Unsupervised Learning Laboratories

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1 Recap on Dimensionality Reduction Techniques

You are required to use your implementations from previous labs, but for the new algorithms introduced today you can use external libraries.

1.1 Exercise 1

Download the fashion mnist dataset available at the following link.
https://github.com/zalandoresearch/fashion-mnist#get-the-data

- Apply your own implementation of PCA to the dataset.
- Apply your own implementation of KernelPCA to the dataset, both with a polynomial and a Gaussian kernel.
- Apply your own implementation of ISOMAP to the dataset, keeping in mind that you'll need to perform an undersampling. As an alternative, you may use the sklearn implementation on the whole dataset.
- Apply the appropriate implementation of t-SNE to the dataset. Look at the documentation available online and choose consequently.
- Apply the appropriate implementation of UMAP to the dataset. Look at the documentation available online and choose consequently.
- Have a look at the autoencoder provided in Notebook 5a and apply it to the dataset. Modify the number of layers and the activation functions.

Play with the parameters of these techniques and find what is the best hyperparameter method combination for the problem at hand. Discuss the differences in the obtained results.

Notes

Modify the autoencoder such that it has one layer and linear activation function. What do you notice?