

Tutorial 5, 6: Solution of Linear Algebraic Equation

1. Using Gauss Jordan method solve the given system of equation

$$6x_1 - 2x_2 + x_3 = 11$$

$$x_1 + 2x_2 - 5x_3 = -1$$

$$-2x_1 + 7x_2 + 2x_3 = 5$$

2. Find the largest Eigen value and the corresponding Eigen vector of the following matrix:

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

3. How Gauss Jordan method differs from Gauss Elimination method? Solve the following system of equations using Gauss Jordan method. How can we use Gauss Jordan method to find the inverse of a matrix? Discuss.

$$2x - y + 4z = 15$$

$$2x + 3y - 2z = 4$$

$$3x + 2y - 4z = -4$$

4. Solve the following set of equations using Gauss Siedal method.

$$x + 2y + 3z = 4$$

$$6x + 4y + 5z = 16$$

$$5x + 2y + 3z = 12$$

5. Factorise the following matrix using Cholesky method.

$$\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$$

6. Write matrix factorization? How can be used to solve a system of linear equations? Factorize the given matrix A and solve the system of equations $Ax = b$ for given b using L and U matrices.

$$A = \begin{matrix} & \begin{matrix} 1 & 2 & 3 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} & \begin{bmatrix} 2 & 8 & 11 \\ 3 & 22 & 36 \end{bmatrix} \end{matrix} \text{ And } B = \begin{matrix} & \begin{matrix} 4 \\ 12 \\ 28 \end{matrix} \end{matrix}$$

7. Solve the following set of linear equations using the Gauss-Jordan method.

$$x_2 + 2x_3 + 3x_4 = 9$$

$$7x_1 + 6x_2 + 5x_3 + 4x_4 = 33$$

$$8x_1 + 9x_2 + x_4 = 27$$

$$2x_1 + 5x_2 + 4x_3 + 3x_4 = 23$$

8. Why partial pivoting is used with Naive Gauss Elimination method? Solve the following system of equations using Gauss Elimination method with partial pivoting? How Gauss Jordan method differs from Gauss elimination method?

$$2x + 2y - z = 6$$

$$4x + 2y + 3z = 4$$

$$x + y + z = 0$$

9. Discuss the Doolittle LU decomposition method for matrix factorization.

10. What is matrix factorization? Factorize the given matrix A into LU using Doolittle algorithm and solve $Ax = b$ for given b using L and U matrices.

$$A = \begin{matrix} & \begin{matrix} 2 & 4 & -4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \end{matrix} & \begin{bmatrix} 5 & -5 \\ 3 & 1 \end{bmatrix} \end{matrix} \text{ and } B = \begin{matrix} & \begin{matrix} 12 \\ 18 \\ 8 \end{matrix} \end{matrix}$$

11. Solve the following set of equations using Gauss Seidel method.

$$x + 2y + 3z = 4$$

$$6x - 4y + 5z = 10$$

$$5x + 2y + 2z = 25$$

12. What is pivoting? Why is it necessary? Explain. Solve the following set of equations using Gauss elimination and Gauss Seidel method.

$$x_1 + 10x_2 + x_3 = 24$$

$$10x_1 + x_2 + x_3 = 15$$

$$x_1 + x_2 + 10x_3 = 33$$

13. Solve the following algebraic system of linear equations by Gauss-Jordan algorithm.

$$2x_2 + x_4 = 0$$

$$2x_1 + 2x_2 + 3x_3 + 2x_4 = -2$$

$$4x_1 - 3x_2 + x_4 = -7$$

$$6x_1 + x_2 - 6x_3 - 5x_4 = 6$$

14. Solve the following set of equation using Gauss elimination or Gauss Jordan method

$$3x_1 + 5x_2 - 3x_3 + x_4 = 16$$

$$2x_1 + x_2 + x_3 + 4x_4 = 9$$

$$3x_1 - 4x_2 - x_4 = 1$$

$$2x_1 + x_2 - 3x_3 + 9x_4 = 5$$

15. Solve the following set of equation using Gauss elimination or Gauss Jordan method

$$3x_1 + 5x_2 - 3x_3 + x_4 = 16$$

$$2x_1 + x_2 + x_3 + 4x_4 = 9$$

$$3x_1 - 4x_2 - x_4 = 1$$

$$2x_1 + x_2 - 3x_3 + 9x_4 = 5$$

16. Find the dominant eigen value and its corresponciing eigen vector of matrix:

$$\begin{bmatrix} 3 & 5 & 5 \\ 5 & 3 & 2 \\ 5 & 2 & 3 \end{bmatrix}$$

17. Solve the following system of equations using factorization methods

$$x+2Y+3Z=5$$

$$2x+8Y+22Z=6$$

$$3x+22Y+82Z: 10$$

18. Find the inverse of the following matrix using the Gauss Jordan Method

$$\begin{bmatrix} 5 & -2 & 0 \\ -2 & 5 & -2 \\ 0 & -2 & 5 \end{bmatrix}$$

19. Using Power method evaluate the dominant Eigen value and its corresponding eigen vector of following matrix

$$\begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$$

20. Solve the following system of equations using Gauss Elimination with Partial Pivoting.
[g]

$$-x+2Y+3z-w=3$$

$$2x+ 4Y + z+2w =-1$$

$$-3x+8Y+4z-w=6$$

$$x+4y+7z-Zw=-4$$

Note:

1. Hand written/Computer typed Numerical work shall be submitted by 3rd of Mangsir 2081(18th November 2024).
2. Algorithm and Python/C++ or C (Python Preferred) Code shall be submitted by 3rd of Mangsir 2081.
3. Copying of other's work shall be disqualified for marking.
4. Plagiarism shall be less than 25%.Above 25% will lead to marks deduction. Plag above 50% shall be disqualified.
5. Failed to submission of work by given date shall be disqualified.
6. The time for submission is 11.59.59 PM of the given date.
7. Please write your name and tutorial name during submission (for eg: Rajan_Tutorial_1).You should strictly follow the naming standard.
8. Code shall be submitted as run on IDE and Screenshot shall be submitted.
9. Report format shall be strictly followed to submit the document. Just photos will not be accepted for algorithm and code.
10. NQ will be granted if no assignment are taken into consideration.
11. I was absent in the class won't be the excuses for assignment.

Please submit the assignment to: assignment.bca81@gmail.com

No other medium shall be accepted.

Best of Luck