Ethics of Data Science – Part III

Week 4: Federated Learning

Implementation

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Federated learning

What?

- Federated analytics: compute simple statistics in a federated fashion
- Federated validation: build ML model centrally, validate against 3rd party data
- Federated learning: co-train an ML model on federated data

Why?

- Obfuscating or aggregating data as a way to de-anonymise is challenging for unstructured data
- Homomorphic encryption is computationally expensive
- “Data does not move” is simpler to communicate and to comply with

Federated learning

Why is it hard?

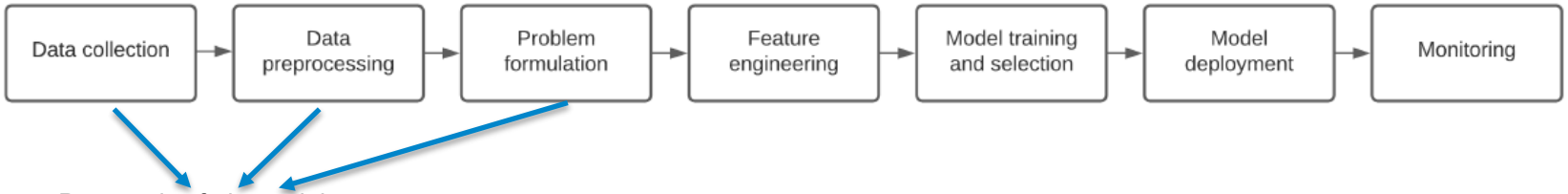
- Technologically, we need to distribute workloads given unreliable, heterogeneous client devices.
- Mathematically, we need to distribute computation.
- Statistically, local clients are operating in heterogeneous environments (dataset shift)
- Privacy-wise, we need to guarantee that data is not being leaked through model updates

Is it worth my time learning about this?

- Clear industry focus on federation (given privacy considerations and availability of edge computing)
- Forward-looking technological trend
- Technically very interesting

Federated learning

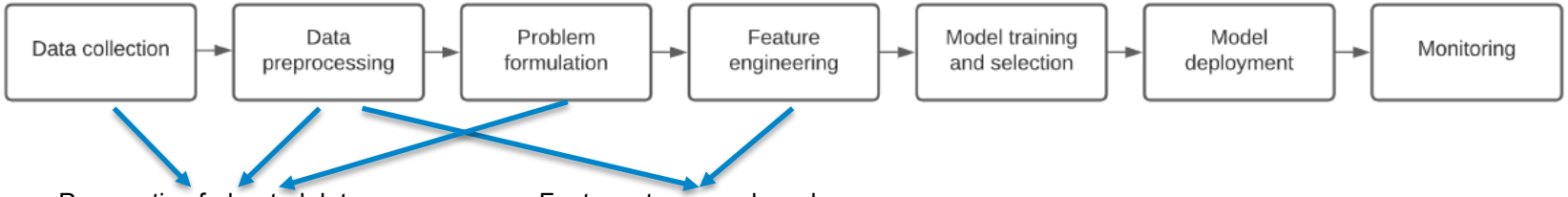
Federated learning



Prospective federated data collection requires strong strategic alignment

Retrospectively, federation requires conversion into a Common Data Model.

Federated learning



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Federated learning

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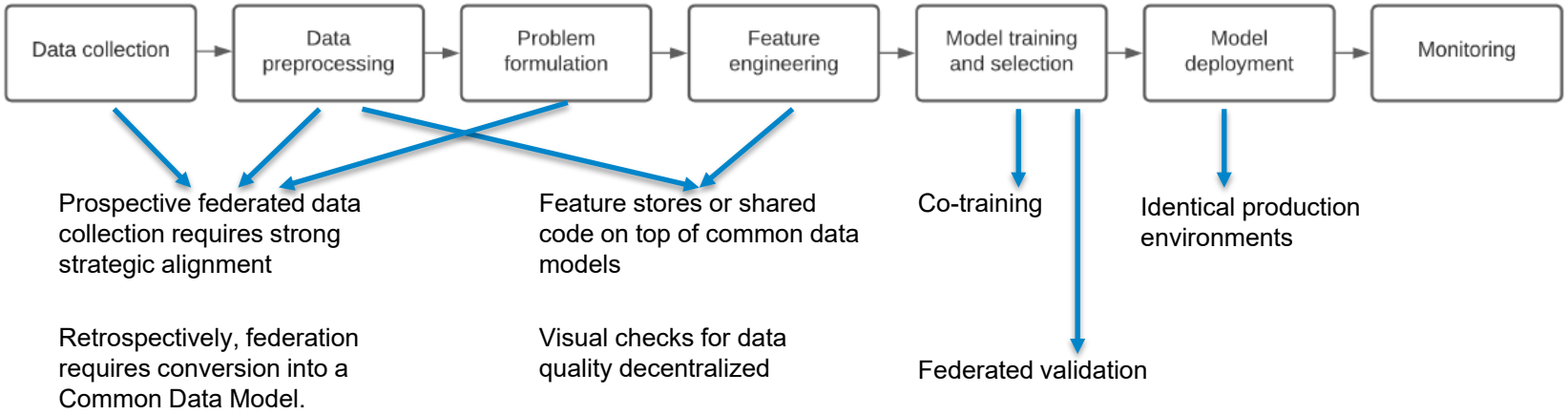
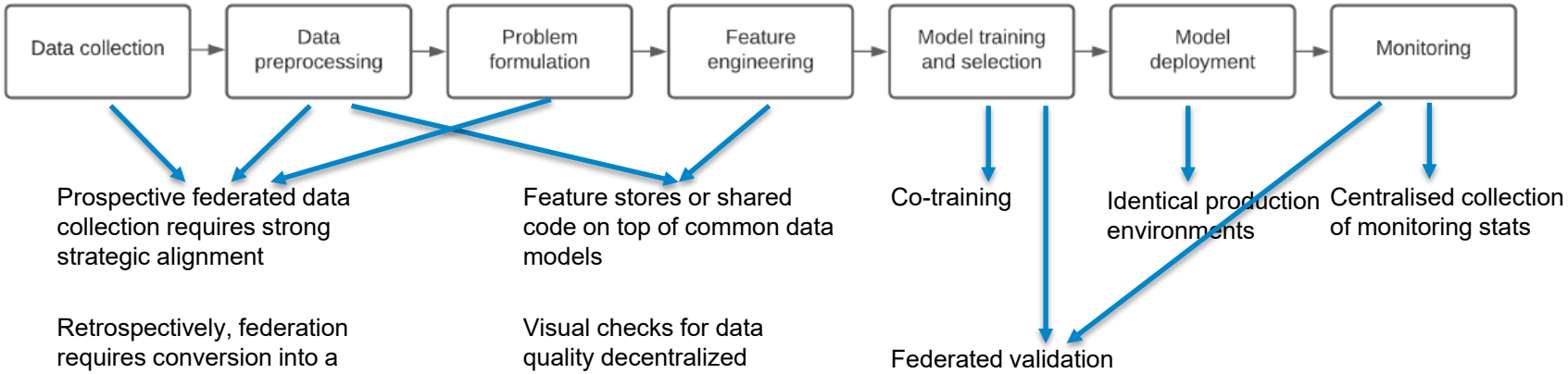
Co-training

Federated validation

Federated learning



Federated learning



Federated learning

Example 1: mobile phones

Example 2: hospitals