

Introduction to Image Processing

HW1

Due: 10/26

Background

You have learned some methods for image enhancement in class, including

piecewise linear stretching,

gamma correction,

And histogram equalization (HE).

However, these methods are the basic solutions and face some limitations.

*Your task is to explore **advanced solutions** to address these limitations.*

Task - Image Enhancement

You might seek AI guidance on potential alternative methods.

In your report, you need to present

1. your analysis of the conventional method (you may select one or more than one),
2. AI-generated insights,
3. research findings, and
4. the used solutions for the advanced image enhancement.

Performance Evaluation

1. Subjective quality: Show the images (origin & enhanced).
2. Objective quality: Compute the **entropy**, **BRIQUE** and **NIQE** score.

$$entropy = - \sum_k p(k) \log_2 p(k), \text{ where } p(k) \text{ is the density of level } k$$

BRIQUE: No-Reference Image Quality Assessment in the Spatial Domain

NIQE: Making a 'Completely Blind' Image Quality Analyzer

Feedback

- **Reflect on Your Learning:** Reflect on the experience of using AI to explore advanced solutions for image processing problems.
 - What challenges did you encounter, and
 - How did AI assist you in overcoming them? (Please provide a thoughtful response.)
- **Future Learning**
 - How do you foresee the role of AI in the field of image processing?
 - What specific topics or areas related to image processing would you like to explore further with the assistance of AI in the coming months? (Please be specific.)

Instructions:

Please carefully read and follow the instructions for the homework assignment:

- ✓ **Collaboration:** This assignment encourages independent research and problem-solving. Collaborate with your classmates for discussion and idea exchange, but each student should submit their unique solutions.
- ✓ **AI Guidance:** You are encouraged to use AI or machine learning tools to explore advanced solutions to the problems presented in this assignment. The purpose is to leverage AI to gain insights and guidance for further research.
- ✓ **Presentation:** Present your findings, insights, and solutions clearly and concisely. Use appropriate diagrams, charts, code snippets, or examples to support your explanations.
- ✓ **References:** If you refer to external sources or AI-generated insights, cite them appropriately using the preferred citation style (e.g., APA, MLA).
- ✓ **Late Submissions:** 10% penalty per overdue day.

Reminder

- Test two images.
 - one over-exposed image and one under-exposed image are used.
- Pack your report and source code into a zip file and upload to ecourse2.