

Assignment 1: Dimensionality Reduction for Classification (15%)

This assignment requires you to explore **how the dimensionality reduction** of the data helps **enhance** the **classification performance** and write a report to record your results, findings and analysis.

- You need create a mini-computer program for the dimensionality reduction, classification and for the computation of the classification accuracy or error rate against the data dimensionality.
- You may use any programming language such as Matlab, Python or others.
- You can choose any **public high dimensional dataset** (images or others) downloaded from internet for your study or even use synthetic data.
- Proper **pre-processing such as alignment and normalization** of the data may be necessary to convert the data suitable for the classification purpose.
- Proper partition of the dataset into training and testing datasets is necessary. All parameters for dimensionality reduction and classification should be specified only by the training data. The testing data can only be used to generate the classification **accuracy or error rate**.
- You may apply **PCA, LDA** or the both or **some others** to reduce the data into various dimensionalities for classification. The **minimum Mahalanobis distance classifier** is recommended in this study.
- Write a report in IEEE conference short paper style of 3 to 5 pages including everything such as figures, **tables** and references, excluding the program. List your program as appendix at the end of the report. The report should record your **experimental process** or settings, results you get from the experiments, **analysis and comparison** of your results, conclusions drawn from the experiments and the list of your program.

Submit the PDF file of the report in NTULearn by Monday of week 10, 23 October 2023. Please use your name on your matric card followed by your matric number as your file name for submission, e.g. HOEJIUNTIAN-G2203856C.

Reference

- [1] X. Jiang, "[Linear Subspace Learning-Based Dimensionality Reduction](#)," *IEEE Signal Processing Magazine*, vol. 28, no. 2, pp. 16-26, March 2011.
- [2] X. Jiang, "[Asymmetric Principal Component and Discriminant Analyses for Pattern Classification](#)," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 31, no. 5, pp. 931-937, May 2009.
- [3] X. Jiang, B. Mandal and A. Kot, "[Eigenfeature Regularization and Extraction in Face Recognition](#)," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 30, no. 3, pp. 383-394, March 2008.