BIRZEIT UNIVERSITY

Electrical and Computer Engineering Department

First Semester, 2023/2024

Intelligent Systems Lab - ENCS5141

Assignment #4

Binary classification with CNNs

The goal of this assignment is to experiment with CNNs for binary classification. Please complete the tasks required and submit your solution in .ipynb format.

Dataset

In this task we will use MNIST dataset. In experiment 7, we apply multiclass classification on handwritten digits from MNIST. However, the goal of this task is to predict if the input image depicts a digit that is greater than a threshold τ such that

τ = the average of all digits in your university ID

Model

The model for the task will be a 5-layers CNN with the following specifications:

University-ID = 1ABCDYX

- Layer-1: Convolutional layer with kernel size 3x3 and number of feature maps (output channels) = (X+4).
- Layer-2: Convolutional layer with kernel size 3x3 number of feature maps (output channels) = (Y+15).
- Layer-3: Fully connected layer with **ABC** neurons.
- Layer-4: Fully connected layer with **16** neurons.
- Layer-5: Fully connected layer with **1** neuron.

Use relu as an activation function for the hidden layers. For the output layer, the activation function should be sigmoid.
Each convolutional layer should be followed by an average pooling layer with window size 2x2 and stride 2.

Loss

Use binary cross entropy loss (nn.BCELoss).

Tasks

1- Train the model specified above on GPU for 3 epochs using Adam optimizer with learning rate 0.0005 and batch size 8.

2- Plot the training accuracy vs. epoch curve.

3- Compute the testing accuracy of the learned model.

4- Plot 4 misclassified images. Show the correct label and the predicted label for each image.