CBCS SCHEME

USN

18EC745

Seventh Semester B.E. Degree Examination, June/July 2024

Machine Learning with Python

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define machine learning. Specify the learning problem for handwriting recognition and robot driving. **(05 Marks)**

b. Explain the designing of a learning system in detail. **(10 Marks)**

c. Explain the issues in machine learning. **(05 Marks)**

OR

2 a. Write the steps involved in Find-S algorithm. **(05 Marks)**

b. Apply candidate elimination algorithm to obtain final version space for the training set shown in Table Q2(b).

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 Q2(b) **(10 Marks)**

c. Explain the concept of inductive bias. **(05 Marks)**

Module-2

3 a. Construct decision tree using ID3 algorithm considering the following training examples.

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

(12 Marks)

b. Discuss the issues of avoiding overfitting the data and handling attributes with differing costs. **(08 Marks)**

OR

4 a. Explain the concept of decision tree learning. Discuss the necessary measures required to select the attributed for building a decision tree using ID3 algorithm. **(11 Marks)**

b. Explain ID3 Algorithm **(06 Marks)**

c. Explain incorporating continuous valued attributes with respect to decision tree learning. **(03 Marks)**

Module-3

5 a. List the appropriate problems for neural network learning. **(05 Marks)**

b. Define perceptrons and discuss its training rule. **(05 Marks)**

c. Derive expressions for training rule of output and hidden unit weights for back propagation algorithm. **(10 Marks)**

OR

6 a. Discuss the applications of neural network which is used to steer an autonomous vehicle. **(06 Marks)**

b. Write gradient descent algorithm to train a linear unit along with the derivation. **(08 Marks)**

c. Discuss the issues of convergence, local minima and generalization, overfitting and stopping criterion. **(06 Marks)**

Module-4

7 a. Explain Bayes theorem and mention the features of Bayesian learning methods. **(07 Marks)**

b. Explain Naïve Bayes classifier. **(05 Marks)**

c. Prove that a maximum likelihood hypothesis can be used to predict probabilities. **(08 Marks)**

OR

8 a. The Table Q8(a) provides a set of 14 training examples of the target concept "Play Tennis" where each day is described by the attributes outlook, temperature, humidity and wind.

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

Table Q8(a)

Use the Naïve Bayes classifier and the training data from this table to classify the following novel instance:

<outlook = Sunny, Temperature = Cool, Humidity = High, Wind = Strong> **(10 Marks)**

b. Write and explain EM algorithm. **(05 Marks)**

c. Explain MAP learning algorithm. **(05 Marks)**

Module-5

9 a. Define :
i) Sample Error ii) True Error iii) Confidence intervals (06 Marks)
b. Explain k-nearest neighbor learning algorithm. (08 Marks)
c. Write a note on Q learning. (06 Marks)

OR

10 a. Define mean value, variance, standard deviation and estimation bias of a random variable. (04 Marks)
b. Explain locally weighted linear regression and radial basis functions. (10 Marks)
c. What is reinforcement learning? How it differs from other function approximation tasks? (06 Marks)

* * * * *