# Memo

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Image Manipulation Tool

**Objective:**

Develop a Python application that can perform basic image manipulation operations like resizing, cropping, rotating, and color filtering.

**Tools:**

Python: The primary programming language for the project.

Pillow (PIL Fork): A Python Imaging Library that adds image processing capabilities to your Python interpreter.

**Features:**

Load and Save Images: Ability to open image files and save edited images.

Resize and Crop: Change the dimensions of an image or crop to a specific area.

Rotate and Flip: Rotate the image by a specified angle or flip it horizontally/vertically.

Color Filters: Apply basic color filters like grayscale, sepia, or black and white.

Brightness and Contrast Adjustment: Modify the brightness and contrast of the image.

**Steps:**

1. Setup:
   1. Introduction to Pillow library and setting up the environment.
2. Basic Image Operations:
   1. Open, display, and save images.
   2. Understanding image data (pixels, color channels).
3. Implementing Manipulation Functions:
   1. Write functions for resizing, cropping, rotating, and flipping images.
   2. Implement color transformations and filters.
   3. Adjust brightness and contrast.
4. Building a User Interface (Optional):
   1. If comfortable, create a simple GUI using Tkinter to make it user-friendly. Otherwise, use command-line arguments.
5. Testing and Debugging:
   1. Test each function individually and then as a whole.
   2. Debug any issues that come up.

**Extension Ideas:**

**Advanced Image Filters**: Implement more complex filters like blur, sharpen, or edge detection.

**Batch Processing:** Add functionality to process multiple images at once.

**Undo/Redo Functionality**: Allow users to undo or redo their actions.

**Image Annotations:** Add text or simple drawing capabilities on images.

**Custom Filters**: Allow users to create their own filter by manipulating pixel values.

**Learning Outcomes:**

* Basics of Python and handling external libraries.
* Understanding of image processing and manipulation basics.
* Familiarity with image data and formats.
* Practical application of loops, functions, and file I/O in Python.
* GUI development (if a graphical interface is implemented).