

```
In [1]: import numpy as np
import pandas as pd
import os
import time
import matplotlib.pyplot as plt

import torch
from torch import nn, optim
import torch.nn.functional as F
from torchvision import datasets, transforms
from torchvision.utils import save_image
from torch.utils.data import Dataset, DataLoader
from PIL import Image

from tqdm import tqdm_notebook as tqdm
```

Generator and Discriminator

```
In [2]: class Generator(nn.Module):
    def __init__(self, nz=128, channels=3):
        super(Generator, self).__init__()

        self.nz = nz
        self.channels = channels

        def convlayer(n_input, n_output, k_size=4, stride=2, padding=0):
            block = [
                nn.ConvTranspose2d(n_input, n_output, kernel_size=k_size, stride=stride),
                nn.BatchNorm2d(n_output),
                nn.ReLU(inplace=True),
            ]
            return block

        self.model = nn.Sequential(
            *convlayer(self.nz, 1024, 4, 1, 0), # Fully connected Layer via convolution
            *convlayer(1024, 512, 4, 2, 1),
            *convlayer(512, 256, 4, 2, 1),
            *convlayer(256, 128, 4, 2, 1),
            *convlayer(128, 64, 4, 2, 1),
            nn.ConvTranspose2d(64, self.channels, 3, 1, 1),
            nn.Tanh()
        )

    def forward(self, z):
        z = z.view(-1, self.nz, 1, 1)
        img = self.model(z)
        return img

class Discriminator(nn.Module):
    def __init__(self, channels=3):
        super(Discriminator, self).__init__()

        self.channels = channels
```

```

def convlayer(n_input, n_output, k_size=4, stride=2, padding=0, bn=False):
    block = [nn.Conv2d(n_input, n_output, kernel_size=k_size, stride=stride, padding=padding)]
    if bn:
        block.append(nn.BatchNorm2d(n_output))
    block.append(nn.LeakyReLU(0.2, inplace=True))
    return block

self.model = nn.Sequential(
    *convlayer(self.channels, 32, 4, 2, 1),
    *convlayer(32, 64, 4, 2, 1),
    *convlayer(64, 128, 4, 2, 1, bn=True),
    *convlayer(128, 256, 4, 2, 1, bn=True),
    nn.Conv2d(256, 1, 4, 1, 0, bias=False), # FC with Conv.
)

def forward(self, imgs):
    out = self.model(imgs)
    return out.view(-1, 1)

```

Parameters of GAN

```

In [3]: batch_size = 32
lr = 0.001
beta1 = 0.5
epochs = 300

real_label = 0.5
fake_label = 0
nz = 128

device = torch.device("cuda" if torch.cuda.is_available() else "cpu")

```

Data loader and Augmentations

```

In [4]: import shutil
shutil.unpack_archive("../input/all-dogs.zip", "/kaggle/working/")

```

```

In [5]: class DogDataset(Dataset):
    def __init__(self, img_dir, transform1=None, transform2=None):

        self.img_dir = img_dir
        self.img_names = os.listdir(img_dir)
        self.transform1 = transform1
        self.transform2 = transform2

        self.imgs = []
        for img_name in self.img_names:
            img = Image.open(os.path.join(img_dir, img_name))

            if self.transform1 is not None:
                img = self.transform1(img)

            self.imgs.append(img)

    def __getitem__(self, index):

```

```

    img = self.imgs[index]

    if self.transform2 is not None:
        img = self.transform2(img)

    return img

def __len__(self):
    return len(self.imgs)

```

```

In [6]: transform1 = transforms.Compose([transforms.Resize(64),
                                      transforms.CenterCrop(64)])

# Data augmentation and converting to tensors
random_transforms = [transforms.RandomRotation(degrees=5)]
transform2 = transforms.Compose([transforms.RandomHorizontalFlip(p=0.5),
                                transforms.RandomApply(random_transforms, p=0.3),
                                transforms.ToTensor(),
                                transforms.Normalize((0.5, 0.5, 0.5), (0.5, 0.5, 0.5))

train_dataset = DogDataset(img_dir='/kaggle/working/all-dogs/',
                           transform1=transform1,
                           transform2=transform2)

train_loader = DataLoader(dataset=train_dataset,
                          batch_size=batch_size,
                          shuffle=True,
                          num_workers=4)

imgs = next(iter(train_loader))
imgs = imgs.numpy().transpose(0, 2, 3, 1)

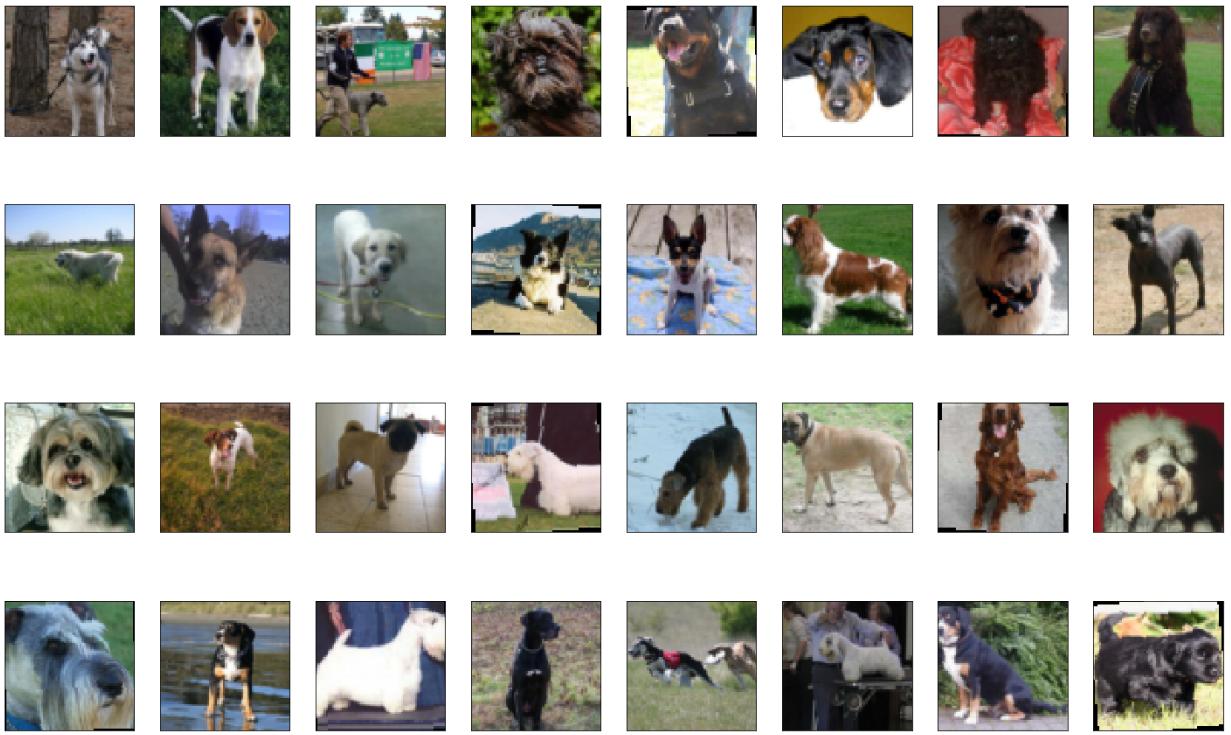
```

Let's see examples of training data

```

In [7]: fig = plt.figure(figsize=(25, 16))
for ii, img in enumerate(imgs):
    ax = fig.add_subplot(4, 8, ii + 1, xticks=[], yticks=[])
    plt.imshow((img+1)/2)

```



Initialize models and optimizers

```
In [8]: from torchvision.models import alexnet
netD = alexnet(pretrained=True)
netD.classifier = nn.Sequential(
    nn.Dropout(p=0.5, inplace=False),
    nn.Linear(in_features=9216, out_features=4096, bias=True),
    nn.ReLU(inplace=True),
    nn.Dropout(p=0.5, inplace=False),
    nn.Linear(in_features=4096, out_features=2048, bias=True),
    nn.ReLU(inplace=True),
    nn.Linear(in_features=2048, out_features=1, bias=True),
    nn.Sigmoid()
)
netD.to(device)
```

Downloading: "https://download.pytorch.org/models/alexnet-owt-4df8aa71.pth" to /root/.cache/torch/checkpoints/alexnet-owt-4df8aa71.pth
100%|██████████| 244418560/244418560 [00:01<00:00, 137674700.27it/s]

```
Out[8]: AlexNet(  
    (features): Sequential(  
        (0): Conv2d(3, 64, kernel_size=(11, 11), stride=(4, 4), padding=(2, 2))  
        (1): ReLU(inplace)  
        (2): MaxPool2d(kernel_size=3, stride=2, padding=0, dilation=1, ceil_mode=False)  
        (3): Conv2d(64, 192, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))  
        (4): ReLU(inplace)  
        (5): MaxPool2d(kernel_size=3, stride=2, padding=0, dilation=1, ceil_mode=False)  
        (6): Conv2d(192, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))  
        (7): ReLU(inplace)  
        (8): Conv2d(384, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))  
        (9): ReLU(inplace)  
        (10): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))  
        (11): ReLU(inplace)  
        (12): MaxPool2d(kernel_size=3, stride=2, padding=0, dilation=1, ceil_mode=False)  
    )  
    (avgpool): AdaptiveAvgPool2d(output_size=(6, 6))  
    (classifier): Sequential(  
        (0): Dropout(p=0.5)  
        (1): Linear(in_features=9216, out_features=4096, bias=True)  
        (2): ReLU(inplace)  
        (3): Dropout(p=0.5)  
        (4): Linear(in_features=4096, out_features=2048, bias=True)  
        (5): ReLU(inplace)  
        (6): Linear(in_features=2048, out_features=1, bias=True)  
        (7): Sigmoid()  
    )  
)
```

```
In [9]: for name, param in netD.named_parameters():  
    if param.requires_grad:  
        param.requires_grad = False
```

```
In [10]: for name, param in netD.classifier.named_parameters():  
    if ('4' in name) or ('6' in name):  
        param.requires_grad = True
```

```
In [11]: len([p for p in netD.parameters() if p.requires_grad])
```

```
Out[11]: 4
```

```
In [12]: netG = Generator(nz).to(device)  
netD = Discriminator().to(device)  
  
criterion = nn.BCELoss()  
  
non_frozen_parameters = [p for p in netD.parameters() if p.requires_grad]  
optimizerD = optim.Adam(non_frozen_parameters, lr=lr, betas=(beta1, 0.999))  
optimizerG = optim.Adam(netG.parameters(), lr=lr, betas=(beta1, 0.999))  
  
fixed_noise = torch.randn(25, nz, 1, 1, device=device)  
  
G_losses = []  
D_losses = []  
epoch_time = []
```

```
In [13]: def plot_loss (G_losses, D_losses, epoch):  
    plt.figure(figsize=(10,5))
```

```

plt.title("Generator and Discriminator Loss - EPOCH " + str(epoch))
plt.plot(G_losses, label="G")
plt.plot(D_losses, label="D")
plt.xlabel("iterations")
plt.ylabel("Loss")
plt.legend()
plt.show()

```

In [14]:

```

def show_generated_img(n_images=5):
    sample = []
    for _ in range(n_images):
        noise = torch.randn(1, nz, 1, 1, device=device)
        gen_image = netG(noise).to("cpu").clone().detach().squeeze(0)
        gen_image = gen_image.numpy().transpose(1, 2, 0)
        sample.append(gen_image)

    figure, axes = plt.subplots(1, len(sample), figsize = (64,64))
    for index, axis in enumerate(axes):
        axis.axis('off')
        image_array = sample[index]
        axis.imshow(image_array)

    plt.show()
    plt.close()

```

Training loop

In [15]:

```

for epoch in range(epochs):
    start = time.time()
    for ii, real_images in tqdm(enumerate(train_loader), total=len(train_loader)):
        #####
        # (1) Update D network
        #####
        netD.zero_grad()
        real_images = real_images.to(device)
        batch_size = real_images.size(0)
        labels = torch.full((batch_size, 1), real_label, device=device)
        outputR = netD(real_images)
        noise = torch.randn(batch_size, nz, 1, 1, device=device)
        fake = netG(noise)
        outputF = netD(fake.detach())
        errD = (torch.mean((outputR - torch.mean(outputF) - labels) ** 2) +
                torch.mean((outputF - torch.mean(outputR) + labels) ** 2))/2
        errD.backward(retain_graph=True)
        optimizerD.step()
        #####
        # (2) Update G network
        #####
        netG.zero_grad()
        outputF = netD(fake)
        errG = (torch.mean((outputR - torch.mean(outputF) + labels) ** 2) +
                torch.mean((outputF - torch.mean(outputR) - labels) ** 2))/2
        errG.backward()
        optimizerG.step()

    # Save Losses for plotting later
    G_losses.append(errG.item())

```

```

        D_losses.append(errD.item())

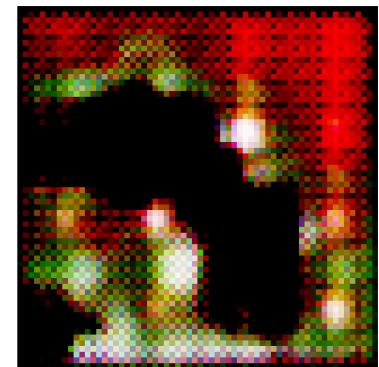
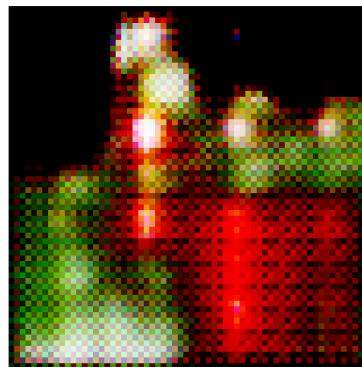
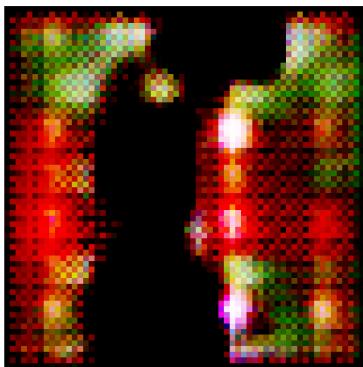
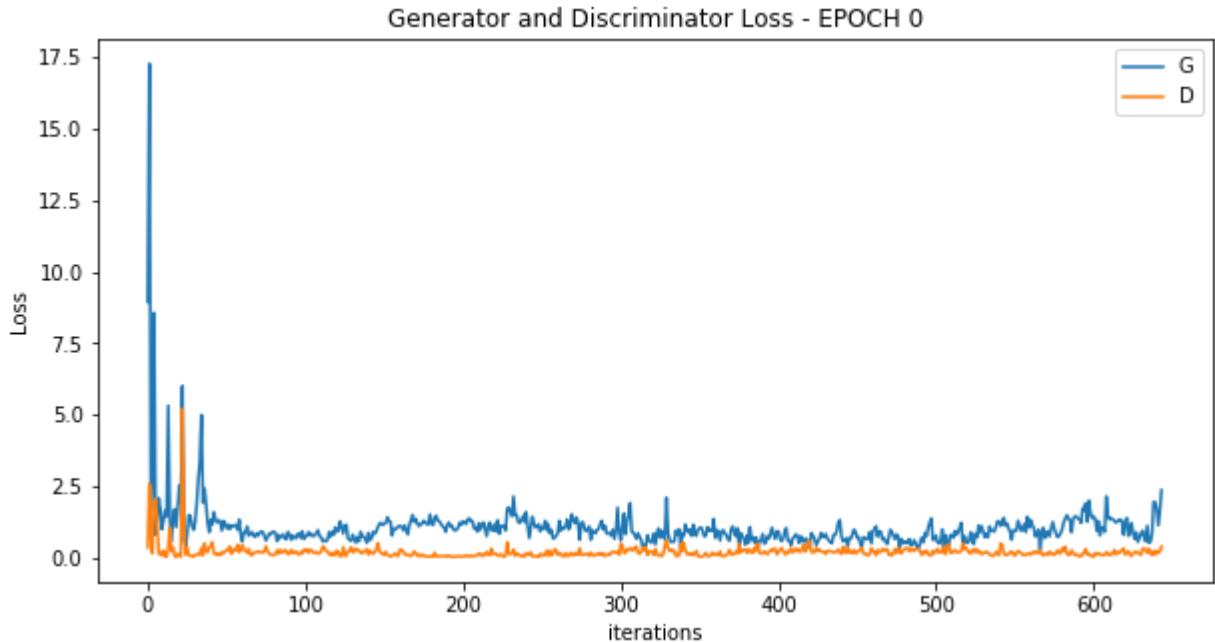
        if (ii+1) % (len(train_loader)//2) == 0:
            print('[%d/%d][%d/%d] Loss_D: %.4f Loss_G: %.4f'
                  % (epoch + 1, epochs, ii+1, len(train_loader),
                     errD.item(), errG.item()))

#     G_Losses = []
#     D_Losses = []
if epoch % 10 == 0:
    plot_loss (G_losses, D_losses, epoch)
    show_generated_img(3)

epoch_time.append(time.time() - start)

```

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
[1/300][322/644] Loss_D: 0.0865 Loss_G: 0.8318
[1/300][644/644] Loss_D: 0.3784 Loss_G: 2.3523



HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
[2/300][322/644] Loss_D: 0.0773 Loss_G: 0.7869
[2/300][644/644] Loss_D: 0.0811 Loss_G: 2.5850

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
[3/300][322/644] Loss_D: 0.1107 Loss_G: 1.0700
[3/300][644/644] Loss_D: 0.1709 Loss_G: 3.9276

```

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[4/300][322/644] Loss_D: 0.1969 Loss_G: 1.4354
[4/300][644/644] Loss_D: 0.2896 Loss_G: 4.3791

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[5/300][322/644] Loss_D: 0.1539 Loss_G: 0.8389
[5/300][644/644] Loss_D: 0.1433 Loss_G: 1.6647

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[6/300][322/644] Loss_D: 0.1432 Loss_G: 1.0331
[6/300][644/644] Loss_D: 0.1114 Loss_G: 2.0730

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[7/300][322/644] Loss_D: 0.2098 Loss_G: 0.6404
[7/300][644/644] Loss_D: 0.5850 Loss_G: 2.0891

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[8/300][322/644] Loss_D: 0.3013 Loss_G: 0.6910
[8/300][644/644] Loss_D: 0.2747 Loss_G: 2.7571

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[9/300][322/644] Loss_D: 0.0863 Loss_G: 0.8031
[9/300][644/644] Loss_D: 0.0353 Loss_G: 2.0550

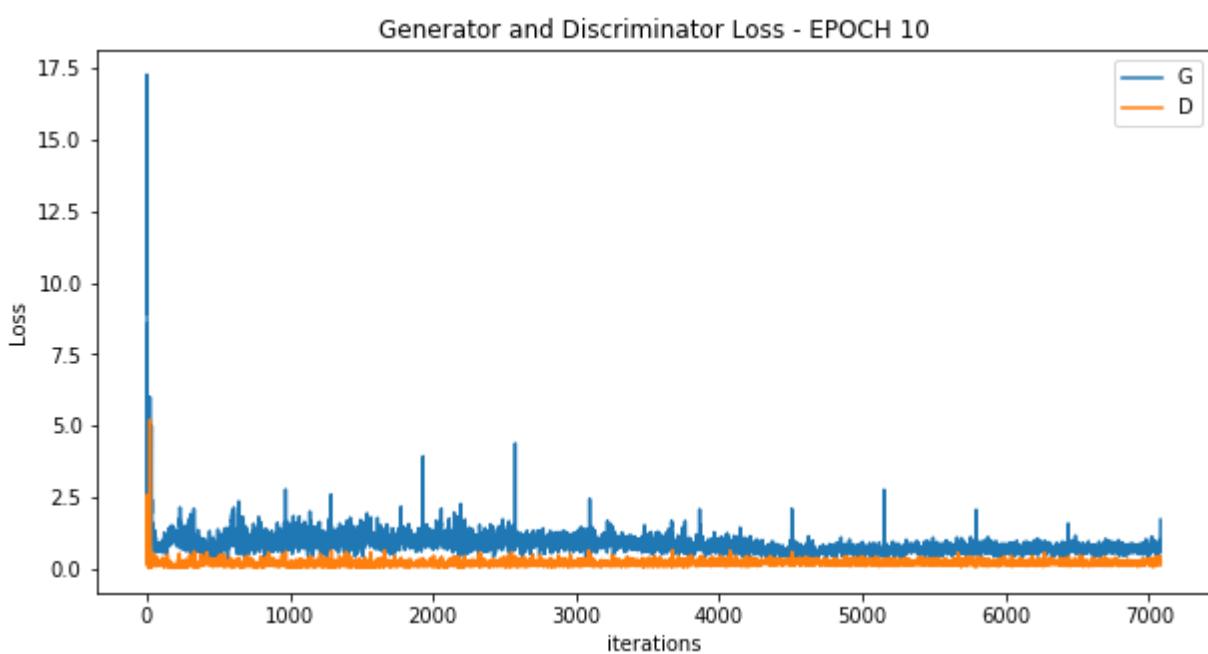
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[10/300][322/644] Loss_D: 0.1758 Loss_G: 0.6611
[10/300][644/644] Loss_D: 0.3233 Loss_G: 1.5816

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[11/300][322/644] Loss_D: 0.2949 Loss_G: 0.7205
[11/300][644/644] Loss_D: 0.1236 Loss_G: 1.7061

```





```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[12/300][322/644] Loss_D: 0.1764 Loss_G: 0.7855  
[12/300][644/644] Loss_D: 0.0779 Loss_G: 0.9288
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[13/300][322/644] Loss_D: 0.3657 Loss_G: 0.4183  
[13/300][644/644] Loss_D: 0.0335 Loss_G: 1.0718
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[14/300][322/644] Loss_D: 0.1392 Loss_G: 0.7429  
[14/300][644/644] Loss_D: 0.1992 Loss_G: 3.0701
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[15/300][322/644] Loss_D: 0.1439 Loss_G: 0.7724  
[15/300][644/644] Loss_D: 0.3162 Loss_G: 4.1956
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[16/300][322/644] Loss_D: 0.1989 Loss_G: 0.8107  
[16/300][644/644] Loss_D: 0.0994 Loss_G: 2.3438
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[17/300][322/644] Loss_D: 0.1420 Loss_G: 0.6699  
[17/300][644/644] Loss_D: 0.4201 Loss_G: 4.1960
```

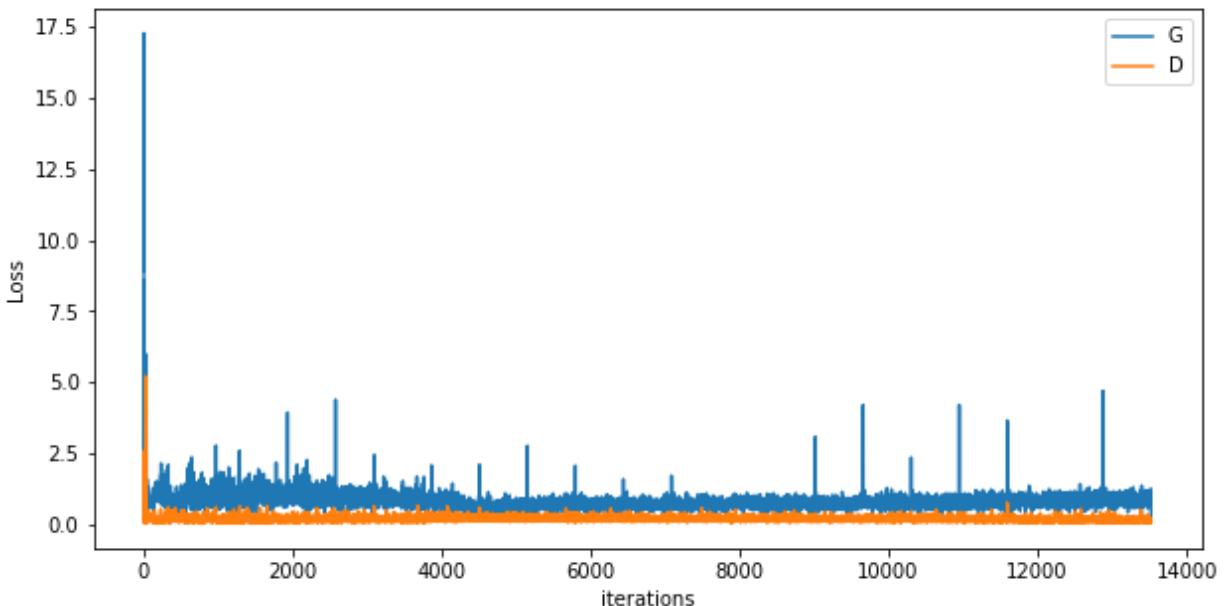
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[18/300][322/644] Loss_D: 0.0409 Loss_G: 1.1474  
[18/300][644/644] Loss_D: 0.7548 Loss_G: 3.6518
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[19/300][322/644] Loss_D: 0.3164 Loss_G: 0.5736  
[19/300][644/644] Loss_D: 0.2720 Loss_G: 0.4388
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[20/300][322/644] Loss_D: 0.2124 Loss_G: 0.6729  
[20/300][644/644] Loss_D: 0.3459 Loss_G: 4.6905
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[21/300][322/644] Loss_D: 0.1371 Loss_G: 1.0437  
[21/300][644/644] Loss_D: 0.1104 Loss_G: 0.2291
```

Generator and Discriminator Loss - EPOCH 20



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[22/300][322/644] Loss_D: 0.1096 Loss_G: 0.8685  
[22/300][644/644] Loss_D: 0.3906 Loss_G: 1.6549
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[23/300][322/644] Loss_D: 0.0973 Loss_G: 0.8128  
[23/300][644/644] Loss_D: 0.0144 Loss_G: 1.7050
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[24/300][322/644] Loss_D: 0.1057 Loss_G: 0.9556  
[24/300][644/644] Loss_D: 0.0431 Loss_G: 0.8651
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[25/300][322/644] Loss_D: 0.0835 Loss_G: 0.9402  
[25/300][644/644] Loss_D: 0.4364 Loss_G: 6.4336
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[26/300][322/644] Loss_D: 0.1182 Loss_G: 0.7811  
[26/300][644/644] Loss_D: 0.2275 Loss_G: 5.3998
```

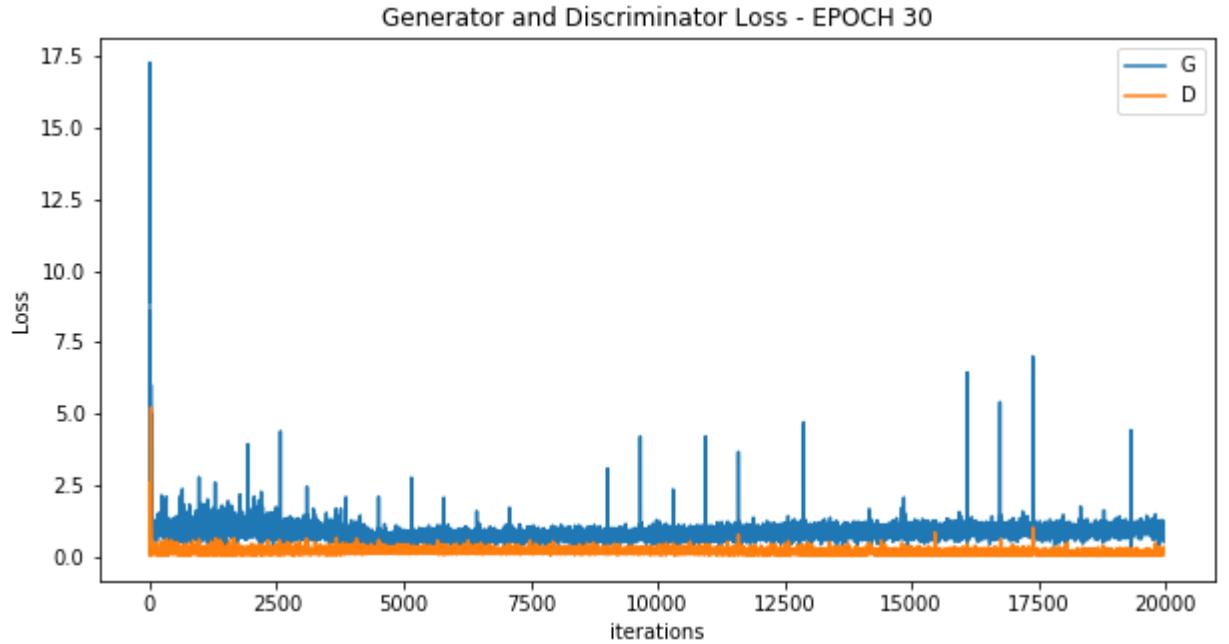
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[27/300][322/644] Loss_D: 0.1550 Loss_G: 0.8910  
[27/300][644/644] Loss_D: 1.0144 Loss_G: 7.0009
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[28/300][322/644] Loss_D: 0.0583 Loss_G: 0.9471  
[28/300][644/644] Loss_D: 0.2765 Loss_G: 0.6848
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[29/300][322/644] Loss_D: 0.1104 Loss_G: 1.2785  
[29/300][644/644] Loss_D: 0.0069 Loss_G: 1.0449
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[30/300][322/644] Loss_D: 0.1769 Loss_G: 0.9307  
[30/300][644/644] Loss_D: 0.1392 Loss_G: 4.4186
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[31/300][322/644] Loss_D: 0.0640 Loss_G: 1.1146  
[31/300][644/644] Loss_D: 0.3160 Loss_G: 0.4987
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[32/300][322/644] Loss_D: 0.0845 Loss_G: 1.0463  
[32/300][644/644] Loss_D: 0.0551 Loss_G: 0.6766
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[33/300][322/644] Loss_D: 0.1003 Loss_G: 1.0458  
[33/300][644/644] Loss_D: 0.1208 Loss_G: 0.0869
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[34/300][322/644] Loss_D: 0.0747 Loss_G: 0.8010  
[34/300][644/644] Loss_D: 0.1729 Loss_G: 4.7130
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[35/300][322/644] Loss_D: 0.0902 Loss_G: 0.7774  
[35/300][644/644] Loss_D: 0.0870 Loss_G: 0.1018
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[36/300][322/644] Loss_D: 0.1086 Loss_G: 0.8330  
[36/300][644/644] Loss_D: 0.1361 Loss_G: 0.1458
```

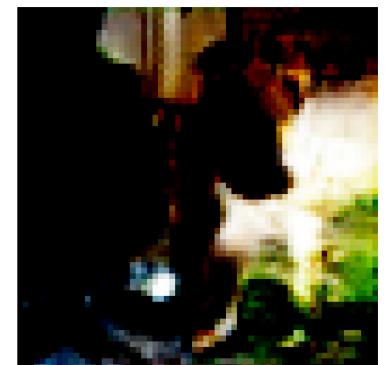
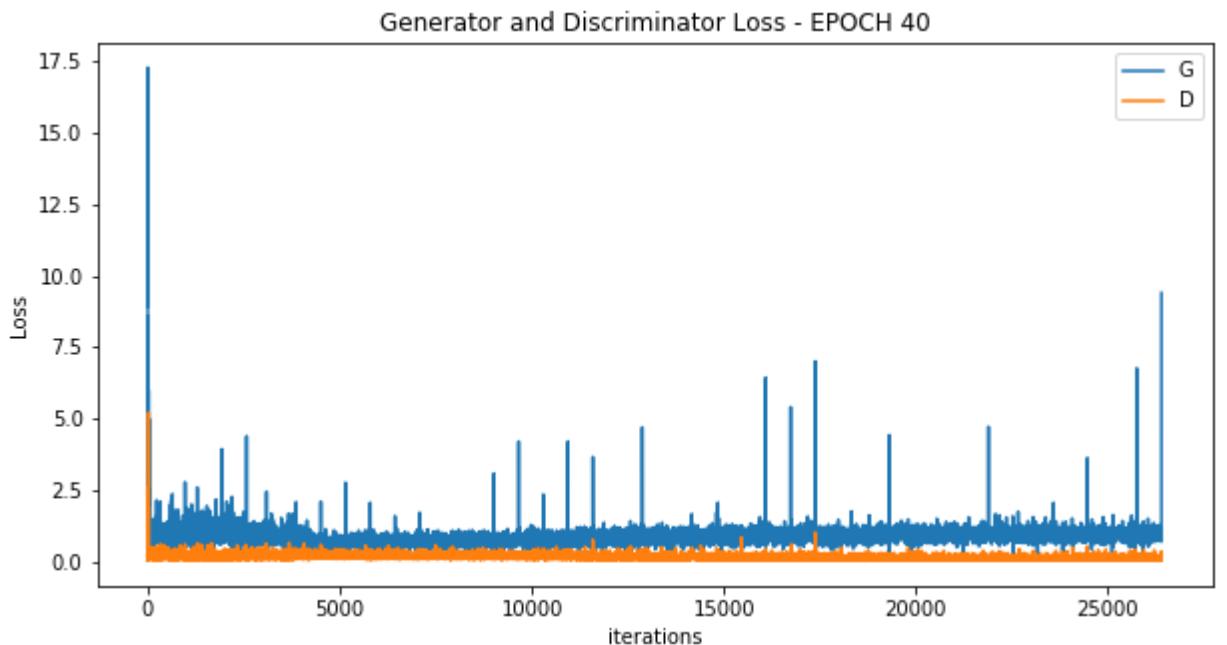
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[37/300][322/644] Loss_D: 0.0621 Loss_G: 1.1019  
[37/300][644/644] Loss_D: 0.0459 Loss_G: 0.0365
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[38/300][322/644] Loss_D: 0.1693 Loss_G: 0.9044  
[38/300][644/644] Loss_D: 0.2423 Loss_G: 3.6179
```

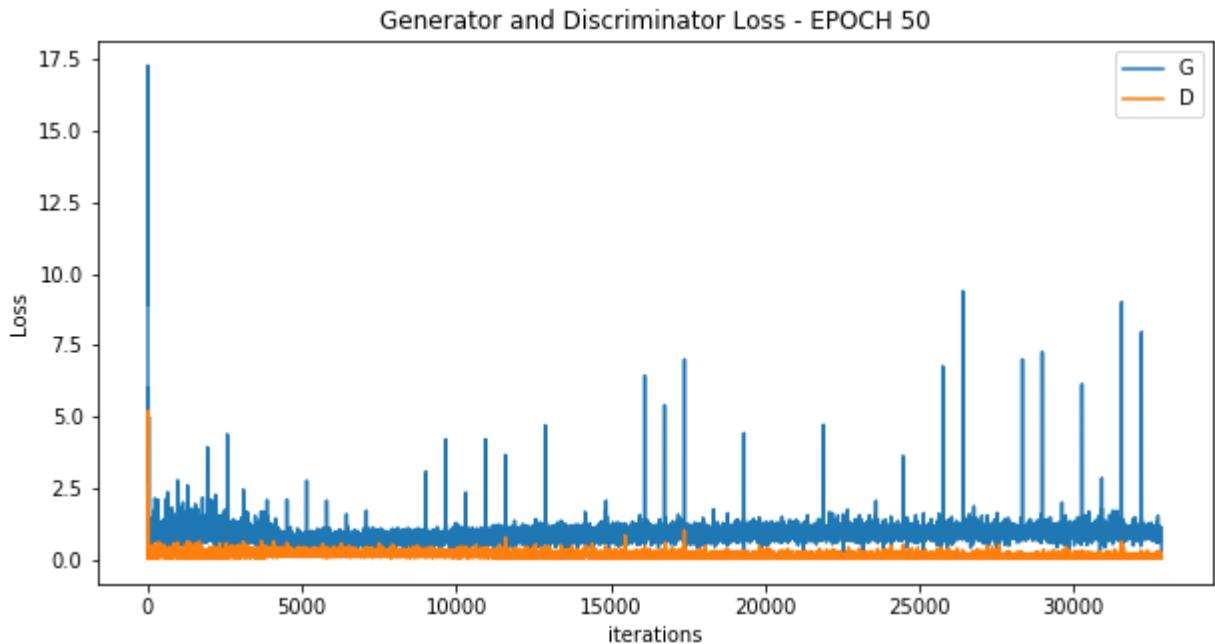
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[39/300][322/644] Loss_D: 0.0843 Loss_G: 0.9662  
[39/300][644/644] Loss_D: 0.0905 Loss_G: 0.2056
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[40/300][322/644] Loss_D: 0.0449 Loss_G: 1.0493  
[40/300][644/644] Loss_D: 0.2305 Loss_G: 6.7583
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[41/300][322/644] Loss_D: 0.0912 Loss_G: 0.8334  
[41/300][644/644] Loss_D: 0.3065 Loss_G: 9.3911
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[42/300][322/644] Loss_D: 0.0595 Loss_G: 0.9844  
[42/300][644/644] Loss_D: 0.0167 Loss_G: 0.8600  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[43/300][322/644] Loss_D: 0.0974 Loss_G: 0.9048  
[43/300][644/644] Loss_D: 0.0537 Loss_G: 1.1962  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[44/300][322/644] Loss_D: 0.0695 Loss_G: 0.9164  
[44/300][644/644] Loss_D: 0.2411 Loss_G: 7.0030  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[45/300][322/644] Loss_D: 0.1229 Loss_G: 0.7846  
[45/300][644/644] Loss_D: 0.1793 Loss_G: 7.2535  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[46/300][322/644] Loss_D: 0.0407 Loss_G: 1.0577  
[46/300][644/644] Loss_D: 0.1483 Loss_G: 0.6525  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[47/300][322/644] Loss_D: 0.1705 Loss_G: 0.8492  
[47/300][644/644] Loss_D: 0.1704 Loss_G: 6.1333  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[48/300][322/644] Loss_D: 0.0831 Loss_G: 0.8684  
[48/300][644/644] Loss_D: 0.1763 Loss_G: 2.8449  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[49/300][322/644] Loss_D: 0.0862 Loss_G: 0.8707  
[49/300][644/644] Loss_D: 0.6319 Loss_G: 9.0059  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[50/300][322/644] Loss_D: 0.0426 Loss_G: 0.9765  
[50/300][644/644] Loss_D: 0.2539 Loss_G: 7.9529  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[51/300][322/644] Loss_D: 0.0815 Loss_G: 0.9082  
[51/300][644/644] Loss_D: 0.0663 Loss_G: 0.2952
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[52/300][322/644] Loss_D: 0.0350 Loss_G: 1.0377  
[52/300][644/644] Loss_D: 0.3931 Loss_G: 9.6171
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[53/300][322/644] Loss_D: 0.0954 Loss_G: 0.9064  
[53/300][644/644] Loss_D: 0.0154 Loss_G: 0.5252
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[54/300][322/644] Loss_D: 0.0470 Loss_G: 1.1327  
[54/300][644/644] Loss_D: 0.0356 Loss_G: 2.0316
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[55/300][322/644] Loss_D: 0.0716 Loss_G: 0.9163  
[55/300][644/644] Loss_D: 0.1478 Loss_G: 3.0039
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[56/300][322/644] Loss_D: 0.0579 Loss_G: 0.8642  
[56/300][644/644] Loss_D: 0.1085 Loss_G: 2.7950
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[57/300][322/644] Loss_D: 0.0405 Loss_G: 1.0914  
[57/300][644/644] Loss_D: 0.0734 Loss_G: 0.2083
```

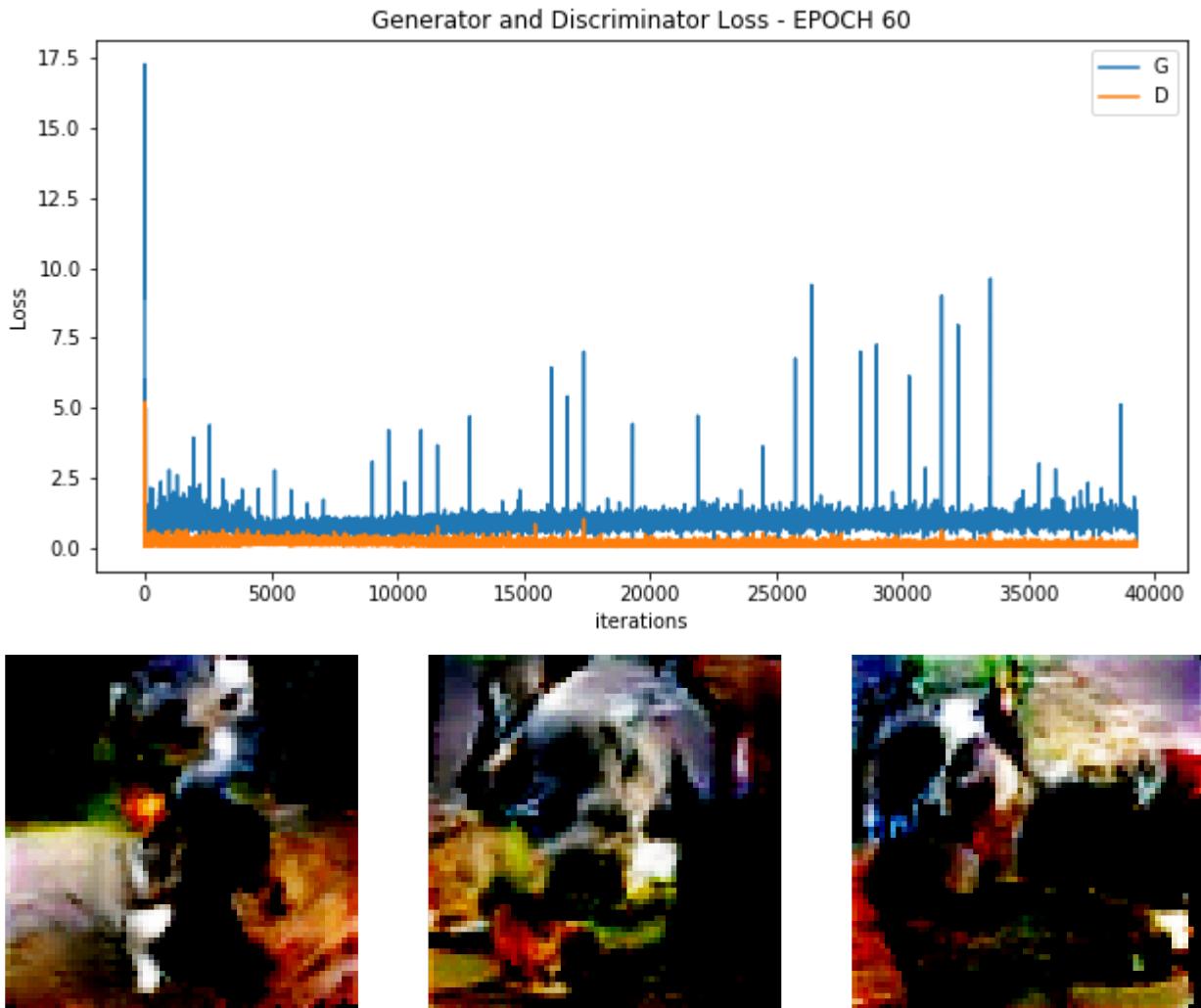
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[58/300][322/644] Loss_D: 0.0456 Loss_G: 1.1016  
[58/300][644/644] Loss_D: 0.0239 Loss_G: 2.3178
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[59/300][322/644] Loss_D: 0.0435 Loss_G: 1.0945  
[59/300][644/644] Loss_D: 0.1009 Loss_G: 1.2520
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[60/300][322/644] Loss_D: 0.0899 Loss_G: 0.8841  
[60/300][644/644] Loss_D: 0.0985 Loss_G: 5.1157
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[61/300][322/644] Loss_D: 0.0583 Loss_G: 1.0818  
[61/300][644/644] Loss_D: 0.0230 Loss_G: 0.1554
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[62/300][322/644] Loss_D: 0.0296 Loss_G: 0.9686  
[62/300][644/644] Loss_D: 0.0435 Loss_G: 2.5706
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[63/300][322/644] Loss_D: 0.0408 Loss_G: 1.1516  
[63/300][644/644] Loss_D: 0.0226 Loss_G: 0.8153
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[64/300][322/644] Loss_D: 0.1121 Loss_G: 0.8431  
[64/300][644/644] Loss_D: 0.4758 Loss_G: 8.2460
```

```

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[65/300][322/644] Loss_D: 0.0429 Loss_G: 0.8706
[65/300][644/644] Loss_D: 0.1154 Loss_G: 6.3117

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[66/300][322/644] Loss_D: 0.1722 Loss_G: 0.5375
[66/300][644/644] Loss_D: 0.3843 Loss_G: 16.2222

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[67/300][322/644] Loss_D: 0.0556 Loss_G: 1.3073
[67/300][644/644] Loss_D: 0.2422 Loss_G: 8.0944

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[68/300][322/644] Loss_D: 0.0394 Loss_G: 0.9434
[68/300][644/644] Loss_D: 0.4245 Loss_G: 13.0597

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[69/300][322/644] Loss_D: 0.0438 Loss_G: 1.0781
[69/300][644/644] Loss_D: 0.0711 Loss_G: 0.0882

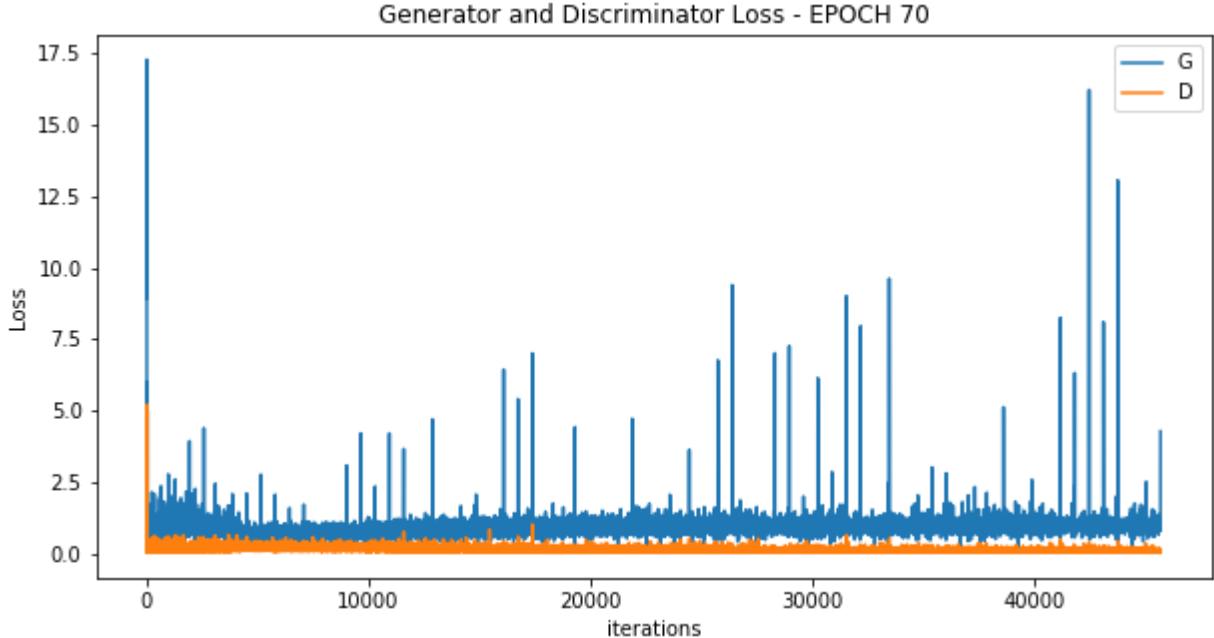
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[70/300][322/644] Loss_D: 0.0685 Loss_G: 1.1693
[70/300][644/644] Loss_D: 0.0232 Loss_G: 2.5003

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[71/300][322/644] Loss_D: 0.0370 Loss_G: 1.0164
[71/300][644/644] Loss_D: 0.1047 Loss_G: 4.2674

```





```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[72/300][322/644] Loss_D: 0.0491 Loss_G: 1.0198  
[72/300][644/644] Loss_D: 0.0630 Loss_G: 0.1066
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[73/300][322/644] Loss_D: 0.0346 Loss_G: 1.0154  
[73/300][644/644] Loss_D: 0.0839 Loss_G: 0.1222
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[74/300][322/644] Loss_D: 0.0439 Loss_G: 1.1445  
[74/300][644/644] Loss_D: 0.1197 Loss_G: 8.4250
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[75/300][322/644] Loss_D: 0.0350 Loss_G: 1.0780  
[75/300][644/644] Loss_D: 0.2430 Loss_G: 10.0354
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[76/300][322/644] Loss_D: 0.0730 Loss_G: 0.9322  
[76/300][644/644] Loss_D: 0.0440 Loss_G: 0.4131
```

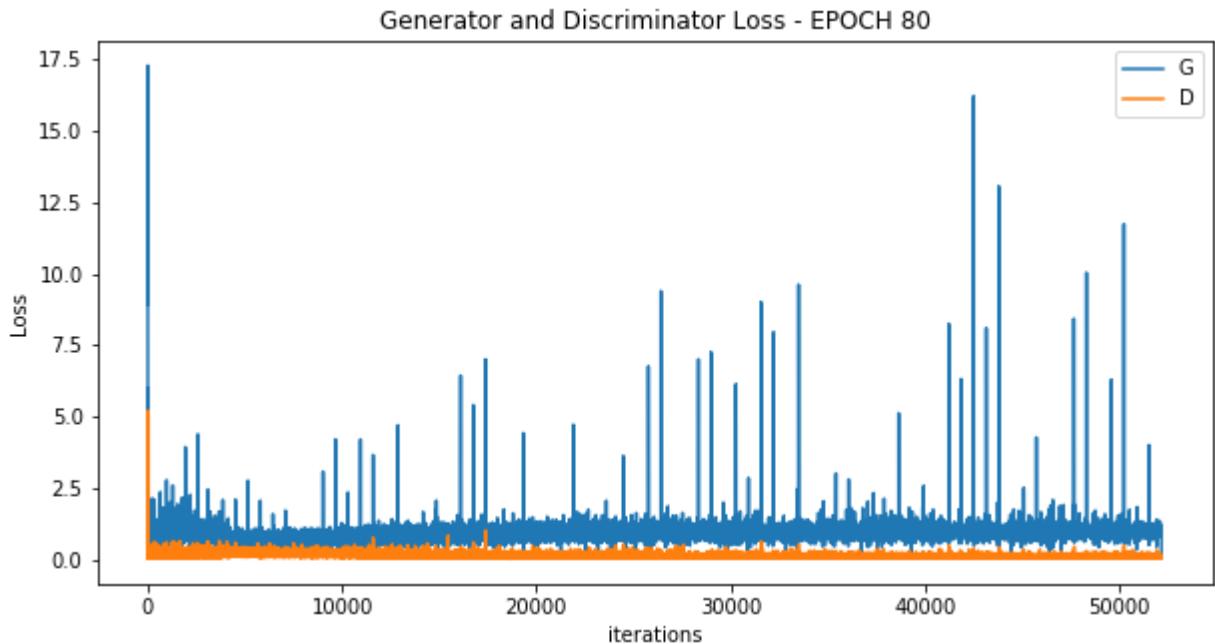
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[77/300][322/644] Loss_D: 0.0488 Loss_G: 1.0010  
[77/300][644/644] Loss_D: 0.1381 Loss_G: 6.2884
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[78/300][322/644] Loss_D: 0.0301 Loss_G: 1.0279  
[78/300][644/644] Loss_D: 0.4792 Loss_G: 11.7344
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[79/300][322/644] Loss_D: 0.0980 Loss_G: 0.9897  
[79/300][644/644] Loss_D: 0.1201 Loss_G: 0.3234
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[80/300][322/644] Loss_D: 0.0294 Loss_G: 1.0021  
[80/300][644/644] Loss_D: 0.2578 Loss_G: 3.9997
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[81/300][322/644] Loss_D: 0.0509 Loss_G: 1.1574  
[81/300][644/644] Loss_D: 0.0945 Loss_G: 0.1029
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[82/300][322/644] Loss_D: 0.0497 Loss_G: 0.9004  
[82/300][644/644] Loss_D: 0.1676 Loss_G: 4.9623
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[83/300][322/644] Loss_D: 0.0257 Loss_G: 1.0554  
[83/300][644/644] Loss_D: 0.1155 Loss_G: 0.7908
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[84/300][322/644] Loss_D: 0.0441 Loss_G: 1.0012  
[84/300][644/644] Loss_D: 0.0492 Loss_G: 0.0237
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[85/300][322/644] Loss_D: 0.0419 Loss_G: 1.1668  
[85/300][644/644] Loss_D: 0.4515 Loss_G: 8.7085
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[86/300][322/644] Loss_D: 0.0406 Loss_G: 0.9623  
[86/300][644/644] Loss_D: 0.0041 Loss_G: 1.8143
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[87/300][322/644] Loss_D: 0.0976 Loss_G: 0.9873  
[87/300][644/644] Loss_D: 0.1073 Loss_G: 0.3834
```

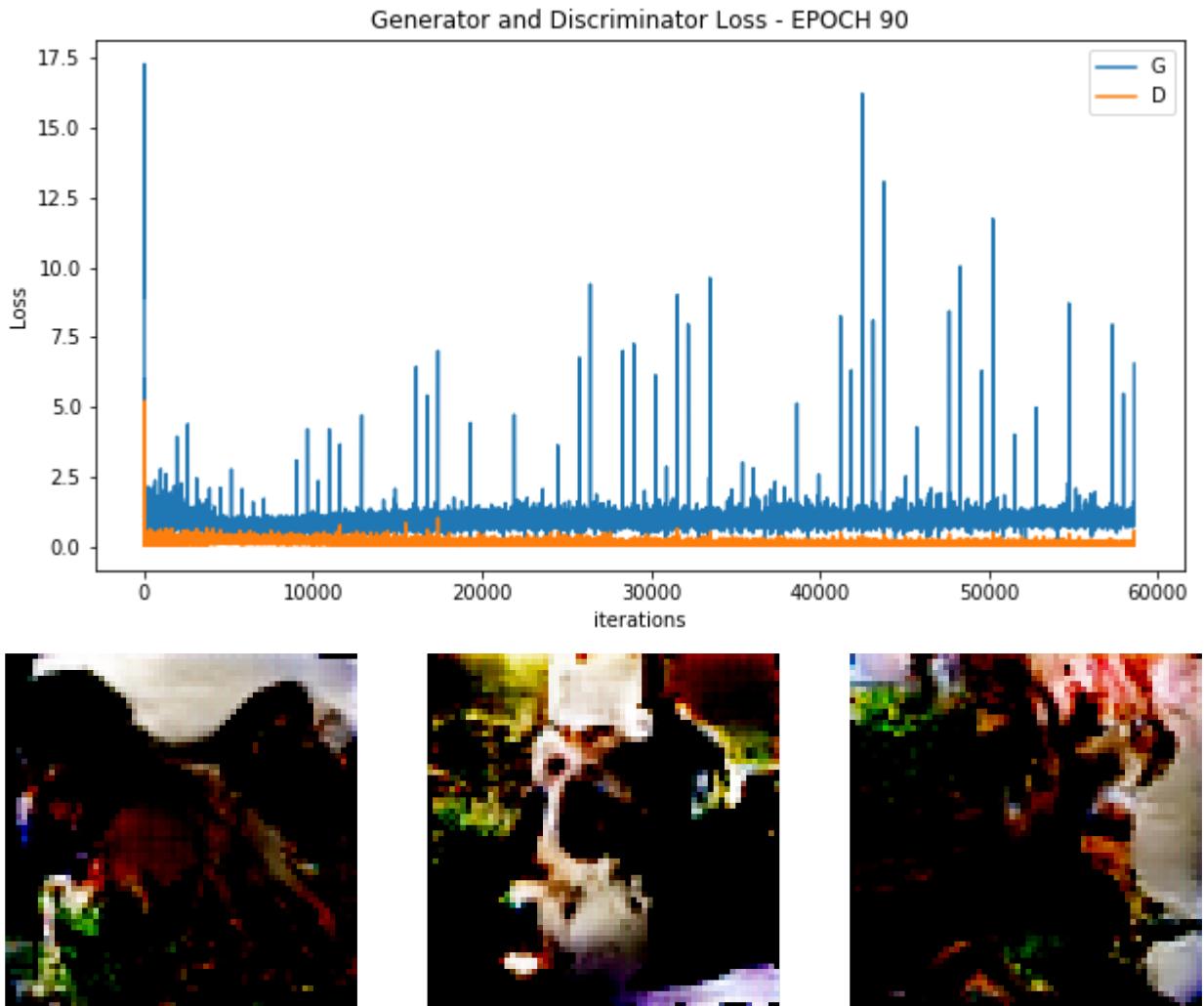
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[88/300][322/644] Loss_D: 0.0632 Loss_G: 1.1131  
[88/300][644/644] Loss_D: 0.1717 Loss_G: 0.9297
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[89/300][322/644] Loss_D: 0.0546 Loss_G: 1.1326  
[89/300][644/644] Loss_D: 0.2032 Loss_G: 7.9468
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[90/300][322/644] Loss_D: 0.0577 Loss_G: 0.8750  
[90/300][644/644] Loss_D: 0.0733 Loss_G: 5.4661
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[91/300][322/644] Loss_D: 0.0624 Loss_G: 1.0182  
[91/300][644/644] Loss_D: 0.5214 Loss_G: 6.5364
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[92/300][322/644] Loss_D: 0.1168 Loss_G: 1.0663  
[92/300][644/644] Loss_D: 0.0222 Loss_G: 0.9856
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[93/300][322/644] Loss_D: 0.0400 Loss_G: 0.9728  
[93/300][644/644] Loss_D: 0.3428 Loss_G: 2.0350
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[94/300][322/644] Loss_D: 0.0880 Loss_G: 0.8922  
[94/300][644/644] Loss_D: 0.0050 Loss_G: 1.8859
```

```

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[95/300][322/644] Loss_D: 0.0424 Loss_G: 0.9333
[95/300][644/644] Loss_D: 0.2381 Loss_G: 7.6454

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[96/300][322/644] Loss_D: 0.0357 Loss_G: 1.0371
[96/300][644/644] Loss_D: 0.0232 Loss_G: 3.5456

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[97/300][322/644] Loss_D: 0.0866 Loss_G: 1.0376
[97/300][644/644] Loss_D: 0.7012 Loss_G: 3.1285

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[98/300][322/644] Loss_D: 0.0665 Loss_G: 0.9895
[98/300][644/644] Loss_D: 0.0239 Loss_G: 0.5642

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[99/300][322/644] Loss_D: 0.0314 Loss_G: 1.0389
[99/300][644/644] Loss_D: 0.0815 Loss_G: 5.1946

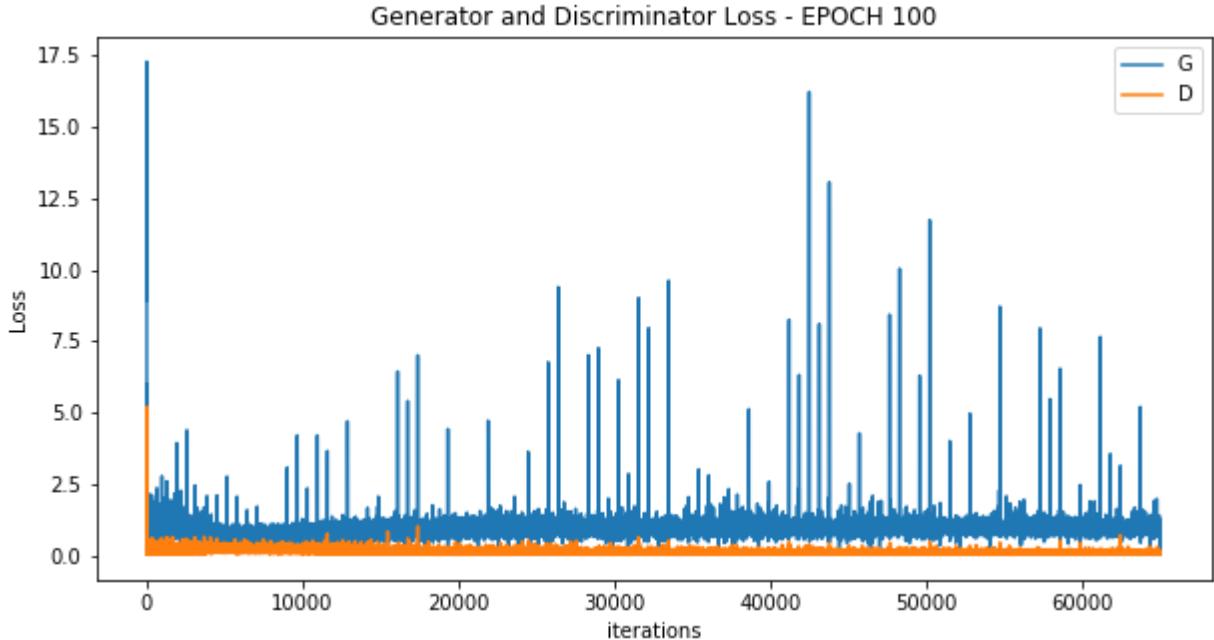
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[100/300][322/644] Loss_D: 0.0408 Loss_G: 1.0280
[100/300][644/644] Loss_D: 0.0428 Loss_G: 0.1243

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[101/300][322/644] Loss_D: 0.0303 Loss_G: 1.0852
[101/300][644/644] Loss_D: 0.0628 Loss_G: 0.1492

```





```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[102/300][322/644] Loss_D: 0.0333 Loss_G: 0.9895  
[102/300][644/644] Loss_D: 0.0962 Loss_G: 6.9944
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[103/300][322/644] Loss_D: 0.1132 Loss_G: 0.7274  
[103/300][644/644] Loss_D: 0.2910 Loss_G: 9.0801
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[104/300][322/644] Loss_D: 0.1005 Loss_G: 1.1200  
[104/300][644/644] Loss_D: 0.0382 Loss_G: 3.7890
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[105/300][322/644] Loss_D: 0.0626 Loss_G: 1.0898  
[105/300][644/644] Loss_D: 0.0534 Loss_G: 2.0381
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[106/300][322/644] Loss_D: 0.0431 Loss_G: 1.0090  
[106/300][644/644] Loss_D: 0.0724 Loss_G: 0.3046
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[107/300][322/644] Loss_D: 0.0628 Loss_G: 1.0239  
[107/300][644/644] Loss_D: 0.0326 Loss_G: 0.5601
```

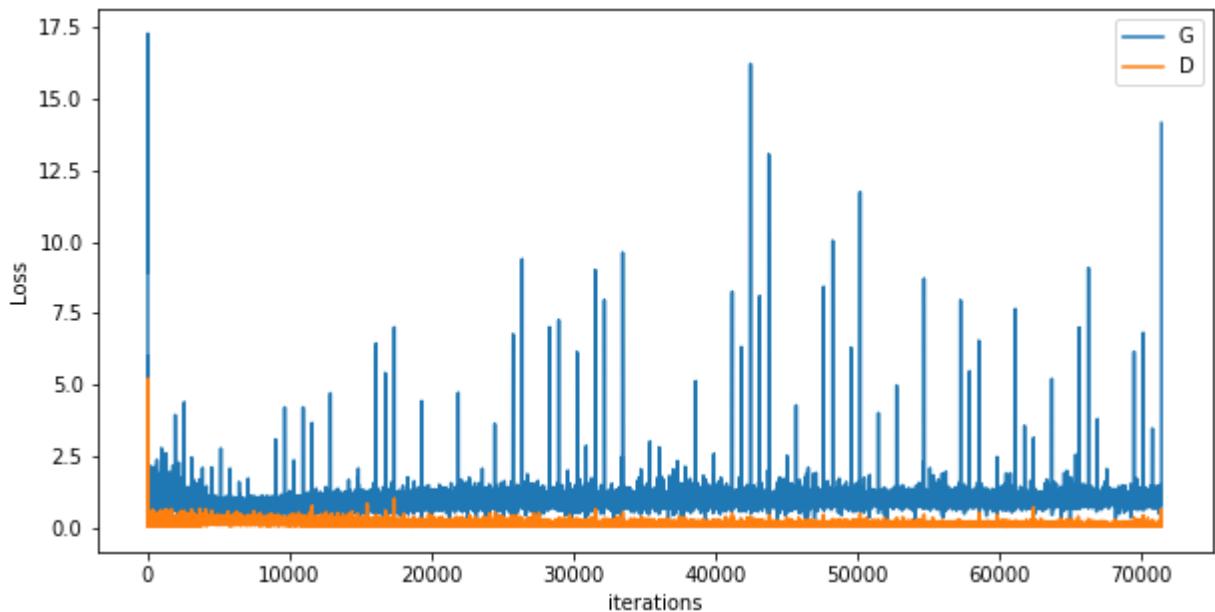
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[108/300][322/644] Loss_D: 0.0538 Loss_G: 1.0064  
[108/300][644/644] Loss_D: 0.2525 Loss_G: 6.1441
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[109/300][322/644] Loss_D: 0.0546 Loss_G: 1.0917  
[109/300][644/644] Loss_D: 0.4126 Loss_G: 6.8101
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[110/300][322/644] Loss_D: 0.0457 Loss_G: 0.8661  
[110/300][644/644] Loss_D: 0.0589 Loss_G: 3.4588
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[111/300][322/644] Loss_D: 0.0270 Loss_G: 1.1048  
[111/300][644/644] Loss_D: 0.6071 Loss_G: 14.1458
```

Generator and Discriminator Loss - EPOCH 110



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[112/300][322/644] Loss_D: 0.0269 Loss_G: 0.9270  
[112/300][644/644] Loss_D: 0.1924 Loss_G: 7.0391
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[113/300][322/644] Loss_D: 0.0367 Loss_G: 0.9449  
[113/300][644/644] Loss_D: 0.0805 Loss_G: 0.2707
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[114/300][322/644] Loss_D: 0.0302 Loss_G: 0.9822  
[114/300][644/644] Loss_D: 0.0502 Loss_G: 4.0243
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[115/300][322/644] Loss_D: 0.0320 Loss_G: 1.0462  
[115/300][644/644] Loss_D: 0.1188 Loss_G: 1.9130
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[116/300][322/644] Loss_D: 0.0740 Loss_G: 1.0094  
[116/300][644/644] Loss_D: 0.0492 Loss_G: 4.1975
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[117/300][322/644] Loss_D: 0.0244 Loss_G: 1.1057  
[117/300][644/644] Loss_D: 0.1137 Loss_G: 0.4387
```

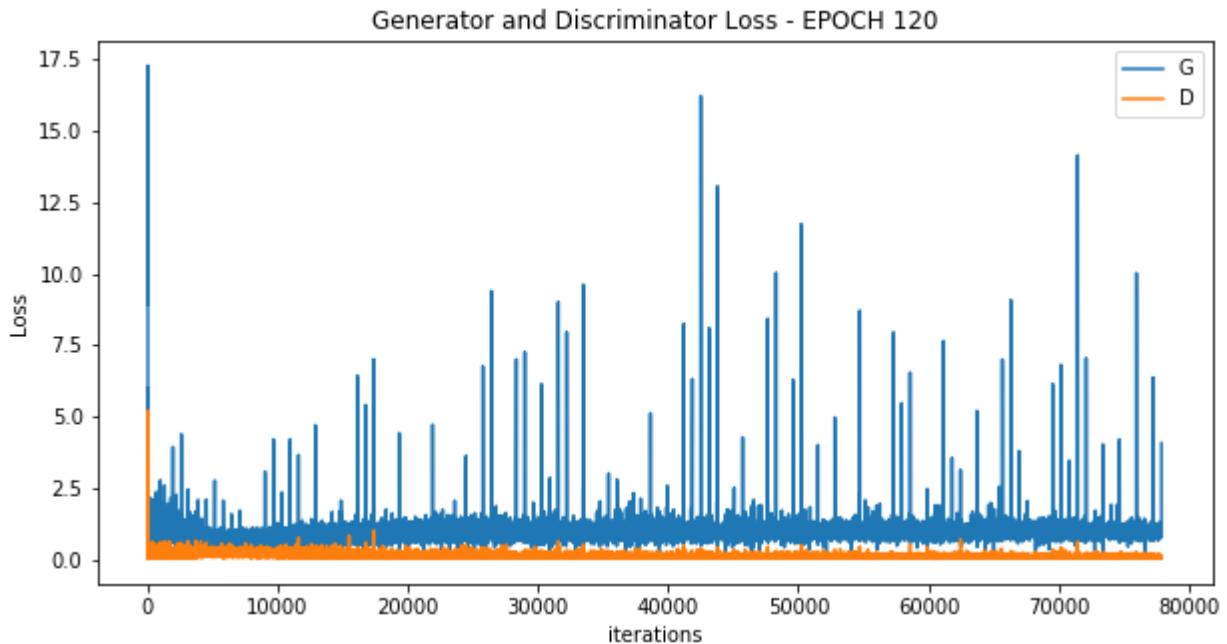
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[118/300][322/644] Loss_D: 0.0401 Loss_G: 1.2163  
[118/300][644/644] Loss_D: 0.2557 Loss_G: 10.0199
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[119/300][322/644] Loss_D: 0.0292 Loss_G: 0.9815  
[119/300][644/644] Loss_D: 0.0420 Loss_G: 0.0504
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[120/300][322/644] Loss_D: 0.0384 Loss_G: 0.9414  
[120/300][644/644] Loss_D: 0.1132 Loss_G: 6.3610
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[121/300][322/644] Loss_D: 0.0279 Loss_G: 1.0538  
[121/300][644/644] Loss_D: 0.0470 Loss_G: 4.0586
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[122/300][322/644] Loss_D: 0.0628 Loss_G: 0.9363  
[122/300][644/644] Loss_D: 0.1722 Loss_G: 9.1135
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[123/300][322/644] Loss_D: 0.0608 Loss_G: 1.3194  
[123/300][644/644] Loss_D: 0.0082 Loss_G: 0.8187
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[124/300][322/644] Loss_D: 0.0593 Loss_G: 1.0844  
[124/300][644/644] Loss_D: 0.0121 Loss_G: 0.5744
```

```

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[125/300][322/644] Loss_D: 0.1121 Loss_G: 1.0692
[125/300][644/644] Loss_D: 0.0175 Loss_G: 2.6028

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[126/300][322/644] Loss_D: 0.0295 Loss_G: 1.0406
[126/300][644/644] Loss_D: 0.0241 Loss_G: 2.4055

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[127/300][322/644] Loss_D: 0.0391 Loss_G: 1.2212
[127/300][644/644] Loss_D: 0.0315 Loss_G: 2.7695

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[128/300][322/644] Loss_D: 0.0365 Loss_G: 1.0609
[128/300][644/644] Loss_D: 0.1443 Loss_G: 9.6012

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[129/300][322/644] Loss_D: 0.0248 Loss_G: 0.9687
[129/300][644/644] Loss_D: 0.0440 Loss_G: 4.1667

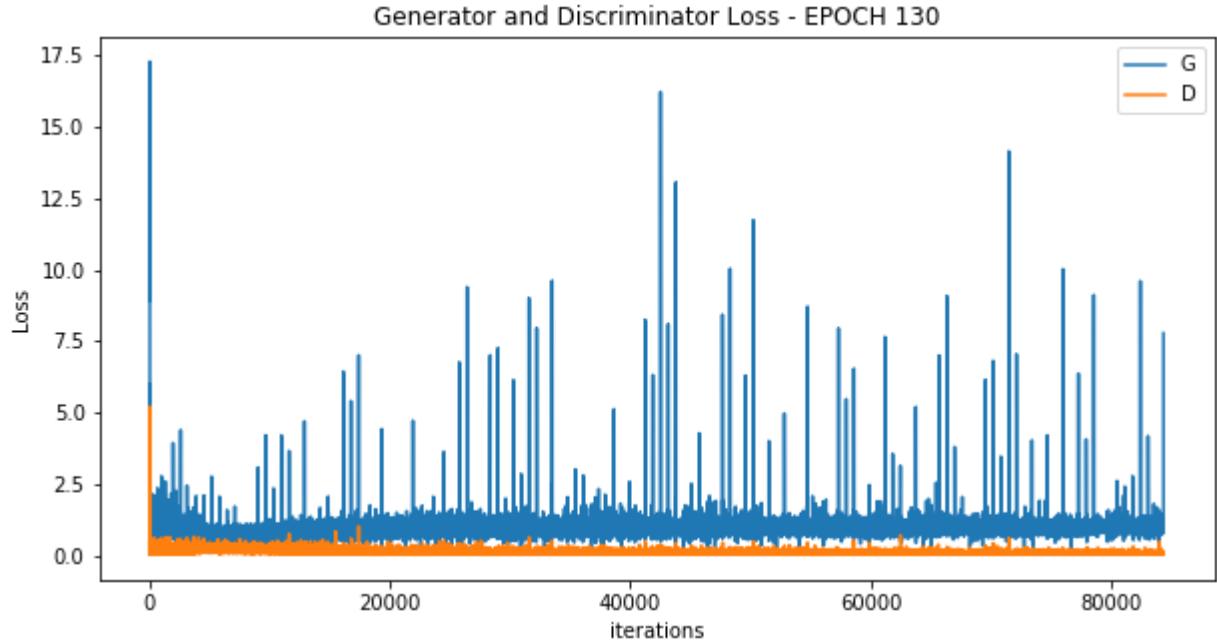
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[130/300][322/644] Loss_D: 0.0379 Loss_G: 0.9445
[130/300][644/644] Loss_D: 0.0148 Loss_G: 1.6864

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[131/300][322/644] Loss_D: 0.0450 Loss_G: 0.9549
[131/300][644/644] Loss_D: 0.1140 Loss_G: 7.7699

```





```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[132/300][322/644] Loss_D: 0.0287 Loss_G: 1.0039  
[132/300][644/644] Loss_D: 0.1194 Loss_G: 0.9413
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[133/300][322/644] Loss_D: 0.0867 Loss_G: 1.0851  
[133/300][644/644] Loss_D: 0.1164 Loss_G: 7.7296
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[134/300][322/644] Loss_D: 0.0415 Loss_G: 0.9630  
[134/300][644/644] Loss_D: 0.0319 Loss_G: 0.3727
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[135/300][322/644] Loss_D: 0.0339 Loss_G: 1.0345  
[135/300][644/644] Loss_D: 0.0215 Loss_G: 2.6706
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[136/300][322/644] Loss_D: 0.0319 Loss_G: 1.0932  
[136/300][644/644] Loss_D: 0.1228 Loss_G: 1.2349
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[137/300][322/644] Loss_D: 0.0468 Loss_G: 0.9611  
[137/300][644/644] Loss_D: 0.0225 Loss_G: 2.7458
```

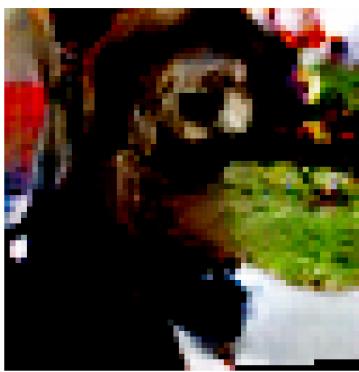
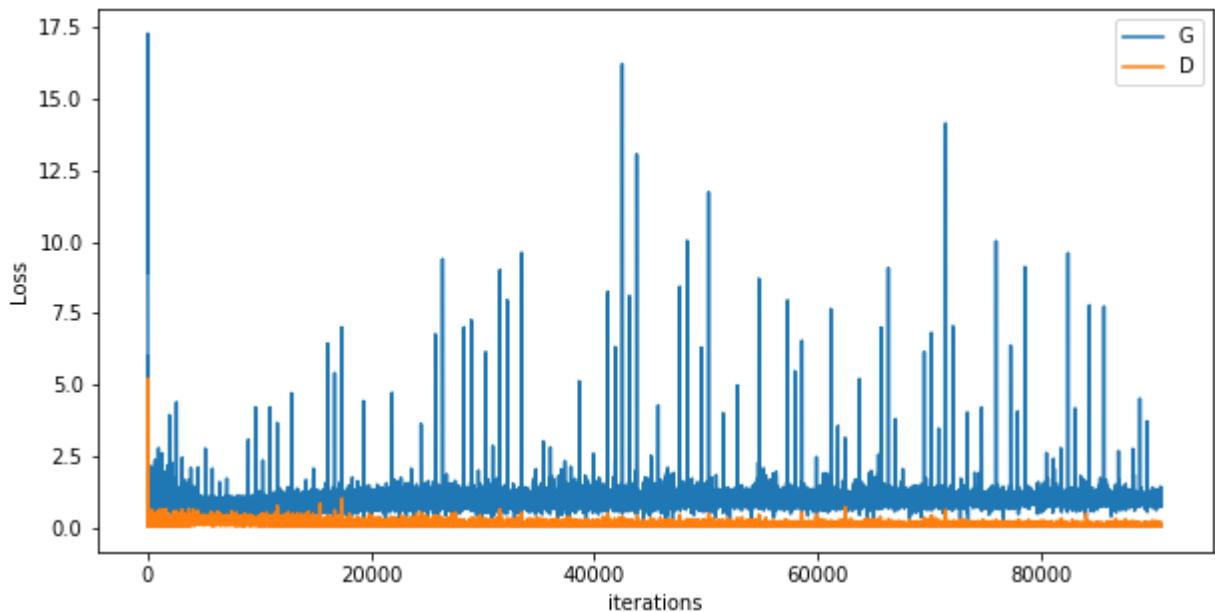
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[138/300][322/644] Loss_D: 0.0282 Loss_G: 1.0627  
[138/300][644/644] Loss_D: 0.0700 Loss_G: 4.5057
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[139/300][322/644] Loss_D: 0.0222 Loss_G: 1.0313  
[139/300][644/644] Loss_D: 0.0500 Loss_G: 3.7074
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[140/300][322/644] Loss_D: 0.0311 Loss_G: 1.0951  
[140/300][644/644] Loss_D: 0.1234 Loss_G: 1.1957
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[141/300][322/644] Loss_D: 0.0295 Loss_G: 1.0553  
[141/300][644/644] Loss_D: 0.0349 Loss_G: 0.7277
```

Generator and Discriminator Loss - EPOCH 140



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[142/300][322/644] Loss_D: 0.0200 Loss_G: 0.9813  
[142/300][644/644] Loss_D: 0.0162 Loss_G: 0.3646
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[143/300][322/644] Loss_D: 0.0212 Loss_G: 0.9567  
[143/300][644/644] Loss_D: 0.1167 Loss_G: 8.8110
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[144/300][322/644] Loss_D: 0.0206 Loss_G: 0.9623  
[144/300][644/644] Loss_D: 0.3338 Loss_G: 11.9294
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[145/300][322/644] Loss_D: 0.0244 Loss_G: 1.0744  
[145/300][644/644] Loss_D: 0.1456 Loss_G: 1.0962
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[146/300][322/644] Loss_D: 0.0328 Loss_G: 0.9762  
[146/300][644/644] Loss_D: 0.2216 Loss_G: 9.0672
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[147/300][322/644] Loss_D: 0.0416 Loss_G: 1.0252  
[147/300][644/644] Loss_D: 0.0147 Loss_G: 0.3544
```

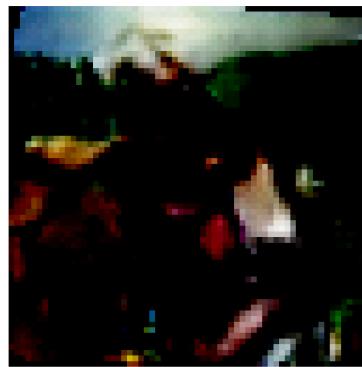
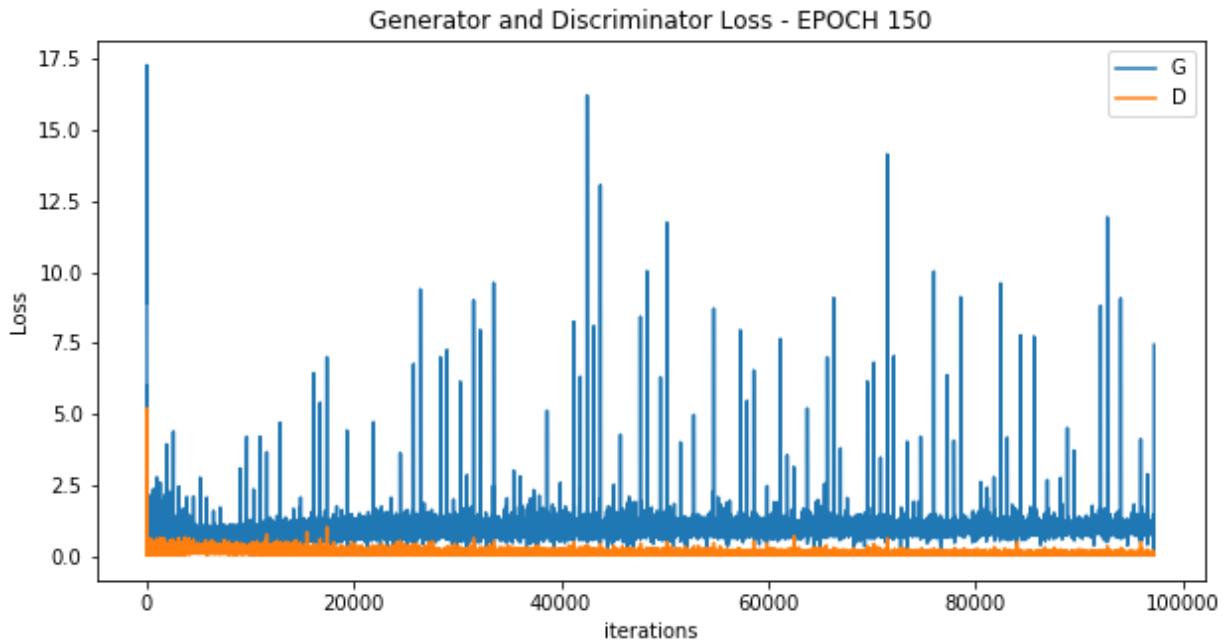
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[148/300][322/644] Loss_D: 0.0200 Loss_G: 1.0337  
[148/300][644/644] Loss_D: 0.0112 Loss_G: 1.8033
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[149/300][322/644] Loss_D: 0.0237 Loss_G: 0.9454  
[149/300][644/644] Loss_D: 0.4750 Loss_G: 4.1092
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[150/300][322/644] Loss_D: 0.0402 Loss_G: 1.0793  
[150/300][644/644] Loss_D: 0.2210 Loss_G: 2.8773
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[151/300][322/644] Loss_D: 0.0249 Loss_G: 0.9998  
[151/300][644/644] Loss_D: 0.1386 Loss_G: 7.4328
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[152/300][322/644] Loss_D: 0.0342 Loss_G: 1.0594  
[152/300][644/644] Loss_D: 0.1567 Loss_G: 1.4597
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[153/300][322/644] Loss_D: 0.0609 Loss_G: 0.8555  
[153/300][644/644] Loss_D: 0.0139 Loss_G: 0.2762
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[154/300][322/644] Loss_D: 0.0647 Loss_G: 1.0302  
[154/300][644/644] Loss_D: 0.0163 Loss_G: 0.3062
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[155/300][322/644] Loss_D: 0.0234 Loss_G: 1.0527
[155/300][644/644] Loss_D: 0.1304 Loss_G: 7.3972

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[156/300][322/644] Loss_D: 0.0277 Loss_G: 1.0510
[156/300][644/644] Loss_D: 0.0005 Loss_G: 0.8007

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[157/300][322/644] Loss_D: 0.0334 Loss_G: 1.0109
[157/300][644/644] Loss_D: 0.1201 Loss_G: 6.9990

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[158/300][322/644] Loss_D: 0.0209 Loss_G: 1.0207
[158/300][644/644] Loss_D: 0.1500 Loss_G: 7.9307

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[159/300][322/644] Loss_D: 0.0257 Loss_G: 1.0772
[159/300][644/644] Loss_D: 0.2621 Loss_G: 10.7021

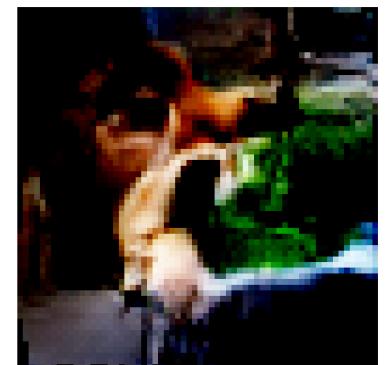
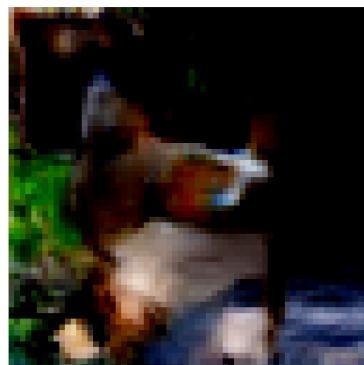
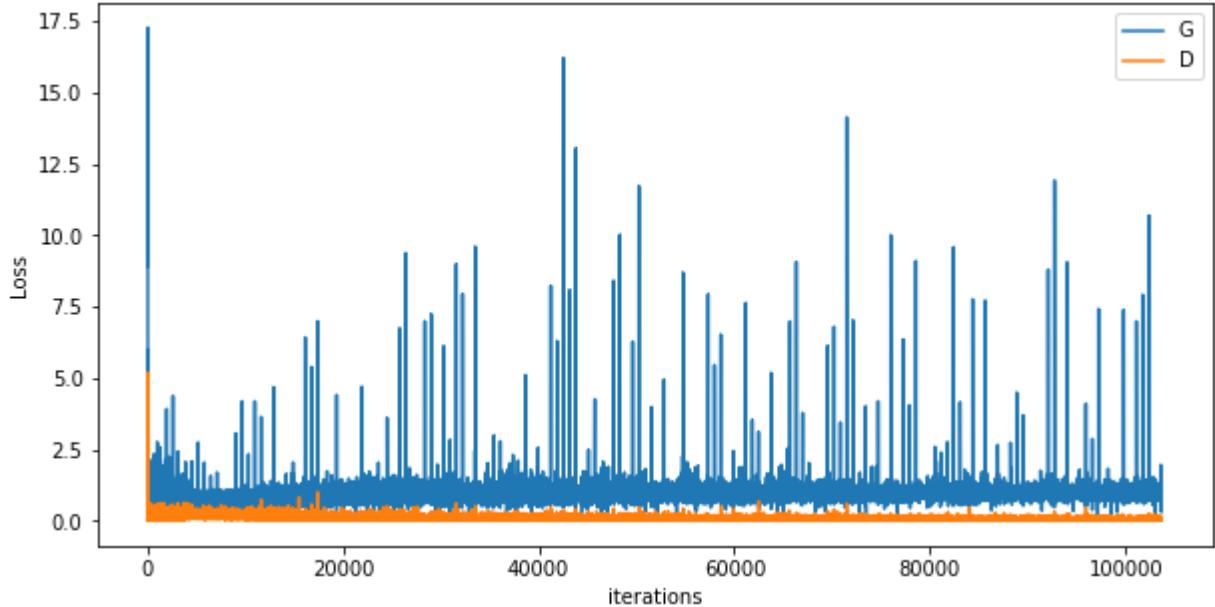
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

[160/300][322/644] Loss_D: 0.0159 Loss_G: 1.0194
[160/300][644/644] Loss_D: 0.0775 Loss_G: 0.1435

HBox(children=(IntProgress(value=0, max=644), HTML(value='')))

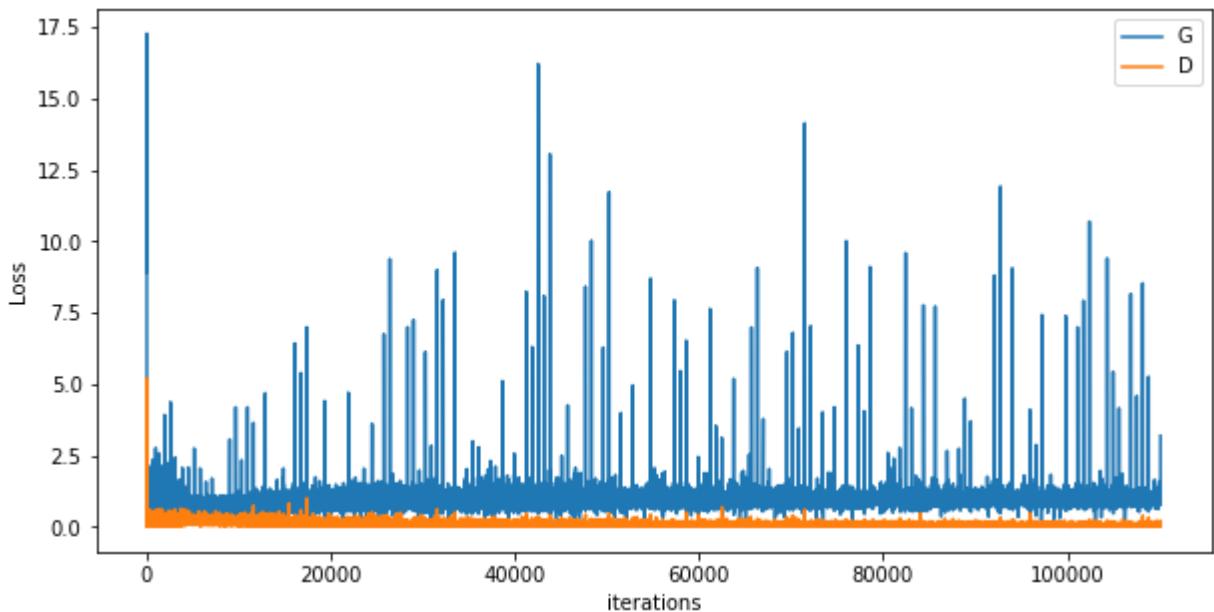
[161/300][322/644] Loss_D: 0.0394 Loss_G: 1.0927
[161/300][644/644] Loss_D: 0.0758 Loss_G: 0.3372
```

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```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[162/300][322/644] Loss_D: 0.0147 Loss_G: 0.9556  
[162/300][644/644] Loss_D: 0.2261 Loss_G: 9.4104  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[163/300][322/644] Loss_D: 0.0191 Loss_G: 1.0061  
[163/300][644/644] Loss_D: 0.0745 Loss_G: 5.4406  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[164/300][322/644] Loss_D: 0.0453 Loss_G: 1.0172  
[164/300][644/644] Loss_D: 0.0456 Loss_G: 4.1642  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[165/300][322/644] Loss_D: 0.0289 Loss_G: 1.1128  
[165/300][644/644] Loss_D: 0.0281 Loss_G: 0.0709  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[166/300][322/644] Loss_D: 0.0190 Loss_G: 1.0350  
[166/300][644/644] Loss_D: 0.1428 Loss_G: 8.1678  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[167/300][322/644] Loss_D: 0.0730 Loss_G: 0.9450  
[167/300][644/644] Loss_D: 0.1167 Loss_G: 4.5892  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[168/300][322/644] Loss_D: 0.0237 Loss_G: 1.1438  
[168/300][644/644] Loss_D: 0.3477 Loss_G: 8.5413  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[169/300][322/644] Loss_D: 0.0275 Loss_G: 1.0613  
[169/300][644/644] Loss_D: 0.2116 Loss_G: 5.2714  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[170/300][322/644] Loss_D: 0.0335 Loss_G: 0.9887  
[170/300][644/644] Loss_D: 0.0431 Loss_G: 1.6529  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[171/300][322/644] Loss_D: 0.0627 Loss_G: 0.8859  
[171/300][644/644] Loss_D: 0.0164 Loss_G: 3.1930
```

Generator and Discriminator Loss - EPOCH 170



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[172/300][322/644] Loss_D: 0.0275 Loss_G: 1.0398  
[172/300][644/644] Loss_D: 0.2605 Loss_G: 5.4081
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[173/300][322/644] Loss_D: 0.0264 Loss_G: 1.0118  
[173/300][644/644] Loss_D: 0.0874 Loss_G: 5.9595
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[174/300][322/644] Loss_D: 0.0250 Loss_G: 1.0589  
[174/300][644/644] Loss_D: 0.2917 Loss_G: 9.9912
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[175/300][322/644] Loss_D: 0.0286 Loss_G: 0.9764  
[175/300][644/644] Loss_D: 0.0609 Loss_G: 4.1844
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[176/300][322/644] Loss_D: 0.0324 Loss_G: 0.9871  
[176/300][644/644] Loss_D: 0.0343 Loss_G: 0.0228
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[177/300][322/644] Loss_D: 0.0394 Loss_G: 1.0391  
[177/300][644/644] Loss_D: 0.0216 Loss_G: 0.8239
```

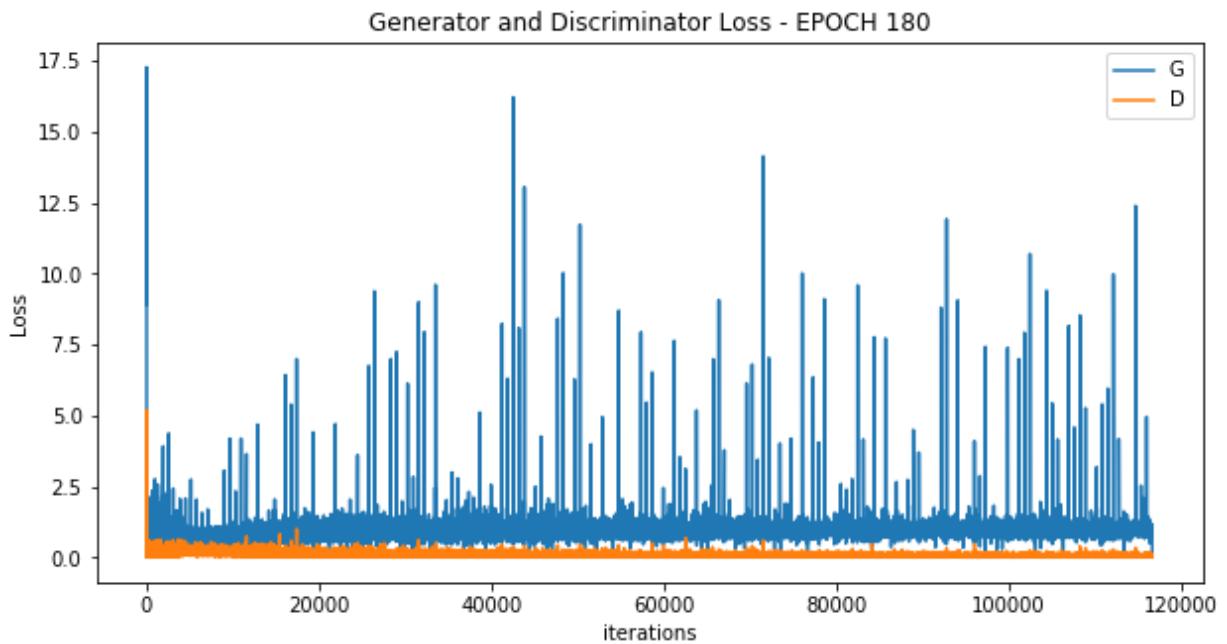
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[178/300][322/644] Loss_D: 0.0218 Loss_G: 0.9851  
[178/300][644/644] Loss_D: 0.3397 Loss_G: 12.3992
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[179/300][322/644] Loss_D: 0.0221 Loss_G: 1.0904  
[179/300][644/644] Loss_D: 0.0268 Loss_G: 2.5417
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[180/300][322/644] Loss_D: 0.0456 Loss_G: 0.8978  
[180/300][644/644] Loss_D: 0.0619 Loss_G: 4.9632
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[181/300][322/644] Loss_D: 0.0196 Loss_G: 0.9352  
[181/300][644/644] Loss_D: 0.0490 Loss_G: 0.0593
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[182/300][322/644] Loss_D: 0.0229 Loss_G: 0.9282  
[182/300][644/644] Loss_D: 0.1077 Loss_G: 0.8069
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[183/300][322/644] Loss_D: 0.0167 Loss_G: 0.8716  
[183/300][644/644] Loss_D: 0.0181 Loss_G: 2.2264
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[184/300][322/644] Loss_D: 0.0212 Loss_G: 0.9629  
[184/300][644/644] Loss_D: 0.0255 Loss_G: 2.1815
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[185/300][322/644] Loss_D: 0.0241 Loss_G: 1.0159  
[185/300][644/644] Loss_D: 0.0548 Loss_G: 0.0735
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[186/300][322/644] Loss_D: 0.0338 Loss_G: 0.9855  
[186/300][644/644] Loss_D: 0.0857 Loss_G: 0.5522
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[187/300][322/644] Loss_D: 0.0400 Loss_G: 1.0823  
[187/300][644/644] Loss_D: 0.2984 Loss_G: 5.7795
```

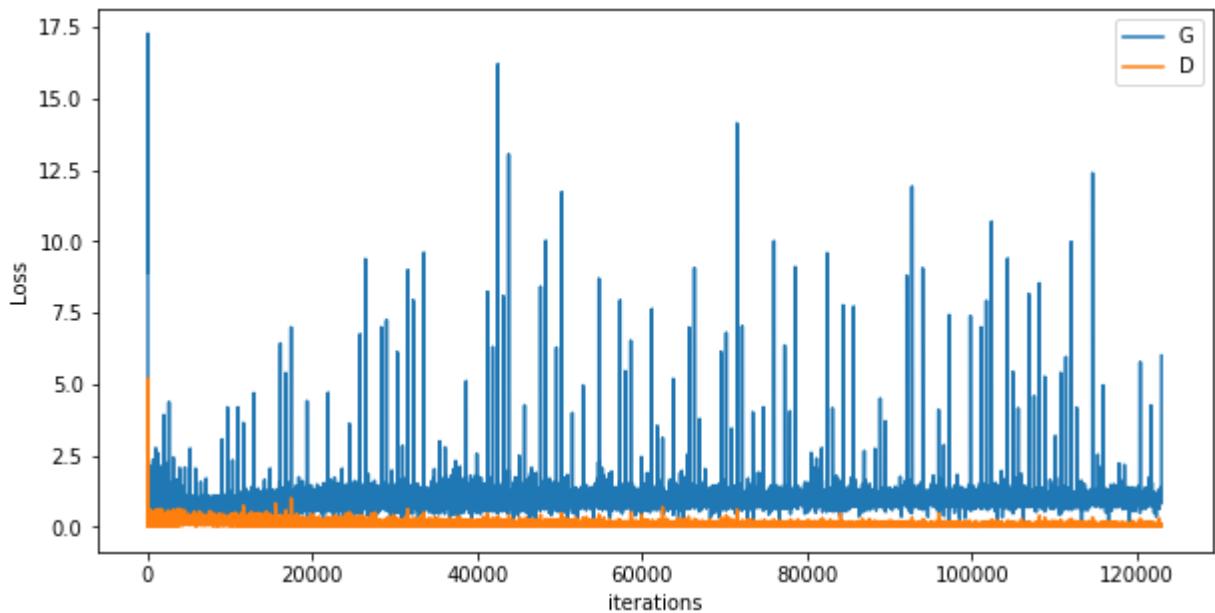
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[188/300][322/644] Loss_D: 0.0169 Loss_G: 1.0119  
[188/300][644/644] Loss_D: 0.0929 Loss_G: 0.7326
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[189/300][322/644] Loss_D: 0.0196 Loss_G: 1.0412  
[189/300][644/644] Loss_D: 0.0376 Loss_G: 4.2630
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[190/300][322/644] Loss_D: 0.0153 Loss_G: 1.0686  
[190/300][644/644] Loss_D: 0.0059 Loss_G: 0.3699
```

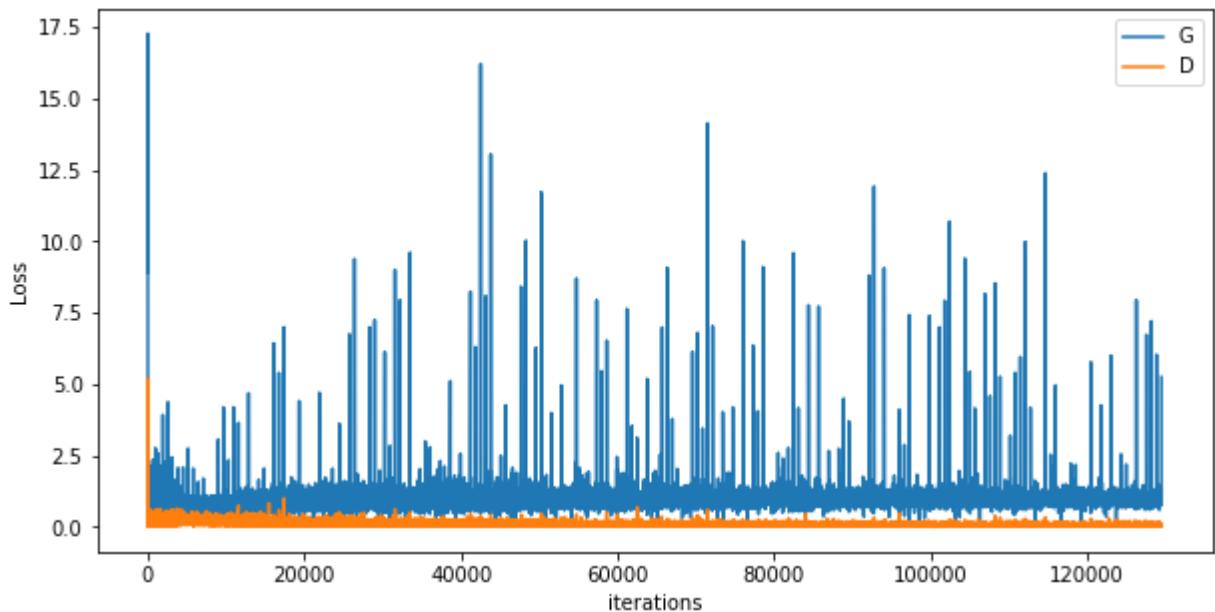
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[191/300][322/644] Loss_D: 0.0227 Loss_G: 0.9606  
[191/300][644/644] Loss_D: 0.0656 Loss_G: 6.0028
```

Generator and Discriminator Loss - EPOCH 190



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[192/300][322/644] Loss_D: 0.0210 Loss_G: 0.9434  
[192/300][644/644] Loss_D: 0.0251 Loss_G: 0.1721  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[193/300][322/644] Loss_D: 0.0167 Loss_G: 1.0349  
[193/300][644/644] Loss_D: 0.0115 Loss_G: 2.5561  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[194/300][322/644] Loss_D: 0.0198 Loss_G: 1.0119  
[194/300][644/644] Loss_D: 0.0115 Loss_G: 2.1968  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[195/300][322/644] Loss_D: 0.0158 Loss_G: 1.0779  
[195/300][644/644] Loss_D: 0.0379 Loss_G: 1.2938  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[196/300][322/644] Loss_D: 0.0199 Loss_G: 1.0082  
[196/300][644/644] Loss_D: 0.1163 Loss_G: 7.9516  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[197/300][322/644] Loss_D: 0.0269 Loss_G: 0.9365  
[197/300][644/644] Loss_D: 0.1636 Loss_G: 1.0087  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[198/300][322/644] Loss_D: 0.0229 Loss_G: 1.0682  
[198/300][644/644] Loss_D: 0.1510 Loss_G: 6.7391  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[199/300][322/644] Loss_D: 0.0771 Loss_G: 0.7696  
[199/300][644/644] Loss_D: 0.1691 Loss_G: 7.2127  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[200/300][322/644] Loss_D: 0.0343 Loss_G: 0.9072  
[200/300][644/644] Loss_D: 0.0982 Loss_G: 6.0448  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[201/300][322/644] Loss_D: 0.0458 Loss_G: 0.8728  
[201/300][644/644] Loss_D: 0.0503 Loss_G: 5.2546
```

Generator and Discriminator Loss - EPOCH 200



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[202/300][322/644] Loss_D: 0.0739 Loss_G: 0.7363  
[202/300][644/644] Loss_D: 0.0188 Loss_G: 0.7283
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[203/300][322/644] Loss_D: 0.0560 Loss_G: 0.9946  
[203/300][644/644] Loss_D: 0.1399 Loss_G: 1.6737
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[204/300][322/644] Loss_D: 0.0636 Loss_G: 0.9355  
[204/300][644/644] Loss_D: 0.1541 Loss_G: 6.1589
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[205/300][322/644] Loss_D: 0.0278 Loss_G: 1.0695  
[205/300][644/644] Loss_D: 0.0200 Loss_G: 0.3532
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[206/300][322/644] Loss_D: 0.0234 Loss_G: 1.0526  
[206/300][644/644] Loss_D: 0.3056 Loss_G: 2.8899
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[207/300][322/644] Loss_D: 0.0222 Loss_G: 0.8973  
[207/300][644/644] Loss_D: 0.1440 Loss_G: 6.2085
```

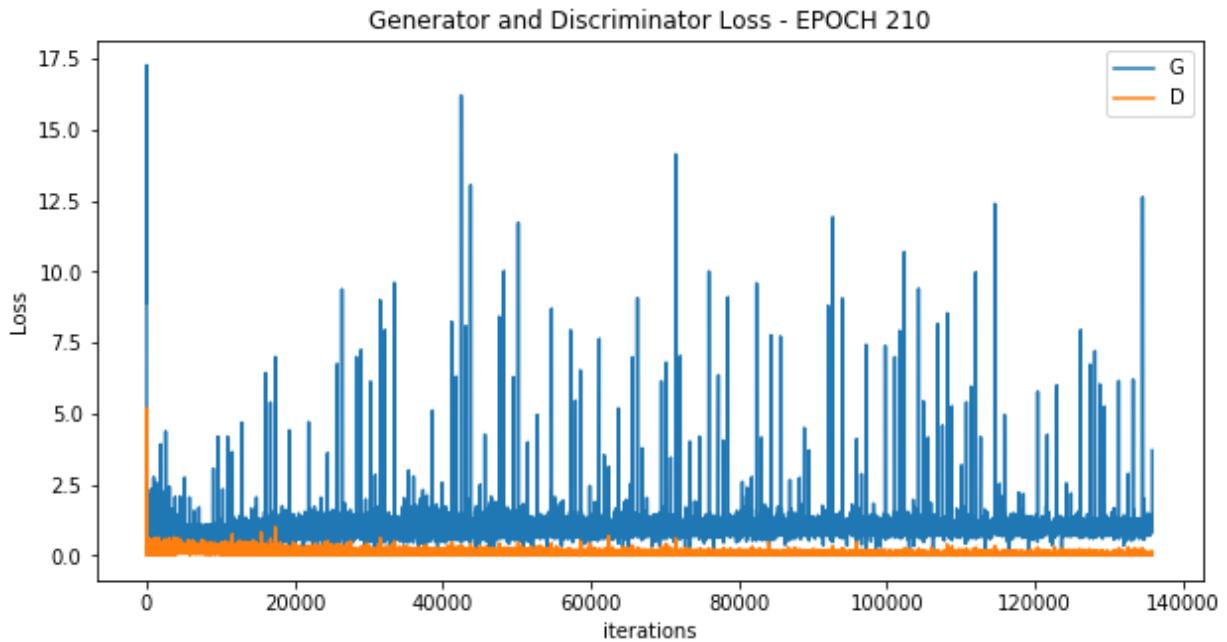
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[208/300][322/644] Loss_D: 0.0159 Loss_G: 1.0051  
[208/300][644/644] Loss_D: 0.1736 Loss_G: 1.3129
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[209/300][322/644] Loss_D: 0.0331 Loss_G: 0.8766  
[209/300][644/644] Loss_D: 0.2415 Loss_G: 12.6334
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[210/300][322/644] Loss_D: 0.0625 Loss_G: 1.0599  
[210/300][644/644] Loss_D: 0.0229 Loss_G: 1.2586
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[211/300][322/644] Loss_D: 0.0166 Loss_G: 0.8949  
[211/300][644/644] Loss_D: 0.0440 Loss_G: 3.7064
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[212/300][322/644] Loss_D: 0.0149 Loss_G: 0.9345  
[212/300][644/644] Loss_D: 0.0400 Loss_G: 4.5182
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[213/300][322/644] Loss_D: 0.0239 Loss_G: 1.0465  
[213/300][644/644] Loss_D: 0.0103 Loss_G: 1.5830
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[214/300][322/644] Loss_D: 0.0772 Loss_G: 0.7024  
[214/300][644/644] Loss_D: 0.0372 Loss_G: 0.0625
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[215/300][322/644] Loss_D: 0.0387 Loss_G: 1.0940  
[215/300][644/644] Loss_D: 0.0085 Loss_G: 0.8236
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[216/300][322/644] Loss_D: 0.0443 Loss_G: 0.8331  
[216/300][644/644] Loss_D: 0.1050 Loss_G: 5.7268
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[217/300][322/644] Loss_D: 0.0299 Loss_G: 0.9909  
[217/300][644/644] Loss_D: 0.1131 Loss_G: 6.1235
```

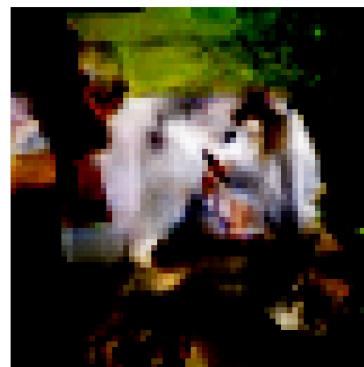
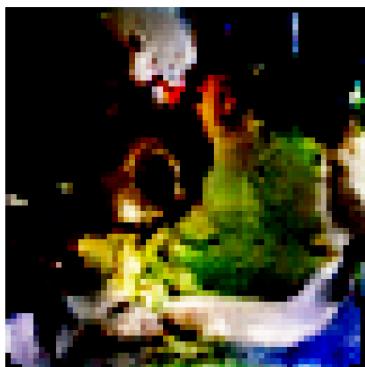
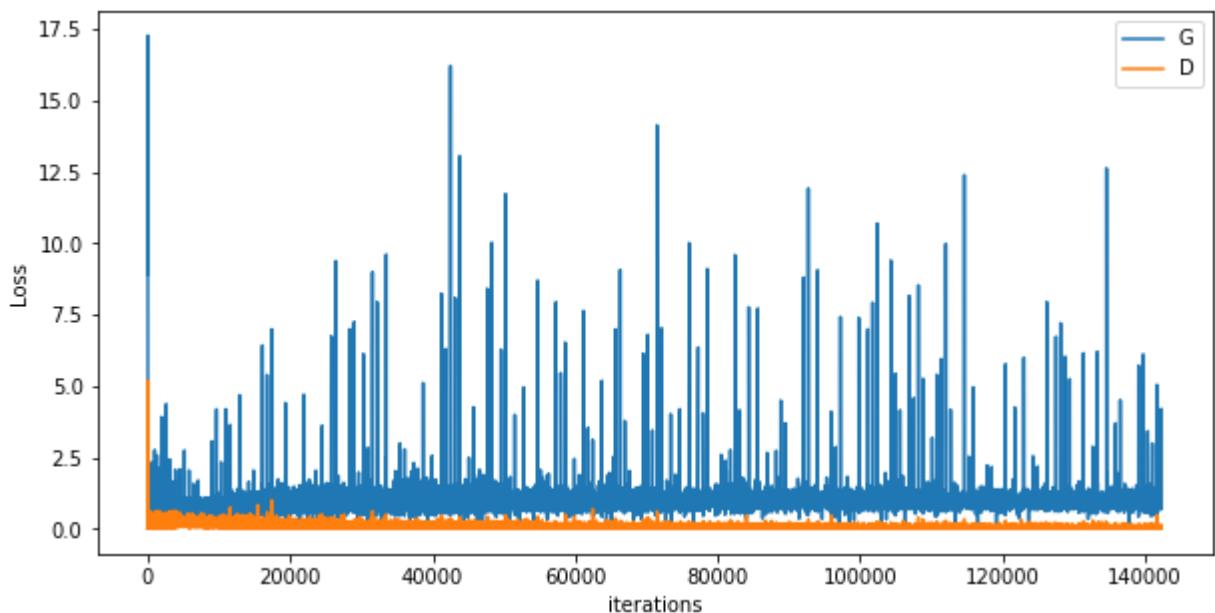
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[218/300][322/644] Loss_D: 0.1537 Loss_G: 0.9158  
[218/300][644/644] Loss_D: 0.0189 Loss_G: 3.4295
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[219/300][322/644] Loss_D: 0.0153 Loss_G: 1.0284  
[219/300][644/644] Loss_D: 0.2070 Loss_G: 2.9995
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[220/300][322/644] Loss_D: 0.0381 Loss_G: 0.9986  
[220/300][644/644] Loss_D: 0.4950 Loss_G: 5.0569
```

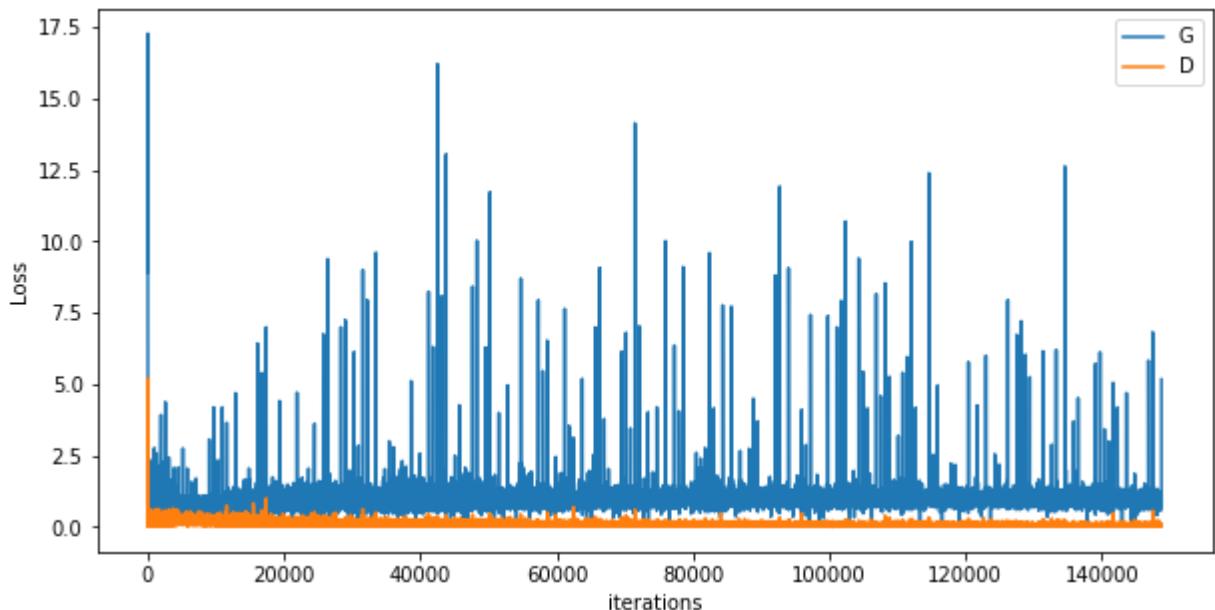
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[221/300][322/644] Loss_D: 0.0170 Loss_G: 0.9354  
[221/300][644/644] Loss_D: 0.0576 Loss_G: 4.1918
```

Generator and Discriminator Loss - EPOCH 220



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[222/300][322/644] Loss_D: 0.0804 Loss_G: 0.8892  
[222/300][644/644] Loss_D: 0.0323 Loss_G: 0.0316  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[223/300][322/644] Loss_D: 0.0150 Loss_G: 1.0048  
[223/300][644/644] Loss_D: 0.0913 Loss_G: 4.6971  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[224/300][322/644] Loss_D: 0.0152 Loss_G: 0.9413  
[224/300][644/644] Loss_D: 0.0493 Loss_G: 0.0585  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[225/300][322/644] Loss_D: 0.0175 Loss_G: 1.0569  
[225/300][644/644] Loss_D: 0.0297 Loss_G: 0.0129  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[226/300][322/644] Loss_D: 0.0153 Loss_G: 0.9930  
[226/300][644/644] Loss_D: 0.0221 Loss_G: 1.3118  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[227/300][322/644] Loss_D: 0.0789 Loss_G: 0.9247  
[227/300][644/644] Loss_D: 0.1298 Loss_G: 0.5978  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[228/300][322/644] Loss_D: 0.0405 Loss_G: 0.9518  
[228/300][644/644] Loss_D: 0.0580 Loss_G: 5.8349  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[229/300][322/644] Loss_D: 0.0732 Loss_G: 0.9360  
[229/300][644/644] Loss_D: 0.5800 Loss_G: 6.8262  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[230/300][322/644] Loss_D: 0.0422 Loss_G: 1.0498  
[230/300][644/644] Loss_D: 0.0220 Loss_G: 0.4169  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[231/300][322/644] Loss_D: 0.0381 Loss_G: 1.1300  
[231/300][644/644] Loss_D: 0.0617 Loss_G: 5.1725
```

Generator and Discriminator Loss - EPOCH 230



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[232/300][322/644] Loss_D: 0.0191 Loss_G: 1.0425  
[232/300][644/644] Loss_D: 0.0423 Loss_G: 7.1108
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[233/300][322/644] Loss_D: 0.0260 Loss_G: 1.1512  
[233/300][644/644] Loss_D: 0.2411 Loss_G: 10.0281
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[234/300][322/644] Loss_D: 0.0549 Loss_G: 0.9273  
[234/300][644/644] Loss_D: 0.2822 Loss_G: 11.2133
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[235/300][322/644] Loss_D: 0.0128 Loss_G: 1.0672  
[235/300][644/644] Loss_D: 0.1104 Loss_G: 6.1027
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[236/300][322/644] Loss_D: 0.0222 Loss_G: 0.9645  
[236/300][644/644] Loss_D: 0.0122 Loss_G: 0.1445
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[237/300][322/644] Loss_D: 0.0161 Loss_G: 0.9750  
[237/300][644/644] Loss_D: 0.0142 Loss_G: 0.5715
```

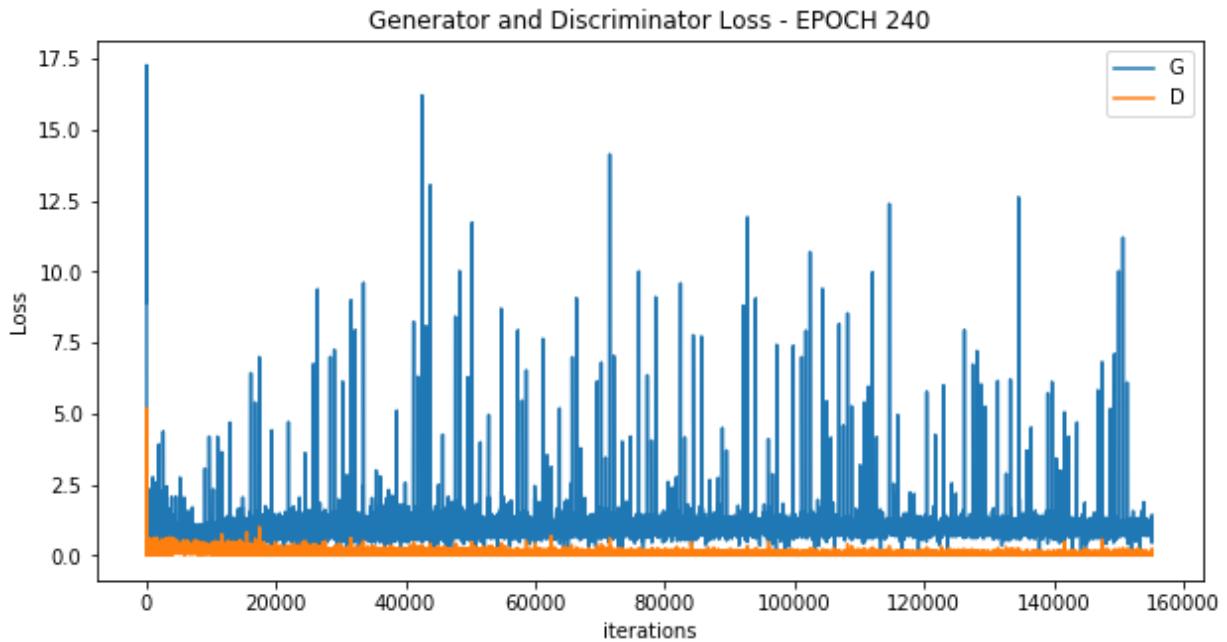
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[238/300][322/644] Loss_D: 0.0178 Loss_G: 1.0176  
[238/300][644/644] Loss_D: 0.0254 Loss_G: 0.0119
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[239/300][322/644] Loss_D: 0.0780 Loss_G: 0.7562  
[239/300][644/644] Loss_D: 0.0065 Loss_G: 1.8857
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[240/300][322/644] Loss_D: 0.0138 Loss_G: 1.0145  
[240/300][644/644] Loss_D: 0.0233 Loss_G: 0.7932
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[241/300][322/644] Loss_D: 0.0237 Loss_G: 1.0868  
[241/300][644/644] Loss_D: 0.0730 Loss_G: 0.8423
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[242/300][322/644] Loss_D: 0.0252 Loss_G: 1.1590  
[242/300][644/644] Loss_D: 0.0311 Loss_G: 2.7646
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[243/300][322/644] Loss_D: 0.0333 Loss_G: 0.9650  
[243/300][644/644] Loss_D: 0.0561 Loss_G: 5.2532
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[244/300][322/644] Loss_D: 0.0318 Loss_G: 1.0053  
[244/300][644/644] Loss_D: 0.4910 Loss_G: 11.1225
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[245/300][322/644] Loss_D: 0.0307 Loss_G: 0.9266  
[245/300][644/644] Loss_D: 0.1117 Loss_G: 6.5976
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[246/300][322/644] Loss_D: 0.0109 Loss_G: 1.0098  
[246/300][644/644] Loss_D: 0.0451 Loss_G: 0.1540
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[247/300][322/644] Loss_D: 0.0157 Loss_G: 1.0921  
[247/300][644/644] Loss_D: 0.0563 Loss_G: 5.3126
```

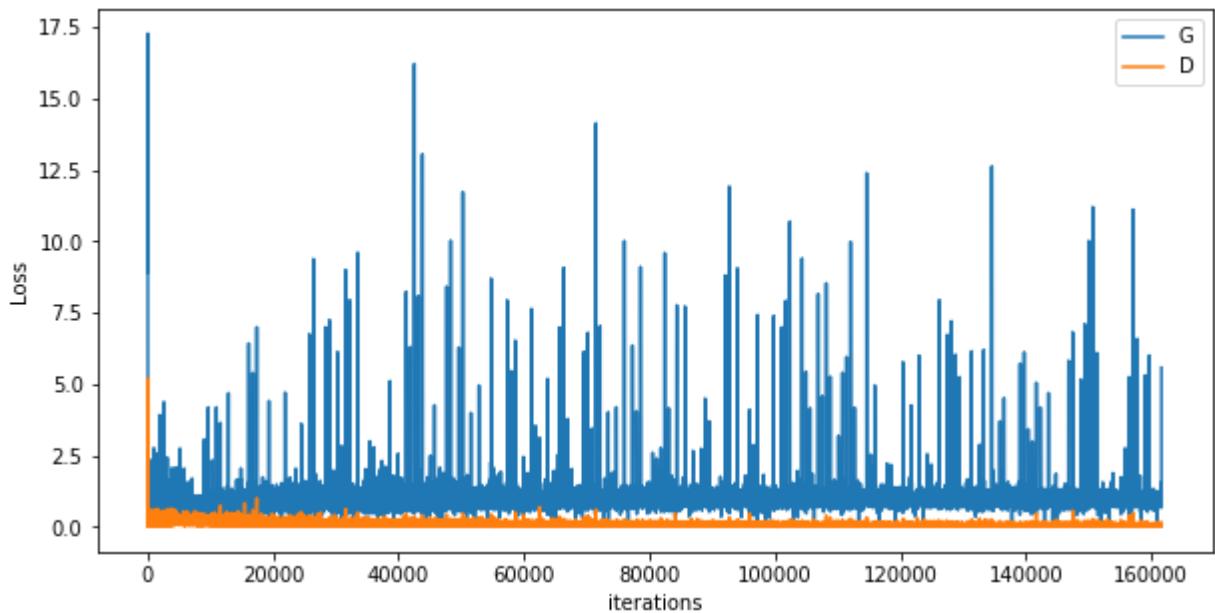
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[248/300][322/644] Loss_D: 0.0257 Loss_G: 0.9602  
[248/300][644/644] Loss_D: 0.0573 Loss_G: 6.0100
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[249/300][322/644] Loss_D: 0.0165 Loss_G: 1.0707  
[249/300][644/644] Loss_D: 0.1235 Loss_G: 0.9244
```

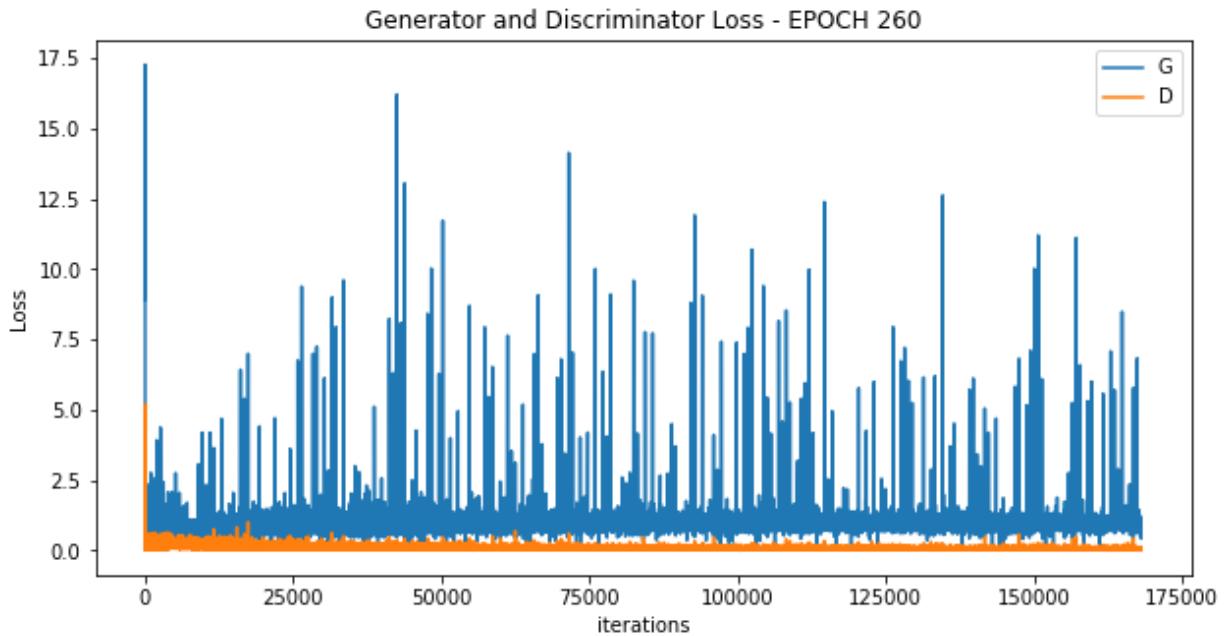
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[250/300][322/644] Loss_D: 0.0280 Loss_G: 1.0021  
[250/300][644/644] Loss_D: 0.0488 Loss_G: 0.0216
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[251/300][322/644] Loss_D: 0.0176 Loss_G: 1.0518  
[251/300][644/644] Loss_D: 0.1498 Loss_G: 5.5819
```

Generator and Discriminator Loss - EPOCH 250



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[252/300][322/644] Loss_D: 0.0475 Loss_G: 0.9347  
[252/300][644/644] Loss_D: 0.0040 Loss_G: 1.1866  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[253/300][322/644] Loss_D: 0.0525 Loss_G: 1.0180  
[253/300][644/644] Loss_D: 0.0636 Loss_G: 7.0909  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[254/300][322/644] Loss_D: 0.0182 Loss_G: 1.0630  
[254/300][644/644] Loss_D: 0.1435 Loss_G: 5.7106  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[255/300][322/644] Loss_D: 0.0294 Loss_G: 0.9419  
[255/300][644/644] Loss_D: 0.0184 Loss_G: 2.9008  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[256/300][322/644] Loss_D: 0.0243 Loss_G: 0.8501  
[256/300][644/644] Loss_D: 0.1252 Loss_G: 8.4949  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[257/300][322/644] Loss_D: 0.0340 Loss_G: 0.7291  
[257/300][644/644] Loss_D: 0.0079 Loss_G: 1.6120  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[258/300][322/644] Loss_D: 0.0171 Loss_G: 1.1040  
[258/300][644/644] Loss_D: 0.0122 Loss_G: 2.3540  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[259/300][322/644] Loss_D: 0.0137 Loss_G: 1.2790  
[259/300][644/644] Loss_D: 0.4478 Loss_G: 5.7891  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[260/300][322/644] Loss_D: 0.0901 Loss_G: 0.8366  
[260/300][644/644] Loss_D: 0.0959 Loss_G: 6.8412  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[261/300][322/644] Loss_D: 0.0208 Loss_G: 1.0001  
[261/300][644/644] Loss_D: 0.1230 Loss_G: 0.4539
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[262/300][322/644] Loss_D: 0.0380 Loss_G: 1.0194  
[262/300][644/644] Loss_D: 0.1908 Loss_G: 6.4712
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[263/300][322/644] Loss_D: 0.0269 Loss_G: 0.9247  
[263/300][644/644] Loss_D: 0.1308 Loss_G: 0.9916
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[264/300][322/644] Loss_D: 0.0290 Loss_G: 0.9953  
[264/300][644/644] Loss_D: 0.0632 Loss_G: 4.8592
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[265/300][322/644] Loss_D: 0.0370 Loss_G: 1.1944  
[265/300][644/644] Loss_D: 0.1742 Loss_G: 1.3240
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[266/300][322/644] Loss_D: 0.0575 Loss_G: 1.2566  
[266/300][644/644] Loss_D: 0.1665 Loss_G: 9.3654
```

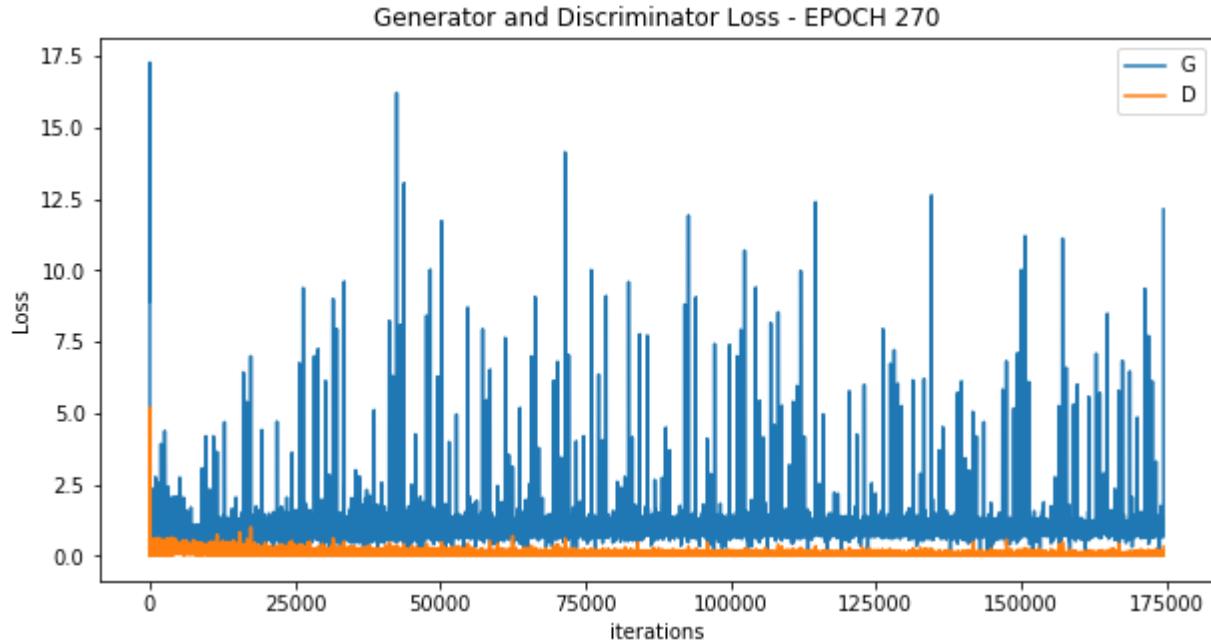
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[267/300][322/644] Loss_D: 0.0145 Loss_G: 0.9993  
[267/300][644/644] Loss_D: 0.1543 Loss_G: 7.7148
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[268/300][322/644] Loss_D: 0.0142 Loss_G: 0.9899  
[268/300][644/644] Loss_D: 0.0888 Loss_G: 6.1236
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[269/300][322/644] Loss_D: 0.0303 Loss_G: 1.1239  
[269/300][644/644] Loss_D: 0.0332 Loss_G: 3.3148
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[270/300][322/644] Loss_D: 0.0123 Loss_G: 1.0142  
[270/300][644/644] Loss_D: 0.0292 Loss_G: 0.0495
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[271/300][322/644] Loss_D: 0.0259 Loss_G: 0.9997  
[271/300][644/644] Loss_D: 0.3187 Loss_G: 12.1399
```



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[272/300][322/644] Loss_D: 0.0441 Loss_G: 0.9559  
[272/300][644/644] Loss_D: 0.0731 Loss_G: 6.7348
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[273/300][322/644] Loss_D: 0.0248 Loss_G: 0.9263  
[273/300][644/644] Loss_D: 0.1747 Loss_G: 7.7521
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[274/300][322/644] Loss_D: 0.0189 Loss_G: 1.0301  
[274/300][644/644] Loss_D: 0.1942 Loss_G: 0.8364
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[275/300][322/644] Loss_D: 0.0191 Loss_G: 1.0170  
[275/300][644/644] Loss_D: 0.1439 Loss_G: 8.5458
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[276/300][322/644] Loss_D: 0.0231 Loss_G: 0.9655  
[276/300][644/644] Loss_D: 0.0095 Loss_G: 0.1706
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[277/300][322/644] Loss_D: 0.0147 Loss_G: 1.0348  
[277/300][644/644] Loss_D: 0.0152 Loss_G: 0.0904
```

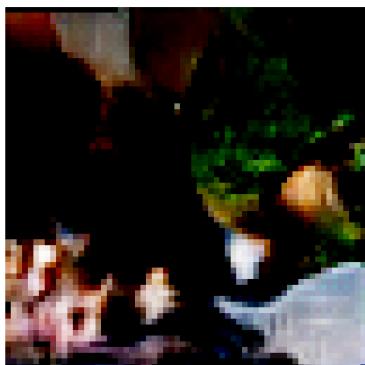
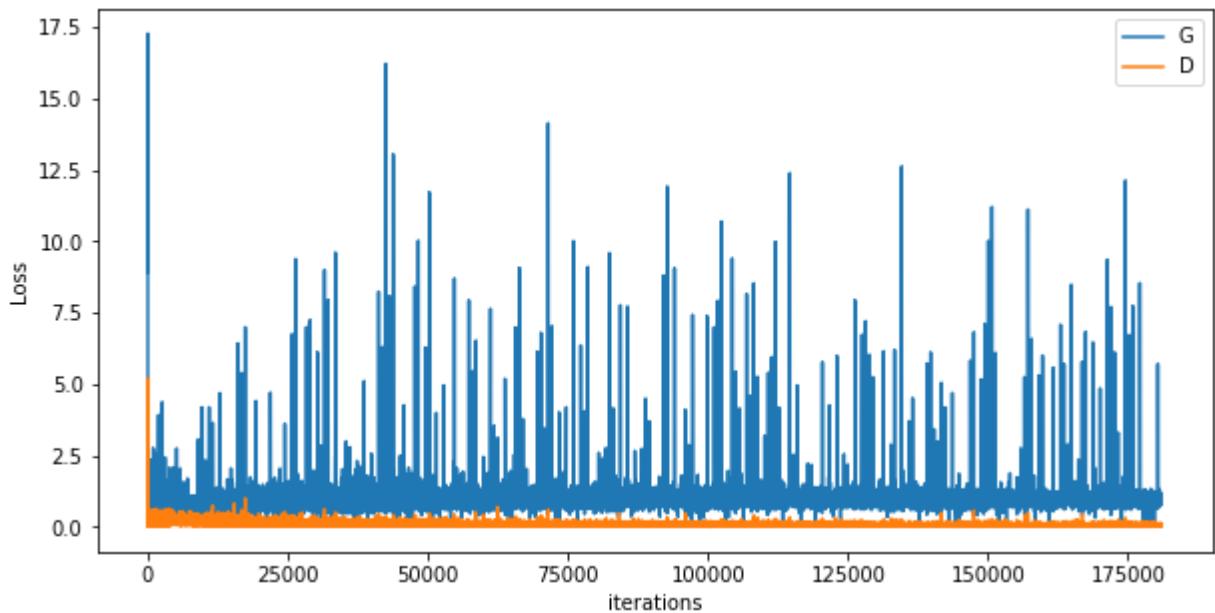
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[278/300][322/644] Loss_D: 0.0194 Loss_G: 0.9185  
[278/300][644/644] Loss_D: 0.0204 Loss_G: 0.1004
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[279/300][322/644] Loss_D: 0.0244 Loss_G: 0.9487  
[279/300][644/644] Loss_D: 0.0139 Loss_G: 0.1153
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[280/300][322/644] Loss_D: 0.0728 Loss_G: 1.2051  
[280/300][644/644] Loss_D: 0.0360 Loss_G: 5.7129
```

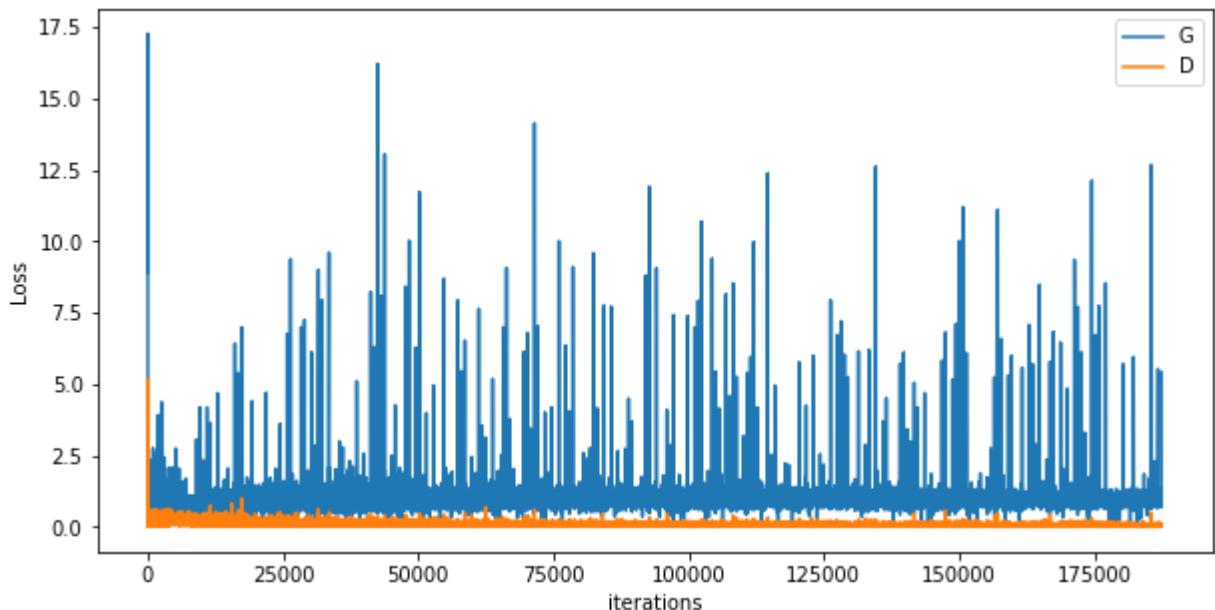
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[281/300][322/644] Loss_D: 0.0583 Loss_G: 0.9742  
[281/300][644/644] Loss_D: 0.1271 Loss_G: 0.8033
```

Generator and Discriminator Loss - EPOCH 280



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[282/300][322/644] Loss_D: 0.0257 Loss_G: 1.1202  
[282/300][644/644] Loss_D: 0.0533 Loss_G: 0.0465  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[283/300][322/644] Loss_D: 0.0142 Loss_G: 1.1483  
[283/300][644/644] Loss_D: 0.0768 Loss_G: 5.9629  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[284/300][322/644] Loss_D: 0.0252 Loss_G: 1.0349  
[284/300][644/644] Loss_D: 0.0263 Loss_G: 0.0212  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[285/300][322/644] Loss_D: 0.0238 Loss_G: 0.9383  
[285/300][644/644] Loss_D: 0.0153 Loss_G: 0.2943  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[286/300][322/644] Loss_D: 0.0176 Loss_G: 0.9849  
[286/300][644/644] Loss_D: 0.0147 Loss_G: 1.8588  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[287/300][322/644] Loss_D: 0.0272 Loss_G: 1.0146  
[287/300][644/644] Loss_D: 0.1145 Loss_G: 0.3989  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[288/300][322/644] Loss_D: 0.0397 Loss_G: 0.9751  
[288/300][644/644] Loss_D: 0.5168 Loss_G: 12.6942  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[289/300][322/644] Loss_D: 0.0716 Loss_G: 0.7272  
[289/300][644/644] Loss_D: 0.0193 Loss_G: 2.3071  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[290/300][322/644] Loss_D: 0.0343 Loss_G: 0.9165  
[290/300][644/644] Loss_D: 0.0518 Loss_G: 5.5374  
  
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[291/300][322/644] Loss_D: 0.0176 Loss_G: 0.9877  
[291/300][644/644] Loss_D: 0.0631 Loss_G: 5.4225
```

Generator and Discriminator Loss - EPOCH 290



```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[292/300][322/644] Loss_D: 0.0190 Loss_G: 1.0589  
[292/300][644/644] Loss_D: 0.1353 Loss_G: 9.2346
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[293/300][322/644] Loss_D: 0.0189 Loss_G: 0.8795  
[293/300][644/644] Loss_D: 0.0395 Loss_G: 0.0366
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[294/300][322/644] Loss_D: 0.0290 Loss_G: 1.0508  
[294/300][644/644] Loss_D: 0.1018 Loss_G: 7.7453
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[295/300][322/644] Loss_D: 0.0140 Loss_G: 1.0883  
[295/300][644/644] Loss_D: 0.0566 Loss_G: 0.3744
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[296/300][322/644] Loss_D: 0.0105 Loss_G: 0.9894  
[296/300][644/644] Loss_D: 0.0012 Loss_G: 0.8006
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[297/300][322/644] Loss_D: 0.0379 Loss_G: 0.9557  
[297/300][644/644] Loss_D: 0.0028 Loss_G: 1.6963
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))
```

```
[298/300] [322/644] Loss_D: 0.0252 Loss_G: 1.0408  
[298/300] [644/644] Loss_D: 0.7406 Loss_G: 11.9614
```

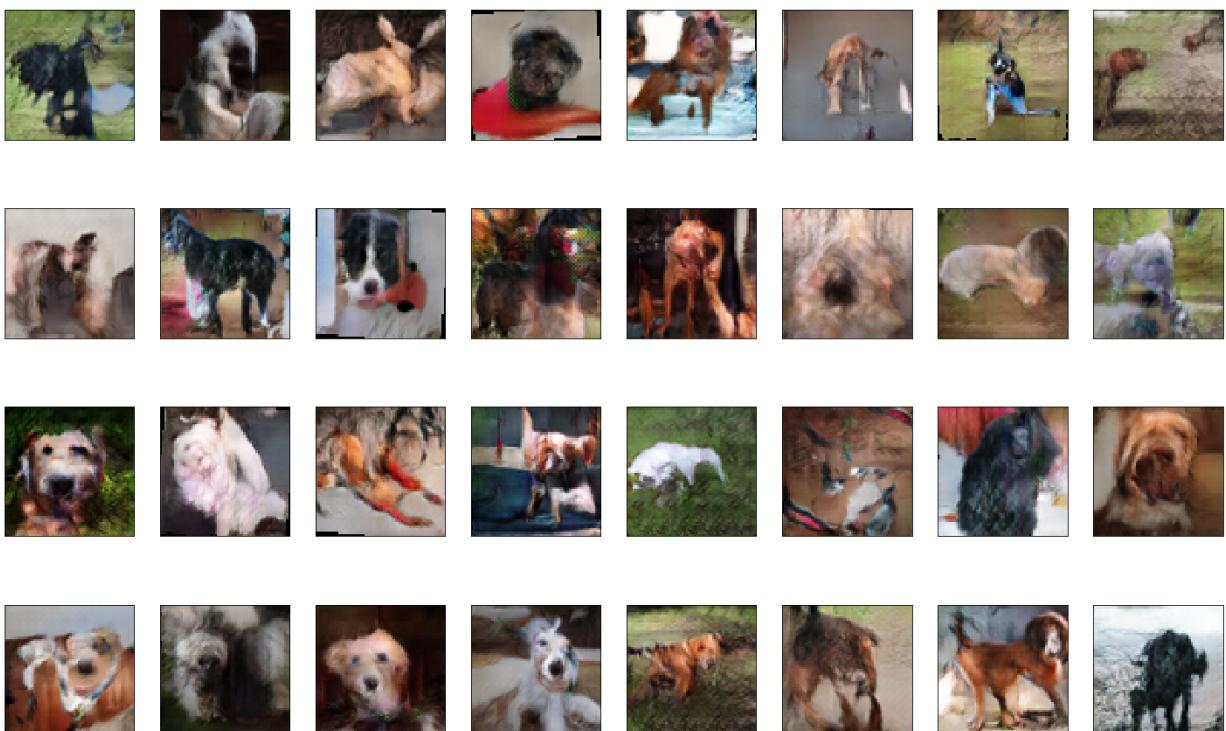
```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[299/300][322/644] Loss_D: 0.0120 Loss_G: 0.9968  
[299/300][644/644] Loss D: 0.0229 Loss G: 2.7973
```

```
HBox(children=(IntProgress(value=0, max=644), HTML(value='')))  
[300/300][322/644] Loss_D: 0.0106 Loss_G: 1.0546  
[300/300][644/644] Loss D: 0.0270 Loss G: 0.0406
```

Let's visualise generated results

```
In [16]: gen_z = torch.randn(32, nz, 1, 1, device=device)
gen_images = (netG(gen_z).to("cpu").clone().detach() + 1)/2
gen_images = gen_images.numpy().transpose(0, 2, 3, 1)
```

```
In [17]: fig = plt.figure(figsize=(25, 16))
for ii, img in enumerate(gen_images):
    ax = fig.add_subplot(4, 8, ii + 1, xticks=[], yticks=[])
    plt.imshow(img)
```



Make predictions and submit

```
In [18]: if not os.path.exists('../output_images'):
    os.mkdir('../output_images')
im_batch_size = 50
n_images=10000
for i_batch in range(0, n_images, im_batch_size):
    gen_z = torch.randn(im_batch_size, nz, 1, 1, device=device)
    gen_images = (netG(gen_z) + 1)/2
```

```
images = gen_images.to("cpu").clone().detach()
images = images.numpy().transpose(0, 2, 3, 1)
for i_image in range(gen_images.size(0)):
    save_image(gen_images[i_image, :, :, :], os.path.join('../output_images', f'img_{i_image}.png'))

import shutil
shutil.make_archive('images', 'zip', '../output_images')

Out[18]: '/kaggle/working/images.zip'
```