BITS Pilani
Pilani | Dubai | Goa | Hyderabad

Work Integrated Learning Programmes Division
M. Tech. in Data Science and Engineering

Assignment 1

SS ZC416 - Mathematical Foundations for Data Science

Instructions

1. Use any programming language (other than Excel) of your choice. Attach only the relevant data in your submission and no need to submit the code.
2. By random entries, I mean a system generated random number of the form m.dddd. No marks would be awarded for deterministic entries.
3. This is not a group activity. Each student should do the problems and submit individually.
4. Assignments have to be handwritten and uploaded as a single pdf file with name BITSID.pdf
5. Submissions beyond 19th of September, 2021 17.00 hrs would not be graded
6. Assignments sent via email would not be accepted
7. Copying is strictly prohibited. Adoption of unfair means would lead to disciplinary action.

Answer all the questions

Q1) Write codes to implement the Gaussian elimination with partial pivoting for the system $\mathbf{A}_{n\times n}\mathbf{x} = \mathbf{b}$. Include a statement in the code to indicate the swapping of rows. Using the code, (5)

a) draw the $\log - \log$ plot of n versus the time taken for forward elimination and backward substitution (as separate graphs) by taking values of n between 1000 and 10000 in steps of 1000. Determine the time taken for a single computation in your machine (by averaging over 1000 runs) and compare the time taken with the actual time derived in the class. This should give the time taken for the partial pivoting.

b) solve the system $\mathbf{A}_{5\times 5}\mathbf{x} = \mathbf{b}$, with random entries and display your results.

Q2) Gauss Jordan method To find the inverse of a non-singular matrix $\mathbf{A}$ by Gauss Jordan method, one starts with the augmented matrix $[\mathbf{A} \mid \mathbf{I}]$ where $\mathbf{I}$ is the identity matrix of the same size and performs elementary row

operations on $\mathbf{A}$ so that $\mathbf{A}$ is reduced to $\mathbf{I}$. Performing the same elementary operations on $\mathbf{I}$ would give $\mathbf{A}^{-1}$. Assuming that $\mathbf{A}_{m\times m}$ is an invertible matrix, write a code to find the inverse of $\mathbf{A}$ using the Gauss Jordan method.

Using the code, find the inverse of a 6 x 6 random matrix which is non-singular. (5)