SS24 HIT137

SOFTWARE NOW

Assignment III

Group Name SYD 02

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1. Introduction:

This project involves developing a desktop application using Python, Tkinter, and OpenCV. The application will allow users to load, crop, resize, and save images while adhering to object-oriented programming principles. The primary objective of this assignment is to enhance students' understanding of Object-Oriented Programming (OOP) concepts in Python, GUI development using the Tkinter library, image processing and manipulation techniques with OpenCV, and collaborative software development using GitHub for version control and teamwork. Through this project, we have gained hands-on experience implementing interactive image processing functionalities while developing an intuitive graphical user interface.

Furthermore, working in a team environment has helped us to improve our collaboration and problem-solving skills, ensuring that each aspect of the application is developed, tested, and refined efficiently. The inclusion of GitHub as a version control system has also introduced us to industry-standard practices for software development, allowing us to track and manage code contributions effectively.

2. Team Roles and Responsibilities:

Coder (Rahul Sharma)

Rahul was responsible for writing the core application logic and implementing image processing functionalities. His role includes developing features like image loading, cropping, resizing, and saving, ensuring that the code is efficient, clean, and modular. He has worked closely with the other team members to integrate the GUI with the backend and ensure that the app performs as expected.

Tester (Nirmal Subedi)

He is responsible for validating the application's functionality and ensuring that all features work as intended. This includes writing and executing test cases to validate the image processing functions and verifying that the user interface is intuitive. He also ensures that

there are no bugs, performance issues, or edge cases that could disrupt the user's experience. He also conducts both manual and automated tests and provides feedback for improvements.

Documentation (Anuj Ojha)

Anuj was responsible for maintaining all project documentation, including the system design, user guides, and reports. This role involves updating the GitHub repository with proper documentation for each module, adding setup instructions, usage guidelines, and API documentation. I also ensure that the code is well-commented and write the final documentation for the project, including a detailed README and an explanation of all features and components.

GUI Developer (Kishor Katuwal)

Kishor is responsible for designing and implementing the user interface of the application using Tkinter. This role focuses on creating an intuitive, user-friendly, and visually appealing GUI that makes it easy for users to interact with the application. He creates interactive elements like buttons, sliders, and image previews and ensures seamless integration between the user interface and the backend functionalities. The GUI Developer works closely with the Coder to ensure that the application behaves as expected.

3. GitHub Repository Setup

A GitHub repository must be created and set to the public. All group members should be added as collaborators with appropriate permissions. Contributions must be recorded in GitHub throughout the development process, and each commit should be properly documented with meaningful commit messages. The repository should include a README.md file outlining the project's objectives, setup instructions, and usage guidelines. The repository link must be saved in a text file named github_link.txt and included in the final submission

4. System Architecture

The application follows a modular architecture with clearly defined components. The Frontend (GUI Layer) uses Tkinter and handles user interactions, displays images, and controls input elements. The Backend (Processing Layer) utilizes OpenCV and NumPy for image processing tasks like cropping, resizing, and modifications. The File Management Module manages loading, saving, and exporting images in various formats. The Event Handling & User Interaction component implements mouse and keyboard interactions for cropping and resizing. The Logging & Debugging component logs user actions and debugging information for error tracking.

5. Functional Requirements

5.1. Image Loading

Users can browse and select images from their local device. The application should support multiple common image formats such as JPEG, PNG, BMP, and TIFF. Loaded images will be displayed in the application as a temporary thumbnail. The displayed thumbnail cannot be modified but serves as a reference for the user.

Figure 1: Image loading GUI

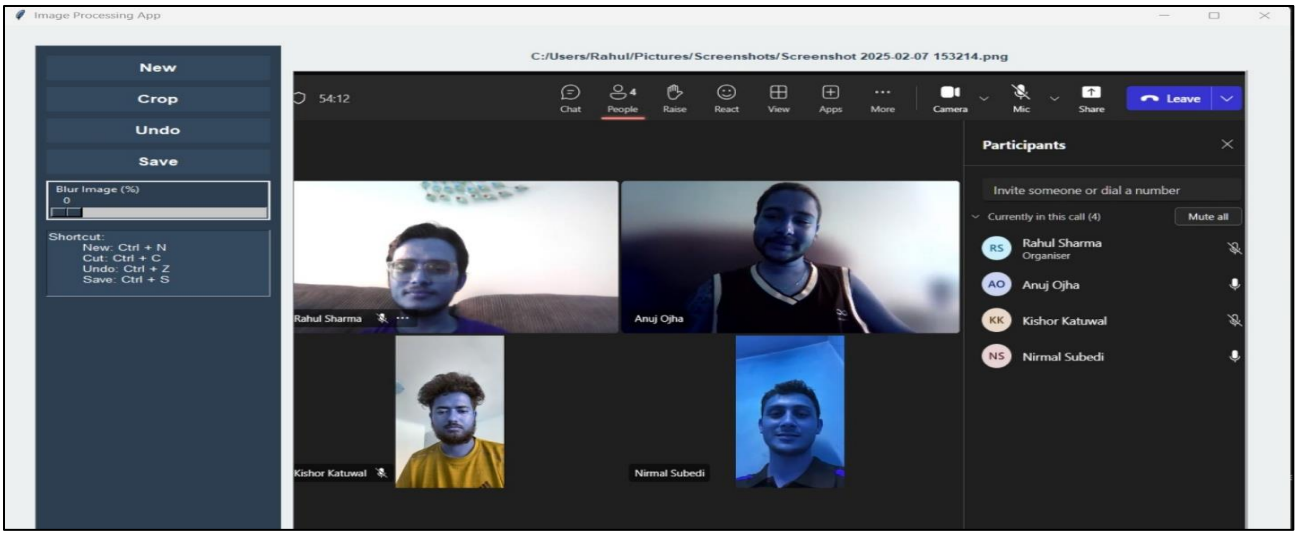

Figure 2: Loading image

5.2. Image Cropping

Users can draw a rectangle using mouse interaction to select an area for cropping. While drawing, the application will provide real-time visual feedback by displaying the inverse of the selected area. The cropping process will remove the selected area instead of retaining it, modifying the image accordingly. The cropped result should be displayed in a new editor. Users should also be allowed to reset the crop selection before finalizing changes.

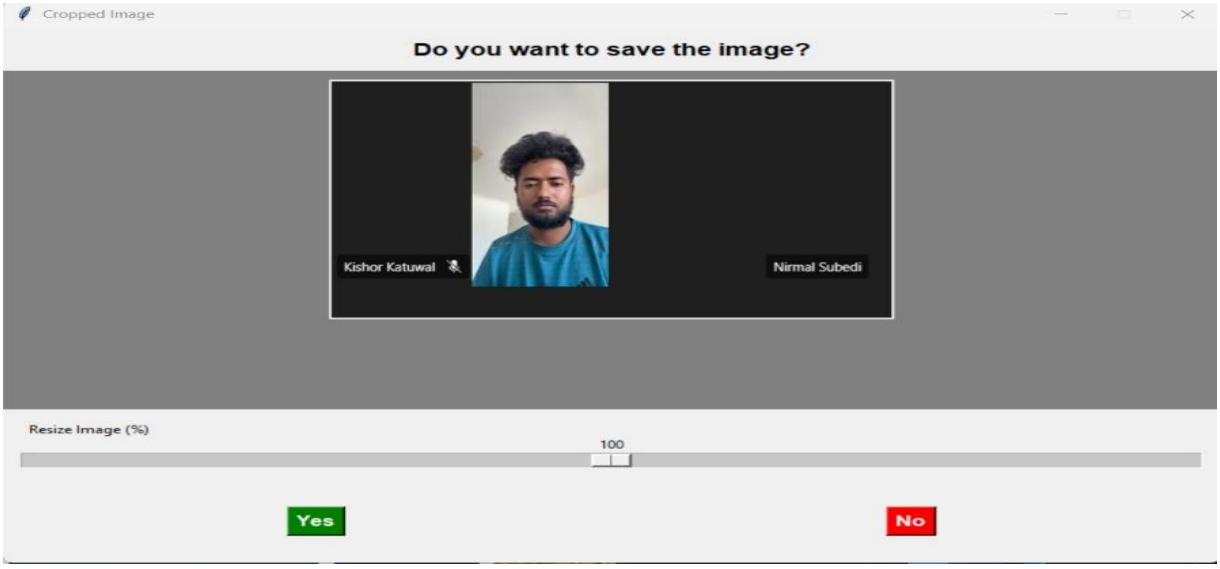

Figure 3: Cropping photo

5.3. Image Resizing

A slider control allows users to resize the cropped image. The resizing effect only applies to the preview while keeping the original dimensions intact for export. As the user moves the slider, the application updates the display in real-time, showing progressive degradation of image size changes. Users should be able to view numerical values indicating the percentage of resizing applied.

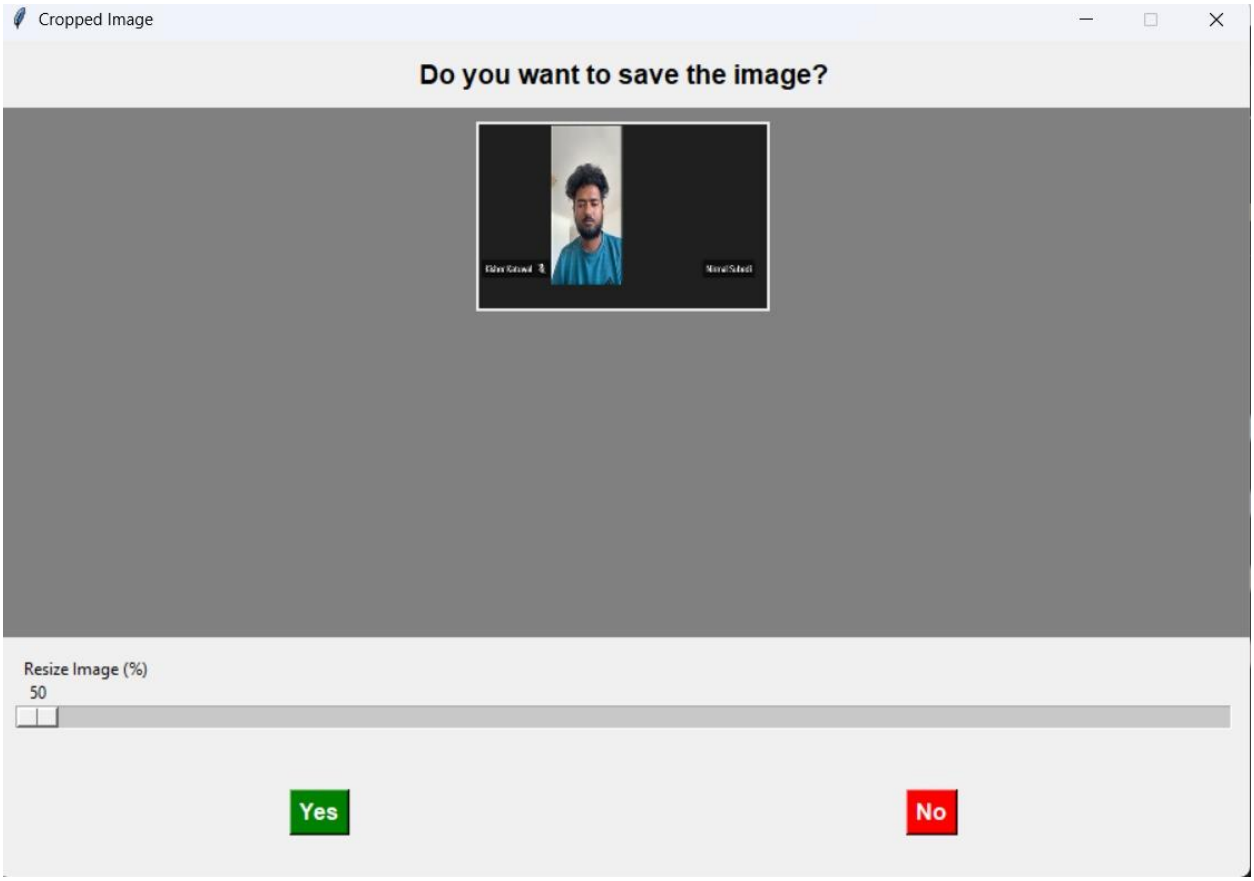

Figure 4: Image resizing

5.4. Save Modified Image

Users can save the modified image to their local device. The saved image retains its original dimensions but incorporates the applied modifications. The application automatically saves the edited image in a public directory and file format (JPEG, PNG, etc.) and includes a confirmation message upon successful save.

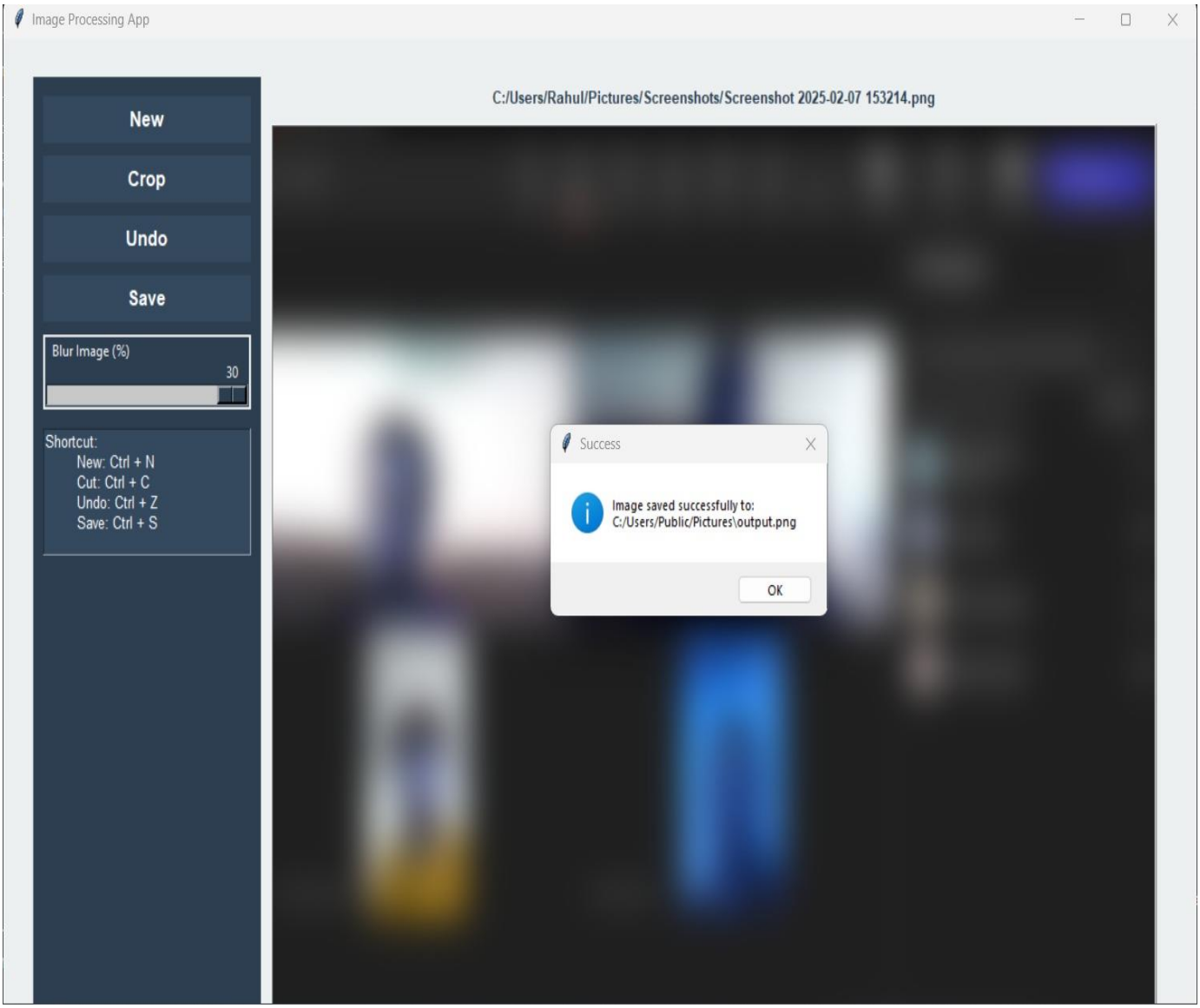

Figure 5: Saved modified image

6. Bonus Features:

6.1. Keyboard Shortcuts

Customized Keyboards shortcuts are implemented, and corresponding instructions are displayed in the user interface to guide and ease their image processing experience.

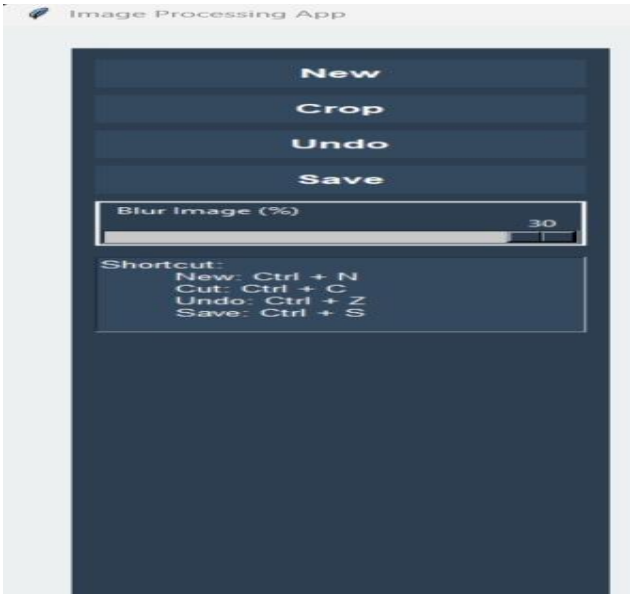

Figure 6: Keyboard shortcuts

6.2. Undo/Redo Functionality

Undo and redo buttons will be present but will permanently commit changes after each operation. Clicking undo/redo will apply to revert to the original state. This feature is intended to rectify the cropped or blurred image to its original state so users can restart their image processing.

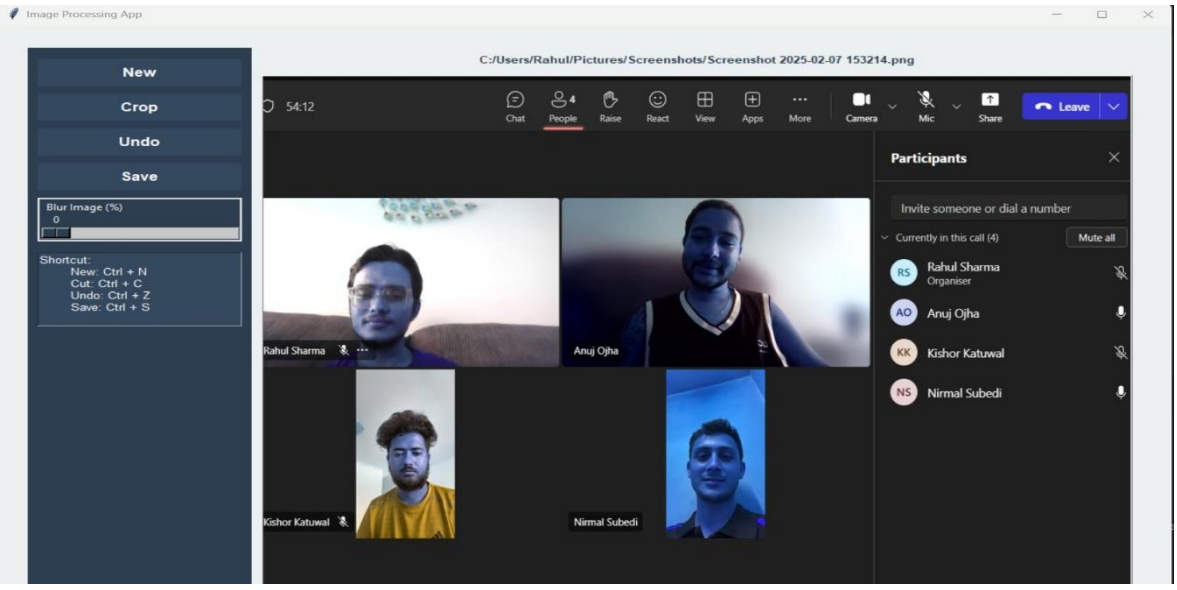

Figure 7: Before blur

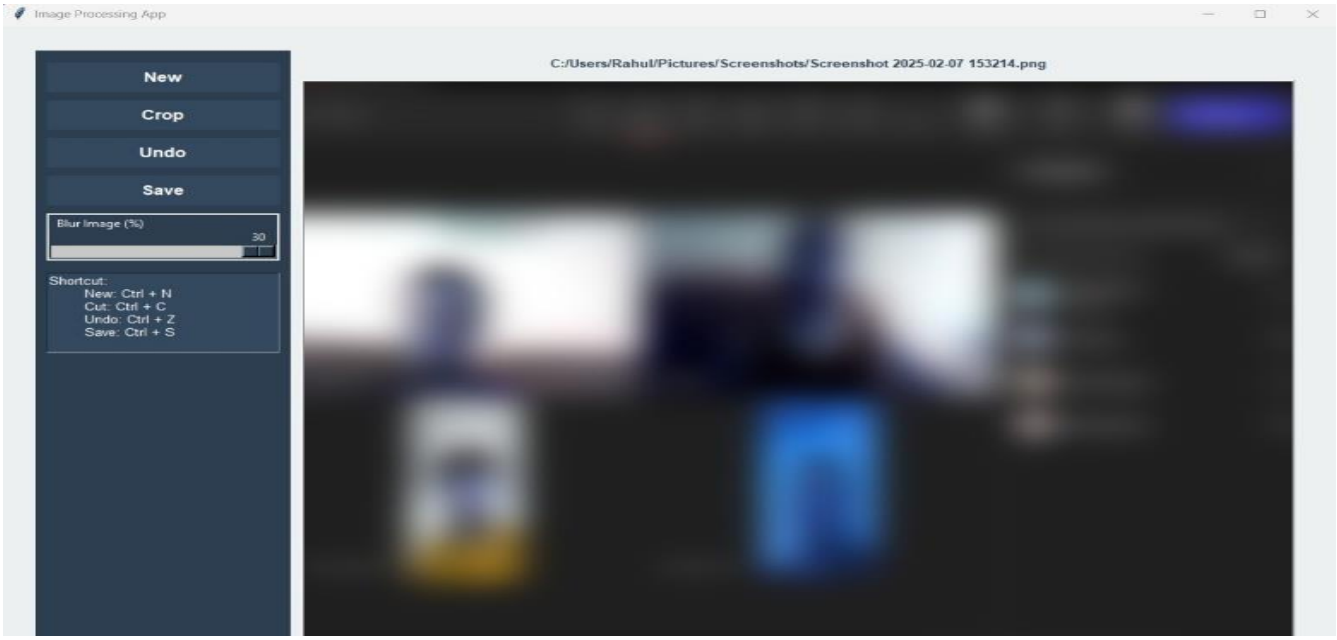

Figure 8: After blur

7. Implementation Plan

The development process will follow a structured timeline.

Week 1: In week 1, we focused on creating the GitHub repository, setting up the project structure, and implementing the basic GUI framework using Tkinter.

Week 2: We were involved in implementing image-loading functionality and designing the interface for cropping and resizing.

Week 3: We were focused on developing the cropping feature with real-time feedback and implementing the image resizing feature with a slider.

Week 4: We were involved in enabling image-saving functionality, debugging, and finalizing bonus features.

Week 5: We were dedicated to final testing, code review, documentation finalization, and project submission on Learnline.

8. Conclusion:

This assignment demonstrates an understanding of object-oriented programming, GUI development, and image processing. The application includes essential image manipulation features while incorporating unique constraints for bonus functionalities. The project also highlights the importance of teamwork and collaboration in software development, emphasizing structured problem-solving and modular design. We have gained real-world experience in managing software projects, troubleshooting issues, and optimizing usability by engaging in this assignment. Ultimately, this project serves as a foundation for more advanced applications and further learning in the field of software development and image processing.