

Enrollment No.....



Faculty of Engineering
End Sem (Even) Examination May-2019
CS3EA07 Machine Learning

Programme: B.Tech.

Branch/Specialisation: CSE

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Suppose $\Theta_0=1$, $\Theta_1=2$, and we simultaneously update Θ_0 and Θ_1 using the rule: $\Theta_j = \Theta_j + \sqrt{\Theta_0\Theta_1}$ (for $j=0$ and $j=1$), what are the resulting values of Θ_0 and Θ_1 ? **1**
- (a) $\Theta_0=1$, $\Theta_1=2$
 (b) $\Theta_0=1+\sqrt{2}$, $\Theta_1=2+\sqrt{2}$
 (c) $\Theta_0=2+\sqrt{2}$, $\Theta_1=1+\sqrt{2}$
 (d) $\Theta_0=1+\sqrt{2}$, $\Theta_1=2+\sqrt{1+\sqrt{2}.2}$
- ii. A _____ is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. **1**
- (a) Decision tree (b) Graphs
 (c) Trees (d) Neural Networks
- iii. Which of the following are real world applications of the SVM? **1**
- (a) Market Segmentation
 (b) Image Classification
 (c) Clustering of News Articles
 (d) All of these
- iv. Which of the following option would you more likely to consider iterating SVM next time? **1**
- (a) You want to increase your data points
 (b) You want to decrease your data points
 (c) You will try to create more features
 (d) You will try to reduce the features

P.T.O.

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- v. Which of the following can act as possible termination conditions in K-Means? **1**
- (a) For a fixed number of iterations.
 - (b) Assignment of observations to clusters does not change between iterations. Except for cases with a bad local minimum.
 - (c) Centroids do not change between successive iterations.
 - (d) All of these
- vi. What will happen when eigen values are roughly equal? **1**
- (a) PCA will perform outstandingly
 - (b) PCA will perform badly
 - (c) Can't Say
 - (d) None of these
- vii. Which of the following algorithm is not an example of an ensemble method? **1**
- (a) Bagging
 - (b) Random Forest
 - (c) Gradient Boosting
 - (d) Decision Tree
- viii. Which of the following is/are true about boosting trees? **1**
- I. In boosting trees, individual weak learners are independent of each other.
 - II. It is the method for improving the performance by aggregating the results of weak learners
 - (a) I
 - (b) II
 - (c) I and II
 - (d) None of these
- ix. The number of nodes in the input layer is 10 and the hidden layer is 5. The maximum number of connections from the input layer to the hidden layer are **1**
- (a) 50
 - (b) Less than 50
 - (c) More than 50
 - (d) It is an arbitrary value
- x. In which of the following applications can we use deep learning to solve the problem? **1**
- (a) Protein structure prediction
 - (b) Prediction of chemical reactions
 - (c) Detection of exotic particles
 - (d) All of these

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- Q.2 Attempt any two: **5**
- i. Define supervised learning. Explain logistic regression in detail **5**
 - ii. Define regression. Discuss k-NN classifier in detail. **5**
 - iii. How decision tree works for classification task? Explain with example. **5**
- Q.3 Attempt any two: **5**
- i. Describe the process of classification with support vector machine with diagram. **5**
 - ii. Explain ranking method in machine learning. Discuss kernel methods. **5**
 - iii. Differentiate binary classification and multi-class classification. **5**
- Q.4 Attempt any two: **5**
- i. Discuss principal component analysis in detail with example. **5**
 - ii. Define clustering. Write algorithm for k-means clustering. **5**
 - iii. Derive eigen values for the given data matrix. **5**
- $$M = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 3 & 1 \end{bmatrix}$$
- Q.5 Attempt any two: **5**
- i. Discuss methods of evaluation for a machine learning algorithm. **5**
 - ii. Explain random forest method with example. **5**
 - iii. What are the pros and cons of using ensemble methods? Discuss in detail. **5**
- Q.6 Attempt any two: **5**
- i. How deep learning improves the process of classification? **5**
 - ii. Differentiate between reinforcement learning and supervised learning. **5**
 - iii. Discuss semi-supervised learning and Bayesian learning method. **5**

Marking Scheme
CS3EA07 Machine Learning

- Q.1 i. Suppose $\Theta_0=1$, $\Theta_1=2$, and we simultaneously update Θ_0 and Θ_1 using the rule: $\Theta_j = \Theta_j + \text{sqrt}(\Theta_0\Theta_1)$ (for $j=0$ and $j=1$), what are the resulting values of Θ_0 and Θ_1 ? **1**
(b) $\Theta_0=1+\text{sqrt}(2)$, $\Theta_1=2+\text{sqrt}(2)$
- ii. A _____ is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. **1**
(a) Decision tree
- iii. Which of the following are real world applications of the SVM? **1**
(d) All of these
- iv. Which of the following option would you more likely to consider iterating SVM next time? **1**
(c) You will try to create more features
- v. Which of the following can act as possible termination conditions in K-Means? **1**
(d) All of these
- vi. What will happen when eigen values are roughly equal? **1**
(b) PCA will perform badly
- vii. Which of the following algorithm is not an example of an ensemble method? **1**
(d) Decision Tree
- viii. Which of the following is/are true about boosting trees? **1**
I. In boosting trees, individual weak learners are independent of each other.
II. It is the method for improving the performance by aggregating the results of weak learners
(b) II
- ix. The number of nodes in the input layer is 10 and the hidden layer is 5. The maximum number of connections from the input layer to the hidden layer are **1**
(a) 50
- x. In which of the following applications can we use deep learning to solve the problem? **1**
(d) All of these

- Q.2 Attempt any two: **5**
- i. Supervised learning 2 marks
Logistic regression 3 marks

- ii. Regression 2 marks **5**
k-NN classifier 3 marks
- iii. Decision tree works for classification task 3 marks **5**
Example 2 marks

- Q.3 Attempt any two: **5**
- i. Process of classification with support vector machine with diagram 1 mark for each point (1 mark * 5). **5**
- ii. Ranking method in machine learning 2 marks **5**
kernel methods 3 marks
- iii. Differentiate binary classification and multi-class classification. 1 mark for each point (1 mark * 5). **5**

- Q.4 Attempt any two: **5**
- i. Principal component analysis 3 marks **5**
Example. 2 marks
- ii. Define clustering 2 marks **5**
Algorithm for k-means clustering. 3 marks
- iii. Derive eigen values for the given data matrix. Stepwise marking **5**

- Q.5 Attempt any two: **5**
- i. Methods of evaluation for a machine learning algorithm 1 mark for each point (1 mark * 5) **5**
- ii. Random forest method 3 marks **5**
Example 2 marks
- iii. Pros and cons of using ensemble methods 1 mark for each point (1 mark * 5) **5**

- Q.6 Attempt any two: **5**
- i. Deep learning improves the process of classification 1 mark for each point (1 mark * 5) **5**
- ii. Differentiate b/w reinforcement learning and supervised learning 1 mark for each point (1 mark * 5). **5**
- iii. Semi-supervised learning 2.5 marks **5**
Bayesian learning method 2.5 marks
