grappleGAN

model: StyleGAN2-ADA

+ Code + Text

GPU Type

```
!nvidia-smi
```

```
Sun Oct 10 04:52:20 2021
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 470.74       Driver Version: 460.32.03    CUDA Version: 11.2     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|                               |                      |               MIG M. |
|===============================+======================+======================|
|   0  Tesla P100-PCIE...  Off  | 00000000:00:04.0 Off |                    0 |
| N/A   44C    P0    29W / 250W |      0MiB / 16280MiB |      0%      Default |
|                               |                      |                  N/A |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                                  |
|  GPU   GI   CI        PID   Type   Process name                  GPU Memory |
|        ID   ID                                                   Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

Environment Set-up

```
from google.colab import drive
drive.mount('/content/drive', force_remount=True)
```

```
Mounted at /content/drive
```

Downgrade to previous Pytorch version

```
!pip uninstall torch
```

```
Found existing installation: torch 1.9.0+cu102
Uninstalling torch-1.9.0+cu102:
  Would remove:
    /usr/local/bin/convert-caffe2-to-onnx
```

```
    /usr/local/bin/convert-onnx-to-caffe2
    /usr/local/lib/python3.7/dist-packages/caffe2/*
    /usr/local/lib/python3.7/dist-packages/torch-1.9.0+cu102.dist-info/*
    /usr/local/lib/python3.7/dist-packages/torch/*
Proceed (y/n)? y
y
y
  Successfully uninstalled torch-1.9.0+cu102
```

```
!pip install torch==1.8.1 torchvision==0.9.1
```

```
Collecting torch==1.8.1
  Downloading torch-1.8.1-cp37-cp37m-manylinux1_x86_64.whl (804.1 MB)
     |████████████████████████████████| 804.1 MB 2.0 kB/s
Collecting torchvision==0.9.1
  Downloading torchvision-0.9.1-cp37-cp37m-manylinux1_x86_64.whl (17.4 MB)
     |████████████████████████████████| 17.4 MB 198 kB/s
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dis
Requirement already satisfied: pillow>=4.1.1 in /usr/local/lib/python3.7/dist-pa
Installing collected packages: torch, torchvision
  Attempting uninstall: torchvision
    Found existing installation: torchvision 0.10.0+cu102
    Uninstalling torchvision-0.10.0+cu102:
      Successfully uninstalled torchvision-0.10.0+cu102
ERROR: pip's dependency resolver does not currently take into account all the pa
torchtext 0.10.0 requires torch==1.9.0, but you have torch 1.8.1 which is incomp
Successfully installed torch-1.8.1 torchvision-0.9.1
```

Install additional dependencies

```
!pip install click requests tqdm pyspng ninja imageio-ffmpeg==0.4.3
```

```
Requirement already satisfied: click in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages (4
Collecting pyspng
  Downloading pyspng-0.1.0-cp37-cp37m-manylinux2010_x86_64.whl (195 kB)
     |████████████████████████████████| 195 kB 2.2 MB/s
Collecting ninja
  Downloading ninja-1.10.2-py2.py3-none-manylinux_2_5_x86_64.manylinux1_x86_64.wh
     |████████████████████████████████| 108 kB 28.7 MB/s
Collecting imageio-ffmpeg==0.4.3
  Downloading imageio_ffmpeg-0.4.3-py3-none-manylinux2010_x86_64.whl (26.9 MB)
     |████████████████████████████████| 26.9 MB 173 kB/s
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/l
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dis
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/di
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (
Installing collected packages: pyspng, ninja, imageio-ffmpeg
Successfully installed imageio-ffmpeg-0.4.3 ninja-1.10.2 pyspng-0.1.0
```

Install NVIDIA StyleGAN2 ADA Pytorch

```
!git clone https://github.com/NariMo91/stylegan2-ada-pytorch
```

```
Cloning into 'stylegan2-ada-pytorch'...
remote: Enumerating objects: 125, done.
remote: Total 125 (delta 0), reused 0 (delta 0), pack-reused 125
Receiving objects: 100% (125/125), 1.12 MiB | 3.09 MiB/s, done.
Resolving deltas: 100% (55/55), done.
```

Convert Images

```
!python /content/stylegan2-ada-pytorch/dataset_tool.py --source /content/drive/MyDrive
```

```
100% 2146/2146 [13:38<00:00,  2.62it/s]
```

```
# If things go wrong
# !rm -R /content/drive/MyDrive/grappleGAN/datasets/bjj1024/*
```

Initial Training

```
import os

#·Modify·these·to·suit·your·needs
RESULTS·=·"/content/drive/MyDrive/grappleGAN/results"
DATA·=·"/content/drive/MyDrive/grappleGAN/datasets/bjj1024"
SNAP·=·4
MIRRORED·=·True

#·Build·the·command·and·run·it
cmd·=·f"/usr/bin/python3·/content/stylegan2-ada-pytorch/train.py·--snap·{SNAP}·--outdi
!{cmd}
```

```
  },
  "run_dir": "/content/drive/MyDrive/grappleGAN/results/00000-bjj1024-mirror-aut
}

Output directory:   /content/drive/MyDrive/grappleGAN/results/00000-bjj1024-mirr
Training data:      /content/drive/MyDrive/grappleGAN/datasets/bjj1024
Training duration:  25000 kimg
Number of GPUs:     1
Number of images:   2146
Image resolution:   1024
Conditional model:  False
Dataset x-flips:    True
```

```
Creating output directory...
Launching processes...
Loading training set...

Num images:  4292
Image shape: [3, 1024, 1024]
Label shape: [0]

Constructing networks...
Setting up PyTorch plugin "bias_act_plugin"... Done.
Setting up PyTorch plugin "upfirdn2d_plugin"... Done.

Generator               Parameters  Buffers  Output shape         Datatype
---                     ---         ---      ---                  ---
mapping.fc0             262656      -        [4, 512]             float32
mapping.fc1             262656      -        [4, 512]             float32
mapping                 -           512      [4, 18, 512]         float32
synthesis.b4.conv1      2622465     32       [4, 512, 4, 4]       float32
synthesis.b4.torgb      264195      -        [4, 3, 4, 4]         float32
synthesis.b4:0          8192        16       [4, 512, 4, 4]       float32
synthesis.b4:1          -           -        [4, 512, 4, 4]       float32
synthesis.b8.conv0      2622465     80       [4, 512, 8, 8]       float32

synthesis.b8.conv1      2622465     80       [4, 512, 8, 8]       float32
synthesis.b8.torgb      264195      -        [4, 3, 8, 8]         float32
synthesis.b8:0          -           16       [4, 512, 8, 8]       float32
synthesis.b8:1          -           -        [4, 512, 8, 8]       float32
synthesis.b16.conv0     2622465     272      [4, 512, 16, 16]     float32
synthesis.b16.conv1     2622465     272      [4, 512, 16, 16]     float32
synthesis.b16.torgb     264195      -        [4, 3, 16, 16]       float32
synthesis.b16:0         -           16       [4, 512, 16, 16]     float32
synthesis.b16:1         -           -        [4, 512, 16, 16]     float32
synthesis.b32.conv0     2622465     1040     [4, 512, 32, 32]     float32
synthesis.b32.conv1     2622465     1040     [4, 512, 32, 32]     float32
synthesis.b32.torgb     264195      -        [4, 3, 32, 32]       float32
synthesis.b32:0         -           16       [4, 512, 32, 32]     float32
synthesis.b32:1         -           -        [4, 512, 32, 32]     float32
synthesis.b64.conv0     2622465     4112     [4, 512, 64, 64]     float32
synthesis.b64.conv1     2622465     4112     [4, 512, 64, 64]     float32
synthesis.b64.torgb     264195      -        [4, 3, 64, 64]       float32
synthesis.b64:0         -           16       [4, 512, 64, 64]     float32
synthesis.b64:1         -           -        [4, 512, 64, 64]     float32
synthesis.b128.conv0    1442561     16400    [4, 256, 128, 128]   float16
synthesis.b128.conv1    721409      16400    [4, 256, 128, 128]   float16
synthesis.b128.torgb    132099      -        [4, 3, 128, 128]     float16
synthesis.b128:0        -           16       [4, 256, 128, 128]   float16
synthesis.b128:1        -           -        [4, 256, 128, 128]   float32
synthesis.b256.conv0    426369      65552    [4, 128, 256, 256]   float16
```

Resume training

[ ] ↳ *5 cells hidden*

Plot Metrics

```
import json
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

Extract FID from the multiple training runs

```
# run 0
with open("/content/drive/MyDrive/grappleGAN/results/00000-bjj1024-mirror-auto1/metric
  json_list = list(f)


# check that number of metrics records matches number of .pkl files
len(json_list)
```

```
8
```

```
data = [json.loads(line) for line in json_list]
for i, _ in enumerate(data):
  data[i]['fid50k_full'] = data[i]['results']['fid50k_full']
  data[i]['kimg'] = i * 4 * 4


data
```

```
 'num_gpus': 1,
 'results': {'fid50k_full': 394.4450870468103},
 'snapshot_pkl': 'network-snapshot-000016.pkl',
 'timestamp': 1631173964.9908788,
 'total_time': 2289.9768319129944,
 'total_time_str': '38m 10s'},
{'fid50k_full': 351.8962399656941,
 'kimg': 32,
 'metric': 'fid50k_full',
 'num_gpus': 1,
 'results': {'fid50k_full': 351.8962399656941},
 'snapshot_pkl': 'network-snapshot-000032.pkl',
 'timestamp': 1631183484.6562629,
 'total_time': 2290.557361841202,
 'total_time_str': '38m 11s'},
{'fid50k_full': 319.82323843107656,
 'kimg': 48,
 'metric': 'fid50k_full',
 'num_gpus': 1,
 'results': {'fid50k_full': 319.82323843107656},
 'snapshot_pkl': 'network-snapshot-000048.pkl',
 'timestamp': 1631193005.5414703,
 'total_time': 2290.2175073623657,
 'total_time_str': '38m 10s'},
{'fid50k_full': 326.33323442719745,
```

```
 'kimg': 64,
 'metric': 'fid50k_full',
 'num_gpus': 1,
 'results': {'fid50k_full': 326.33323442719745},
 'snapshot_pkl': 'network-snapshot-000064.pkl',
 'timestamp': 1631202530.964554,
 'total_time': 2290.147933244705,
 'total_time_str': '38m 10s'},
{'fid50k_full': 283.2206022085435,
 'kimg': 80,
 'metric': 'fid50k_full',
 'num_gpus': 1,
 'results': {'fid50k_full': 283.2206022085435},
 'snapshot_pkl': 'network-snapshot-000080.pkl',
 'timestamp': 1631212062.0272033,
 'total_time': 2289.5196397304535,
 'total_time_str': '38m 10s'},
{'fid50k_full': 236.99933039037495,
 'kimg': 96,
 'metric': 'fid50k_full',
 'num_gpus': 1,
 'results': {'fid50k_full': 236.99933039037495},
 'snapshot_pkl': 'network-snapshot-000096.pkl',
 'timestamp': 1631221595.2317576,
 'total_time': 2289.667427301407,
 'total_time_str': '38m 10s'},
{'fid50k_full': 224.07721838133503,
 'kimg': 112,
 'metric': 'fid50k_full',
 'num_gpus': 1,
 'results': {'fid50k_full': 224.07721838133503},
 'snapshot_pkl': 'network-snapshot-000112.pkl',
 'timestamp': 1631231145.9300315,
 'total_time': 2295.1827523708344,
 'total time str': '38m 15s'}]
```

```
# run 1
with open("/content/drive/MyDrive/grappleGAN/results/00001-bjj1024-mirror-auto1-resume
  json_list = list(f)


len(json_list)
```

```
6
```

```
data1 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data1):
  data1[i]['fid50k_full'] = data1[i]['results']['fid50k_full']
  data1[i]['kimg'] = (i * 4 * 4) + data[-1]['kimg'] #add kimg from previous run


# run 2
with open("/content/drive/MyDrive/grappleGAN/results/00002-bjj1024-mirror-auto1-resume
  json_list = list(f)
```

```
len(json_list)
# there are 3 metrics entries, but the next training run picks up from the 4th .pkl fi
```

```
3
```

```
data2 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data2):
  data2[i]['fid50k_full'] = data2[i]['results']['fid50k_full']
  data2[i]['kimg'] = (i * 4 * 4) + data1[-1]['kimg'] #add kimg from previous run
```

```
# run 3
with open("/content/drive/MyDrive/grappleGAN/results/00003-bjj1024-mirror-auto1-resume
  json_list = list(f)
```

```
len(json_list)
```

```
6
```

```
data3 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data3):
  data3[i]['fid50k_full'] = data3[i]['results']['fid50k_full']
  data3[i]['kimg'] = (i * 4 * 4) + data2[-1]['kimg'] + 16 #add kimg from previous run
```

```
# run 4
with open("/content/drive/MyDrive/grappleGAN/results/00004-bjj1024-mirror-auto1-resume
  json_list = list(f)
```

```
len(json_list)
```

```
6
```

```
data4 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data4):
  data4[i]['fid50k_full'] = data4[i]['results']['fid50k_full']
  data4[i]['kimg'] = (i * 4 * 4) + data3[-1]['kimg'] #add kimg from previous run
```

```
# run 5
with open("/content/drive/MyDrive/grappleGAN/results/00005-bjj1024-mirror-auto1-resume
  json_list = list(f)
```

```
len(json_list)
```

```
5
```

```
data5 = [json.loads(line) for line in json_list]
```

```
for i, _ in enumerate(data5):
  data5[i]['fid50k_full'] = data5[i]['results']['fid50k_full']
  data5[i]['kimg'] = (i * 4 * 4) + data4[-1]['kimg'] #add kimg from previous run


# run 6
with open("/content/drive/MyDrive/grappleGAN/results/00006-bjj1024-mirror-auto1-resume
  json_list = list(f)


len(json_list)
```

```
3
```

```
data6 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data6):
  data6[i]['fid50k_full'] = data6[i]['results']['fid50k_full']
  data6[i]['kimg'] = (i * 4 * 4) + data5[-1]['kimg'] #add kimg from previous run


fid_all = data + data1 + data2 + data3 + data4 + data5 + data6
df = pd.DataFrame(fid_all)
df = df.drop_duplicates(subset='kimg', keep='last')
df
```

results	metric	total_time	total_time_str	num_gpus	snapshot_pkl	ti
{'fid50k_full': 43.6344250747313}	fid50k_full	2390.345353	39m 50s	1	network-snapshot-000000.pkl	1.63
{'fid50k_full': 94.4450870468103}	fid50k_full	2289.976832	38m 10s	1	network-snapshot-000016.pkl	1.63
{'fid50k_full': 51.8962399656941}	fid50k_full	2290.557362	38m 11s	1	network-snapshot-000032.pkl	1.63
{'fid50k_full': 9.82323843107656}	fid50k_full	2290.217507	38m 10s	1	network-snapshot-000048.pkl	1.63
{'fid50k_full': 6.33323442719745}	fid50k_full	2290.147933	38m 10s	1	network-snapshot-000064.pkl	1.63
{'fid50k_full': 83.2206022085435}	fid50k_full	2289.519640	38m 10s	1	network-snapshot-000080.pkl	1.63
{'fid50k_full': 6.99933039037495}	fid50k_full	2289.667427	38m 10s	1	network-snapshot-000096.pkl	1.63
{'fid50k_full': 24.4355556856611}	fid50k_full	3072.400557	51m 12s	1	network-snapshot-000000.pkl	1.63
{'fid50k_full': 2.71522332100687}	fid50k_full	2471.317870	41m 11s	1	network-snapshot-000016.pkl	1.63
{'fid50k_full': 67.6171415519558}	fid50k_full	2465.274207	41m 05s	1	network-snapshot-000032.pkl	1.63
{'fid50k_full': 43.2378859104435}	fid50k_full	2466.792973	41m 07s	1	network-snapshot-000048.pkl	1.63
{'fid50k_full': 2.66421266765252}	fid50k_full	2466.643378	41m 07s	1	network-snapshot-000064.pkl	1.63
{'fid50k_full': 2.69958855961843}	fid50k_full	3053.123706	50m 53s	1	network-snapshot-000000.pkl	1.63
{'fid50k_full': 5.10655060608627}	fid50k_full	2441.423884	40m 41s	1	network-snapshot-000016.pkl	1.63
{'fid50k_full':	fid50k_full	2448.589609	40m 49s	1	network-	1.63

4.54162906573977}	fid50k_full	2448.589699	40m 49s	1	snapshot-000032.pkl	1.63
{'fid50k_full': 0.93921521878661}	fid50k_full	3301.171000	55m 01s	1	network-snapshot-000000.pkl	1.63
{'fid50k_full': 00.4701004511796}	fid50k_full	2696.649821	44m 57s	1	network-snapshot-000016.pkl	1.63
{'fid50k_full': 9.98252394452695}	fid50k_full	2687.782405	44m 48s	1	network-snapshot-000032.pkl	1.63
{'fid50k_full': 6.08550947260886}	fid50k_full	2690.094939	44m 50s	1	network-snapshot-000048.pkl	1.63
{'fid50k_full': 3.26877840153483}	fid50k_full	2686.005014	44m 46s	1	network-snapshot-000064.pkl	1.63
{'fid50k_full': 3.12604648895646}	fid50k_full	3158.569351	52m 39s	1	network-snapshot-000000.pkl	1.63
{'fid50k_full': 2.56612696920007}	fid50k_full	2288.269195	38m 08s	1	network-snapshot-000016.pkl	1.63
{'fid50k_full': 4.94286453402509}	fid50k_full	2287.059482	38m 07s	1	network-snapshot-000032.pkl	1.63
{'fid50k_full': 2.59251590853506}	fid50k_full	2286.639648	38m 07s	1	network-snapshot-000048.pkl	1.63
{'fid50k_full':	fid50k_full	2286.872875	38m 07s	1	network-snapshot-	1.63

```
# lowest FID achieved during training
round(df['fid50k_full'].min(), 2)
```

```
61.06
```

```
sns.set_context('talk', font_scale=0.8)
sns.set_style('darkgrid')

plt.figure(figsize=(8,5))
sns.lineplot(x='kimg', y='fid50k_full', data=df)
plt.title('FID')
plt.tight_layout()
plt.xlabel('kimg (number of reals shown to D)')
plt.savefig('/content/drive/MyDrive/grappleGAN/grappleFID.png');
```