

GAN-GPU-test

February 1, 2019

0.1 GAN

URL

[GANDCGAN](#)

```
In [1]: import warnings
        warnings.filterwarnings('ignore')

        #

        from keras.layers import Input, Dense, Reshape, Flatten, Dropout
        from keras.layers import BatchNormalization, Activation, ZeroPadding2D
        from keras.layers.advanced_activations import LeakyReLU
        from keras.layers.convolutional import UpSampling2D, Conv2D
        from keras.models import Sequential, Model
        from keras.optimizers import Adam
        from keras.utils import np_utils
        import tensorflow as tf
        from keras.backend import tensorflow_backend
```

Using TensorFlow backend.

```
In [2]: import matplotlib.pyplot as plt
        import os
        import numpy as np
```

```
In [3]: #
        save_dir = 'images/gen_imgs'
        os.makedirs(save_dir, exist_ok=True)
        latent_dir = 'images/latent'
        os.makedirs(latent_dir, exist_ok=True)
        os.makedirs('ganmodels', exist_ok=True)
```

```
In [4]: #
        np.random.seed(0)
        np.random.RandomState(0)
        tf.set_random_seed(0)
```

```

In [5]: #
        shape = (128, 128, 3)

        #
        z_dim = 100

In [6]: #
def build_generator():
    noise_shape = (z_dim,)

    model = Sequential()

    model.add(Dense(128 * 32 * 32, activation="relu", input_shape=noise_shape))
    model.add(Reshape((32, 32, 128)))
    model.add(BatchNormalization(momentum=0.8))
    model.add(UpSampling2D())
    model.add(Conv2D(128, kernel_size=3, padding="same"))
    model.add(Activation("relu"))
    model.add(BatchNormalization(momentum=0.8))
    model.add(UpSampling2D())
    model.add(Conv2D(64, kernel_size=3, padding="same"))
    model.add(Activation("relu"))
    model.add(BatchNormalization(momentum=0.8))
    model.add(Conv2D(3, kernel_size=3, padding="same"))
    model.add(Activation("tanh"))

    model.summary()

    noise = Input(shape=noise_shape)
    img = model(noise)

    return Model(noise, img)

In [7]: #
def build_discriminator():
    img_shape = shape

    model = Sequential()

    model.add(Conv2D(32, kernel_size=3, strides=2, input_shape=img_shape, padding="same"))
    model.add(LeakyReLU(alpha=0.2))
    model.add(Dropout(0.25))
    model.add(Conv2D(64, kernel_size=3, strides=2, padding="same"))
    model.add(ZeroPadding2D(padding=((0, 1), (0, 1))))
    model.add(LeakyReLU(alpha=0.2))
    model.add(Dropout(0.25))
    model.add(BatchNormalization(momentum=0.8))
    model.add(Conv2D(128, kernel_size=3, strides=2, padding="same"))

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model.add(LeakyReLU(alpha=0.2))
model.add(Dropout(0.25))
model.add(BatchNormalization(momentum=0.8))
model.add(Conv2D(256, kernel_size=3, strides=1, padding="same"))
model.add(LeakyReLU(alpha=0.2))
model.add(Dropout(0.25))

model.add(Flatten())
model.add(Dense(1, activation='sigmoid'))

model.summary()

img = Input(shape=img_shape)
validity = model(img)

return Model(img, validity)

```

In [8]: # GAN

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def build_combined(generator, discriminator):
    discriminator.trainable = False
    model = Sequential([generator, discriminator])

    return model

```

In [9]: optimizer = Adam(lr=0.0002, beta_1=0.5)

discriminator = build_discriminator()

discriminator.compile(loss='binary_crossentropy', optimizer=optimizer, metrics=['accuracy'])

Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 64, 64, 32)	896
leaky_re_lu_1 (LeakyReLU)	(None, 64, 64, 32)	0
dropout_1 (Dropout)	(None, 64, 64, 32)	0
conv2d_2 (Conv2D)	(None, 32, 32, 64)	18496
zero_padding2d_1 (ZeroPaddin	(None, 33, 33, 64)	0
leaky_re_lu_2 (LeakyReLU)	(None, 33, 33, 64)	0
dropout_2 (Dropout)	(None, 33, 33, 64)	0
batch_normalization_1 (Batch	(None, 33, 33, 64)	256
conv2d_3 (Conv2D)	(None, 17, 17, 128)	73856

leaky_re_lu_3 (LeakyReLU)	(None, 17, 17, 128)	0
dropout_3 (Dropout)	(None, 17, 17, 128)	0
batch_normalization_2 (Batch Normalization)	(None, 17, 17, 128)	512
conv2d_4 (Conv2D)	(None, 17, 17, 256)	295168
leaky_re_lu_4 (LeakyReLU)	(None, 17, 17, 256)	0
dropout_4 (Dropout)	(None, 17, 17, 256)	0
flatten_1 (Flatten)	(None, 73984)	0
dense_1 (Dense)	(None, 1)	73985
=====		
Total params: 463,169		
Trainable params: 462,785		
Non-trainable params: 384		

```
In [10]: generator = build_generator()
         # generator.compile(loss='binary_crossentropy', optimizer=optimizer)
```

Layer (type)	Output Shape	Param #
=====		
dense_2 (Dense)	(None, 131072)	13238272
reshape_1 (Reshape)	(None, 32, 32, 128)	0
batch_normalization_3 (Batch Normalization)	(None, 32, 32, 128)	512
up_sampling2d_1 (UpSampling2D)	(None, 64, 64, 128)	0
conv2d_5 (Conv2D)	(None, 64, 64, 128)	147584
activation_1 (Activation)	(None, 64, 64, 128)	0
batch_normalization_4 (Batch Normalization)	(None, 64, 64, 128)	512
up_sampling2d_2 (UpSampling2D)	(None, 128, 128, 128)	0
conv2d_6 (Conv2D)	(None, 128, 128, 64)	73792
activation_2 (Activation)	(None, 128, 128, 64)	0

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batch_normalization_5 (Batch Normalization) (None, 128, 128, 64) 256
-----
conv2d_7 (Conv2D) (None, 128, 128, 3) 1731
-----
activation_3 (Activation) (None, 128, 128, 3) 0
=====
Total params: 13,462,659
Trainable params: 13,462,019
Non-trainable params: 640
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In [11]: z = Input(shape=(z_dim,))
         img = generator(z)

         discriminator.trainable = False

         valid = discriminator(img)

         combined = Model(z, valid)
         combined.compile(loss='binary_crossentropy', optimizer=optimizer)

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```

In [12]: from PIL import Image

```

```

In [13]: !wget https://github.com/makaishi2/sample-data/raw/master/kill_me_baby.gz | tail -1

--2019-01-31 12:26:36--  https://github.com/makaishi2/sample-data/raw/master/kill_me_baby.gz
Resolving github.com (github.com)... 192.30.253.112, 192.30.253.113
Connecting to github.com (github.com)|192.30.253.112|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://raw.githubusercontent.com/makaishi2/sample-data/master/kill_me_baby.gz [following]
--2019-01-31 12:26:36--  https://raw.githubusercontent.com/makaishi2/sample-data/master/kill_me_baby.gz
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 151.101.48.133
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|151.101.48.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 20670367 (20M) [application/octet-stream]
Saving to: kill_me_baby.gz.1

kill_me_baby.gz.1  100%[=====>]  19.71M  --.-KB/s    in 0.1s

2019-01-31 12:26:37 (167 MB/s) - kill_me_baby.gz.1 saved [20670367/20670367]

```

```

In [14]: !tar xzvf kill_me_baby.gz

```

kill_me_baby_datasets/
kill_me_baby_datasets/botsu/
kill_me_baby_datasets/yasuna&sonya&agiri/
kill_me_baby_datasets/others/
kill_me_baby_datasets/yasuna&sonya/
kill_me_baby_datasets/yasuna&agiri/
kill_me_baby_datasets/yasuna/
kill_me_baby_datasets/sonya/
kill_me_baby_datasets/agiri/
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kill_me_baby_datasets/others/08_020.png
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kill_me_baby_datasets/others/11_027.png
kill_me_baby_datasets/others/08_019.png
kill_me_baby_datasets/others/07_074.png
kill_me_baby_datasets/others/12_045.png
kill_me_baby_datasets/others/09_050.png
kill_me_baby_datasets/others/06_016.png
kill_me_baby_datasets/others/12_035.png
kill_me_baby_datasets/others/09_053.png
kill_me_baby_datasets/others/06_028.png
kill_me_baby_datasets/others/11_054.png
kill_me_baby_datasets/others/09_046.png
kill_me_baby_datasets/others/05_048.png
kill_me_baby_datasets/others/10_135.png

```

kill_me_baby_datasets/others/10_121.png
kill_me_baby_datasets/others/07_029.png
kill_me_baby_datasets/others/07_001.png
kill_me_baby_datasets/others/10_096.png
kill_me_baby_datasets/others/09_043.png
kill_me_baby_datasets/others/09_057.png
kill_me_baby_datasets/others/10_122.png
kill_me_baby_datasets/others/09_055.png
kill_me_baby_datasets/others/10_095.png
kill_me_baby_datasets/others/07_003.png
kill_me_baby_datasets/others/09_068.png
kill_me_baby_datasets/others/10_137.png
kill_me_baby_datasets/yasuna&sonya&agiri/07_047.png
kill_me_baby_datasets/botsu/07_034.png
kill_me_baby_datasets/botsu/07_035.png
kill_me_baby_datasets/botsu/07_036.png
kill_me_baby_datasets/botsu/03_058.png
kill_me_baby_datasets/botsu/03_064.png
kill_me_baby_datasets/botsu/11_034.png
kill_me_baby_datasets/botsu/11_036.png
kill_me_baby_datasets/botsu/11_03.png
kill_me_baby_datasets/botsu/03_069.png
kill_me_baby_datasets/botsu/11_069.png

```

```

In [15]: root_dir = './kill_me_baby_datasets'
        class_names = os.listdir(root_dir)

```

```

In [16]: print(class_names)

```

```

['yasuna&sonya&agiri', 'botsu', 'yasuna', 'others', 'sonya', 'yasuna&agiri', 'yasuna&sonya', '']

```

```

In [17]: # one hot
        def get_class_one_hot(class_str):
            label_encoded = class_names.index(class_str)
            label_hot = np_utils.to_categorical(label_encoded, len(class_names))
            return label_hot

```

```

In [18]: #
        def load_imgs():

            img_paths = []
            labels = []
            images = np.empty((0,128,128,3))

            for cl_name in class_names:
                img_names = os.listdir(os.path.join(root_dir, cl_name))
                for img_name in img_names:

```

```

        img_path = os.path.abspath(os.path.join(root_dir, cl_name, img_name))
        img = Image.open(img_path)
        img_array = np.array(img)
        img_shape = img_array.shape
        if (img_shape == (128,128,3)):
            img_array2 = np.expand_dims(img_array, axis=0)
            images = np.concatenate((images, img_array2), axis=0)
            hot_cl_name = get_class_one_hot(cl_name)
            labels.append(hot_cl_name)

    return (images, np.array(labels))

In [19]: images, labels = load_imgs()

In [20]: print(images.shape)

(684, 128, 128, 3)

In [21]: print(labels.shape)

(684, 8)

In [22]: #
def save_imgs(iteration, check_noise, r, c):
    noise = check_noise
    gen_imgs = generator.predict(noise)

    # 0-1 rescale
    gen_imgs = 0.5 * gen_imgs + 0.5

    fig, axs = plt.subplots(r, c)
    cnt = 0
    for i in range(r):
        for j in range(c):
            axs[i, j].imshow(gen_imgs[cnt, :, :, :])
            axs[i, j].axis('off')
            cnt += 1
    fig.savefig('%s/kill_me_%d.png' % (save_dir, iteration))
    plt.close()

In [23]: def visualizeInterpolation(start, end, save=True, nbSteps=10):
    print("Generating interpolations...")

    steps = nbSteps
    latentStart = start
    latentEnd = end

```

```

startImg = generator.predict(latentStart)
endImg = generator.predict(latentEnd)

vectors = []

alphaValues = np.linspace(0, 1, steps)
for alpha in alphaValues:
    vector = latentStart * (1 - alpha) + latentEnd * alpha
    vectors.append(vector)

vectors = np.array(vectors)

resultLatent = None
resultImage = None

for i, vec in enumerate(vectors):
    gen_img = np.squeeze(generator.predict(vec), axis=0)
    gen_img = (0.5 * gen_img + 0.5) * 255
    gen_img2 = np.expand_dims(gen_img, axis=0)
    # interpolatedImage = cv2.cvtColor(gen_img, cv2.COLOR_RGB2BGR)
    # interpolatedImage = interpolatedImage.astype(np.uint8)
    resultImage = gen_img2 if resultImage is None else np.concatenate((resultImage, gen_img2), axis=0)
return resultImage

```

```

In [24]: #
batch_size = 32
#iterations = 200000
#save_interval = 1000
#model_interval = 5000

#iterations = 1000
#disp_interval = 100
#save_interval = 100
#model_interval = 100

iterations = 100000
disp_interval = 1000
save_interval = 5000
model_interval = 5000

r = 5
c = 5
check_noise = np.random.uniform(-1, 1, (r * c, 100))

```

```

In [25]: #
X_train, labels = load_imgs()

half_batch = int(batch_size / 2)

```

```

X_train = (X_train.astype(np.float32) - 127.5) / 127.5

In [26]: # main loop

for iteration in range(iterations):

    # -----
    # Training Discriminator
    # -----
    idx = np.random.randint(0, X_train.shape[0], half_batch)

    imgs = X_train[idx]

    noise = np.random.uniform(-1, 1, (half_batch, z_dim))

    gen_imgs = generator.predict(noise)

    d_loss_real = discriminator.train_on_batch(imgs, np.ones((half_batch, 1)))
    d_loss_fake = discriminator.train_on_batch(gen_imgs, np.zeros((half_batch, 1)))

    d_loss = 0.5 * np.add(d_loss_real, d_loss_fake)

    # -----
    # Training Generator
    # -----

    noise = np.random.uniform(-1, 1, (batch_size, z_dim))

    g_loss = combined.train_on_batch(noise, np.ones((batch_size, 1)))

    if iteration % disp_interval == 0:
        print("%d [D loss: %f, acc.: %.2f%%] [G loss: %f]" % (iteration, d_loss[0], 1

    if iteration % save_interval == 0:
        save_imgs(iteration, check_noise, r, c)
        start = np.expand_dims(check_noise[0], axis=0)
        end = np.expand_dims(check_noise[1], axis=0)
        resultImage = visualizeInterpolation(start=start, end=end)
        pil_img = Image.fromarray(np.uint8(resultImage[0]))
        resultFn = latent_dir + "/latent_{}.png".format(iteration)
        pil_img.save(resultFn)

    if iteration % model_interval == 0:
        generator.save("ganmodels/dcgan-{}-iter.h5".format(iteration))

0 [D loss: 1.810685, acc.: 15.62%] [G loss: 0.247997]

```

Generating interpolations...

1000	[D loss: 0.426913, acc.: 71.88%]	[G loss: 4.018016]
2000	[D loss: 0.264904, acc.: 84.38%]	[G loss: 5.212813]
3000	[D loss: 0.275198, acc.: 81.25%]	[G loss: 6.226729]
4000	[D loss: 0.299165, acc.: 93.75%]	[G loss: 5.837486]
5000	[D loss: 0.209168, acc.: 90.62%]	[G loss: 3.783403]

Generating interpolations...

6000	[D loss: 0.149680, acc.: 93.75%]	[G loss: 8.972551]
7000	[D loss: 0.082623, acc.: 93.75%]	[G loss: 6.413553]
8000	[D loss: 0.033280, acc.: 100.00%]	[G loss: 8.673372]
9000	[D loss: 3.822504, acc.: 56.25%]	[G loss: 13.956351]
10000	[D loss: 0.070728, acc.: 93.75%]	[G loss: 8.627046]

Generating interpolations...

11000	[D loss: 0.335063, acc.: 90.62%]	[G loss: 11.123259]
12000	[D loss: 0.008012, acc.: 100.00%]	[G loss: 12.498615]
13000	[D loss: 0.739312, acc.: 84.38%]	[G loss: 14.198737]
14000	[D loss: 0.037914, acc.: 96.88%]	[G loss: 14.090603]
15000	[D loss: 0.008862, acc.: 100.00%]	[G loss: 11.610912]

Generating interpolations...

16000	[D loss: 0.229926, acc.: 96.88%]	[G loss: 10.832044]
17000	[D loss: 0.275606, acc.: 96.88%]	[G loss: 10.699986]
18000	[D loss: 0.002902, acc.: 100.00%]	[G loss: 11.495017]
19000	[D loss: 0.059572, acc.: 96.88%]	[G loss: 13.655407]
20000	[D loss: 0.009194, acc.: 100.00%]	[G loss: 12.104136]

Generating interpolations...

21000	[D loss: 0.003095, acc.: 100.00%]	[G loss: 15.434471]
22000	[D loss: 0.000942, acc.: 100.00%]	[G loss: 12.633148]
23000	[D loss: 0.007674, acc.: 100.00%]	[G loss: 14.246333]
24000	[D loss: 0.000203, acc.: 100.00%]	[G loss: 15.945797]
25000	[D loss: 0.000086, acc.: 100.00%]	[G loss: 14.762423]

Generating interpolations...

26000	[D loss: 0.000053, acc.: 100.00%]	[G loss: 14.930677]
27000	[D loss: 0.001047, acc.: 100.00%]	[G loss: 15.169921]
28000	[D loss: 0.007017, acc.: 100.00%]	[G loss: 13.786139]
29000	[D loss: 0.000012, acc.: 100.00%]	[G loss: 15.494579]
30000	[D loss: 0.004154, acc.: 100.00%]	[G loss: 11.105337]

Generating interpolations...

31000	[D loss: 0.000709, acc.: 100.00%]	[G loss: 15.647774]
32000	[D loss: 0.503957, acc.: 96.88%]	[G loss: 14.609900]
33000	[D loss: 0.000019, acc.: 100.00%]	[G loss: 15.670704]
34000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.267235]
35000	[D loss: 0.002403, acc.: 100.00%]	[G loss: 13.262276]

Generating interpolations...

36000	[D loss: 0.039343, acc.: 96.88%]	[G loss: 15.322517]
37000	[D loss: 0.000001, acc.: 100.00%]	[G loss: 16.118095]
38000	[D loss: 0.000038, acc.: 100.00%]	[G loss: 15.733040]
39000	[D loss: 0.072161, acc.: 96.88%]	[G loss: 14.619597]
40000	[D loss: 0.000013, acc.: 100.00%]	[G loss: 16.118095]

Generating interpolations...

41000	[D loss: 0.000046, acc.: 100.00%]	[G loss: 15.365615]
42000	[D loss: 0.000793, acc.: 100.00%]	[G loss: 15.992141]
43000	[D loss: 0.403655, acc.: 96.88%]	[G loss: 15.703935]
44000	[D loss: 0.000232, acc.: 100.00%]	[G loss: 15.390696]
45000	[D loss: 0.000135, acc.: 100.00%]	[G loss: 14.580755]

Generating interpolations...

46000	[D loss: 0.000003, acc.: 100.00%]	[G loss: 16.118095]
47000	[D loss: 0.000078, acc.: 100.00%]	[G loss: 15.348072]
48000	[D loss: 0.000058, acc.: 100.00%]	[G loss: 16.118095]
49000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.699007]
50000	[D loss: 0.000025, acc.: 100.00%]	[G loss: 16.118095]

Generating interpolations...

51000	[D loss: 0.030442, acc.: 96.88%]	[G loss: 16.118095]
52000	[D loss: 0.000087, acc.: 100.00%]	[G loss: 16.118095]
53000	[D loss: 0.001088, acc.: 100.00%]	[G loss: 14.740477]
54000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.030249]
55000	[D loss: 0.160141, acc.: 96.88%]	[G loss: 15.959938]

Generating interpolations...

56000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.990242]
57000	[D loss: 0.020197, acc.: 100.00%]	[G loss: 16.118095]
58000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]
59000	[D loss: 0.000004, acc.: 100.00%]	[G loss: 15.583026]
60000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.629300]

Generating interpolations...

61000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]
62000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]
63000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.619471]
64000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.293287]
65000	[D loss: 0.000009, acc.: 100.00%]	[G loss: 15.198036]

Generating interpolations...

66000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]
67000	[D loss: 0.499797, acc.: 93.75%]	[G loss: 13.922342]
68000	[D loss: 0.045504, acc.: 96.88%]	[G loss: 16.118095]
69000	[D loss: 0.026316, acc.: 96.88%]	[G loss: 16.118095]
70000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]

Generating interpolations...

71000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]
72000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.817126]
73000	[D loss: 0.039272, acc.: 96.88%]	[G loss: 16.118095]
74000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]
75000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]

Generating interpolations...

76000	[D loss: 0.464903, acc.: 93.75%]	[G loss: 15.479875]
77000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 15.617167]
78000	[D loss: 0.175758, acc.: 96.88%]	[G loss: 15.200135]
79000	[D loss: 0.498226, acc.: 96.88%]	[G loss: 15.871202]
80000	[D loss: 0.000000, acc.: 100.00%]	[G loss: 16.118095]

```

Generating interpolations...
81000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
82000 [D loss: 0.000000, acc.: 100.00%] [G loss: 15.847670]
83000 [D loss: 0.000003, acc.: 100.00%] [G loss: 16.118095]
84000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
85000 [D loss: 0.000000, acc.: 100.00%] [G loss: 15.770546]
Generating interpolations...
86000 [D loss: 0.000000, acc.: 100.00%] [G loss: 15.616348]
87000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
89000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
90000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
Generating interpolations...
91000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
92000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
93000 [D loss: 0.006402, acc.: 100.00%] [G loss: 16.118095]
94000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
95000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
Generating interpolations...
96000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
97000 [D loss: 0.000000, acc.: 100.00%] [G loss: 15.719671]
98000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]
99000 [D loss: 0.000000, acc.: 100.00%] [G loss: 16.118095]

```

```
In [27]: !ls -l images/gen_imgs
```

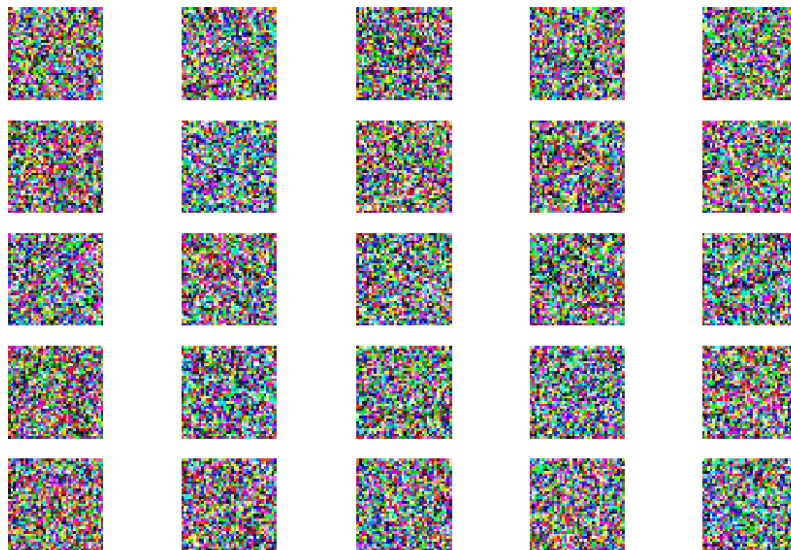
```

total 3136
-rw-r----- 1 gpuuser gpuuser 122449 Jan 31 12:33 kill_me_0.png
-rw-r----- 1 gpuuser gpuuser 105556 Jan 31 13:26 kill_me_10000.png
-rw-r----- 1 gpuuser gpuuser 108755 Jan 31 12:17 kill_me_100.png
-rw-r----- 1 gpuuser gpuuser 107008 Jan 31 13:52 kill_me_15000.png
-rw-r----- 1 gpuuser gpuuser 107781 Jan 31 14:18 kill_me_20000.png
-rw-r----- 1 gpuuser gpuuser 108331 Jan 31 12:17 kill_me_200.png
-rw-r----- 1 gpuuser gpuuser 107881 Jan 31 14:45 kill_me_25000.png
-rw-r----- 1 gpuuser gpuuser 108357 Jan 31 15:11 kill_me_30000.png
-rw-r----- 1 gpuuser gpuuser 109636 Jan 31 12:18 kill_me_300.png
-rw-r----- 1 gpuuser gpuuser 106855 Jan 31 15:37 kill_me_35000.png
-rw-r----- 1 gpuuser gpuuser 106766 Jan 31 16:04 kill_me_40000.png
-rw-r----- 1 gpuuser gpuuser 108649 Jan 31 12:18 kill_me_400.png
-rw-r----- 1 gpuuser gpuuser 107642 Jan 31 16:30 kill_me_45000.png
-rw-r----- 1 gpuuser gpuuser 106190 Jan 31 16:56 kill_me_50000.png
-rw-r----- 1 gpuuser gpuuser 107144 Jan 31 12:59 kill_me_5000.png
-rw-r----- 1 gpuuser gpuuser 108272 Jan 31 12:19 kill_me_500.png
-rw-r----- 1 gpuuser gpuuser 107704 Jan 31 17:22 kill_me_55000.png
-rw-r----- 1 gpuuser gpuuser 107201 Jan 31 17:48 kill_me_60000.png
-rw-r----- 1 gpuuser gpuuser 109173 Jan 31 12:19 kill_me_600.png
-rw-r----- 1 gpuuser gpuuser 107401 Jan 31 18:14 kill_me_65000.png
-rw-r----- 1 gpuuser gpuuser 107147 Jan 31 18:40 kill_me_70000.png

```

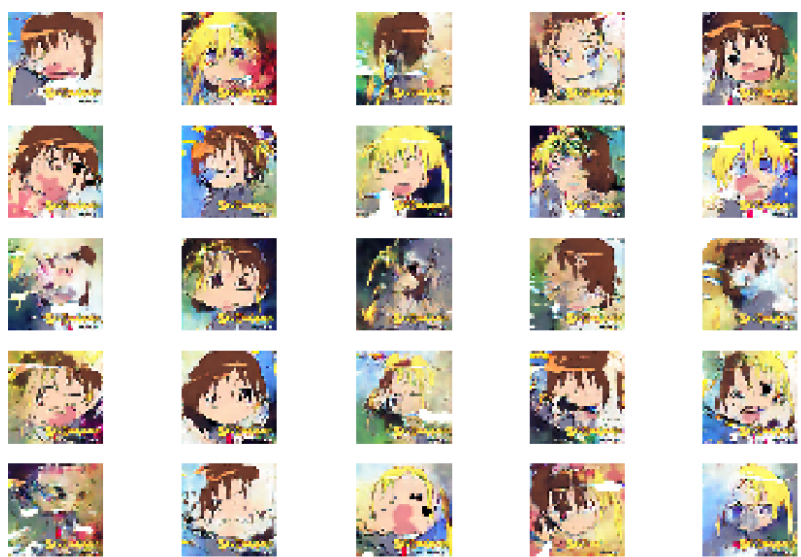
```
-rw-r----- 1 gpuuser gpuuser 109544 Jan 31 12:20 kill_me_700.png
-rw-r----- 1 gpuuser gpuuser 107934 Jan 31 19:06 kill_me_75000.png
-rw-r----- 1 gpuuser gpuuser 107187 Jan 31 19:32 kill_me_80000.png
-rw-r----- 1 gpuuser gpuuser 108713 Jan 31 12:20 kill_me_800.png
-rw-r----- 1 gpuuser gpuuser 107044 Jan 31 19:58 kill_me_85000.png
-rw-r----- 1 gpuuser gpuuser 107113 Jan 31 20:24 kill_me_90000.png
-rw-r----- 1 gpuuser gpuuser 108577 Jan 31 12:21 kill_me_900.png
-rw-r----- 1 gpuuser gpuuser 110315 Jan 31 20:50 kill_me_95000.png
```

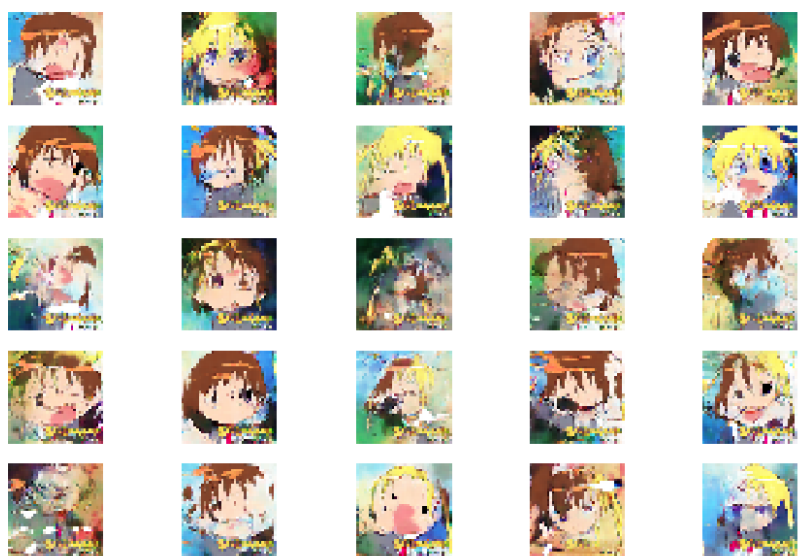
```
In [28]: for i in range(0,100000,5000):
         fn = 'images/gen_imgs/kill_me_%d.png' % i
         im = Image.open(fn)
         plt.figure(figsize=(20,20))
         plt.axis('off')
         plt.imshow(np.array(im))
         plt.show()
```







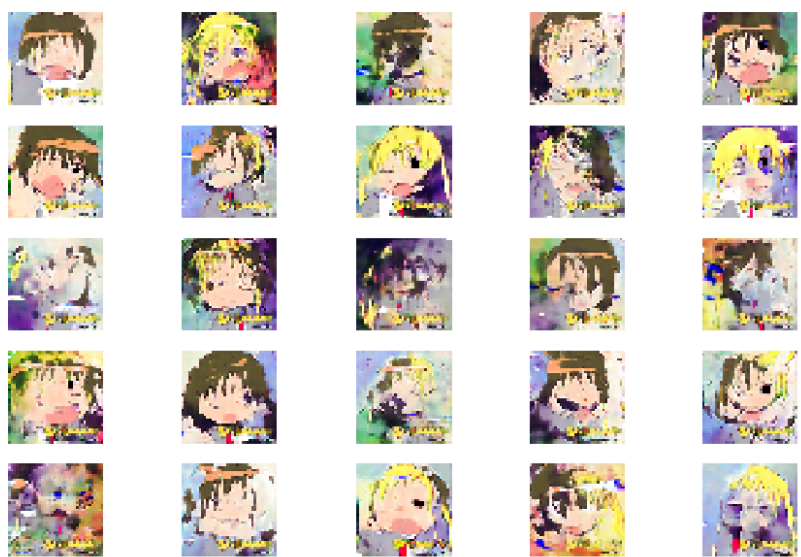














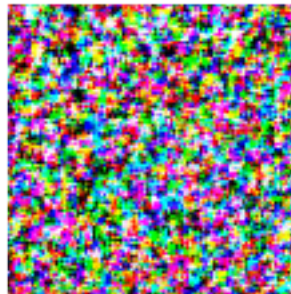


```
In [29]: !ls -l images/latent
```

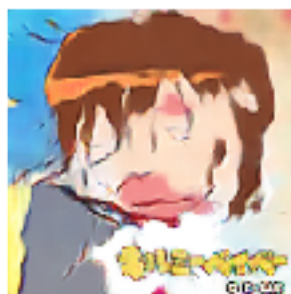
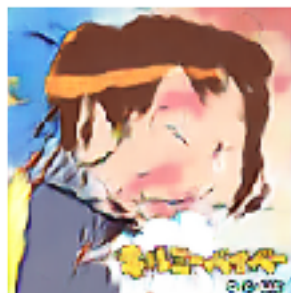
```
total 1020
-rw-r----- 1 gpuuser gpuuser 47997 Jan 31 12:33 latent_0.png
-rw-r----- 1 gpuuser gpuuser 32062 Jan 31 13:26 latent_10000.png
-rw-r----- 1 gpuuser gpuuser 37017 Jan 31 12:17 latent_100.png
-rw-r----- 1 gpuuser gpuuser 31564 Jan 31 13:52 latent_15000.png
-rw-r----- 1 gpuuser gpuuser 31005 Jan 31 14:18 latent_20000.png
-rw-r----- 1 gpuuser gpuuser 37223 Jan 31 12:17 latent_200.png
-rw-r----- 1 gpuuser gpuuser 32013 Jan 31 14:45 latent_25000.png
-rw-r----- 1 gpuuser gpuuser 31670 Jan 31 15:11 latent_30000.png
-rw-r----- 1 gpuuser gpuuser 37502 Jan 31 12:18 latent_300.png
-rw-r----- 1 gpuuser gpuuser 30873 Jan 31 15:37 latent_35000.png
-rw-r----- 1 gpuuser gpuuser 30192 Jan 31 16:04 latent_40000.png
-rw-r----- 1 gpuuser gpuuser 37139 Jan 31 12:18 latent_400.png
-rw-r----- 1 gpuuser gpuuser 30455 Jan 31 16:30 latent_45000.png
-rw-r----- 1 gpuuser gpuuser 29705 Jan 31 16:56 latent_50000.png
-rw-r----- 1 gpuuser gpuuser 34073 Jan 31 12:59 latent_5000.png
-rw-r----- 1 gpuuser gpuuser 37443 Jan 31 12:19 latent_500.png
-rw-r----- 1 gpuuser gpuuser 30150 Jan 31 17:22 latent_55000.png
-rw-r----- 1 gpuuser gpuuser 29896 Jan 31 17:48 latent_60000.png
-rw-r----- 1 gpuuser gpuuser 37614 Jan 31 12:19 latent_600.png
-rw-r----- 1 gpuuser gpuuser 30605 Jan 31 18:14 latent_65000.png
```

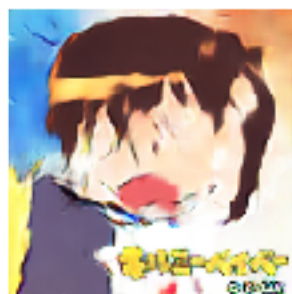
```
-rw-r----- 1 gpuuser gpuuser 30488 Jan 31 18:40 latent_70000.png
-rw-r----- 1 gpuuser gpuuser 37833 Jan 31 12:20 latent_700.png
-rw-r----- 1 gpuuser gpuuser 30220 Jan 31 19:06 latent_75000.png
-rw-r----- 1 gpuuser gpuuser 30196 Jan 31 19:32 latent_80000.png
-rw-r----- 1 gpuuser gpuuser 37773 Jan 31 12:20 latent_800.png
-rw-r----- 1 gpuuser gpuuser 29557 Jan 31 19:58 latent_85000.png
-rw-r----- 1 gpuuser gpuuser 30104 Jan 31 20:24 latent_90000.png
-rw-r----- 1 gpuuser gpuuser 36982 Jan 31 12:21 latent_900.png
-rw-r----- 1 gpuuser gpuuser 31366 Jan 31 20:50 latent_95000.png
```

```
In [30]: for i in range(0,100000,5000):
         fn = 'images/latent/latent_%d.png' % i
         im = Image.open(fn)
         plt.figure(figsize=(2,2))
         plt.axis('off')
         plt.imshow(np.array(im))
         plt.show()
```















```
In [31]: !ls -l ganmodels
```

```
total 1525864
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 12:33 dcgan-0-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 13:26 dcgan-10000-iter.h5
```

```

-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:17 dcgan-100-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 13:52 dcgan-15000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 14:18 dcgan-20000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:17 dcgan-200-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 14:45 dcgan-25000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 15:11 dcgan-30000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:18 dcgan-300-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 15:37 dcgan-35000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 16:04 dcgan-40000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:18 dcgan-400-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 16:30 dcgan-45000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 16:56 dcgan-50000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 12:59 dcgan-5000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:19 dcgan-500-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 17:22 dcgan-55000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 17:48 dcgan-60000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:19 dcgan-600-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 18:14 dcgan-65000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 18:40 dcgan-70000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:20 dcgan-700-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 19:06 dcgan-75000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 19:32 dcgan-80000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:20 dcgan-800-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 19:58 dcgan-85000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 20:24 dcgan-90000-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878208 Jan 31 12:21 dcgan-900-iter.h5
-rw-r----- 1 gpuuser gpuuser 53878192 Jan 31 20:50 dcgan-95000-iter.h5

```

In [32]: ! tar czvf gan-result.gz ganmodels images/latent images/gen_imgs

```

ganmodels/
ganmodels/dcgan-90000-iter.h5
ganmodels/dcgan-75000-iter.h5
ganmodels/dcgan-20000-iter.h5
ganmodels/dcgan-600-iter.h5
ganmodels/dcgan-100-iter.h5
ganmodels/dcgan-60000-iter.h5
ganmodels/dcgan-25000-iter.h5
ganmodels/dcgan-30000-iter.h5
ganmodels/dcgan-45000-iter.h5
ganmodels/dcgan-15000-iter.h5
ganmodels/dcgan-95000-iter.h5
ganmodels/dcgan-35000-iter.h5
ganmodels/dcgan-70000-iter.h5
ganmodels/dcgan-900-iter.h5
ganmodels/dcgan-0-iter.h5
ganmodels/dcgan-65000-iter.h5

```

ganmodels/dcgan-200-iter.h5
ganmodels/dcgan-40000-iter.h5
ganmodels/dcgan-10000-iter.h5
ganmodels/dcgan-50000-iter.h5
ganmodels/dcgan-80000-iter.h5
ganmodels/dcgan-800-iter.h5
ganmodels/dcgan-300-iter.h5
ganmodels/dcgan-500-iter.h5
ganmodels/dcgan-85000-iter.h5
ganmodels/dcgan-700-iter.h5
ganmodels/dcgan-55000-iter.h5
ganmodels/dcgan-5000-iter.h5
ganmodels/dcgan-400-iter.h5
images/latent/
images/latent/latent_55000.png
images/latent/latent_20000.png
images/latent/latent_60000.png
images/latent/latent_100.png
images/latent/latent_85000.png
images/latent/latent_700.png
images/latent/latent_90000.png
images/latent/latent_80000.png
images/latent/latent_900.png
images/latent/latent_0.png
images/latent/latent_70000.png
images/latent/latent_400.png
images/latent/latent_40000.png
images/latent/latent_300.png
images/latent/latent_500.png
images/latent/latent_5000.png
images/latent/latent_45000.png
images/latent/latent_95000.png
images/latent/latent_800.png
images/latent/latent_25000.png
images/latent/latent_30000.png
images/latent/latent_75000.png
images/latent/latent_200.png
images/latent/latent_65000.png
images/latent/latent_50000.png
images/latent/latent_10000.png
images/latent/latent_600.png
images/latent/latent_15000.png
images/latent/latent_35000.png
images/gen_imgs/
images/gen_imgs/kill_me_40000.png
images/gen_imgs/kill_me_70000.png
images/gen_imgs/kill_me_25000.png
images/gen_imgs/kill_me_80000.png

```
images/gen_imgs/kill_me_100.png
images/gen_imgs/kill_me_400.png
images/gen_imgs/kill_me_900.png
images/gen_imgs/kill_me_200.png
images/gen_imgs/kill_me_20000.png
images/gen_imgs/kill_me_85000.png
images/gen_imgs/kill_me_700.png
images/gen_imgs/kill_me_90000.png
images/gen_imgs/kill_me_800.png
images/gen_imgs/kill_me_65000.png
images/gen_imgs/kill_me_0.png
images/gen_imgs/kill_me_55000.png
images/gen_imgs/kill_me_10000.png
images/gen_imgs/kill_me_600.png
images/gen_imgs/kill_me_75000.png
images/gen_imgs/kill_me_95000.png
images/gen_imgs/kill_me_45000.png
images/gen_imgs/kill_me_50000.png
images/gen_imgs/kill_me_60000.png
images/gen_imgs/kill_me_30000.png
images/gen_imgs/kill_me_300.png
images/gen_imgs/kill_me_15000.png
images/gen_imgs/kill_me_35000.png
images/gen_imgs/kill_me_500.png
images/gen_imgs/kill_me_5000.png
```

```
In [33]: # @hidden_cell
# The following code contains the credentials for a file in your IBM Cloud Object Storage
# You might want to remove those credentials before you share your notebook.
credentials = {
    'IAM_SERVICE_ID': 'iam-ServiceId-4eb032a9-1fac-45f8-897b-e8d7b5e2e08a',
    'IBM_API_KEY_ID': 'wYCilYz7_ybxudQI1FNsSS2C6EpSqkwGxKaEAYMhj1b4',
    'ENDPOINT': 'https://s3-api.us-geo.objectstorage.service.networklayer.com',
    'IBM_AUTH_ENDPOINT': 'https://iam.bluemix.net/oidc/token',
    'BUCKET': 'gputest-donotdelete-pr-bfulih0ojdqt4',
    'FILE': 'zu3.pdf'
}
```

```
In [34]: from ibm_botocore.client import Config
import ibm_boto3

cos = ibm_boto3.client(service_name='s3',
    ibm_api_key_id=credentials['IBM_API_KEY_ID'],
    ibm_service_instance_id=credentials['IAM_SERVICE_ID'],
    ibm_auth_endpoint=credentials['IBM_AUTH_ENDPOINT'],
    config=Config(signature_version='oauth'),
    endpoint_url=credentials['ENDPOINT'])
```

```
In [35]: filename = 'gan-result.gz'
        cos.upload_file(Filename=filename,Bucket=credentials['BUCKET'],Key=filename)
```

```
In [ ]:
```