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# Machine Learning HW6

ML TAs mlta-2022-  
spring@googlegroups.com

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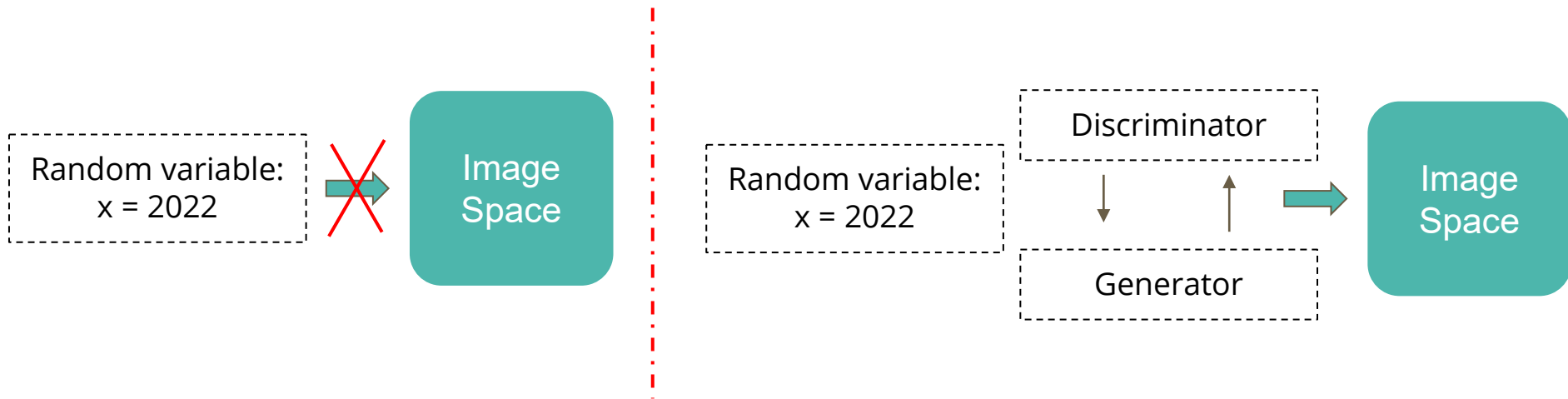
# Outline

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

# Task introduction

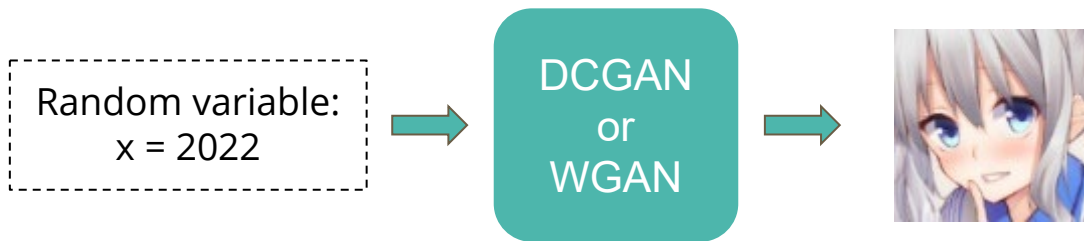
# Task introduction - GAN

1. When you want to project some random variables into specific space
2. GAN structure: Generator and Discriminator



# Task introduction - Anime face generation

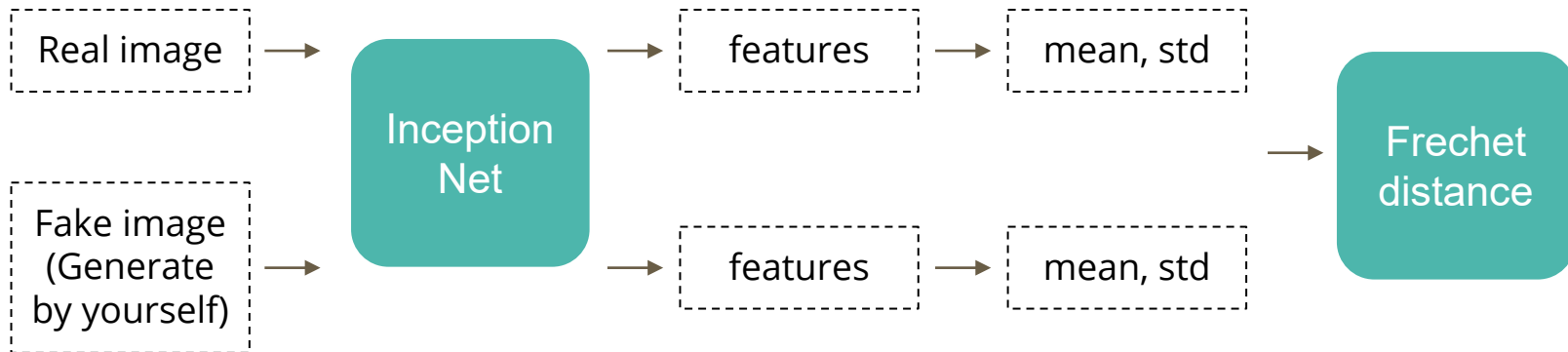
1. Input: random number
2. Output: Anime face
3. Implementation requirement: DCGAN & WGAN & WGAN-GP
4. Target: generate 1000 anime face images



# 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

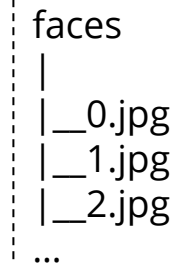
1. Website which can generate anime face by yourself
2. Thanks Arvin Liu for collecting the dataset
3. [Website Link](#)



# 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
```

1. 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](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	$\text{FID} \leq 30000$	$\text{AFD} \geq 0$
1%	Medium baseline	$\text{FID} \leq 12000$	$\text{AFD} \geq 0.4$
1%	Strong baseline	$\text{FID} \leq 10000$	$\text{AFD} \geq 0.5$
1%	Boss baseline	$\text{FID} \leq 9000$	$\text{AFD} \geq 0.6$

**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

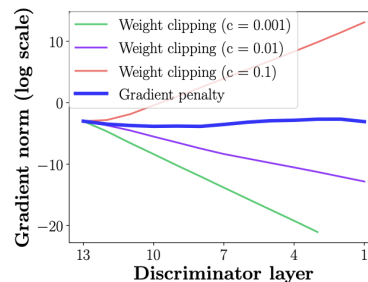
Ex: <student\_id>\_hw6.zip

1. Only submit the code you use, do not submit other files (model ,data...)
2. 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**

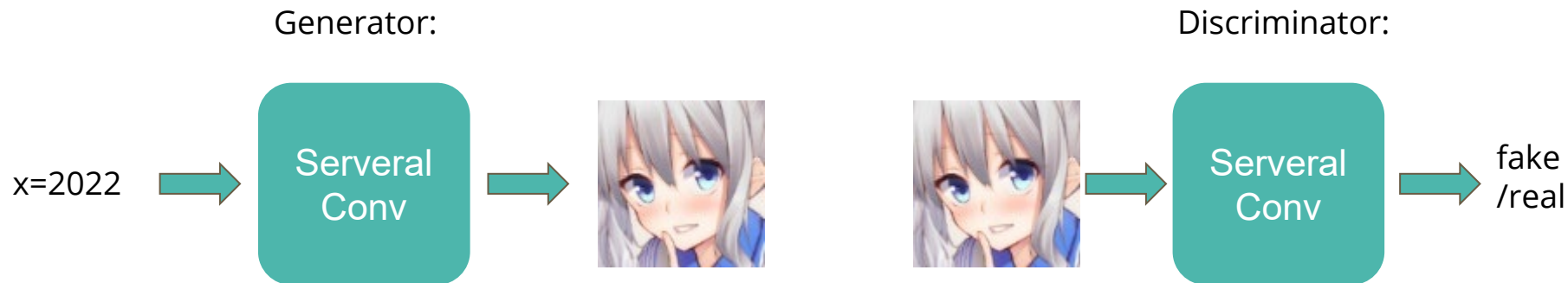
# Regulations

- 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  $\times 0.9$  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 several conv layers to generate image



# 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

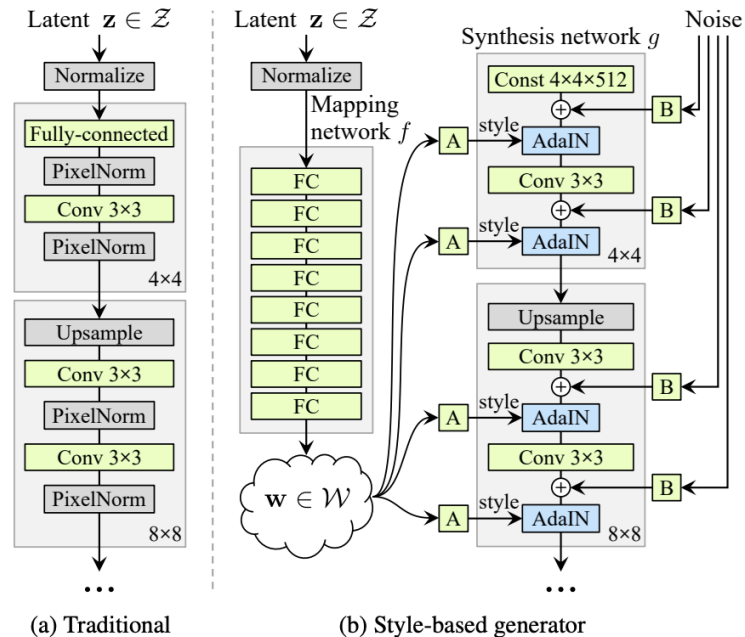
- a. Use gradient penalty to replace weight clipping
- b. Gradient penalty accumulate gradient from an interpolated image
- c. [Link](#)



# StyleGAN

## 1. StyleGAN

- First transform latent variable  $z$  to  $w$
- Use  $w$  in different stage in generator (Deal with different resolutions)
- Useful [link](#)



**Link**

Colab