



UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
FAKULTI TEKNOLOGI DAN KEJURUTERAAN ELEKTRONIK DAN KOMPUTER

# BERR 4723

# DIGITAL IMAGE PROCESSING

Semester 1 2024/2025

## ASSIGNMENT

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### Assignment Overview (20%)

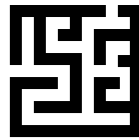
This assignment consisted of 2 parts. You need to complete both path and submit within the time frame given.

- **Part I: Group Assignment:** 15%
- **Part II: Personal Engagement:** 5%

This assignment will help students demonstrate **CLO3** (communicate effectively through well-structured report writing, presentations, documentation, digital portfolio and video demonstration).

**Complex Engineering Activities (CEA):** The assignment encourages students to demonstrate their ability to apply engineering concepts to solve complex problems, as well as their critical thinking in implementing these solutions.

**PART I**  
**GROUP ASSIGNMENT**  
**15%**



## 1.0 Project Topic Selection

1.1 Choose a real-world problem where digital image processing techniques can be applied.

### 1.2 Example Topics:

- Medical Imaging: Enhancing MRI or CT scan images for better diagnostic results.
- Smart Photo Image Restoration: Restoring old or damaged photographs.
- Photo Object Detection and Segmentation: Using edge detection and thresholding techniques for segmenting objects in images.
- Image Compression: Implementing algorithms to compress and reconstruct image data efficiently.

## 2.0 Requirements

2.1 **Code Implementation:** The project must use at **least four (4)** of the following image processing techniques:

- Image Enhancement (e.g., histogram equalization, contrast stretching)
- Image Restoration (e.g., noise removal, deblurring)
- Geometric Transformations (e.g., translation, rotation, scaling)
- Image Segmentation (e.g., thresholding, edge detection)
- Compression (e.g., JPEG, PNG compression)
- Color Image Processing (e.g., color space transformations, color enhancement)
- Feature Extraction (e.g., edge detection, texture analysis)

2.2 **Documentation:** Clearly document the code, explaining each step and the rationale behind choosing particular techniques. Provide a detailed report covering the project goals, methodology, results, and conclusions.

### 3.0 Deliverables

- 3.1 **Code:** Well-commented source code, written in MATLAB, OpenCV or Python, which implements the selected image processing techniques.
- 3.2 **Project Report/Digital Portfolio:** A detailed report (in PDF, EPUB, or interactive digital format) that includes:
- Introduction: Overview of the project and the image processing techniques applied.
  - Methodology: Clear explanation of the methods and algorithms used, including justification for their selection.
  - Results: Before-and-after images demonstrating the effectiveness of the techniques used.
  - Challenges and Solutions: A discussion of any challenges faced during the project and how they were overcome.
  - Conclusion: Summary of the outcomes and possible future improvements for the project.
- 3.3 **Video Demonstration:** A required 2-3 minute video showcasing your project. This video should:
- Explain the techniques used.
  - Show the process of applying the techniques.
  - Demonstrate the results achieved, such as showing before-and-after images or the effects of the applied transformations.
  - Video must be engaging, clearly communicating the value of the work to an audience.
- 3.4 **Group Work and Submission:**
- Group Size: 4 members per group.
  - Group Registration: Register your group in the ULearn system.
  - Submission: Submit your code, report, digital portfolio, and video by the deadline.

## 4.0 Marks

### 4.1 Breakdown of the Group Assignment (15%):

| Criteria  | Weight     | Details   |
|---|------------|---|
| <b>Creativity and Innovation</b>                  | <b>10%</b> | Evaluated based on originality and innovative problem-solving.  |
| <b>Implementation and Code Quality</b>            | <b>20%</b> | Evaluated based on the structure and quality of code implementation.  |
| <b>Application of Image Processing Techniques</b> | <b>30%</b> | Evaluated on how well techniques are applied to solve real-world problems.  |
| <b>Project Report/Digital Portfolio</b>           | <b>20%</b> | Evaluated on clarity, organization, and detail in the project report or digital portfolio (whichever format the student selects). |
| <b>Video Demonstration</b>                        | <b>20%</b> | Evaluated based on the quality, clarity, and engagement of the project demonstration video.                                       |

## 4.2 Rubric for Group Assignment (15%)

| Criteria  | 5 (Excellent)   | 4 (Good)   | 3 (Satisfactory)  | 2 (Needs Improvement)   | 1 (Poor)   | Weight     |
|---|---|--|---|---|--|------------|
| <b>Creativity and Innovation</b>                  | Highly creative and original approach to solving the problem. Clear and innovative application of image processing techniques.                        | Good creativity, some innovative aspects, and thoughtful use of image processing techniques.             | Basic application of image processing techniques. Minimal creativity or originality.                  | Lacks creativity, uses basic techniques without much thought or innovation.                                 | No creativity or innovation, inappropriate or irrelevant methods used.                                   | <b>10%</b> |
| <b>Implementation and Code Quality</b>            | Code is well-structured, efficient, and fully functional. Highly optimized and well-documented.   | Code is functional with minor errors. Some optimization required, and mostly commented.                  | Code is functional but lacks optimization and organization. Documentation is minimal.                 | Code is disorganized, with several errors affecting functionality. Documentation is poor or lacking.        | Code is poorly written and does not work as expected. Documentation is inadequate.                       | <b>20%</b> |
| <b>Application of Image Processing Techniques</b> | Excellent selection and application of techniques that are highly relevant and effectively address the problem.                                       | Techniques are appropriately applied, though some could be more effective for the given problem.         | Some techniques are correctly applied, but others may be inappropriate or under-developed.            | Several techniques misapplied or not relevant to the problem.   | Incorrect or irrelevant techniques applied, failing to solve the problem.                                | <b>30%</b> |
| <b>Project Report / Digital Portfolio</b>         | Clear, detailed, and well-organized report or digital portfolio. Thorough analysis, all sections included (Introduction, Methodology, Results, etc.). | Report or digital portfolio is mostly clear and well-organized. Some sections may lack depth or clarity. | Report or digital portfolio is basic and lacks depth in some sections. May have unclear explanations. | Report or digital portfolio is poorly organized or missing significant sections. Lack of clarity or detail. | Report or digital portfolio is incomplete, poorly structured, or unclear. Missing essential information. | <b>20%</b> |
| <b>Video Demonstration</b>                        | Video is clear, engaging, and highly professional. Effectively demonstrates the project's goals, methods, and results.                                | Video is informative and clear but could be more engaging. Covers the methods and results well.          | Video covers the key aspects but lacks clarity, engagement, or important details.                     | Video is unclear, lacks engagement, and does not effectively communicate the project.                       | Video is poorly produced, unclear, and fails to communicate the project's goals and results.             | <b>20%</b> |

## 5.0 Submission Guidelines

- 5.1 Submit the following files via **ULearn portal**:
- **Source code** (in ZIP format).
  - **Project report/digital portfolio** (PDF, EPUB, or interactive format).
  - **Video demonstration** (file sharing).
  - **Personal Digital Portfolio** (including Padlet screenshots and reflections, submitted in written or video format).
- 5.2 Rename all your files according to this format: **Gx\_Sy\_BERR**, which reflecting your group name and section.
- 5.3 Only one files per group. Submitted by the leader.
- 5.4 Must include **Front Page** and **Evaluation Form** (given in **Appendix**).
- 5.5 **Deadline**: The assignment is due on [please refer in the ULearn].

## 6.0 Additional Guidance

- 6.1 **Choosing the Right Techniques**:  
Think about the problem you're solving and how the image processing techniques can best address it. For instance, if you're working on **image restoration**, you might need to apply **noise removal and deblurring techniques**.
- 6.2 **Tools and Libraries**:  
Students are encouraged to use **MATLAB** (with the **Image Processing Toolbox**) or **OpenCV** for coding. These tools are powerful for image manipulation and will allow you to experiment with various techniques and algorithms.
- 6.3 **Project Documentation**:  
Ensure that your **code** is well-commented, and your **project report** (or digital portfolio) is clear and concise. A good report should not only describe what you did but also explain **why** you did it and how the results met your expectations.
- 6.4 **Resources**:
- **MATLAB Documentation**: MATLAB Image Processing Toolbox
  - **OpenCV Documentation**: OpenCV Documentation

## 7.0 Tools for Developing Your Digital Portfolio

### 7.1 Online Tools

- **Google Sites:** A user-friendly website builder ideal for creating simple and effective portfolios. Easily integrates with other Google services for seamless functionality.
- **WordPress:** A versatile platform for creating blogs and portfolios with numerous themes and plugins available for customization. Suitable for users looking for more flexibility in design.
- **Wix:** A drag-and-drop website builder that offers customizable templates, allowing you to create visually appealing portfolios without coding knowledge.
- **Canva:** A graphic design tool that provides templates for creating presentations, infographics, and other visual content. Great for adding creative elements to your portfolio.
- **Adobe Spark:** An easy-to-use tool that allows you to create web pages, videos, and graphics. Ideal for developing engaging multimedia portfolios with minimal effort.

### 7.2 Offline Tools

- **Keynote:** A powerful presentation software that allows you to create interactive and visually engaging portfolios. Supports animations and transitions for effective storytelling.
- **Pages:** A word processing and page layout application that provides templates for creating professional documents. Suitable for text-rich portfolios that can include images and diagrams.
- **Microsoft PowerPoint:** A widely-used tool for creating presentations, which can also be adapted for portfolio creation. Allows for the inclusion of multimedia elements such as videos and animations.
- **Adobe InDesign:** Professional desktop publishing software for creating high-quality layouts and designs. Ideal for detailed portfolios with rich visual content.
- **EPUB Creation Tools (e.g., Calibre):** Tools that help you create EPUB files for easy distribution and reading on various devices. Useful for creating text-based portfolios that incorporate images and links.
- **PDF Editors (e.g., Adobe Acrobat):** Use to create and edit PDF documents for your portfolio. Enables the integration of different content types and interactive features.



# **PART II**

# **INDIVIDUAL ASSIGNMENT**

## **5%**



## 8.0 Personal Engagement

### 8.1 Padlet Participation

- This part will be evaluated individually. You are required to engage and participate in the learning digital platforms indicated in the class session. Link will be given in ULearn.
- Actively contribute to Padlet by sharing resources (for example: articles, infographics, video or relevant material) and engaging in discussions.
- Engage with other students' posts by providing insightful comments or asking thought-provoking questions.

8.2 Marks will be given according to your personal contributions in that platform from Week 1-14. Spamming and usual greetings will NOT be considered as points. Post must also abide the rules and regulations by University.

### 8.3 Personal Reflection

- By the end of the semester, write or record a personal reflection. The reflection should cover:
  - What you shared or learned.
  - How you interacted with others in class or during assignment
  - Insights gained or how you applied the knowledge from the interaction.
  - Or any additional information.

### 8.4 Submission Requirements

8.4.1 **Screenshot** your Padlet contributions and include them in your personal digital portfolio. Make sure you register **your account name** accordingly. Anonymous entries will not be counted.

8.4.2 Include your **reflections** in the same portfolio, ensuring it is well-organized and clearly presented.

8.4.3 **Reflection Format:** You can choose to submit your personal reflection either as a **written format** or as a **video reflection**.

8.4.4 Submit your **personal digital portfolio** by the end of the semester.

8.4.5 Rename and submit your personal digital portfolio as: **YourName\_ Gx\_Sy\_BERR**, which also reflecting your group name and section.

8.4.6 At the end of the semester, you will have the opportunity to reflect on your engagement contributions:

- Consider what you learned from interacting with peers.
- Reflect on how your contributions enhanced your own understanding and that of your classmates.

8.4.7 You can also put a link of your personal digital portfolios and reflection as a link to Google, Cloud or YouTube based on your preferences.

## 9.0 Marks (5%)

| Criteria             | 5 (Excellent)  | 4 (Good)  | 3 (Satisfactory)   | 2 (Needs Improvement)  | 1 (Poor)   | Weight |
|----------------------|--|---|--|--|--|--------|
| Padlet Participation | Highly engaged; contributed valuable resources and feedback to peers.                        | Engaged regularly and contributed meaningful resources or feedback.                 | Contributed occasionally with minimal engagement.                | Minimal participation or only posted to fulfill the requirement. | No participation or irrelevant contributions.          | 2%     |
| Personal Reflection  | Deep, thoughtful reflection on learning, fully demonstrating engagement and insights gained. | Clear reflection on learning, showing good understanding of the engagement process. | Basic reflection on learning with some insights but lacks depth. | Minimal reflection, lacks insight or detail.                     | No reflection, or very superficial without engagement. | 3%     |

## 10.0 Engagement Contribution Guidelines

The goal of engagement contributions is to foster a collaborative learning environment where students actively participate, share knowledge, and enhance their understanding of the course material. Active engagement involves participating thoughtfully in class discussions and collaborative platforms (like Padlet). Contributions can include:

### 10.1 Quality Responses:

- Provide detailed and insightful answers to questions posed by peers or instructors.
- Build on others' contributions with additional thoughts or examples.
- **Example:** Instead of simply agreeing with a classmate's point, elaborate by saying, *"I agree with your point about sorting algorithms being essential for efficiency. In our project, we could explore how Quick Sort compares to Merge Sort in terms of time complexity."*

### 10.2 Asking Insightful Questions:

- Pose thoughtful questions that encourage deeper discussion and exploration of the topic.
- Engage others by asking for their perspectives or clarifications.
- **Example:** "What challenges do you think we might face when implementing a binary tree for our project? Are there specific scenarios where it might be less effective?"

### 10.3 Sharing Resources:

- Share relevant articles, videos, or tools that enhance understanding of the subject matter.
- Provide links to external resources that relate to the current topics being discussed in class.
- **Example:** *"I found a tutorial on YouTube that explains the differences between stacks and queues in a very visual way. Here's the link: [YouTube Video]. I think it could help clarify these concepts for us."*

### 10.4 Creating Original Content:

- Encourage students to create and share their own original infographics or videos that explain key concepts or processes from the course.
- These should be visually appealing and clearly present information.
- **Example:** Create an infographic that compares different sorting algorithms, including visuals and brief explanations of each. Alternatively, produce a short video demonstrating how to implement a stack in C++.

### 10.5 Quality Standards for Contributions

- **Clarity:** Ensure that your contributions are clear and understandable.

- **Professionalism:** Use proper language and formatting in your posts.
- **Creativity:** When creating original content, strive for originality and visual appeal. Avoid poorly handwritten materials, as they will not be considered high-quality contributions.
- **Real Name Usage:** Students must use their real names when posting on Padlet. Anonymity is not allowed, as this helps track contributions accurately.

#### 10.6 **Spamming Policy**

Marks will be deducted if students engage in spamming—posting irrelevant or low-quality content solely to fulfill engagement requirements—by the end of the weeks. Contributions should be meaningful and contribute to the learning environment rather than merely increasing post count.

#### 10.7 **Submission Requirements**

At the end of the semester, students need to compile and screenshot all their engagement posts and contributions into a single document. This document should be saved as a PDF and submitted as part of your personal digital portfolio.

## TYPES OF POSTS FOR POINTS IN LEARNING DIGITAL PLATFORMS

- 1. Helpful Responses:** Students who provide detailed and helpful responses to their peers' questions or discussions.
- 2. Insightful Questions:** Asking thoughtful questions that spark further discussion or demonstrate a deep understanding of the material.
- 3. Sharing Resources:** Students who share relevant articles, videos, or other resources that enhance the understanding of the topic.
- 4. Engagement with Course Material:** Posts that demonstrate engagement with the course material beyond the basic requirements, such as sharing additional insights or connecting the material to real-world examples.
- 5. Collaborative Projects:** Students who actively participate in collaborative projects on the platform, contributing to the group's success.
- 6. Infographics:** A visual representation of information or data related to the course. It can include charts, graphs and images to make complex information easier to understand. Your hand sketches will do!
- 7. Animated explanation:** A video or moving pictures that illustrates how something works or explains.
- 8. Creative visualization:** Using creative of visually appealing methods to represent information or concepts, making them more engaging and easier to remember.
- 9. Data Structure visualization:** Representing how data is organized and accessed using visuals like diagrams or animations, which helps in understanding complex data structures.
- 10. Problem-Solving Animations:** An animated demonstration of how to solve a problem, showing the step-by-step process using animations or visuals.

(\* Number 6-10 will give you bonus points if created with your original works)

## EXAMPLE OF POSTS

### 1. Helpful Response

- "In response to your question about time complexity, here's a breakdown of how to analyze the efficiency of an algorithm..."

### 2. Insightful Question

- "I was thinking about how we could apply the concepts of data structures to optimize this specific problem in our project. Any thoughts?"

### 3. Sharing Resources

- "I came across this article that explains linked-list really well. I think it could help everyone understand the topic better."

### 4. Engagement with Course Material

- "After reviewing the lecture on sorting algorithms, I found a real-world example of how quicksort was used to improve the performance of a large-scale database. Here's the link if anyone's interested."

### 5. Collaborative Projects

- "Our group made significant progress on our project this week. I implemented the stack data structure, and we're now working on implementing push and pop operations for it."

### 6. Infographic

- "I created an interactive infographic to explain the different sorting algorithms we learned in class. Check it out and let me know what you think!"

### 7. Animated Explanation

- "I made a short animated video explaining the concept of Big O Notation. I hope it helps everyone understand the concept better!"

### 8. Creative Visualization

- "I created a series of graphics to illustrate the process of circular queues. Each graphic shows a different step in the process, making it easier to follow along."

### 9. Data Structure Visualization

- "I created a 3D animation to visualize how a binary search tree works. It shows how nodes are inserted, deleted and searched within the tree."

### 10. Problem-Solving Animation

- "I created an animated story problem to demonstrate how to use a stack data structure to solve a real-world problem. I hope it helps illustrate the concept in a fun and engaging way!"

# APPENDIX









**APPENDIX 1: SAMPLE OF FRONT PAGE** (please edit accordingly)

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
**FAKULTI TEKNOLOGI DAN KEJURUTERAAN ELEKTRONIK DAN KOMPUTER**

**BERR 4723**  
**DIGITAL IMAGE PROCESSING**  
**Sem 1 2024/2025**

**G7 S2**

| No | Name                    | Matrix No | Photo   |
|----|-------------------------|-----------|---|
| 1  | Ismail Marzuki          | B02222001 |  |
| 2  | Jose Rizal              | B02222011 |  |
| 3  | Sara Lee                | B02222021 |  |
| 4  | Siti Khadijah binti Abu | B02222031 |  |

## APPENDIX 2:

### FORM OF EVALUATION

COURSE : **BERR 4723**  
SEM / SESSION : **x 20xx/20xx**  
GROUP : **< fill this >**  
SECTION : **< fill this >**

| No     | Category  | 5 | 4 | 3 | 2 | 1 | Marks | Total |
|--------|---|---|---|---|---|---|-------|-------|
| Part I | Creativity and Innovation (10)                  |   |   |   |   |   |       |       |
|        | Implementation and Code Quality (20)            |   |   |   |   |   |       |       |
|        | Application of Image Processing Techniques (30) |   |   |   |   |   |       |       |
|        | Project Report / Digital Portfolio (20)         |   |   |   |   |   |       |       |
|        | Video Demonstration (20)                        |   |   |   |   |   |       |       |
|        | TOTAL   |   |   |   |   |   |       |       |

**COMMENTS:**

### APPENDIX 3: ASSIGNMENT RUBRIC (all PO10)

#### Part I: Group Assignment (Total: 15%)

| Criteria  | 5 (Excellent)   | 4 (Good)   | 3 (Satisfactory)  | 2 (Needs Improvement)   | 1 (Poor)   | Weight     |
|---|---|--|---|---|--|------------|
| <b>Creativity and Innovation</b>                  | Highly creative and original approach to solving the problem. Clear and innovative application of image processing techniques.                        | Good creativity, some innovative aspects, and thoughtful use of image processing techniques.             | Basic application of image processing techniques. Minimal creativity or originality.                  | Lacks creativity, uses basic techniques without much thought or innovation.                                 | No creativity or innovation, inappropriate or irrelevant methods used.                                   | <b>10%</b> |
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| <b>Application of Image Processing Techniques</b> | Excellent selection and application of techniques that are highly relevant and effectively address the problem.                                       | Techniques are appropriately applied, though some could be more effective for the given problem.         | Some techniques are correctly applied, but others may be inappropriate or under-developed.            | Several techniques misapplied or not relevant to the problem.   | Incorrect or irrelevant techniques applied, failing to solve the problem.                                | <b>30%</b> |
| <b>Project Report / Digital Portfolio</b>         | Clear, detailed, and well-organized report or digital portfolio. Thorough analysis, all sections included (Introduction, Methodology, Results, etc.). | Report or digital portfolio is mostly clear and well-organized. Some sections may lack depth or clarity. | Report or digital portfolio is basic and lacks depth in some sections. May have unclear explanations. | Report or digital portfolio is poorly organized or missing significant sections. Lack of clarity or detail. | Report or digital portfolio is incomplete, poorly structured, or unclear. Missing essential information. | <b>20%</b> |
| <b>Video Demonstration</b>                        | Video is clear, engaging, and highly professional. Effectively demonstrates the project's goals, methods, and results.                                | Video is informative and clear but could be more engaging. Covers the methods and results well.          | Video covers the key aspects but lacks clarity, engagement, or important details.                     | Video is unclear, lacks engagement, and does not effectively communicate the project.                       | Video is poorly produced, unclear, and fails to communicate the project's goals and results.             | <b>20%</b> |

**Part II: Individual Assessment (Total: 5%)**

| Criteria             | 5 (Excellent)  | 4 (Good)  | 3 (Satisfactory)   | 2 (Needs Improvement)  | 1 (Poor)   | Weight |
|----------------------|--|---|--|--|--|--------|
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