Department of Computer Science
University of Kerala
M Sc Computer Science (AI) 24 - 26 Batch
CAI-CC-524-Pattern Recognition Laboratory

Cycle 2- List of Experiments

1. Apply LDA for dimensionality reduction and any classifier for face recognition on the ORL dataset and analyze the performance.
2. Use PCA to reduce the dimensionality of an image dataset and apply KNN for classification.
3. Perform exploratory data analysis (EDA) on Iris dataset to understand its structure. Apply Principal Component Analysis (PCA) for dimensionality reduction. Visualize the transformed dataset and analyze the effectiveness of PCA in reducing the dimensions.
4. Implement a method to compute the Euclidean distance between two grayscale images.
5. Apply Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) on MNIST dataset. Compare the performance of PCA vs. LDA for classifying handwritten digits (MNIST dataset).
6. Load an image dataset (eg: Iris dataset). Compute the following distances between sample points.
    a) Hamming Distance
    b) Euclidean distance
    c) Manhattan (City block) Distance

7. Perform union, intersection, and complement operations on two fuzzy sets. Visualize the fuzzy sets and their operations. Implement De Morgans law on Fuzzy sets.
8. Write a Python program to plot Triangular, Trapezoidal, and Bell-shaped membership functions using NumPy and Matplotlib
9. Write a Python program to fuzzify the input variable temperature using Triangular membership functions for Low, Medium, and High with Input temperature values [10, 20, 30, 40, 50].
10. Implement and compare defuzzification methods using the fuzzy output set. {10: 0.0, 20: 0.3, 30: 0.5, 40: 0.8, 50: 1.0, 60: 0.8, 70: 0.4, 80: 0.2}. Visualize the fuzzy output and highlight each defuzzified result on the plot.
11. Implement a Python script to model a Markov Decision Process using a given transition matrix and reward function of 3 states and 2 actions. Calculate the value function for each state provided the policy for all states and actions are initialized as

0.5. Provide a sample MDP and demonstrate the corresponding value function (Set discount factor = 0.9).

12. Implement the Q-learning algorithm in Python for a simple 5x5 grid world environment for an agent to reach the bottom-right cell as its goal starting from the top-left position and with action space defined as {up, down, right, left}. Use this implementation to find the optimal policy.

Basic	7,8
Advanced	9,10,11,12