

FedGTP: Exploiting Inter-Client Spatial Dependency in Federated Graph-based Traffic Prediction

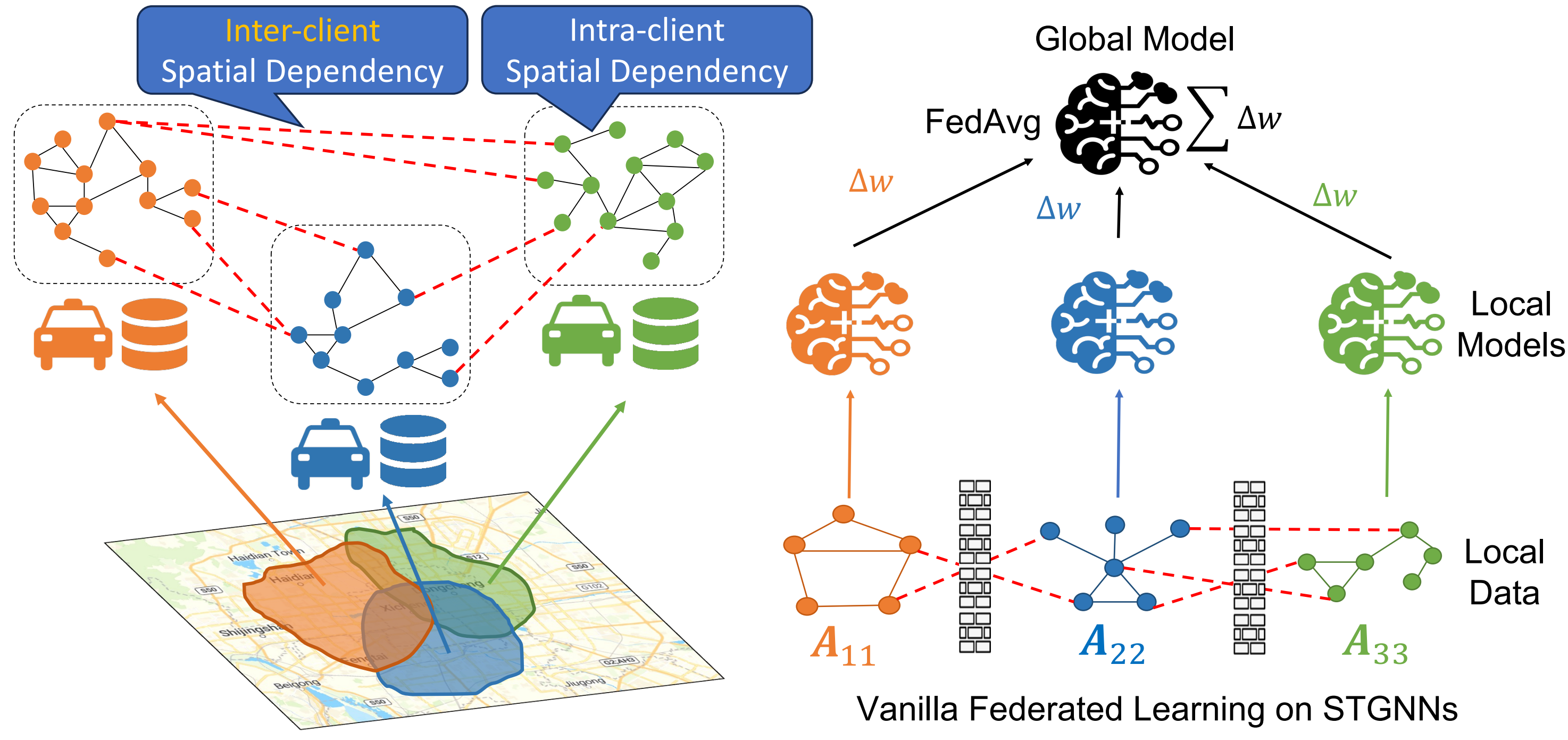
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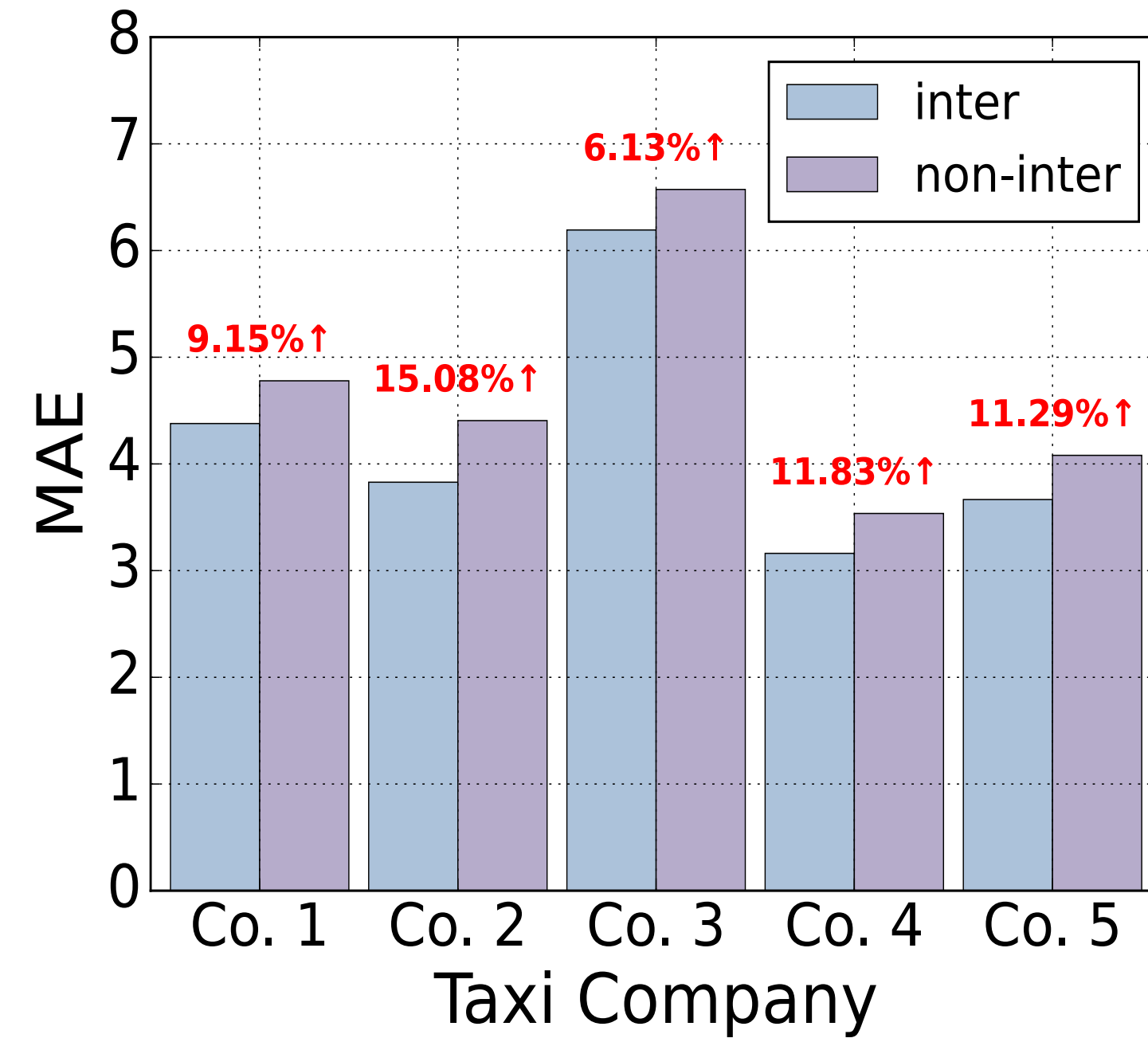
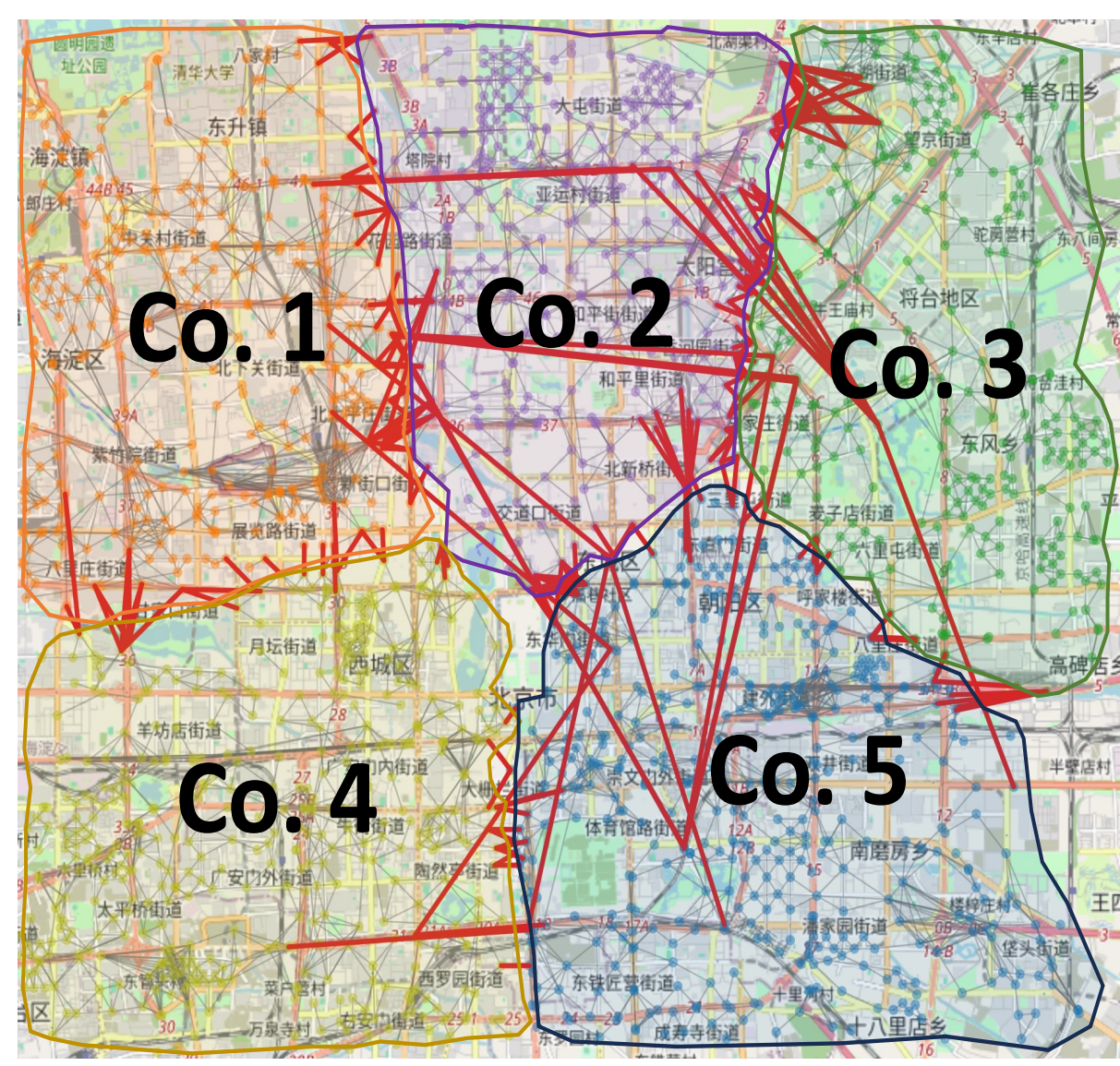


Introduction

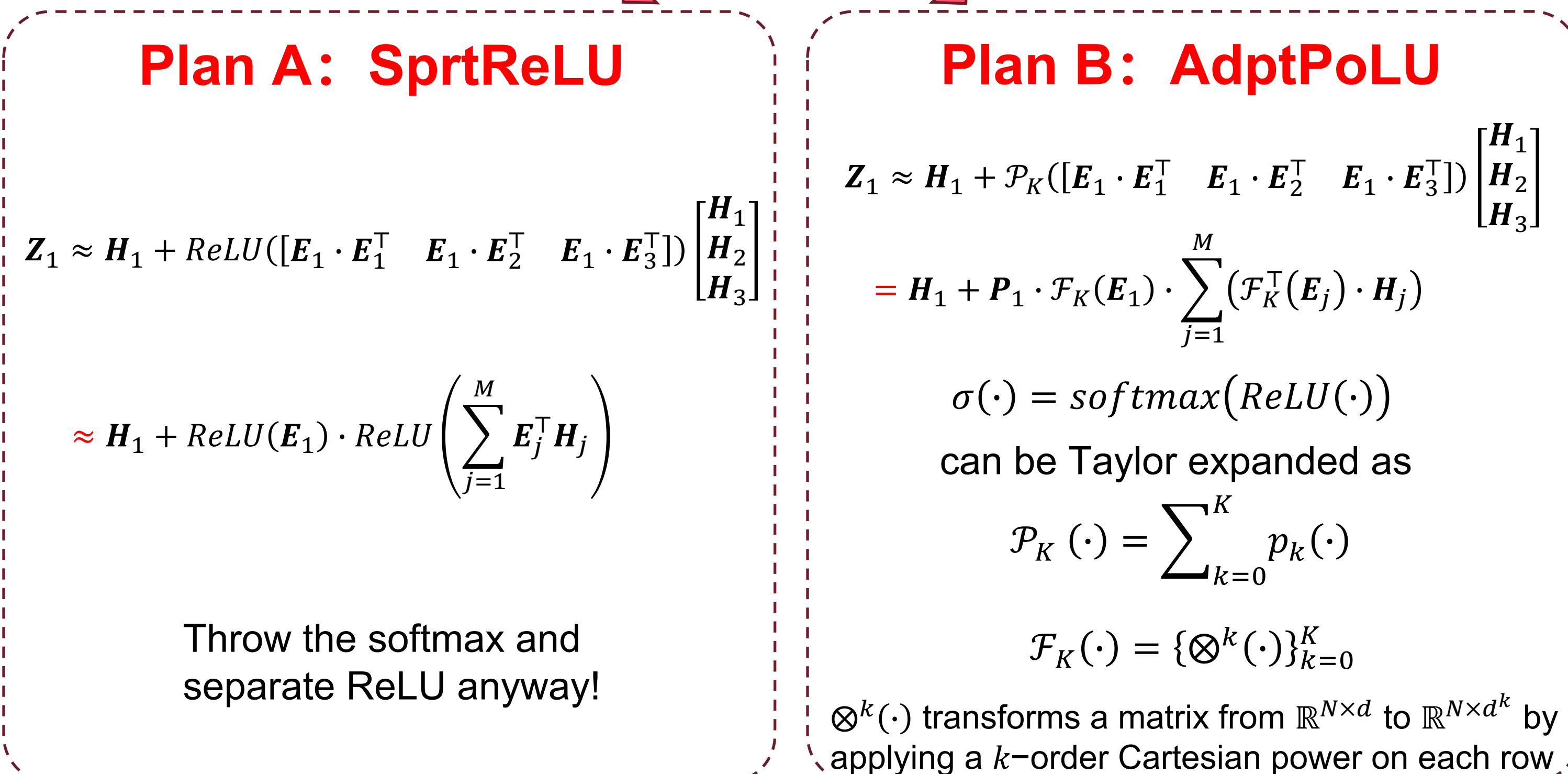
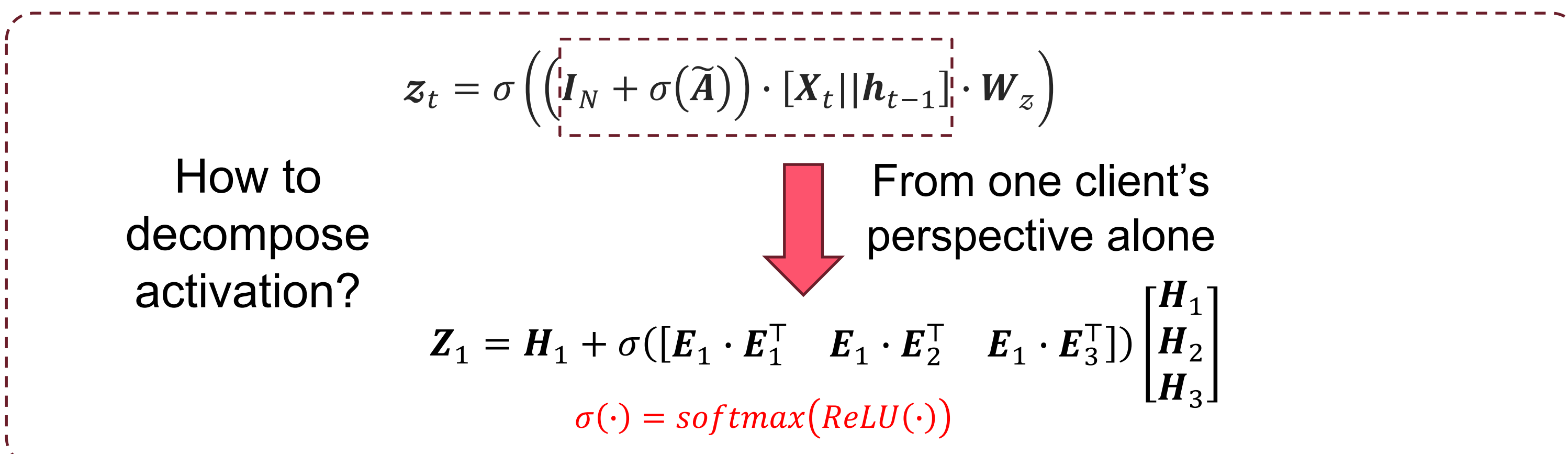
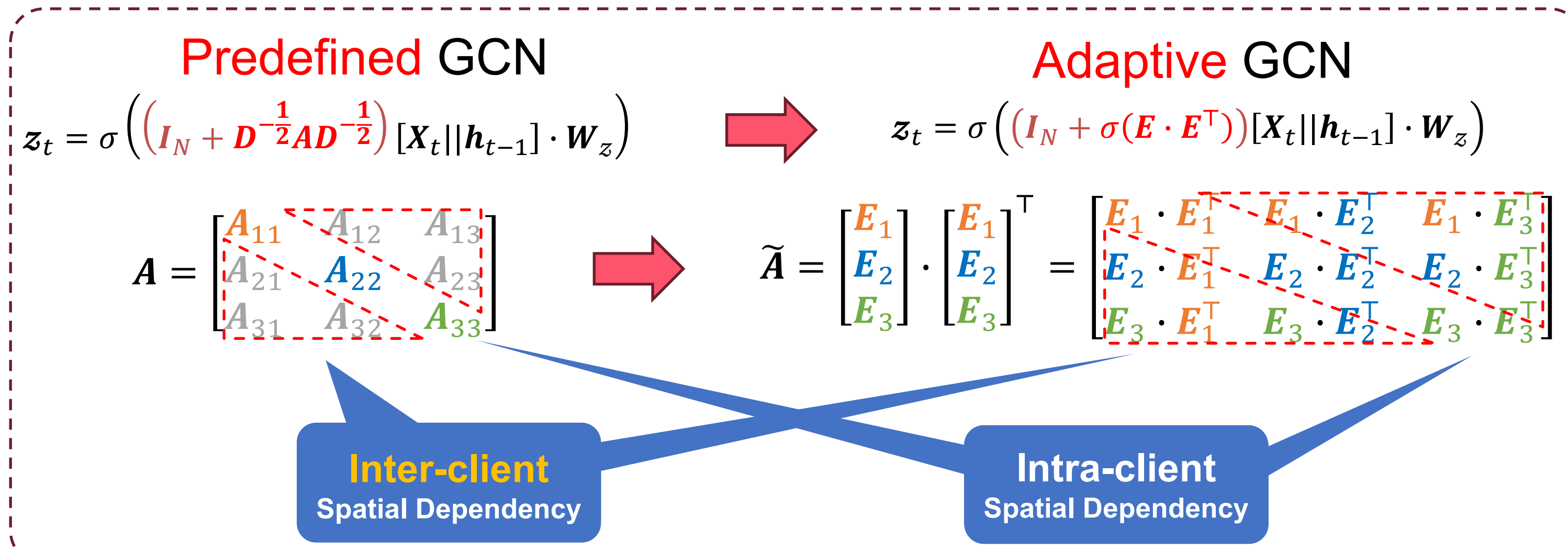
Graph-based methods have witnessed tremendous success in traffic prediction, attributed to their superior ability in capturing and modeling spatial dependencies. **Spatial-Temporal Graph Neural Networks (STGNNs)** are one of the most primary tool for graph-based traffic prediction. However, urban-scale traffic data are usually distributed among various owners, limited in sharing due to privacy restrictions like GDPR. This fragmentation of data impedes the utilization of **inter-client spatial dependencies** even when using vanilla Federated Learning.



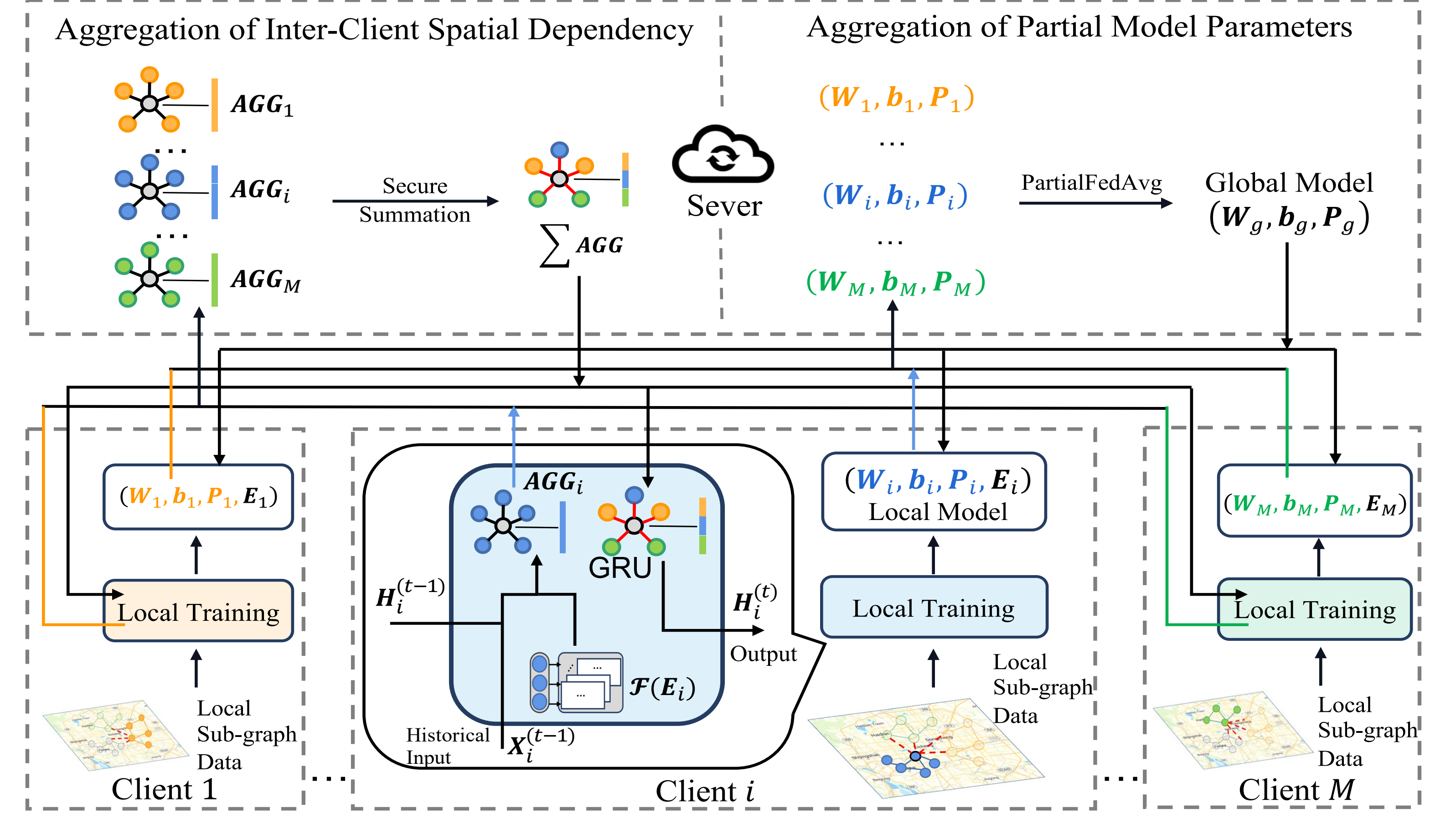
A toy example predicts the traffic flows of five taxi companies in a city and reveals that removing inter-client dependencies (in red lines) from training data results in up to **15% error increase** for each taxi company.



Design of FedGTP

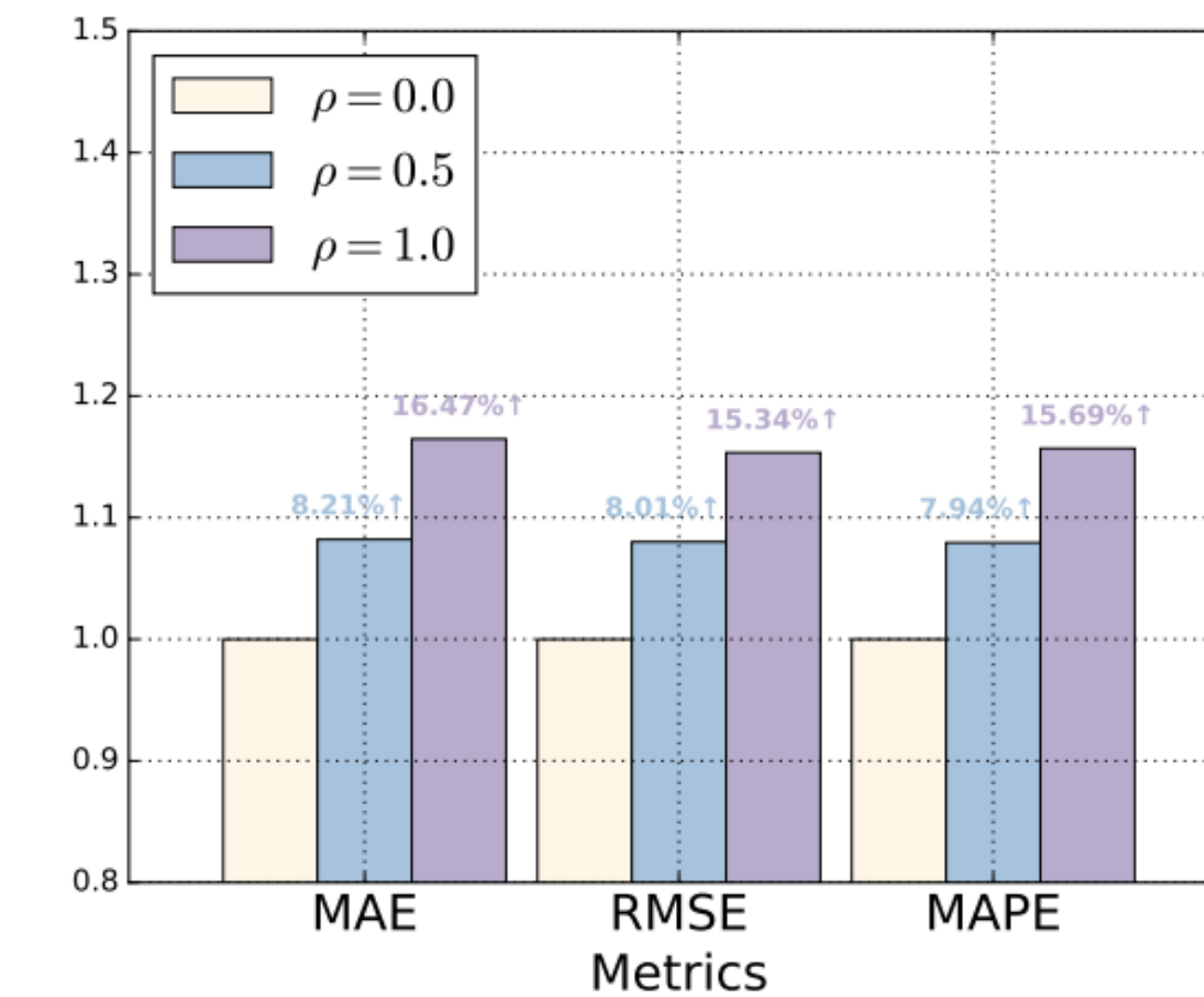


FedGTP System Overview

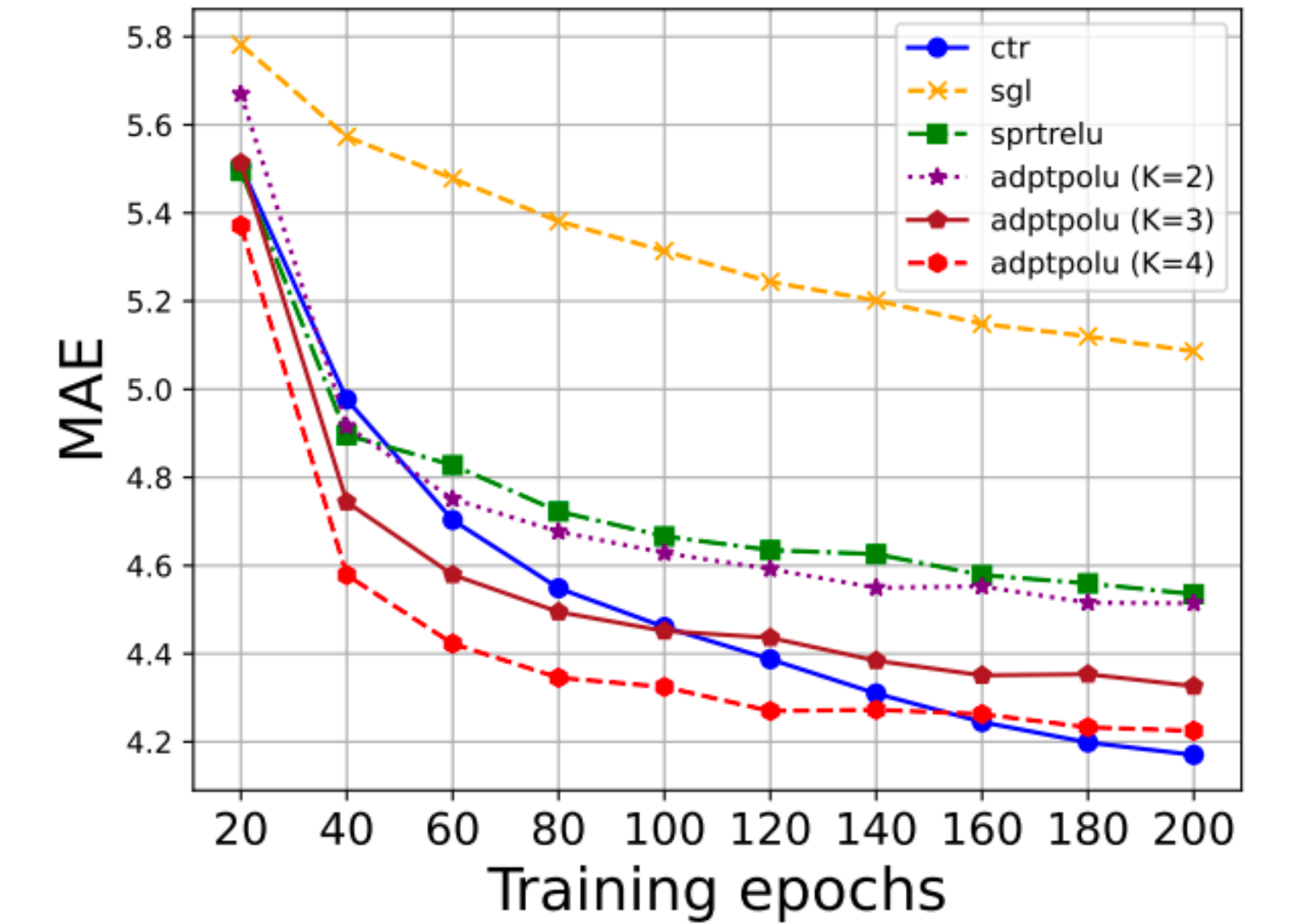


Results

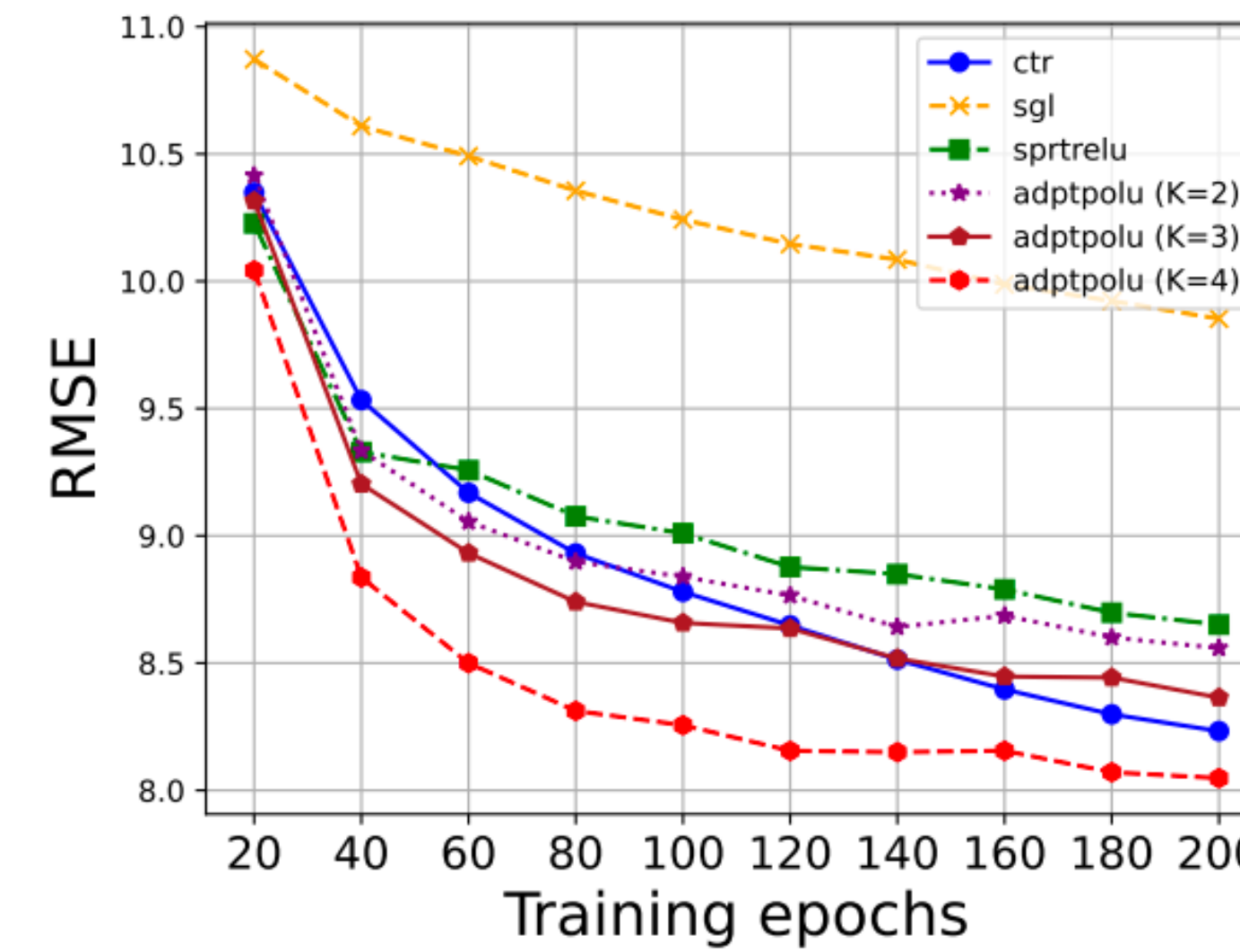
Ablation Study



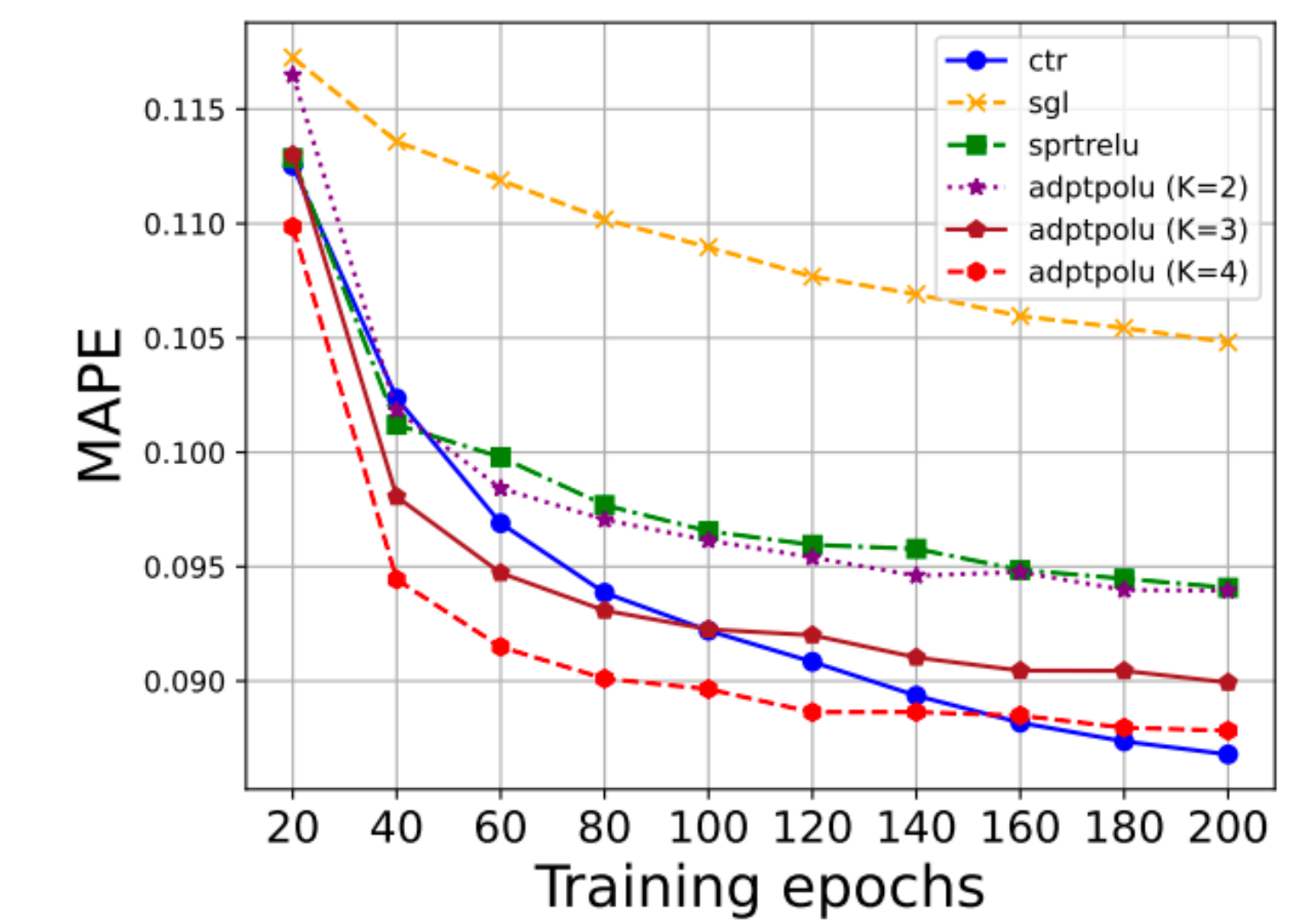
(a) Impact of inter-client spatial dependency on performance



(b) Impact of activation decomposition on MAE



(c) Impact of activation decomposition on RMSE



(d) Impact of activation decomposition on MAPE

Case Study

