



Final Assessment Test - November 2024

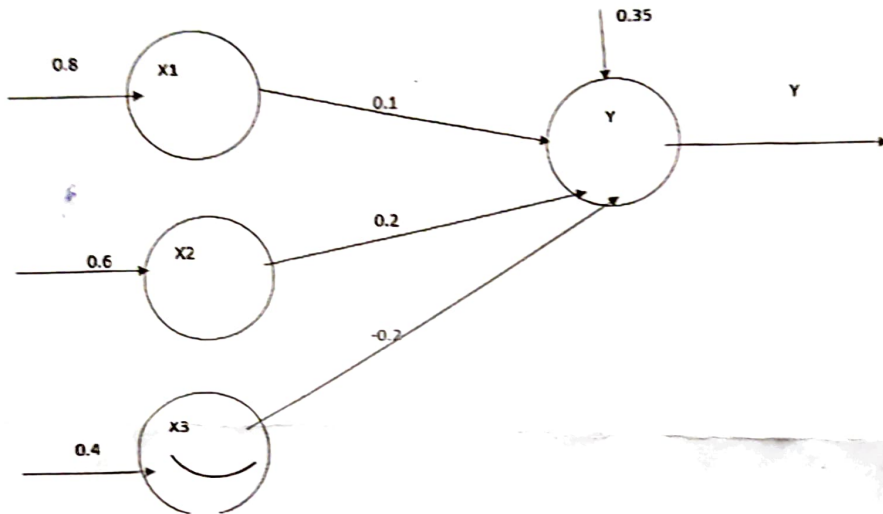
Course: BCSE332L - Deep Learning
 Class NBR(s): 1748/1751/1752/1754/1757/3093
 Time: Three Hours

Slot: D2+TD2
 Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions
 (10 X 10 = 100 Marks)

1. a) Compute the output(y) using Binary step activation function.
 b) Compute the output(y) using Sigmoid activation function.



- 2.a) How the Gradient Descent Algorithm Works? Derive the backward propagation from the gradient (Mean squared Error) MSE loss function for $J(w, b)$ with respect to w and b to find the optimal value of w and b ? Where w is the weight and b is the bias of the typical neural network.

OR

- 2.b) Assume that the neurons shown in the Fig. 1 have a sigmoid activation function, perform a forward pass and one backward pass on the network. Assume that the actual output of y is 0.5 and learning rate is 1.

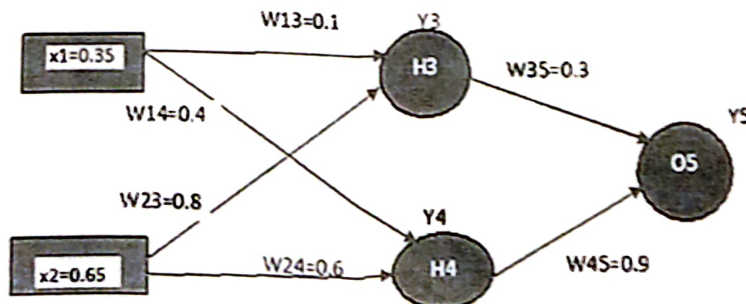


Fig. 1

3. Derive the optimization algorithm from gradient momentum optimization of Adagrad to RMS-prop Ada- delta of hyperparameter tuning to update the learning rate and weight.

4. Apply the SoftMax classifier for the input $X=25$ considering the model parameters β_0, β_1 to evaluate the three level of classes. mdz

Z1 of $\beta_0=5.444, \beta_1=0.446$

Z2 of $\beta_0=-0.385, \beta_1=0.007$

Z3 of $\beta_0=-10.936, \beta_1=-0.208$

5. Use the image matrix and construct CNN model with ReLu activation function with bias $b=-2$ and apply maxpooling of 2×2 to predict the output.

$F(x,y) =$

0	0	1	1	0	0
0	1	0	0	1	0
1	0	0	0	0	1
1	0	0	0	0	1
0	1	0	0	1	0
0	0	1	1	0	0

Kernel

0	0	1
0	1	0
1	0	0

6. Construct an inception model of advanced neural network to reduce the dimension of the parameter using inception v1 and inception v3 with its architectural blocks 3

7.a) Construct and evaluate the RNN model for the previous two time step inputs $x_1=1, x_2=0.5$ and current input $x_3=0.5$ for today with input weight $w_1=1.8$, recurrent weight $w_2=0.5$, and output weight $w_3=1.1$ with bias $b=0$. Predict the output using argmax strategy. 4

OR

7.b) Compute the output of LSTM forget gate and output gate for the given parameters?

Short term memory (STM)=1,

Long term memory (LTM)=2,

Input $X=1$,

The STM Forget Gate weight is $w_1=2.70$

The input Forget Gate weight is $w_2=1.63$

The STM Input gate weight is $w_3=2$,

The input Gate weight $w_4=1.65$,

The STM New gate weight is $w_5=1.41$,

The input New gate weight is $w_6=0.94$,

The STM Output gate weight is $w_7=4.38$,

The input output gate weight is $w_8=-0.19$

The input output gate weight is $w_8 = -0.19$

8. Construct the transformer encoder and decoder with different phases of QVK with the example of word translation focusing in the roles of Query, key, values. Use example words "cat on the wall" to illustrate the process. 5
9. Given the ground truth bounding box (x_1, y_1, x_2, y_2) and with predicted bounding box (P_x1, P_y1, P_x2, P_y2) . Calculate the intersection over union (IOU) between the two bounding box. Illustrates the calculations with your own numerical values. 6
10. Find the shortest path to reach the goal 5 using Q learning algorithm. 7

