

AI-2043
Examination – May-June - 2022
B.Tech. IV Sem: AIADS
Introduction to Machine Learning

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any. Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,
 Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) Explain the perspective and issues with machine learning. 02
 (b) Define Machine learning? Briefly explain the types of learning. 02
 (c) Write down the Find_S algorithm and discuss the issues with the said algorithm. 03
 (d) Briefly explain with the help an example, the various stages involved in designing of a learning system. 07

OR

The Following table shows the malignant tumors found from the MRI scans. 07

Example	Shape	Size	Color	Surface	Thickness	Output
1	Oval	Large	Light	Smooth	Thick	Malignant
2	Oval	Large	Light	Smooth	Thin	Benign
3	Oval	Small	Dark	Irregular	Thin	Malignant
4	Circular	Small	Dark	Irregular	Thick	Malignant
5	Circular	Small	Light	smooth	Thick	Benign
6	Circular	Large	Light	Irregular	Thick	Malignant

Show the specific and general boundaries of the version space after applying candidate elimination algorithm. (malignant is positive and Benign is negative)

- Q.2 (a) Discuss Maximum Likelihood and Least Square Error Hypothesis. 02
 (b) Contrast the hypothesis space search in ID3. 02
 (c) Define the Decision tree. Construct the decision tree to represent the following Boolean function 03
 (i) $A \text{ AND } (\text{NOT } B)$ (ii) $A \text{ XOR } B$
 (d) Explain the features and issues of Bayesian learning methods. 07

OR

Consider the following set of training example 07

Instance	Classification	a_1	a_2
1	1	1	1
2	1	1	1
3	0	1	0
4	1	0	0
5	1	1	1
6	0	0	1

What is the entropy of the above training examples with respect to the target function classification? What is the information gain of a_2 relative to the said training example?



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- Q.3 (a) 02
 (b) 02
 (c) 03
 (d) Explain with the help of an example, what the response variable is in a logistic regression and the tricks used to convert this into a mathematical regression equation. 07

OR

Consider the training data in the following table where disease is a class attribute. In the table, the BP attribute has values "L" (for low) or "H" (for high). Diabetes has values 07

- 3 (a) Differentiate between simple error and true error. 02
 (b) What do you understand by Brute force Baye's Concept Learning? 02
 (c) Explain the basic elements of a Hidden Markov Model (HMM). List any two applications of HMM. 03
 (d) Explain with the help of an example, what the response variable is in a logistic regression and the tricks used to convert this into a mathematical regression equation. 07

OR

Consider the training data in the following table where disease is a class attribute. In the table, the BP attribute has values "L" (for low) or "H" (for high), Diabetes has values "Y" (for yes) or "N" (for no), BMI has values "A" (for above standard) or "R" (for within Range), and Disease has values "Yes" or "No". 07

BP	Diabetes	BMI	Disease
L	N	R	NO
L	Y	R	NO
H	Y	A	YES
H	N	R	YES
H	N	A	YES

What is class label for the following combination (BP=L, Diabetes=N, BMI=A), according to naïve Bayesian classification?

- 4 (a) Illustrate the k-Means Algorithm with an example. 02
 (b) Make the flowchart for the Expectation-Maximization algorithm. 03
 (c) What are Bayesian Belief nets? Discuss the pros and cons of using it.
 (d) Suppose 5000 patients get tested for COVID, out of them 3500 were found symptomatic and rest were found asymptomatic. For the symptomatic, a test was positive for 100 and negative for 520. For the asymptomatic people, the same test was positive for 100 and negative for 820. Construct a confusion matrix for the data and compute the precision and recall for the data.

OR

For the given set of points identify clusters using complete link agglomerative clustering 07

Sample No.	P1	P2	P3	P4	P5	P6
A	1	1.5	5	3	4	2.5
B	1	1.5	5	3.5	3	2.5

- (a) Differentiate between Gradient Descent and Perceptron training rule. 02
 (b) Write down the five steps in the back propagation learning algorithm. 02
 (c) Calculate the output y of a three input neuron with bias. The input feature vector is $(x_1, x_2, x_3) = (0.8, 0.6, 0.4)$ and weight values are $[w_1, w_2, w_3, b] = [0.2, 0.1, -0.3, 0.35]$. Use binary Sigmoid function as activation function. 03
 (d) Describe the TANGENTPROP algorithm to train a neural network to fit both training values and training derivatives. 07

OR

Explain the various terms with respect to neural networks with proper diagrams: 07

(a) Layers (b) Neurons (c) Firing of Neuron (d) Weights (e) Bias (f) Activation function



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Roll No.

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Machine Learning**

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- Q.1 (a) What if there are several maximally specific consistent hypotheses? 02
(b) List the perspective and issues of machine learning. 02
(c) Has Find-S converged to the correct target concept? Explain your answer in brief. 03
(d) What do you mean by well posed learning problem? Explain the important features that are required to well defined a learning problem? 07

OR

Define the Concept Learning? Assume a training data set and deduce hypothesis using concept learning for the dataset. 07

- Q.2 (a) List some of the solution for avoiding over fitting. 02
(b) What are the measures for selecting best Tree? 02
(c) Point out and describe the main issues in decision tree learning. 03
(d) Explain the concept of Naive Bayes learning algorithm using suitable example. 07

OR

Show how to tune a decision tree? Also compare Parameters and Hyper parameters of decision tree. 07

- Q.3 (a) Logistics regression is more suitable than decision tree, how? 02
(b) Why parameter smoothing is important in machine learning? 02
(c) How generative models are different from discriminative models? Explain. 03
(d) Discuss the major drawbacks of K-nearest Neighbors learning algorithm and how it can be corrected? 07

OR

Define CBR in machine learning? List out the challenges and applications of CBR. 07

- Q.4 (a) What is labelled Data? Explain with example. 02
(b) Give some applications of semi supervised learning. 02
(c) Provide two practical scenarios where we need clustering. 03
(d) How does Hierarchical agglomerative clustering works? Explain the methods to measure the distance between two clusters. 07

OR

What are the core ideas of Expectation maximization (EM)? How it deals with unobserved data? 07

- Q.5 (a) What are the steps in the life cycle of Machine Learning? 02
(b) List out some challenges of ANN. 02
(c) What is the role of genetic operators? Explain. 03
(d) How can we learn multilayer network from back propagation algorithm? Explain. 07

OR

List the limitation of genetic algorithms? Explain how to use parallel genetic algorithms for optimization. 07
