SLIATE
SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION
(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology
Second Year, Second Semester Examination – 2022
HNDIT4212: Machine Learning

Instructions for candidates:
Answer **five** questions **only.**
All questions carry **equal** marks.

No. of questions : 06
No. of pages : 03
Time : Three Hours

Question 01

1. What is Machine Learning?

(04 Marks)

2. Name three applications of Machine Learning and briefly explain them

(06 Marks)

3. Define the term Random variable and give example for it.

(04 Marks)

4. Machine Learning is now affected the life of ours. Do you agree with this? Explain your view.

(06 Marks)
(20 Marks)

Question 02

The Bayesian classifier that uses the Naïve Bayes assumption and computes the MAP hypothesis is called Naïve Bayes classifier.
Consider the following training data set. It has two classes as: C1:buys_computer = 'yes' and C2:buys_computer = 'no'. New Data: X = (age <=30, Income = medium, Student = yes, Credit_rating = Fair).

age	income	student	credit_rating	buys_computer
<=30	high	no	fair	no
<=30	high	no	excellent	no
31…40	high	no	fair	yes
>40	medium	no	fair	yes
>40	low	yes	fair	yes
>40	low	yes	excellent	no
31…40	low	yes	excellent	yes
<=30	medium	no	fair	no
<=30	low	yes	fair	yes
>40	medium	yes	fair	yes
<=30	medium	yes	excellent	yes
31…40	medium	no	excellent	yes
31…40	high	yes	fair	yes
>40	medium	no	excellent	no

a) Compute P(C) The prior probability of each class can be computed based on the training tuples: P(buys_computer=yes) and P(buys_computer=no).

(04 Marks)

b) Compute P(X|buys_computer=yes)

(06 Marks)

c) compute P(X|Ci), P(X|buys_computer=no)

(06 Marks)

d) compute P(X|Ci)P(Ci) for each class and give the naïve Bayesian Classifier prediction.

(04 Marks)

(20 Marks)

Question 03

1. Draw the structure of a single neuron.

(04 Marks)

2. Consider the following data set which include one neuron as a network. x1 and x2 are normalized attribute value of data. Weight values w1 and w2.

x1	x2	w1	w2
0.3	0.8	0.5	0.5

a) Write function to calculate the weighted sum. (02 Marks)

b) Find weighted sum for above data set (02 Marks)

c) Activation function is defined as **y = f(x)** , where f(x) is defined as

f(x) = 0 { when x< 0.5 }

f(x) = 1 { when x >= 0.5 }

find the class for correspondant input attribut values. (02 Marks)

3. Write the first order linear model.

(04 Marks)

4. Consider the Estimated Coefficients for a data set related to the regression equation that estimates an equation of the first order linear model.

$$\overline{X} = 36,009.45;$$

$$\overline{Y} = 14,822.823;$$

$$s_X^2 = \frac{\sum(X_i - \overline{X})^2}{n-1} = 43,528,690$$

$$\text{cov}(X,Y) = \frac{\sum(X_i - \overline{X})(Y_i - \overline{Y})}{n-1} = -2,712,511$$

a) Calculate b_1

(03 Marks)

b) Calculate b_0

(03 Marks)

(20 Marks)

Question 04

1. What is Deep Learning (DL)

(04 Marks)

2. Name three types of learning and briefly explain them.

(06 Marks)

3. What is the Loss function used in deep learning?

(04 Marks)

4. Briefly explain two Deep learning frameworks

(06 Marks)

(20 Marks)

Question 05

1. What is meant by data mining?

(04 Marks)

2. Name three Common data mining tasks

(06 Marks)

3. What is meant by Principal Component defined in Principal Component Analysis?

(04 Marks)

4. Principal component analysis is a variable reduction procedure. Explain it.

(06 Marks)

(20 Marks)

Question 06: Write short note on following topics

1. Monte Carlo simulation

(05 Marks)

2. Ensemble Learning

(05 Marks)

3. Decision Tree

(05 Marks)

4. Gibbs Sampling

(05 Marks)

(20 Marks)