

Department of Computer Science and Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination

Fall 2020

4th Year, 1st Semester

Course Code: CSE 427

Course Title: Machine Learning

Credits: 3.00

Full Marks: 120* (Written)

Duration: 2 Hours

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Partial marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Name and define different activation functions in an artificial neuron with necessary expression and diagram. [10]

- b) Explain the schematic representation of a perceptron. Design a two-layer network of perceptron to implement A AND B. [20]

2. a) Name and define the characteristics of an artificial neural networks. [10]

- b) What is the basic idea of the backpropagation algorithm? Illustrate the various steps in the backpropagation algorithm, using a small network with two inputs, two outputs and one hidden layer. Assume that there are two observations: [20]

Sample	Input 1	Input 2	Output target 1	Output target 2
	i1	i2	T1	T2
1	0.05	0.10	0.01	0.99
2	0.25	0.18	0.23	0.79

3. a) State the mathematical formulation of the SVM problem. Give the solution of the SVM problem. [10]

- b) Give an outline of an algorithm to find the SVM classifier. Using the SVM algorithm, find the SVM classifier for the following data: [20]

Example no.	x1	x2	Class
1	2	1	+1
2	4	3	-1

4. a) What is criterion for minimization of error in Regression problem? [10]

- b) State Bayes theorem and illustrate it with an example. Based on the following data determine the gender of a person having height 6 ft., weight 130 lbs. and foot size 8 in. (use naive Bayes algorithm). [20]

Person	height (feet)	weight (lbs)	foot size (inches)
male	6.00	180	10

male	6.00	180	10
male	5.50	170	8
male	6.00	170	10
female	5.00	130	8
female	5.50	150	6
female	5.00	130	6
female	6.00	150	8

Or,

4. a) Explain briefly the terms: Norm; Inner product; Angle between two vectors; Perpendicularity using following data: $n=4$; $x=(-1, 2, 0, 3)$; $y=(2, 3, 1, -4)$. [10]
- b) Consider the following set of training examples: [20]

Instance	Classification	a1	a2
1	+	T	T
2	+	T	T
3	−	T	F
4	+	F	F
5	−	F	T
6	−	F	T

- (i) What is the entropy of this collection of training examples with respect to the target function “classification”?
- (ii) What is the information gain of a2 relative to these training examples?