

Indian Institute of Information Technology, Design and Manufacturing
Chennai -600 127, India
Pattern Recognition
Assignment 4
Deadline : 11 May 2022

Deliverables for this assignment:

- i. Programming Assignment (MATLAB or Python)
 - ii. Code file and output screenshots for all.
1. Train a **single perceptron and SVM** to learn an AND gate with two inputs x_1 and x_2 . Assume that all the weights of the perceptron are initialized as 0. Show the calculation for each step and also draw the decision boundary for each update.
 2. Train a **single perceptron and SVM** to learn the two classes in the following table.

x_1	x_2	ω
2	2	1
-1	-3	0
-1	2	1
0	-1	0
1	3	1
-1	-2	0
1	-2	0
-1	-1	1

where x_1 and x_2 are the inputs and ω is the target class. Assume that all the weights of the perceptron are initialized as 0 with learning rate 0.01 and 0.5 separately. Also, tabulate the number of iterations required to converge the perceptron algorithm with these two learning rates.

3. In the given I set of images from poly1.png to poly14.png, let poly1 to poly 7 belong to class 1 and poly 8 to poly 14 belong to class 2. Assume that all the weights of the perceptron are initialized as 0 with the learning rate of 0.01.
 - Identify two discriminant features x_1 and x_2 for the two target classes $\omega = \{\omega_1, \omega_2\}$. Here, ω_1 - class 1 and ω_2 - class 2.
 - Generate an input feature vector X for all the images mapping them to a corresponding target classes ω_i , where $i \in (1, 2)$.
 - Train a **single perceptron and SVM** to learn the feature vector X mapping to ω .
 - Plot and draw the final decision boundary separating the two classes.

[Note: Use poly.zip file in the attachments.]

4. From the iris dataset, choose the 'petal_length', 'sepal_width' for setosa, versicolor and virginica flowers. Learn a decision boundary for the two features using a **single perceptron and SVM**. Assume that all the weights of the perceptron are initialized as 0 with the learning rate of 0.01. Draw the decision boundary.
5. Eigenfaces- Face classification using PCA (40 classes)
 - Use the following face image files (face-ds.zip) to classify the faces of 40 different people.
 - Use PCA to reduce the dimensions from d to d' .
 - Use appropriate classifier taught in class (any classification algorithm taught in class like Bayes classifier, minimum distance classifier, and so on)
6. Fisherfaces- Face classification using LDA (40 classes)
 - Use the following face image files (face-ds.zip) to classify the faces of 40 different people.
 - Use LDA to reduce the dimensions from d to d' .

- Use appropriate classifier taught in class (any classification algorithm taught in class like Bayes classifier, minimum distance classifier, and so on)
- Compare the performance of LDA and PCA using appropriate performance measures.