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NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Deep Learning - IIT Ropar (course)

Course outline

About NPTEL ()

How does an NPTEL online course work? ()

Week 1 ()

Week 2 ()

Week 3 ()

- Feedforward Neural Networks (a.k.a multilayered network of neurons) (unit? unit=46&lesso n=47)

- Learning Parameters of Feedforward Neural Networks (Intuition)

Week 3 : Assignment 3

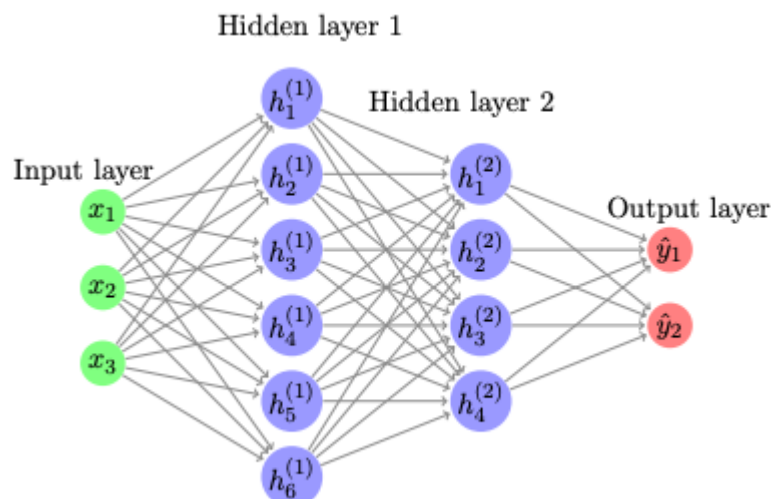
The due date for submitting this assignment has passed.

Due on 2024-08-14, 23:59 IST.

Assignment submitted on 2024-08-08, 16:02 IST

Use the following data to answer the questions 1 to 3

The diagram below shows a neural network. The network contains two hidden layers and one output layer. The input to the network is a column vector $x \in \mathbb{R}^3$. The first hidden layer contains 6 neurons, the second hidden layer contains 4 neurons and the output layer contains 2 neurons. Each neuron in the l^{th} layer is connected to all the neurons in the $(l+1)^{th}$ layer. Each neuron has a bias connected to it (not explicitly shown in the figure).



In the diagram, \mathbf{W}_1 is a matrix and $\mathbf{x}, \mathbf{a}_1, \mathbf{h}_1$, and \mathbf{O} are all column vectors. The notation $\mathbf{W}_i[\mathbf{j}, :]$ denotes the j^{th} row of the matrix \mathbf{W}_i , $\mathbf{W}_i[:, \mathbf{j}]$ denotes the j^{th} column of the matrix \mathbf{W}_i and \mathbf{W}_{kij} denotes an element at i^{th} row and j^{th} column of the matrix \mathbf{W}_k .

1) Choose the correct dimensions of \mathbf{W}_1 and \mathbf{a}_1

1 point



(unit?
unit=46&lesso
n=48)

- ☐ Output functions and Loss functions (unit?
unit=46&lesso
n=49)
- ☐ Backpropagation (Intuition) (unit?
unit=46&lesso
n=50)
- ☐ Backpropagation: Computing Gradients w.r.t. the Output Units (unit?
unit=46&lesso
n=51)
- ☐ Backpropagation: Computing Gradients w.r.t. Hidden Units (unit?
unit=46&lesso
n=52)
- ☐ Backpropagation: Computing Gradients w.r.t. Parameters (unit?
unit=46&lesso
n=53)
- ☐ Backpropagation: Pseudo code (unit?
unit=46&lesso
n=54)
- ☐ Derivative of the activation function (unit?
unit=46&lesso
n=55)
- ☐ Information content, Entropy & cross entropy (unit?

$$\mathbf{W}_1 \in \mathbb{R}^{6 \times 3}$$

☐

$$\mathbf{W}_1 \in \mathbb{R}^{3 \times 6}$$

☐

$$\mathbf{W}_1 \in \mathbb{R}^{1 \times 6}$$

☒

$$\mathbf{a}_1 \in \mathbb{R}^{6 \times 1}$$

☐

$$\mathbf{a}_1 \in \mathbb{R}^{1 \times 6}$$

☐

$$\mathbf{a}_1 \in \mathbb{R}^{1 \times 1}$$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$$\mathbf{W}_1 \in \mathbb{R}^{6 \times 3}$$

$$\mathbf{a}_1 \in \mathbb{R}^{6 \times 1}$$

2) How many learnable parameters(including bias) are there in the network?

62

Yes, the answer is correct.

Score: 1

Accepted Answers:

(Type: Numeric) 62

1 point

3) Which of the following loss functions can be used for the classification problem?

1 point

- ☐ Means Squared error
- ☒ Cross entropy
- ☐ Both Mean Squared Error and Cross Entropy loss can be used

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both Mean Squared Error and Cross Entropy loss can be used

4) We have a multi-classification problem that we decide to solve by training a feedforward neural network. What activation function should we use in the output layer to get the best results? 1 point

- ☐ Logistic
- ☐ Step function
- ☒ Softmax
- ☐ linear

Yes, the answer is correct.

Score: 1

Accepted Answers:

Softmax

5) We have data x with the following labels $y = ['car', 'bus', 'bike', 'car', 'bus', 'car', 'bus', 'bike', 'car']$. Which of the following distribution will give the lowest cross-entropy loss with y ? (Distribution is given in the following order $['car', 'bus', 'bike']$)? 1 point

unit=46&less
n=56)

- ☐ Lecture
Material for
Week 3 (unit?
unit=46&less
n=57)

**Quiz: Week 3
: Assignment
3
(assessment?
name=287)**

- ☐ Week 3
Feedback
Form: Deep
Learning - IIT
Ropar (unit?
unit=46&less
n=186)

week 4 ()

Week 5 ()

Week 6 ()

Week 7 ()

Week 8 ()

Week 9 ()

week 10 ()

Week 11 ()

Week 12 ()

**Download
Videos ()**

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Transcripts
()**

**Problem
Solving
Session -
July 2024 ()**

☐
[0.49, 0.30, 0.21]

☐
[0.44, 0.33, 0.22]

☐
[0.50, 0.30, 0.20]

☐
[0.44, 0.39, 0.19]

Yes, the answer is correct.

Score: 1

Accepted Answers:

[0.44, 0.33, 0.22]

6) Which of the following statements about backpropagation is true? **1 point**

- ☐ It is used to compute the output of a neural network.
☐ It is used to initialize the weights in a neural network.
☒ It is used to optimize the weights in a neural network.
☐ It is used to regularize the weights in a neural network.

Yes, the answer is correct.

Score: 1

Accepted Answers:

It is used to optimize the weights in a neural network.

7) Given two probability distributions p and q , under what conditions is the cross entropy between them minimized? **1 point**

- ☐ All the values in p are lower than corresponding values in q
☐ All the values in p are lower than corresponding values in q
☐ $p = 0$ (0 is a vector)
☒ $p = q$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$p = q$

8) Given that the probability of Event A occurring is 0.80 and the probability of Event B occurring is 0.20, which of the following statements is correct? **1 point**

- ☒ Event A has a low information content
☐ Event A has a high information content
☐ Event B has a low information content
☒ Event B has a high information content

Yes, the answer is correct.

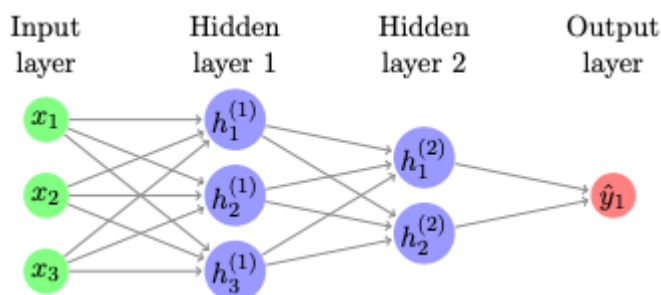
Score: 1

Accepted Answers:

Event A has a low information content

Event B has a high information content

Use the following data to answer the questions 9 and 10 The following diagram represents a neural network containing two hidden layers and one output layer. The input to the network is a column vector $x \in \mathbb{R}^3$. The activation function used in hidden layers is sigmoid. The output layer doesn't contain any activation function and the loss used is squared error loss $(pred_y - true_y)^2$.



The following network doesn't contain any biases and the weights of the network are given below:

$$\mathbf{W}_1 = \begin{bmatrix} 1 & 1 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 3 \end{bmatrix} \quad \mathbf{W}_2 = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix} \quad \mathbf{W}_3 = \begin{bmatrix} 2 & 3 \end{bmatrix}$$

The input to the network is: $\mathbf{x} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

The target value y is: $y = 8$

9) What is the predicted output for the given input \mathbf{x} after doing the forward pass? (Choose the option closest to your answer)

Yes, the answer is correct.

Score: 1

Accepted Answers:

(Type: Range) 4.7,5.2

1 point

10) Compute and enter the loss between the output generated by input \mathbf{x} and the true output \mathbf{y}

Yes, the answer is correct.

Score: 1

Accepted Answers:

(Type: Range) 8.82,9.74

1 point