GUI-based Image Manipulation Application

21L-6053

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BCS-7A

DIGITAL IMAGE PROCESSING

Browse an Image

Approach

The Browse button lets the user select an image file in formats such as JPG, PNG, BMP, or TIFF using `uigetfile`. The image is then loaded and displayed in the `uiaxes` using `imshow`.

Working and screenshots

Browse Button and Axes add.

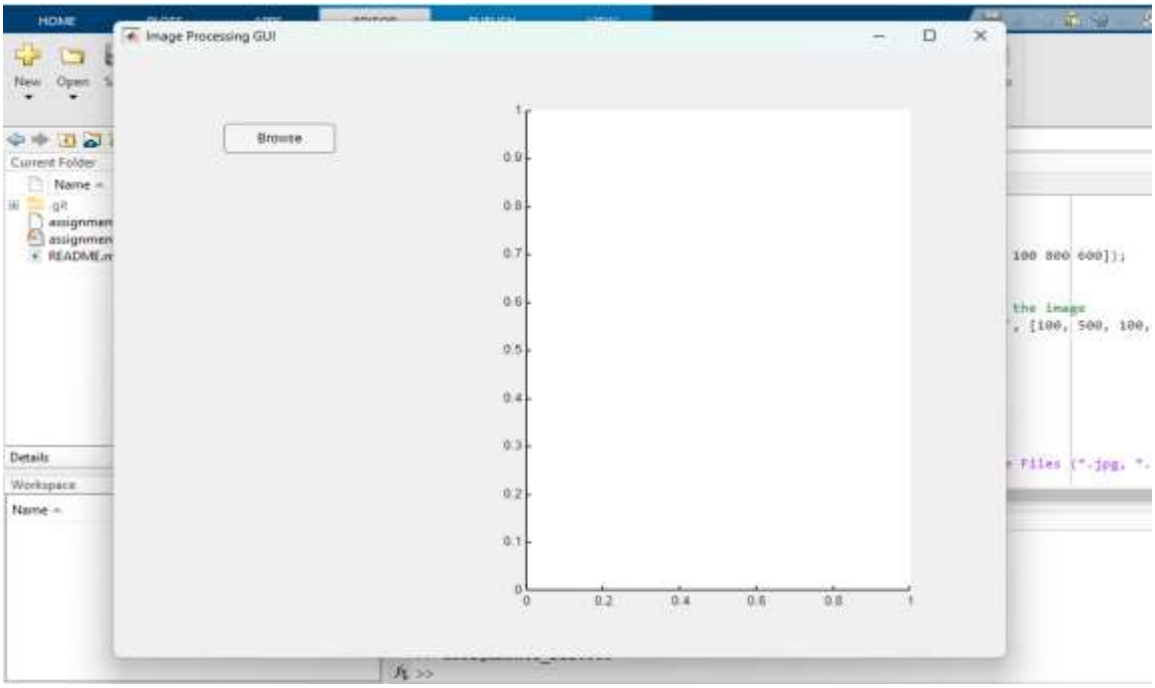
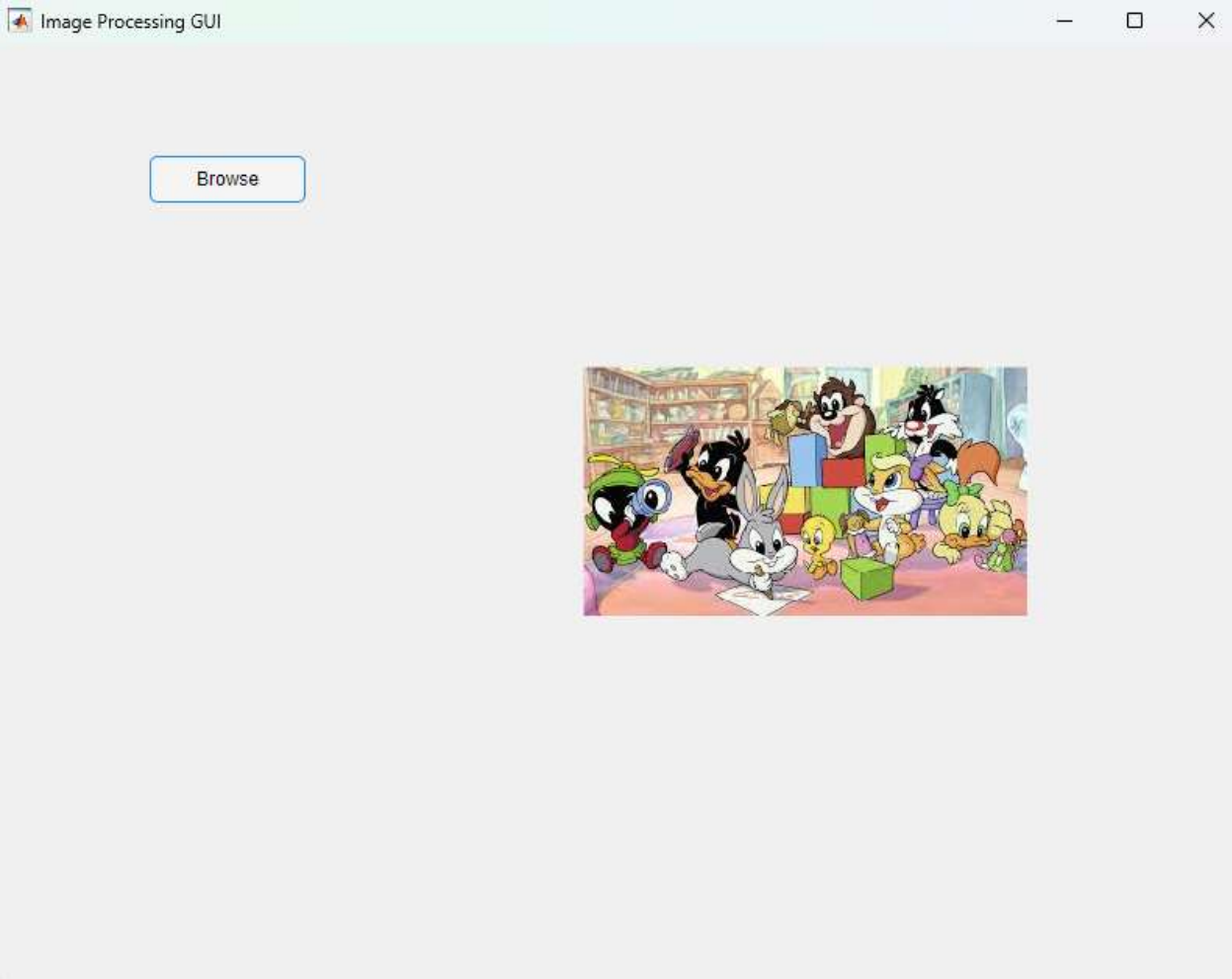


Image is Loaded SuccessFully



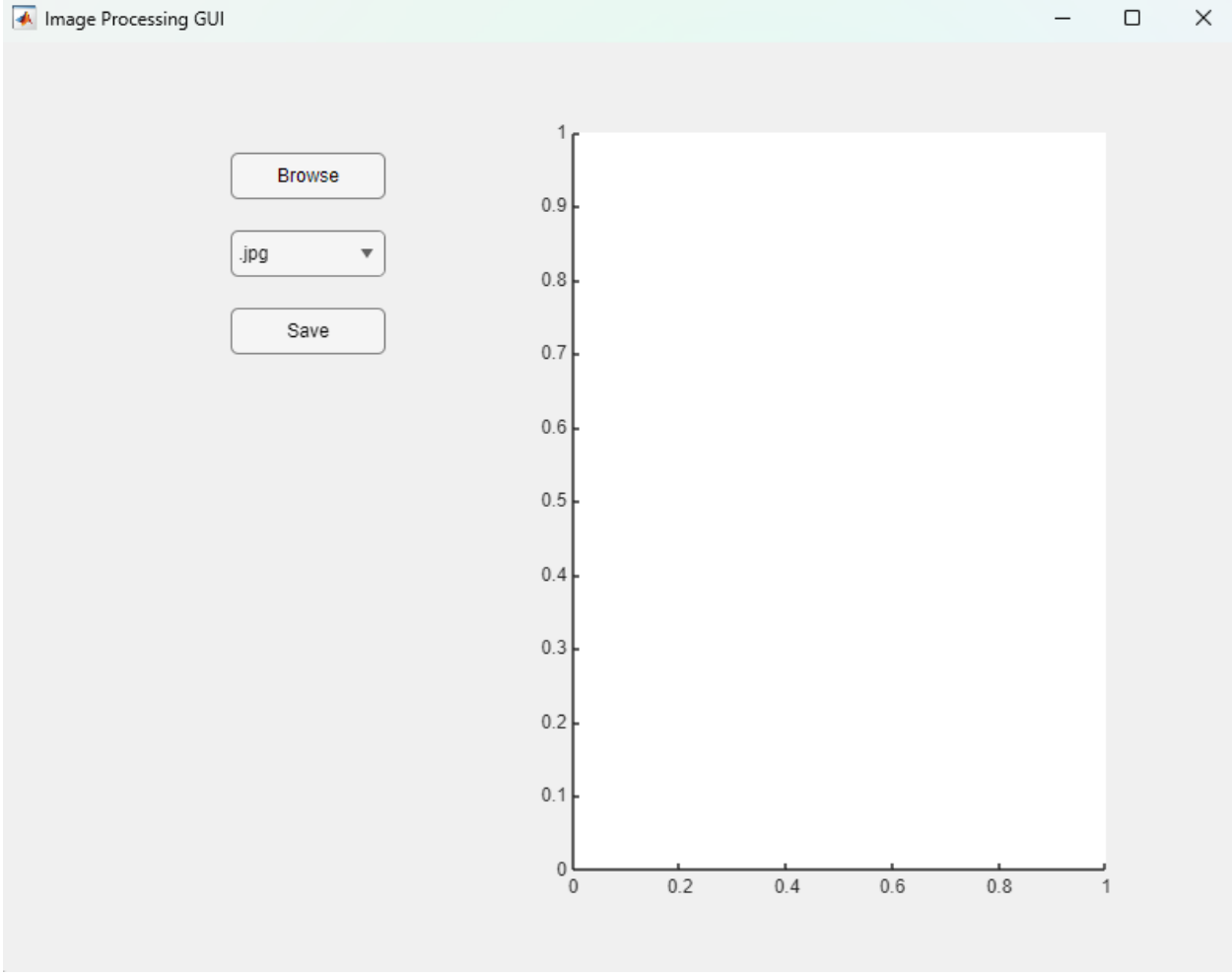
Save the Image on basis of selected format

Approach

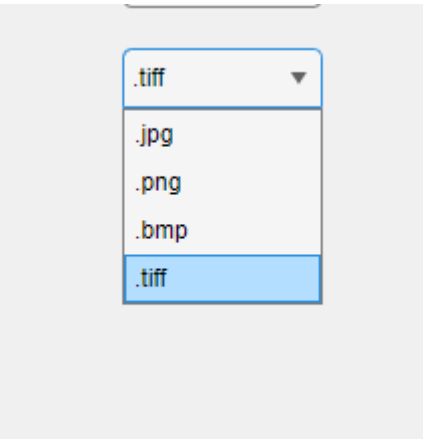
The Save button allows the user to save the loaded image in a chosen format (JPG, PNG, BMP, or TIFF).

Working and screenshots

Dropdown for formats and save button are added.



Selected format is .tiff.



Selected location to save the image is desktop

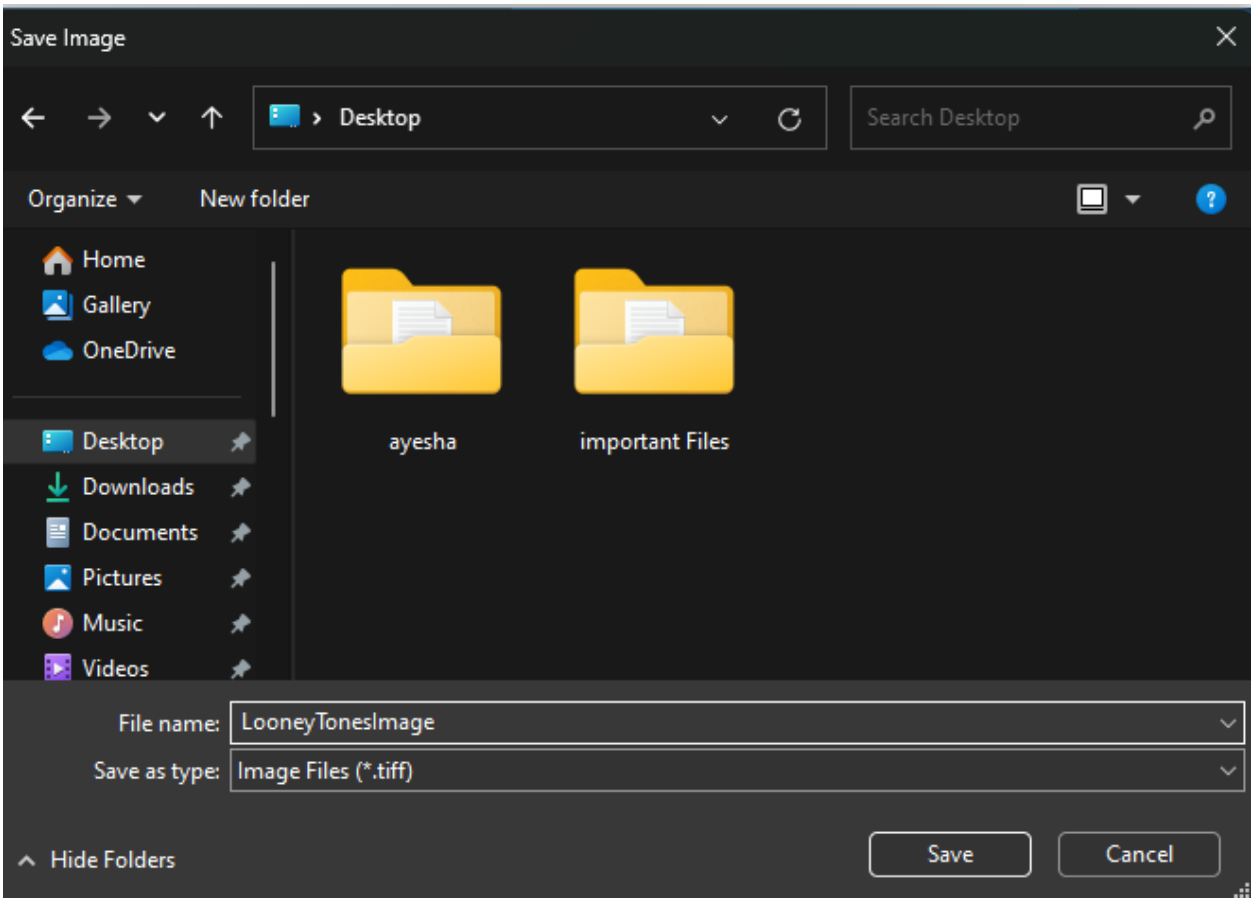


Image successfully saved on desktop

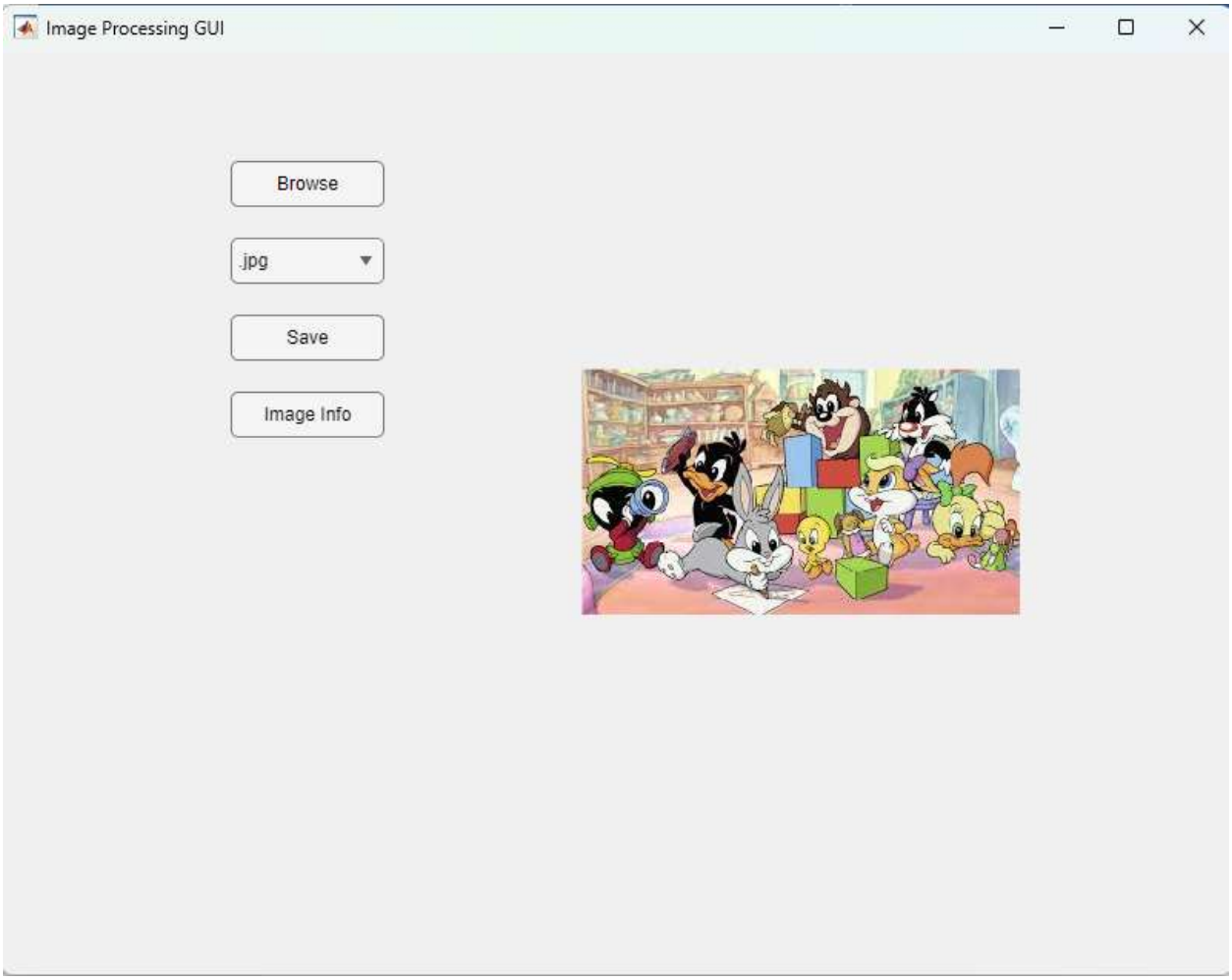
Display image information

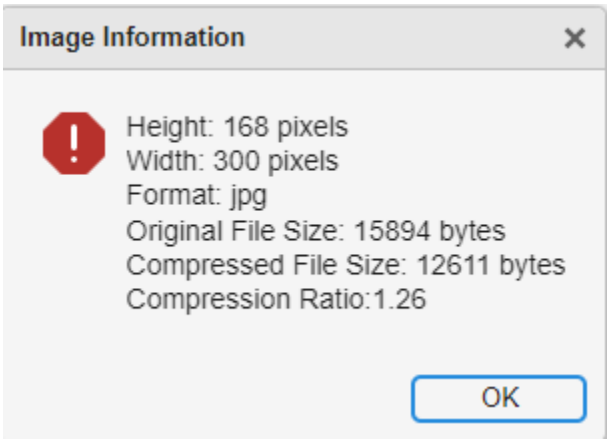
Approach

The Image Info button displays details such as the image format, height, width, original size, compressed size, and compression ratio. This is achieved using MATLAB's "imfinfo", "size" and "dir" functions.

Working and screenshots

Image Info Button added.





Conversion of Grayscale image to black and white

Approach

Converts an image to black and white selected by the user.

Working and screenshots

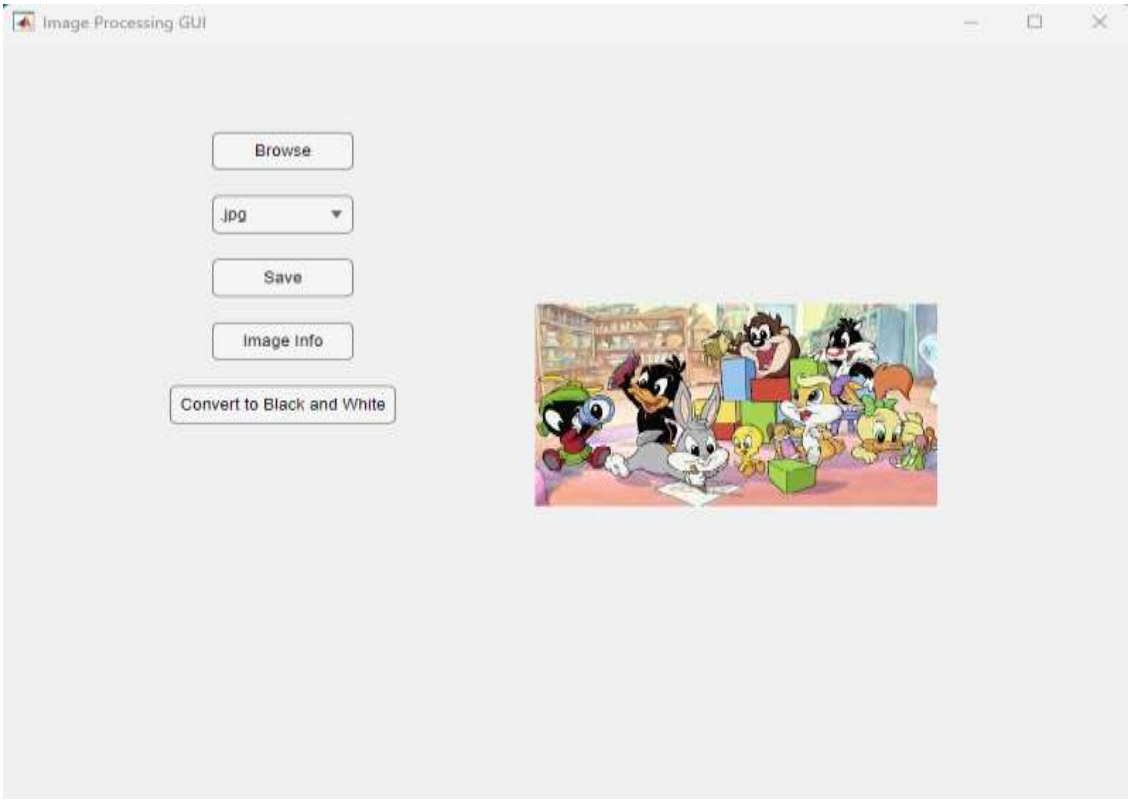
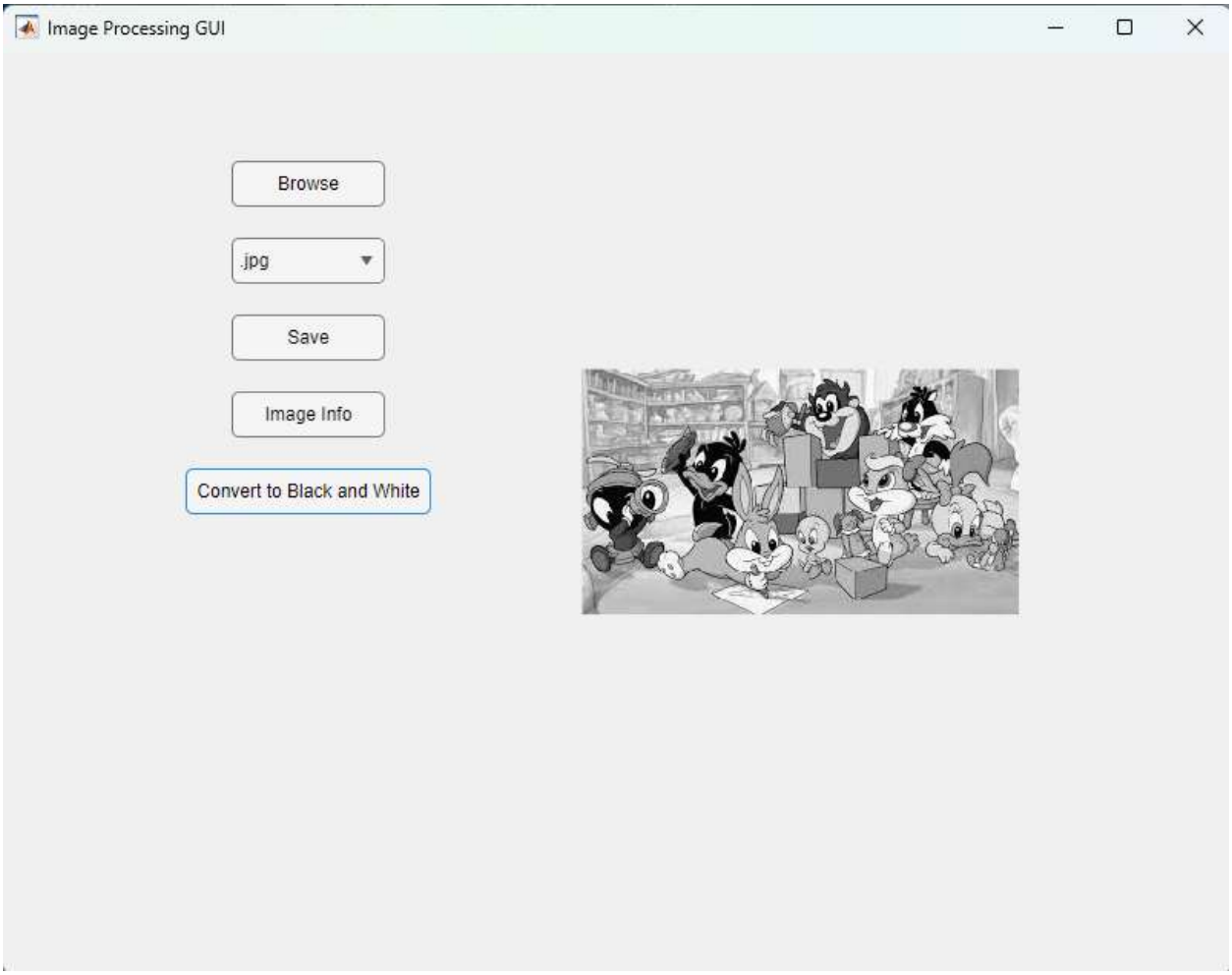


Image converted to Black and White successfully.



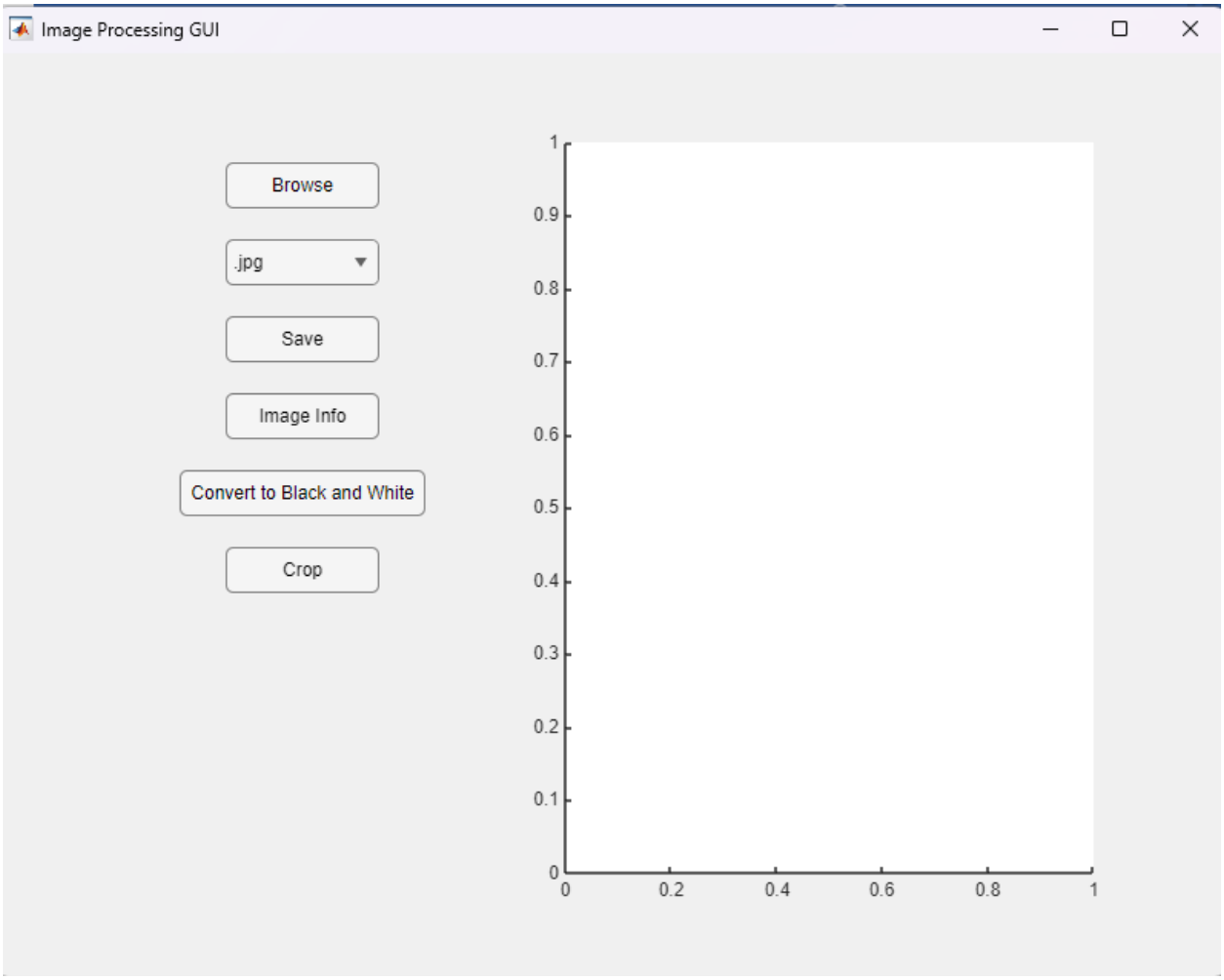
Cropping image

Approach

Prompts the user to input the coordinates and size of the crop rectangle and crops the image accordingly.

Working and screenshots

Crop button added



Taking coordinates as Input from user.

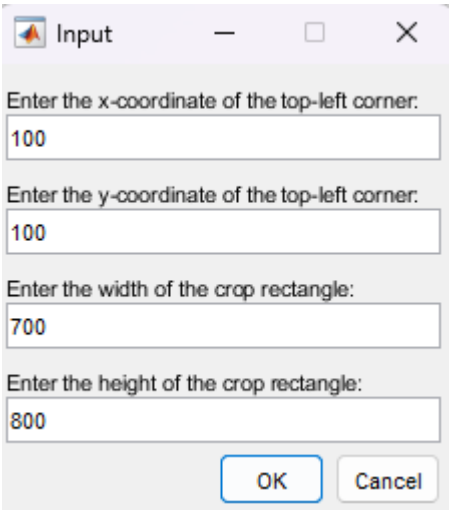


Image is cropped.

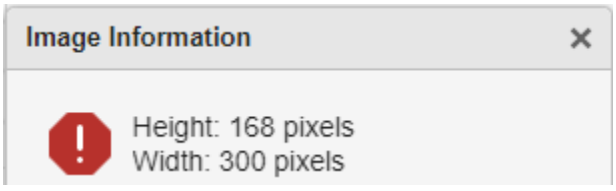
Resizing the image

Approach

Prompts the user for new dimensions and resizes the image using `imresize`

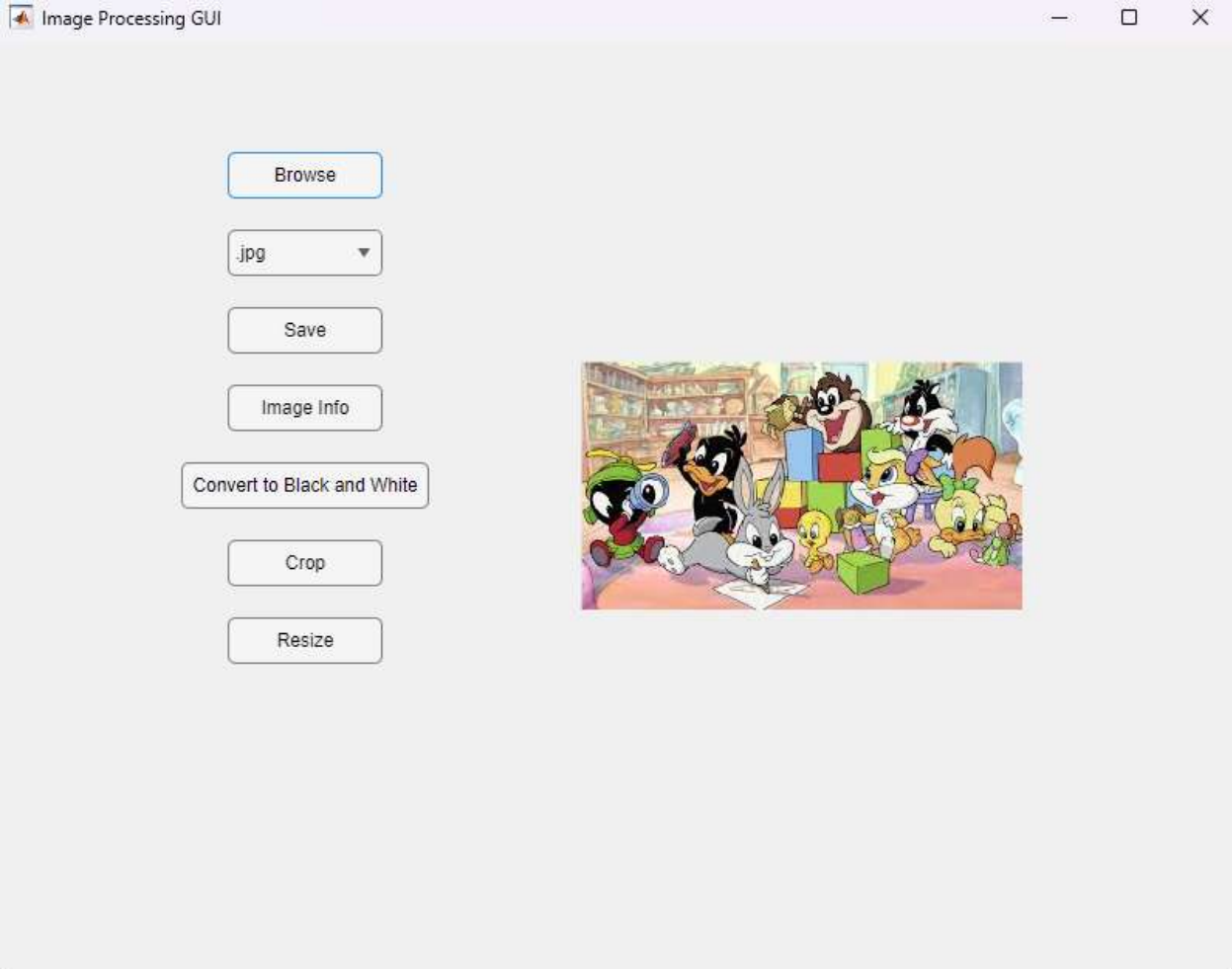
Working and screenshots

Resize Button Added and original image added.



Original width: 168 pixels

Original height: 300 pixels



Taking new height and width as input from user.

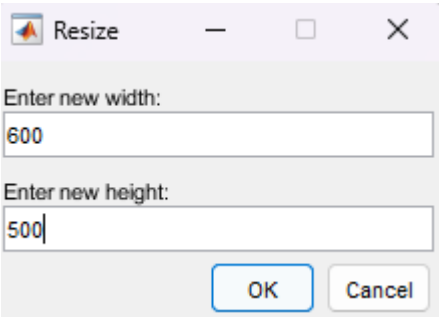
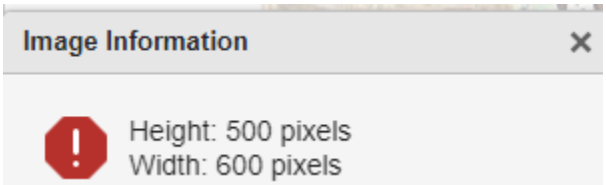
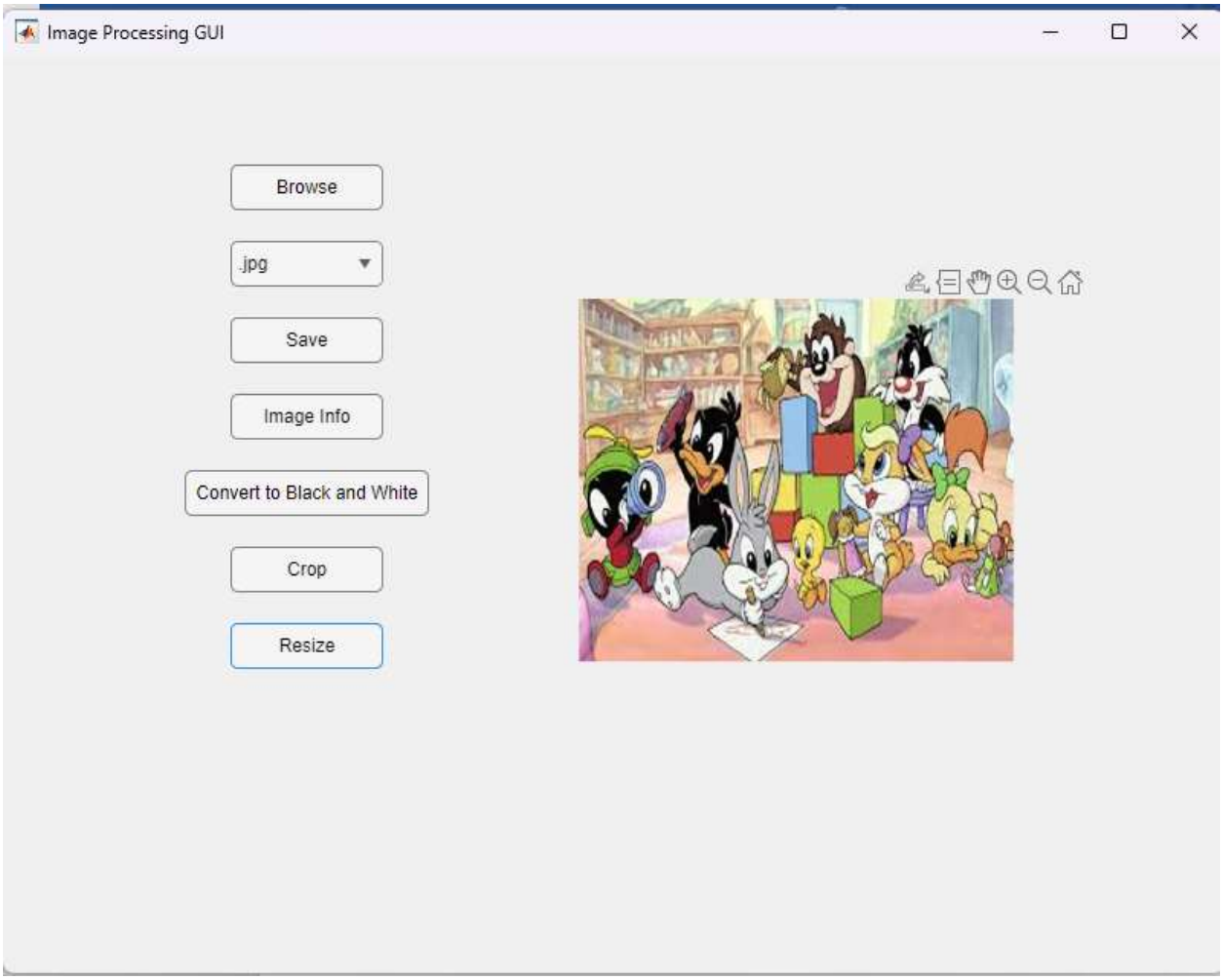


Image resized successfully.





Flip the image vertically or horizontally

Approach

Flips the image either vertically or horizontally based on the user's selection in the dropdown menu.

Working and screenshots

Dropdown to choose flipping direction and the flip button are added. Image is loaded using browse button.

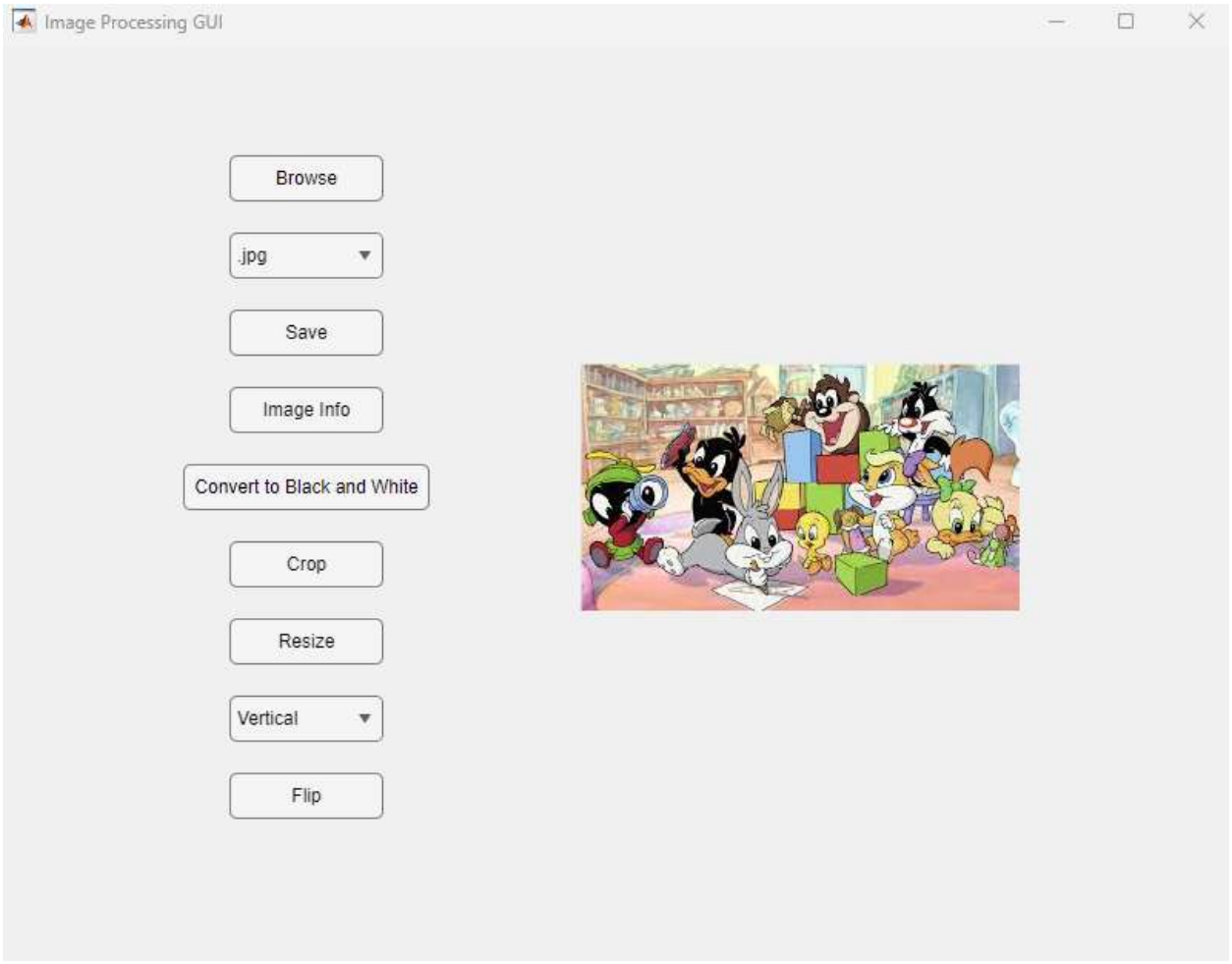
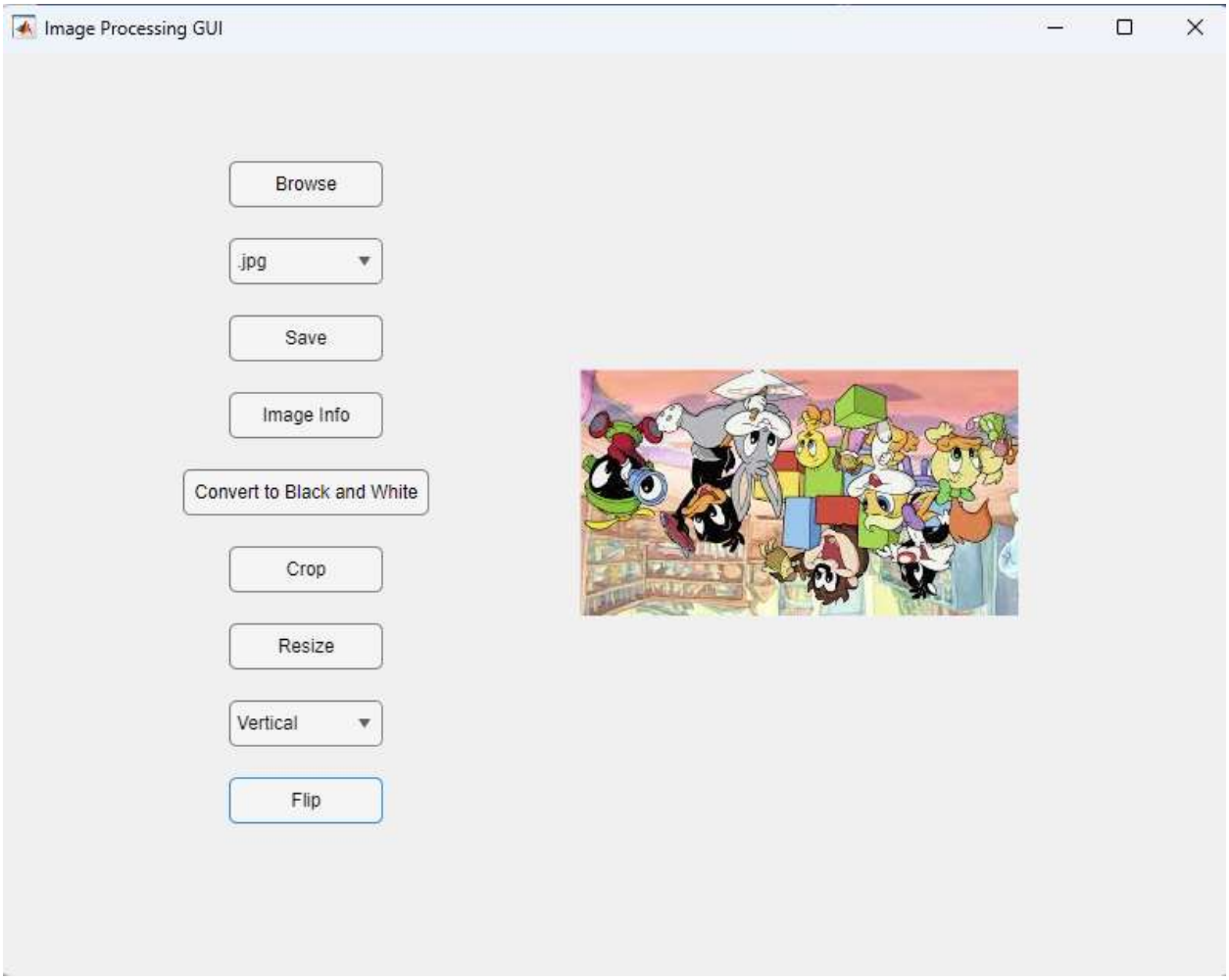
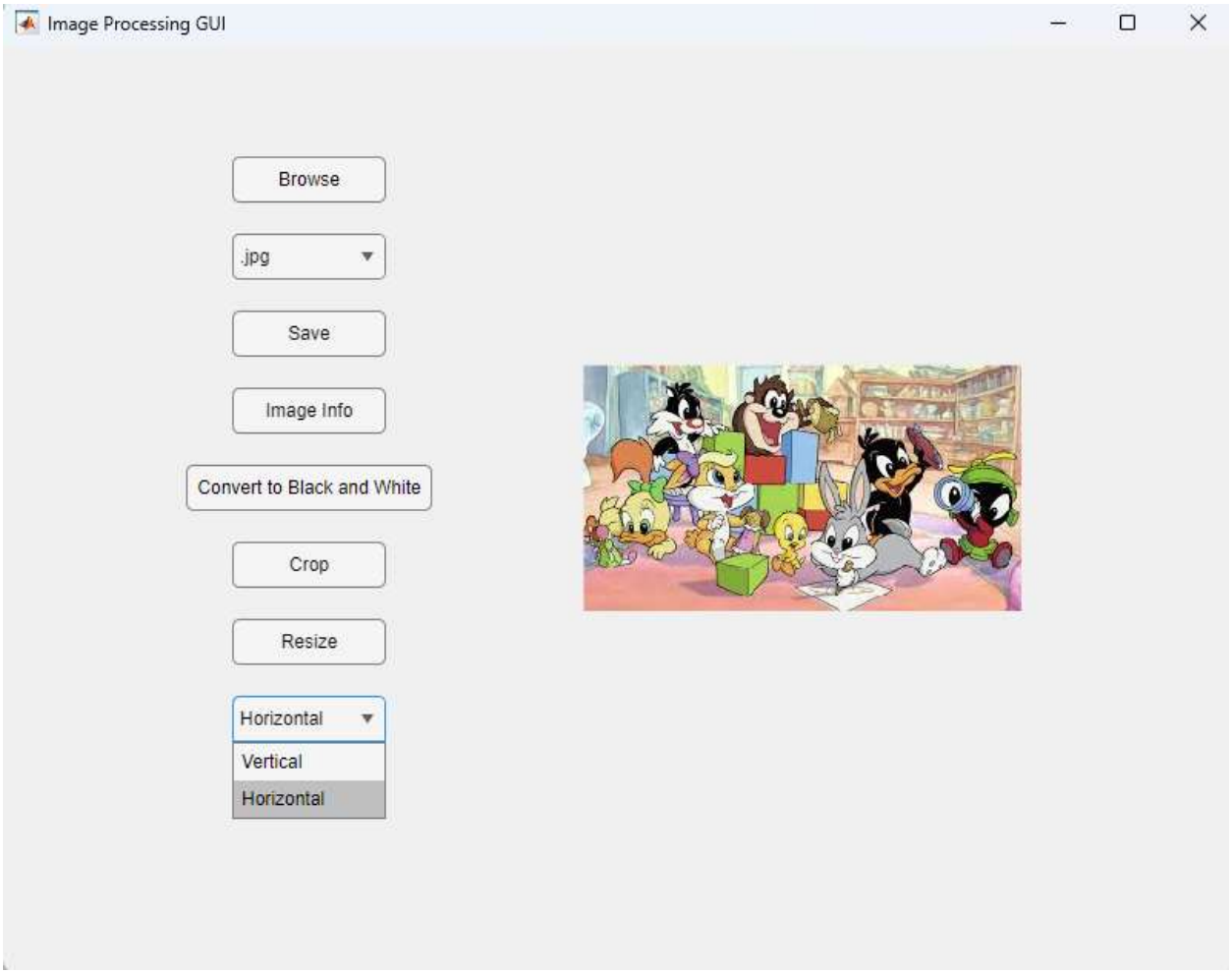


Image Processing GUI
Browse
jpg
Save
Image Info
Convert to Black and White
Crop
Resize
Vertical
Flip

Vertical Flipping



Horizontal Flipping



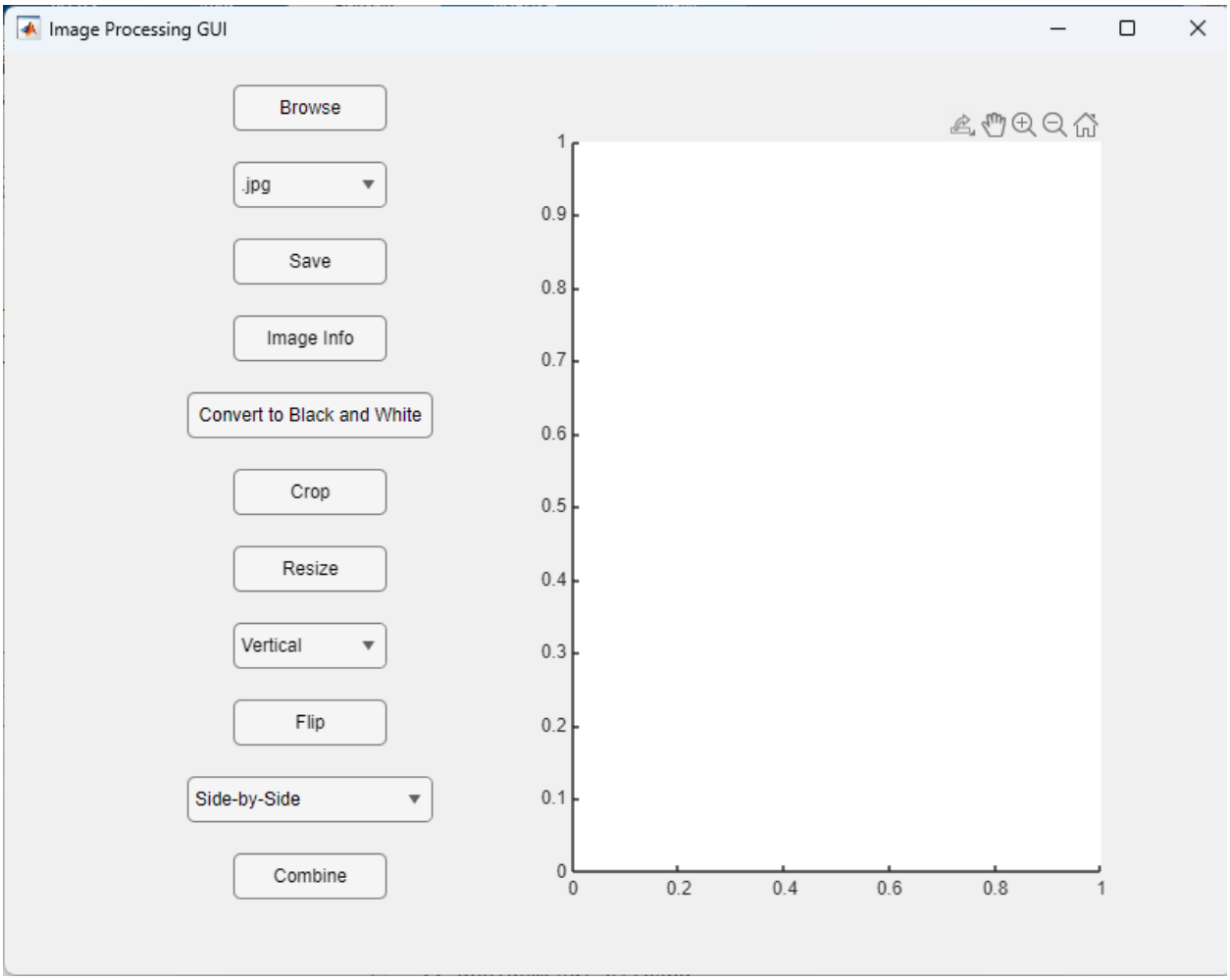
Combine two images (side-by-side or overlay)

Analysis

Combines two images either side-by-side or overlay based on the user's selection in the dropdown menu. Images are overlayed using the max function and placed side-by-side manually by making a new image and adjusting it coordinates accordingly. First image is placed prior to the second image.

Working and screenshots

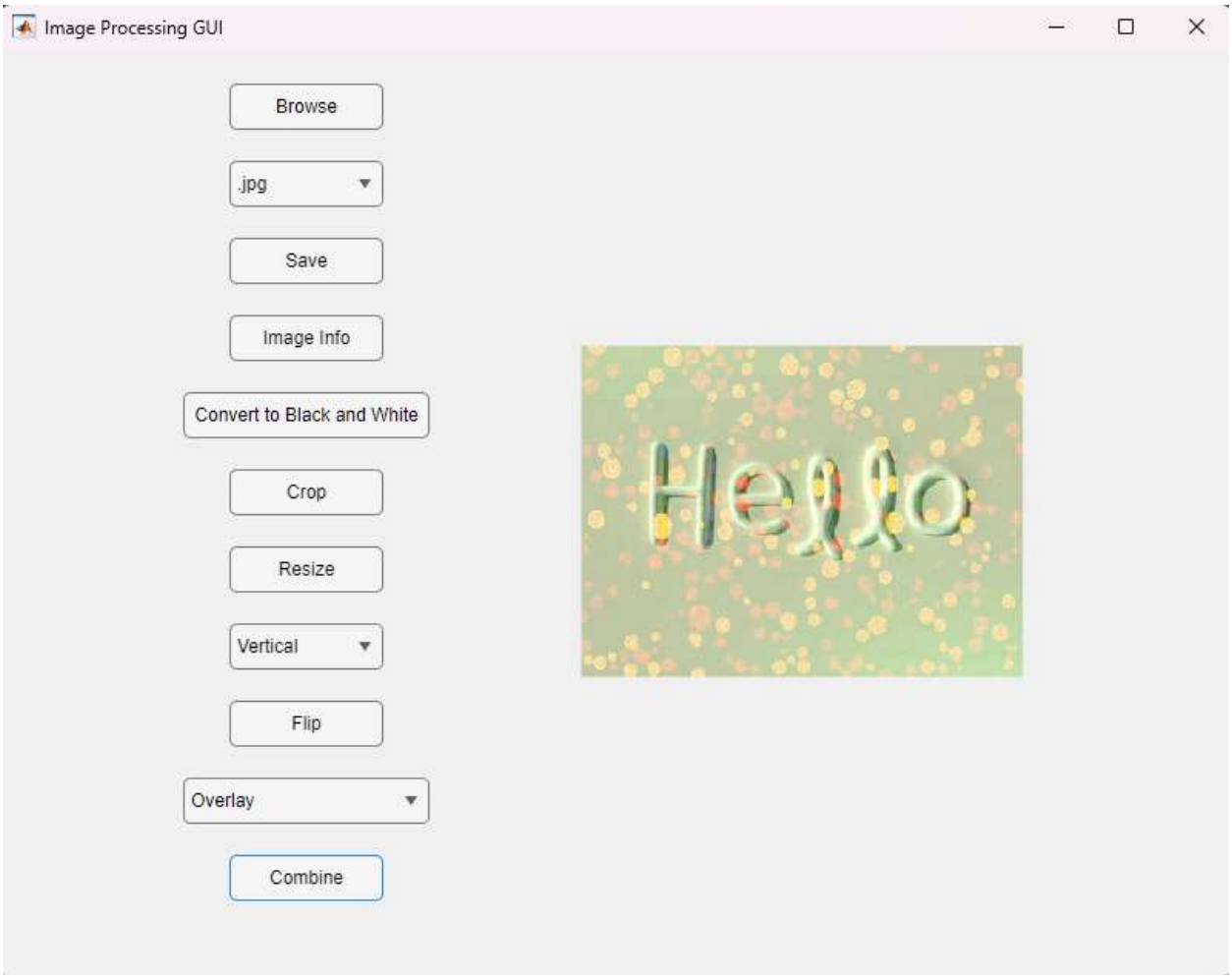
Dropdown for selecting combine mode and combine button is added.



When Overlay mode is Selected

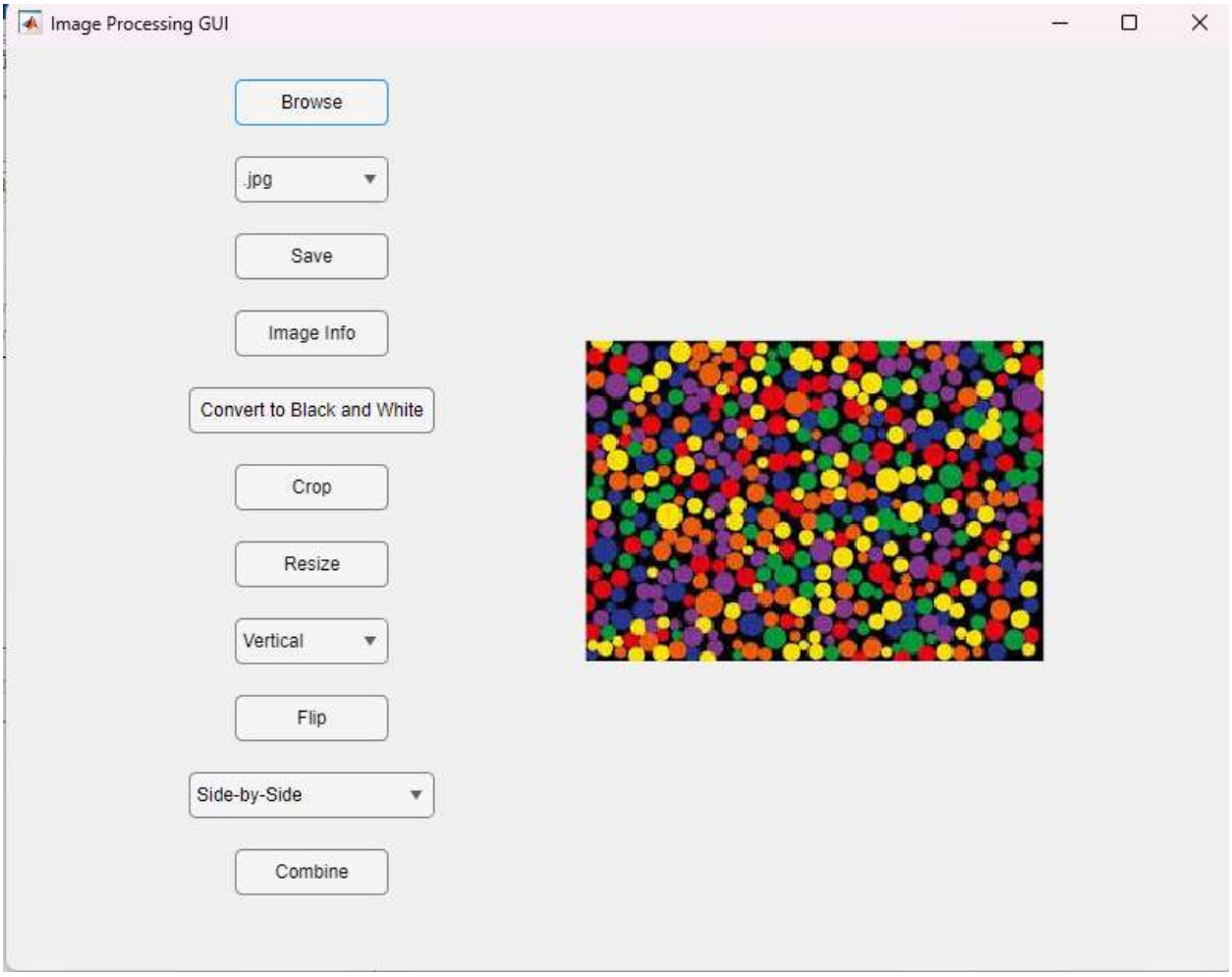
- Before Overlay

- After Overlay

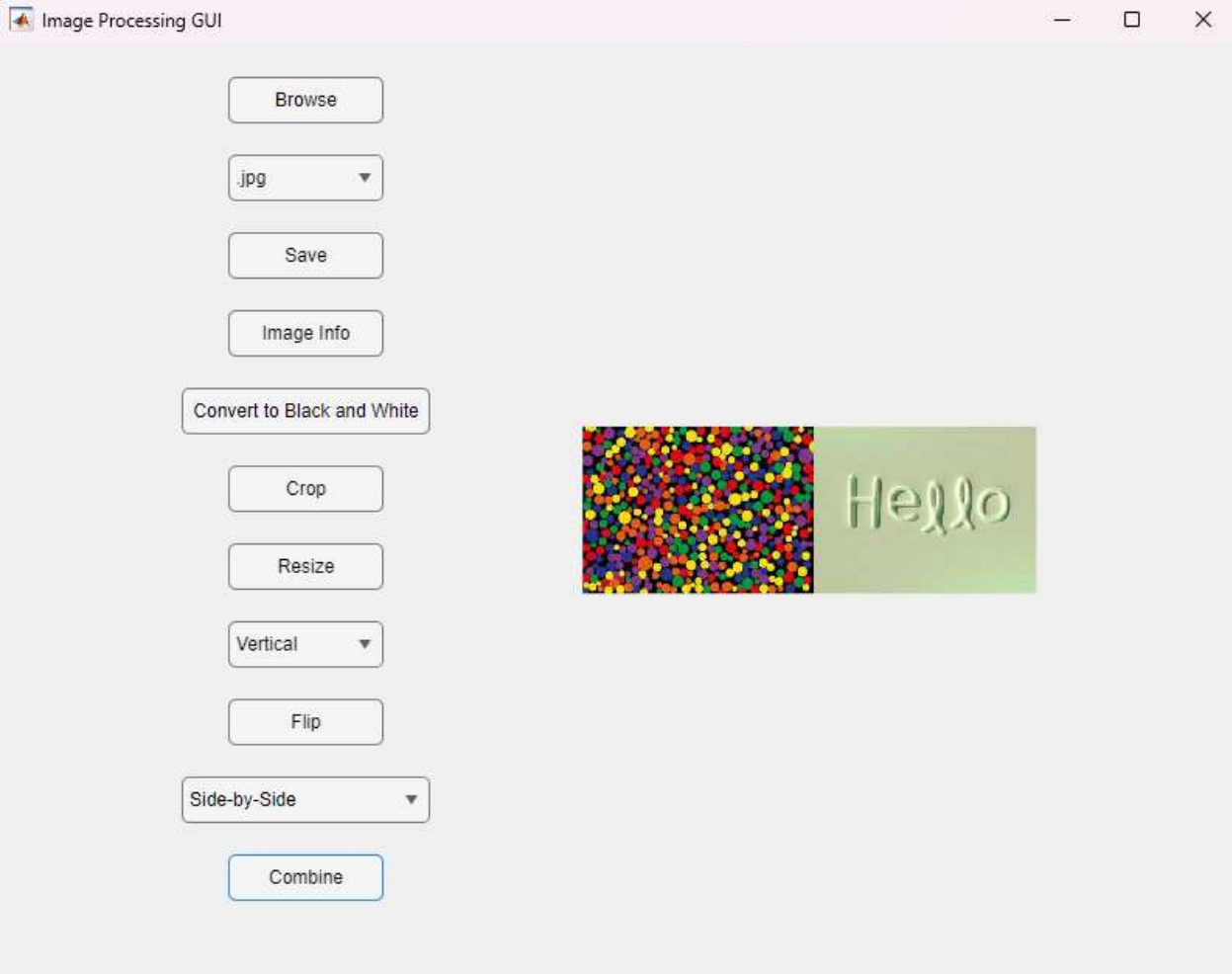


When side-by-side mode is selected

1st image before combination.



After side-by-side combination



Additional Features

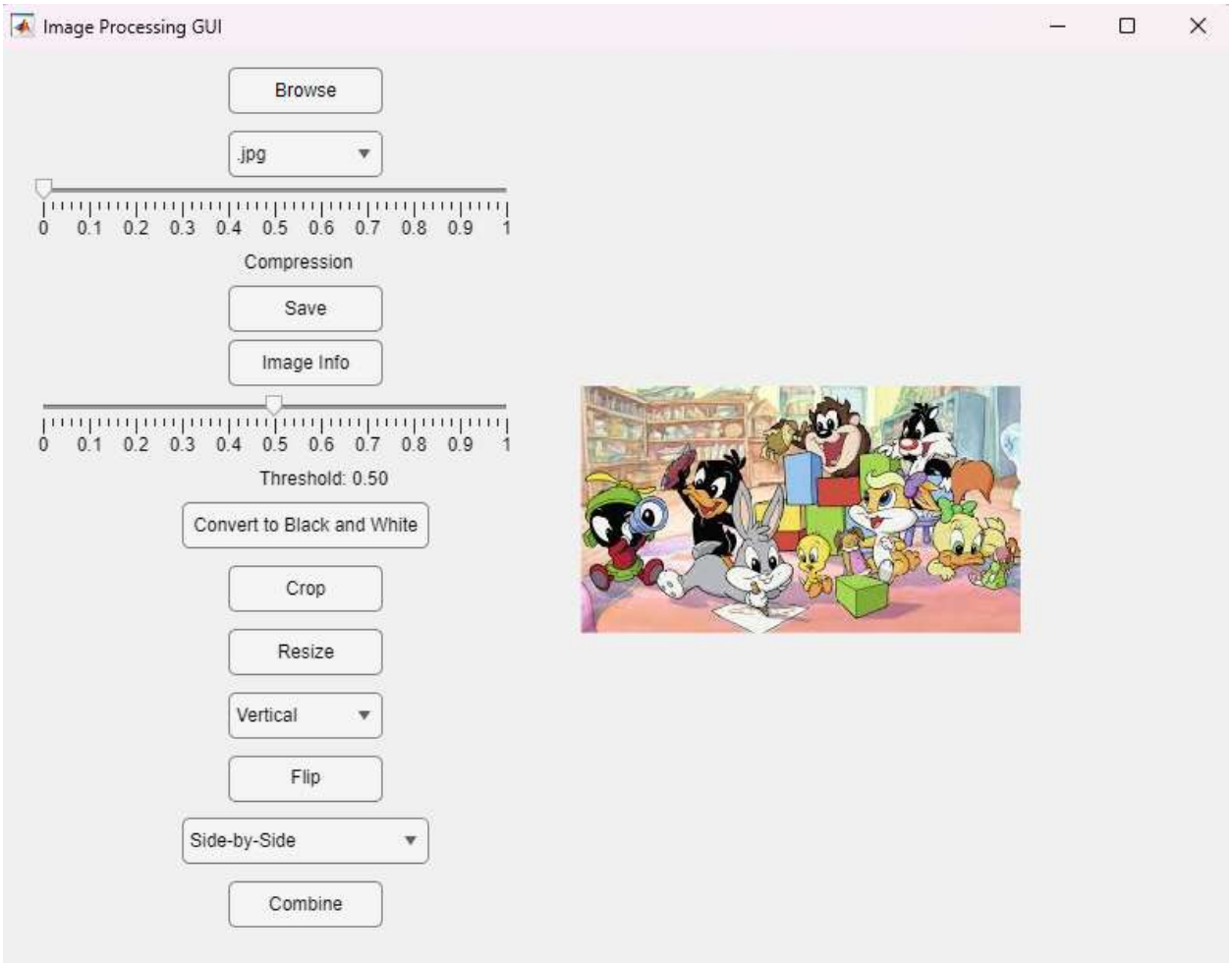
Slider for dynamically adjusting the threshold when converting to black and white

Approach

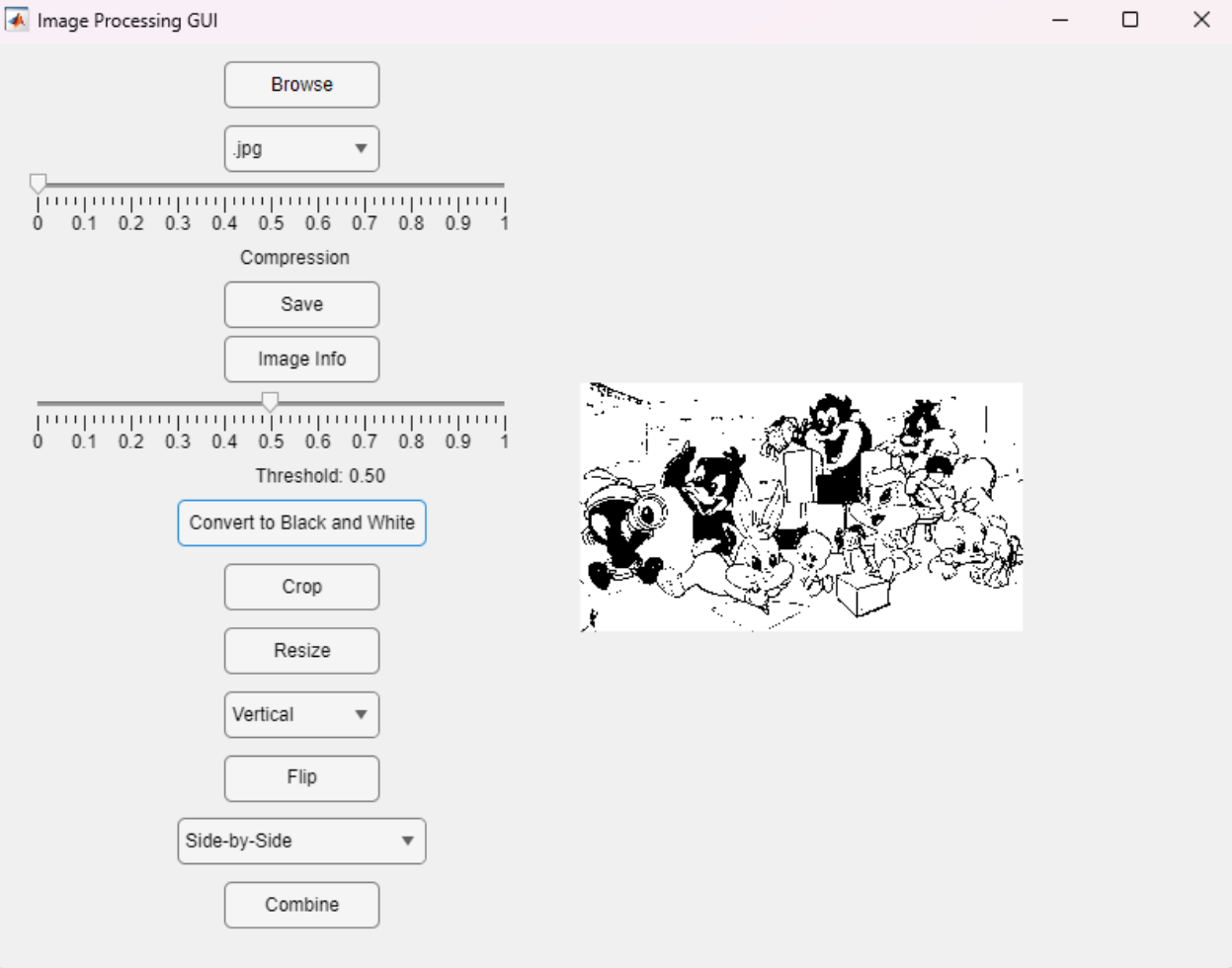
The compression slider allows the user to set a threshold value in order to set the compression quality value and that is applied to the grayscale image for conversion to black and white image.

Working and screenshots

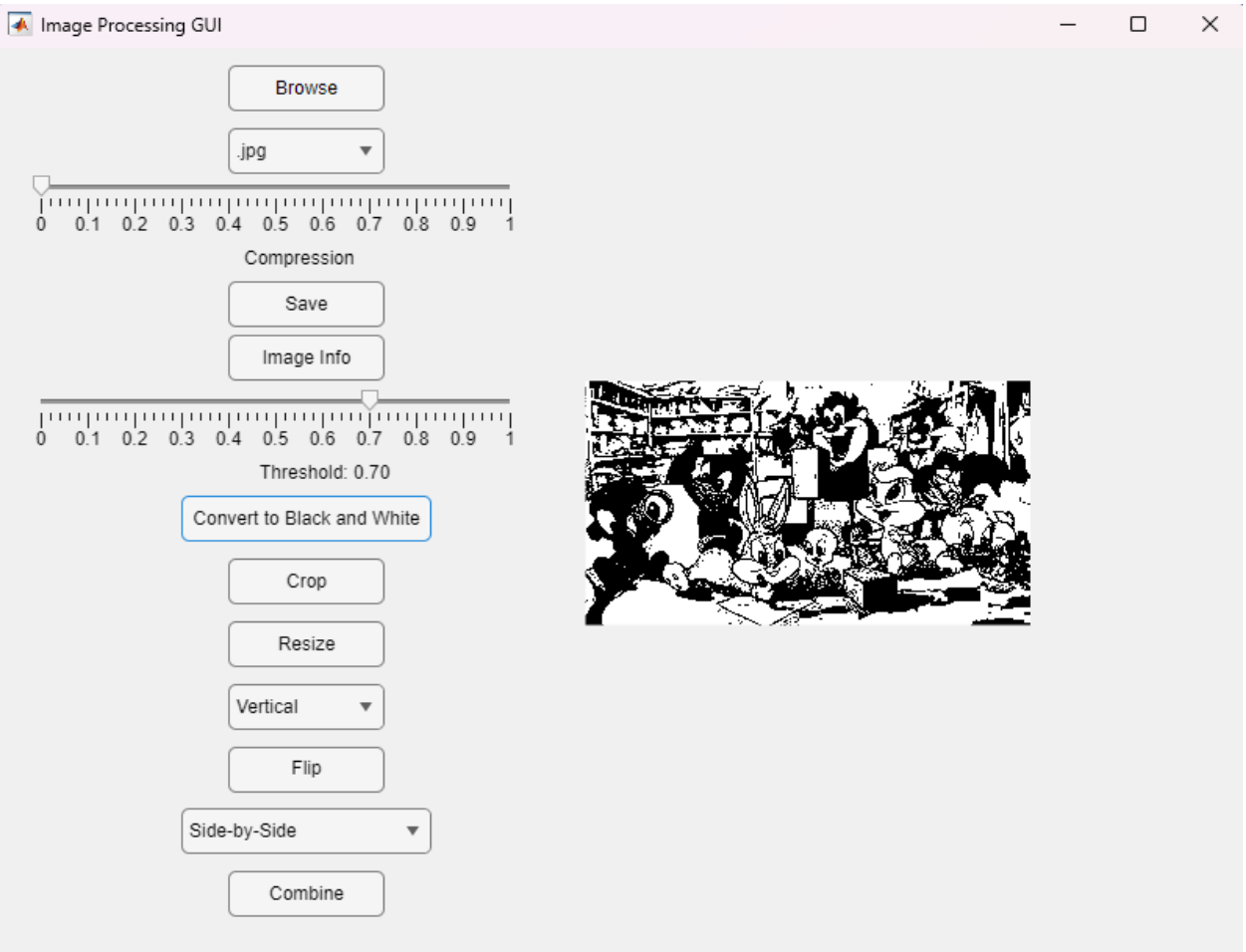
Slider has added for setting a threshold for conversion to black and white image.



Converted Black and White Image with threshold set to 0.5.



Converted Black and White Image with threshold set to 0.7.



Allow users to choose custom compression levels (for example, when saving as .jpg).

Approach

The Save button allows the user to save the loaded image in a chosen format (JPG, PNG, BMP, or TIFF). If JPG is selected, the user can adjust the compression level through a slider. The compression level is then mapped to JPG quality (0–100), and the image is saved using imwrite.

Working and screenshots

Only for jpg image while saving compression value is applied. The compression value is set using the slider. For other formats no compression is applied.

The loaded Image:

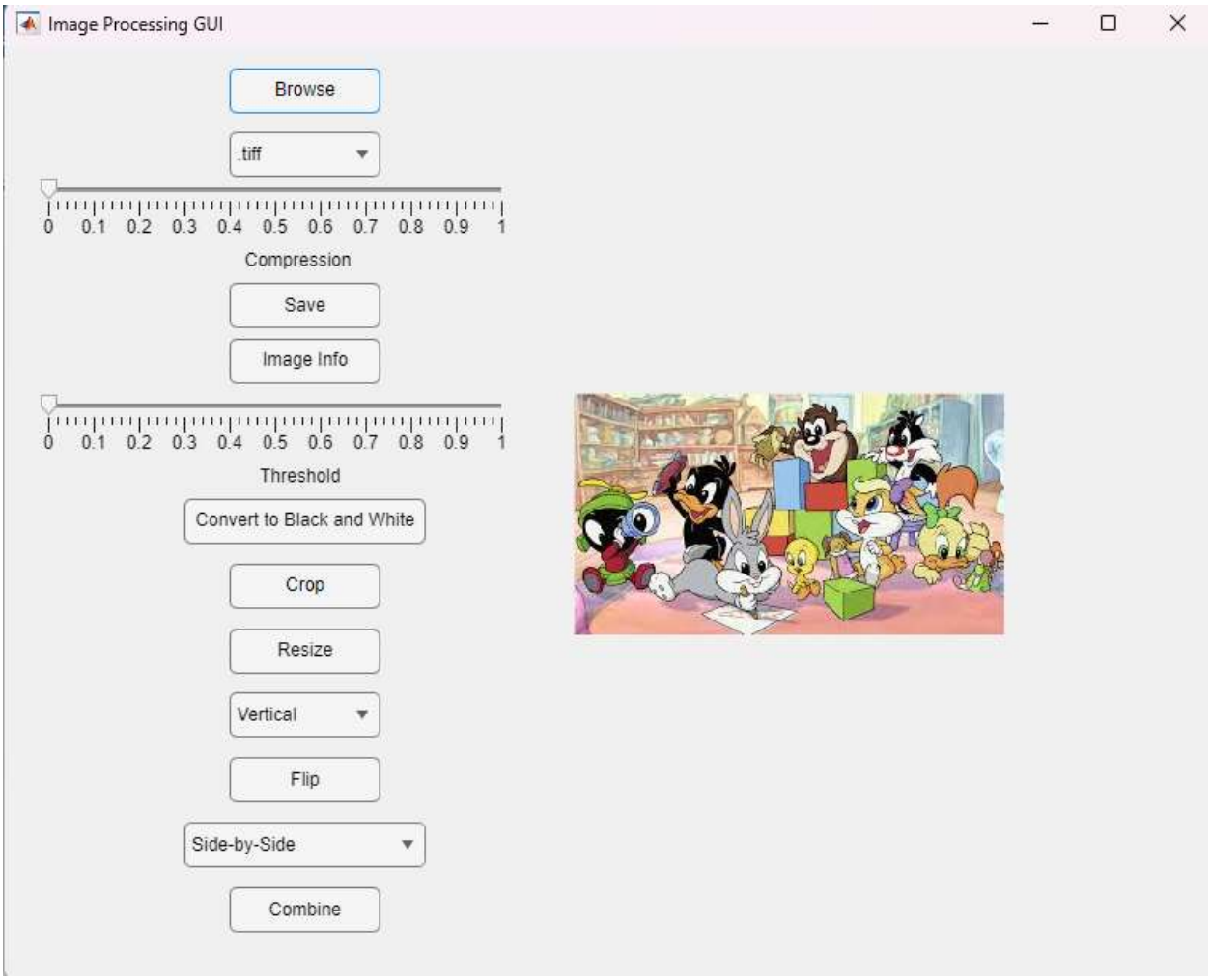


Image Processing GUI
Browse
.tiff
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Compression
Save
Image Info
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Threshold
Convert to Black and White
Crop
Resize
Vertical
Flip
Side-by-Side
Combine

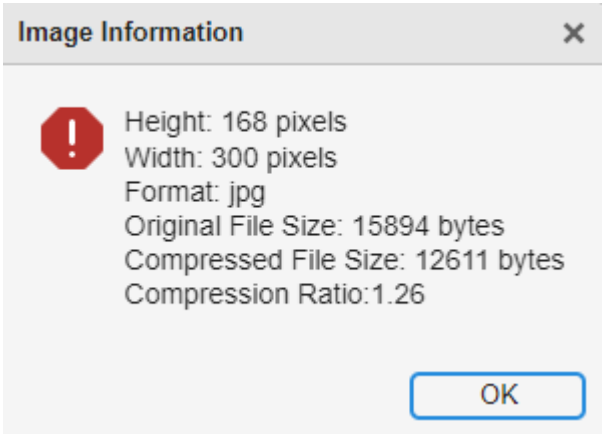
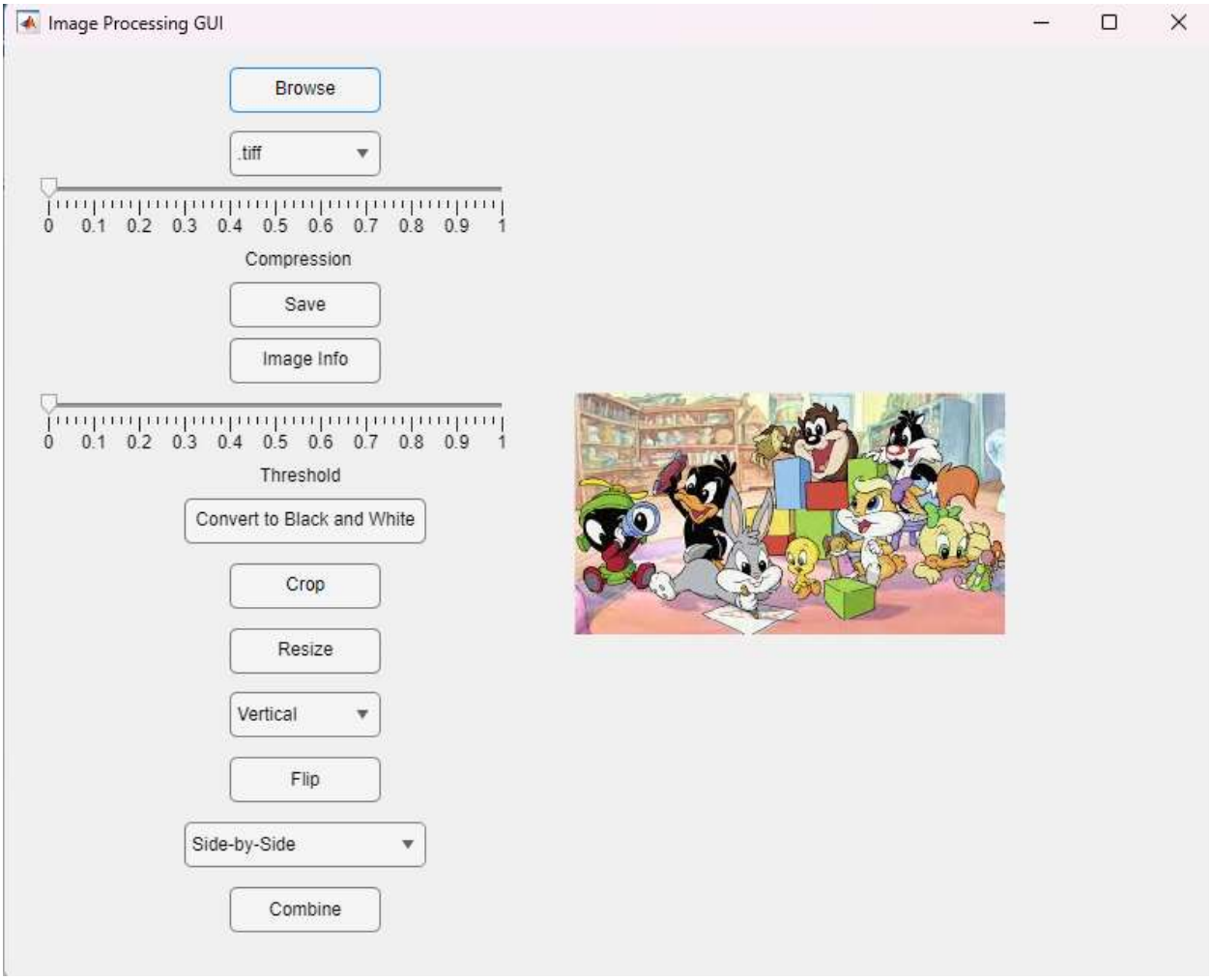
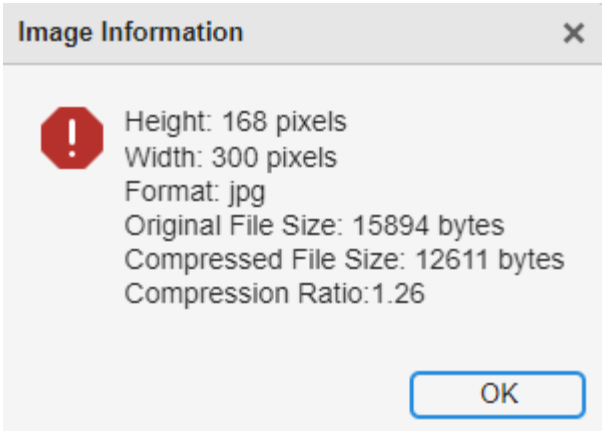


Image Information
Height: 168 pixels
Width: 300 pixels
Format: jpg
Original File Size: 15894 bytes
Compressed File Size: 12611 bytes
Compression Ratio:1.26
OK

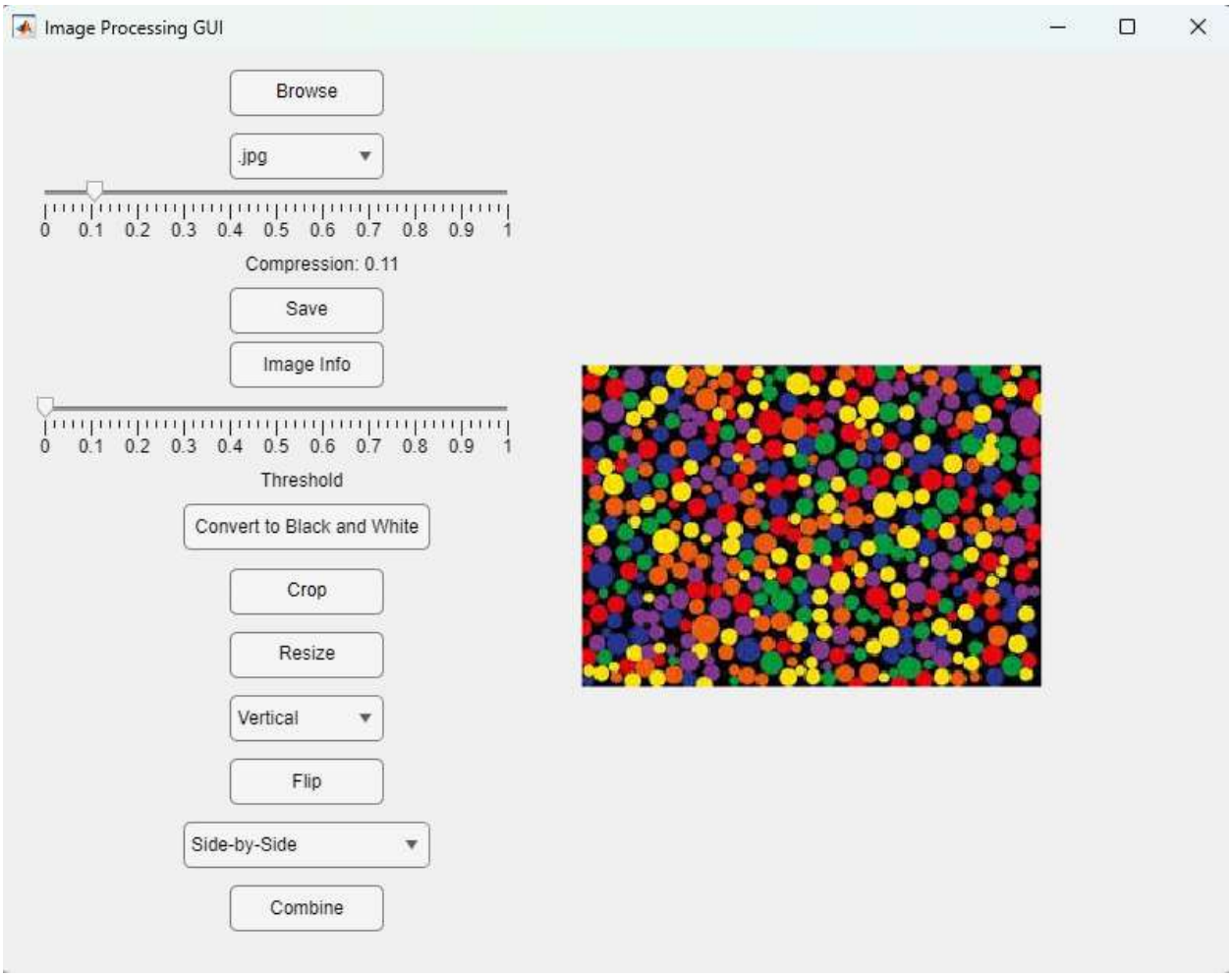
- No compression applied when the format was set to .tiff (other that.jpg). Original file size remains same in both the formats.

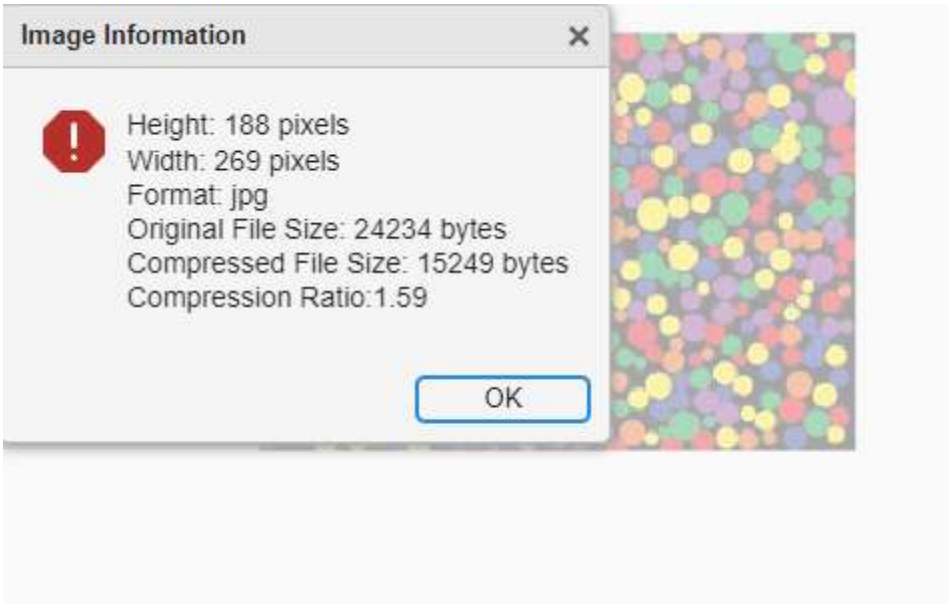




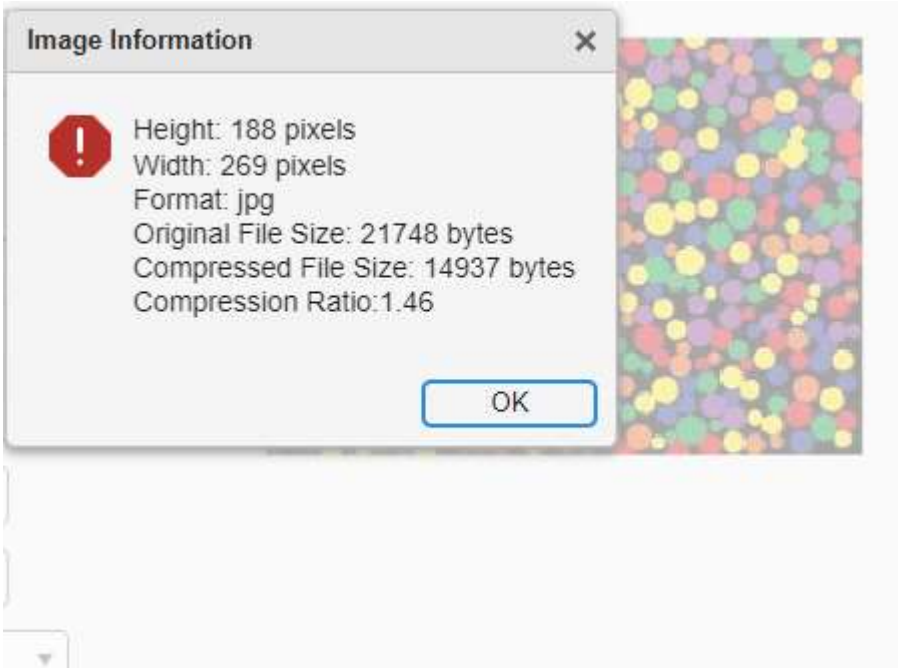
- When compression of 11 was applied and the format was set to .jpg. Slider value is set to 0.11. It will be rounded to 11 before implementation. The image is compressed.

The loaded image:





The compressed image:



Challenges faced during implementation

Here are the key challenges that I faced during the development of GUI based image processing application:

1. **MATLAB version issue**: I had to install the latest MATLAB version (2024) because many functions were not recognized by prior version (2021).
2. **First-time MATLAB use**: As a first-time user, learning MATLAB syntax was challenging.
3. **Drag and drop limitation:** I could not implement drag and drop as it is not supported even in the latest 2024 version of MATLAB.
4. **Time-consuming:** The assignment took a long time to complete, but the learning process was enjoyable.
5. **Interesting experience**: Despite the challenges, I found the assignment interesting and rewarding, gaining new skills.