

University of Wollongong
School of Computing and information Technology
CSCI435/CSCI935 Computer Vision
Spring 2025





Group Projects (25 marks)
Due 11:30pm Sunday, 26 October 2025.







Introduction

In the group project, you will act as a computer vision practitioner and are required to work on the following case: develop a solution, a reference implementation, and a comprehensive experimental evaluation of the solution on the provided dataset, as well as generate a consulting report.

Case: Rice Leaf Disease Classification and Detection for Bangladeshi Local Rice

You are given a dataset representing almost all the harmful diseases of rice in Bangladesh. This dataset consists of 1106 images of five harmful diseases called Brown Spot, Leaf Scald, Rice Blast, Rice Tungro, and Sheath Blight, in two different background variations named field background and white background. The data is collected from the rice fields of Dhaka Division and can be used for rice leaf disease classification and disease detection using Computer Vision and Pattern Recognition. Following are some samples.

Disease	Image in Field	Image on a White Background
Rice Blast		
Rice Tungro		

Sheath Blight		
Brown spot		
Leaf scald		

The dataset and its detailed description are available at [here](#).

You are approached by a client for a computer vision method that can identify the disease present in an image of a field or in an image with a white background. In other words, given a field image or an image with a white background, the method needs to be able to predict the types of diseases, assuming that the rice in the image has one of the five diseases. The provided dataset will be used for developing and evaluating the system.

Requirements

You are required to

- study the problem by inspecting and analysing the sample images that are available for download in Moodle.
- search for relevant literature (papers) from the IEEE Xplore database that is available through UoW's library.
- recommend or devise a method (algorithm),
- provide an analysis of the pros and cons of the recommended method.
- provide a reference implementation of the method

- evaluate the method on the provided dataset and discuss the results, and
- complete a consultation report for the client.

The report must have the following sections and will be marked according to the specified requirements and its logical presentation. Use block diagrams or flowcharts whenever appropriate.

1. Coversheet

The coversheet should contain the following information: the title of the project, the names of the group members, and the contributions of the individual members.

2. Executive Summary (1 mark) (up to 1/2 pages)

The executive summary is an abstract of your report and is a mini-report that precisely summarises sections 3 to 6.

3. Problem Description (5 marks) (up to 1 page)

In this section, you should describe the problem and translate it into a computer vision problem after studying the sample images and the client's requirements. (JUST) For example, you may describe the computer vision problem as either an image classification problem, an image segmentation problem, a shape detection problem, object detection, etc., or a combination of them based on the topics that have been covered in the subject. Diagrams, if any, should be numbered, captioned and referenced in the text properly.

Based on your description of the problem, an in-depth analysis of the characteristics of the images and the challenges of the problem should be articulated. This analysis must support the choice or design of the method to described in Section 5

4. Related Work (2 marks) (up to 2 page)

You need to search the IEEE Xplore database through UoW's library and identify **at least 4** papers published **after 2021. These papers must be relevant to the problem.** Read the papers and provide a summary of these papers in this section in the context of the problem described in Section 3. You need to organise the summary logically and cite the papers properly. The papers you are to summarise in this section must be listed in the reference section and cited using IEEE style (i.e., to cite reference one, use [1]). Use your own words; direct copying from the papers will be considered plagiarism. Diagrams, if any, should be numbered and referenced in the text properly.

5. Method and Implementation (8 marks) (up to 3 pages)

In this section, you need to recommend a method or algorithm as a solution to the problem. You may choose an algorithm from the papers you just studied or devise your own algorithm. In either case, you have to justify why you recommend such an algorithm by presenting the rationale behind your recommendation AND describing your algorithm step by step in detail. Your description should be detailed enough so that someone (e.g., your classmates) with some background knowledge of computer vision will be able to implement the algorithm. Organise the description logically, use your own words, and do not copy anything directly from any books or papers! Block diagrams or algorithms in pseudocode are preferred, and they should be numbered and referenced in the text properly.

Also in this section, a detailed description of how you implement the recommended algorithm should be provided. Note that this description of the implementation is different from the actual code. The description may include modules in pseudocode. Do not copy python code directly; if you do, a heavy penalty will apply!

6. Experimental Results and Analysis (8 marks) (up to 2 pages)

In this section, you are to report the evaluation of the recommended method on the provided dataset. The report should include the following subsections:

6.1 Experimental Settings

This should include the values of all hyperparameters you used to generate models, the results, a scheme to separate the training, validation (if any), and testing datasets; and a list of experiments you have conducted.

6.2 Results

Results of each experiment listed in Section 6.1 are reported in this section. All results should be an average over 5 runs with different random splits (same percentages) of training, validation (if applicable), and testing. Both the average of the chosen performance metrics and their standard deviation should be reported.

You need to report results for at least three scenarios:

- a) the test images have a white background
- b) the test images have a field background
- c) the test images are either with a white background or a field background

Note that it is acceptable that individual models to be used for these scenarios, and you are free to use the provided dataset in any way as long as the test samples are not included in the training of the models, and it is clearly stated in the report.

6.3 Discussion of the Results

This section provides an analysis and discussion of the results, particularly concerning whether the results meet your expectations of the recommended method; what the typically successful cases are, what the typically failure cases are, and what are the challenging cases are, and explain the reasons for each.

Also, including in this section should be a discussion on how the method (not the dataset size) may be improved.

7. References (1 mark)

All references should be listed in this section. IEEE style should be used. Here are the examples for fictitious conference papers and journal papers respectively.

- [1] D. G. Bailey, "A new approach to lens distortion correction," in Proceedings of International Conference on Computer Vision and Pattern Recognition (CVPR) 2025, pp.59-64.
- [2] G. Wyvill, C. McPheeters, and B. Wyvill, "Data structures for soft objects," IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), vol.98, pp. 227-234, 2025.

8. Appendix: User Manual (up to 2 pages)

You must provide clear instructions on

- a) The packages required to run your code and how to install them, and
- b) how to run your code to reproduce the results included in your report.

Failing to provide such instructions will result in the reported results being considered not reproducible and, hence, will incur a heavy penalty.

Format and maximum number of pages of the report:

To ensure that your PDF report is readable both online and in print, you must follow the formatting requirements below:

- Use a single-column layout with page numbers starting from 1 (excluding the cover page).
- Use 12-point font.
- Maintain a minimum margin of 1.25 cm on all sides.

The maximum number of pages for each section is listed above. **Only content within the specified page limits will be marked**; anything beyond those limits will be ignored.

Requirements for the implementation:

- (a) **The program MUST be in Python.** The permitted packages are Python 3.12, its standard libraries, NumPy, matplotlib, OpenCV 4.12, scikit-learn, scikit-image, and pyTorch. Other packages that are specifically required by your method may also be permitted, but they must be available and clear instructions to download and install them must be included in the user manual. **Failing to do so will be considered that the code does not run, and the results are not reproducible.**
- (b) **Your code must support the structure of the dataset folder. The path to the main dataset is assumed to be “. \Dhan-Shomadhan\” .** If you need to create interim data in different folders, they must be under the main dataset folder and you must provide a tool in Python to generate these folders and their content.
- (c) Use of pre-trained models is permissible. You must justify the use in the “Problem Description” and “Method and Implementation” sections. These models must be available to download. Clear instructions should be given on how to download and where to place them in the Appendix: User Manual. **Failing to do so will be considered that the code does not run, and the results are not reproducible.**

Submission

Zip the **group_name.py** and **group_name.pdf** files to **group_name.zip**. The zip file must be submitted via Moodle.

IMPORTANT:

- *DO NOT include and submit the image folders and any interim data in the zip file. Your submission may not be accepted if you do so.*
- Submission through email **WILL NOT** be accepted.