Fundamentals of Computer Vision Spring 25

Assignment 1

Programming Assignment: Improve a Given Image Using Custom Transformations

You can do this alone or in a group of two students. No Late submissions will be acceptable. Make sure to submit the assignment on time.

Objective

This assignment aims to develop an intuitive understanding of image processing by improving a given image using logical and mathematical transformations. This will encourage creativity while reinforcing fundamental image-processing concepts.

Assignment Description

Students must apply custom transformations to improve an image using NumPy and Matplotlib. They will then explain their approach and compare their results to the original image.

Tasks

1. **Load the Given Image**
    - Read the image file and convert it into a NumPy array for processing.
2. **Develop an Improvement Strategy**
    - Analyze the image and determine the necessary transformations for enhancement.
    - Use logic-based transformations without relying on OpenCV or other image-processing libraries.
3. **Apply and Save the Transformed Image**
    - Implement at least two custom transformations in Python.
    - Save the improved image.
4. **Compare & Explain**
    - Display the original and improved images side by side in a Jupyter Notebook.
    - Provide a detailed explanation including:
        - The problems identified in the original image.
        - The transformations applied and why they were chosen.
        - How the image quality has improved as a result.

Restrictions

- **No OpenCV (cv2) or any other image processing library is allowed.**
- Students can only use **NumPy** for image manipulation and **Matplotlib** for visualization.
- Transformations must be implemented manually using plain Python.

Deliverables

- A Jupyter Notebook (`.ipynb` file) named using the student's roll number in the format:
  `24L-XXXX_A1.ipynb` (e.g., `24L-1234_A1.ipynb`).
- The roll number should also be mentioned in the first cell of the notebook.
- The notebook should display the **output of every cell** to show step-by-step image processing results.
- The final explanation should be **written as Markdown** inside the notebook.

Submission Deadline

13th February 2025