This paper presents an innovative framework that uses Representation Learning via autoencoders to generate privacy-preserving embedded data. Thus, organizations can share the data representation to increase machine learning models’ performance in scenarios with more than one data source for a shared predictive downstream task.

### RESULTS

We tested this methodology in 3 case study: House Price, Mnist Numbers, and Buzz in Social Media. These are the results:

**Scenario 0:** Trains a predictive model for the downstream task using a single data source
**Scenario 1:** We preprocess a unique dataset to obtain a single representation vector and use it to train a predictive model
**Scenario 2:** Simulate two peers and preprocessing them individually to obtain a representation vector for each source
**Scenario 3 and 4:** We adjust the autoencoder and transform it into a multitask neural network that, on one side, predicts the representation performance and, on the other, predicts the objective variable.

### CONCLUSIONS AND FUTURE WORK

In this paper, we propose an alternate solution to traditional privacy-preserving approaches in machine learning and proof that with an accurate representation learning model, peers can share an embedded dataset that follows the observations’ patterns and behavior. Changing the original features to a latent space representation does not drastically deteriorate the performance of the downstream task. In our use cases, the model results decreased for less than 10pp with a representation error between 5% and 11%. Therefore, peers or organizations can collaborate without risking the organization’s privacy policies or violating potential clients’ privacy concerns.