Survey on Explainable Federated Learning

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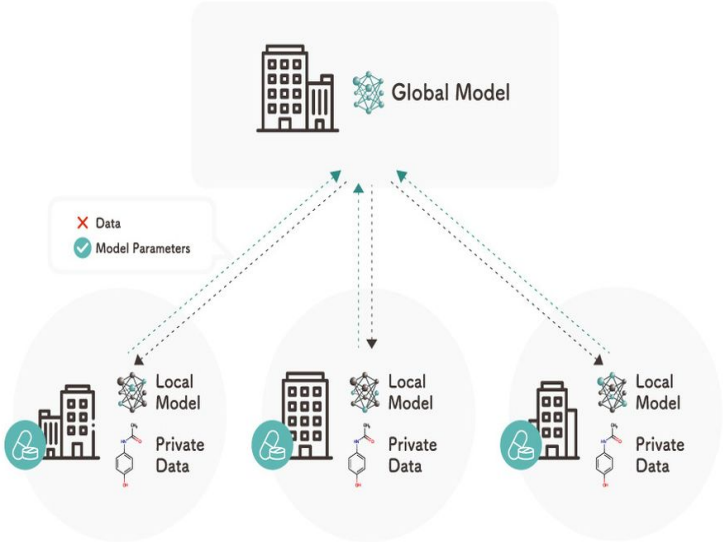
General
Data
Protection
Regulation

Outline

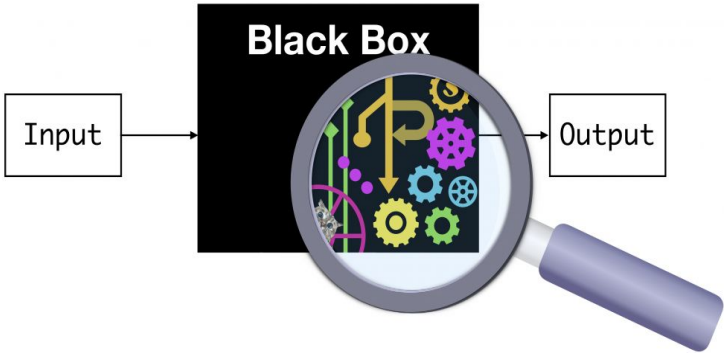
- Introduction
- Method
- Existing work
- Discussions
- Conclusion

Introduction

Federated Learning (FL) : Privacy preserving collaborative training of AI models.

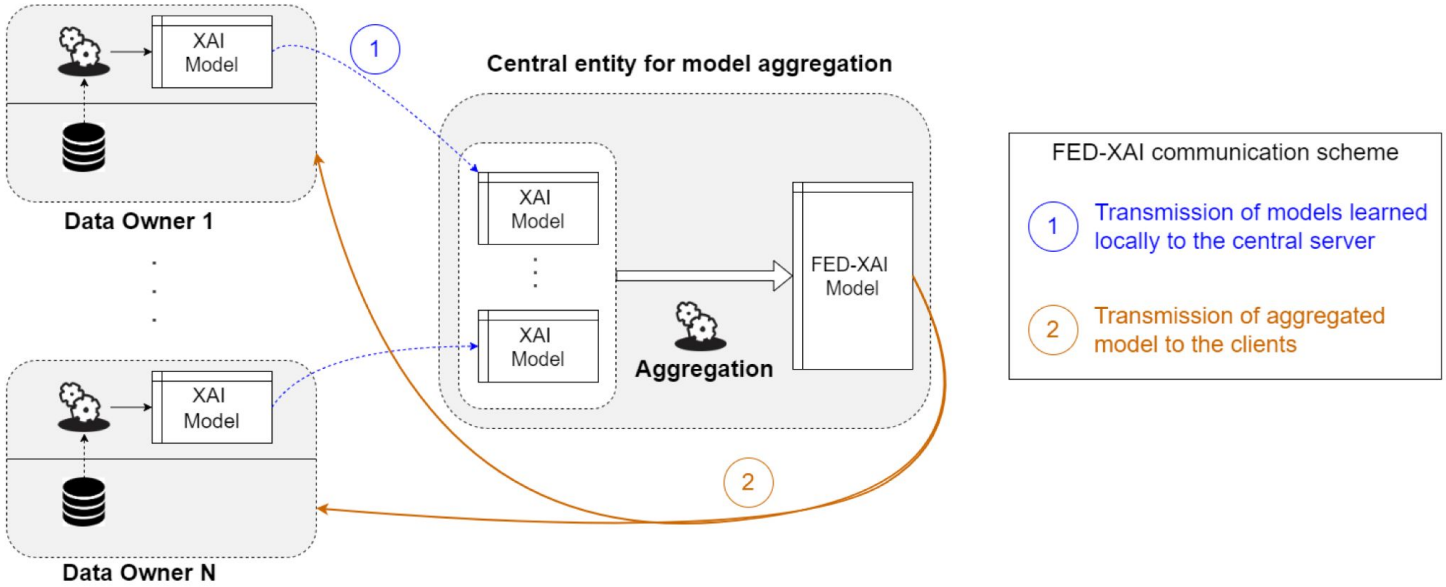


Explainable AI (XAI) : Enables humans to understand the outcome produced by Black Box AI models



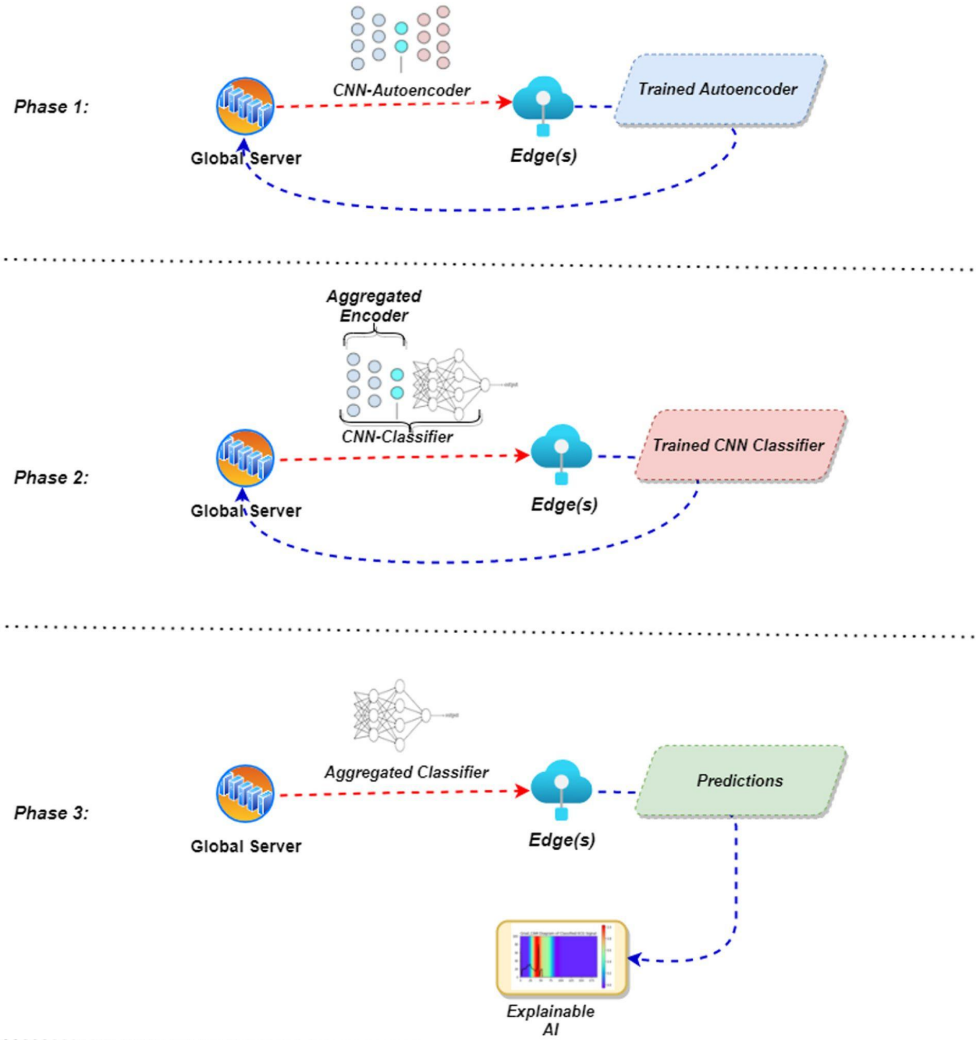
Methods

Inherently Explainable Methods



Methods

Post-hoc Methods



Existing Works

Work	Application	FL Feature	XAI Feature
[1]	Smart healthcare	For privacy and security	Inherently explainable
[2]	Regression problems	Vanilla FL	Fuzzy Rule-based Systems
[3]	6G-Automated vehicle networks	One shot communication FL	Inherently XAI
[4]	Data oriented AI systems	Vertical FL	Counterfactual explanation
[5]	Social media 3.0(IoT based)	Blockchain based, differentially private	Inherently explainable due to blockchains
[6]	Industry settings	Industry FL(IoT)	Dashboard visualization

Existing Works

Work	Application	FL Feature	XAI Feature
[7]	COVID-19 Detection	FedMoCo	GradCAM++
[8]	Personal Health Care	Horizontal FL	Feature relevance analysis and Visual explanation
[9]	ECG Based Healthcare	Federated Transfer Learning: FedMod	GradCAM
[10]	Taxi Travel Time Prediction	FedAverage	Integrated Gradients
[11]	Industrial Control System	FedeX	SHAP
[12]	Trustworthy FL	FederatedScope	Feature Importance MAP

Discussion

- There is a substantial lack of approaches for FL of inherently explainable models.
- Rule based methods cannot be integrated into FL using basic FL aggregation strategies due to its if-else modelling.
- The formulation of a differentiable global objective is impossible for these models
- We aim to propose a method with a twofold objective of privacy preservation (FL) and inherent explainability.

Conclusion

- Merging of XAI and FL is a big step towards data protection and explainability, leading us to Responsible AI.
- Thus, we studied & analyzed existing works in the area of ExplainableFL.
- We found a major gap in existing inherently explainable methods and their application in FL and as a future research direction, our goal is to tackle this challenge.

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Thank you !

Open to Feedback and Questions!

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