



Lab N°4

Solving a Linear System Using MATLAB

Image processing

Learning Objective

- 1) Understanding and solving linear systems efficiently is crucial in various fields.
- 2) Interaction with the user: reading the values entered by the user and displaying results.
- 3) Manipulations of some basic image processing.

Part 1:

Solve a Linear System Using MATLAB

Consider the following linear system:

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

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

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

Write a MATLAB script to solve this system of equations using matrix operations.

Your script should:

1. Define the coefficient matrix A , the constant vector b , and the variable vector x .
2. Use MATLAB's built-in function to solve the system of equations.
3. Display the solution vector x .

Test your script with the given linear system and verify that it produces the correct

Part 2:

Consider the following linear system:

$$2x + 3y - z + 4w = 5$$

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

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

$$2x - 3y + 2z - w = 1$$

Write a MATLAB script to solve this system of equations using any method of your choice, such as Gaussian elimination, LU decomposition, or any other suitable technique.

Your script should:

1. Define the coefficient matrix A and the constant vector b
2. Implement the chosen method to solve the system of equations.
3. Display the solution vector x . Ensure that your script is robust enough to handle this larger system of equations and that it produces the correct solution.

Part 3

Load and Display Image:

- Load the sample image 'lena.png' using the **imread** command.
- Display the image using **the imshow** command.

Apply Gaussian Filter:

- Apply a Gaussian filter to the image to reduce noise and blur using **the imgaussfilt** function.
- Experiment with different standard deviation values to observe the effect on the filtered image.

Display Results:

- Display the original and filtered images side by side using **the subplot** function for comparison.
- Label each subplot appropriately to distinguish between the original and filtered images.

Analysis:

- Compare the original and filtered images visually.
- Discuss how the Gaussian filter smooths out noise and enhances image details.

Save Results:

- Save the filtered image to a new file using **the imwrite** function.