

CBCS SCHEME

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17EC834

Eighth Semester B.E. Degree Examination, July/August 2022 Machine Learning

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. List and explain perspectives and issues in machine learning. (08 Marks)
b. Explain List-Then-Eliminate algorithm. (04 Marks)
c. Write FIND-S algorithm and find maximally specific hypothesis for the given instances shown in Table Q1(c) using find – S.

Example	Sky	Air temp.	Humidity	Wind	Water	Forecast	Enjoy sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cool	Change	Yes

Table Q1(c)

(08 Marks)

OR

- 2 a. Explain the various stages involved in designing a learning system. (10 Marks)
b. Apply candidate elimination algorithm to find specific and general boundaries of the version space on the given training example shown in Table Q2(b).
(Note : Malignant is +ve, Benign is – ve).

Explain	Shape	Size	Color	Surface	Thickness	Target Concept
1	Circular	Large	Light	Smooth	Thick	Malignant
2	Circular	Large	Light	Irregular	Thick	Malignant
3	Oval	Large	Dark	Smooth	Thin	Benign
4	Oval	Large	Light	Irregular	Thick	Malignant

Table Q2(b)

(10 Marks)

Module-2

- 3 a. Define decision tree construct the decision tree to represent the following Boolean function :
i) $A \wedge \neg B$
ii) $A \vee [B \wedge C]$
iii) $A \text{ XOR } B$
iv) $[A \wedge B] \vee [C \wedge D]$. (10 Marks)
b. Derive and explain gradient descent rule and explain stochastic approximation to gradient descent. (10 Marks)

OR

- 4 a. Discuss the two approaches to prevent overfitting of data. (08 Marks)
 b. Construct decision tree for the following data using ID3 algorithm shown in Table Q4(b).

Instance	a ₁	a ₂	a ₃	Classification
1	True	Hot	High	No
2	True	Hot	High	No
3	False	Hot	High	Yes
4	False	Cool	Normal	Yes
5	False	Cool	Normal	Yes
6	True	Cool	High	No
7	True	Hot	High	No
8	True	Hot	Normal	Yes
9	False	Cool	Normal	Yes
10	False	Cool	High	Yes

Table Q4(b)

(12 Marks)

Module-3

- 5 a. Prove that minimizing the square error between the output hypothesis predictions and training data will output a maximum likelihood hypothesis. (08 Marks)
 b. Classify the data set : <Green, 2, Tall, No> using Naïve Bayes classifier, the dataset shown in Table Q5(b). Also find conditional probability for attributes.

No.	Color	Legs	Height	Smelly	Species
1	White	3	Short	Yes	M
2	Green	2	Tall	No	M
3	Green	3	Short	Yes	M
4	White	3	Short	Yes	M
5	Green	2	Short	No	H
6	White	2	Tall	No	H
7	White	2	Tall	No	H
8	White	2	Short	Yes	H

Table Q5(b)

(12 Marks)

OR

- 6 a. Explain brute force MAP learning algorithm. (08 Marks)
 b. Classify the dataset : <Red, SUV, Domestic> using Naïve Bayes classifier using the dataset shown in Table Q6(b). Also find conditional probability for attributes.

Example No.	Color	Type	Origin	Stolen
1	Red	Sports	Domestic	Yes
2	Red	Sports	Domestic	No
3	Red	Sports	Domestic	Yes
4	Yellow	Sports	Domestic	No
5	Yellow	Sports	Imported	Yes
6	Yellow	SUV	Imported	No
7	Yellow	SUV	Imported	Yes
8	Yellow	SUV	Domestic	No
9	Red	SUV	Imported	No
10	Red	Sports	Imported	Yes

Table Q6(b)

(12 Marks)

Module-4

- 7 a. Explain K-nearest neighbor learning algorithm. (08 Marks)
b. Describe radial basis functions. (08 Marks)
c. Explain Locally weighted regression. (04 Marks)

OR

- 8 a. What is learning set of First Order Rule (FOIL)? Explain briefly. (08 Marks)
b. Describe sequential covering algorithm. (08 Marks)
c. Describe case based reasoning. (04 Marks)

Module-5

- 9 a. Explain in detail the explanation based learning algorithm PROLOG – EBG. (10 Marks)
b. Explain the Q-Function and Q-Learning algorithm assuming deterministic reward and action with example. (10 Marks)

OR

- 10 a. Explain FOCL algorithm with example. (10 Marks)
b. Write a short note on :
i) Analytical Versus Inductive Learning
ii) Reinforcement Learning. (10 Marks)
