Indian Institue of Information Technology, Design and Manufacturing

Assignment - 3

Chennai -600 127, India

Pattern Recognition - COM 511, Mar 12,2019

Deadline : 23rd March 2020

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 calulation for each step and also draw the decision boundary for each updation.

2. Train a single **perceptron and SVM** to learn the two classes in the following table.

$\mathbf{x_1}$	$\mathbf{x_2}$	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 perception 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 ω=$\{\omega_1, \omega_2\}$. 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 taget classes ω_i, where $i \, \epsilon \, (1, 2)$.
   - 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

4. From the iris dataset, choose the 'petal_length' and 'sepal_width' for setosa and versicolor 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. Compute the perceptron and MSE procedure for the dataset, with learning rate of 0.1 and initial weight vector [0.1, 0.1, 0.1]. For MSE procedure, with the margin $[1, 1, 1, 1, 1, 1, 1, 1]^T$

$\mathbf{x_1}$	$\mathbf{x_2}$	ω
1	6	0
7	2	0
8	9	0
9	9	0
2	1	1
2	2	1
2	4	1
7	1	1