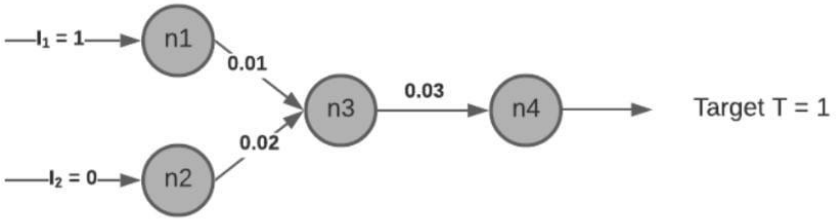
1. What do you mean by Artificial Neural Network (ANN) and write down some applications of Artificial Neural Network.

2. Give some idea about the advantages and limitations of Artificial Neural Network.

3. What is Deep Learning? Differentiate between Machine Learning and Deep Learning.

4. Describe four different types of activation functions.

5. Consider a simple neural network as shown in Figure. The inputs and initial weights are also shown in Figure. Target of the given neural network is T=1. Use back propagation to train the network. The activation function is sigmoid function. Using the learning rate=0.3.



a) Perform the forward pass and calculate the predicated output.

b) Find out the error at the output layer.

c) Perform the backward pass and update the weights. .

6. What are the applications of SVD in machine learning and artificial intelligence?

7. Using singular value decomposition, find the matrices U, V and Σ for the matrix $A = \begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{bmatrix}$.

8. What is Principal Component Analysis and how does it work?

9. Given data $X1$:={ 2, 3, 4, 5, 6, 7} and $X2$: = {1, 5, 3, 6, 7, 8 }. Compute the principal component using PCA Algorithm.

10. What is the significance of Eigenvectors and Eigenvalues in PCA?

11. What is the purpose of pooling layer in CNN?

12. Describe the term padding in CNN and the purpose of using padding in image processing.

13. Input matrix and kernel matrix are given by

$$I = \begin{bmatrix} 1 & 4 & 7 & 1 & 5 \\ 2 & 5 & 8 & 0 & 6 \\ 3 & 6 & 9 & 2 & 7 \\ 0 & 1 & 2 & 3 & 8 \\ 1 & 0 & 3 & 4 & 9 \end{bmatrix} \text{ and, } k = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

respectively.
(a) Perform a convolution operation and find the feature map with stride value 2.

(b) If padding of 1 is applied on all sides of input matrix then what will be the feature matrix with stride value 2.
(c) Apply the average pooling (2,2) operation on the output matrix of 13.(b).

14. What is Natural Language Processing, and how does it differ from Natural Language Understanding (NLU) and Natural Language Generation (NLG)?

15. Given the following corpus of 3 documents.

(i) "The apple is red and sweet."
(ii) "The orange is orange and tangy."
(iii) "The fruit basket contains apples, oranges, and bananas."

(a) Calculate the TF for the term "apple" and "sweet"for the document (i). Also, calculate IDF for the term "orange" and "fruit."

(b) Find term-document matrix for documents (i) and (ii).