Faculty of Engineering
End Sem (Odd) Examination Dec-2022
EC3ET05 Introduction to Machine Learning
Programme: B.Tech.   Branch/Specialisation: EC

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.   Generally, which of the following method(s) is used for predicting continuous dependent variable?   **1**
            I.   Linear Regression
            II. Logistic Regression
            (a) I and II   (b) Only I   (c) Only II   (d) None of these

     ii.   Which of the following methods do we use to best fit the data in logistic regression?   **1**
            (a) Least square error   (b) Maximum likelihood
            (c) Jaccard distance   (d) Both (a) and (b)

     iii. Which Boolean function can't be represented by a single layer perceptron?   **1**
            (a) AND   (b) OR   (c) NAND   (d) XOR

     iv.   The sigmoid unit used in multilayer N/W is-   **1**
            (a) Differentiable   (b) Non differential
            (c) Constant   (d) None of these

     v.   Slack variables in SVM is used, when data are-   **1**
            (a) Linearly separable   (b) Non-linearly separable
            (c) Both (a) and (b)   (d) None of these

     vi.   What do you mean by generalization error in terms of the SVM?   **1**
            (a) How far the hyperplane is from the support vectors
            (b) How accurately the SVM can predict outcomes for unseen data
            (c) The threshold amount of error in an SVM
            (d) None of these

P.T.O.

vii. PCA method of machine learning is based on- **1**
(a) Supervised learning   (b) Unsupervised learning
(c) Reinforcement learning   (d) None of these

viii. Which method of analysis does not classify variables as dependent or independent? **1**
(a) Regression analysis   (b) Discriminant analysis
(c) Analysis of variance   (c) Cluster analysis

ix. Which of the following statements is true when you use 1×1 convolutions in a CNN? **1**
(a) It can help in dimensionality reduction
(b) It can be used for feature pooling
(c) It suffers less overfitting due to small kernel size
(d) All of these

x. Deep learning can be applied to which of the following NLP tasks? **1**
(a) Machine translation
(b) Sentiment analysis
(c) Question answering system
(d) All of these

Q.2 i. Define under fitting and over fitting. **2**
ii. Write down the difference between classification and regression. **3**
iii. Calculate the parameters of multivariate linear regression. **5**
OR iv. In basket analysis, we want to find the dependence between two items X and Y. Given a database of customer transactions, how can you find these dependencies? How you can generalize this to more than two items? **5**

Q.3 i. Show the perceptron that calculates NAND of its two inputs. **4**
ii. How gradient descent rule will be used to upgrade the weights in neural network? Explain with suitable diagram. **6**
OR iii. Consider a MLP architecture with one hidden layer where there are also direct weights from the input directly to the output units. Explain when such structure would be helpful and how it can be trained. **6**

Q.4 i. When the concept of kernel will be used? **3**
ii. What do you understand by margin in SVM? Why is it used? In what circumstances soft margin will be used? discuss all points with suitable diagrams. **7**
OR iii. How constrained optimization problem can be converted into unconstrained optimization? Discuss with suitable example. **7**

Q.5 i. Why dimension reduction techniques will be used? Give several reasons. **4**
ii. Derive the expression of principal components, at least two components in PCA, with suitable diagram. **6**
OR iii. What can do k-means clustering, partition the instances and then calculate the S_i separately in each group, why is this not a good idea? **6**

Q.6 Attempt any two:
i. How deep learning is different from neural network? **5**
ii. Discuss CNN Architecture. **5**
iii. Discuss RNN Architecture. **5**

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Scheme of Marking

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Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	b	1
	ii)	b	1
	iii)	d	1
	iv)	a	1
	v)	b	1
	vi)	b	1
	vii)	b	1
	viii)	c	1
	ix)	d	1
	x)	d	1
Q.2	i.	Define under fitting 1 mark and over fitting 1 mark	2
	ii.	Write the minimum three differences	3
	iii.	Calculate the parameters of multivariate linear regression	5
OR	iv.	Finding the dependencies between X & Y 2.5 marks and generalize this to more than two items 2.5 marks	5
Q.3	i.	Draw perceptron with two i/ps 1 mark, showing its o/p which follow NAND gate 2 marks and show its o/p 1 mark	4
	ii.	Draw diagram 1 mark, define gradient descent rule 2 marks, how it upgrade the wts. In NN 3 marks	6
OR	iii.	Draw MLP architecture 1 mark, explain the structure 2.5 marks, explain how it can be trained 2.5 marks	6
Q.4	i.	What is kernel 1 mark, when it will be used 2 marks	3
	ii.	Diagram 1 mark, define margin in SVM 2 marks, why it is used 1 mark, define circumstances where soft margin will be used 3	7

		marks	
OR	iii.	Explanation of constrained optimization 2 marks, how it is converted to unconstrained optimization 3 marks, suitable example 2 marks.	7
Q.5	i.	Write down the four reasons	4
	ii.	Diagram 1 mark, derive expression of principal components 5 marks	6
OR	iii.	Explain K-means clustering 2 marks, explain its process 4 marks	6
Q.6			
	i.	Write minimum 5 differences	5
	ii.	Draw architecture 1, define 4 marks	5
	iii.	Draw architecture 1, define 4 marks	5

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