



**SRINIVAS UNIVERSITY  
INSTITUTE OF ENGINEERING AND  
TECHNOLOGY  
MUKKA, MANGALURU**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**QUESTION BANK**

**MACHINE LEARNING**

**SUBJECT CODE: 19SCS32**

**COMPILED BY:**

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# **MODULE 1**

## **INTRODUCTION**

1. Define the following terms: a. Learning b. LMS weight update rule c. Version Space d. Consistent Hypothesis e. General Boundary f. Specific Boundary g. Concept
2. What are the important objectives of machine learning?
3. Explain find –S algorithm with given example. Give its application
4. What do you mean by a well –posed learning problem? Explain the important features that are required to well –define a learning problem.
5. Explain the inductive biased hypothesis space and unbiased learner
6. What are the basic design issues and approaches to machine learning?
7. Explain Candidate Elimination algorithm with example
8. How do you design a checkers learning problem
9. Explain the various stages involved in designing a learning system
10. Differentiate between Training data and Testing Data
11. Differentiate between Supervised, Unsupervised and Reinforcement Learning
12. What are the issues in Machine Learning
13. Explain the List Then Eliminate Algorithm with an example
14. What is the difference between Find-S and Candidate Elimination Algorithm
15. Explain the concept of Inductive Bias
16. With a neat diagram, explain how you can model inductive systems by equivalent deductive systems
17. What do you mean by Concept Learning?

## MODULE 2

### DECISION TREE LEARNING

1. Give decision trees to represent the following boolean functions: (a)  $A \wedge \neg B$  (b)  $A \vee [B \wedge C]$  (c)  $A \text{ XOR } B$  (d)  $[A \wedge B] \vee [C \wedge D]$
2. Consider the following set of training examples:

<u>Instance</u>	<u>Classification</u>	<u>a1</u>	<u>a2</u>
1	+	T	T
2	+	T	T
3	-	T	F
4	+	F	F
5	-	F	T
6	-	F	T

- (a) What is the entropy of this collection of training examples with respect to the target function classification? (b) What is the information gain of a2 relative to these training example
3. Discuss Entropy in ID3 algorithm with an example
  4. Compare Entropy and Information Gain in ID3 with an example.
  5. Describe hypothesis Space search in ID3 and contrast it with Candidate-Elimination algorithm.
  6. Relate Inductive bias with respect to Decision tree learning.
  7. List the issues in Decision Tree Learning. Interpret the algorithm with respect to Overfitting the data.
  8. Discuss the effect of reduced Error pruning in decision tree algorithm.
  9. What type of problems are best suited for decision tree learning
  10. Write the steps of ID3Algorithm
  11. What are the capabilities and limitations of ID3
  12. Define (a) Preference Bias (b) Restriction Bias
  13. Explain the various issues in Decision tree Learning
  14. Describe Reduced Error Pruning
  15. What are the alternative measures for selecting attributes
  16. What is Rule Post Pruning

## **MODULE 3**

### **ARTIFICIAL NEURAL NETWORK**

- 1) What is Artificial Neural Network?
- 2) What are the type of problems in which Artificial Neural Network can be applied.
- 3) Explain the concept of a Perceptron with a neat diagram.
- 4) Discuss the Perceptron training rule.
- 5) What do you mean by Gradient Descent?
- 6) Derive the Gradient Descent Rule.
- 7) What are the conditions in which Gradient Descent is applied.
- 8) What are the difficulties in applying Gradient Descent.
- 9) Differentiate between Gradient Descent and Stochastic Gradient Descent
- 10) Define Delta Rule.
- 11) Derive the Backpropagation rule considering the training rule for Output Unit weights and Training Rule for Hidden Unit weights
- 12) Write the algorithm for Back propagation.
- 13) Explain how to learn Multilayer Networks using Gradient Descent Algorithm.
- 14) What is Squashing Function?

## **MODULE 4**

### **BAYESIAN LEARNING**

1. Define Bayesian theorem? What is the relevance and features of Bayesian theorem? Explain the practical difficulties of Bayesian theorem.
2. Define is Maximum a Posteriori (MAP) Maximum Likelihood (ML) Hypothesis. Derive the relation for  $h_{MAP}$  and  $h_{ML}$  using Bayesian theorem.
3. Consider a medical diagnosis problem in which there are two alternative hypotheses: 1. that the patient has a particular form of cancer (+) and 2. That 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 cases in which the disease is not present. Furthermore, .008 of the entire population have this cancer. Determine whether the patient has Cancer or not using MAP hypothesis.
4. Explain Brute force Bayes Concept Learning
5. What are Consistent Learners?
6. Discuss Maximum Likelihood and Least Square Error Hypothesis
7. Describe Maximum Likelihood Hypothesis for predicting probabilities.
8. Explain the Gradient Search to Maximize Likelihood in a Neural Net
9. Describe the concept of MDL. Obtain the equation for  $h_{MDL}$ .
10. Explain Naïve Bayes Classifier with an Example
11. What are Bayesian Belief nets? Where are they used?
12. Explain Bayesian belief network and conditional independence with example
13. Explain Gradient Ascent Training of Bayesian Networks
14. Explain the concept of EM Algorithm. Discuss what are Gaussian Mixtures

## MODULE 5

### INSTANCE BASED LEARNING

1. Explain the two key difficulties that arise while estimating the Accuracy of Hypothesis.
2. Define the following terms
  - a. Sample error b. True error c. Random Variable
  - d. Expected value e. Variance f. standard Deviation
3. Explain Binomial Distribution with an example.
4. Explain Normal or Gaussian distribution with an example.
5. Suppose hypothesis  $h$  commits  $r = 10$  errors over a sample of  $n = 65$  independently drawn examples.
  - What is the variance and standard deviation for number of true error rate  $\text{error}_D(h)$ ?
  - What is the 90% confidence interval (two-sided) for the true error rate?
  - What is the 95% one-sided interval (i.e., what is the upper bound  $U$  such that  $\text{error}_D(h) \leq U$  with 95% confidence)?
  - What is the 90% one-sided interval?

$\alpha$	0.100	0.050	0.025	0.001
$1 - \alpha$	0.900	0.950	0.975	0.999
$z_{1-\alpha}$	1.28	1.64	1.96	3.09

6. What are instance based learning? Explain key features and disadvantages of these methods.
7. Explain the K – nearest neighbour algorithm for approximating a discrete – valued function  $f : \mathbb{R}^n \rightarrow V$ , with pseudo code

8. Describe K-nearest Neighbour learning Algorithm for continuous (real) valued target function.
9. Discuss the major drawbacks of K-nearest Neighbour learning Algorithm and how it can be corrected
10. Define the following terms with respect to K - Nearest Neighbour Learning :  
i) Regression ii) Residual iii) Kernel Function.
11. Explain Locally Weighted Linear Regression.
12. Explain radial basis function
13. Explain CADET System using Case based reasoning.
14. What is Reinforcement Learning and explain Reinforcement learning problem with neat diagram.
15. Write Reinforcement learning problem characteristics.
16. Explain the Q function and Q Learning Algorithm assuming deterministic rewards and actions with example.

