

**Practical Machine Learning**

**ECEN 478/878**

**Programming Assignment 3**

**Fall 2024**

**Designing and Training MLP Classifiers Using Backpropagation**

ECEN 478: 100 points

ECEN 878: 115 points

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Last Name:

First Name:

NUID:

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**Obtained Score:**

**Part A: Table 2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Layer Configuration** | | | | **Result** |
|  | kernel\_initializer (all layers) | activation  (hidden layers) | Dropout (hidden layers) |
| Experiment 1 | zeros | sigmoid | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 2 | ones | sigmoid | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 3 | random\_normal | sigmoid | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 4 | random\_normal | tanh | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 5 | random\_normal | relu | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 6 | random\_normal | relu | Yes  Hidden layer 1: rate=0.1  Hidden layer 2: rate=0.1 | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 7 | random\_normal | relu | Yes  Hidden layer 1: rate=0.5  Hidden layer 2: rate=0.1 | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 8 | random\_normal | relu | Yes  Hidden layer 1: rate=0.5  Hidden layer 2: rate=0.1  SGD learning rate=0.5 | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 9 | random\_normal | relu | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 10 | random\_normal | relu | No | Train accuracy =  Test accuracy =  Epochs = |
| Experiment 11 | Use optimal values for these hyperparameters. Your goal is to increase the test accuracy. Use your knowledge from experiments 1 – 10 and perform an empirical investigation. | | | Train accuracy =  Test accuracy =  Epochs = |
|  |  |  |

**Part B: Table 3**

|  |  |
| --- | --- |
|  |  |
| Number of hidden layers |  |
| Number of neurons in each hidden layer | * 1st Layer: * 2nd Layer: * Etc. |
| Weight initializer function |  |
| Activation function (hidden layer) |  |
| Regularization technique(s) |  |
| Size of mini batch |  |
| Learning rate |  |
| Train accuracy |  |
| Test accuracy |  |