Machine Learning (2025)

Final Project: Few-Shot Learning

Code Deadline: 2025/6/10

Report & Video Deadline: 2025/6/15

For this final project, our topic is Few-Shot Learning.You will receive a dataset containing 30 types of food, with 10 images for each type, making a total of 300 images. You can decide how to split the data into training and validation sets, and your task is to train an image classification model. We will send you a test set of 1,500 images so that you can evaluate the classification performance of your own model.

The biggest challenge of this assignment is that you will need to train a model using only a small amount of data. You are free to use any methods or models to complete this task. For example, in terms of data processing, you can try techniques such as data augmentation or synthetic data generation. On the algorithmic side, you might consider using approaches like transfer learning or MAML.

Dataset Example:

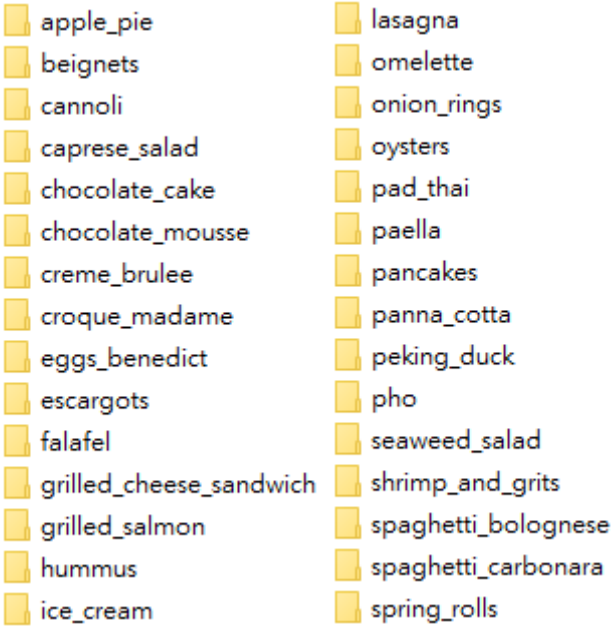
Apple Pie:

Eggs Benedict:

After you complete the training, you will test your model using the test set. The results should be saved in a CSV file, and the file should be renamed as **outputs.csv**. The file should contain two columns:

1. The first column is labeled "picture", where you should enter the test image numbers (e.g., for 5030.jpg, just write 5030). The order should follow numerical sorting.
2. The second column is labeled "class", where you should enter the predicted class for each image. For example, if your model predicts the image as apple_pie, you should write apple_pie. You can refer to the folder names in your training dataset for the full class names.
3. The example result is shown in the image below.

	A	B
1	picture	class
2	5030	apple_pie
3	5351	apple_pie
4	5723	apple_pie
5	5967	apple_pie
6	5968	apple_pie
7	6134	apple_pie
8	7248	apple_pie
9	7588	apple_pie
10	7972	apple_pie
11	8098	apple_pie
12	10055	apple_pie
13	10348	apple_pie
14	10354	apple_pie
15	13228	apple_pie



Homework Rules and Grading Policy

Homework will be graded by:

1. Baseline Performance (15%)

   As long as your model achieves at least **40%** accuracy on the 1,500 test images and the number of model parameters is less than **1000M** (You need to use "from torchinfo import summary"), you will receive full credit for this part of the assignment. If too few groups reach this benchmark, we may consider lowering the threshold accordingly.

2. Accuracy Ranking Score (15%) & Parameter Ranking Score (15%)

   Based on relative performance compared to other teams.

3. Report and Video (55%)

   - Tried new methods, architectures, or techniques to improve performance or made creative modifications to existing methods.
   - Compared different methods and conducted a result analysis.
   - Explore how you achieved the optimal balance between model performance and the number of parameters.

Remind:

- Program: Please implement your solution using **Python** and the **PyTorch** framework and the entire development process must be demonstrated in **Google Colab(Free)**. The entire process—including data processing, model training, test set evaluation, and result output—must be completed within **60 minutes**.

  The submitted code consists of two parts: the first, **train.ipynb**, is used to train the model and output the model weights as **model.pth**; the second, **predict.ipynb**, uses model.pth to test 1500 images from the test set and outputs the results to **outputs.csv**. Also need to print the **number of parameters** in the model.

- Method: You may use any method you can think of to train your model, including using pre-trained models. However, you are strictly limited to using only the 300 images we provided for training. It is **absolutely forbidden to use any additional datasets** found online for training purposes.

- Report and Video: You must submit both a **PDF file** and a **PPT file**. Then, using your prepared PPT, record a video of approximately 10 minutes to explain your final project. After recording the video, upload it to YouTube and include the URL in your PDF report.

- Team: This assignment requires **two people** per group. You need to coordinate and divide the responsibilities among yourselves, including the code, the written report, and the video explanation. Each group only needs to have **one person** submit the assignment to E3.
- Deadline: Late submissions will **not be accepted** for this assignment.
- Plagiarism: If two codes show high similarity, both teams will receive zero marks after confirmation.
- Test dataset: The code submission deadline is June 10. The test dataset will be released on June 11, so it's okay to leave the test/ folder empty when submitting your code. If you want to check whether predict.ipynb runs properly, you can simply copy a few images from the training set into the test/ folder and try it out.

  In addition to the test dataset, we will also provide you with the ground truth CSV file. You will need to include the results of your testing in the report and video for discussion.

Upload1:
[Web] E3
[File Name] FinalProject_{Group ID}.zip
(e.g., FinalProject_1.zip)
[Deadline] 2025/6/10

```
FinalProject_{Group ID}/
├── train/
├── test/
├── outputs.csv
├── model.pth
├── train.ipynb
└── predict.ipynb
```

Upload2:
[Web] E3
[File Name] Report_{Group ID}.pdf、Report_{Group ID}.ppt
(e.g., Report_1.pdf、Report_1.ppt)
[Deadline] 2025/6/15