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NPTEL

Courses　»　Introduction to Machine Learning

Announcements　　**Course**　　Forum　　Progress　　Mentor

Unit 6 - Week 5

Course outline

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Week 1

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Week 5

● Lecture 23 : Logistic Regression

● Lecture 24: Introduction Support Vector Machine

● Lecture 25: SVM : The Dual Formulation

● Lecture 26: SVM : Maximum Margin with Noise

● Lecture 27: Nonlinear SVM and Kennel Function

● Lecture 28: SVM : Solution

Week 5 Assignment 1

Due date for this assignment: 2017-09-03, 23:59 IST.

1) Which of the following is true about functional margin of SVM? I. Functional margin **1 point** of a point (xi) is measured by its distance from the decision boundary (w, b). II. Larger functional margin implies more confidence for correct prediction.

○ A. I only
○ B. II only
○ C. None
◉ D. Both I and II

2) The dual of the large margin linear classifier problem allow us to use kernels to get **1 point** optimal margin classifiers to work efficiently in very high dimensional spaces.

◉ A. True
○ B. False

3) Which of the following is NOT a kernel function?　　　　　　　　　　　　**2 points**

○
A. $K(x_i, x_j) = x_i . x_j$
◉
B. $K(x_i, x_j) = (1 - x_i . x_j)^3$
○
C. $K(x_i, x_j) = e^{(-\|xi - xj\|^2/(2\sigma^2))}$
○
D. $K(x_i, x_j) = tanh(\beta_0 x_i . x_j + \beta_1)$

4) Which of the following ARE TRUE about SMO algorithm (multiple answers).　　**2 points**

☐ A. The SMO can efficiently solve the primal problem.
☐ B. The SMO can efficiently solve the dual problem
☐ C. The SMO solves the optimization problem by co-ordinate ascent.
☐ D. The SMO solves the optimization problem by co-ordinate descent.

5) Which among the following is/are the most appropriate kernels that can be used **2 points** with SVM to separate the classes below.

Week 6
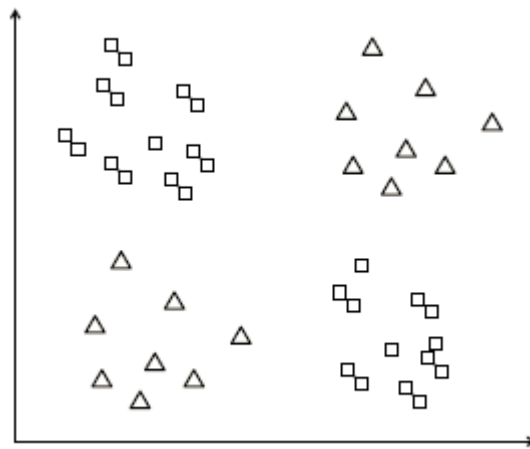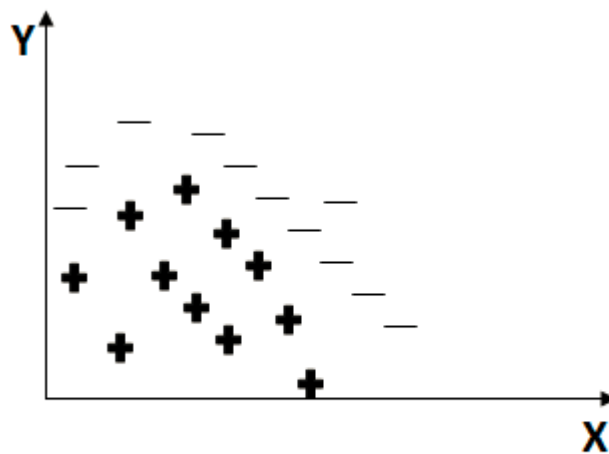

○ A. Linear kernel

○ B. Gaussian RBF kernel

○ C. Both A and B

○ D. None of the above

6) The optimization problem for large margin linear binary classifier where w, x and y ϵ **1 point**
{-1,1} represent the parameter vector, data point and label respectively, is given by,

◉

A. minimize $\frac{1}{2} ||w||^2$ such that for all data points $y_i(w^T x_i + b) \geq 1$

○

B. minimize $\frac{1}{2} ||w||$ such that for all data points $y_i(w^T x_i + b) \leq 1$

○

C. minimize $\frac{1}{2} ||w||^2$ such that for all data points $y_i(w^T x_i + b) \leq 1$

○

D. maximize $\frac{1}{2} ||w||$ such that for all data points $y_i(w^T x_i + b) \geq 1$

7) Which kernels can we use in SVM to separate the two classes (denoted by '+'   **2 points**
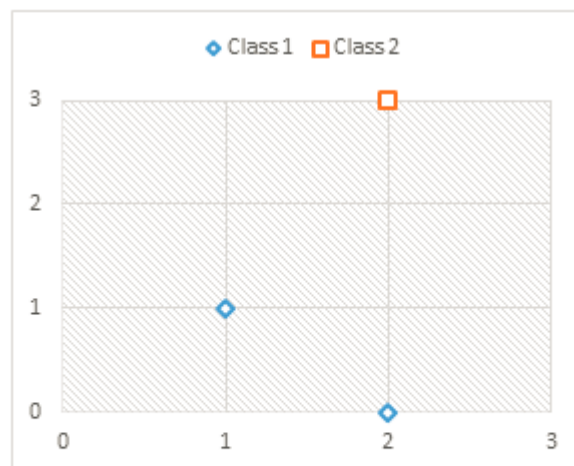and '-') in the figure below.

○ A. Linear kernel

◉ B. Quadratic kernel

◯ C. Both A and B

◯ D. None

8) The diagram below shows data points from two different classes (denoted by '+' **2 points**
and '-'). If an SVM is trained on the data, which points will act as the support vectors?

◯
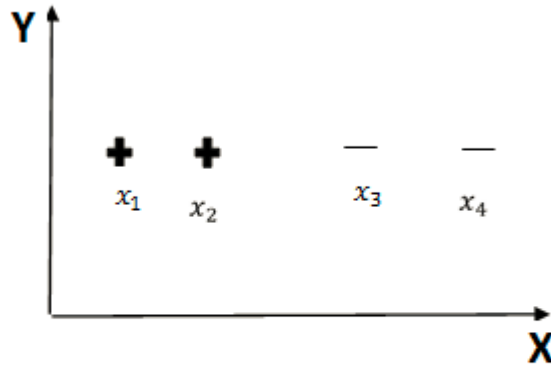
A. $x_1|$ and $x_2|$

◉

B. $x_2|$ and $x_3|$

◯

C. $x_3|$ and $x_4|$

◯

D. $x_1|$ and $x_4|$

9) Consider building an SVM over the dataset shown in the figure below. **2 points**

The equation of the hyperplane is given by

    A. w = (4/5, 2/5), b= -11/5

    B. w = (2/5, 4/5), b= -11/5

    C. w = (-2/5,- 4/5), b= -11/5

    D. w = (2/5, 4/5), b= 11/5

The data for programming question 10 and 11 may be downloaded from this link (https://drive.google.com/file/d/0B1wemHAii3JQR25kR2Z5UTVEOVU/view?usp=sharing).

Load the data using the code given in the link (https://drive.google.com/file/d/0B1wemHAii3JQeEEwZ25hRld2bW8/view?usp=sharing).
Train SVM using RBF kernel, linear kernel and polynomial kernel of degree 3 using scikit-learn.
Set the value of parameter C to 10.0. Based on above information answer question 10 and 11.

10) How many support vectors obtained using rbf, linear and polynomial of degree 3   **2 points**
kernels respectively on the given data?

    A. 3,81,3

    B. 81,3,81

    C. 81,3,3

    D. 3,3,3

11) Which of the following point is common among the support vectors obtained using **2 points**
linear kernel and polynomial kernel of degree 3?

    A. [19.96749215, 11.77640679]

    B. [2.34752767, 4.5295017]

    C. [12.11631344, 17.70352844]

    D. None of the above

You may submit any number of times before the due date. The final submission will be considered for grading.

Submit Answers

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