APMA 2070 Deep Learning for Scientists and Engineers
Homework 1
Due Date: 02-01-2023

Homeworks Module-1

Submodule 1.2

1. First task is to install Anaconda. Ensure you are able to launch the jupyter notebook and import all the required modules.

2. Write a Python code for orthonormalizing N vectors using the modified Gram-Schmidt Algorithm. Test your code on $S = \{v_1, v_2, v_3\}$, where $v_1 = (1, 2, 2), v_2 = (-1, 0, 2), v_3 = (0, 0, 1)$.

3. Write a Python code to perform Singular Value Decomposition (SVD) of a matrix. You are only allowed to use NumPy (you should not use built-in routines like `numpy.linalg.svd`).

   Test your code on

   $$M = \begin{bmatrix} 1 & 0 & 0 & 0 & 2 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \end{bmatrix}$$

4. Write a python subroutine to compute the L^2- norm of a vector of length N. Test your code on the vector $\left(\cos \frac{\pi}{4} \sin \frac{\pi}{8}, \sin \frac{\pi}{4} \sin \frac{\pi}{8}, \cos \frac{\pi}{8}\right)$.