**M Abdullah Nawaz**

**i21-1393**

**DIP -7A**

**Approach**

The goal was to develop a MATLAB-based graphical user interface (GUI) application for image processing. This application provides various functionalities including loading an image, displaying image information, and performing common image manipulations such as converting to black and white, cropping, resizing, flipping, and combining images.

**Components and Features:**

**Heading:**

Displays the application title.

**Buttons and Controls:**

Include 'Browse' for loading images, 'Save Image As' dropdown for saving in different formats, and buttons for image processing tasks (e.g., Convert to Black and White, Crop Image, Resize Image, Flip Image, Combine Images).

**Slider:**

Allows dynamic adjustment of the threshold value for black white image.

**Browse Image:**

Uses a file dialog to load images into the application.

**Show Image Information:**

Displays detailed information about the loaded image, including dimensions, format, file size.

**Convert to Black and White:**

Converts images to grayscale and applies binarization based on a user-adjustable threshold.

**Crop Image:**

Provides an interactive cropping tool for users to select and crop a region of the image.

**Resize Image:**

Prompts users to input new dimensions and resizes the image accordingly.

**Flip Image:**

Allows users to flip the image vertically or horizontally.

**Combine Images:**

Supports combining two images side-by-side or overlaying one image on top of another.

**CHALLENGES FACED**

**Image Resizing:**

Handling user input for dimensions required validation to ensure the values were numeric and within reasonable bounds. This involved checking for invalid or non-numeric entries and providing appropriate error messages.

**Real-Time Image Processing:**

* **Threshold Adjustment:** Implementing real-time updates for the threshold slider involved ensuring that changes were immediately reflected in the image processing. This required a responsive callback function to update the image display as the slider value changed.

**User Interface and Error Handling:**

* **UI Responsiveness:** Managing the GUI components and ensuring that all buttons, dropdowns, and sliders functioned as expected required careful testing and debugging.