AMAT5200 Homework #1

Due on Monday, Oct. 09

Topic: Data Fitting via two-layer NNs

Question 1: Go through the in class notebook "PythonLinearFitting" and answer the questions listed in it.

Question 2: Perform numerical tests on training two-layer NNs to fit low dimensional data (1D or 2D), and check the convergence/performance.

Design your own topic, topics can be (but unlimited to): the phenomena of overfitting, underfitting, relationship between training error and generalization error, the effect of data structure, the effect of sampling, the effect of neural network parameters (activation functions, optimizer, number of neurons, etc), the convergence as a function of epochs...

Try at least 5 different types of target functions, for example, high frequency vs. low frequency, 1D data vs. 2D data, periodic vs. non-periodic, smooth vs. non-smooth, or 1D/2D low dimensional manifold embedded in a high dimensional space (you can achieve this by constructing a parameterized function), and many other possibilities.

Summarize what you observe/find in a typed report (using Latex, LyX, word, etc). The code can be written in tensorflow (either 1.0 or 2.0), PyTorch, Julia or just from scratch in python.

Upon deadline, all the materials, including report, code, and data sets are required to be submitted.