PES University, Bengaluru

(Established under Karnataka Act 16 of 2013)
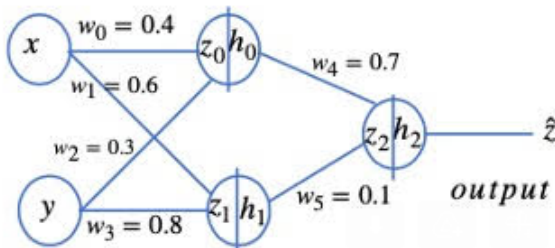
END SEMESTER ASSESSMENT (ESA) - May 2023

UE20CS342 - Topics in Deep Learning

Total Marks : 100.0

1.a. Why Deep learning is preferred over Machine Learning? Give any two reasons and justify   (5.0 Marks)

1.b.

Calculate the output $\hat{z} = h_2$ for the neural network as shown in the figure. Assume the activation function as sigmoid in all three neurons and the value of x =1 and y=1.   (9.0 Marks)

1.c. Explain how momentum always works faster than standard gradient descent. What is the hyperparameter related with it? Explain.   (6.0 Marks)

2.a. i)What is strided convolution? Give its significance
ii) What is the functionality of "Padding" in CNN? Show the functionality of padding with a suitable example.   (8.0 Marks)

2.b. Perform 3X3 Max pooling for a given activation map of size 7X7 with strides 1 and 2. Show the required steps and generate 2 output activation maps.

Activation Map =

6	3	4	4	5	0	3
4	7	4	0	4	0	4
7	0	2	3	4	5	2
3	7	5	0	3	0	7
5	8	1	2	5	4	2
8	0	1	0	6	0	0
6	4	1	3	0	4	5

(6.0 Marks)

2.c. i)In Object detection, why Region Proposal is preferred than traditional CNN?
ii) Write Selective Search Algorithm   (6.0 Marks)

3.a. What are the differences between LSTM and GRU in terms of their architecture and performance for sequence modeling?   (8.0 Marks)

3.b. i) While training an RNN, it is found that the weights are all taking on the value of NaN ("Not a Number"). Give reasons and solution.

ii) What is the purpose of the attention mechanism in machine translation?

(4.0 Marks)

3.c. Draw the architecture of Encoder-Decoder model with brief explanation for performing the following operations:
   1. Image Captioning
   2. Video Classification

(8.0 Marks)

4.a. Explain the architecture of a Naïve GAN with a neat diagram. Explain the two main components and their functionalities. (8.0 Marks)

4.b. Detail the min-max objective function of GAN with its respective equation.

(6.0 Marks)

4.c. What is Siamese Network. Explain with neat diagram and explain the loss
function.   (6.0 Marks)

5.a. Differentiate the following with suitable examples:
 i)Episodic Vs Sequential Environment
ii) Fully Observable Vs Partially Observable Environment
iii) Single Agent Vs Multi-Agent Environment   (6.0 Marks)

5.b. Consider the following table of Q-values for a simple three-state, three-action
MDP:

State	Action 1	Action 2	Action 3
S1	0	0	0
S2	1	0	0
S3	0	2	0

Assume a learning rate of α = 0.3 and a discount factor of γ = 0.5. If the agent takes
action 3 in state S2 and receives a reward of -2, what is the updated Q-value for
Q(S2, Action 3)? (Consider, s = S2, a = Action 3, reward = -2,s' = S3).   (6.0 Marks)

5.c. In Deep RL, explain the significance of Target Networks and Experience Replay.
                                                                         (8.0 Marks)