جامعة حلوان

كلية الحاسبات والذكاء الاصطناعي

كلية الحاسبات والذكاء الإصطناعي
Faculty of Computers & Artificial Intelligence

Image Processing Project

No.	Team Member	Id	Grade
1			
2			
3			
4			
5			
6			
7			

Design and implement a Python program with a graphical user interface (GUI) to perform the image operations listed in Table 1. The following requirements must be met:

Custom Implementation:

- Write the code for each operation from scratch **without relying on built-in functions** that complete the entire process.
- Use basic operations like filter, sum, min, max, median, etc., to implement the functionality.

User Interface Design:

- Ensure the GUI is aesthetically pleasing, with a consistent and visually appealing design in terms of layout, shapes, and colors.
- Group related operations (e.g., operations producing similar outcomes) into organized sections or boxes for better user experience.

Functionality and Workflow:

- Start with a button to upload an image from the user's device. Display the uploaded image in a side frame within the program window.
- Provide buttons for each image operation. When clicked, the corresponding process should be applied, and the result displayed dynamically.

Encourage Creativity:

- Add any creative features or enhancements that would increase the overall value and usability of the program.

Table 1: Project Processes

Process	Description	Grade
Image Color	Convert image to grayscale.	
Threshold	Make a function that calculates the threshold of the image based on the average values of pixels. Is the result of this function getting an optimal threshold or not?	
Halftone	Apply simple halftone (threshold).	
	Apply advanced halftone (error diffusion).	
Histogram	Make a function that gets a histogram of the image. Is the result of this histogram good or not, and why?	
	Apply histogram equalization.	
Simple Edge Detection Methods	Apply sobel operator.	
	Apply prewitt operator.	
	Apply kirsch compass masks and get the edge direction.	
Advanced Edge Detection Methods	Apply homogeneity operator.	
	Apply difference operator.	
	Apply difference of gaussians using 7*7 and 9*9 masks in figure 6.6 on the book page (63).	
	Apply contrast-based edge detection using smoothing mask in figure 6.10 on the book page (67).	
	Apply variance.	
	Apply range.	
Filtering	Apply a high-pass filter using the first mask in figure 7.18 on the book page (89).	
	Apply a low-pass filter using the first mask in figure 7.3 on the book page (78).	
	Apply median filter.	
Image Operations	Make a copy of the image and add the image and its copy.	
	Make a copy of the image and subtract the image and its copy.	
	Invert the image.	
Histogram Based Segmentaion	Apply manual technique.	
	Apply histogram peak technique.	
	Apply histogram valley technique.	
	Apply adaptive histogram technique.	

Note: Part of the grades will be on the questions for each member of the team, and the other part will be on the implementation of the project.