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 CS 473
 Artificial Neural Networks
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Assignment #8

0.1 Given: Quiz problem # 2:

Find: Write Matlab/Python/C/C++ code to implement the forward propagation of the ANN. Calculate \vec{W} 's and $\hat{\vec{y}}$.

$$\vec{X} = [x_0 \ x_1 \ x_2]^T = [1.0 \ 0.7 \ 0.3]^T$$

$$\vec{y} = [y_0] = 1.0$$

This class takes the number of nodes per layer as arguments for its constructor. It generates random weight matrices and 0 filled nodes (not sure if creating the empty nodes is actually necessary in python)

```

1  import numpy as np
2
3
4  class NeuralNet(object):
5      def __init__(self, *nodes_per_layer):
6          self.n_inputs = nodes_per_layer[0]
7          self.n_outputs = nodes_per_layer[len(nodes_per_layer) - 1]
8
9          self.weight_matrix_list = [None] * (len(nodes_per_layer) - 1)
10         self.node_array_list = [None] * (len(nodes_per_layer))
11
12         #Create n x m matrices for the weights
13         for i in range(0, len(nodes_per_layer) - 1):
14             self.weight_matrix_list[i] = np.random.rand(
15                 nodes_per_layer[i + 1], #Rows
16                 nodes_per_layer[i]) #Columns
17
18         #Create 1 x n arrays for all nodes except inputs
19         for i in range(0, len(nodes_per_layer)):
20             self.node_array_list[i] = np.zeros((1, nodes_per_layer[i])).T
21
22
23     def __str__(self):
24         nodes = "\nLayers:\n"
25         matrices = "\nMatrices\n"
26
27         for i, matrix in enumerate(self.weight_matrix_list):

```

```
28         matrices += str(i) + ":\n" + str(matrix) + "\n\n"
29     for i, node in enumerate(self.node_array_list):
30         nodes += str(i) + ":\n" + str(node) + "\n\n"
31
32     return( matrices + nodes )
33
34     def set_inputs(self, X):
35         for i in range(len(X)):
36             self.node_array_list[0][i] = X[i]
37
38     def forward(self):
39         for i in range(len(self.weight_matrix_list)):
40             self.node_array_list[i+1] = np.matmul( self.weight_matrix_list[i],
41             ↪ self.node_array_list[i] )
42
43 TEST = NeuralNet(3, 3, 2, 1)
44 X = [1.0, 0.7, 0.3]
45 TEST.set_inputs(X)
46 print(TEST)
47 TEST.forward()
48 print(TEST)
```