



KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

20AD503 & MACHINE LEARNING TECHNIQUES

QUESTION BANK

UNIT I

MACHINE LEARNING BASICS

PART A

- 1 Compare learning vs programming.
- 2 Examine the importance of machine learning algorithms.
- 3 Summarize algorithm technique in ML
- 4 What are major components involved in each machine algorithm?
- 5 List different forms of learning.
- 6 Build the machine learning framework.
- 7 Draw basic learning system model.
- 8 What are the factors affecting the performance of machine learning algorithm?
- 9 Compare generic machine model and discriminate machine learning model.
- 10 Discuss major applications of machine learning.
- 11 Define Gaussian process.
- 12 Distinguish Joint probability vs conditional probability.
- 13 Point out/examine supervised learning category and technique.
- 14 Define maximum likelihood estimation (MLE).
- 15 Explain semi supervised learning?
- 16 Explain Inductive machine learning?
- 17 How AI differ from Machine learning?
- 18 Discuss the difference between training set and testing set.
- 19 List the application software tools.

PART B

- 1 What is machine learning? Discuss about learning and machine learning. Choose various types of machine learning.
- 2 Demonstrate the supervised learning structure.

- 3 Explain briefly about unsupervised learning structure?
- 4 Examine in detail about machine learning process with an example.
- 5 Explain various learning techniques involved in supervised learning?
- 6 Explain various learning techniques involved in unsupervised learning?
- 7 How to develop /frame inductive learning and summarize the machine learning process?
- 8 Explain generative machine learning model and analyze how it differ from discriminative machine learning model?
- 9 What is Gaussian process? And explain in detail of Gaussian parameter estimates with suitable examples.
- 10 Develop procedure in parameter estimation for Bayesian parameter estimation.
- 11 Discuss about MLE and how it derive from MAP and extreme estimator.
- 12 Summarize the advantages and disadvantages of Gaussian process
- 13 Short note on a) Bias and variance
b) Bias and variance trade off.

UNIT II

MACHINE LEARNING METHODS

PART A

- 1 Compare biological neuron and artificial neuron
- 2 Draw the structure of artificial single neuron based on biological neuron
- 3 List out major parts of biological neuron
- 4 Discuss about types of artificial neural networks
- 5 What is the drawback of McCulloch & Pitts mathematical model of an artificial neuron?
- 6 Define perceptron
- 7 Draw the simple perceptron model.
- 8 Identify the parameters in a perceptron network and its significance
- 9 Why XOR problem could not be solved by simple perceptron?
- 10 Define multilayer perceptron
- 11 How a multilayer perceptron solve XOR problem?
- 13 List some linear and nonlinear activation function
- 14 Apply the formula for sigmoidal function
- 15 How to estimate error in the output layer?
- 16 How to evaluate the update weight in back propagation?

PART B

- 1 Explain biological Neuron.
- 2 Explain simple model of an Artificial Neuron and its functions.
- 3 Construct and explain Artificial Neural network structure.
- 4 Determine activation function and list few activation function with description.
- 5 Summarize and Explain various types of artificial neural network.
- 6 Explain application of ANN and list the challenges of ANN.
list Advantages and disadvantages of ANN.
- 7 Develop simple perception model and explain learning theory.
- 8 Analyze the XOR is not linearly separable? Justify how it can be solved.
- 9 List the factors affecting MLP performance and explain each.
- 10 What is the importance of MLP? Explain learning in MLP.
- 11 Compare Linear Vs nonlinear regression.
Explain back propagation nonlinear regression.
- 12 Explain Back propagation network.
- 13 Discuss the steps involved in Back propagation algorithm.
- 14 How dimensionality reduction is important in NN? Justify.

UNIT III

MACHINE LEARNING IN PRACTICE

PART A

- 1 Explain biological Neuron.
- 2 Explain simple model of an Artificial Neuron and its functions.
- 3 Construct and explain Artificial Neural network structure.
- 4 Determine activation function and list few activation function with description.
- 5 Summarize and Explain various types of artificial neural network.
- 6 Explain application of ANN and list the challenges of ANN.
list Advantages and disadvantages of ANN.
- 7 Develop simple perception model and explain learning theory.
- 8 Analyze the XOR is not linearly separable? Justify how it can be solved.
- 9 List the factors affecting MLP performance and explain each.
- 10 What is the importance of MLP? Explain learning in MLP.
- 11 Compare Linear Vs nonlinear regression. Explain back propagation nonlinear

regression.

- 12 Explain Back propagation network.
- 13 Discuss the steps involved in Back propagation algorithm.
- 14 How dimensionality reduction is important in NN? Justify.

PART B

- 1 Design single layer perceptron with two iteration. Consider the perceptron having with the initial weights $w_1=0.5$, $w_2 = 0$, learning rate $\alpha=0.2$ and bias $b=0.4$ for AND Boolean function. The activation function is the Step function $f(x)$ which gives the output either 0 or 1. If value of $f(x)$ is greater than or equal to 0, it outputs 1 or else it outputs 0.
- 2 Perform a feedforward operation in a Multi-Layer Perception and conclude the result. This given MLP consists of an Input layer, one Hidden layer and an Output layer. The input layer has 4 neurons, the hidden layer has 2 neurons and the output layer has a single neuron and the Learning rate is 0.8 .
- 3 Design Back propagation using Multi-Layer Perception which has three layers like the input layer has 4 neurons, the hidden layer has 2 neurons and the output layer has a single neuron. Train the MLP by updating the weights and biases in the network. Learning rate: $=0.8$. Refer Q.no : 3 for the structure of MLP and their weights.
- 4 What is Boosting? Discuss with neat relevant example?
- 5 Explain the concept of Bagging with its uses?
- 6 What is Random forest? Explain with example?
- 7 Explain any 2 machine learning algorithms and their performance factors?
- 8 Discuss Linear Discriminate Analysis algorithm with neat sketch?
- 9 Discuss Learning Vector Quantization algorithm with neat sketch?
- 10 Explain boosting and ADA boosting algorithm with neat sketch?

UNIT IV
MACHINE LEARNING AND DATA ANALYTICS
PART A

- 1 Define entropy
- 2 Relate entropy and information gain
- 3 Define regression
- 4 What is the role of regression model in exploratory data analysis?
- 5 What is CART?
- 6 How does CART solve the regression problems?
- 7 Compare regression and Estimations
- 8 Compare classification and regression models
- 9 What is the principle of ordinary least square in linear regression?
- 10 Compare linear regression model and logistic regression model
- 11 Identify pros and cons of regression models.
- 12 Develop the concepts of K- Nearest Neighbours.
- 13 What are benefits of K- NN algorithm?
- 14 Identify the disadvantage of K- NN algorithm
- 15 Discuss how data normalization / standardization is required in K-NN?
- 16 List out the advantages of SVM
- 17 What do you understand by similarity based learning?
- 18 Discuss instance based learning vs model based learning.
- 19 How does the structure of decision tree help in classifying a data instance?
- 20 What are the different metrics used in deciding the splitting attribute?

PART B

- 1 Build the structure of a decision tree.
- 2 Explain logistic regression with suitable example
- 3 Discuss about linear regression and derive the Individual error & Minimization functions.
- 4 Write short notes on (i) Regression and Correlation
(ii) Limitation of Regression model
- 5 Explain the difference between linear and logistics regression with example.

- 6 What are the Metrics used to validate the result of regression and explain each.
- 7 How to construct Regression tree and write procedure to construct regression tree with example.
- 8 Explain CART (Classification & Regression tree) algorithm with example.
- 9 Compare Instance based learning and Model based learning. List example of Instance-based learning algorithm.
- 10 What is the role of kernels? Classify the different type of Kernel.
- 11 List the advantages of SVM and how optimal Hyperplane differ from Hyper plane
- 12 Explain Soft margin support vector machine.
- 13 Explain weighted K-nearest Neighbor algorithm.
- 14 Develop the following (i) Kernel based non-linear classifier.
(ii) Support Vector Regression.

UNIT V
APPLICATIONS OF MACHINE LEARNING
PART A

- 1 Define Pattern?
- 2 Explain pattern recognition
- 3 Compare statistical and structural approaches in pattern recognition
- 4 State Bayes theorem.
- 5 Illustrate the random variable.
- 6 Examine the parametric estimation method.
- 7 Distinguish between maximum likely hood and Bayes' method.
- 8 Explain feature extraction.
- 9 List properties of expectation-maximization algorithm.
- 10 What is clustering?
- 11 List Parametric and Non-Parametric techniques
- 12 Develop the F1 score? How would you use it?
- 13 Apply Precision and Recall to any model?
- 14 Organize how to Tackle Overfitting and Under fitting?
- 15 Summarize Ensemble learning.
- 16 Explain Correlation and Covariance?

- 17 Build the design pattern recognition system.
- 18 Discuss on Principal Component Analysis.
- 19 Discuss on non-parametric methods.
- 20 Define dimensionality reduction.

PART B

- 1 Explain general principles of likelihood estimation.
- 2 Recall maximum Likelihood estimation with mean and variance.
- 3 When the maximum likelihood and Bayes' method differ? Explain.
- 4 Explain principle component analysis.
- 5 Write an algorithm for expectation-maximization.
- 6 Derive the computation of hidden Markov model.
- 7 Estimate density Estimation under non-parametric method.
- 8 Write Short notes on Parzen-Window Estimation Estimation of Posterior Probability.
- 9 What is Linear Discriminant Function and explain its categories.
- 10 Write a Descent Algorithm under Relaxation procedures.
- 11 Describe Support Vector Machine. How the vector developed in the training pattern.
- 12 Discuss SVM for XOR problems.
- 13 Examine Pattern Recognition Systems and explain each components.
- 14 Construct a general Pattern Recognition Systems under design cycle.

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