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

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**
Course Code: 23AM5PCINN **Max Marks: 100**
Course: Introduction to Neural Networks

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, and appeal to the evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Define neural networks and elaborate the benefits of neural networks.	*CO1*	*PO1*	**05**
	b)	Apply the fundamental rules in the construction of signal-flow graphs used to depict a network.	*CO1*	*PO1*	**05**
	c)	Derive the perceptron convergence theorem by illustrating the hyperplane as a decision boundary in the context of a two-class pattern classification problem.	*CO2*	*PO2*	**10**
		OR			
2	a)	Elaborate the process of adaptive filtering problem for an unknown dynamic system.	*CO1*	*PO1*	**05**
	b)	How to build invariances and prior information into the design of neural networks?	*CO2*	*PO1*	**05**
	c)	Derive the Gauss-Newton method to minimize the cost function w.r.t to the weight vector.	*CO2*	*PO2*	**10**
		UNIT - II			
3	a)	Illustrate the two fundamental signal flows in a fully connected graph of multilayer perceptron.	*CO2*	*PO1*	**06**
	b)	Distinguish between Batch and Online Learning.	*CO1*	*PO1*	**06**
	c)	Describe the heuristics required to significantly improve the performance of the back-propagation algorithm.	*CO2*	*PO1*	**08**
		UNIT - III			
4	a)	Explain the multifold method of cross-validation to improve the performance of a model.	*CO2*	*PO1*	**06**
	b)	Illustrate how generalization may occur in hypothetical network.	*CO2*	*PO1*	**08**
	c)	Illustrate the key considerations and challenges in implementing Hessian-based network pruning methods.	*CO1*	*PO1*	**06**

			UNIT - IV			
	5	a)	Analyze the linear separability manifest within a Radial Basis Function (RBF) network with an example to illustrate its practical implications.	*CO2*	*PO2*	**06**
		b)	Illustrate the hybrid learning procedure as the "K means, RLS" algorithm, aimed at training an RBF network.	*CO1*	*PO1*	**06**
		c)	Apply the cover's theorem to improve the effectiveness of the pattern classification task by enhance the separatibility of patterns in the RBF network.	*CO2*	*PO2*	**08**
			OR			
	6	a)	Illustrate the interpolation problem by considering a network represents a mapping from the higher-dimensional input space to the single-dimensional output space.	*CO1*	*PO1*	**06**
		b)	In the XOR problem, there are four patterns -(1, 1), (0, 1), (0, 0), and (1, 0) in a two-dimensional input space. Construct a pattern classifier that produces the binary output '0' in response to the input pattern (1, 1), or (0, 0) and the binary output '1' in response to the input pattern (0, 1) or (1, 0) using suitable Radial Basis Function (RBF).	*CO2*	*PO2*	**06**
		c)	The size of the hidden layer, in the RBF network is large and computing the inverse matrix R-1(n) for n = K (where K is number of hidden layer) is computationally intensive. Using Recursive Least Square algorithm, provide alternate solution to find R-1(n).	*CO2*	*PO1*	**08**
			UNIT - V			
	7	a)	Differentiate between Willshaw–von der Malsburg's model and Kohonen model.	*CO1*	*PO1*	**05**
		b)	Describe three essential processes involved in the formation of the self-organizing map.	*CO2*	*PO1*	**07**
		c)	In a project on urban planning, is it possible to utilize the contextual maps within a Self-Organizing Map to analyze spatial patterns on traffic congestion, land use, and population density? Justify.	*CO2*	*PO2*	**08**

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