BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – M.Tech.(RA)-2023
Course Name – Machine Learning in Robotics
Course Code - PEC-MIRA201A
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) What is the primary objective of supervised learning?
   a) To minimize the error between predicted and actual outputs
   b) To identify patterns in data
   c) To explore and visualize data
   d) To make decisions based on data

(ii) What is the primary objective of unsupervised learning?
   a) To minimize the error between predicted and actual outputs
   b) To identify patterns in data
   c) To explore and visualize data
   d) To make decisions based on data

(iii) Which of the following is not a commonly used algorithm for supervised learning?
   a) Decision trees
   b) Naive Bayes
   c) k-means clustering
   d) Support vector machines

(iv) Identify which technique is used to solve optimization problems by iteratively moving towards the direction of steepest descent?
   a) Genetic algorithms
   b) Simulated annealing
   c) Gradient descent
   d) Interior-point methods

(v) Select what is the main purpose of the perceptron learning algorithm?
   a) To train recurrent neural networks
   b) To train deep neural networks
   c) To classify linearly separable patterns
   d) To perform feature extraction

(vi) Identify which one in the following is not Machine Learning disciplines.
   a) Physics
   b) Information Theory
   c) Neurostatistics
   d) Optimization Control

(vii) Predict Reinforcement learning is one of _____ basic machine learning paradigms

a) 5
b) 4
c) 2
d) 3

(viii) Predict in which of the option, output depends on the state of the current input and the next input depends on the output of the previous input.

a) Supervised learning
b) Unsupervised learning
c) Reinforcement learning
d) None of these

(ix) Select which component is responsible for mapping states to actions in reinforcement learning?

a) Policy
b) Reward function
c) Environment
d) Agent

(x) Machine learning as various Search and Optimisation algorithms. Interpret among the following which is not evolutionary computation.

a) Genetic algorithm
b) Genetic Programming
c) Neuroevolution
d) Perceptron

(xi) Analyze the incorrect numerical functions in the various function representation of machine learning.

a) Case-based
b) Neural Network
c) Linear regression
d) All of these

(xii) Analyze which of the following cross validation strategies cannot be stratified.

a) K-fold cross validation
b) Hold out cross validation
c) Leave one out cross validation
d) Shuffle split cross validation

(xiii) Analyze the following in which dimensionality reduction reduces.

a) Performance
b) Entropy
c) Stochastics
d) Collinearity

(xiv) Decide a reasonable way to select the number of principal components.

a) Choose k to be the smallest value so that at least 99% of the varinace is retained
b) Use the elbow method
c) Choose k to be 99% of m (k = 0.99*m, rounded to the nearest integer)
d) Choose k to be the largest value so that 99% of the variance is retained

(xv) Choose the successful applications of ML

a) Learning to recognize spoken words
b) Learning to drive an autonomous vehicle
c) Learning to classify new astronomical structures
d) All of these

Group-B

(Short Answer Type Questions) 3 x 5=15

2. What distinguishes the Kalman filter from other estimation methods? (3)

3. What is bias and variance? (3)

4. Determine Support Vectors in SVM. (3)

5. Identify what is the key characteristic of a Gaussian distribution? (3)

6. Differentiate in between supervised and unsupervised machine learning? (3)

OR

Differentiate between clustering and classification. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Describe the Gaussian distribution and its key properties. (5)

8. Discuss how subset selection can be used for dimensionality reduction (5)

9. Explain the concept of a Perceptron with a neat diagram. (5)

10. Expain supervised learning in details? (5)

11. Explain how does reinforcement learning differ from supervised learning and unsupervised learning? (5)

12. Illustrate the aspects of developing a learning system. (5)

OR

Explain the Bias-Variance Trade-off and how the Overfitting can be avoided? (5)

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