Tutorial 2

Question

What is the major difference between a discriminative & a generative model?

Question

How do you compute the prior probability of a class given a dataset?

Question

Can we ignore the prior probability of the data in a Naive Bayes classifier? (roughly the evidence) Justify your answer.

Question

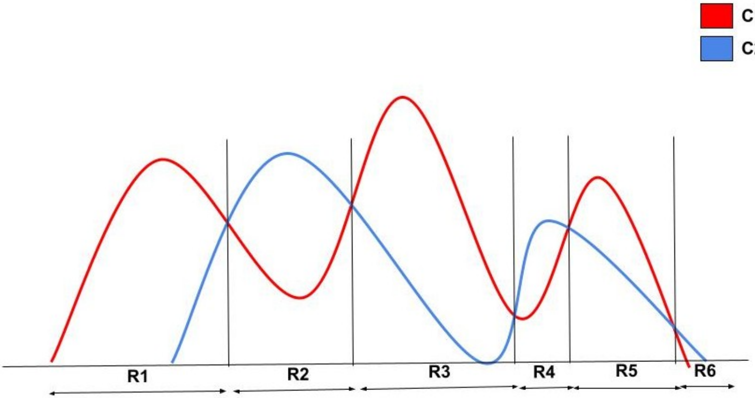
Why is Bayes classifier the optimal classifier?

Question

Are the decision regions in an optimal binary classifier always contiguous? Give an example to justify your answer.

Question

In the figure below, write down the class to which the regions R1 up to R6 belong in a Bayes classifier.



Question

Consider a classifier that classifies cancer patients into stages, i.e., $\{$S1, S2, S3, S4$\}$. Its corresponding loss matrix is given below, where the rows correspond to true-labels and the columns correspond to predicted labels.

$$\begin{bmatrix} 0 & 1 & 2 & 3 \\ 100 & 0 & 1 & 2 \\ 200 & 100 & 0 & 1 \\ 300 & 200 & 100 & 0 \end{bmatrix}$$

Given the following prior probabilities, find the expected loss:

$$P(S1|x) = 0.1, P(S2|x) = 0.07, P(S3|x) = 0.04, P(S4|x) = 0.01$$

Question

Model the following problems so that you can use Naive Bayes.

(a) Describe your feature vector.

(b) What are you assuming that the problem satisfies?

(c) What distribution will you use for each of the features and why ?

Suppose you are given a set of emails and you have to decide if it’s spam or not.?

Question

Suppose you have a bakery and you sell one pound vanilla cakes there . Given the amount of sugar, baking powder , oil , temperature and duration to be baked. Will the cake be fit for customers ?

Question

Given if it’ s warm or not, if it’ s raining or not, if the student is tired or not , if it’ s windy outside or not ; will a student be able to focus ?

Question

If you have a lot of data points , will the KNN algorithm if implemented in the naive way be practical?

Question

Find the best linear regressor for given data points using the formula: $\beta = (X^\top X)^{-1} X^\top Y$

$x_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $y_1 = 3$

Question

$$x_1 = \begin{bmatrix} 1 \\ 3 \end{bmatrix} \text{ , } y_1 = 1 \text{ ; } x_2 = \begin{bmatrix} 1 \\ 7 \end{bmatrix} \text{ , } y_2 = 2$$

Question

Modify the regression solution to $\beta' = (X^\top X + I)^{-1} X^\top Y$. Now find β' $x_1 = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$, $y_1 = 1$; $x_2 = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$, $y_2 = 2$. Why were you able to do this ?

Question

Find β' for $x_1 = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$, $y_1 = 1$; $x_2 = \begin{bmatrix} 1 \\ 7 \end{bmatrix}$, $y_2 = 2$. Calculate mean square error and and write your observation.

Question

For the above problem you have found β and $\beta^{'}$. Compare the test error for the data $t_1 = \begin{bmatrix} 1 \\ 6 \end{bmatrix}$, $l_1 = 1.5$.