

CSE 574 - Introduction to Machine Learning

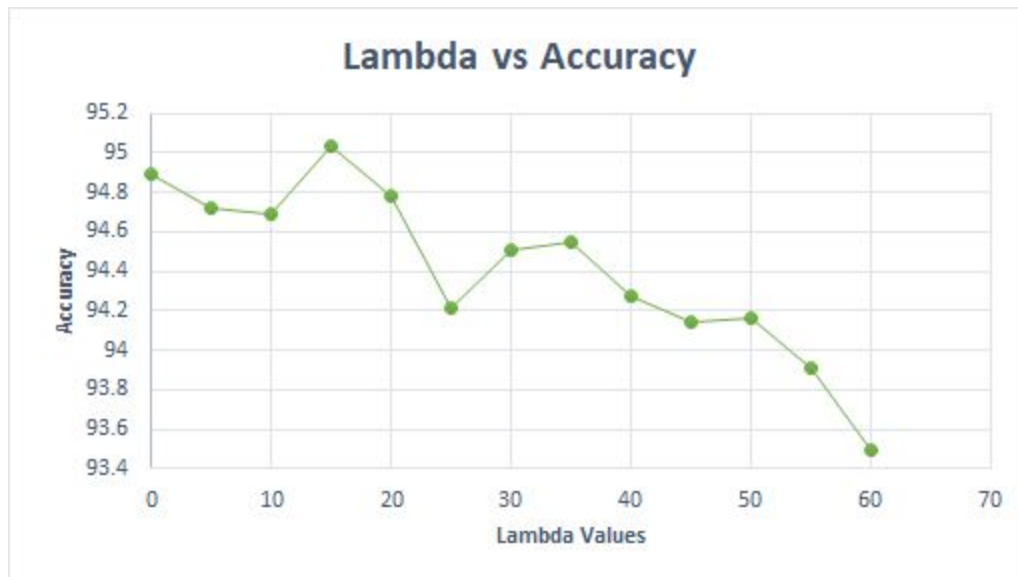
Programming Assignment 2

Project Report

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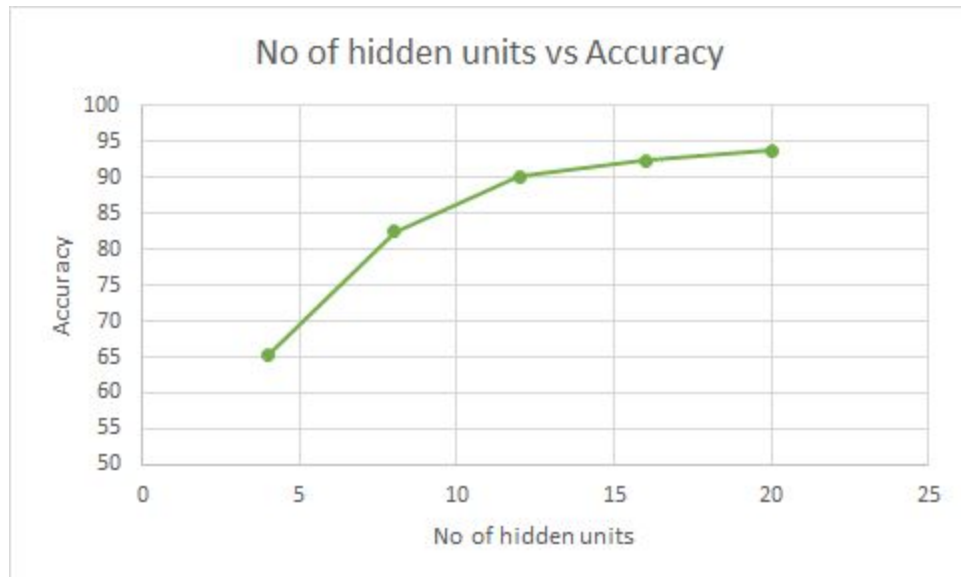
Results of nnscript.py:

Report 1: Selection of Optimum lambda:

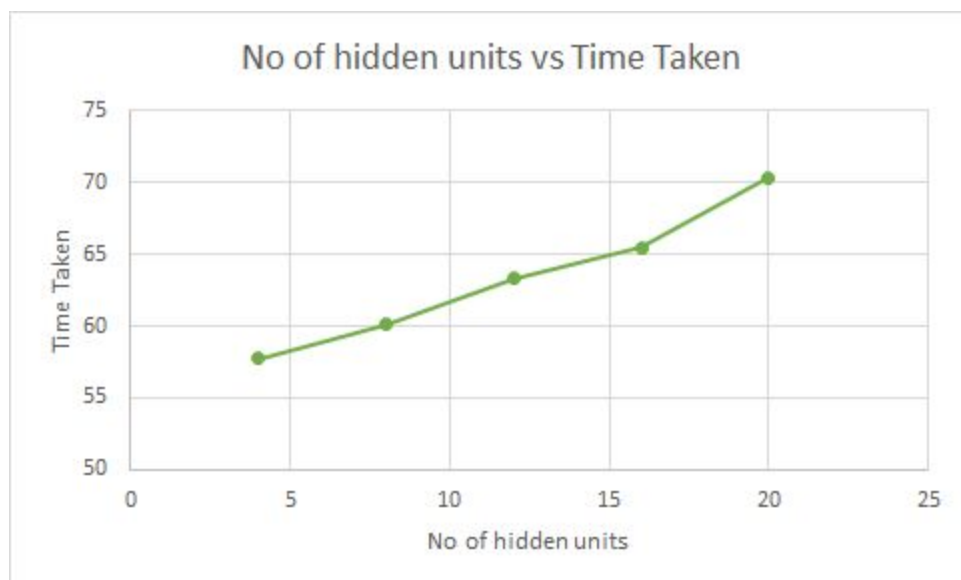


From the above graph, we can observe that the highest value of accuracy is at $\lambda = 15$. We take λ as 15 as optimum λ for $n_{\text{hidden}} = 50$. When we try to increase the regularization parameter further, there is a decrease in accuracy. This may be because of overfitting the model.

Report 2: Impact on accuracy and time taken on changing number of hidden units:



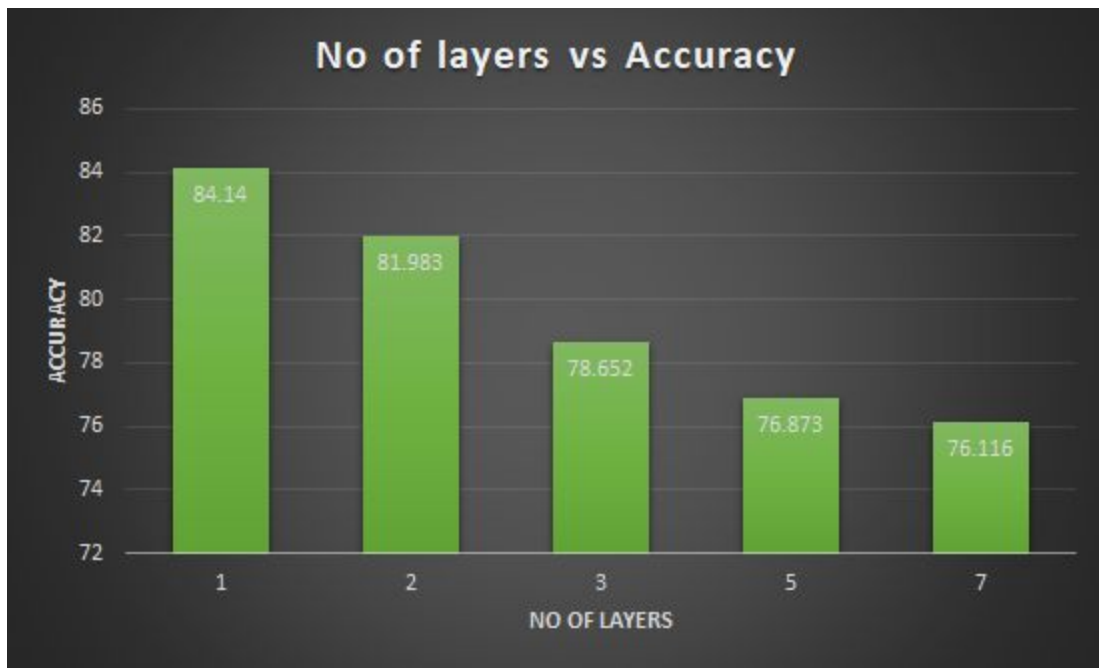
From the above line graph, we can see that as the number of hidden units increases, accuracy of the model increases. However, in the below line graph, we can see that, as the number of hidden units increases, the time taken also goes up, because the time required to learn neural network parameters also increases.



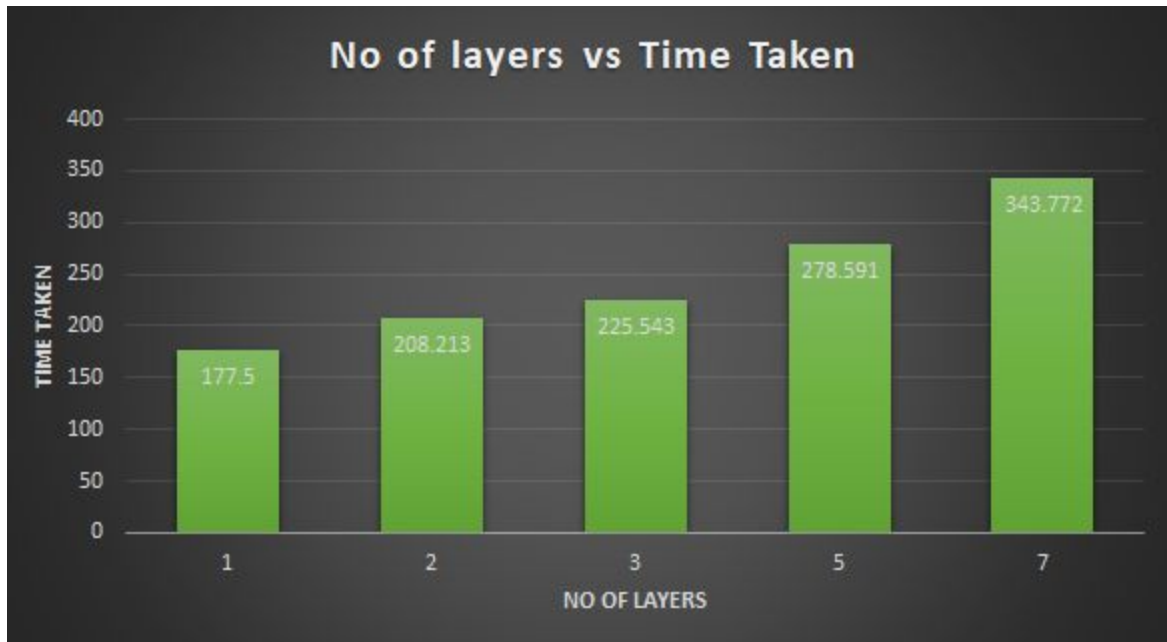
Results of facennScript.py and deepnnScript.py:

Report 3:

Impact on Accuracy and time with change in number of hidden layers:



From the above graph, we can observe that the accuracy of single layer network is the highest for the Celeb Face dataset. Ideally, there should be increase in accuracy upon increase in number of layers. But in this case, surprisingly, as we **increase the number of hidden layers, the accuracy decreases**. Well, we believe the reason is because the **model overfits** on the training data as we increase the number of hidden layers. If we increase the regularization parameter, it might help in reducing this overfitting problem.



As we can observe from the above graph, the **time increases** as the **number of hidden layers increases**.

Results of cnnScript.py:

Report 4: Accuracy and Time Taken by Convolutional Neural Network

After 1 iteration:

Test Set Accuracy : **13.1 %**

After 100 iterations:

Test Set Accuracy: **65.2 %**

After 1000 iterations:

Test Set Accuracy: **93.6 %**

After 10000 iterations:

Test Set Accuracy: **98.9 %**

Total Time Taken : 0:11:58

As we can observe from the above data, the accuracy increases as the number of epochs increases.