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Towards Scalable, Efficient and Privacy Preserving Machine Learning
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Context and Motivation

- Minimize the computational costs incurred by privacy preservation.
- Provide an end-to-end privacy preserving outsourced data classification service.
- Enable a set of mutually untrusted data owners to have a global vision on the union of their data without breaching the privacy of each one of them.
- Enable dynamic data model updates when new training data samples are available.

Preliminary results:

- Central Supervision Authority: Data Mining for fraud detection
- Fraudulent company: Local bank transactions of Q
- Company: Classification Service Provider

Related work

Different ML algorithms
- Clustering (1)
- Classification (2)
- Association Rule Mining (3)

Different Privacy-preservation objectives
- ML output protection
- Privacy Preservation techniques
- Original data protection

Privacy

Design principles

- Cryptographic based protection (data model, training data, classification queries and responses)
- Partial homomorphic encryption (PHE ) based building blocks
- Combine PHE with cryptographic blinding (DTPKC cryptosystem [6])
- We implemented the VFDT incremental decision tree learning algorithm [7]

Naive approach: a combination of low level PPML

1st optimization: use inline building blocks

2nd optimization: Parallel computing

References