Machine Learning HW15
Meta Learning

ML TAs
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Outline

- Task Description

- Data Format

- Grading

- Submission

- Regulations

- Contact

Task: Few-shot Classification

The Omniglot dataset

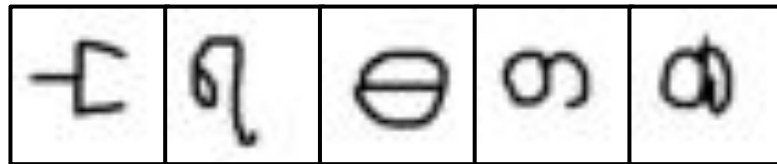# Task: Few-shot Classification

The Omniglot dataset

-   background set: 30 alphabets
-   evaluation set: 20 alphabets

Problem setup: **5-way 1-shot classification**

Support set
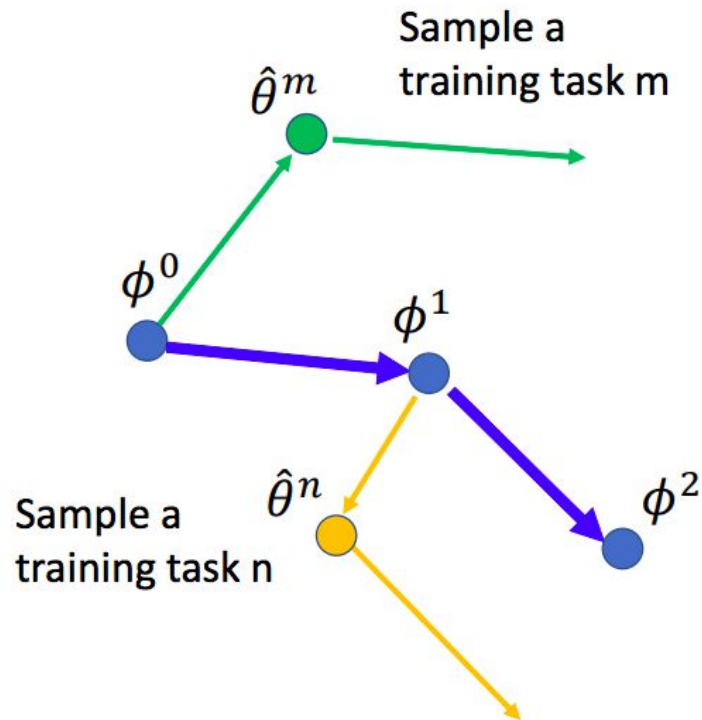

Query set

Task: Few-shot Classification

Training MAML on Omniglot classification task.

Data Format

Training / validation set:

30 alphabets

- multiple characters in one alphabet
- 20 images for one character

```
Omniglot/images_background/Alphabet_of_the_Magi.0
├── character01
│   ├── 0709_01.png
│   ├── 0709_02.png
│   ├── 0709_03.png
│   ├── 0709_04.png
│   ├── 0709_05.png
│   ├── 0709_06.png
│   ├── 0709_07.png
│   ├── 0709_08.png
│   ├── 0709_09.png
│   ├── 0709_10.png
│   ├── 0709_11.png
│   ├── 0709_12.png
│   ├── 0709_13.png
│   ├── 0709_14.png
│   ├── 0709_15.png
│   ├── 0709_16.png
│   ├── 0709_17.png
│   ├── 0709_18.png
│   ├── 0709_19.png
│   └── 0709_20.png
├── character02
│   ├── 0710_01.png
│   ├── 0710_02.png
```

Data Format

Testing set:

640 support and query pairs

- 5 support images
- 5 query images

```
Omniglot-test/support/0000
├── image_0.png
├── image_1.png
├── image_2.png
├── image_3.png
└── image_4.png
Omniglot-test/support/0001
├── image_0.png
├── image_1.png
├── image_2.png
├── image_3.png
└── image_4.png
Omniglot-test/query/0000
├── image_0.png
├── image_1.png
├── image_2.png
├── image_3.png
└── image_4.png
Omniglot-test/query/0001
├── image_0.png
├── image_1.png
├── image_2.png
├── image_3.png
└── image_4.png
```

About Testing

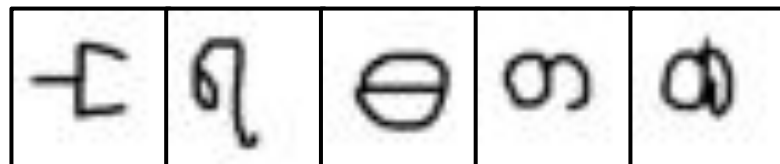**For each task in testing set:**

Support set

image_0.png image_1.png image_2.png image_3.png image_4.png

Query set

image_0.png image_1.png image_2.png image_3.png image_4.png

label: 4 label: 2 label: 3 label: 1 label: 0

Guidance - Simple Baseline

Simple transfer learning model (implemented in sample code)

training
- normal classification training on randomly chose five tasks

validation / testing
- finetune on the five support images, and do inference on query images

Guidance - Medium / Strong Baseline

Finish the TODO blocks for meta learning inner & outer loop (in sample code)

Medium baseline
- FO-MAML

Strong baseline
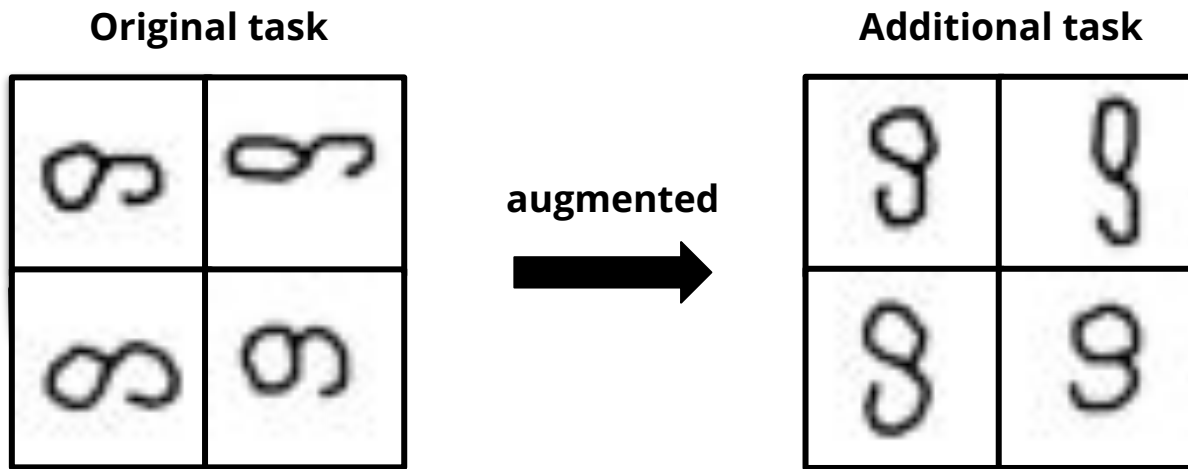- MAML / ANIL

- Original MAML: slides p.12 - p.18 & p. 21 - p. 26
- First-order approximation MAML (FO-MAML): slides p. 24 - 27
- Reptile: slides p. 29 - p. 31
- MAML tips: How to train your MAML?
- ANIL: Feature reuse

Guidance - Boss Baseline

Task augmentation (with meta learning)

- What is a reasonable way to create new task?

Original task **Additional task**

augmented

Grading - Baseline Guide

- Simple baseline (acc ~ 0.6)
  - Transfer learning (sample code)

- Medium baseline (acc ~ 0.7)
  - Meta learning (FO-MAML)

- Strong baseline (acc ~ 0.9)
  - Meta learning (MAML)

- Boss baseline (acc ~ 0.95)
  - Meta learning (MAML) + task augmentation

Grading - Baselines

- Simple baseline (public)   +0.5 pt
- Simple baseline (private)   +0.5 pt
- Medium baseline (public)   +0.5 pt
- Medium baseline (private)   +0.5 pt
- Strong baseline (public)   +0.5 pt
- Strong baseline (private)   +0.5 pt
- Boss baseline (public)   +0.5 pt
- Boss baseline (private)   +0.5 pt
- **Report**   +4 pts
- **Code submission**   +2 pts

Total: **10** pts

Grading - Bonus

If your **ranking in private set is top 3**, you can choose to share a report to

NTU COOL and get extra 0.5 pts.

About the report [(report template)](report template)

- Your name and student_ID
- Methods you used in code
- Reference
- In 200 words
- Deadline is **a week after code submission (7/14)**
- Please upload to NTU COOL's discussion of HW15

Report questions (4%)

Part 1: Number of Tasks

1. Plot the **relation between dev accuracy and the number of tasks**. Include at least three different experiment in the figure. (1pt)

2. A one sentence description of what you observe from the above figure. (1pt)

Report questions (4%)

Part 2:

Please read <u>How to train your MAML</u> and answer the questions according to the paper.

1. Please write down one of the problems that occur when using MAML and explain why it happens. (1pt)
2. Please write down the solution to the problem you mentioned in the first question. (1pt)

Links

- [Colab](#)
- [Kaggle](#)
- [Report (On Gradescope)](#)

Submission - Deadlines

- **Kaggle, Report (GradeScope), Code Submission (NTU COOL)**

  2023 7/7 23:59 (UTC+8)

  No late submission!

  Submit early!

Submission - NTU COOL

- **NTU COOL**
  - Compress your code into

  ### <student ID>_hwX.zip

    * e.g. b08902000_hw15.zip

    * X is the homework number

  - We can only see your last submission.
  - Do not submit your model or dataset.
  - If your code is not reasonable, your semester grade x 0.9.

Regulations

- You should NOT plagiarize, if you use any other resource, you should cite it in the reference. (＊)
- You should NOT modify your prediction files manually.
- Do NOT share codes or prediction files with any living creatures.
- Do NOT use any approaches to submit your results more than 5 times a day.
- **Do NOT search or use additional data.**
- **You are allowed to use pre-trained models on any image datasets.**
- Your **final grade x 0.9** if you violate any of the above rules.
- Prof. Lee & TAs preserve the rights to change the rules & grades.

(＊) Academic Ethics Guidelines for Researchers by the Ministry of Science and Technology

If you have any question…

- NTU COOL (recommended)
  - [HW15 discussion board](#)
- Kaggle discussion
- Email
  - mlta-2023-spring@googlegroups.com
  - The title should begin with "**[hw15]**"