CSE 574-Introduction to Machine Learning
Programming Assignment 2
Project Report

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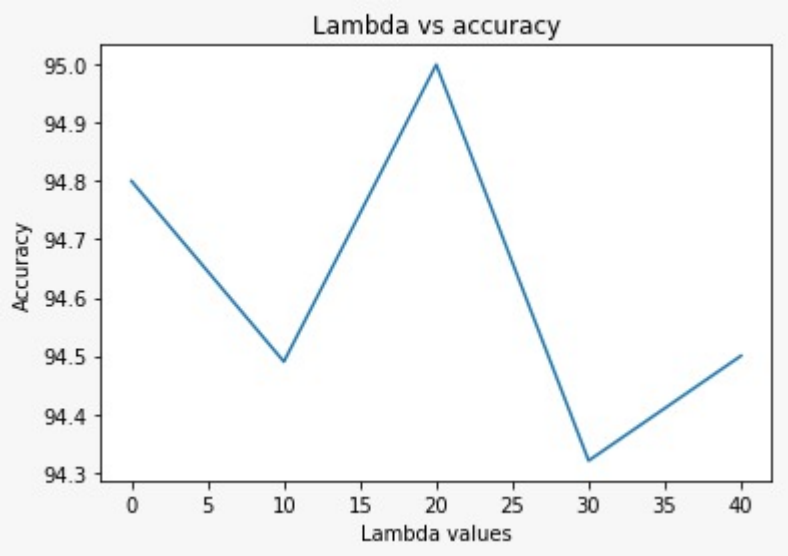
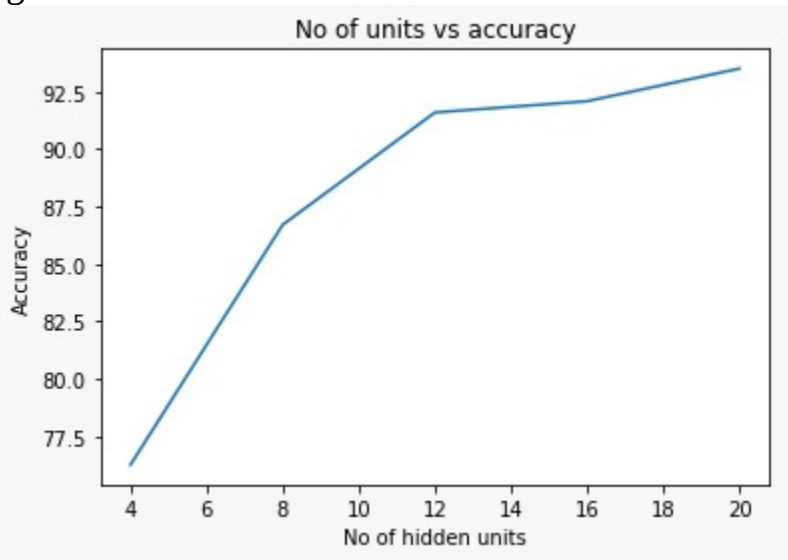
Results of nnscript.py:

Report 1: Selection of Optimum Lambda:

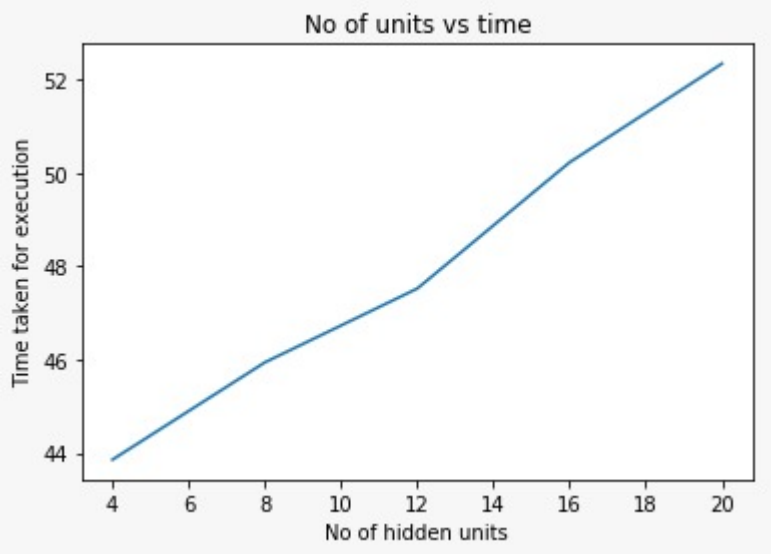


From the above graph it is clear that the highest value of accuracy is at lambda=20. We take lambda as 20 as the optimum lambda for n_hidden=50. When we increase the regularization parameter further we obtain lower values of accuracy. This may be because the model starts to overfit.

Report 2: Changing number of Hidden Units:

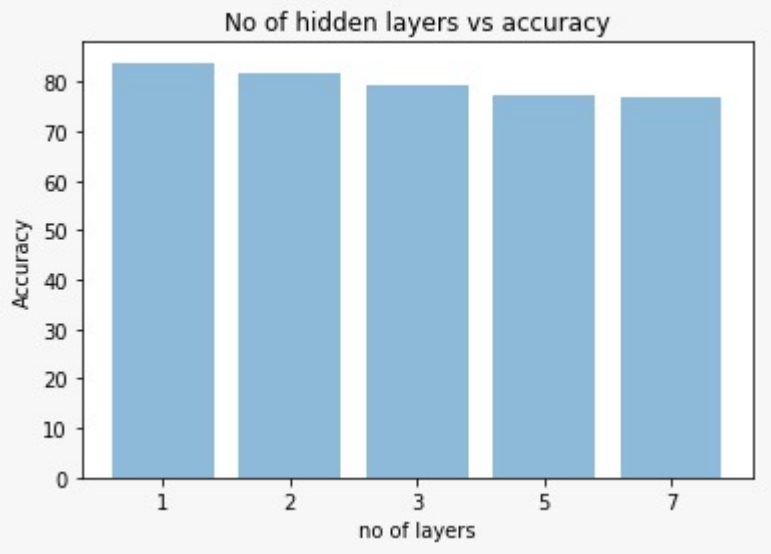


Unsurprisingly, from the above line plot it is clear that as we increase the number of neurons in the hidden layer the model starts becoming more accurate, i.e the classes of more and more test data points are predicted correctly. However, as seen from the graph below as we increase the number of hidden units, the time taken by the program to learn the parameters also goes up. This is because the number of computations required to learn the neural network parameters also increase.

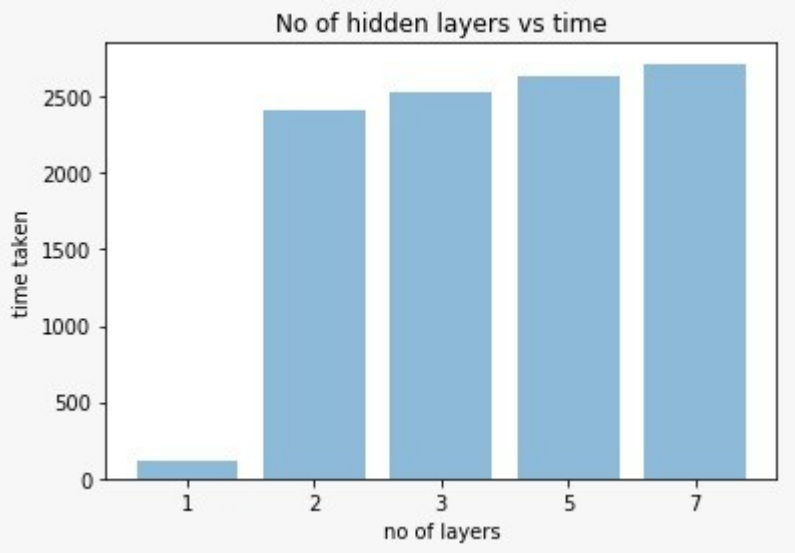


Results of facennScript.py and deepnnScript.py

Report 3: Changing number of Hidden Layers:



From the above bar chart it is clear that a single layer neural network gives the highest accuracy for the Celeb Face Dataset. As we increase the hidden layers the accuracy on the Test Dataset goes down. While this is surprising at first glance after a much deeper thought we believe that this is because the model overfits on the training data as we increase the number of hidden layers. Increasing the regularization parameter might help in reducing this overfitting problem to a certain extent.



As expected, as the number of hidden layers goes up the time taken to learn the neural net parameters also goes up.

Result of cnnScript.py

Report 4: Accuracy and Time Taken by Convolutional Neural Network

After 1 iteration:
Test Set Accuracy:15.1
After 10 iterations:
Test Set Accuracy:66.2
After 100 iterations:
Test Set Accuracy:93.3
After 1000 iterations:
Test Set Accuracy:98.8
Total Time taken:00:07:13
From the above data it is clear that the accuracy of the CNN goes up as the number of epochs increases. The network almost converges after 1000 iterations.