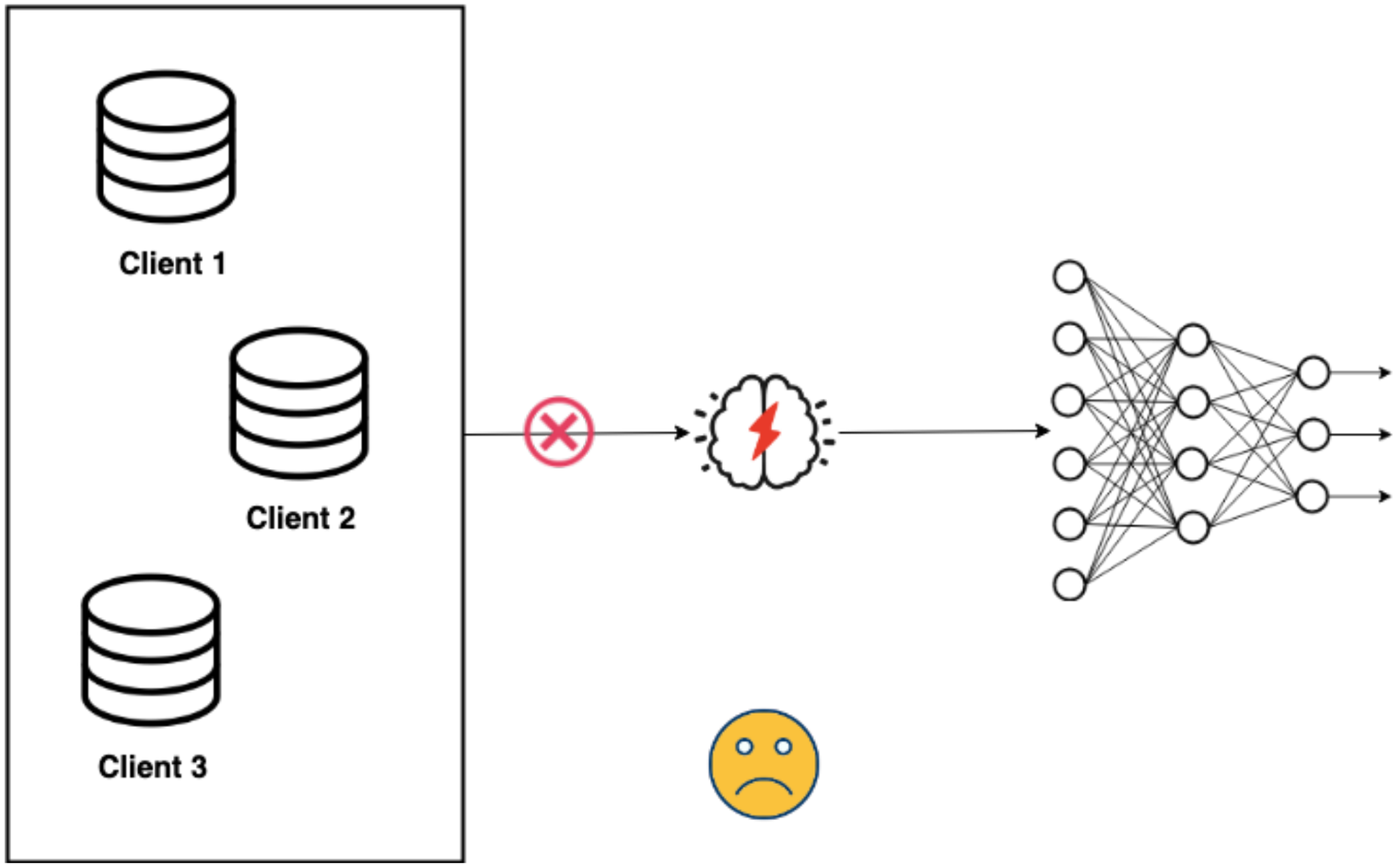
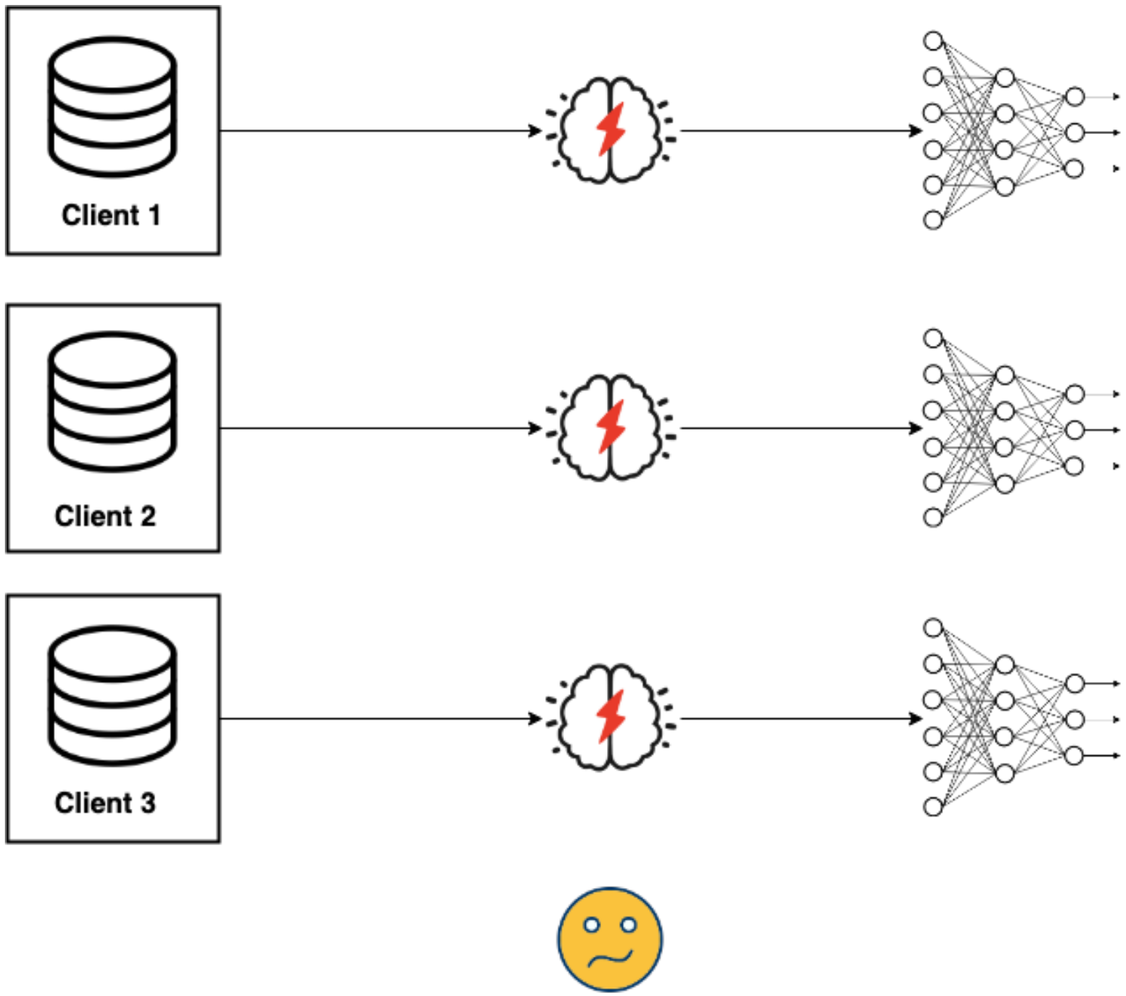
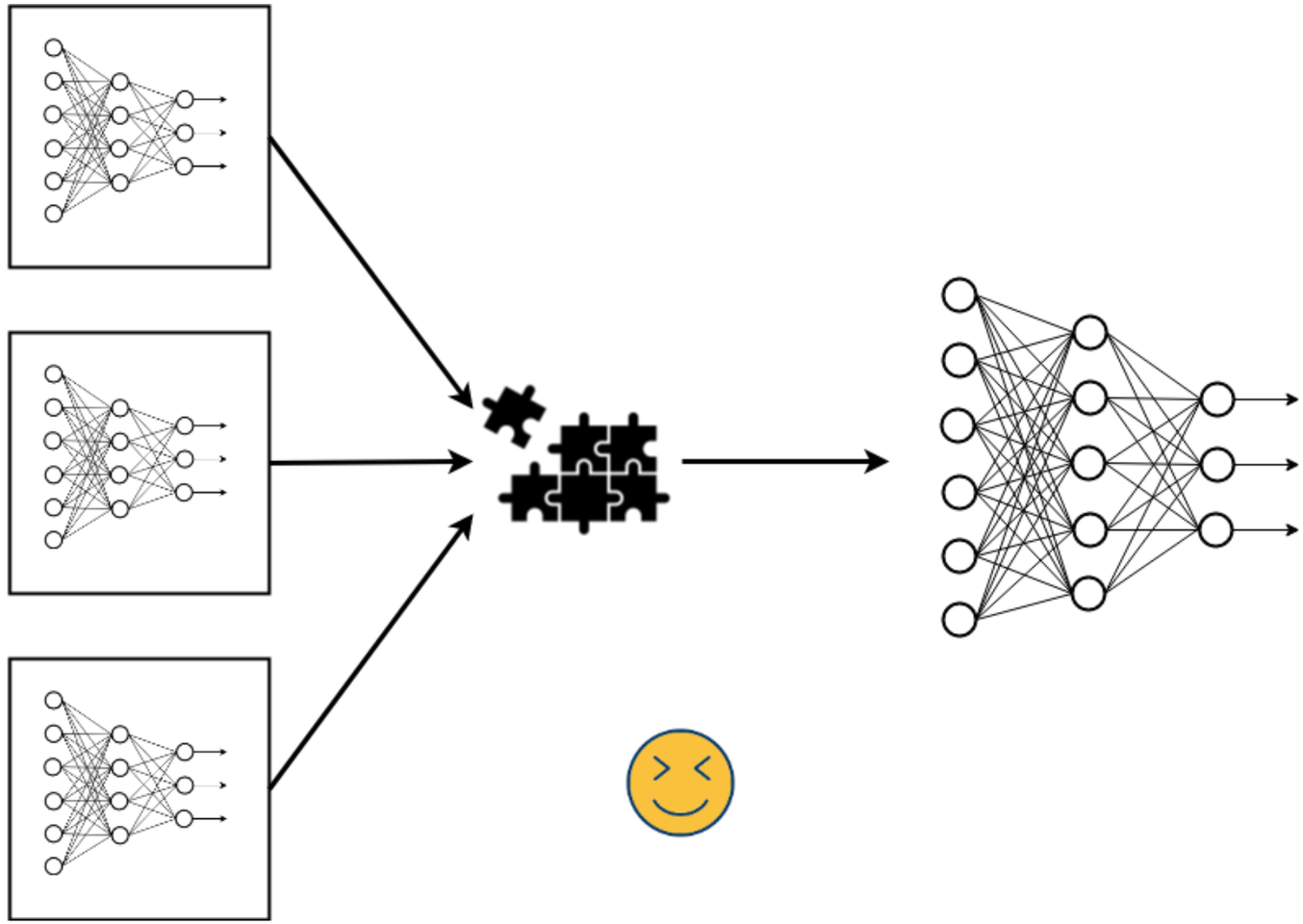
Federated Learning



Model fusion perspective

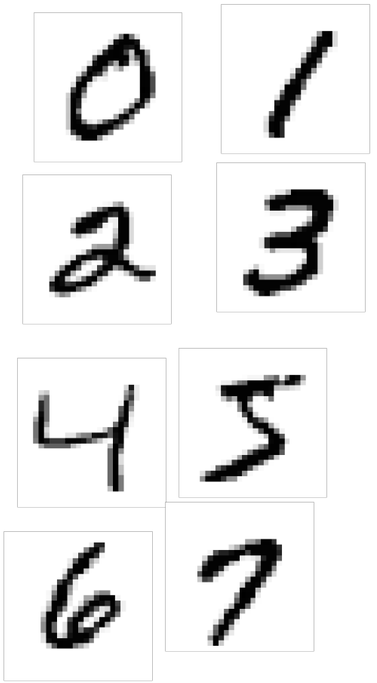


Probabilistic Federated Neural Matching

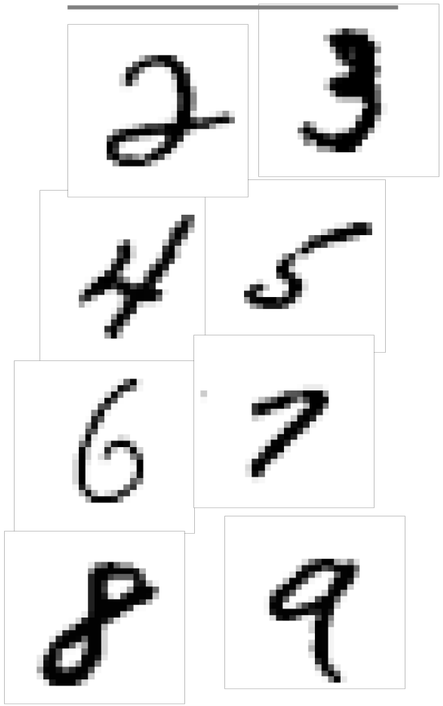


Simulated heterogeneous Federated Learning on MNIST

Client 1



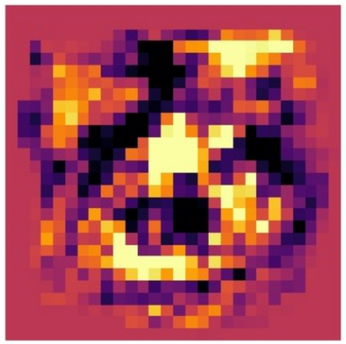
Client 2



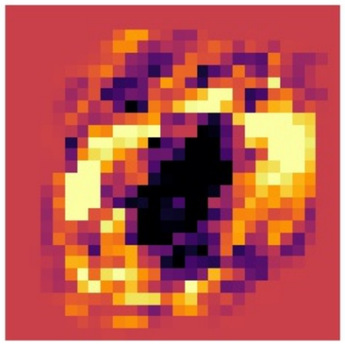
Examples of first layer weights

Client 1

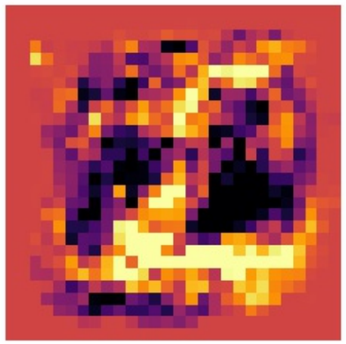
Neuron 12



Neuron 21

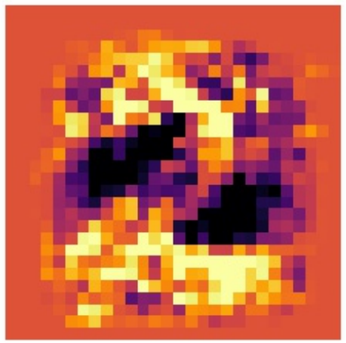


Neuron 49



Client 2

Neuron 7

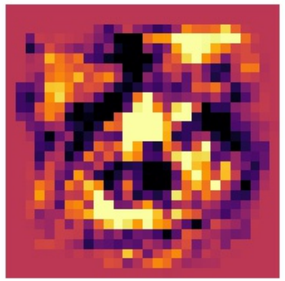


Neuron 8

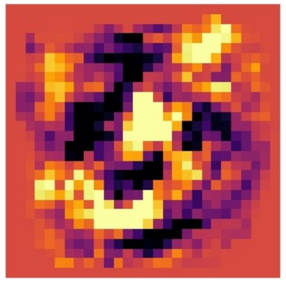
Neuron 36

PFNM discovers correspondences among weights

Client 1
Neuron 12

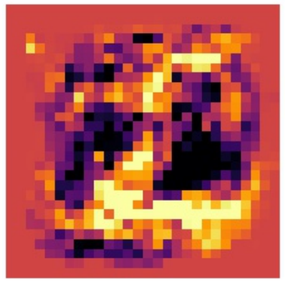


Client 2
Neuron 8

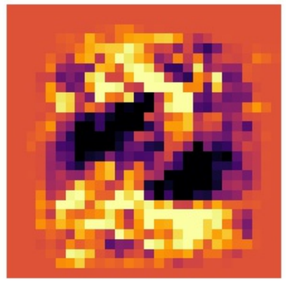


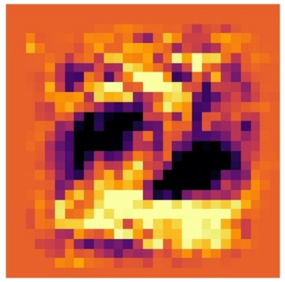
Matched neuron 8

Client 1
Neuron 49



Client 2
Neuron 7



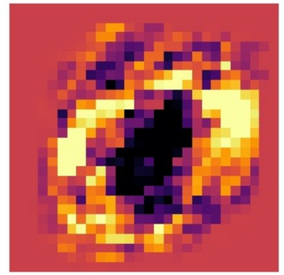


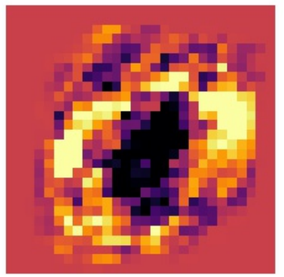
Matched neuron 33

Client 2
Neuron 36

Matched neuron 44

Client 1
Neuron 21





Matched neuron 58

Summary

PFNM is a method for combining pre-trained fully-connected neural networks:

- Can combine NNs trained on heterogeneous data without access to data
- Can be further improved with few communication rounds (if data is available)
- Outperforms Distributed SGD and Federated Averaging

Technical contributions:

- Indian Buffet Process based model to govern correspondences between weights of local neural networks. Applicable to multilayer networks
- BNP allows for adaptive learning of global NN size
- Fast MAP inference using iterative Hungarian algorithm

THANK YOU | **Please come to poster #20**