Minor - 1

Submission Deadline: 11:59 PM, 13th February 2023

Instructions:

Submission Policy and Requirements :
- You can use whatever resources you want but you should not discuss with any living being in any manner whatsoever (except the Course Instructor).
- We will perform a plagiarism check on your submission. Any case of violation would call for an action as per the institute policies.
- Programming languages and framework allowed: Python + PyTorch (use of Tensorflow will fetch no marks)
- Do cite references (if any)
- Submissions should include a working code (with Readme) for the questions asked, a report to show the analysis of results in each of the parts, and a video demonstration indicating the functional codes.
- Submission of the report is mandatory.

Assessment criterion:
The assessment will be done on the basis of the following components:
- Working codes.
- Analysis and clarity of results (drawing comparisons across different parts) & clarity of the report.
- Understanding the theoretical concepts and the choice of hyperparameters (not given in the paper).
- List down the hyperparameters that are fit to you as per your details (see the question for more details).

Guidelines for Submission:
- A single report (in pdf) for all questions
- Mention all the relevant results and comparisons as asked or wherever required for a better understanding of the results.
- A single zip file containing the report, codes, video demonstration of working codes, and readme.
- Name the file with roll number: <Roll_Number_minor1.zip>

Question 01 [50 marks] :

Let your date of birth be DD/MM/YY. Let the last three digits of your roll number at
IITJ is ABC. Finally, let your first name be FIRST and last name be LAST. And your program will
be PROG.

- Train a CNN with the following details.

Dataset details
- For **B.Tech** students:
  - FashionMNIST dataset if ABC is even; MNIST otherwise.
- For **M.Tech/Ph**D students:
  - CIFAR10 dataset

Weight Initialization:
- Xavier initialization if MM is even; He initialization otherwise.

Data Augmentation Details:
- If DD is even, use flip and random noise augmentation.
- If DD is odd, rotate by 10 degrees and gaussian noise.

Pooling Operation Details:
- AvgPool if MM is even; MaxPool otherwise.

Target Classification Details:
- If the sum of DD, MM, and YY is even then your target 5-classes will be 0,2,4,6,8.
- If the sum of DD, MM, and YY is odd then your target 5-classes will be 1,3,5,7,9.

Model Details:
- For **B.Tech** students:
  - Feature Extraction layers:
    - If last digit of ABC is less than 6:
      - If ABC is even, your network should have 4 conv layers and 1 pool layer.
      - If ABC is odd, your network should have 3 conv layers and 2 pool layers.
    - If last digit of ABC is greater than or equal to 6:
      - Your network should have 5 conv layers and 1 pooling layer.
    - If ABC is even, your network will have 10 filters in the first layer.
    - If ABC is odd, your network will have 8 filters in the first layer.

  - Fully-Connected layers:

- ■ If the sum of digits of ABC is even, your network should have 1 FC layer with 512 nodes.
- ■ If the sum of digits of ABC is odd, your network should have 1 FC layer with 256 nodes.
- ● For **M.Tech/PhD** students:
  - ○ Feature Extraction layers:
    - ■ If ABC is even, your network should have 5 conv layers and 2 pool layers.
    - ■ If ABC is odd, your network should have 6 conv layers and 1 pool layer.
    - ■ If ABC is even, your network will have 16 filters in the first layer.
    - ■ If ABC is odd, your network will have 12 filters in the first layer.

  - ○ Fully-Connected layers:
    - ■ If the sum of digits of ABC is even, your network should have 1 FC layer with 1024 nodes.
    - ■ If the sum of digits of ABC is odd, your network should have 1 FC layer with 512 nodes.

Question 02 [50 marks] :

Train an autoencoder with the same details as given before and compare your results with CNN results. The number of AE layers will be 4 if ABC even else 3. The classification layer will be single FC with 512 nodes if your MM is even, else 256. Rest of the hyperparameters are left to you (please list them and explain the reason of your choice).