IPParis HPDA/PDS Master projects 2023-2024
Federated Learning for Smart Community Collaboration:
Leveraging Decentralized Selective Sharing.
September 13, 2023

Project Description In today's digital age the challenge of collaborative endeavors while upholding data privacy emerges as a pivotal conundrum. Visualize a network of smart communities, each bursting with invaluable insights and data, perched at the precipice of collaborative machine learning. A significant hurdle, however, is: how can these communities work together without jeopardizing their individual autonomy and the privacy of their respective datasets?

Unlike traditional models that require centralized data aggregation, Federated Learning allows for local dataset training, sharing only model updates. This strategy is particularly crucial when data privacy is paramount or data transfer overheads are significant.

However, our proposed system takes this concept further. Instead of excluding a community that opts out of collaborative learning, our system maintains inclusivity. For instance, with a participation in a federation of three smart communities A, B, and C, if C decides against direct data-sharing, it should still be able to gain insights from the ML model derived from A and B's data. Thus, no community is left behind in terms of knowledge, irrespective of its participation choice. Each community should be also decide how they manage their data and the subsequent machine learning models. For instance, if Community A and B indulge in federated learning with their data, the resulting model from A+B can be shared with Community C. Consequently, Community C can employ this model with its local data, effectively creating a model trained with A+B+C data.

Project Objectives

The selected student will concentrate on addressing specific research challenges, to enable:

- Selective Participation: Designing a system where communities aren't forced to participate but can still access collaboration benefits even as non-participants.
- Dynamic Integration: Ensuring that non-participating communities can effortlessly integrate insights from the federated model without manual interventions.
- Data Privacy with Customized Rulesets: Apart from minimal data sharing, the selective sharing mechanism should be robust and transparent, safeguarding each community's data privacy. Every community should also be able to establish their data and model management rules.

Skills & qualities

- Fluent in English
- Familiarity with distributed systems
- Familiarity with machine learning models and algorithms.
- Deep understanding of federated learning principles and frameworks is a plus but not compulsory.

Supervisors

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