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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 22EC7PE3DL **Max Marks: 100**
Course: Deep Learning

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, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Justify the term Deep learning mentioning few of its applications.	*CO 1*	*PO 1*	**6**
	b)		Briefly discuss the utility of the following python libraries for deep learning: • Numpy • Tensorflow • Keras	*CO 1*	*PO 1*	**6**
	c)		Discuss the working of K-Means clustering algorithm. Given the data table as below, find the clusters formed after one iteration using Euclidean distance metric. Initial centroids: A(1.5, 2) and B(2.5, 1). Data points: 1 (2, 3); 2 (6, 1); 3 (1, 2); 4 (3, 0)	*CO 1*	*PO 1*	**8**
			OR			
2	a)		Briefly explain simple linear regression and illustrate the objective function.	*CO 1*	*PO 1*	**8**
	b)		Discuss few deep learning techniques, where linear algebra concepts can be applied.	*CO 1*	*PO 1*	**8**
	c)		Mention the challenges to be addressed in unsupervised learning.	*CO 1*	*PO 1*	**4**
			UNIT - II			
3	a)		Given two hidden neurons N1 and N2 connected in a feed forward network. The input 'x'=1.2 is applied to N1 and actual output of N2 is 2.5. Weights and biases at N1 and N2 are initialized as: w1=0.15, b1=1; w2=0.45, b2=1 and learning rate =0.1. Apply	*CO 2*	*PO 2*	**10**

			sigmoid activation and using Gradient Descent, update w1 and w2. Analyze the condition of vanishing gradient.			
		b)	Analyze various activation functions used in deep neural networks.	***CO 2***	***PO 2***	**10**
			OR			
	4	a)	With neat diagram, briefly explain the structural design of a multilayer perceptron. Design a Boolean Ex-OR logic using an appropriate MLP model.	***CO 2***	***PO 2***	**10**
		b)	Given in the table, the scores for the three classes at the output layer of a classifier. Compare the output probabilities with sigmoid and softmax activations and suggest the appropriate one. If the one-hot encoded output is [1,0,0], calculate the cross entropy loss. Class | Score 1 | 1.4 2 | -3.5 3 | 0.9	***CO 2***	***PO 2***	**10**
			UNIT - III			
	5	a)	Write a python program using Keras APIs to develop a multiclass classifier using FCN. The network has 2 dense layers having 10 neurons each and the dataset has 6 features and 3 different classes.	***CO 3***	***PO 3***	**10**
		b)	What is a hyperparameter? Interpret the model regularization techniques: 'Batch Normalization', 'Dropout' and 'Learning rate decay'.	***CO 2***	***PO 2***	**10**
			OR			
	6	a)	Write a python program using Keras APIs to develop a regression model using FCN with the given specification: The network has 2 dense layers having 20 neurons each and the dataset has 8 unique features.	***CO 3***	***PO 3***	**10**
		b)	Briefly discuss 'RMSProp' and 'AdaGrad' and 'Adam' optimization functions used in deep neural networks.	***CO 2***	***PO 2***	**10**
			UNIT - IV			
	7	a)	Briefly explain the feature learning through convolution and pooling layers in a feed forward convolutional neural network mentioning the feature difference between fully connected layer and convolutional layer.	***CO 2***	***PO 2***	**10**
		b)	Write a python program using Keras APIs to develop an image classifier model based on Convolutional Neural Network. The network has 2 Conv2D layers having 32 filters each, of size 3X3, connected to maxpooling by 2X2, the dense layer has 512 neurons and an output layer. The input image dimension is 150X150X3 and there are 10 categories of images in the given dataset.	***CO 3***	***PO 3***	**10**
			OR			
	8	a)	Design the deep neural network with AlexNet Architecture and calculate the total number of weights being trained in all the convolutional layers. Identify the major contributions of AlexNet.	***CO 3***	***PO 3***	**10**

		b)	If input has 4 elements: I_1 | I_2 | I_3 | I_4 And weight window has 3 elements: W_1 | W_2 | W_3 (i) What is the output dimension of convolution if P=0 and S=1? (ii) Write equations for each output. (iii) Prove with the jacobian matrices: dL/dW= Correlation(I, LO) and dL/dI = Correlation(W_{pad}, LO_{Flip})	***CO 2***	***PO 2***	**10**
			UNIT - V			
	9	a)	Illustrate one Recurrent Neural Network cell and identify the reason of its short term memory.	***CO 2***	***PO 2***	**10**
		b)	With the design, briefly discuss on Autoencoder architecture. Mention few of its applications.	***CO 2***	***PO 2***	**10**
			OR			
	10	a)	LSTM architecture preserves the context for longer duration. Analyze with illustration.	***CO 2***	***PO 2***	**10**
		b)	With a generic diagram, interpret how a generative adversarial neural network can be trained to generate.	***CO 2***	***PO2***	**10**

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