Machine Learning HW6

ML TAs
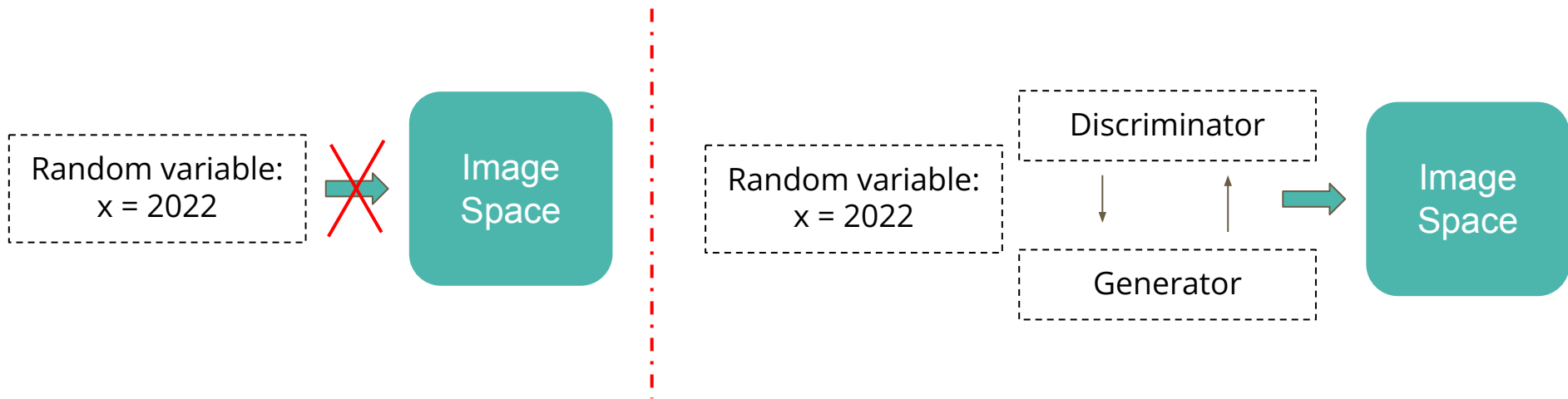mlta-2022-spring@googlegroups.com

Outline

1. Task introduction
2. Dataset & Submit format
3. Submission & Grading
4. Useful information

Task introduction

Task introduction - GAN

1. When you want to project some random variables into specific space
2. GAN structure: Generator and Discriminator
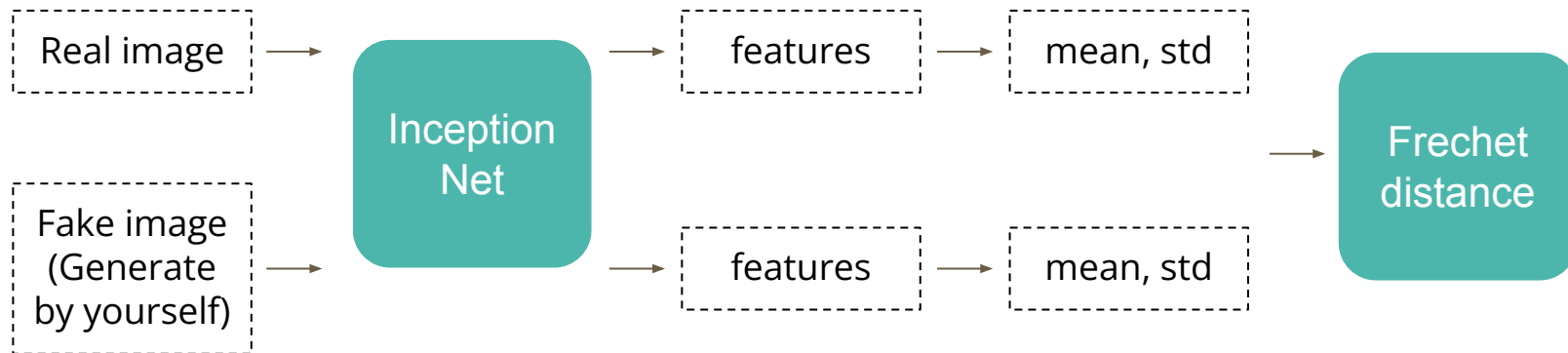
Task introduction - Anime face generation

1. Input: random number
2. Output: Anime face
3. Implementation requirement: DCGAN & WGAN & WGAN-GP
4. Target: generate 1000 anime face images

Random variable:
x = 2022
→
DCGAN
or
WGAN
→
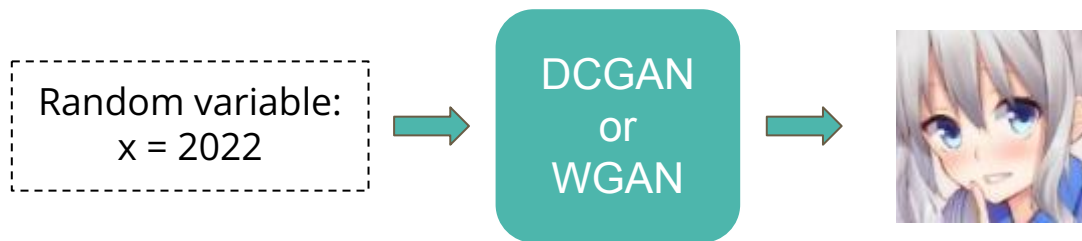
Task introduction - Evaluation metrics

FID (Frechet Inception Distance) score

1. Use another model to create features for real and fake images
2. Calculate the Frechet distance between distribution of two features

Task introduction - Evaluation metrics

AFD (Anime face detection) rate

1. To detect how many anime faces in your submission
2. The higher, the better

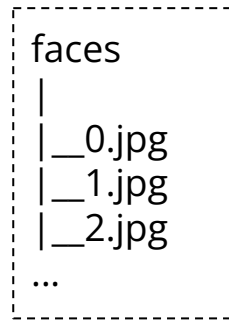# Dataset & Summit format

Dataset & Submit format

Crypko

1. Website which can generate anime face by yourself
2. Thanks Arvin Liu for collecting the dataset
3. [Website Link](#)

Dataset & Submit format

Crypko

1. Dataset link is in the colab
2. Dataset format
3. There are 71,314 pictures in the folder
4. You can use additional datas to increase the performance*

```
faces
|
|__0.jpg
|__1.jpg
|__2.jpg
...
```

*If you use additional data, please keep the relevant data and we reserve the right to verify additional data.

Submission & Grading

Submission & Grading

1. You should generate **1000** images, and name each image **\<number\>**.jpg
   a. e.g. 1.jpg, 2.jpg, ... , 1000.jpg
2. Use **tar** to compress your images, and name the file with **.tgz** as extension.
3. The untarred files should not contain the folder.
4. The compressing code is provided in the sample code.
5. Sample script:

   cd \<the images folder\> && tar -zcvf ../images.tgz *.jpg

6. The folder containing your generated images **should only contain 1000 images.**

Submission & Grading - JudgeBoi General Rules

- 5 submission quota per day, reset at midnight.
  - Users not in the whitelist will have no quota.
- The countdown timer on the homepage is for reference only.
- We do limit the number of connections and request rate for each IP.
  - If you cannot access the website temporarily, please wait a moment.
- The system can be very busy as the deadline approaches
  - If this prevents uploads, we do not offer additional opportunities for remediation
- Please do not attempt to attack JudgeBoi.
- Every Friday from 6:00 to 9:00 is our system maintenance time.
- For any JudgeBoi issues, please post on NTUCOOL discussion
  - Discussion Link: https://cool.ntu.edu.tw/courses/11666/discussion_topics/91777

Submission & Grading - JudgeBoi HW6-Specific Rules

- Only *.tgz file is allowed, file size should be smaller than **2MB**.
- You can only select one submission since there is no private score.
  - If none of the submissions is selected, we will use the first submission.
- JudgeBoi should complete the evaluation within one minute.
  - You do not need to wait for the progress bar to finish
- **Please DO NOT directly upload the anime pictures from internet**

Submission & Grading

- Leaderboard: JudgeBoi (4%)
- Code submission: NTU COOL (2%)
- Report submission: Gradescope (4%)

Submission & Grading - Leaderboard

Score	Name	FID score	AFD rate
1%	Simple baseline	FID ≤ 30000	AFD ≥ 0
1%	Medium baseline	FID ≤ 12000	AFD ≥ 0.4
1%	Strong baseline	FID ≤ 10000	AFD ≥ 0.5
1%	Boss baseline	FID ≤ 9000	AFD ≥ 0.6

Deadline: 2022/4/22 23:59

Submission & Grading - Leaderboard

Baseline	Suggestion	Estimated time
Simple baseline	Use sample code(DCGAN)	< 1 hour
Medium baseline	Use DCGAN with more epochs	1 ~ 1.5 hours
Strong baseline	Use WGAN or WGAN-GP	2 ~ 3 hours
Boss baseline	StyleGAN	< 5 hours

Submission & Grading - NTU COOL

1. Compress the code, and submit to NTU COOL, the format is show below

   Ex: <student_id>_hw6.zip

2. Only submit the code you use, do not submit other files (model ,data...)
3. Deadline: 2022/4/22 23:59

Submission & Grading - Gradescope

Report questions:

1. Describe the difference between WGAN* and GAN**, list at least two differences

2. Please plot the "Gradient norm" result.
    a. Use training dataset, set the number of discriminator layer to 4 (minimum requirement)
    b. Plot two setting:
        i. weight clipping
        ii. gradient penalty
    c. Y-axis: gradient norm(log scale), X-axis: discriminator layer number (from low to high)
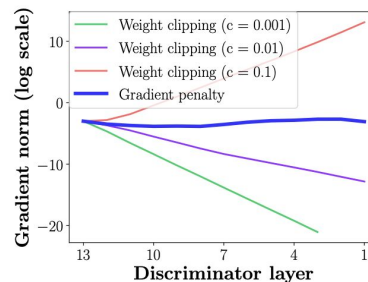
*WGAN paper
**GAN paper

Submission & Grading - Gradescope

Report submission:

1. Submit the files on gradescope
2. Deadline: 2022/4/22 23:59

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 use additional data or pre-trained models.
- Your assignment will not be graded and 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.

Useful information

DCGAN

1. Sample code implementation
2. Use serveral conv layers to generate image

Generator:

x=2022 → Serveral Conv → <image>

Discriminator:

→ Serveral Conv → fake/real
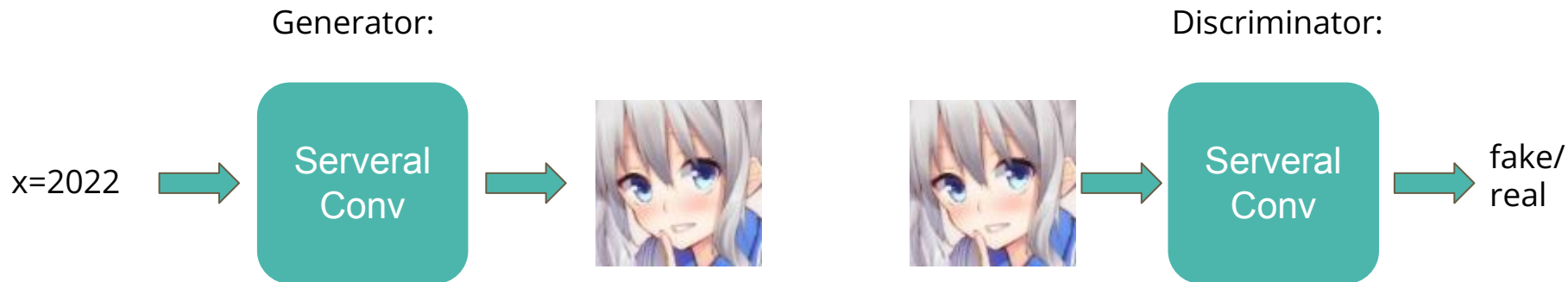
WGAN & WGAN-GP

1. WGAN: Modify from DCGAN
   a. Remove the last sigmoid layer from the discriminator.
   b. Do not take the logarithm when calculating the loss.
   c. Clip the weights of the discriminator to a constant (1 ~ -1).
   d. Use RMSProp or SGD as the optimizer.
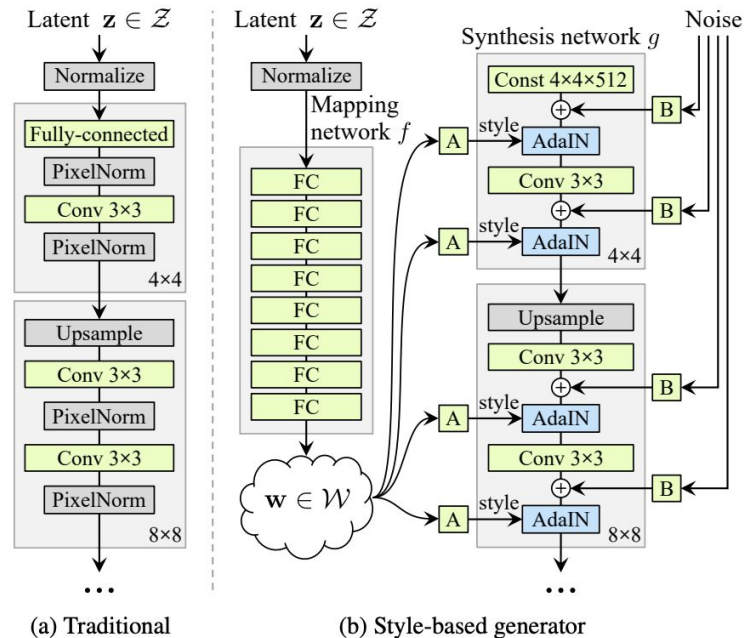   e. [Link](#)
2. WGAN-GP: Modify from WGAN
   a. Use gradient penalty to replace weight clipping
   b. Gradient penalty accumulate gradient from an interpolated image
   c. [Link](#)

StyleGAN

1. StyleGAN
   a. First transform latent variable z to w
   b. Use w in different stage in generator
      (Deal with different resolutions)
   c. Useful link

(a) Traditional   (b) Style-based generator

Link

Colab