```
import numpy as np
import pandas as pd

import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))


import os
import torch
import torchvision
import pandas as pd
import torch.nn as nn
import torch.nn.functional as F
from tqdm.notebook import tqdm
import torchvision.models as models
from torch.utils.data import Dataset
from torch.utils.data import DataLoader
from torch.utils.data import random_split
from torchvision.utils import make_grid
import torchvision.transforms as transforms
from torchvision.datasets.folder import default_loader
import matplotlib.pyplot as plt
%matplotlib inline


artists = pd.read_csv("artists.csv")

for i in artists['name']:
    print(i,end=" | ")
```

```
 Amedeo Modigliani | Vasiliy Kandinskiy | Diego Rivera | Claude Monet | Rene Magritte | Salvador Dali | Edouard Manet | Andrei Rublev |
```

```
batch_size = 128
image_size = (64,64)
stats = (0.5, 0.5, 0.5), (0.5, 0.5, 0.5)


import torchvision.transforms as transforms
from torchvision import datasets
from torch.utils.data import DataLoader

# Define your image_size and stats variables

transform_ds = transforms.Compose([
    transforms.Resize(image_size),
    # transforms.RandomCrop(32, padding=2),
    # transforms.RandomHorizontalFlip(),
    transforms.ToTensor(),
    transforms.Normalize(*stats)
])

train_ds = datasets.ImageFolder(root="/content/drive/My Drive/resized/", transform=transform_ds)

train_dl = DataLoader(train_ds, batch_size, shuffle=True, num_workers=3, pin_memory=True)
print(len(train_ds))
```

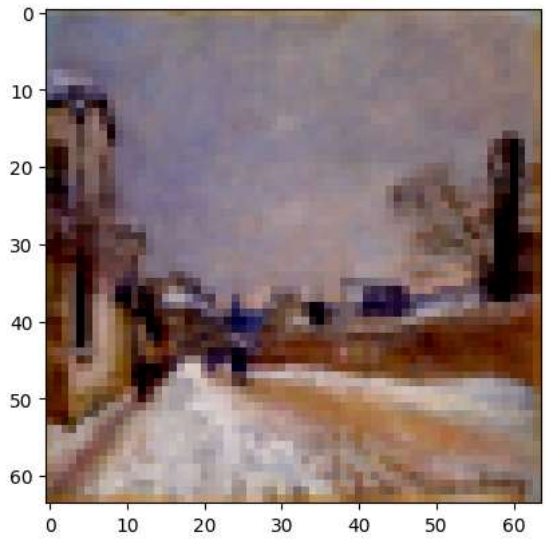
```
 8358
 /usr/local/lib/python3.10/dist-packages/torch/utils/data/dataloader.py:557: UserWarning: This DataLoader will create 3 worker processes
   warnings.warn(_create_warning_msg(
```

```
from google.colab import drive
drive.mount('/content/drive')
```

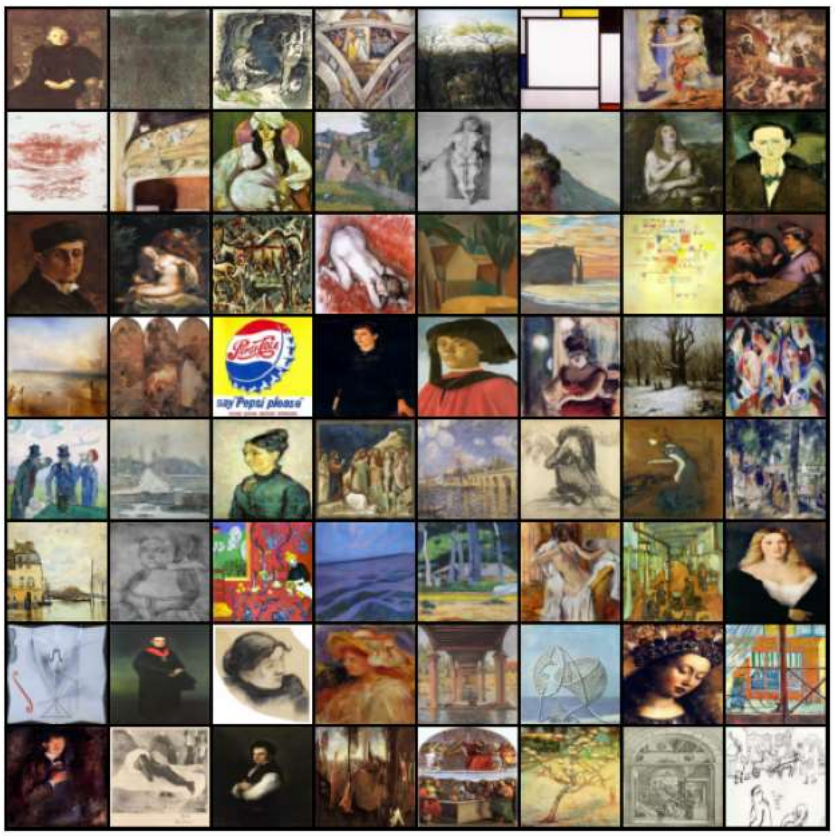
```
 Mounted at /content/drive
```

```
images,_ = train_ds[382]
print(images.size())
plt.imshow(images.permute(1,2,0))
```

```
WARNING:matplotlib.image:Clipping input data to the valid range for imshow with RGB dat
torch.Size([3, 64, 64])
<matplotlib.image.AxesImage at 0x7da5c44260b0>
```




```
def denorm(img_tensors):
    return img_tensors * stats[1][0] + stats[0][0]
def show_images(images, nmax=64):
    fig, ax = plt.subplots(figsize=(8, 8))
    ax.set_xticks([]); ax.set_yticks([])
    ax.imshow(make_grid(denorm(images.detach()[:nmax]), nrow=8).permute(1, 2, 0))

def show_batch(dl, nmax=64):
    for images, _ in dl:
        show_images(images, nmax)
        break


show_batch(train_dl)
```



```
def get_default_device():
    """Pick GPU if available, else CPU"""
    if torch.cuda.is_available():
        return torch.device('cuda')
    else:
        return torch.device('cpu')

def to_device(data, device):
    """Move tensor(s) to chosen device"""
    if isinstance(data, (list,tuple)):
        return [to_device(x, device) for x in data]
    return data.to(device, non_blocking=True)

class DeviceDataLoader():
    """Wrap a dataloader to move data to a device"""
    def __init__(self, dl, device):
        self.dl = dl
        self.device = device

    def __iter__(self):
        """Yield a batch of data after moving it to device"""
        for b in self.dl:
            yield to_device(b, self.device)

    def __len__(self):
        """Number of batches"""
        return len(self.dl)


device = get_default_device()
device
```

```
 device(type='cpu')
```

```
device = get_default_device()
device
```

```
 device(type='cpu')
```

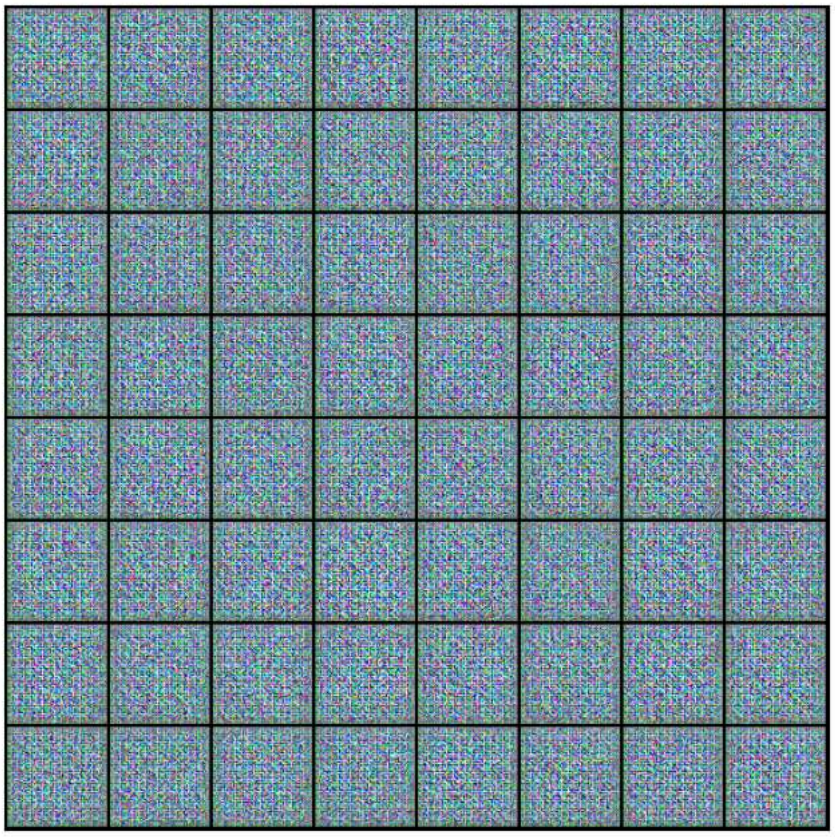
```
discriminator = nn.Sequential(
    # in: 3 x 64 x 64

    nn.Conv2d(3, 64, kernel_size=4, stride=2, padding=1, bias=False),
    nn.BatchNorm2d(64),
    nn.LeakyReLU(0.2, inplace=True),
    # out: 64 x 32 x 32

    nn.Conv2d(64, 128, kernel_size=4, stride=2, padding=1, bias=False),
    nn.BatchNorm2d(128),
    nn.LeakyReLU(0.2, inplace=True),
    # out: 128 x 16 x 16

    nn.Conv2d(128, 256, kernel_size=4, stride=2, padding=1, bias=False),
    nn.BatchNorm2d(256),
    nn.LeakyReLU(0.2, inplace=True),
    # out: 256 x 8 x 8

    nn.Conv2d(256, 512, kernel_size=4, stride=2, padding=1, bias=False),
    nn.BatchNorm2d(512),
    nn.LeakyReLU(0.2, inplace=True),
    # out: 512 x 4 x 4

    nn.Conv2d(512, 1, kernel_size=4, stride=1, padding=0, bias=False),
    # out: 1 x 1 x 1

    nn.Flatten(),
    nn.Sigmoid())
discriminator = to_device(discriminator, device)
latent_size = 150
```

```
generator = nn.Sequential(
    # in: latent_size x 1 x 1

    nn.ConvTranspose2d(latent_size, 512, kernel_size=4, stride=1, padding=0, bias=False),
```

```
        nn.BatchNorm2d(512),
        nn.ReLU(True),
        # out: 512 x 4 x 4

        nn.ConvTranspose2d(512, 256, kernel_size=4, stride=2, padding=1, bias=False),
        nn.BatchNorm2d(256),
        nn.ReLU(True),
        # out: 256 x 8 x 8

        nn.ConvTranspose2d(256, 128, kernel_size=4, stride=2, padding=1, bias=False),
        nn.BatchNorm2d(128),
        nn.ReLU(True),
        # out: 128 x 16 x 16

        nn.ConvTranspose2d(128, 64, kernel_size=4, stride=2, padding=1, bias=False),
        nn.BatchNorm2d(64),
        nn.ReLU(True),
        # out: 64 x 32 x 32

        nn.ConvTranspose2d(64, 3, kernel_size=4, stride=2, padding=1, bias=False),
        nn.Tanh()
        # out: 3 x 64 x 64
    )


    xb = torch.randn(batch_size, latent_size, 1, 1) # random latent tensors
    fake_images = generator(xb)
    print(fake_images.shape)
    show_images(fake_images)
    generator = to_device(generator, device)
    def train_discriminator(real_images, opt_d):
        # Clear discriminator gradients
        opt_d.zero_grad()

        # Pass real images through discriminator
        real_preds = discriminator(real_images)
        real_targets = torch.ones(real_images.size(0), 1, device=device)
        real_loss = F.binary_cross_entropy(real_preds, real_targets)
        real_score = torch.mean(real_preds).item()

        # Generate fake images
        latent = torch.randn(batch_size, latent_size, 1, 1, device=device)
        fake_images = generator(latent)

        # Pass fake images through discriminator
        fake_targets = torch.zeros(fake_images.size(0), 1, device=device)
        fake_preds = discriminator(fake_images)
        fake_loss = F.binary_cross_entropy(fake_preds, fake_targets)
        fake_score = torch.mean(fake_preds).item()

        # Update discriminator weights
        loss = real_loss + fake_loss
        loss.backward()
        opt_d.step()
        return loss.item(), real_score, fake_score
    def train_generator(opt_g):
        # Clear generator gradients
        opt_g.zero_grad()

        # Generate fake images
        latent = torch.randn(batch_size, latent_size, 1, 1, device=device)
        fake_images = generator(latent)

        # Try to fool the discriminator
        preds = discriminator(fake_images)
        targets = torch.ones(batch_size, 1, device=device)
        loss = F.binary_cross_entropy(preds, targets)

        # Update generator weights
        loss.backward()
        opt_g.step()

        return loss.item()
    from torchvision.utils import save_image
    sample_dir = 'generated'
    os.makedirs(sample_dir, exist_ok=True)
    def save_samples(index, latent_tensors, show=True):
```

```
    fake_images = generator(latent_tensors)
    fake_fname = 'generated-images-{0:0=4d}.png'.format(index)
    save_image(denorm(fake_images), os.path.join(sample_dir, fake_fname), nrow=8)
    print('Saving', fake_fname)
    if show:
        fig, ax = plt.subplots(figsize=(8, 8))
        ax.set_xticks([]); ax.set_yticks([])
        ax.imshow(make_grid(fake_images.cpu().detach(), nrow=8).permute(1, 2, 0))
```

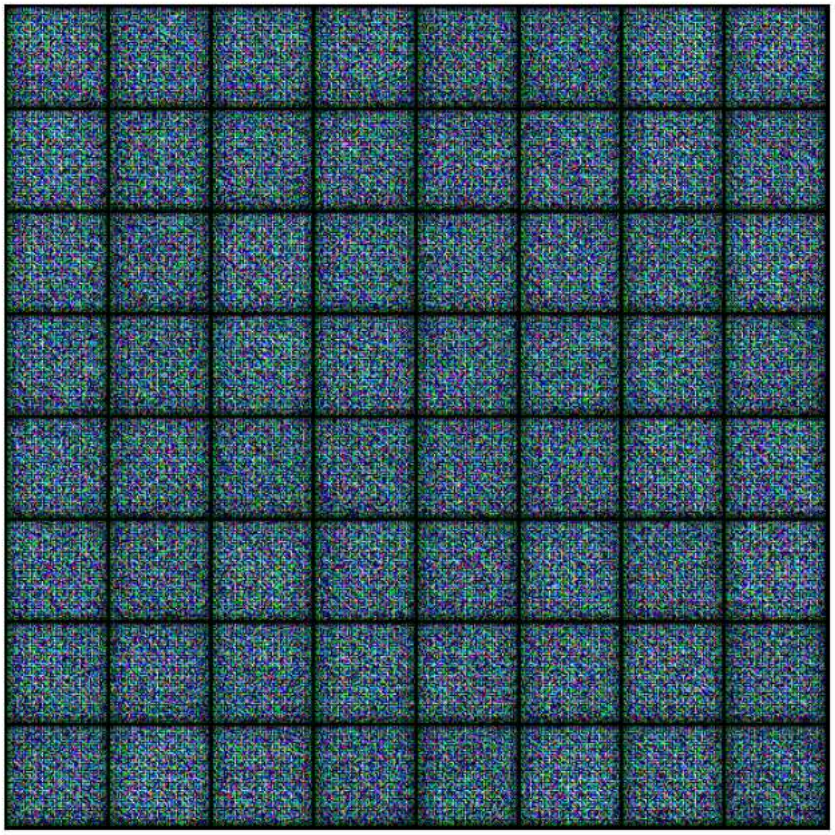
```
 torch.Size([128, 3, 64, 64])
```



```
fixed_latent = torch.randn(64, latent_size, 1, 1, device=device)
save_samples(0, fixed_latent)
from tqdm.notebook import tqdm
import torch.nn.functional as F
def fit(epochs, lr, start_idx=1):
    torch.cuda.empty_cache()

    # Losses & scores
    losses_g = []
    losses_d = []
    real_scores = []
    fake_scores = []

    # Create optimizers
    opt_d = torch.optim.Adam(discriminator.parameters(), lr=lr, betas=(0.5, 0.999))
    opt_g = torch.optim.Adam(generator.parameters(), lr=lr, betas=(0.5, 0.999))

    for epoch in range(epochs):
        for real_images, _ in tqdm(train_dl):
            # Train discriminator
            loss_d, real_score, fake_score = train_discriminator(real_images, opt_d)
            # Train generator
            loss_g = train_generator(opt_g)

        # Record losses & scores
        losses_g.append(loss_g)
        losses_d.append(loss_d)
        real_scores.append(real_score)
        fake_scores.append(fake_score)

        # Log losses & scores (last batch)
```

```
        print("Epoch [{}/{}], loss_g: {:.4f}, loss_d: {:.4f}, real_score: {:.4f}, fake_score: {:.4f}".format(
            epoch+1, epochs, loss_g, loss_d, real_score, fake_score))

        # Save generated images
        save_samples(epoch+start_idx, fixed_latent, show=False)

    return losses_g, losses_d, real_scores, fake_scores
```

```
WARNING:matplotlib.image:Clipping input data to the valid range for imshow with RGB dat
Saving generated-images-0000.png
```



Start coding or generate with AI.