SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

QUESTION BANK

I SEMESTER

1912105-MACHINE LEARNING TECHNIQUES

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Unit -I

Machine learning: What and why? - Examples of Machine Learning Applications - Types Of Machine Learning Supervised Learning - Machine Learning Process- The Curse of Dimensionality, Over fitting - Training, Testing, and Validation Sets-The Confusion Matrix & Basic Statistics-Bias-Variance Tradeoff.
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PART – A

Q.No	Questions	Competence	BT Level
1	What is machine learning?	Remember	BTL1
2	Point out few examples of machine learning applications.	Analyze	BTL 4
3	Distinguish between supervised and unsupervised learning.	Understand	BTL 2
4	Define Activation Function.	Remember	BTL 1
5	Describe the steps involved in machine learning process.	Understand	BTL 2
6	Analyze Accuracy metrics in Confusion matrix.	Apply	BTL3
7	Explain the issues in machine learning.	Analyze	BTL 4
8	Explain generalization.	Evaluate	BTL 5
9	Define Supervised Learning.	Remember	BTL 1
10	Assess the various types of Machine learning.	Evaluate	BTL 5
11	Define Over fitting.	Remember	BTL 1
12	Develop an example for Data sparsity.	Create	BTL 6
13	Define Confusion Matrix.	Remember	BTL 1
14	Identify the applications of Machine Learning.	Remember	BTL1
15	Examine the process of Machine learning.	Apply	BTL 3
16	Discuss about Bias Variance Trade off	Understand	BTL 2
17	Discover Curse of Dimensionality.	Apply	BTL 3
18	Develop an example that elaborates confusion matrix.	Create	BTL 6
19	Analyze Precision and Recall.	Analyze	BTL 4
20	Describe with example variance and covariance.	Understand	BTL 2

PART-B (13 MARK)

1	(i)What is machine learning? Discuss about learning and machine learning. (7) (ii)Discuss the various types of machine learning. (6)	Analyze	BTL 4
2	(i)Discuss in detail about Supervised learning. (7) (ii)Discuss about the Classification problem.(6)	Understand	BTL 2
3	(i)Summarize the Issues in Machine Learning.(7) (ii)Summarize the Curse of Dimensionality.(6)	Evaluate	BTL 5
4	(i)Describe the concept of Overfitting. (7) (ii)Describe Training , Testing and Validation sets with examples. (6)	Remember	BTL 1
5	Explain confusion Matrix with an example. (13)	Apply	BTL 3
6	Explain in detail about Machine Learning Process with an example.(13)	Apply	BTL 3
7	Develop an example for Naïve Bayes Classifier and discuss in detail.(13)	Create	BTL 6
8	(i)Describe in detail about the statistics involved in Machine Learning. (7)	Remember	BTL 1

	(ii)Discuss: Bias Variance Tradeoff with example. (6)		
9	(i)Discuss about Confusion Matrix. (7) (ii)Discuss about the concept of Precision and Recall with example.(6)	Understand	BTL 2
10	(i)Describe about Training, Testing and Validation sets. (7) (ii)Explain about the Machine Learning Process in detail.(6)	Remember	BTL 1
11	(i)Describe Naïve Bayes Classification. (7) (ii)Discuss about Bias and Variance. (6)	Remember	BTL 1
12	Summarize in detail about types of Regression and Classification in Supervised Learning. (13)	Understand	BTL 2
13	(i)Explain in detail about Supervised Learning. (7) (ii)Discuss the various application of Machine Learning. (6)	Analyze	BTL 4
14	Explain about Regression and Classification with an example. (13)	Analyze	BTL 4
PART - C (15 MARK)			
1	Given the confusion matrix [[73 7] [4 144]], Develop and Calculate Accuracy, Precision, Recall and Specificity, Explain in detail. (15)	Create	BTL 6
2	Explain the following for designing a learning system (i)choosing a function approximation algorithm (ii)estimating training values (iii)adjusting the weights (iv)the final design. (15)	Analyze	BTL 4
3	Describe in detail, how Machine Learning Algorithms can be tested with necessary examples. (15)	Remember	BTL 1
4	Describe Learning Process & Explain Supervised Learning in detail, Give Necessary examples. (15)	Remember	BTL 1

Unit -II

Hebb's Rule - Neural Networks - The Perceptron - Linear Separability& Linear Regression. The Multi-layer Perceptron: Biases, Algorithm - Local minima and Stochastic gradient Descent Examples Of Using The MLP : Regression Problem & Classification Example - Deriving Back-Propagation

PART - A

Q.No	Questions	Competence	BT Level
1	Analyze Back propagation Algorithm.	Analyze	BTL4
2	Write about Multilayer Perceptrons.	Remember	BTL1
3	List out different output activation functions.	Remember	BTL1
4	Discuss Local minima.	Understand	BTL2
5	What is Hebb's Rule?	Remember	BTL1
6	Give difference between local and distributed representation.	Understand	BTL2
7	Write about Linear Separability & Linear Regression.	Remember	BTL1
8	Name the two parts of MLP.	Understand	BTL2
9	Explain Regression problem.	Understand	BTL2
10	Write the error function used for the perceptron.	Remember	BTL1
11	Illustrate Neural Network and its functionality.	Apply	BTL 3
12	Describe the various steps of deriving Back Propagation.	Apply	BTL 3
13	What is Perceptron? Illustrate and explain.	Apply	BTL 3
14	Explain the principles of gradient descent.	Evaluate	BTL 5
15	Define Biases.	Remember	BTL 1
16	Differentiate optimal separating hyperplane and soft margin hyperplane.	Analyze	BTL 4
17	Analyze Local minima.	Analyze	BTL 4
18	Summarize Back propagation of error	Evaluate	BTL-5
19	Justify McCulloch and Pitt's Neuron.	Create	BTL-6
20	How perecptron learning algorithm used?	Create	BTL-6

PART-B (13 MARK)

1	(i)Write about multilayer perceptron. (7) (ii)Draw the structure of MLP network with inputs and outputs layer (6)	Remember	BTL 1
2	(i) Define the Back propagation Rule. (7) (ii)Describe the training rule for output unit weights (6)	Remember	BTL 1
3	(i)Write about Multilayer perceptron algorithm. (7) (ii)Describe how the MLP is designed to be a batch algorithm (6)	Remember	BTL 1
4	(i)What is Local Minima? (7) (ii)Discuss in detail about picking up Momentum (6)	Remember	BTL 1
5	Discuss the following (i) Data preparation in MLP (5) (ii)Amount of training Data (4) (iii)Number of Hidden layers (4)	Understand	BTL 2
6	(i)Describe the Linear separability and Linear Regression.(7)	Understand	BTL 2

	(ii)How to train test and validate the MLP. (6)		
7	(ii)Discuss Regression Problem of using MLP. (7) (ii) How Data compression is performed (6)	Understand	BTL 2
8	(i)Illustrate Generalization of multivariate data. (7) (ii)Describe in detail about Classification Problem(6)	Apply	BTL 3
9	Explain in detail about Neural network. (13)	Apply	BTL 3
10	(i)Create some examples of using MLP(7) (ii)Investigate how to derive Back Propogation. (6)	Analyze	BTL 4
11	(i)Explain the Perceptron Convergence Theorem. (7) (ii)Examine the Linear Regression examples. (6)	Analyze	BTL 4
12	(i) Generate the use and limitations of MccCulloch and Pits Neuronal Model. (7) (ii) Discuss about back propagation with time. (6)	Analyze	BTL 4
13	(i)Summarize about back propagation error. (7) (ii)Explain how the weights of the network are trained (6)	Evaluate	BTL 5
14	(i)Justify your answer why we use Interpolation and Basis function.(7) (ii)Discuss in detail about MLP Algorithm. (6)	Create	BTL 6
PART - C (15 MARK)			
1	Write about the MLP as a Universal Approximator. (15)	Evaluate	BTL5
2	(i)Create an example and explain about Linear Regression. (8) (ii)Describe Linear Separability. (7)	Create	BTL6
3	Illustrate some examples of using MLP and the four types of problems that are generally solved using MLP. (15)	Evaluate	BTL5

4	Write a case study for the following (15)
	     (i) Illustrate an example of using MLP
	     (ii) task involved
	     (iii) Input choice
	     (iv) Input encoding and output encoding.
		Create	BTL 6

Unit -III			
Linear Discriminant Analysis (LDA) - PRINCIPAL COMPONENTS ANALYSIS (PCA), Factor Analysis - Independent Components Analysis - **PROBABILISTIC MODEL -** Gaussian Mixture Models : EM Algorithm - Nearest Neighbour Methods - Support Vector Machines			
PART - A			
Q.No	Questions	Competence	BT Level
1	Define LDA.	Remember	BTL1
2	What is Support Vector Machine?	Remember	BTL1
3	What is Principal Component Analysis?	Remember	BTL1
4	Illustrate an example for Gaussian Mixture Models.	Apply	BTL3
5	Describe Factor Analysis.	Understand	BTL2
6	List out the advantages of SVM.	Remember	BTL1
7	Show the difference between LDA and PCA.	Apply	BTL3
8	Define EM algorithm.	Remember	BTL1
9	What is meant by Nearest Neighbour methods.	Understand	BTL2
10	Classify the different ways for Dimensionality Reduction.	Apply	BTL3
11	Point out the distance measure in Nearest neighbor methods.	Analyze	BTL4
12	Analyze the PCA and its relation with Multi Layer Perceptron.	Analyze	BTL4
13	Explain what is Locally Linear embedding.	Evaluate	BTL5
14	Define Independent Component analysis.	Remember	BTL1
15	What is Kernel PCA?	Understand	BTL2
16	Can you give the algorithmic steps in PCA?	Evaluate	BTL5
17	Justify the efficient distance computation methods.	Create	BTL6
18	Compose the distance measure used in probabilistic model.	Create	BTL6
19	What is SVM Regression?	Understand	BTL2
20	Analyze General Expectation-Maximisation (EM) Algorithm.	Analyze	BTL4
PART-B (13 MARK)			
1	(i)What is Principal Component Analysis. (7) (ii)Write the algorithm of PCA. (6)	Remember	BTL1
2	(i)Describe the PCA relation with MLP. (7) (ii)Explain Kernel PCA Algorithm. (6)	Remember	BTL1
3	(i)Explain in detail about Gaussian Mixture Models. (7) (ii)How Independent Component Analysis is done. (6)	Analyze	BTL4
4	Discuss the Probabilistic Learning methods involved in Machine Learning. (13)	Understand	BTL2
5	**Illustrate** the Gaussian Expectation-Maximization Algorithm with necessary example. (13)	Apply	BTL3
6	(i)What is KD-Tree? (7) (ii) Explain the Nearest Neighbor methods with example.(6)	Remember	BTL1
7	Illustrate the concept of Support Vector Machine with necessary examples.(13)	Apply	BTL3

8	(i) Write about Factor Analysis (6) (ii)Explain The Expectation-Maximization (Em) Algorithm. (7)	Remember	BTL1
9	Explain the following Statistics (i)Gaussian (6) (ii)EM Algorithm. (7)	Analyze	BTL4
10	(i) Describe the Nearest Neighbor Algorithm. (7) (ii)Write in detail about Nearest Neighbor Smoothing.(6)	Understand	BTL2
11	(i)Discuss the basic idea of KD-Tree (7) (ii)Write in detail about the Margin and Support Vectors. (6)	Understand	BTL2
12	(i)Write about Independent Component Analysis. (7) (ii)Discuss the Linear Discriminant Analysis. (6)	Evaluate	BTL5
13	Explain optimal Separation in Support Vector Machine.. (13)	Analyze	BTL4
14	(i)Illustrate the XOR Example. (7) (ii)Illustrate SVM Regression. (6)	Create	BTL6
PART - C (15 MARK)			
1	Illustrate EM Algorithm and explain the algorithm for the coin flipping Example. (15)	Create	BTL6
2	Discuss in detail the working of Support Vector Machine, its implementation and examples. (15)	Evaluate	BTL 5
3	(i)Explain in detail about Gaussian Mixture Model. (7) (ii)Write the General Expectation (EM) Algorithm. (8)	Evaluate	BTL 5
4	Justify the need of Dimensionality Reduction by explaining the following methods (i)Linear Discriminant Analysis (5) (ii) Principal Component Analysis (5) (iii) Independent Component Analysis (4)	Create	BTL6

	Unit -IV		
Evolutionary Learning **-** The Genetic Algorithms (GA)-Reinforcement Learning -Decision Trees - CLASSIFICATION AND REGRESSION TREES (CART) - Ensemble Learning : Boosting, Bagging, Random Forests - Unsupervised Learning : K-Means – Algorithm - Vector Quantisation.

PART - A
Q.No	**Questions**	**Competence**	**BT Level**
1	Point out the need of Evolutionary Learning.	Analyze	BTL4
2	Define Genetic Algorithm.	Remember	BTL1
3	Write the concept involved in evaluating fitness.	Understand	BTL2
4	Define mutation.	Remember	BTL1
5	Describe the basic Genetic algorithm.	Understand	BTL2
6	Discover the use of Vector Quantisation.	Apply	BTL3
7	Explain the Limitation of Genetic Algorithm.	Analyze	BTL4
8	Explain Boosting and Bagging.	Evaluate	BTL5
9	Define Markov property.	Remember	BTL1
10	Write a simple example of a Markov decision Process.	Evaluate	BTL5
11	How K-Means Algorithm is used in Unsupervised Learning.	Remember	BTL1
12	Express the basic concept involved in CART.	Create	BTL6
13	Define Gini Impurity.	Remember	BTL1
14	Identify how reinforcement learning maps states to action.	Remember	BTL1
15	Examine Genetic Programming.	Apply	BTL3
16	Discuss about reward function.	Understand	BTL2
17	Discover entropy function..	Apply	BTL3
18	Differentiate Sarsa and Q-learning.	Create	BTL6
19	Analyze ID3.	Analyze	BTL4
20	Describe shortly Random Forest Algorithm.	Understand	BTL2
PART-B (13 MARK)
1	(i)Write the use of Genetic Algorithm. (7) (ii)Discuss an example that illustrate the use of Genetic Algorithm. (6)	Analyze	BTL4
2	Discuss in detail about Reinforcement Learning and elaborate on Markov Decision Process. (13)	Understand	BTL2
3	(i)Write in detail about Decision Tree. (7) (ii)Write in detail Classification and Regression Tree (CART).(6)	Evaluate	BTL5
4	Describe Random Forest Algorithm with an example. (13)	Remember	BTL1
5	(i) Explain in detail about Boosting (7) (ii) Discover the use of Bagging. (6)	Apply	BTL3
6	Explain the concept and algorithm involved in Unsupervised Learning Environment. (13)	Create	BTL6
7	(i)Describe Knapsack Problem using Genetic Algorithm. (7) (ii) Describe about Limitations involved in Genetic Algorithm. (6)	Remember	BTL1
8	(i)Describe in detail about Generating Offspring Genetic Operators. (7) (ii)Discuss the Basic Genetic Algorithm. (6)	Understand	BTL2

9	(i)Identify the difference between Sarsa and Q-learning. (7) (ii)Discuss an example for the reinforcement learning. (6)	Remember	BTL1
10	(i)Describe Knapsack problem for GA. (7) (ii)Describe the for peaks Problem for GA. (6)	Remember	BTL1
11	(i)Write in detail about reinforcement learning. (7) (ii)Illustrate the use of reinforcement learning.(6)	Create	BTL6
12	(i)Write about the ID3. (7) (ii) Generalize how Classification is done with an Example. (6)	Create	BTL 6
13	(i)Write in detail about CART. (7) (ii)Show the different ways to combine classifiers. (6)	Remember	BTL 1
14	Describe in detail about (i)K-Means Clustering algorithm (7) (ii) Vector Quantisation.(6)	Create	BTL 6
PART - C (15 MARK)			
1	Generalize Decision Tree and explain the implementation of Decision Tree (15)	Create	BTL 6
2	Write in detail about Reinforcement Learning, Give an Example implementation and write down its uses. (15)	Create	BTL 6
3	Choose two destination with different routes connecting them. Apply genetic algorithm to find the optional path based on distance. (15)	Analyze	BTL 4
4	(i)Explain about K-Means Algorithm with an example. (8) (ii) Explain about Normalization and Vector Quantization. (7)	Evaluate	BTL 5

	Unit -V		
	Bayesian Networks - Markov Random Fields - Hidden Markov Models (HMMS) - Markov Chain Monte Carlo (MCMC) Methods - Deep Belief Networks (DBN)		

PART - A

Q.No	Questions	Competence	BT Level
1	Point the concept involved in Bayesian Networks.	Analyze	BTL4
2	Define MCMC	Remember	BTL1
3	Distinguish random numbers and Gaussian Random numbers	Understand	BTL2
4	Define Deep Belief Network.	Remember	BTL1
5	Describe Markov Chains	Understand	BTL2
6	Discover Graphical models use.	Apply	BTL3
7	Explain the Various MCMC methods	Analyze	BTL4
8	Explain graphical models	Evaluate	BTL5
9	Define HMM.	Remember	BTL1
10	Write Variable Elimination Algorithm.	Evaluate	BTL5
11	List the purpose of Gibbs Sampling.	Remember	BTL1
12	Express Bayesian Belief network	Create	BTL6
13	Difference Deep learning and Machine Learning.	Remember	BTL1
14	Write about Baum–Welch or Forward–Backward Algorithm	Remember	BTL1
15	Examine the various tracking methods.	Apply	BTL3
16	Discuss the concept of Deep Learning.	Understand	BTL2
17	Discover the Markov Random Field Image Denoising Algorithm	Apply	BTL3
18	Express in detail about Viterbi algorithm.	Create	BTL6
19	Analyze Markov Random Fields.	Analyze	BTL4
20	Describe the Forward algorithm.	Understand	BTL2
PART-B (13 MARK)			
1	Analyze the concept involved in Markov Random Fields. (13)	Analyze	BTL4
2	(i)Discuss Gaussian Random numbers. (7) (ii)Describe Markov Random Fields. (6)	Understand	BTL2
3	(i) Write the Rejection Sampling Algorithm. (7) (ii)Show the histogram of a mixture of two Gaussians. (6)	Evaluate	BTL5
4	(i) Describe Sampling –importance resampling algorithm. (7) (ii) Describe Gibbs Sampling. (6)	Remember	BTL1
5	(i) Explain in detail about MCMC (7) (ii) Discover Simulated Annealing by a distribution. (6)	Apply	BTL3
6	(i)Structure two graphical models and show the various relationship between the nodes.(7) ii) Explain about conditional table. (6)	Create	BTL6
7	(i).Describe variable elimination algorithm. (7) (ii)Describe the Approximate Inference. (6)	Remember	BTL1
8	Describe the concept involved in Simulated Annealing and Gibbs Sampling. (13)	Understand	BTL2
9	Explain the decoding problem by viterbi algorithm. (13)	Remember	BTL1
10	(i)Describe in detail Markov Random fields. (7) (ii)Write the Markov Random Field Image Denoising Algorithm. (6)	Remember	BTL1

11	(i)Write in detail forward algorithm. (7) (ii)Discuss HMM forward algorithm. (6)	Create	BTL6
12	Write a HMM Baum-Welch(forward –Backward)algorithm. (13)	Create	BTL 6
13	(i)Write about Tracking methods. (7) (ii) Identify hidden Markov models in detail. (6)	Remember	BTL 1
14	(i)Describe in detail about Kalman Filter Algorithm. (7) (ii)Discuss about The particle Filter. (6)	Create	BTL 6
PART - C (15 MARK)			
1	Discuss about Bayesian Network and discuss in detail with "Exam Fear" example. Also explain the making of Bayesian Networks. (15)	Create	BTL 6
2	Write the concept involved in Deep Belief Network and its algorithm also justify how Deep learning is the most prominent field in current generation. (15)	Create	BTL 6
3	Explain about Markov Chain Monte Carlo Methods, algorithm and implementation with example. (15)	Analyze	BTL 4
4	Describe in detail about the Hidden Markov Models.(HMMS) also generate the Forward, Viterbi and Baum Welch Algorithm. (15)	Evaluate	BTL 5