

Tutorial 5

9th September 2021

Question 1

Is Naive Bayes Classifier a generative model or a discriminative model?

Question 2

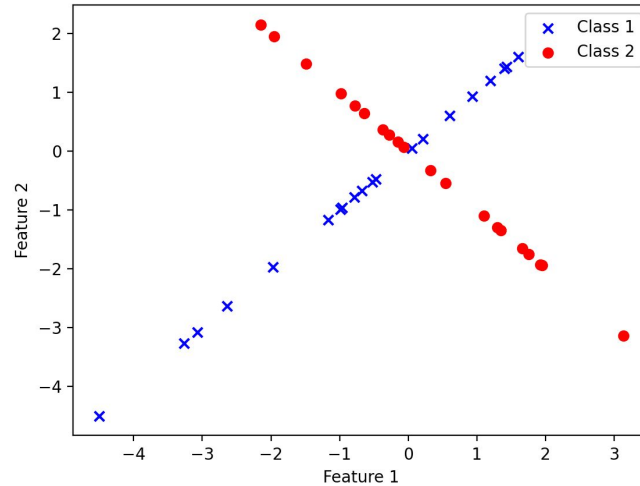
We are in the process of training a perceptron model. The current weight vector is given as $w_t = [0.1, 0.2, -0.1]$. The next training data point (x_i, y_i) is given as $([-1, 3, 3], -1)$. Find the updated weight vector i.e w_{t+1} using perceptron update rule.

Question 3

What if in the previous question the next training data point (x_i, y_i) is given as $([-1, 3, 7], -1)$. Find the updated weight vector i.e w_{t+1} using perceptron update rule.

Question 4

A dataset with two classes is plotted below.



Does the data satisfy the Naive Bayes assumption?

Question 5

In the following dataset outlook, temperature, humidity and windy are independent features and play is dependent feature.

Outlook	Temperature	Humidity	Windy	Play
Sunny	85	85	false	no
Sunny	80	90	true	no
Overcast	83	86	false	yes
Rainy	70	96	false	yes
Rainy	68	80	false	yes
Rainy	65	70	true	no
Overcast	64	65	true	yes
Sunny	72	95	false	no
Sunny	69	70	false	yes
Rainy	75	80	false	yes
Sunny	75	70	true	yes
Overcast	72	90	true	yes
Overcast	81	75	false	yes
Rainy	71	91	true	no

Predict whether a student will play or not given that

$x = (\text{Outlook}=\text{sunny}, \text{Temperature}=66, \text{Humidity}=90, \text{Windy}=\text{True})$

Question 6

Which of the following functions can be learnt using a perceptron?

- a. AND
- b. OR
- c. XOR
- d. NAND
- e. NOR
- f. XNOR

Question 7

Consider the below dataset:

x	y
India won the match.	<i>Cricket</i>
The Mercedes car was driven by Lewis Hamilton.	<i>Formula 1</i>
The ball was driven through the covers for a boundary.	<i>Cricket</i>
Jasprit Bumrah is a fast bowler.	<i>Cricket</i>
Max Verstappen has a fast car.	<i>Formula 1</i>
Max Verstappen won the race.	<i>Formula 1</i>

Suppose you have to classify a test example “The ball won the race to the boundary” and are asked to compute $P(\text{Cricket} \mid \text{“The ball won the race to the boundary”})$, what is an issue that you will face if you are using Naive Bayes Classifier, and how will you work around it? Assume you are using word frequencies to estimate all the probabilities.

Note: There is no need to solve this question numerically.

Question 8

Consider the following data for 20 budget phones, 30 mid-range phones and 20 high-end phones.

Type	Single SIM	5G Compatibility	NFC	Total
Budget	15	5	0	20
Mid-range	20	20	15	30
High-end	15	15	15	20

Suppose a phone has 2 SIM card slots and 5G compatibility but no NFC. Calculate the probabilities of this phone being a budget phone, mid-range phone and a high-end phone. The correct ordering of the phone type from the highest to the lowest probability is?

Question 9

Consider the following data for 20 budget phones, 30 mid-range phones and 20 high-end phones.

Type	Single SIM	5G Compatibility	NFC	Total
Budget	15	5	0	20
Mid-range	20	20	15	30
High-end	15	15	15	20

Consider a phone that has 2 SIM card slots and NFC but no 5G compatibility. Calculate the probabilities of this phone being a budget phone, mid-range phone and a high-end phone. The correct ordering of the phone type from the highest to the lowest probability is?