# Image Processing GUI Toolkit

## 1. Problem Statement

The objective of this project is to design and implement a user-friendly graphical interface for performing basic image processing operations such as enhancement, filtering, and transformation. The toolkit allows users to upload, process, and analyze images without requiring deep programming knowledge.

## 2. Introduction

Image processing is an essential domain in computer vision and artificial intelligence. This project introduces a GUI-based toolkit developed using Python, OpenCV, and Streamlit, allowing users to perform real-time image operations. The interface provides functionalities like histogram equalization, filtering, edge detection, and more.

## 3. Requirements

The system requires Python 3.10 or above along with essential libraries like OpenCV, NumPy, Pillow, and Streamlit. Hardware requirements include a standard PC with minimum 4GB RAM. The toolkit is lightweight and runs in any modern browser.

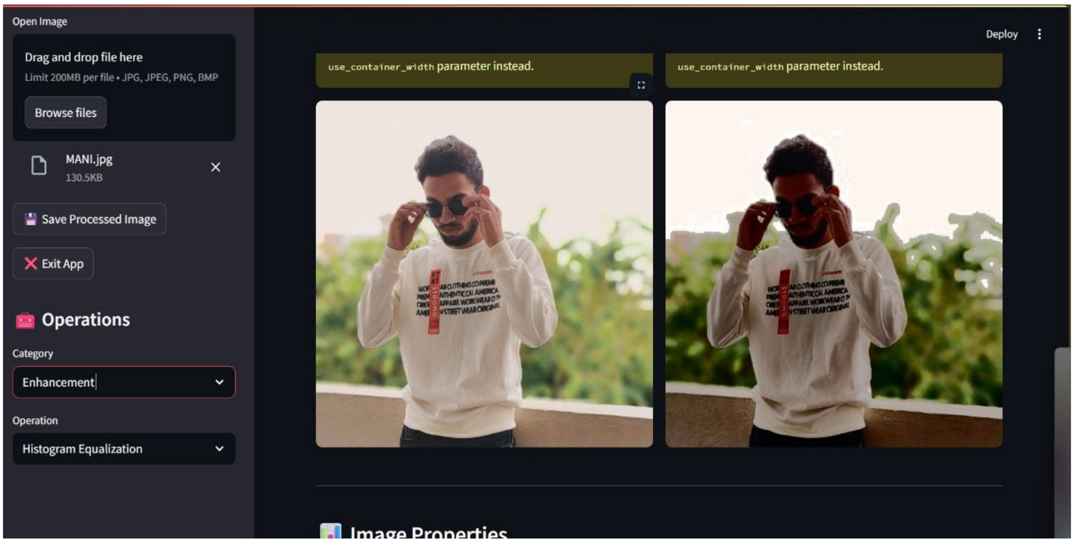
## 4. Methodology

The methodology involves four main steps: 1. Uploading an image using the GUI file uploader. 2. Selecting operations such as enhancement, histogram equalization, or edge detection. 3. Applying transformations using OpenCV and NumPy functions. 4. Displaying results side-by-side for comparison. Streamlit is used for frontend interface, while OpenCV handles the backend image processing tasks.

## 5. Results

The following screenshots demonstrate the working of the Image Processing Toolkit. Users can upload an image, perform operations such as Histogram Equalization, and view processed results instantly.

### Original vs Processed Images:



use_container_width parameter instead.

use_container_width parameter instead.

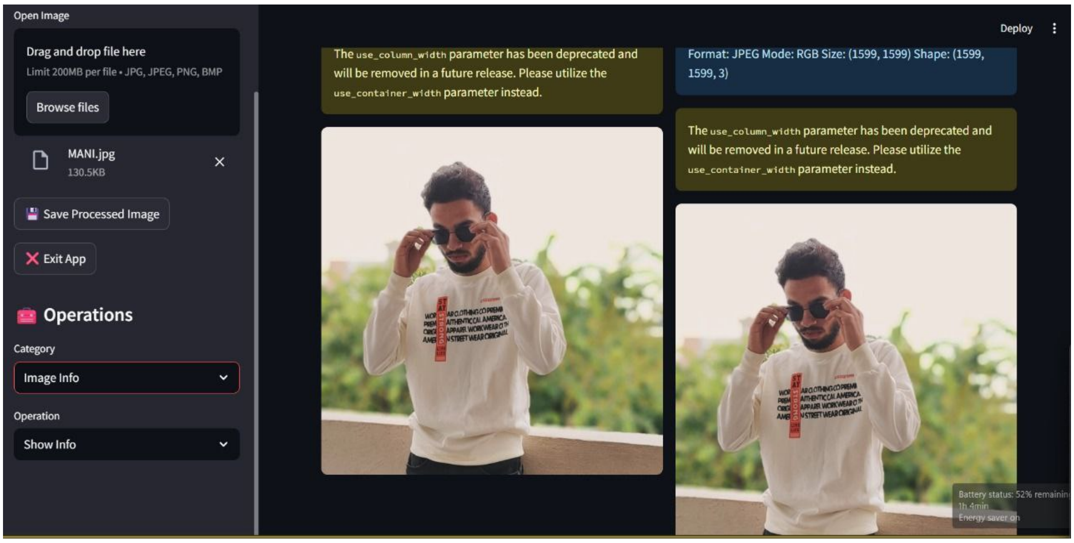
Operations

Category: Enhancement

Operation: Histogram Equalization

Image Properties

## Image Information Output:



The use_column_width parameter has been deprecated and will be removed in a future release. Please utilize the use_container_width parameter instead.

Format: JPEG Mode: RGB Size: (1599, 1599) Shape: (1599, 1599, 3)

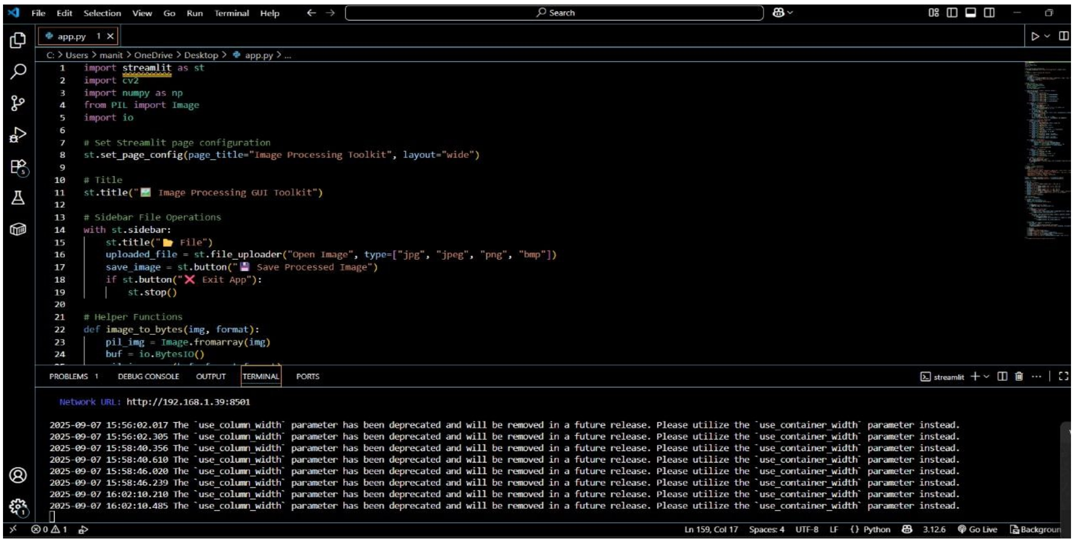
The use_column_width parameter has been deprecated and will be removed in a future release. Please utilize the use_container_width parameter instead.

Operations

Category: Image Info

Operation: Show Info

## Code Execution in VS Code:



```python
import streamlit as st
import cv2
import numpy as np
from PIL import Image
import io

# Set Streamlit page configuration
st.set_page_config(page_title="Image Processing Toolkit", layout="wide")

# Title
st.title("🖼️ Image Processing GUI Toolkit")

# Sidebar File Operations
with st.sidebar:
    st.title("📂 File")
    uploaded_file = st.file_uploader("Open Image", type=["jpg", "jpeg", "png", "bmp"])
    save_image = st.button("💾 Save Processed Image")
    if st.button("❌ Exit App"):
        st.stop()

# Helper Functions
def image_to_bytes(img, format):
    pil_img = Image.fromarray(img)
    buf = io.BytesIO()
```

```
  Network URL: http://192.168.1.39:8501

2025-09-07 15:56:02.017 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 15:56:02.305 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 15:58:40.356 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 15:58:40.610 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 15:58:46.020 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 15:58:46.239 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 16:02:10.210 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
2025-09-07 16:02:10.485 The `use_column_width` parameter has been deprecated and will be removed in a future release. Please utilize the `use_container_width` parameter instead.
```

# 6. Conclusion

The Image Processing GUI Toolkit successfully demonstrates how complex image operations can be simplified using a user-friendly interface. It eliminates the need for in-depth programming, making it useful for beginners, researchers, and students exploring image processing techniques.