IT416: TOPICS IN DEEP LEARNING

Assignment 3 : Designing Artificial Neural Network from Scratch

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1 LEARNING OUTCOME

At the end of this assignment you will learn how to train and test the Artificial Neural Netwok from scratch. Also we will work on some way of how to analyse observations which will help in future sessions.

2 PROBLEM DESCRIPTION

Implement Artificial Neural Network on two different Datasets (MNIST and CIFAR-10).

3 IMPLEMENTATION

3.1 Exercise

- Implement a 5-layer Neural Network (3 Hidden Layers) as depicted in 2.1.
- Activation functions for hidden layers and output layers can be chosen as per your choice. Play around with Sigmoid , Softmax , RELU and TanH functions. Comment on the observations
- Use different Batch Sizes and analyse how the accuracy is changing.
- Also play around with different sizes of Hidden Layers and see the difference you get. Comment on it.
- Design a Confusion Matrix depicting the outputs you got

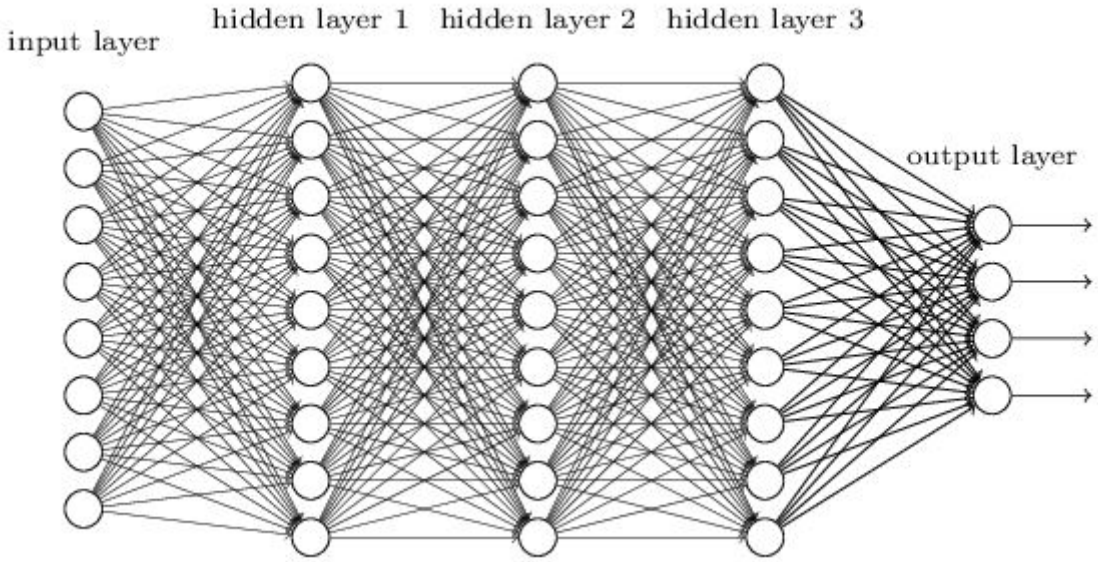

Figure 2.1: Neural Network Architecture

- Visualize Weight Matrices and see the change as the epochs increase. (during training)
- Visualize the Layer outputs for MNIST digits like 0,1,2... (during prediction) . Try to do the same for CIFAR test images
- Comment on the Accuracies(Training and Testing set) received for both the datasets and justify the difference in them, if any.

3.2 Instructions

- You need to implement the above Neural Network Forward Propagation Step in Tensorflow 2.0 . **Do not use Keras library or pytorch inbuilt functions**.
- Keras Library can **only** be used for downloading MNIST and CIFAR-10 dataset.
- Calculate both the Training and Testing accuracies. Make sure you make an ideal train_test_split.
- Provide necessary Visualizations.

4 REFERENCES

- https://keras.io/api/datasets/

5 SUBMISSION

- You have to submit your assignment in Google Colab notebook (.ipynb file) with proper comments and explanation of your approach.

- Your filename should be named as **LabAssignment3_StudentId** . If your id is 202011001 then filename will be **LabAssignment3_202011001.ipynb**

- The submission deadline for this assignment is **14th September 2020 11:59 pm**