Towards Scalable, Efficient and Privacy Preserving Machine Learning
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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.

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 Ciphered framework [8].

Preliminary results:

- Context and Motivation:
  - C1: Company 1
  - C2: Company 2
  - B1: Local bank transactions of C1
  - B2: Fraudulent company
  - A: Central Supervision Authority
  - M: Data Mining for fraud detection

- Objectives:

  1. Minimize the computational costs incurred by privacy preservation.
  2. Provide an end-to-end privacy preserving outsourced data classification service.
  3. 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.
  4. Enable dynamic data model updates when new training data samples are available.

- 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)

- 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]

- References:

  8. R. Boss et al.: Machine Learning Classification over Encrypted Data. NDSS 2015