Question Set 1 | Target Course Outcome: CO3

Department of Computer Science and Engineering
Amrita School of Computing
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III Year B.Tech. CSE VI Sem CSE/CCE
19CSE456 – Neural Networks and Deep Learning (PE-3)
Lab Evaluation – I

Instructions:

- The total mark for the lab evaluation is 10.
- The questions should be neatly worked out in VS Code/Anaconda's Jupyter IDE and it needs to be made sure that the python notebook is named as Roll_Number_NNDL_Eval1.ipynb (e.g. CB.EN.U8CSE96108_NNDL_Eval1.ipynb).
- The pdf (the file name should be same as the name of ipynb) exported version of ipynb should be uploaded to the outlook form whose link is: **https://forms.office.com/r/Hja3w03wvr.**

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1. **Loading the dataset (3 marks)**
    a. Import all necessary dependencies to construct a Multilayer Perceptron and for carrying out visualization. (0.5 mark)
    b. Load the **mnist** dataset (with train and test split) from **keras**. (0.5 mark)
    c. Perform necessary preprocessing on the images loaded from the **mnist** dataset. (1 mark)
    d. Show the shapes of train and test sets (both predictor and predicted variables) (0.5 mark)
    e. Select a sample set of 16 images from the dataset and visualize in a 4X4 grid. (0.5 mark)

2. **MLP Construction (3 marks)**
    a. Construct a MLP network architecture with an input layer, 4 hidden layers, and an output layer. The number of neurons in the hidden layers can be 512, 256, 128, and 64, respectively. **ReLU** must be the choice for hidden layers' activation functions and Present the summary of the network. (2 marks)
    b. Compile the model with **adam** to be the optimized and **sparse_categorical_ crossentropy** being the loss function. Fit the constructed MLP with training data with values for epochs, batch_size, and validation_set being 5, 32, and 0.1, respectively. (1 mark)

3. **Performance Evaluation (4 marks)**
    a. Draw the accuracy and loss plots for training and validation sets for whatever model built because of fitting happening in questions number 2. (2 marks)

b. Change the number of epochs and batch_size in question number 2 to 10 and 64. Then, draw the accuracy and loss plots for training and validation sets. (1 mark)
c. Present the test set accuracy and loss for both models (model created in question number 2 and 3) (1 mark)
