

▼ maliGAN

model: StyleGAN2-ADA

▼ GPU Type

```
!nvidia-smi
```

Sun Oct 10 02:28:54 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	33C	P0	26W / 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 2.6 kB/s
Collecting torchvision==0.9.1
  Downloading torchvision-0.9.1-cp37-cp37m-manylinux1_x86_64.whl (17.4 MB)
    |████████████████████████████████████████| 17.4 MB 200 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 pypng 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 pypng
  Downloading pypng-0.1.0-cp37-cp37m-manylinux2010_x86_64.whl (195 kB)
    |████████████████████████████████████████| 195 kB 6.7 MB/s
Collecting ninja
  Downloading ninja-1.10.2-py2.py3-none-manylinux_2_5_x86_64.manylinux1_x86_64.w
    |████████████████████████████████████████| 108 kB 52.8 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 1.2 MB/s
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dis
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: 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: pypng, ninja, imageio-ffmpeg
Successfully installed imageio-ffmpeg-0.4.3 ninja-1.10.2 pypng-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 | 3.07 MiB/s, done.
Resolving deltas: 100% (55/55), done.
```

▼ Convert images

```
!python /content/stylegan2-ada-pytorch/dataset\_tool.py --source /content/drive/MyDrive
```

```
100% 392/392 [02:21<00:00, 2.77it/s]
```

```
# If things go wrong
```

```
# !rm -R /content/drive/MyDrive/maliGAN/datasets/food-eheitner1024/\*
```

▼ Initial training

```
import os
```

```
# Modify these to suit your needs
```

```
RESULTS = "/content/drive/MyDrive/maliGAN/results"
```

```
DATA = "/content/drive/MyDrive/maliGAN/datasets/food-eheitner1024"
```

```
SNAP = 4
```

```
MIRRORED = True
```

```
AUG = "ada"
```

```
AUGPIPE = "bgcfnc"
```

```
TARGET = 0.7
```

```
# Build the command and run it
```

```
cmd = f"/usr/bin/python3 /content/stylegan2-ada-pytorch/train.py --snap {SNAP} --outdi  
!{cmd}"
```

```
Training options:
```

```
{
  "num_gpus": 1,
  "image_snapshot_ticks": 4,
  "network_snapshot_ticks": 4,
  "metrics": [
    "fid50k_full"
  ],
}
```

```

"random_seed": 0,
"training_set_kwargs": {
    "class_name": "training.dataset.ImageFolderDataset",
    "path": "/content/drive/MyDrive/malliGAN/datasets/food-eheitner1024",
    "use_labels": false,
    "max_size": 392,
    "xflip": true,
    "resolution": 1024
},
"data_loader_kwargs": {
    "pin_memory": true,
    "num_workers": 3,
    "prefetch_factor": 2
},
"G_kwargs": {
    "class_name": "training.networks.Generator",
    "z_dim": 512,
    "w_dim": 512,
    "mapping_kwargs": {
        "num_layers": 2
    },
    "synthesis_kwargs": {
        "channel_base": 32768,
        "channel_max": 512,
        "num_fp16_res": 4,
        "conv_clamp": 256
    }
},
"D_kwargs": {
    "class_name": "training.networks.Discriminator",
    "block_kwargs": {},
    "mapping_kwargs": {},
    "epilogue_kwargs": {
        "mbstd_group_size": 4
    },
    "channel_base": 32768,
    "channel_max": 512,
    "num_fp16_res": 4,
    "conv_clamp": 256
},
"G_opt_kwargs": {
    "class_name": "torch.optim.Adam",
    "lr": 0.002,
    "betas": [
        0,
        0.99
    ],
    "eps": 1e-08
},
"D_opt_kwargs": {

```

► Resume training

[] ↪ 6 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

```
with open("/content/drive/MyDrive/maliGAN/results/00000-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)
```

```
json_list
```

```
[{"results": {"fid50k_full": 362.0709050767614}, "metric": "fid50k_full", "total_time": 2313.912511587143},
 {"results": {"fid50k_full": 369.2238479424669}, "metric": "fid50k_full", "total_time": 2301.6874616146088},
 {"results": {"fid50k_full": 299.9726982568777}, "metric": "fid50k_full", "total_time": 2301.8887615203857}]
```

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

```
data
```

```
[{'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 362.0709050767614},
  'snapshot_pkl': 'network-snapshot-000000.pkl',
  'timestamp': 1631588116.2966187,
  'total_time': 2313.912511587143,
  'total_time_str': '38m 34s'},
 {'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 369.2238479424669},
  'snapshot_pkl': 'network-snapshot-000016.pkl',
  'timestamp': 1631597871.0039513,
  'total_time': 2301.6874616146088,
  'total_time_str': '38m 22s'},
 {'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 299.9726982568777},
  'snapshot_pkl': 'network-snapshot-000032.pkl',
  'timestamp': 1631607624.9745834,
  'total_time': 2301.8887615203857,
  'total_time_str': '38m 22s'}]
```

```
for i, _ in enumerate(data):
```

```
data[i]['fid50k_full'] = data[i]['results']['fid50k_full']
data[i]['kimg'] = i * 4 * 4
```

data

```
[{'fid50k_full': 362.0709050767614,
  'kimg': 0,
  'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 362.0709050767614},
  'snapshot_pkl': 'network-snapshot-000000.pkl',
  'timestamp': 1631588116.2966187,
  'total_time': 2313.912511587143,
  'total_time_str': '38m 34s'},
 {'fid50k_full': 369.2238479424669,
  'kimg': 16,
  'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 369.2238479424669},
  'snapshot_pkl': 'network-snapshot-000016.pkl',
  'timestamp': 1631597871.0039513,
  'total_time': 2301.6874616146088,
  'total_time_str': '38m 22s'},
 {'fid50k_full': 299.9726982568777,
  'kimg': 32,
  'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 299.9726982568777},
  'snapshot_pkl': 'network-snapshot-000032.pkl',
  'timestamp': 1631607624.9745834,
  'total_time': 2301.8887615203857,
  'total_time_str': '38m 22s'}]
```

```
with open("/content/drive/MyDrive/maliGAN/results/00001-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)
```

```
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) + 48 #add kimg from previous run
```

data2

```
[{'fid50k_full': 231.93313160636123,
  'kimg': 48,
  'metric': 'fid50k_full',
  'num_gpus': 1,
  'results': {'fid50k_full': 231.93313160636123},
  'snapshot_pkl': 'network-snapshot-000000.pkl',
  'timestamp': 1631649920.2616522,
  'total_time': 2546.3751966953278,
  'total_time_str': '42m 26s'},
 {'fid50k_full': 187.61681349739325,
```

```

'king': 64,
'metric': 'fid50k_full',
'num_gpus': 1,
'results': {'fid50k_full': 187.61681349739325},
'snapshot_pkl': 'network-snapshot-000016.pkl',
'timestamp': 1631660968.3264294,
'total_time': 2390.8223462104797,
'total_time_str': '39m 51s'},
{'fid50k_full': 207.2614859233689,
'king': 80,
'metric': 'fid50k_full',
'num_gpus': 1,
'results': {'fid50k_full': 207.2614859233689},
'snapshot_pkl': 'network-snapshot-000032.pkl',
'timestamp': 1631672026.3032165,
'total_time': 2381.9961335659027,
'total_time_str': '39m 42s'},
{'fid50k_full': 161.12890958917302,
'king': 96,
'metric': 'fid50k_full',
'num_gpus': 1,
'results': {'fid50k_full': 161.12890958917302},
'snapshot_pkl': 'network-snapshot-000048.pkl',
'timestamp': 1631683101.6471658,
'total_time': 2384.7996344566345,
'total_time_str': '39m 45s'},
{'fid50k_full': 151.32710140951588,
'king': 112,
'metric': 'fid50k_full',
'num_gpus': 1,
'results': {'fid50k_full': 151.32710140951588},
'snapshot_pkl': 'network-snapshot-000064.pkl',
'timestamp': 1631694187.4244099,
'total_time': 2387.465434074402,
'total_time_str': '39m 47s'},
{'fid50k_full': 137.319075007602,
'king': 128,
'metric': 'fid50k_full',
'num_gpus': 1,
'results': {'fid50k_full': 137.319075007602},
'snapshot_pkl': 'network-snapshot-000080.pkl',
'timestamp': 1631705184.859178,
'total_time': 2373.956124305725,
'total_time_str': '39m 34s'},
{'fid50k_full': 135.95974347368414,
'king': 144,
'metric': 'fid50k_full',
'num_gpus': 1,
'results': {'fid50k_full': 135.95974347368414},
'snapshot_pkl': 'network-snapshot-000096.pkl',
'timestamp': 1631716271.2345678,
'total_time': 2361.2345678901234,
'total_time_str': '39m 21s'}

```

```

with open("/content/drive/MyDrive/malliGAN/results/00002-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)

```

```
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) + 144 #add kimg from previous run

data3[-1]['kimg']

240

with open("/content/drive/MyDrive/maliGAN/results/00003-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)

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

with open("/content/drive/MyDrive/maliGAN/results/00004-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)

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

with open("/content/drive/MyDrive/maliGAN/results/00005-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)

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

with open("/content/drive/MyDrive/maliGAN/results/00006-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)

data7 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data7):
    data7[i]['fid50k_full'] = data7[i]['results']['fid50k_full']
    data7[i]['kimg'] = (i * 4 * 4) + data6[-1]['kimg'] #add kimg from previous run

with open("/content/drive/MyDrive/maliGAN/results/00007-food-eheitner1024-mirror-auto") as f:
    json_list = list(f)

data8 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data8):
    data8[i]['fid50k_full'] = data8[i]['results']['fid50k_full']

```



```

data8[i]['king'] = (i * 4 * 4) + data7[-1]['king'] #add king from previous run

with open("/content/drive/MyDrive/maliGAN/results/00008-food-eheitner1024-mirror-auto
json_list = list(f)

data9 = [json.loads(line) for line in json_list]
for i, _ in enumerate(data9):
    data9[i]['fid50k_full'] = data9[i]['results']['fid50k_full']
    data9[i]['king'] = (i * 4 * 4) + data8[-1]['king'] #add king from previous run

fid_all = data + data2 + data3 + data4 + data5 + data6 + data7 + data8 + data9

df = pd.DataFrame(fid_all)
df[df.duplicated(subset='king', keep=False)]

```

	results	metric	total_time	total_time_str	num_gpus	snapshot_pi
9	{'fid50k_full': 135.95974347368414}	fid50k_full	2389.670976	39m 50s	1	netwo snapsh 000096.f
10	{'fid50k_full': 136.039789658117}	fid50k_full	2558.623752	42m 39s	1	netwo snapsh 000000.f
16	{'fid50k_full': 90.6646674088789}	fid50k_full	2443.376663	40m 43s	1	netwo snapsh 000096.f
17	{'fid50k_full': 90.77434383701686}	fid50k_full	2440.454109	40m 40s	1	netwo snapsh 000000.f
24	{'fid50k_full': 85.5219995854263}	fid50k_full	2297.698040	38m 18s	1	netwo snapsh 000112.f
25	{'fid50k_full': 85.6499673783444}	fid50k_full	2378.774137	39m 39s	1	netwo snapsh 000000.f
32	{'fid50k_full': 78.62854357308844}	fid50k_full	2303.013170	38m 23s	1	netwo snapsh 000112.r

```

df = df.drop_duplicates(subset='king', keep='last')
df

```

	results	metric	total_time	total_time_str	num_gpus	snapshot_pi
0	{'fid50k_full': 362.0709050767614}	fid50k_full	2313.912512	38m 34s	1	netwo snapsh 000000.f
1	{'fid50k_full': 369.2238479424669}	fid50k_full	2301.687462	38m 22s	1	netwo snapsh 000016.f
2	{'fid50k_full': 299.9726982568777}	fid50k_full	2301.888762	38m 22s	1	netwo snapsh 000032.f
3	{'fid50k_full': 231.93313160636123}	fid50k_full	2546.375197	42m 26s	1	netwo snapsh 000000.f
4	{'fid50k_full': 187.61681349739325}	fid50k_full	2390.822346	39m 51s	1	netwo snapsh 000016.f
5	{'fid50k_full': 207.2614859233689}	fid50k_full	2381.996134	39m 42s	1	netwo snapsh 000032.f
6	{'fid50k_full': 161.12890958917302}	fid50k_full	2384.799634	39m 45s	1	netwo snapsh 000048.f
7	{'fid50k_full': 151.32710140951588}	fid50k_full	2387.465434	39m 47s	1	netwo snapsh 000064.f
8	{'fid50k_full': 137.319075007602}	fid50k_full	2373.956124	39m 34s	1	netwo snapsh 000080.f
10	{'fid50k_full': 136.039789658117}	fid50k_full	2558.623752	42m 39s	1	netwo snapsh 000000.f
11	{'fid50k_full': 128.72904888890483}	fid50k_full	2443.033737	40m 43s	1	netwo snapsh 000016.f
12	{'fid50k_full': 119.6268762397335}	fid50k_full	2447.538244	40m 48s	1	netwo snapsh 000032.f
13	{'fid50k_full': 108.97447067867039}	fid50k_full	2436.058487	40m 36s	1	netwo snapsh 000048.f
14	{'fid50k_full': 104.1028404458504}	fid50k_full	2439.628042	40m 40s	1	netwo snapsh 000064.f
15	{'fid50k_full': 104.1028404458504}	fid50k_full	2439.628042	40m 40s	1	netwo snapsh 000064.f

15	100.35370025499726}	fid50k_full	2430.020193	40m 30s	1	netwo snapsh 000080.f
17	{'fid50k_full': 90.77434383701686}	fid50k_full	2440.454109	40m 40s	1	netwo snapsh 000000.f
18	{'fid50k_full': 100.73267314298849}	fid50k_full	2296.542279	38m 17s	1	netwo snapsh 000016.f
19	{'fid50k_full': 98.35139923343549}	fid50k_full	2296.619475	38m 17s	1	netwo snapsh 000032.f
20	{'fid50k_full': 96.07275824798812}	fid50k_full	2298.033861	38m 18s	1	netwo snapsh 000048.f
21	{'fid50k_full': 81.39067785227466}	fid50k_full	2298.830457	38m 19s	1	netwo snapsh 000064.f
22	{'fid50k_full': 81.85086356564182}	fid50k_full	2297.615529	38m 18s	1	netwo snapsh 000080.f
23	{'fid50k_full': 85.2249363797199}	fid50k_full	2298.285653	38m 18s	1	netwo snapsh 000096.f
25	{'fid50k_full': 85.6499673783444}	fid50k_full	2378.774137	39m 39s	1	netwo snapsh 000000.f
26	{'fid50k_full': 91.89128710797624}	fid50k_full	2298.737087	38m 19s	1	netwo snapsh 000016.f
27	{'fid50k_full': 82.24570160001070}	fid50k_full	2298.126575	38m 18s	1	netwo snapsh

```
# lowest FID achieved during training
```

```
round(df['fid50k_full'].min(), 2)
```

```
67.56
```

```
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/maliGAN/maliFID.png');
```

