CBCS SCHEME

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18EC745

Seventh Semester B.E. Degree Examination, Dec.2024/Jan.2025
Machine Learning with Python

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is a well posed learning problem? Give 2 examples. **(06 Marks)**

b. Generate the representation for target function for the checkers learning example. Explain the LMS weight update rule. **(06 Marks)**

c. Explain with a neat diagram, the final design of the checkers learning problem. **(08 Marks)**

OR

2 a. Define the General to Specific ordering of Hypothesis with relevant expressions and diagram. **(06 Marks)**

b. Discuss Find-S algorithm with a pseudo code/python program. List its benefits and drawbacks. **(08 Marks)**

c. Apply Candidate Elimination Algorithm and find the final version space.

Origin	Manufacturer	Color	Decade	Type	Example Type
Japan	Honda	Blue	1980	Economy	Positive
Japan	Toyota	Green	1970	Sports	Negative
Japan	Toyota	Blue	1990	Economy	Positive
USA	Chrysler	Red	1980	Economy	Negative
Japan	Honda	White	1980	Economy	Positive
Japan	Toyota	Green	1980	Economy	Positive
Japan	Honda	Red	1990	Economy	Negative

(06 Marks)

Module-2

3 a. Discuss the ID3 algorithm pseudocode. Write the expression for Entropy and Information gain. **(08 Marks)**

b. Draw the Decision tree to represent (i) $A \wedge \neg B$ (ii) A XOR B **(04 Marks)**

c. Discuss any 2 issues in decision tree learning. Explain any two. **(08 Marks)**

OR

4 a. Define inductive bias. Explain inductive bias in ID3. **(06 Marks)**

b. Discuss the differences between Candidate Elimination Algorithm and Decision trees. Indicate which is preferred. **(06 Marks)**

c. Explain how decision trees handle continuous valued attributes and handling training examples with missing attributes values. **(08 Marks)**

Module-3

5 a. What is a perceptron? Write the equation for computation of output of perceptron. Discuss how the learning happens for perceptron. **(06 Marks)**

b. What is the motivation for Delta Rule and Gradient Descent Algorithm? Explain the Gradient Descent Algorithm and derive an expression of error. **(08 Marks)**

c. Derive an expression for training Rule for output units using Back Propagation algorithm. **(06 Marks)**

OR

6 a. Discuss the Backpropagation algorithm for a feedforward network containing 2 hidden layers. **(10 Marks)**

b. Discuss the role of convergence and local minima for Back propagation algorithm. How can this be addressed to improve convergence. **(05 Marks)**

c. Define Generalization, Overfitting and Stopping Criteria for Back propagation algorithm. Discuss the approaches to overcome the problem of overfitting. **(05 Marks)**

Module-4

7 a. Define Bayesian Theorem. What is the relevance and features of Bayesian Theorem. Explain the practical difficulties of Bayesian theorem. **(06 Marks)**

b. Consider a medical diagnosis problem in which there are 2 alternative hypotheses:

(i) The patient has a particular form of cancer

(ii) The patient does not

A patient takes a lab test and the result comes back positive. The test returns a correct positive result in only 98% of the cases in which the disease is actually present and a correct negative result in only 97% of the case in which the disease is not present. Furhermore 0.008 of the entire population have this cancer. Determine whether the patient has cancer or not using MAP hypothesis. **(06 Marks)**

c. Derive an expression for maximum likelihood hypothesis that indicates minimization of least square error. **(08 Marks)**

OR

8 a. Obtain Maximum and Posteriori hypothesis for predicting probabilities. **(10 Marks)**

b. Explain Bayesian Belief network and conditional independence with example. **(10 Marks)**

Module-5

9 a. What is instance based learning? Explain key features and disadvantages of three methods. **(08 Marks)**

b. Discuss where Binomial distribution can be applied. **(04 Marks)**

c. Define (i) Mean (ii) Variance (iii) Bias (iv) Confidence. Intervals with relevant examples. **(08 Marks)**

OR

10 a. Discuss how learning algorithms can be compared. **(06 Marks)**

b. Explain the K-nearest neighbor algorithm for approximating a discrete valued function $f : R^n \rightarrow V$ with pseudocode. **(06 Marks)**

c. Explain the Q function and Q learning algorithm assuming a deterministic rewards and actions with an example. **(08 Marks)**

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