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.

Objectives

- Preliminary results
  - We have used a synthetic dataset for fraud detection in a B2B network.
  - This dataset contains 1000 bank transactions with 9 attributes each.
  - We compare our work to the Ciphermed framework [8].

Related work

- Different ML algorithms
  - Clustering [1]
  - Classification [2]
  - Association Rule Mining [3]

- Different Privacy-preservation objectives
  - ML output protection [4]
  - Original data protection [5]

- Different architectures
  - Distributed [4]
  - Outsourced [5]

Design principles

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

Naive approach: a combination of low level PPML building blocks
1st optimization: use online building blocks
2nd optimization: Parallel computing

References

3. L.Liu et al.: Privacy-Preserving Mining of Association Rule on Outsourced Data from Multiple Parties. AOPC 2018: 412-423
8. R.Bost et al.: Machine Learning Classification over Encrypted Data. NDSIS 2015