

HOMWORKS MODULE-1

APMA 2070: Deep Learning for Scientists and Engineers

Homework 02

Instructor.: Khemraj Shukla

Due Date: 02-24-2025, 11:59 pm (E.T.)

Lecture 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

$$v_1 = (1, 2, 2), \quad v_2 = (-1, 0, 2), \quad v_3 = (0, 0, 1).$$

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

$$\left(\cos \frac{\pi}{4} \sin \frac{\pi}{8}, \sin \frac{\pi}{4} \sin \frac{\pi}{8}, \sin \frac{\pi}{4} \sin \frac{\pi}{8}, \cos \frac{\pi}{8} \right).$$