4 Kernel PCA

You can use external libraries for linear algebra operations but you are expected to write your own algorithms.

4.1 Exercise 1

Use the `data_kPCA_2023.txt` and `labels_kPCA_2023.txt` uploaded in the `Datasets` folder. The first file contains the variables describing the data, while the second one contains the labels of the classes associated to it.

- Apply **your own** implementation of PCA to the dataset and plot the eigenvalue spectrum.
- Project the data in the first two principal components and color by class.
- Implement your own version of Kernel PCA.
- Apply Kernel PCA to the dataset. Test both a Gaussian kernel with width $\sigma \in [0.05, 2.0]$ and a polynomial kernel varying the value of $\delta \in \mathbf{N}$.
- Plot the transformed data in 2d and 3d for the different kernels.

Notes

Use the second version of the polynomial kernel introduced in class (the one with "$1 + \ldots$").