PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023

Semester : Semester VI - B.Tech ECE - 2020
Course Code : ECE3031
Course Name : Sem VI - ECE3031 - Applications of Deep Learning
Program : B.Tech. Electronics and Communication Engineering

Date : 15-APR-2023
Time : 2:00PM - 3:30PM
Max Marks : 60
Weightage : 30%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS   **(5 X 2 = 10M)**

1. The neural network training and testing process is time consuming in nature. The transfer learning reduces training and testing time to a lower value. Elaborate the concept of transfer learning.with a short note.
                                                        (CO1) [Knowledge]

2. The dimenssions of a neural network carries a lot of importance in the training and testing process. As the network size chnages the training and testing times also chnages. Write short note on curse of dimensionality in neural networks.
                                                        (CO1) [Knowledge]

3. Activation function is an essential part of neural network structure. It is applied in alost all layers of neural networks. Describe the significance of activation function in neural network operation.
                                                        (CO1) [Knowledge]

4. The size of neural network is defined using width and depth of the network. Define width and depth of neural networks.
                                                        (CO2) [Knowledge]

5. Perceptron is the smallest possible neural network which can perform various classification and regression task.What are the limitations of simple perceptron that led to the development of multilayer perceptron?
   (CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS   **(2 X 15 = 30M)**

6. The Police department is planning to design a face recognition system using CNN. The system should recognize the input image based on the training data images. Consider yourself as a designer as answer the following questions.

   a] Explain in brief note on CNN architecture you need to implement for face recognition. The note should include details about number of convolutional layers, pooling layer and significance of each layer in network design. [10M]

   b] Explain in brief about testing the designed model based on training accuracy. Testing accuracy, recall and F1 score. [05M]

                                                        (CO1) [Comprehension]

7. Part A] For the given neural network architecture compute the output of forward propoagation using ReLu activation function. The required the values of input, wieghts and bias ate given below. [10M]

W11=0.2	W21=0.25	W31=0.3
W12=0.35	W22=0.4	W32=0.45
W13=0.1	W23=0.15	W33=0.16
W14=0.22	W24=0.25	W34=0.33
W15=0.34	W25=0.36	W35=0.45
WH11=0.24	WH21=0.26	WH31=0.29
WH12=0.11	WH22=0.21	WH32=0.31
W13=0.25	WH23=0.47	WH33=0.65
WH41=0.55	WH51=0.50	B1=1
WH42=0.8	WH52=0.6	B2=1
WH43=0.25	WH53=0.75	
X1=2	X2=3	X3=1
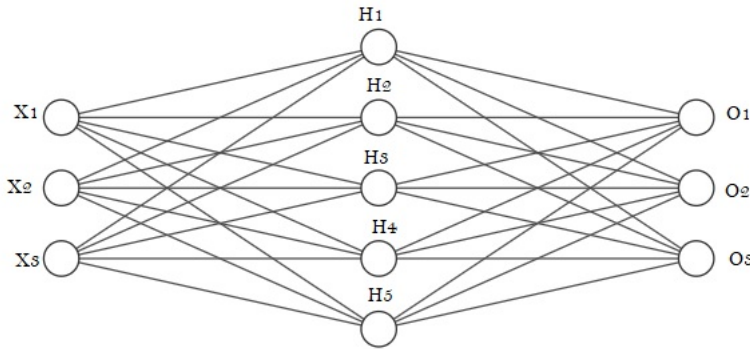
Input Layer ∈ ℝ³   Hidden Layer ∈ ℝ⁵   Output Layer ∈ ℝ³

Part B] There are various evaluation metrics available evaluation of the neural network. Confusion matrix is one of the popular metric which enables the designer to analyze the classification performance in detailed manner. Elaborate the significance of confusion matrix in Autonomous vehicle system using neural networks. For the given confusion matrix compute accuracy, positive recall, positive precision, positive F1 score. [5M]

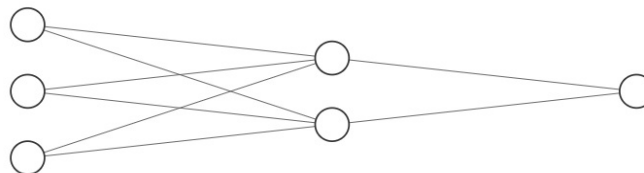|		Ground Truth			
		1	2	3	4
Prediction	1	20	5	7	5
	2	10	20	3	4
	3	5	3	12	3
	4	5	2	8	8

(CO2) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION   **(1 X 20 = 20M)**

8. For the given neural network compute the forward propagation and one iteration of backpropagation to show error correction capability of neural network using backpropagation. Use following values for computation.

Input Layer ∈ ℝ³   Hidden Layer ∈ ℝ²   Output Layer ∈ ℝ¹

W11=0.35	W12=0.25
W21=0.55	W22=0.15
W31=0.35	W32=0.15
WH1=0.3	WH2=0.4
B1=1	B2=1
X1=2	X2=3.5
X3=1	
Target values	
O1=3.5	
Learning Rate=0.15	

(CO1) [Application]