SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OFELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

VII SEMESTER

CS8082 MACHINE LEARNING TECHNIQUES

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Prepared by

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SRM VALLIAMMAI ENGNIEERING COLLEGE
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SUBJECT : CS8082 MACHINE LEARNING TECHNIQUES
SEM / YEAR: VII/IV

UNIT I – INTRODUCTION			
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.			
PART-A (2 - MARKS)			
Q. No	QUESTIONS	Competence	BT Level
1.	Why Machine learning is important?	Remember	BTL-1
2.	Classify positive and negative examples for the target concept.	Apply	BTL-3
3.	Mention the summary of choices in designing the checkers learning program.	Apply	BTL-3
4.	List applications of machine learning.	Analyze	BTL-4
5.	Illustrate terms of machine learning.	Remember	BTL-1
6.	Sketch a decision tree for an example of play tennis.	Analyze	BTL-4
7.	Summarize the steps in designing a program to learn to play checkers.	Evaluate	BTL-5
8.	Write short notes on concept learning as a search.	Remember	BTL-1
9.	Mention the issues in machine learning.	Understand	BTL-2
10.	Describe the four modules of final design in checkers learning problem.	Remember	BTL-1
11	What are the useful perspective on machine learning?	Evaluate	BTL-5
12.	State the inductive Learning Hypothesis.	Remember	BTL-1
13.	List the algorithms of concept learning.	Remember	BTL-1
14.	Summarize the concept of Biased Hypothesis Space.	Create	BTL-6
15.	Write about the Decision tree learning.	Analyze	BTL-4
16.	Outline the effect of reduced Error pruning in decision tree algorithm.	Understand	BTL-2

17.	What are the instances for the EnjoySport concept learning task?	Create	BTL-6
18.	Examine how we use the more-general-than partial ordering to organize the search for a hypothesis consistent with the observed training examples.	Apply	BTL-3
19.	Express how three Hypotheses h1, h2, h3 from EnjoySport example are related by the >=g relation?	Understand	BTL-2
20.	Labelthe set of instances with an example.	Understand	BTL-2
	PART-B (13- MARKS)		
1.	Statethe three features to have a well-defined learning problem for the following (i)A checkers learning problem (4) (ii)A handwritten recognition learning problem (4) (iii)A robot driving learning problem. (5)	Remember	BTL1
2.	Summarize the steps in detail about how to design a program to learn to play checkers. (13)	Understand	BTL2
3.	(i)Describe in detail the rule for estimating training values. (7) (ii)State the final design of checkers learning system. (6)	Remember	BTL1
4.	Explain the useful perspectives of machine learning in different applications. (13)	Apply	BTL3
5.	Write about the differentissues in Machine Learning. (13)	Understand	BTL2
6.	(i)Generalize the concept of Learning task. (7) (ii)With the help of training example explain the Inductive Learning Hypothesis. (6)	Create	BTL6
7.	(i)Define the concept learning as search? (7) (ii)Describe the General-to-Specific Ordering of Hypotheses. (6)	Remember	BTL1
8.	(i)Illustrate with a diagram the decision tree representation for the concept of playtennis. (7) (ii)List the appropriate problems for Decision tree learning. (6)	Apply	BTL3
9.	(i)Explain in detail the FIND-S: Finding a Maximally Specific Hypothesis. (7) (ii)Find the key properties of FIND-S algorithm. (6)	Evaluate	BTL5

10.	Explainthe following : (i)Compact Representation for Version Spaces (ii)The LIST-THEN-ELIMINATE Algorithm.	(7) (6)	Analyze	BTL4
11.	Illustrate the basic decision tree algorithm with an example.	(13)	Apply	BTL3
12.	Summarize the Candidate–Elimination Algorithm with an example.	(13)	Understand	BTL2
13.	(i)Define Inductive Bias. (ii)Write short notes on biased Hypothesis Space.	(3) (10)	Remember	BTL1
14.	(i) Explain in detail an Unbiased Learner for Enjoy sport learning task. (ii) List out about the Futilityof Bias-Free Learning.	(7) (6)	Analyze	BTL4
	PART-C (15- MARK)			
1.	Sketch and explainthe decision tree to represent the following Boolean functions: a) $A \cap B$ b) $A \cup [B \cap C]$ c)Axor B d)$[A \cap B] \cup [C \cap D]$	(15)	Create	BTL6
2.	Draw and solve the decision trees for the following set of training examples . (table below)	(15)	Create	BTL6
3.	Write short notes about the following: (i)Will the Candidate –Elimination Algorithm Converge to the Correct Hypothesis? (ii)What Training Example Should the Learner	(15)	Evaluate	BTL5

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

	Request Next?			
4.	(i) Assess the Candidate-Elimination algorithm. (ii)Explain the candidate elimination algorithm. Apply the algorithm to obtain the final version space for the training example.	(15)	Evaluate	BTL5

SI.No	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	Cold	Change	Yes

UNIT II - NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

PART-A (2 - MARKS)

Q.No	QUESTIONS	BT Level	Competence
1.	Define the biological motivation for studying ANN.	Create	BTL6
2.	State the concept of Artificial neural network.	Remember	BTL1
3.	Describe with an example Neural network representation.	Remember	BTL1
4.	Label the linearly separable sets of examples.	Remember	BTL1
5.	List out the characteristic to which the back propagation algorithm is used.	Remember	BTL1
6.	Compare and contrast the gradient descent and Delta rule.	Analyze	BTL4
7.	What are all the Boolean functions represented by perceptron?	Remember	BTL1
8.	Assess about theBack propagation algorithm.	Evaluate	BTL5
9.	What type of unit we can use as the basis for constructing multilayer network?	Understand	BTL2
10.	Why perceptron is used to represent AND, OR, NAND and NOR is important?	Analyze	BTL4
11.	How hypothesis in Genetic Algorithm is represented?	Create	BTL6
12.	Describe about Genetic Algorithm.	Understand	BTL2
13.	What are the advantages of genetic algorithm?	Understand	BTL2
14.	Examine about the Baldwin Effect.	Apply	BTL3
15.	Distinguish betweencrossover and mutation.	Analyze	BTL4

16.	Write short notes on crowding.		Remember	BTL1
17.	How to perform genetic programming?		Evaluate	BTL5
18.	Illustrate the Lamarckian Evolution.		Apply	BTL3
19.	Summarize about the Schema in GA.		Understand	BTL2
20.	Write about program tree representation in genetic programming.		Apply	BTL3
1.	Explain the multi-layer perceptron model with a neat diagram.	(13)	Analyze	BTL-4
2.	Assess for which problems is ANN learning is well suited and write down the characteristics.	(13)	Create	BTL6
3.	(i)Illustrate the diagram for visualizing the Hypothesis space. (ii)Examine the derivation of the Gradient Descent Rule.	(7) (6)	Apply	BTL3
4.	(i)Summarize the derivation of the Back propagation Algorithm. (ii)Explain Detail about theGradient Descent algorithm.	(7) (6)	Evaluate	BTL5
5.	(i)Define Perceptrons with neat diagram. (ii)Describe about perceptron with an example and draw the decision surface represented by a two-input perceptron.	(7) (6)	Remember	BTL1
6.	(i)What is the Perceptron Training rule? (ii)Enumerate the Backpropagationalgorithm.	(3) (10)	Remember	BTL1
7.	(i)Distinguish between Gradient descent and Delt rule. (ii)Describethe delta training rule with an example.	(5) (8)	Understand	BTL2
8.	(i)Explore how the hypothesis inGAs are represented by bit strings (ii)Write aboutthe IF-THEN rules and the reason why it can be encoded.	(7) (6)	Analyze	BTL4
9.	(i)List out the Geneticalgorithm steps with example. (ii) Illustratethe prototypical genetic algorithm.	(8) (5)	Remember	BTL1
10.	(i)List and explainthe common operators for GeneticAlgorithm. (ii)State about the crossovers with diagram.	(7) (6)	Apply	BTL-3
11.	(i)Define fitness function.	(5)	Understand	BTL2

	(ii)Examine how genetic algorithm searches large space of candidate objects with an example According to fitness function.	(8)		
12	(i)Explainhypothesis space search of GAs with neural network back propagation. (ii)Illustrate what isAdd Alternativeand DropCondition.	(7) (6)	Apply	BTL3
13.	Write in detail the Population Evolution and the Schema Theorem.	(13)	Understand	BTL-2
14.	(i)Label the genetic programming and draw the program tree representation in genetic programming. (ii)Describe an example to explain the genetic programming.	(7) (6)	Remember	BTL-1
PART-C (15 -MARKS)				
1.	Outline the concepts of Inductive Bias and Generalize the Hidden Layer Representations.	(15)	Create	BTL6
2.	Explain in detail the following (i)Alternative Error Functions (ii) Alternative Error Minimization Procedures	(8) (7)	Evaluate	BTL5
3.	Formulate the models of evolution and learning in Genetic algorithm.	(15)	Create	BTL6
4.	Assess the parallelizing Genetic Algorithms with an example.	(15)	Evaluate	BTL5
UNIT-III BAYESIAN AND COMPUTATIONAL LEARNING				
Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description LengthPrinciple – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – BayesianBelief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and InfiniteHypothesis Spaces – Mistake Bound Model.				
PART-A (2 - MARKS)				
1.	List the advantages of studying Bayesian learning methods.		Remember	BTL1
2.	Define Bayes Theorem.		Remember	BTL1
3.	DescribeMaximum likelihood.		Remember	BTL1
4.	What is Minimum Description Length principle?		Remember	BTL1
5.	Name theBayes optimal classification.		Remember	BTL1
6.	State about the Gibbs Algorithm.		Remember	BTL1
7.	Write the formulas of basic probability		Understand	BTL2
8.	Differentiate Bayes theorem and concept learning.		Analyze	BTL4

9.	Explain Bayesian belief networks.		Evaluate	BTL5
10.	Find the formula for probability density function.		Understand	BTL2
11.	Generalize the probably approximately correct (PAC) learning model.		Create	BTL6
12.	Illustrate the mistake bound model of learning.		Apply	BTL3
13.	Assess the true error.		Analyze	BTL4
14.	Formulate the term sample complexity.		Create	BTL6
15.	Summarize the advantages of EM algorithm.		Understand	BTL2
16.	Outline €-exhausting the version space		Evaluate	BTL5
17.	Describe Brute-Force Map Learning Algorithm.		Understand	BTL2
18.	Explain about the EM algorithm.		Analyze	BTL4
19.	List the set of three instances shattered by eight hypotheses.		Apply	BTL3
20.	Illustrate the Shattering a Set of Instances		Understand	BTL2
PART-B (13- MARKS)				
1.	(i)Examine the detail about Bayes theorem with an Example. (ii)Outline the features of Bayesian learning method.	(7) (6)	Understand	BTL2
2.	(i)Summarize in detail the relationship between Bayes theorem and Concept learning. (ii)Write down the Brute force Bayes Concept Learning.	(7) (6)	Evaluate	BTL5
3.	Explain maximum likelihood algorithm.	(13)	Analyze	BTL4
4.	Illustrate with an example why Gibbs Algorithm is better than the Bayes Optimal classifier.	(13)	Apply	BTL3
5.	(i)State and explain the minimum description length principle. (ii)Describe the concepts of Minimum Description Length principle.	(7) (6)	Understand	BTL2
6.	(i)Write about theBayes optimal classifier. (ii)Elaborate the Bayes optimal classification.	(7) (6)	Create	BTL6
7.	(i)Illustrate the naïve Bayes classifier. (ii)Explain naive Bayes classifier with example.	(7) (6)	Analyze	BTL4
8.	(i)Illustrate about the Bayesian belief networks (ii)Describe the conditional Independence.	(7) (6)	Remember	BTL1
9.	(i)State about the about the EM algorithm. (ii)Write short notes onEstimating Means of k Gaussians.	(7) (6)	Remember	BTL1

<table>
<tr><td>10.</td><td>(i)Examine the detail of probability learning.
(ii)Define the Error of a Hypothesis.</td><td>(7)
(6)</td><td>Remember</td><td>BTL1</td></tr>
<tr><td>11.</td><td>Explain detail about the PAC Learnability.</td><td>13)</td><td>Analyze</td><td>BTL-4</td></tr>
<tr><td>12.</td><td>(i)Write aboutsample complexity for finite hypothesis Spaces.
(ii)Outline the mistake bound model of learning.</td><td>(7)
(6)</td><td>Understand</td><td>BTL-2</td></tr>
<tr><td>13.</td><td>(i)What is the €-exhausting the version space?
(ii)Write about the Learning and Inconsistent Hypotheses.</td><td>(7)
(6)</td><td>Remember</td><td>BTL-1</td></tr>
<tr><td>14.</td><td>(i)Illustratethe sample complexity for infinite hypothesis spaces.
(ii)Write a short note on vapnik-chervonenkis dimension.</td><td>(7)
(6)</td><td>Apply</td><td>BTL-3</td></tr>
<tr><td colspan="5">PART-C(15 -MARKS)</td></tr>
<tr><td>1.</td><td>Does the patient have cancer, or does he 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, 0.008 of the entire population have this cancer.</td><td>(15)</td><td>Create</td><td>BTL-6</td></tr>
<tr><td>2.</td><td>(i)Assess theBayesian belief network.
(ii)Mention the Importance of Bayesian network is used to infer values of target variable?</td><td>(15)</td><td>Evaluate</td><td>BTL5</td></tr>
<tr><td>3.</td><td>
<table>
<tr><th>Day</th><th>Outlook</th><th>Temperature</th><th>Humidity</th><th>Wind</th><th>Play Tennis</th></tr>
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<tr><td>D5</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr>
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</table>
A set of 14 training examples of the target concept</td><td>(15)</td><td>Create</td><td>BTL-6</td></tr>
</table>

	Play Tennis, where each day is described by the attributes Outlook, Temperature, Humidity, and Wind. use the naive Bayes classifier and the training data from this table to classify the following novel instance: (Outlook = sunny, Temperature = cool, Humidity = high, Wind = strong)			
4.	(i)Summarize the General Statement of EM Algorithm. (ii) Explain in detail about k -Means Algorithm.	(6) (9)	Evaluate	BTL5
UNIT IV- INSTANT BASED LEARNING				
K-NearestNeighbourLearning–LocallyweightedRegression–RadialBasisFunctions – Case Based learning				
PART-A (2 -MARKS)				
1.	Define the formula for the distance between two instances.		Remember	BTL1
2.	Mention the accuracy of radial basis function network.		Apply	BTL3
3.	Describe the k-nearest neighbor learning algorithm.		Remember	BTL1
4.	Illustrate how the Instance-based learning methods differ from function approximation.		Apply	BTL3
5.	Write the the k-nearest neighbour algorithm for approximating a discrete-valued function.		Analyze	BTL4
6.	What is the nature of the hypothesis space H implicitly considered by the k-nearest neighbour algorithm?		Remember	BTL1
7.	Write about the locally weighted regression.		Remember	BTL1
8.	Identify the distance-weighted nearest neighbour algorithm.		Remember	BTL1
9.	State about thecurse of dimensionality.		Remember	BTL1
10.	Differentiate Regression, Residual, Kernel function.		Analyze	BTL4
11.	List the advantages of instance –based methods.		Understand	BTL2
12.	Summarize the advantage and disadvantage of Locally weighted Regression.		Understand	BTL2
13.	Distinguish between lazy versus eager learning?		Understand	BTL2
14.	Write the three properties that are shared by the Instance-based methods.		Create	BTL6
15.	Summarize the three lazy learning methods.		Evaluate	BTL5
16.	Sketch the voronoi diagram for k nearest neighbour.		Apply	BTL3
17.	Define radial basis functions.		Evaluate	BTL5
18.	Write the formula for Locally Weighted Linear -		Create	BTL6

	Regression.			
19.	What is the inductive bias of k-nearest neighbour?		Analyze	BTL4
20.	Distinguish between CADET and k-nearest Neighbor.		Understand	BTL2
PART-B (13- MARKS)				
1.	(i) Illustrate the disadvantages of Instance –based methods. (ii) Examine the k-nearest learning algorithm.	(7) (6)	Apply	BTL3
2.	Assess the detail about distance-weighted nearest neighbour algorithm.	(13)	Evaluate	BTL5
3.	(i)Explain Locally weighted linear regression. (ii)Illustrate Locally Weighted Linear Regression with an example.	(7) (6)	Create	BTL6
4.	(i)Outline the concepts of the radial basis functions. (ii)Describe the two stage process of the RDF networks.	(7) (6)	Analyze	BTL4
5.	(i)Summarize the detail about locally weighted regression (ii)Mention the pros and cons of Locally weighted regression.	(7) (6)	Understand	BTL 2
6.	Explain the inductive bias of k-Nearest neighbor algorithm with example.	(13)	Analyze	BTL4
7.	List and explain the generic properties of case-based reasoning systems.	(13)	Understand	BTL2
8.	State the prototypical example of case-based reasoning system.	(13)	Remember	BTL1
9.	How the lazy learning differs from other learning model explain with example?	(13)	Remember	BTL1
10.	Examine the Instance-based learning methods.	(13)	Remember	BTL1
11.	(i)Explain in detail about eager learning. (ii)How the eager learning differs from lazy learning?	(7) (6)	Analyze	BTL4
12.	Illustrate several generic properties of case –based Reasoning systems	(13)	Apply	BTL-3
13.	Outline the concepts of CADET system with an example.	(13)	Understand	BTL-2
14.	Describe the disadvantages and advantages of Lazy and Eager learning.	(13)	Remember	BTL-1
PART-C (15-MARKS)				

1.	Explain about the Case-based reasoning (CBR).	(15)	Evaluate	BTL-5
2.	Compare the difference between the Lazy and Eager learning algorithms.	(15)	Evaluate	BTL-5
3.	Illustrate the Generalize the Locally weighted regression model.	(15)	Create	BTL-6
4.	Predict the error E(x,) to emphasize the fact that now the error is being defined as a function of the query point x.	(15)	Create	BTL-6
UNIT V- ADVANCED LEARNING				
Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First OrderRules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution–Analytical Learning–Perfect Domain Theories–Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.				
PART-A (2 -MARKS)				
1.	What is explanation based learning?		Remember	BTL1
2.	Define the concepts of first-order Horn clauses.		Apply	BTL3
3.	State the learn-one-rule.		Remember	BTL1
4.	What is Sequential Covering Algorithm.		Apply	BTL3
5.	Examine the Prolog-EBG.		Apply	BTL3
6.	Describe Inverting resolution.		Remember	BTL1
7.	List out the terminology in Horn clause.		Remember	BTL1
8.	Define Turing-equivalent programming language		Remember	BTL1
9.	Write about the Reinforcement learning model.		Remember	BTL1
10.	How the learn rule sets differ from genetic algorithm?		Analyze	BTL4
11.	Outline the importance of Temporal learning.		Understand	BTL2
12.	Write about the sequential covering algorithm for learning a disjunctive set of rules.		Understand	BTL2
13.	Distinguish between the FOIL and the other algorithm.		Understand	BTL2
14.	How to represent induction as inverted deduction?		Create	BTL6
15.	What is inductive logic programming.		Evaluate	BTL5
16.	Outline the concept of Q learning algorithm.		Analyze	BTL4
17.	Compare Inductive and Analytical Learning Problems		Evaluate	BTL5
18.	Assess a Proportional form if clauses C1 and C2 are given.		Create	BTL6
19.	Define the Horn clause.		Analyze	BTL4
20.	Summarize about theFOIL algorithm.		Understand	BTL2
PART-B(13 MARKS)				

1.	Assess the learning sets of rules and how it differs from other algorithms.	(13)	Evaluate	BTL5
2.	(i)Summarize the steps involved in Sequential Covering Algorithm. (ii)Explain the Learn one rule on one example.	(7) (6)	Analyze	BTL4
3.	Outline theconcepts of learning task and temporal difference learning.	(13)	Understand	BTL2
4.	(i)Write in detail sequential –covering algorithm. (ii)State about the AQ algorithm.	(7) (6)	Remember	BTL1
5.	Explain in detail about the first order logic basic definitions.	(13)	Analyze	BTL4
6.	Illustrate the diagram for the search for rule preconditions as learn-one-rule proceeds from general to specific.	(13)	Apply	BTL3
7.	(i)Write about the learning Rule sets. (ii)Write some common evaluation functions in the learning rule sets.	(7) (6)	Analyze	BTL4
8.	Relate the concepts of induction as inverted deduction	(13)	Apply	BTL3
9.	Write in detail Learning First –order rules.	(13)	Understand	BTL2
10.	(i)List thelearning sets of first-order rules: foil (ii)Memorize about the Basic Foil algorithm.	(7) (6)	Remember	BTL1
11.	(i)Describe about learning with perfect domain theories: prolog-eb. (ii)Identify any training with example for PROLOG-EBG.	(7) (6)	Remember	BTL1
12.	Summarize about the Q-learning model and explain with diagram.	(13)	Understand	BTL2
13.	(i)Explain Reinforcement learning with an example. (ii)Prove the theory of Temporal difference learning.	(7) (6)	Create	BTL6
14.	Define and explain about the Analytical learningmodel with example.	(13)	Remember	BTL1
PART-C(15 MARKS)				
1.	Assess the following horn clauses (i) First-Order Horn Clauses (ii) Basic terminology in horn clauses.	(15)	Create	BTL6
2.	Generalize the concept of inverting resolution	(15)	Create	BTL6

	model.			
3.	Summarize the merits and demerits of FOCL Algorithm	(15)	Evaluate	BTL5
4.	Describethe Temporal Difference Learning model with an example.	(15)	Evaluate	BTL5