School of Computer Science Engineering and Technology

Course- BTech
Course Code- 301
Year- 2022
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Type- Core
Course Name-AIML
Semester- Even
Batch- 4th Sem (SPL)

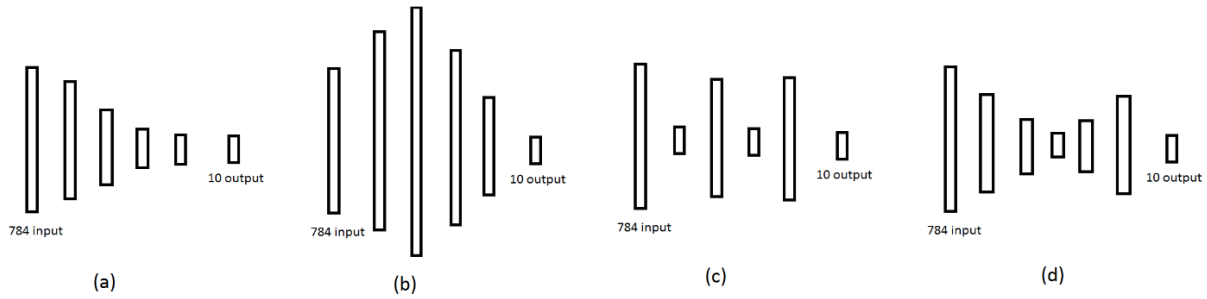
Lab Assignment No. 8.1

Objective: Exploring different Neural Network design choices for Digit classification using MNIST dataset with the help of Keras library. Use the helper .ipynb file provided.

1. **Number of Nodes:** Run neural network with single hidden layer, 32 nodes (with any activation function and any optimizer) for 10 epochs. Change number of nodes as 4, 32, 128, 512, 2056. What is the training and testing accuracies? Print the number of parameters of the model and training time for each of these configurations.

2. **Number of Layers:** Run neural network with 3 hidden layer, 32 nodes each (with any activation function and any optimizer) for 10 epochs. Change number of layers as 4, 6, 8, 16. What is the training and testing accuracies? Print the number of parameters of the model and training time for each of these configurations. Run the same models for 30 epochs. Any changes?

3. **Layer-node combinations:** Run different models mimicking the following structures. Which one gives best accuracy? Print the number of parameters of the model and training time for each of these configurations. Here, large sized bar means a layer with larger number of neurons in it. You can choose the number of neurons such as 256, 128, 64, 32 etc.



4. **Input Size:** Run neural network with 3 hidden layer, 128 nodes each (with any optimizer) with relu activation function for all layers, for 10 epochs. Print accuracies change?

5. **Dataset Split:** Instead of 60k images of training and 10k images for testing, run different models with different training and testing sizes, and see the changes in the accuracies.

6. **Activation function**: Run neural network with 3 hidden layer, 32 nodes each (with any optimizer) with sigmoid activation function for all layers, for 10 epochs. Change only the activation function as tanh, relu (for all 3 layers) etc. What is the training and testing accuracies? Run the same models for 30 epochs. Any changes?

7. **Activation function combinations**: For the three layers use different combinations of activation functions such as layer 1: sigmoid, layer 2: relu, layer 3: tanh. There can be lot of combinations like this. Which one is the best for 3 layer each with 32 node architecture?