**Homework #4 Report**

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**P1**

**P2.4**

Best Parameters for Logistic Regression:

lambda = 1; (regularization term)

Best Parameters for NN (for digits classification):

Hidden layers size: 64;

Lambda = 0.1;

Code:

compare\_classifiers.m

|  |  |  |
| --- | --- | --- |
| Partition Number | Accuracy for Logistic Regression | Accuracy for Neural Network |
| 1 | 0.5 = 0.5 | 1.0 |
| 2 | 1-0.545 = 0.455 | 1.0 |
| 3 | 1-0.409 = 0.591 | 1.0 |
| 4 | 1-0.318 = 0.682 | 1.0 |
| 5 | 1-0.591 = 0.409 | 1-0.045 = 0.955 |
| 6 | 1-0.455 = 0.545 | 1.0 |
| 7 | 0.5 | 1-0.045 = 0.955 |
| 8 | 1-0.591 = 0.409 | 1-0.045 = 0.955 |
| 9 | 0.5 | 1.0 |
| 10 | 1-0.364 = 0.636 | 1.0 |

|  |  |  |
| --- | --- | --- |
| Partition Number | Error for Logistic Regression | Error for Neural Network |
| 1 | 0.5 = 0.5 | 0 |
| 2 | 0.545 | 0 |
| 3 | 0.409 | 0 |
| 4 | 0.318 | 0 |
| 5 | 0.591 | 0.045 |
| 6 | 0.455 | 0 |
| 7 | 0.5 | 0.045 |
| 8 | 0.591 | 0.045 |
| 9 | 0.5 | 0 |
| 10 | 0.364 | 0 |

Random Variable Y computed as difference of errors:

Y\_mean = 0.4636;

Y\_std\_dev = 0.0796;

t-value = 18.4190;

Doing t-test for 1 sample t-test: Where Y\_i is the vector containing the values for the random variable Y.

For two-tailed test:

[h, p, ci,stats] = ttest(Y\_i)

p = 1.8747e-08

**Reasoning:**

Probability of observing data given null hypothesis is true is 1.8747e-08. Reject the null hypothesis and that the two methods have the same error rate at 5% significance level in favor of the hypothesis that they are different.

For one-tailed test (null hypothesis being that the expectation of Y is 0):

[h, p, ci,stats] = ttest(Y\_i,zeros(1,size(Y\_i,1)),'Tail','Right')

p = 9.3737e-09

**Reasoning:**

Probability of observing data given null hypothesis is true is 9.3737e-09. Reject the null hypothesis and that the two methods have the same error rate at 5% significance level in favor of the hypothesis that they are error rate of logistic regression is higher than error rate of neural network.