Assignment 1 (Fall 2025)

Total marks: 9

You are given an incomplete program as an ipynb file. Complete the program to create a deep neural network with 2 hidden layers using the Sequential and Dense layer in Keras and perform classification on the MNIST handwritten dataset. Perform the following steps. Upload the notebook as a single file.

(a) In the first experiment, use 100 relu neurons in the first layer and 50 tanh neurons in the second layer. Employ BatchNormalization and a Dropout of 0.2. 1 + 1 + 1 marks

(b) Now, use sgd optimizer with a fixed learning rate = 0.07 and nesterov = False. Evaluate the performance of the network in terms of training and validation accuracy over 20 epochs and a batch size of 128. 4 x 0.5 marks

(c) Clearly print the history of the fit which should show the training and validation accuracy as a function of epochs. 1 mark

(d) Plot the training and the test accuracy in a single graph as a function of the number of epochs. Put x-axis label as 'epochs' and y-axis label as 'accuracy'. Use two data legends: one for training and another for test. The legends should be at the bottom right corner of the plot. 1 + 1 + 1 marks