

## Homework 5 (Programming Only)

### Task-0: Classification of Fashion-MNIST images (100 points).

In this task, you will build MLP and CNN models to classify Fashion-MNIST images in 10 classes.

**Dataset:** Read and Run H5T0\_dataset.ipynb to obtain the training, validation, and test sets. The three sets will be saved in a file H5T0\_train\_val\_test\_data.pt. If you do not use H5T0\_train\_val\_test\_data.pt for this task, you will get zero point for this task.

#### General Requirements:

Do NOT use the test set for hyperparameter optimization. (zero point if doing so).

Do NOT fit/train model on the test set (zero point if doing so).

Do NOT use weighted/balanced accuracy because there is no class-imbalance (zero point if doing so).

Follow the standard steps of training, validation, testing

There are 10 classes. Missing n classes in accuracy calculation will result in a loss of  $n \cdot 10\%$  of the points.

#### Example: H5T0\_LR\_example.ipynb

The logistic regression classifier achieves an accuracy of 79.1% on the test set

#### Grading for MLP (40 points)

steps: Define an MLP, train it in a for loop, and find the best model during training.

The best model is the model that performs best on the validation set.

More detailed instructions are in H5T0\_MLP.ipynb

zero point if not using PyTorch; zero point if not using MLP; zero point if not using dataloader

(5 points) If the best model achieves an accuracy of  $\geq 79\%$  on the test set

(15 points) If the best model achieves an accuracy of  $\geq 80\%$  on the test set

(15 points) If the best model achieves an accuracy of  $\geq 81\%$  on the test set

(5 points) If the best model achieves an accuracy of  $\geq 82\%$  on the test set

#### Grading for 2D CNN (60 points)

steps: Define a CNN, train it in a for loop, and find the best model during training.

The best model is the model that performs best on the validation set.

More detailed instructions are in H5T0\_CNN.ipynb

zero point if not using PyTorch; zero point if not using 2D CNN; zero point if not using dataloader

(5 points) If the best model achieves an accuracy of  $\geq 79\%$  on the test set

(10 points) If the best model achieves an accuracy of  $\geq 80\%$  on the test set

(15 points) If the best model achieves an accuracy of  $\geq 81\%$  on the test set

(15 points) If the best model achieves an accuracy of  $\geq 82\%$  on the test set

(10 points) If the best model achieves an accuracy of  $\geq 83\%$  on the test set

(5 points) If the best model achieves an accuracy of  $\geq 84\%$  on the test set

**Note:** (1) you can try many times and submit the best ones

(2) transfer learning is allowed but it may not be necessary for this task.

#### Upload those to Blackboard:

(1) H5T0\_MLP.ipynb

(2) H5T0\_CNN.ipynb

(3) your “signature” and the best MLP model in MLP\_best.pt (lose 50 points if the model file is missing)

(4) your “signature” and the best CNN model in CNN\_best.pt (lose 50 points if the model file is missing)

About “signature”: read H5T0\_MLP.ipynb and H5T0\_CNN.ipynb

Your signature for MLP needs to be unique in your file.

Your signature for CNN needs to be unique in your file.

**This is an individual assignment. You must complete it on your own. Do not collaborate with or share code with other students.**

**Before you submit homework files, make sure you run each and every code cell of your program file. If a code cell is supposed to generate some output (text or figure) and nothing shows up below the cell, you will lose the points of that cell.**