

Assignment No:7

Title: Python program to show back propogation network for XOR function with binary input and output.

Name: Tavhare Ruchita Sharad

Roll No: 58

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In [2]: import numpy as np
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In [4]: class XORNetwork:
    def __init__(self):
        self.W1=np.random.randn(2,2)
        self.b1=np.random.randn(2)
        self.W2=np.random.randn(2,1)
        self.b2=np.random.randn(1)
    def sigmoid(self,x):
        return 1/(1 +np.exp(-x))
    def sigmoid_derivative(self,x):
        return x*(1-x)
    def forward(self,X):
        #Performtheforwardpass
        self.z1=np.dot(X,self.W1)+self.b1
        self.a1=self.sigmoid(self.z1)
        self.z2=np.dot(self.a1,self.W2)+self.b2
        self.a2=self.sigmoid(self.z2)
        return self.a2
    def backward(self, X, y,output):
        # Perform the backward
        self.output_error=y - output
        self.output_delta=self.output_error*self.sigmoid_derivative(output)
        self.z1_error=self.output_delta.dot(self.W2.T)
        self.z1_delta=self.z1_error*self.sigmoid_derivative(self.a1)
        self.W1 +=X.T.dot(self.z1_delta)
        self.b1+=np.sum(self.z1_delta,axis=0)
        self.W2+=self.a1.T.dot(self.output_delta)
        self.b2+=np.sum(self.output_delta,axis=0)
    def train(self,X,y,epochs):
        #Trainthenetworkforagivennumberolepochs
        for i in range(epochs):
            output=self.forward(X)
            self.backward(X,y,output)
    def predict(self,X):
        #Makepredictionsforagivensetofinputs
        return self.forward(X)
```

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In [6]: #CreateanewXORNetworkinstance
xor_nn=XORNetwork()
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In [8]: #Definetheinputandoutputdatasetsfor
X=np.array([[0,0], [0,1], [1,0],[1, 1]])
y=np.array([[0],[1],[1],[0]])
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In [10]: #Trainthenetworkfor10000epochs
xor_nn.train(X,y,epochs=10000)
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In [12]: #Makepredictionsontheinputidalaset
predictions=xor_nn.predict(X)
```

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In [14]: #Printhepredictions
print(predictions)
```

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[[0.0130398 ]
 [0.98886294]
 [0.98884335]
 [0.01147762]]
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In [ ]:
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