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Informatics and Computer Science
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Machine Learning, Winter 2022
Practice Assignment 10

Exercise 10-1

Consider the data about conditions for playing tennis given below:

Day	Outlook	Temperature	Humidity	Play Tennis?
1	Sunny	Hot	High	No
2	Cloudy	Hot	High	**Yes**
3	Rain	Mild	High	No
4	Rain	Cool	Normal	No
5	Cloudy	Cool	Normal	**Yes**
6	Sunny	Mild	High	**Yes**
7	Sunny	Cool	Normal	**Yes**
8	Rain	Mild	Normal	No
9	Sunny	Mild	Normal	**Yes**
10	Cloudy	Mild	High	**Yes**

Using Naive Bayes classifier, predict if one should play tennis on a Sunny, Hot with Normal humidity day. Note that since the data is discrete, you can use the frequentist statistics to compute the needed probabilities.

Exercise 10-2

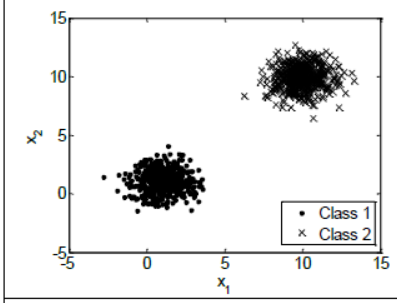
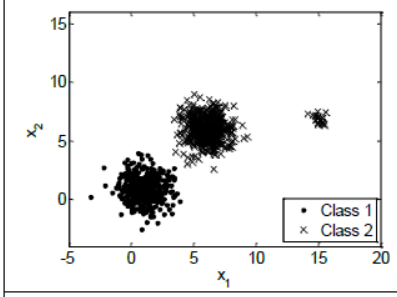
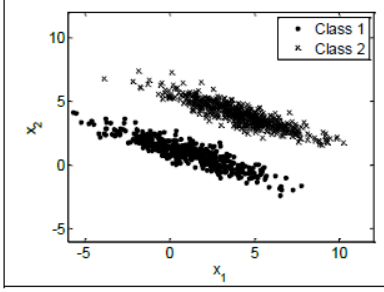
Consider the data given below about the weight and height of different individuals:

ID	Weight (Kg)	Height (cm)	Gender?
1	65	155	Female
2	60	157	Female
3	63	153	Female
4	72	159	Female
5	75	165	Male
6	70	162	Male
7	80	180	Male
8	75	173	Male
9	85	170	Male

Using Naive Bayes classifier, predict the gender of an individual with weight of 75 Kg and height 170 cm. Note that since the data is continuous, you can use the Gaussian distribution $N(x|\mu,\sigma)$ for each feature that takes the form $N(x|\mu,\sigma) = \frac{1}{\sqrt{2\pi\sigma^2}} exp(\frac{-(x-\mu)^2}{2\sigma^2})$, where $\mu = \frac{1}{M}\sum_{i=1}^{2} x_i$ and $\sigma^2 = \frac{1}{M}\sum_{i=1}^{2}(x_i-\mu)^2$

Exercise 10-3

For each of the datasets shown in the left column, approximately sketch the decision boundary corresponding to each of the classifiers listed in the right column and briefly state below why they perform this way. You can sketch your decision boundaries on the same figures in the left column.

A) 	1. Least Squares Classifier 2. Naïve Bayes Classifier
B) 	1. Least Squares Classifier 2. Perceptron
C) 	1. Least Squares Classifier 2. Naïve Bayes Classifier

Exercise 10-4

Consider the data about annual salary prediction given below:

Employee No.	Department	Status	Age	Salary?
1	Sales	Senior	30-35	100,000
2	Sales	Junior	25-30	80,000
3	Sales	Junior	30-35	80,000
4	Systems	Junior	25-30	60,000
5	Systems	Junior	35-40	80,000
6	Systems	Senior	35-40	80,000
7	Marketing	Senior	35-40	100,000
8	Marketing	Junior	30-35	80,000
9	Secretary	Junior	20-25	60,000
10	Secretary	Senior	20-25	60,000

Use Naive Bayes classifier to predict what the salary of a new employee who is 37 years old should be if he will be hired in the Marketing department as a Senior. The predicted salary should be 60,000, 80,000 or 100,000. Use frequentist statistics in your calculations.

Exercise 10-5

Solve Exercises 1 & 2 manually using Python (without the use of predefined methods)