

Introduction to Machine Learning 2024

Final Project: Defect Classifications of AOI

Announced Date:	2024/11/25 (Mon.)
Oral Presentation Date:	To be announced...
Final Report & Code Due Date:	2024/12/22 (Sun.) 23:59:59

TAs' Contact Information

王浩 (howard.h.wang.23@gmail.com)

I. Grading Policy:

1. The number of people in a group is **2~3 people** and you should fill in the grouping list at eeclass.
2. In the final project, the **code** and **report (report.pdf)** should be compressed into a **ZIP file (Final_Project_GroupID.zip)**, uploaded to eeclass. Also, please write a **README file** explaining how to run your code and describe related characteristics in your report. The report format is not limited.
3. Please save the screenshot of your best score, and name it as **score.png**.
4. You should prepare PowerPoint slides for the **oral presentation**. The presentation will be 5-10 minutes for each group.
5. You are required to finish this project with **Python 3** and **Pytorch**. Moreover, built-in machine learning libraries or functions, e.g., *sklearn.linear_model*, are allowed to be used.
6. Please properly **comment on your code** to let us understand your thoughts.
7. Discussions are encouraged, but plagiarism is strictly prohibited (changing variable names, etc.). You can use any open source you want with a clear reference mentioned in your report. **If there is any plagiarism, you will get a 0 on this project.**

II. Submission

Please follow the following format and naming rules.

```
Final_Project_GroupID.zip
| --- report.pdf (Written report)
| --- README.md
|         (Explain how to run your code, load the data/weights, the environment, libraries, etc.)
| --- score.png (The screenshot of your best score)
| --- your code (*.py or *.ipynb files)
| --- prediction.csv (The prediction of the test dataset)
```

The zip file doesn't need to contain the dataset, just clearly mention how to load the data and the weights. You need to upload **Final_Project_GroupID.zip** to eeclass.

III. Project Description

Automated Optical Inspection (AOI for short) [1] is a high-speed and high-precision optical image inspection system, using machine vision as the inspection standard technology, which can improve the shortcomings of traditional manual inspection using optical instruments. The application level includes research and development of high-tech industries, manufacturing quality control, national defense, people's livelihood, medical care, environmental protection, electric power...etc. The Institute of Electro-Optics of the Industrial Technology Research Institute has invested in developing flexible electronic displays for many years. During the trial mass production process, it hopes to improve production quality through AOI technology. This time, data scientists from all walks of life are invited to participate in this grand event to interpret the classification of defects based on the provided AOI image data and to improve the efficiency of AOI interpretation through data science.

Data

1. Register an account with Aldea [1] and participate in the AOI defect classification competition.
2. Download the AOI image dataset. The dataset contains 6 classes (Normal + 5 defect classes), as shown in Figure 1.

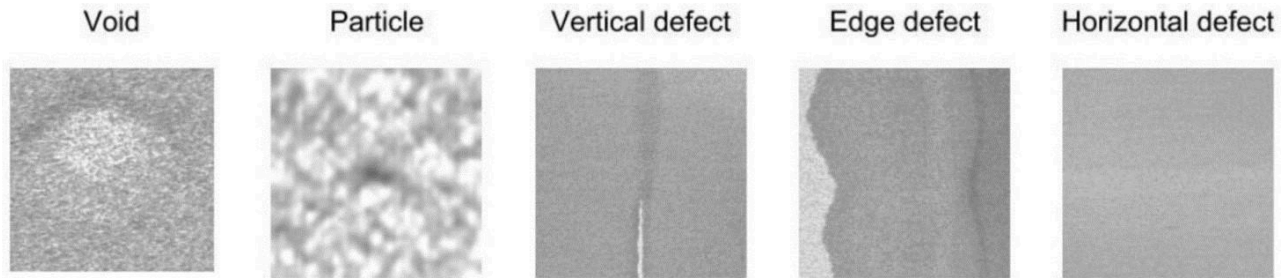


Figure 1. Defect example

Structure of Dataset

aoi.zip

- | --- train_images.zip: Image data (PNG format) required for training, 2,528 instances in total.
- | --- train.csv: Contains 2 fields, ID and Label.
- | --- test_images.zip: Image data (PNG format) required for testing, 10,142 instances in total.
- | --- test.csv: Contains 2 fields, ID and Label.

ID: The file name of the image.

Label: Defect classification category

(0: normal, 1: void, 2: horizontal defect, 3: vertical defect, 4: edge defect, 5: particle).

Evaluation Metric

$$Accuracy = \frac{\text{Number of correct predictions}}{\text{Number of total predictions}}$$

Selected Platform Rule

1. Uploads are limited to 3 times/day.
2. Any manual annotations are prohibited.

Score Evaluation

After obtaining your **prediction.csv**, you can upload the CSV file to the platform to obtain the evaluated score. The filename of the CSV file is not limited to this platform, but the final one submitted to the TAs should be **prediction.csv**.

Are you ready? Uploading your best results ASAP!

No file is selected

Select a file

Upload result

*Only csv file is accepted

Public Leaderboard

Private Leaderboard

檔名	Upload time	Evaluation result	Ranking
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Figure 2. Schematic diagram of uploading CSV files

IV. Implementation

You should enroll in an account at Aidea and join “Defect Classifications of AOI competition”[1]. Build your classification model. You can use any tricks you learned during the class. For instance, you may choose to apply Transfer Learning or train from scratch. You can only use **PyTorch** to construct your model. The accuracy should be higher than **95%** for **testing data**. More detailed information is in [1].

V. Report

The format is not limited, but it should contain at least the following sections: Introduction, Method, Future Direction, and Conclusion. Within the report, you may mention the model architecture, implementation detail, testing accuracy, etc. in detail.

VI. Oral Presentation

The presentation will be 5-10 minutes for each group. You may summarize what you have implemented during the final project. Highlight your novelties or tricks you have applied to achieve the best performance.

VII. Appendix

[1] Defect Classifications of AOI competition

https://aidea-web.tw/topic/285ef3be-44eb-43dd-85cc-f0388bf85ea4?fbclid=IwAR3NR9UiSB0_u4GxvOfc_xs6b7Bw0dLJfCMnJWpFb5xazd6vzB_q5bV7ofDs