CS4013/5013 Assignment 7

Fall 2024

Due Date: Dec 1, 2024.

In this assignment, we implement a multi-layer perception (MLP) using the Python Scikit-Learn library, and evaluate its classification accuracy on the Diabetes data set. A template with detailed instruction is given to you.

Task 1. Evaluate the Impact of Layer Size on Classification Accuracy

Fix the number of layers to 5 and vary the number of neurons per layer k. Report training error and testing error versus k in Figure . Note the figure should contain two curves, one for training error and the other for testing error. Pick 5 values of k by yourself.

Goal: you should aim to observe both underfitting and overfitting in this figure.

Figure 1:

Task 2. Evaluate the Impact of Layer Depth on Classification Accuracy

Fix the number of neurons per layer to a proper number (picked by yourself) and vary the number of layers m. Report training error and testing error versus m in Figure . Note the figure should contain two curves, one for training error and the other for testing error. Pick 5 values of m by yourself.

Goal: you should aim to at least observe underfitting in this figure.

Figure 2:

Task 3. Evaluate the Impact of Activation Function on Classification Accuracy

Fix both the number of layers and the number of neurons per layer to proper numbers (picked by yourself) and vary the choice of activation functions between (1) identity, (2) logistic, (3) tanh and (4) ReLU. Report training error and testing error for each choice in Table **??**.

Activation Function	Training Error	Testing Error
Identity		
Logistic		
Tanh		
ReLU		

Task 4. Quiz Questions

A set of quiz questions will be posted on Canvas.

Submissions Instructions

You should generate 2 figures and 1 table, place them all (sorted based on task number) in a pdf file named 'hw7.pdf' and upload it to Canvas through the submission page for hw7.

You also need to upload the code that generate the figures and table, including

– hw7_task1.py for Figure 1

– hw7_task2.py for Figure 2

– hw7_task3.py for Table 1 (set it to ReLU)

You can generate the pdf file using any tool, although you are encouraged to generate it using Overleaf. A latex template 'hw7_Latex.txt' will be provided to you.