**Programming Assignment-4: A Two-Layer ANN[[1]](#footnote-1) Part II**

**First Name1: \_\_\_\_\_\_\_\_\_\_\_\_ Last Name1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**First Name2:\_\_\_\_\_\_\_\_\_\_\_\_ Last Name 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Introduction**

In this programming assignment, you will build an artificial neural network with a hidden layer. You will implement the backward propagation algorithm and apply it to the given data set. You will use the **leaky relu** activation function in the hidden layer

**Two layer artificial neural network**

In this part of the assignment, you will implement an artificial neural network with a hidden layer.

**Steps:**

1. Define the artificial neural network structure (# of input units and # of hidden units, as we only have one hidden layer).

2. Initialize the network’s parameters, **including the parameter**

3. Iterations:

- Implement forward propagation

- Compute loss function

- Implement backward propagation to get the gradients

- Update parameters (gradient descent)

**Question 1:** By using the provided alpha, eta (, # of epochs, and # of hidden units, what is the classification accuracy?

Accuracy: 72%

**Question 2:** Does the initialization of the weights play a role in determining the classification accuracy? Compared to Part I of the assignment, should you initialize the weights to bigger values or smaller values?

Yes, Initializing weights play a role in the classification accuracy. Initializing the weights makes all nodes identical hence never updating the weights. The weights should be assigned to a small because the smaller the weights the lower the loss.

**Question 3:** Please play with alpha, eta (**,** # of hidden units, and # of epochs, what’s the highest classification accuracy?

|  |  |
| --- | --- |
| **Values** | **Accuracy** |
| num\_hidden\_units = 7  alpha = 0.9  eta = 3  num\_of\_epochs = 20000 | Accuracy: 86% |
| num\_hidden\_units = 7  alpha = 0.9  eta = 3  num\_of\_epochs = 10000 | Accuracy: 85% |

alpha = 7

eta = 0.9

# of hidden units = 3

# of epochs = 20000

**Question 4:** Please paste the decision boundary diagram in this document (the one corresponding to the highest accuracy).

**Chart

Description automatically generated**

**Submission:**

* **Rule1:**
  + If you work with a partner, please name your zipped file as follows:

PA4\_LNAME1\_LNAME2.Zip for folder and PA4\_LNAME1\_LNAME2.docx for a word document, i.e., the file names should include both LAST NAMEs.

* + If you work on your own, the format should be

PA4\_LNAME.Zip for folder and PA4\_LNAME.docx for a word document.

* **Rule2:**
  + Put your FULL names whether working in a group or individual in the word document that answers all the questions.
* **Rule3:**
  + **EVERYONE** in the class should submit this Assignment, which should provide all files (like test excel files etc.. ) that are necessary for the execution of code in the submission folder.
* **Rule4:**
  + Please submit two Jupyter files, each of which is corresponding to Part I and Part II, respectively.

1. Data is obtained from Dr. Andrew Ng’s Machine Learning course. [↑](#footnote-ref-1)