

### Homework #3

Please, report your results clearly and answer all questions to receive full credit.

Please complete the assignment using Jupyter Notebook or Google Colab and implement your code using PyTorch.

Please email your completed assignment as a single PDF file to `mmarini2@Central.UH.EDU`.

#### **Problem 1: Binary Classification**

This problem involves binary classification to predict whether a breast tumor is malignant or benign using the following dataset: [https://scikit-learn.org/stable/modules/generated/sklearn.datasets.load\\_breast\\_cancer.html#sklearn.datasets.load\\_breast\\_cancer](https://scikit-learn.org/stable/modules/generated/sklearn.datasets.load_breast_cancer.html#sklearn.datasets.load_breast_cancer)

1. Implement a Multilayer perceptron (MLP) with one hidden layer with 64 hidden units for this binary prediction task.
2. Train a classification model for 15 epochs using a 80-20 random split between training and testing, and evaluate the model's performance by **plotting the training loss function** and the **classification accuracy** (on the test set) with respect to the number of epochs. Compare the performance for 3 different batch sizes.

#### **Problem 2: Multi-class Classification**

This problem involves 10-class classification using the MNIST dataset from torchvision.

1. Write a Python script to implement a MLP with 3 hidden layers with 10, 10 , 10 hidden units for the task of multiclass classification.
2. Using the MNIST dataset, train the model for 20 epochs (training and test samples are already assigned in the set); evaluate the model's performance by **plotting the training loss function** and the **classification accuracy** (on the test set) with respect to the number of epochs. Compare the performance for 3 different batch sizes.