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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**
Course Code: 22AM5PCINN **Max Marks: 100**
Course: Introduction to Neural Networks **Date: 19.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1	a)	With a neat schematic diagram, explain artificial neural model. Provide the equation.		**6**
	b)	Explain any two activation functions used in neural networks.		**4**
	c)	Derive and explain four rules of Knowledge Representation in artificial neural networks and also using rule 1 illustrate the relationship between inner product and Euclidean distance as measure of similarity between patterns.		**10**

OR

2	a)	Illustrate the following Learning process through signal flow graph. Provide the equation. i. Error correction Learning. ii. Memory based Learning.		**6**
	b)	What is meant by Linear separability? Explain how do you solve linear separable problems by giving example.		**4**
	c)	Describe characteristics and derive the model of associative memory using mathematical equations and diagrams.		**10**

UNIT - II

3	a)	State and derive the weight update procedure in Gauss-Newton Method. What is the condition on learning rate for convergence of this algorithm.		**6**
	b)	State and prove perceptron convergence theorem by illustrating the hyperplane as decision boundary for a two-class pattern-classification problem.		**10**
	c)	What should be the optimum decision rule for classifying M outputs of the network, after a multilayer perceptron is trained. Explain with a diagram.		**4**

UNIT - III

4	a)	Illustrate how heuristics makes the Back-propagation algorithm performs better with necessary diagrams and equations.	**10**
	b)	Derive the expressions to find the weight update relations of back propagation algorithm.	**10**

OR

5	a)	State and Realize the different approaches of complexity regularization of network pruning.	**8**
	b)	Illustrate the early-stopping rule based and Multifold cross-validation method of cross validation with necessary diagrams.	**6**
	c)	Outline the principle techniques for improving the generalization ability of networks. Explain the factors which influences the generalization.	**6**

UNIT - IV

6	a)	A manufacturing company has collected a large amount of data in the form of pairs of real valued input and output vectors, and wants to build a system that will predict the outputs for new inputs. Design an appropriate Radial Basis Function (RBF) network for the same. Explain what will be computed at each network layer.	**6**
	b)	Derive and discuss the Regularization problem in RBF using Green's function and Tikhonov Functional Regularization theory.	**10**
	c)	Describe in detail the similarities and differences between Multi-Layer Perceptron (MLP) and Radial Basis Function (RBF) networks.	**4**

UNIT - V

7	a)	Examine how Learning Vector Quantization (LVQ) can improve the performance of a Kohonen Network. In this context, explain what is meant by the term Voronoi Tessellation.	**10**
	b)	In the context of Kohonen Networks, explain what is meant by the terms Density Matching and Topological ordering.	**4**
	c)	The self-organizing process can be said to have four major components: Initialization, Competition, Cooperation, and Adaptation. Briefly describe how each of these components is implemented using mathematical equations.	**6**

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