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Cryptography Meets Topological Data Analysis

Topological Data Analysis (TDA) offers a suite of computational tools that provide quantified shape features in high-dimensional data, which can be utilized by modern statistical and predictive machine learning models. In particular, persistent homology (PH) takes in data and derives compact representations of latent topological structures, known as persistence diagrams. PH has been widely adopted for model development on sensitive data, motivating the computation of PH on encrypted data. In this presentation, I will provide brief introductions to TDA and secure computing and then demonstrate how to modify the boundary matrix reduction algorithm to compute PH on encrypted data using homomorphic encryption.