CSE 474-INTRO TO MACHINE LEARNING

Neural Networks

Project Assignment 2

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Report 1:

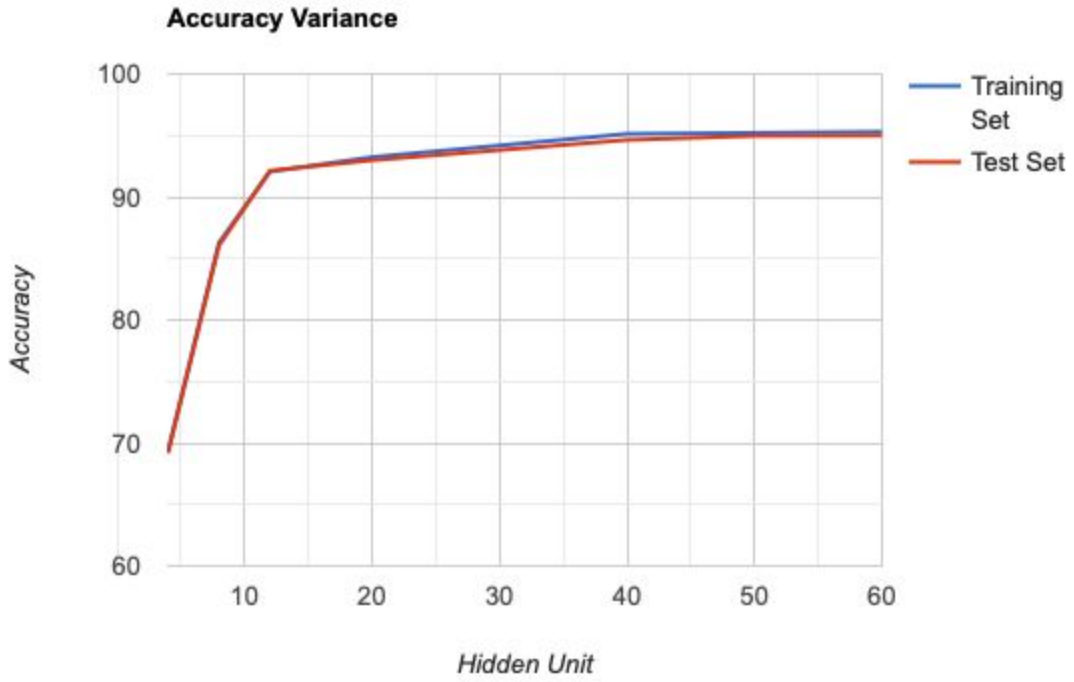
Choosing the hyper-parameters for the neural network:

Case 1: Keeping the Lambda Constant and then finding the optimal number of the hidden layers

Lambda = 0
Hidden Units = 4,8,12,16,20,40,50,60

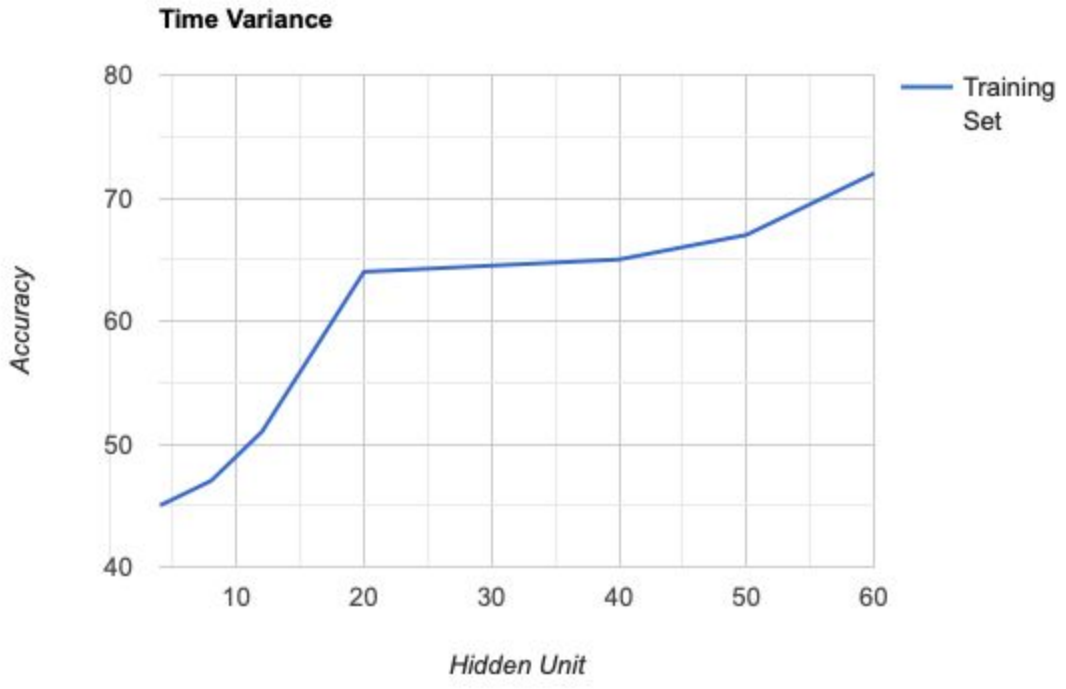
Accuracy Variance

Hidden Unit	Training Set	Test Set
4	69.35	69.17
8	86.29	86.06
12	92.06	92.14
20	93.24	92.99
40	95.13	94.64
50	95.21	94.99
60	95.42	95



Time Variance

Hidden Unit	Time
4	45
8	47
12	51
20	64
40	65
50	67
60	72



Conclusion:

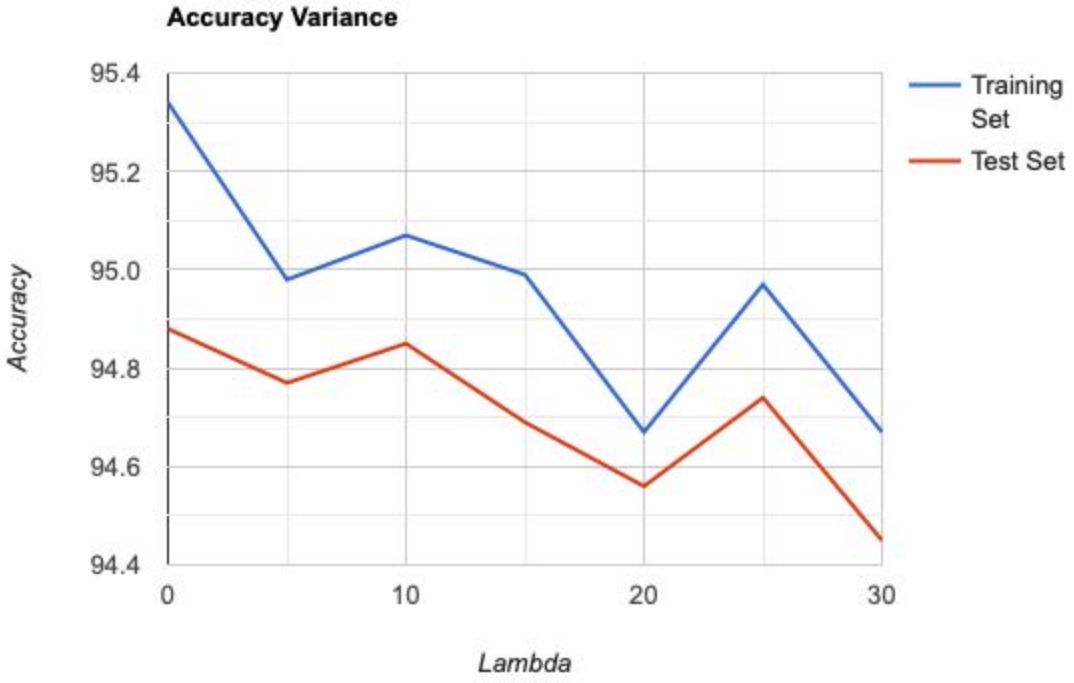
By increasing the number of the hidden layers in network the accuracy first increases and then it becomes constant and then starts to fall with taking a long time to process the output. If we are more concern about the accuracy as well as performance of the neural network we are taking the hidden unit value 50 as a optimal hidden unit as it produces the best result with the least time on the test data.

Case 2: Keeping the Hidden Units Constant and then finding the optimal number of the Lambda

Hidden Unit = 50
Lambda = 0, 5, 10, 15, 20, 25, 30

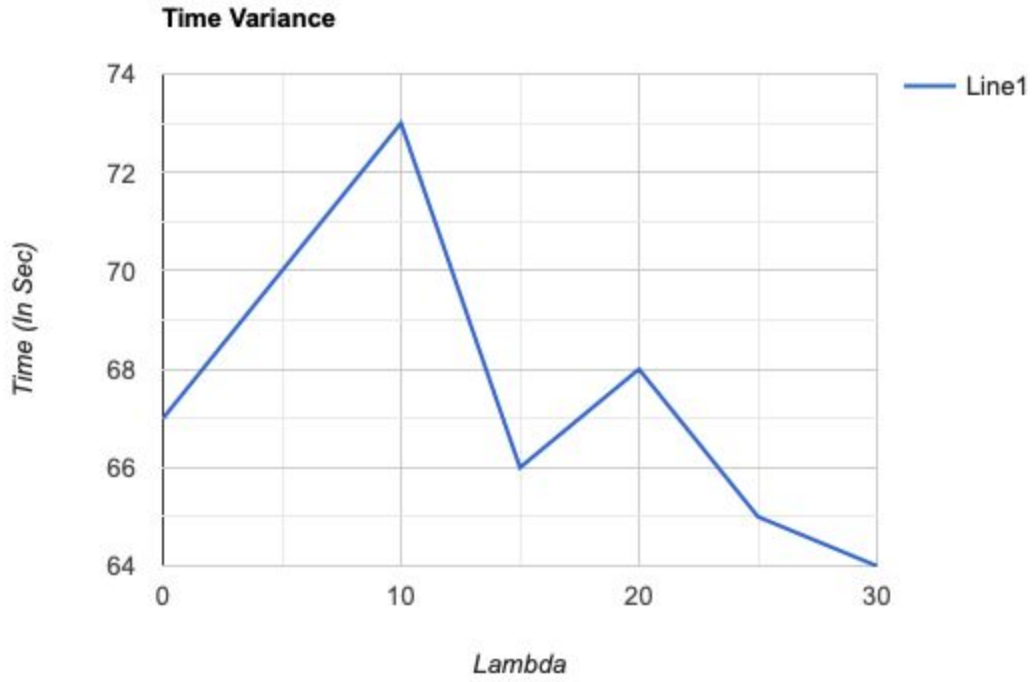
Accuracy Variance

Lambda	Training Set	Test Set
0	95.21	94.99
5	94.98	94.77
10	95.07	94.85
15	94.99	94.69
20	94.67	94.56
25	94.97	94.74
30	94.67	94.45



Time Variance

Lambda	Time
0	67
5	70
10	73
15	66
20	68
25	65
30	64



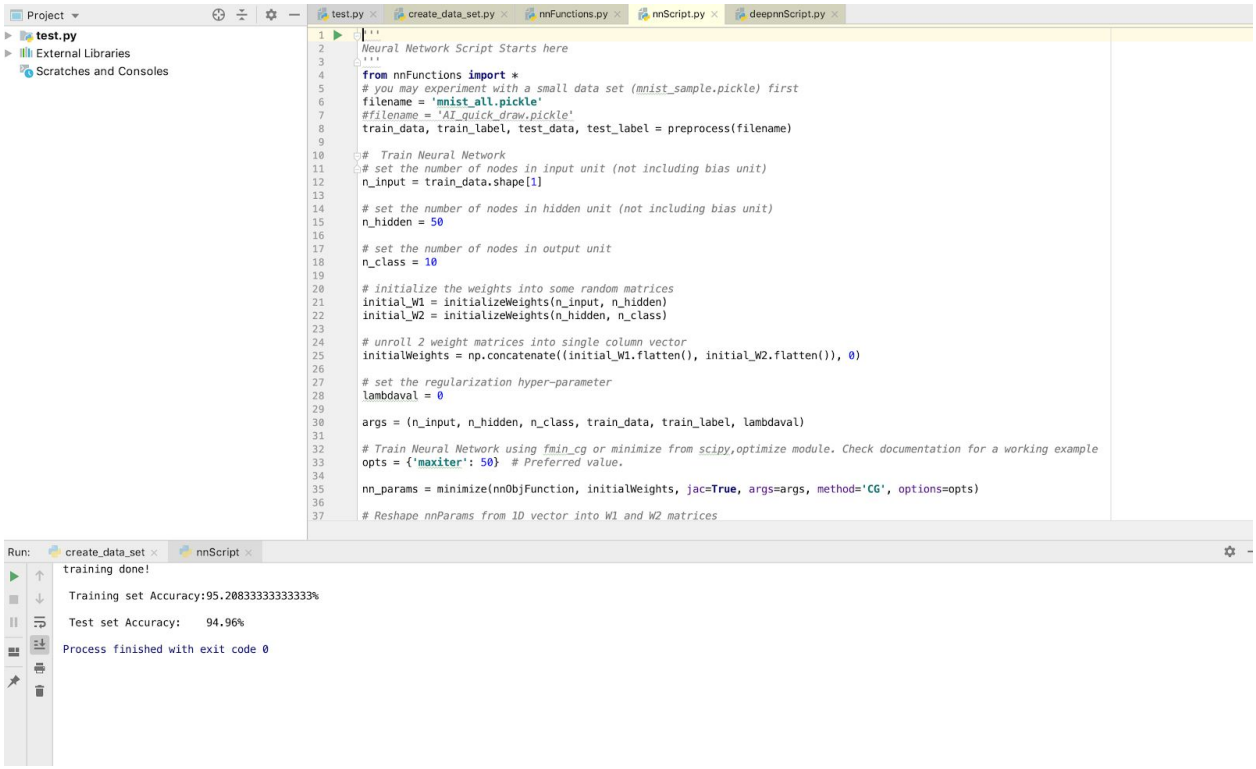
Conclusion:

By increasing the value of Lambda, Accuracy first decrease and then increase start at value 10 and eventually it drops. Time is comparable for almost all the values of Lambda. Since we are more concern about accuracy so we are taking Lambda value 0 as a optimal Lambda.

Report 2:

Accuracy of classification method on the handwritten digits test data:

Ans: The accuracy of the classification on the handwritten digits test data comes out to be 95.20% on the training data and 94.96% on the test data.



Report 3:

Accuracy of classification method on the AI Quick Draw data set:

Ans: The accuracy of the classification on the handwritten digits test data comes out to be 75.20% on the multivariable data of 3000 images.

Report 4:

Compare the accuracy and training time of deep neural network (using TensorFlow) with different number of layers:

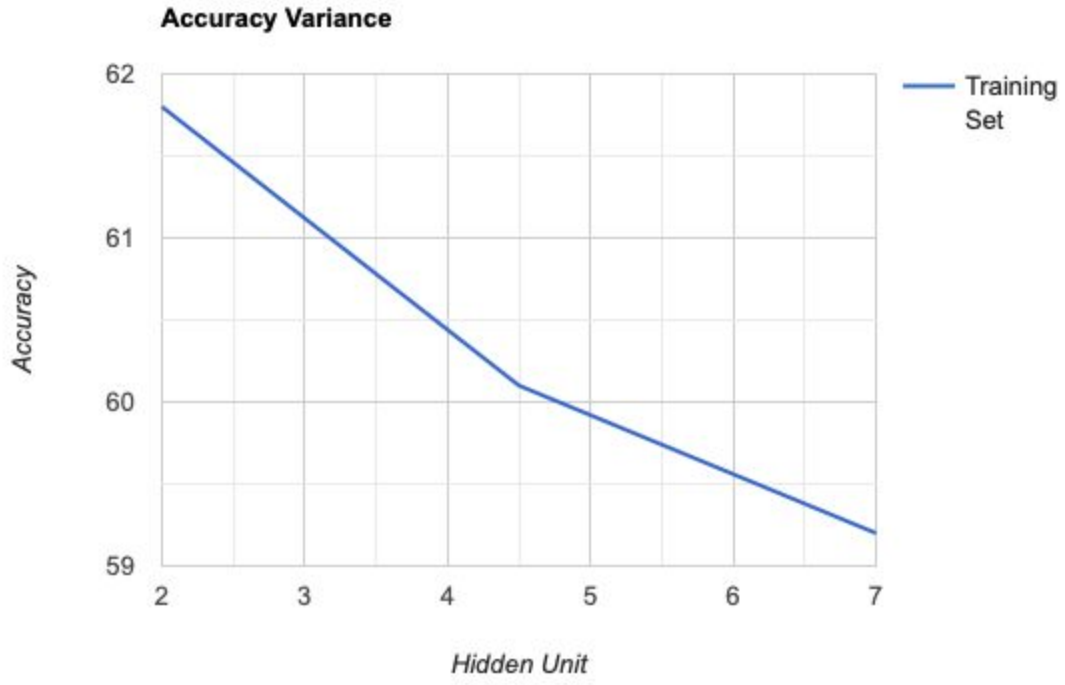
Ans: The accuracy and training time of deep neural network with different number of layers is:

Accuracy Variance

Layers	Accuracy
2	61.8
5	60.1
7	59.2

Time Variance

Layers	Time(in sec)
2	1020
5	1300
7	1477



Conclusion:

We can see that, deepnnScript.py gave 61.8 for 2 layers, 60.1 for 5 layers and 59.2 for 7 layer. On comparing these details, we conclude that the neural network with one hidden layer perform better than multiple layers and the accuracy goes on decreasing as we increase the number of hidden layers.