

M.E. COMPUTER SCIENCE AND ENGINEERING FIRST YEAR FIRST SEMESTER - 2018

Machine Learning

Time: Three hours

Full Marks: 100

Answer any FIVE questions.

1. a) How to measure purity (impurity) of a collection of training examples? Define information gain measure? What is its use in decision tree learning? Give a suitable example.

What are reasons of overfitting? Describe the methods for avoiding overfitting in Decision tree learning?

(2+3) + 5 + (3+7) = 20 marks

2. a) How to represent hypothesis for a perceptron model?

Derive gradient descent rule for a sigmoid unit perceptron model.

Explain when the error surface may have only one global minimum and when it may have many local minima.

What is the role of momentum parameter while training Artificial Neural Networks.

- b) What is the need of hidden layers in Artificial Neural Networks? Justify with an example.

(3+7+2+3) + 5 = 20 marks

3. Derive backpropagation algorithm used to train Artificial Neural Networks.

20 marks

4. What is meant by Deep Neural Networks? What are the limitations of the traditional backpropagation (BP) algorithm when it is used in training Deep Neural Networks?

What is Autoencoder? What is its use?

Describe the steps of training Deep Belief Networks (DBN).

(2+5)+5 +8=20 marks

5. a) What are the merits of Support Vector Machines (SVM)? What are called support vectors?

With necessary formulation and derivation, justify the following statement:

"SVM cares only about the instances close to the boundary and discards those that lie more than sufficiently away from the discriminant"

What is the connection of Kernel methods with training SVM? -explain.

(3+2) + 10+5=20 marks

6. Consider the following set of training examples and design *Naïve Bayesian* classifier. Show how the obtained model will classify the test instances, *<sunny, mild, normal, weak>* and *<overcast, cool, normal, strong>*.

Day	Outlook	Temp.	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	Weak	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cold	Normal	Weak	No
D10	Rain	Mild	Normal	Strong	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

Explain how the continuous attributes are handled in Bayesian learning. 15 + 5=20 marks

7.

- a) Explain (with examples) the following performance measures for machine learning algorithms
 - i. *Accuracy* ii. *Error rate* iii. *True positive rate* iv. *False positive rate* v. *F-measure*
- b) Discuss the merits and demerits of *K-means* clustering algorithm.
- c) What are the merits of Bayesian learning algorithm?

10+ 5 +5 = 20 marks
