



جامعة طنطا
كلية الحاسوب والذكاء الاصطناعي



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Faculty of Computers & Artificial Intelligence

Image Processing Project

Team No. ()

No.	Team Member	Id	Grade
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

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 with 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	Detailed Description	Grade
Image Reading	<ul style="list-style-type: none"> Upload a colored image. Display image information: resolution, size, and type. 	
Grayscale Conversion	<ul style="list-style-type: none"> Convert the uploaded image into a grayscale image. 	
Binary Image Conversion	<ul style="list-style-type: none"> Convert the grayscale image to binary. Implement a function that calculates the threshold using the average pixel intensity. Evaluate whether this threshold is optimal or not. 	
Affine Transformations	<ul style="list-style-type: none"> Apply translation. Apply scaling. Apply rotation. Apply x-direction shear. Apply y-direction shear. 	
Image Interpolation (Resolution Enhancement)	<ul style="list-style-type: none"> Resize image using nearest-neighbor interpolation. Resize using bilinear interpolation. Resize using bicubic interpolation. 	
Image Operations	<ul style="list-style-type: none"> Crop a selected region of the image. 	
Histogram Analysis	<ul style="list-style-type: none"> Implement a function to compute the histogram of a grayscale image. Assess whether the histogram is good or not and justify the answer. Apply histogram equalization. 	
Low-Pass Filtering	<ul style="list-style-type: none"> Apply a 19×19 Gaussian filter with $\sigma = 3$. Apply a 7×7 median filter. 	
High-Pass Filtering	<ul style="list-style-type: none"> Apply Laplacian filter (second derivatives). Apply Sobel filter. Apply gradient filter (first derivatives). 	



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Image Compression Techniques

- Apply Huffman coding.

- Apply Golomb–Rice coding.

- Apply Arithmetic coding.

- Apply LZW coding.

- Apply Run-Length coding (RLE).

- Apply Symbol-based coding.

- Apply Bit-plane coding.

- Apply Block Transform coding (e.g., DCT).

- Apply Predictive coding.

- Apply Wavelet coding.

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.