Spr 2023: CSCI 4/5588 Programming Assignment #3

DUE: Wednesday, April 12, 2023 (**Softcopy** @10 AM via Moodle).

Instructions

- All work must be your own (besides the instructor-provided codes and hints to be used). You are NOT to work in teams on this assignment.
- Format: Your solution must be typed. Submit as a single compressed file (via moodle) **containing all the related files in it**. Name it as PA3_<Your_name>. Provide hardcopy (see Reporting section.)
- The top/cover page of the report should have the title, "Spr 2023: CSCI 4/5588 Programming Assignment #3". Then your, "Name:_____ and ID:_____
- **Marks**: 100.

Description

This programming assignment is to build an Artificial Neural Network (ANN) to recognize handwritten 10 digits: '0', '1', '2', …, '9'.

- You will build 4 different ANNs having hidden layer(s): 1, 2, 5, and 10.
- Each of the hidden layers will have random units ranging from 5 to 100.
- You are welcome to generate any additional useful features from the given datasets to be used as an input feature.
- Train your ANN(s) using the training datasets and identify the best weights (parameters) using the test datasets.
- The exit condition for the ANN is at least 2000 epochs.

Data

- Information about the dataset:
  - https://hastie.su.domains/ElemStatLearn/datasets/zip.info.txt
- Dataset:
  - Training: https://hastie.su.domains/ElemStatLearn/datasets/zip.train.gz
  - Individual digit-wise training data is also available: https://hastie.su.domains/ElemStatLearn/datasets/zip.digits
  - Test: https://hastie.su.domains/ElemStatLearn/datasets/zip.test.gz
- Check Moodle for a copy of the datasets and related information.

Submission of the Report

- Submit a report that includes the following:
  - For each of the ANNs, plot graphs of the training and test of
    - (a) MSE, and
    - (b) classification accuracy,

for epochs, at least ranging from 1 to 200.

  - In a table, show the minimum training and test error (i.e., MSE) collected from each of the ANNs, running at least 2000 epochs.
- A readme file describing how to run your program.
- Program code with necessary comments.

Information

- **You must follow the ANN code provided by the instructor in the class**. Extend the code for this assignment problem (You may convert the given code or idea of the code to a different programming language, and then you can also extend it further).

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