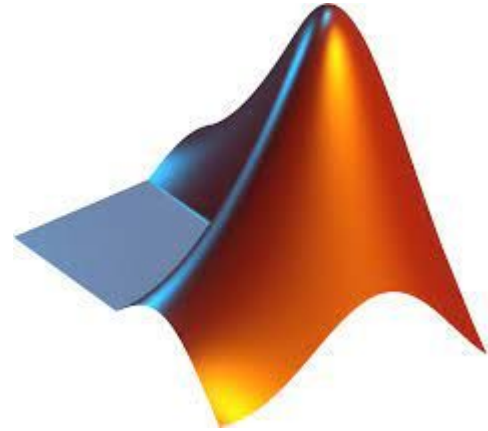


What is MATLAB? - High level Language

- **MATLAB, developed by MathWorks, is a proprietary multi-paradigm programming language and numeric computing environment.**
- **It enables matrix manipulations, function and data plotting, algorithm implementation, user interface creation, and integration with programs written in other languages.**



Who uses MATLAB?

- ☐ **Engineers and scientists worldwide use MATLAB for a range of applications:**
- ☐ **Deep learning and machine learning**
- ☐ **Signal processing and communications**
- ☐ **Image and video processing**
- ☐ **Control systems**
- ☐ **Test and measurement**
- ☐ **Computational biology.**

Why MATLAB?

- **Robust plotting capabilities for visualizing data and functions, making it easy to interpret results.**
- **Simple syntax and powerful built-in functions streamline complex mathematical calculations.**

MATLAB basic commands

- ☐ **clc** - Clears the command window.
- ☐ **clear** - Removes variables from the workspace.
- ☐ **close** - Closes figure windows.
- ☐ **fprintf** - Prints formatted data to the screen or a file.
- ☐ **disp** - Displays text or array contents in the command window.

MATLAB basic commands

- ☐ **input** - Prompts the user for input.
- ☐ **size** - Returns the size of an array.
- ☐ **length** - Returns the length of the largest array dimension.
- ☐ **plot** - Creates a 2D line plot.
- ☐ **title** - Adds a title to the plot.

MATLAB basic commands

- subplot - Creates a subplot in a figure.

subplot(m, n, p)

m: Number of rows in the grid.

n: Number of columns in the grid.

p: Position of the subplot in the grid (counted row-wise from the top-left).

MATLAB basic commands

- **if** - Begins an if statement for conditional execution.
- **else** - Begins the else part of an if statement.
- **for** - Begins a for loop.
- **while** - Begins a while loop.
- **end** - Terminates blocks such as for, while, if, switch, try, and function

MATLAB basic commands

- ☐ **imread** - Reads an image from a file.
- ☐ **imshow** - Displays an image.
- ☐ **im2gray** - Converts an RGB image to a grayscale image.
- ☐ **imbinarize** - Converts grayscale image to binary (black & white)

MATLAB basic commands

- ☐ **imresize** - Resizes an image to the specified dimensions.
- ☐ **imrotate** - Rotates an image by a specified angle.
- ☐ **imcrop** - Crops an image to a specified rectangle.

Practical 1A - Write a MATLAB program to Display and Access Pixel Intensity Values in Grayscale Image

Use cameraman.jpeg file

Practical 1B - Write a MATLAB program to Display RGB Image and show its dimensions.

Use badminton.jpg file

Practical 1A

```
img = imread('cameraman.jpeg');  
figure;  
imshow(img);  
title('Grayscale Image');  
disp(img);  
id=im2double(img);  
disp(id);
```

%Accessing Specific pixel

```
row = 60;
```

```
col = 105;
```

```
intensity = img(row, col);
```

```
fprintf('Pixel intensity at row %d, column %d: %d\n', row, col, intensity);
```

Practical 1B

```
clc;
```

```
clear;
```

```
close all;
```

```
img = imread('badminton.jpg');
```

```
imshow(img);
```

```
[h, w, ch] = size(img);
```

```
fprintf('Height: %d pixels\n', h);
```

```
fprintf('Width: %d pixels\n', w);
```

```
fprintf('Number of Color Channels: %d\n', ch);
```

Practical 1C - Write a MATLAB program to convert RGB Image into Grayscale Image

Use badminton.jpg file

Practical 2A - Write a MATLAB program for Conversion of RGB Image to Different Color Spaces and Display using Subplots

Use **badminton.jpg** file

Output

Original	GrayScale	Black & White
YCbCr	HSV	CMY

Practical 2B- Write a MATLAB program to perform Histogram Processing

Use cameraman.jpeg file

Practical 3A - Write a MATLAB program to Display Image metadata information.

Use chestXray.tif and basketball.jpeg file

Display File Name, Format, Bit Depth, ColorType, FileSize

Practical 3B - Write a MATLAB program to perform Uniform Quantization

Use cameraman.jpeg file

```
clc; clear; close all;  
a = imread("C:\Users\Poojan Shah\Desktop\odd  
2025\dip\sample\cameraman.jpeg");
```

% Uniform quantization

```
nbits = 2;  
levels = 2^nbits;  
ad = im2double(i);  
steps = 1 / levels;
```

% Quantization bin index

```
bin = floor(ad / steps);
```

% Map index back to quantized value (center of bin)

```
qv = (bin * steps) + (steps/2);
```

% Back to uint8 for image display

```
qvimg = im2uint8(qv);
```

```
figure;  
subplot(2,2,1); imshow(a); title('Original Image');  
subplot(2,2,2); imhist(a); title('Histogram of Original');  
subplot(2,2,3); imshow(qvimg); title('Quantized Image');  
subplot(2,2,4); imhist(qvimg); title('Histogram of  
Quantized');
```

Practical 4A - Write a MATLAB program for Image Arithmetic Operations using 8 switch case (Add two images, Add image with constant value,) and explain the results findings

Use basketball.jpeg

Use badminton.jpg file

Practical 4B - Write a MATLAB program for Bitwise Logical Operations

Use `basketball.jpeg`

Use `badminton.jpg` file

- Read Input Images
- Resize the second image to the same size as the first one
- Convert Images to Unsigned 8-bit Integer Format
- Using switch case perform BITWISE OR, AND, XOR, NOT

Practical 4C - Write a MATLAB program for RGB Channel Separation.

Use badminton.jpg file