

1 Introduction

The objective of this homework assignment is to create our own pizza-generating Generative Adversarial Network (GAN). Through this assignment, we experimented with two different GAN learning criteria: Binary Cross Entropy (BCE) loss and the Wasserstein distance. We evaluated the generated images quantitatively using the Fréchet Inception Distance (FID).

2 Theoretical Background

2.1 Generative Adversial Networks

In the *adversial nets* framework, a generative model is pitted against a discriminative model that learns to determine whether a sample is from the model distribution or the data distribution [1]. The models are trained such that the discriminator is capable of distinguishing between the real and fake images and the generator is capable of generating images that the discriminator is unable to determine are fake. The equilibrium of this framework is when the generator is generating perfect fakes that look similar to the training data, and the discriminator is left to always guess at 50% confidence that the generator output is either real or fake [2].

To understand GANs mathematically, we define the Discriminator as a function $D(x, \theta_d)$ where x is the image and θ_d are the weights in the Discriminator network. This function returns the probability that the input x is from the probability distribution that describes the training data [3]. The Generator is also defined as a function $G(x, \theta_g)$ that maps the noise vectors to images that look like the training data and θ_g represents the learnable parameters in the Generator network [3].

The assumption is made that the training images are described by a probability distribution p_{data} . The objective of the generator is to transform the noise vector \vec{z} into an image that should look like the training image. \vec{z} is assumed to have been generated with a probability distribution $p_Z(z)$. Therefore, $G(\vec{z}, \theta_d)$ transforms the input $p_Z(z)$ into output probability distribution denoted as p_G [3].

During the training for the discriminator, we want the parameters θ_d to maximize the following expression

$$\max_{\theta_d} \mathbb{E}_{X \sim p_{data}} [\log(D(x))] \quad (1)$$

which means to maximize the probability of assigning the correct label to an input image [3]. While we train the discriminator as described by Eq. 1, the generator is trained such that the following expression is minimized

$$\min_{\theta_g} \mathbb{E}_{Z \sim p_z} [\log(1 - D(G(z)))] \quad (2)$$

We minimize Eq. 2 because we want the discriminator to classify the fake images as real images from the training distribution [3], and this is achieved when the output of the discriminator function is a maximum (a one as opposed to a zero since the discriminator is a binary classifier).

Combining Eq. 1 and Eq. 2 yields this minmax game for the adversarial network as follows

$$\min_{\theta_g} \max_{\theta_d} [\mathbb{E}_{X \sim p_{data}} [\log(D(x))] + \mathbb{E}_{Z \sim p_z} [\log(1 - D(G(z)))] \quad (3)$$

2.2 Deep Convolution Generative Adversial Networks

The Deep Convolution GAN or DCGAN is an extension of the GAN explained above in the sense that the network is designed to explicitly only use convolutional and convolutional-transpose layers in the discriminator and the generator [4]. The loss function used for DCGAN is known as the Binary Cross Entropy Loss.

2.3 Wasserstein Generative Adversial Networks with Gradient Penalty

Unlike the GAN or DCGAN, the Wasserstein GAN (WGAN) does not have a discriminator but rather has what is known as critic whose objective is to not accept or reject what is produced by the Generator but to become adept at estimating the Wasserstien distance between the distribution that corresponds to the training dataset and the distribution that has been learnt by the Generator thus far[3].

The Wasserstein Distance is a metric as it obeys the properties:

1. The values are guaranteed to be non-negative
2. Symmetric with respect to its arguments
3. Obeys the triangle inequality

and is expressed as follows [5]

$$d_W(P_r, P_\theta) = \sup_{\|f\|_L \leq 1} [\mathbb{E}_{X \sim P_r} \{f_w(x)\} - \mathbb{E}_{Z \sim P_z} \{f_w(g_\theta(z))\}] \quad (4)$$

Where P_r is the marginal with respect to the random variable X and P_z is the marginal with respect to the random variable Y of the set of all possible joint distributions $\gamma(X, Y)$ for **ALL** 1-Lipschitz Functions $f()$ [3]. The 1-Lipschitz function is defined as [3]

$$|f(x_1) - f(x_2)| \leq 1 \cdot d(x_1, x_2) \forall x_1, x_2 \in X \quad (5)$$

P_r is the real distribution that describes the training data and P_z describes the distribution of the noise vectors that is fed into the Generator [3].

The objective of the WGAN is to learn a generator G that minimizes the wasserstein distance between the true distribution P_r and its learnt approximation P_z . At the same time, the GAN must discover a critic C that seeks to maximize the same distance. So similar to the GAN, we end up with a minmax game for the framework [3].

$$\min_G \max_C [\mathbb{E}_{X \sim P_r}[C(x)] - \mathbb{E}_{Z \sim P_z}[C(G(z))]] \quad (6)$$

2.3.1 Gradient Penalty

As shown in the paper *Improved Training of Wasserstein GANs*, implementing a 1-Lipschitz constraint with weight clipping biases the critic towards learning rather than it being a simple probability distribution function [6]. The performance of the WGAN is improved by using the theoretical property that the optimal critic C has a unit gradient norm almost everywhere under P_r and P_z , so the following is the Critic Loss

$$\text{Critic Loss} = \underbrace{\mathbb{E}_{Z \sim P_z}[C(G(z))] - \mathbb{E}_{X \sim P_r}[C(x)]}_{\text{Original Critic Loss}} + \underbrace{[\|\nabla_{\hat{x}} C(\hat{x})\|^2 - 1]^2}_{\text{Gradient Penalty}} \quad (7)$$

The gradient penalty term in Eq. 7 is the output of the 1-Lipschitz function. The $\hat{x} = \epsilon(\text{Real Data}) + (1 - \epsilon)(\text{Fake Data})$ is the constructed fictitious sample resulted from taking a weighted sum of a sample drawn from the training data and one produced by the Generator using a randomly chosen fractional number ϵ .

3 Implementation and Results

The entirety of the code written for this assignment and the results obtained are shown in the following page.

Implementation

April 3, 2023

```
[1]: # Import Libraries
import numpy as np
import torch
import torchvision.transforms as tv
import torch.utils.data
import torch.nn as nn
import torch.nn.functional as F
import matplotlib.pyplot as plt
from PIL import Image
import os
from pprint import pprint
from torchinfo import summary
import torchvision.datasets
import time
import datetime
from pytorch_fid.fid_score import calculate_activation_statistics,
    ↪ calculate_frechet_distance
from pytorch_fid.inception import InceptionV3

import warnings
warnings.simplefilter(action='ignore', category=FutureWarning)
warnings.simplefilter(action='ignore', category=DeprecationWarning)
```

```
/home/dfarache/.conda/envs/cent7/2020.11-py38/eceDL2/lib/python3.8/site-
packages/tqdm/auto.py:21: TqdmWarning: IPProgress not found. Please update
jupyter and ipywidgets. See
https://ipywidgets.readthedocs.io/en/stable/user_install.html
    from .autonotebook import tqdm as notebook_tqdm
```

```
[2]: # Global Variables
train_dir = r"/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/train"
eval_dir = r"/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/eval"
path_to_model = r"/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/model"
path_to_results = r"/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/results"
batch_size = 16
image_size = 64 # 64x64 image size
```

```
device = 'cuda' if torch.cuda.is_available() else 'cpu'
print(f"Torch is on {device}")
device = torch.device(device)
```

Torch is on cuda

0.1 Generate Dataloaders

```
[3]: def generate_dataloader(path, train="train", transform=None):
    dataset = torchvision.datasets.ImageFolder(path, transform=transform)
    print(f"Length of {train} dataset is {len(dataset)}")

    dataloader = torch.utils.data.DataLoader(dataset, batch_size=batch_size,
    ↪ num_workers=2, shuffle=True, drop_last=True)
    return dataloader

# Transformation to apply on the images
transform = tvl.Compose([tvl.Resize(image_size),
                        tvl.CenterCrop(image_size),
                        tvl.ToTensor(),
                        tvl.Normalize((0.5, 0.5, 0.5), (0.5, 0.5, 0.5))])

# Get Trainloader
trainloader = generate_dataloader(path=train_dir, train="train",
    ↪ transform=transform)
testloader = generate_dataloader(path=eval_dir, train="eval",
    ↪ transform=transform)
```

Length of train dataset is 8213

Length of eval dataset is 1000

```
[4]: # Displaying a sample of the training images
images_in_batch, _ = next(iter(trainloader))
plt.figure(figsize=(10, 10))
plt.axis("off")
plt.title("Sample of Training Images")
plt.imshow(np.transpose(torchvision.utils.make_grid(images_in_batch[:
    ↪ batch_size], padding=2, nrow=4, normalize=True), (1, 2, 0)))

# images, _ = next(iter(train_data_loader))
# plt.figure(figsize=(10, 10))
# plt.axis("off")
# plt.title("Training Images")
# plt.imshow(np.transpose(torchvision.utils.make_grid(images[:32], padding=2,
    ↪ normalize=True), (1, 2, 0
# )))
```

[4]: <matplotlib.image.AxesImage at 0x2b0c24fbf910>



0.2 Creating the Networks

```
[5]: # Used by both DCGAN and Wasser GAN
class Generator(nn.Module):
    def __init__(self):
        super(Generator, self).__init__()

        # Bias = False because we don't want to add a learnable parameter to
        ↪ the output
```

```

        self.latent_to_image = nn.ConvTranspose2d(in_channels=100,
        ↪out_channels=512, kernel_size=4, stride=1, padding=0, bias=False)
        self.upsampler2 = nn.ConvTranspose2d(in_channels=512, out_channels=256,
        ↪kernel_size=4, stride=2, padding=1, bias=False)
        self.upsampler3 = nn.ConvTranspose2d(in_channels=256, out_channels=128,
        ↪kernel_size=4, stride=2, padding=1, bias=False)
        self.upsampler4 = nn.ConvTranspose2d(in_channels=128, out_channels=64,
        ↪kernel_size=4, stride=2, padding=1, bias=False)
        self.upsampler5 = nn.ConvTranspose2d(in_channels=64, out_channels=3,
        ↪kernel_size=4, stride=2, padding=1, bias=False)

        # Batch Normalization
        self.bn1 = nn.BatchNorm2d(num_features=512)
        self.bn2 = nn.BatchNorm2d(num_features=256)
        self.bn3 = nn.BatchNorm2d(num_features=128)
        self.bn4 = nn.BatchNorm2d(num_features=64)

        # Activation Function
        self.tanh = nn.Tanh()

    def forward(self, x):
        x = self.latent_to_image(x)
        x = F.relu(self.bn1(x))

        x = self.upsampler2(x)
        x = F.relu(self.bn2(x))

        x = self.upsampler3(x)
        x = F.relu(self.bn3(x))

        x = self.upsampler4(x)
        x = F.relu(self.bn4(x))

        x = self.upsampler5(x)
        return self.tanh(x)

```

```

[6]: # Number of layers and learnable parameters in the Generator
netG = Generator()
num_layers = len(list(netG.parameters()))
num_learnable_parameters = sum(p.numel() for p in netG.parameters() if p.
    ↪requires_grad)

print(f"Number of layers in the generator network: {num_layers}")
print(f"Number of learnable parameters in the generator network:
    ↪{num_learnable_parameters}")
summary(netG, input_size=(batch_size, 100, image_size, image_size))

```

Number of layers in the generator network: 13

Number of learnable parameters in the generator network: 3576704

```
[6]: =====
=====
Layer (type:depth-idx)                Output Shape                Param #
=====
Generator                             [16, 3, 1072, 1072]        --
  ConvTranspose2d: 1-1                 [16, 512, 67, 67]         819,200
  BatchNorm2d: 1-2                    [16, 512, 67, 67]         1,024
  ConvTranspose2d: 1-3                 [16, 256, 134, 134]       2,097,152
  BatchNorm2d: 1-4                    [16, 256, 134, 134]       512
  ConvTranspose2d: 1-5                 [16, 128, 268, 268]       524,288
  BatchNorm2d: 1-6                    [16, 128, 268, 268]       256
  ConvTranspose2d: 1-7                 [16, 64, 536, 536]        131,072
  BatchNorm2d: 1-8                    [16, 64, 536, 536]        128
  ConvTranspose2d: 1-9                 [16, 3, 1072, 1072]       3,072
  Tanh: 1-10                          [16, 3, 1072, 1072]       --
=====
=====
Total params: 3,576,704
Trainable params: 3,576,704
Non-trainable params: 0
Total mult-adds (T): 1.92
=====
=====
Input size (MB): 26.21
Forward/backward pass size (MB): 9267.02
Params size (MB): 14.31
Estimated Total Size (MB): 9307.54
=====
=====
```

0.2.1 DCGAN Networks

```
[7]: class Discriminator(nn.Module):
      def __init__(self):
          super(Discriminator, self).__init__()
          self.conv_in1 = nn.Conv2d(in_channels=3, out_channels=64,
          ↪kernel_size=4, stride=2, padding=1)
          self.conv_in2 = nn.Conv2d(in_channels=64, out_channels=128,
          ↪kernel_size=4, stride=2, padding=1)
          self.conv_in3 = nn.Conv2d(in_channels=128, out_channels=256,
          ↪kernel_size=4, stride=2, padding=1)
          self.conv_in4 = nn.Conv2d(in_channels=256, out_channels=512,
          ↪kernel_size=4, stride=2, padding=1)
```



```

        self.conv_in5 = nn.Conv2d(in_channels=512, out_channels=1024,
↪kernel_size=4, stride=2, padding=1)
        self.conv_in6 = nn.Conv2d(in_channels=1024, out_channels=1,
↪kernel_size=4, stride=2, padding=1)

        # Batch Normalization
        self.bn1 = nn.BatchNorm2d(128)
        self.bn2 = nn.BatchNorm2d(256)
        self.bn3 = nn.BatchNorm2d(512)
        self.bn4 = nn.BatchNorm2d(1024)

        # Activation Function
        self.sig = nn.Sigmoid()

    def forward(self, x):
        x = F.leaky_relu(self.conv_in1(x), negative_slope=0.2, inplace=True)
        x = self.bn1(self.conv_in2(x))
        x = F.leaky_relu(x, negative_slope=0.2, inplace=True)
        x = self.bn2(self.conv_in3(x))
        x = F.leaky_relu(x, negative_slope=0.2, inplace=True)
        x = self.bn3(self.conv_in4(x))
        x = F.leaky_relu(x, negative_slope=0.2, inplace=True)
        x = self.bn4(self.conv_in5(x))
        x = F.leaky_relu(x, negative_slope=0.2, inplace=True)
        x = self.sig(self.conv_in6(x))
        return x

```

```

[8]: # Number of layers and learnable parameters in the Discriminator
netD = Discriminator()
num_layers = len(list(netD.parameters()))
num_learnable_parameters = sum(p.numel() for p in netD.parameters() if p.
↪requires_grad)

print(f"Number of layers in the discriminator network: {num_layers}")
print(f"Number of learnable parameters in the discriminator network:
↪{num_learnable_parameters}")
summary(netD, input_size=(batch_size, 3, image_size, image_size))

```

Number of layers in the discriminator network: 20
Number of learnable parameters in the discriminator network: 11166401

```

[8]: =====
=====
Layer (type:depth-idx)                Output Shape                Param #
=====
=====
Discriminator                          [16, 1, 1, 1]              --

```

Conv2d: 1-1	[16, 64, 32, 32]	3,136
Conv2d: 1-2	[16, 128, 16, 16]	131,200
BatchNorm2d: 1-3	[16, 128, 16, 16]	256
Conv2d: 1-4	[16, 256, 8, 8]	524,544
BatchNorm2d: 1-5	[16, 256, 8, 8]	512
Conv2d: 1-6	[16, 512, 4, 4]	2,097,664
BatchNorm2d: 1-7	[16, 512, 4, 4]	1,024
Conv2d: 1-8	[16, 1024, 2, 2]	8,389,632
BatchNorm2d: 1-9	[16, 1024, 2, 2]	2,048
Conv2d: 1-10	[16, 1, 1, 1]	16,385
Sigmoid: 1-11	[16, 1, 1, 1]	--

```

=====
=====
Total params: 11,166,401
Trainable params: 11,166,401
Non-trainable params: 0
Total mult-adds (G): 2.20
=====
=====
Input size (MB): 0.79
Forward/backward pass size (MB): 24.12
Params size (MB): 44.67
Estimated Total Size (MB): 69.57
=====
=====

```

0.2.2 Wasser GAN

```

[9]: class Critic(nn.Module):
      def __init__(self):
          super(Critic, self).__init__()
          self.DIM = 64
          self.sequence = nn.Sequential(
              nn.Conv2d(in_channels=3, out_channels=self.DIM, kernel_size=5,
↪stride=2, padding=2),
              nn.ReLU(True),
              nn.Conv2d(in_channels=self.DIM, out_channels=2*self.DIM,
↪kernel_size=5, stride=2, padding=2),
              nn.ReLU(True),
              nn.Conv2d(in_channels=2*self.DIM, out_channels=4*self.DIM,
↪kernel_size=5, stride=2, padding=2),
              nn.ReLU(True),
              nn.Conv2d(in_channels=4*self.DIM, out_channels=8*self.DIM,
↪kernel_size=5, stride=2, padding=2),
              nn.ReLU(True)
          )

```

```

        self.output = nn.Linear(in_features=4*4*4*self.DIM, out_features=1)

    def forward(self, x):
        x = x.view(-1, 3, 64, 64)
        x = self.sequence(x)
        x = x.view(-1, 4*4*4*self.DIM)
        x = self.output(x)

        assert x.mean(dim=0) == x.mean(0), "Dimensions are not the same"
        x = x.mean(dim=0) # Return only one value as required by the
↪ expectation operator
        x = x.view(1)
        return x

```

```

[10]: # Number of layers and learnable parameters in the Critic
netC = Critic()
num_layers = len(list(netC.parameters()))
num_learnable_parameters = sum(p.numel() for p in netC.parameters() if p.
↪ requires_grad)

print(f"Number of layers in the discriminator network: {num_layers}")
print(f"Number of learnable parameters in the discriminator network:
↪ {num_learnable_parameters}")
summary(netC, input_size=(batch_size, 3, image_size, image_size))

```

Number of layers in the discriminator network: 10

Number of learnable parameters in the discriminator network: 4310657

```

[10]: =====
=====
Layer (type:depth-idx)                Output Shape                Param #
=====
=====
Critic                                [1]                          --
  Sequential: 1-1                      [16, 512, 4, 4]            --
    Conv2d: 2-1                        [16, 64, 32, 32]           4,864
    ReLU: 2-2                          [16, 64, 32, 32]           --
    Conv2d: 2-3                        [16, 128, 16, 16]          204,928
    ReLU: 2-4                          [16, 128, 16, 16]          --
    Conv2d: 2-5                        [16, 256, 8, 8]            819,456
    ReLU: 2-6                          [16, 256, 8, 8]            --
    Conv2d: 2-7                        [16, 512, 4, 4]            3,277,312
    ReLU: 2-8                          [16, 512, 4, 4]            --
  Linear: 1-2                          [32, 1]                    4,097
=====
=====
Total params: 4,310,657

```

Trainable params: 4,310,657
Non-trainable params: 0
Total mult-adds (G): 2.60

```
=====
=====
Input size (MB): 0.79
Forward/backward pass size (MB): 15.73
Params size (MB): 17.24
Estimated Total Size (MB): 33.76
=====
=====
```

0.3 Training and Evaluation

```
[11]: def plot_losses(lossD, lossG, epochs, gan_type):
        # Plot the training losses
        assert len(lossD) == len(lossG), f"Lengths of losses do not match_
        ↪{len(lossD)} != {len(lossG)}"
        iterations = range(len(lossD))

        plt.plot(iterations, lossG, label="Generator Loss")
        plt.plot(iterations, lossD, label=gan_type + " Loss")

        plt.title("Training Loss")
        plt.xlabel("Iterations")
        plt.ylabel("Loss")
        plt.legend(loc="upper right")

        filename = "train_loss_" + gan_type + ".jpg"
        plt.savefig(os.path.join("/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/
        ↪results", filename))
        plt.show()
```

```
[12]: def transform_tensor_to_PIL(tensor_image):
        transform = tvh.ToPILImage()
        img = transform(tensor_image)

        return img

def plot_fake_real_images(image_list, trainloader):
    # Plot Final Fake Image Result
    real_batch = next(iter(trainloader))
    real_batch = real_batch[0]

    plt.figure(figsize=(15, 15))
    plt.subplot(1, 2, 1)
```

```

plt.axis("off")
plt.title("Real Images")
plt.imshow(np.transpose(torchvision.utils.make_grid(real_batch.to(device),
padding=1, pad_value=1, nrow=4, normalize=True).cpu(), (1,2,0)))

plt.subplot(1, 2, 2)
plt.axis("off")
plt.title("Fake Images")
plt.imshow(np.transpose(image_list[-1], (1, 2, 0)))
plt.savefig(os.path.join(path_to_results, "fake_real_DCGAN.jpg"))
plt.show()

```

```

[13]: def weights_init(m):
    """
    From the DCGAN paper, the authors specify that all model weights shall be
    randomly initialized from a Normal distribution with mean=0, stdev=0.02.
    The weights_init function takes an initialized model as input and
    reinitializes
    all convolutional, convolutional-transpose, and batch normalization layers
    to
    meet this criteria. This function is applied to the models immediately
    after
    initialization.

    https://pytorch.org/tutorials/beginner/dcgan_faces_tutorial.html
    """

    classname = m.__class__.__name__
    if(classname.find('Conv') != -1): # If Conv not found in the classname
        nn.init.normal_(m.weight.data, mean=0.0, std=0.02)
    elif(classname.find('BatchNorm') != -1): # If BatchNorm not found in the
    classname
        nn.init.normal_(m.weight.data, mean=1.0, std=0.02)
        nn.init.constant_(m.bias.data, val=0)

```

```

[14]: def compute_fid_score(fake_paths, real_paths, dims=2048):
    block_idx = InceptionV3.BLOCK_INDEX_BY_DIM[dims]
    model = InceptionV3([block_idx]).to(device)
    m1, s1 = calculate_activation_statistics(real_paths , model , device=device)
    m2, s2 = calculate_activation_statistics(fake_paths , model , device=device)

    fid_value = calculate_frechet_distance(m1, s1, m2, s2)
    print(f"FID: {fid_value :.2f}")
    return fid_value

```

0.3.1 DCGAN

Train

```
[15]: # Parameters for training DCGAN
lr = 0.0004 # Learning Rate
betas = (0.5, 0.999) # Betas factor
epochs = 16 # Number of epochs to train
criterion = nn.BCELoss() # Measuring the loss at the output of the
    ↪ discriminator, since the result will be binary
netG = Generator()
netD = Discriminator()
optimizerD = torch.optim.Adam(netD.parameters(), lr=lr, betas=betas) # Adam
    ↪ Optimizer for Discriminator
optimizerG = torch.optim.Adam(netG.parameters(), lr=lr, betas=betas) # Adam
    ↪ Optimizer for Generator
```

```
[16]: def DCGAN_train(netD, netG, trainloader):
    nz = 100 # Set the number of channels for the 1x1 input noise vectors for
    ↪ the Generator

    # Push networks to GPU and apply weights initialized
    netD = netD.to(device)
    netD.apply(weights_init)

    netG = netG.to(device)
    netG.apply(weights_init)

    # Use the same noise batch to check on the progress made for the Generator
    fixed_noise = torch.randn(batch_size, nz, 1, 1, device=device)

    # Establish an integer-encoding convention for the real and fake labels
    ↪ during training
    real_label = 1
    fake_label = 0

    # Store all the results during training
    image_list = []
    lossesG = []
    lossesD = []
    iters = 0

    print(f"Training started at time {datetime.datetime.now().time()}")
    start_time = time.time()

    for epoch in range(1, epochs + 1):
        g_losses_per_print_cycle = []
        d_losses_per_print_cycle = []

        for batch_idx, (real_images_in_batch, _) in enumerate(trainloader):
```

```

        real_images_in_batch = real_images_in_batch.to(device) # Push
↪images to gpu
        assert batch_size == real_images_in_batch.shape[0], "Batch size is
↪not equal"

        netD.zero_grad()

        # Train the discriminator on the real labels
        labels = torch.full(size=(batch_size, ), fill_value=real_label,
↪dtype=torch.float, device=device) # Fill the tensor with the integer
↪encoding for the real label
        output = netD(real_images_in_batch).view(-1) # size([16])
        lossD_for_real_images = criterion(output, labels)
        lossD_for_real_images.backward()

        # Train the Discriminator on the fake labels
        noise = torch.randn(batch_size, nz, 1, 1, device=device)
        fake_images = netG(noise) # Generate noisy fake images [16, 3, 64,
↪64]

        labels.fill_(fake_label) # Replace real labels with fake labels
        output = netD(fake_images.detach()).view(-1) # size([16])
        lossD_for_fake_images = criterion(output, labels)
        lossD_for_fake_images.backward()

        lossD = lossD_for_fake_images + lossD_for_real_images # total
↪discriminator loss combining real and fake images
        d_losses_per_print_cycle.append(lossD)
        optimizerD.step()

        # Minimize  $1 - D(G(z))$  and since  $D$  is constrained to lie within
↪ $(0,1)$ , we have to maximize  $D(G(z))$ 
        netG.zero_grad()
        labels.fill_(real_label)
        output = netD(fake_images).view(-1) # size([16])
        lossG = criterion(output, labels)
        g_losses_per_print_cycle.append(lossG)
        lossG.backward()
        optimizerG.step()

        if(batch_idx % 50 == 0):
            mean_lossD = torch.mean(torch.
↪FloatTensor(d_losses_per_print_cycle))
            mean_lossG = torch.mean(torch.
↪FloatTensor(g_losses_per_print_cycle))

```

```

        print("[epoch=%d/%d  iter=%4d]          mean_D_loss=%7.4f  \n
↪mean_G_loss=%7.4f" % ((epoch),epochs,(batch_idx+1), mean_lossD, mean_lossG))

        d_losses_per_print_cycle = []
        g_losses_per_print_cycle = []

        torch.save(netD.state_dict(), os.path.join(path_to_model,\n
↪"dcgan_discriminator.pt"))
        torch.save(netG.state_dict(), os.path.join(path_to_model,\n
↪"dcgan_generator.pt"))

        lossesG.append(lossG.item())
        lossesD.append(lossD.item())

        if((iters % 500 == 0) or ((epoch == epochs) and (batch_idx ==\n
↪len(trainloader) - 1))):
            with torch.no_grad():
                fake_image = netG(fixed_noise).detach().cpu()
                image_list.append(torchvision.utils.make_grid(fake_image,\n
↪padding=1, pad_value=1, nrow=4, normalize=True))
                iters += 1

        print("Training concluded in %s seconds" % (time.time() - start_time))
        return lossesD, lossesG, image_list

```

```
[17]: lossD, lossG, image_list = DCGAN_train(netD, netG, trainloader)
```

Training started at time 22:39:10.211215

[epoch=1/16	iter= 1]	mean_D_loss= 1.8494	mean_G_loss=13.6447
[epoch=1/16	iter= 51]	mean_D_loss= 1.4749	mean_G_loss=11.3321
[epoch=1/16	iter= 101]	mean_D_loss= 0.9137	mean_G_loss= 5.5519
[epoch=1/16	iter= 151]	mean_D_loss= 1.1991	mean_G_loss= 3.7284
[epoch=1/16	iter= 201]	mean_D_loss= 0.9667	mean_G_loss= 4.2317
[epoch=1/16	iter= 251]	mean_D_loss= 0.8082	mean_G_loss= 4.9240
[epoch=1/16	iter= 301]	mean_D_loss= 0.6527	mean_G_loss= 5.0944
[epoch=1/16	iter= 351]	mean_D_loss= 0.6555	mean_G_loss= 5.5534
[epoch=1/16	iter= 401]	mean_D_loss= 0.6953	mean_G_loss= 4.9584
[epoch=1/16	iter= 451]	mean_D_loss= 0.7622	mean_G_loss= 5.5515
[epoch=1/16	iter= 501]	mean_D_loss= 0.8843	mean_G_loss= 5.2009
[epoch=2/16	iter= 1]	mean_D_loss= 0.2153	mean_G_loss= 5.0691
[epoch=2/16	iter= 51]	mean_D_loss= 0.9057	mean_G_loss= 5.4144
[epoch=2/16	iter= 101]	mean_D_loss= 0.9524	mean_G_loss= 4.1201
[epoch=2/16	iter= 151]	mean_D_loss= 0.9205	mean_G_loss= 3.9855
[epoch=2/16	iter= 201]	mean_D_loss= 0.9419	mean_G_loss= 3.9813
[epoch=2/16	iter= 251]	mean_D_loss= 0.9853	mean_G_loss= 4.1669
[epoch=2/16	iter= 301]	mean_D_loss= 0.7759	mean_G_loss= 4.2905
[epoch=2/16	iter= 351]	mean_D_loss= 0.8891	mean_G_loss= 4.5635

[epoch=2/16	iter= 401]	mean_D_loss= 1.0671	mean_G_loss= 4.3068
[epoch=2/16	iter= 451]	mean_D_loss= 0.9370	mean_G_loss= 3.8683
[epoch=2/16	iter= 501]	mean_D_loss= 0.9352	mean_G_loss= 3.7164
[epoch=3/16	iter= 1]	mean_D_loss= 0.6301	mean_G_loss= 3.6283
[epoch=3/16	iter= 51]	mean_D_loss= 0.8005	mean_G_loss= 4.0204
[epoch=3/16	iter= 101]	mean_D_loss= 0.8391	mean_G_loss= 4.6274
[epoch=3/16	iter= 151]	mean_D_loss= 0.9950	mean_G_loss= 4.1727
[epoch=3/16	iter= 201]	mean_D_loss= 0.8003	mean_G_loss= 4.1442
[epoch=3/16	iter= 251]	mean_D_loss= 0.8855	mean_G_loss= 4.2238
[epoch=3/16	iter= 301]	mean_D_loss= 0.8351	mean_G_loss= 3.7565
[epoch=3/16	iter= 351]	mean_D_loss= 0.7388	mean_G_loss= 4.3740
[epoch=3/16	iter= 401]	mean_D_loss= 0.8047	mean_G_loss= 4.5043
[epoch=3/16	iter= 451]	mean_D_loss= 0.8981	mean_G_loss= 4.1915
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[epoch=4/16	iter= 1]	mean_D_loss= 0.4069	mean_G_loss= 4.7683
[epoch=4/16	iter= 51]	mean_D_loss= 0.7475	mean_G_loss= 4.5243
[epoch=4/16	iter= 101]	mean_D_loss= 0.9528	mean_G_loss= 4.5486
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[epoch=4/16	iter= 251]	mean_D_loss= 0.8809	mean_G_loss= 4.2169
[epoch=4/16	iter= 301]	mean_D_loss= 0.8379	mean_G_loss= 3.9427
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[epoch=4/16	iter= 401]	mean_D_loss= 0.9194	mean_G_loss= 4.4526
[epoch=4/16	iter= 451]	mean_D_loss= 0.7621	mean_G_loss= 4.2333
[epoch=4/16	iter= 501]	mean_D_loss= 0.9019	mean_G_loss= 4.3919
[epoch=5/16	iter= 1]	mean_D_loss= 0.4761	mean_G_loss= 5.2038
[epoch=5/16	iter= 51]	mean_D_loss= 0.7770	mean_G_loss= 4.2643
[epoch=5/16	iter= 101]	mean_D_loss= 0.8093	mean_G_loss= 4.4694
[epoch=5/16	iter= 151]	mean_D_loss= 0.8720	mean_G_loss= 4.3741
[epoch=5/16	iter= 201]	mean_D_loss= 0.7947	mean_G_loss= 4.1990
[epoch=5/16	iter= 251]	mean_D_loss= 0.7408	mean_G_loss= 4.5406
[epoch=5/16	iter= 301]	mean_D_loss= 0.7507	mean_G_loss= 5.2353
[epoch=5/16	iter= 351]	mean_D_loss= 0.6940	mean_G_loss= 4.3805
[epoch=5/16	iter= 401]	mean_D_loss= 0.7940	mean_G_loss= 4.6890
[epoch=5/16	iter= 451]	mean_D_loss= 0.8015	mean_G_loss= 4.5758
[epoch=5/16	iter= 501]	mean_D_loss= 0.7552	mean_G_loss= 4.0019
[epoch=6/16	iter= 1]	mean_D_loss= 0.8452	mean_G_loss= 3.4559
[epoch=6/16	iter= 51]	mean_D_loss= 0.7346	mean_G_loss= 4.6819
[epoch=6/16	iter= 101]	mean_D_loss= 0.7780	mean_G_loss= 4.1652
[epoch=6/16	iter= 151]	mean_D_loss= 0.7807	mean_G_loss= 4.5158
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[epoch=6/16	iter= 251]	mean_D_loss= 0.7331	mean_G_loss= 4.5132
[epoch=6/16	iter= 301]	mean_D_loss= 0.7518	mean_G_loss= 4.3531
[epoch=6/16	iter= 351]	mean_D_loss= 0.6387	mean_G_loss= 4.4619
[epoch=6/16	iter= 401]	mean_D_loss= 0.7723	mean_G_loss= 4.3342
[epoch=6/16	iter= 451]	mean_D_loss= 0.7426	mean_G_loss= 4.1380
[epoch=6/16	iter= 501]	mean_D_loss= 0.8280	mean_G_loss= 4.2378
[epoch=7/16	iter= 1]	mean_D_loss= 0.3688	mean_G_loss= 4.1539

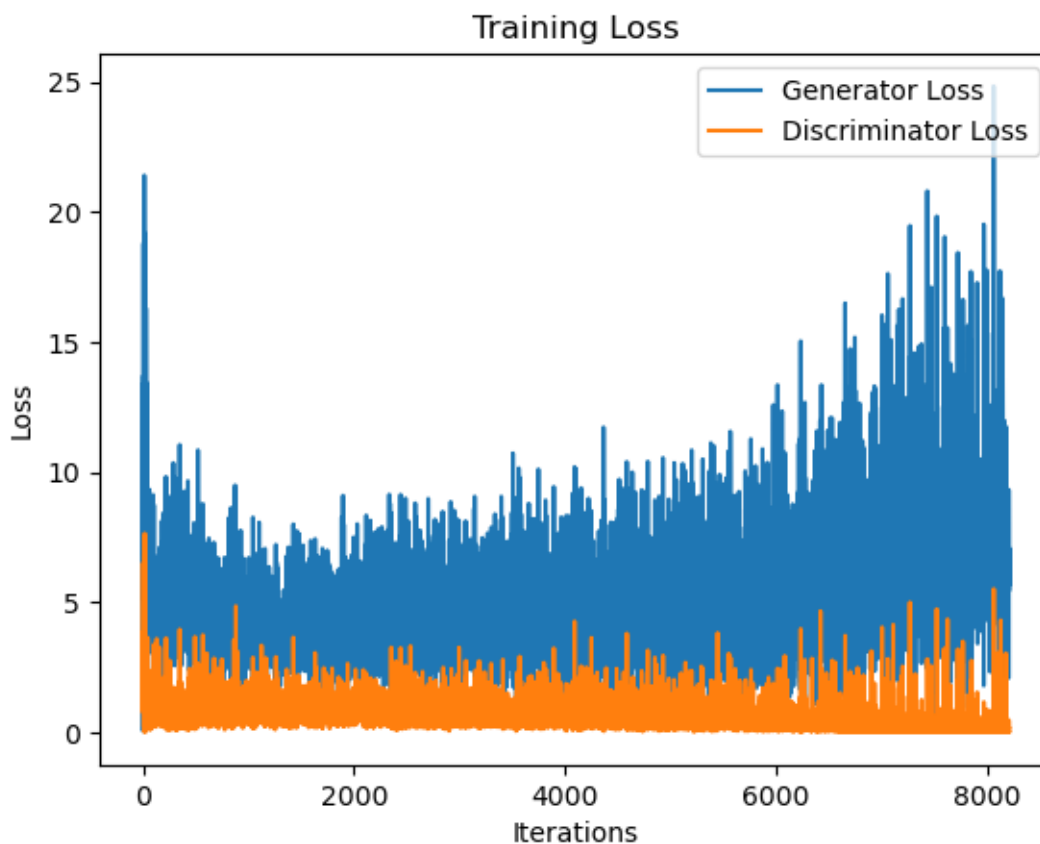
[epoch=7/16	iter= 51]	mean_D_loss= 0.6855	mean_G_loss= 4.2549
[epoch=7/16	iter= 101]	mean_D_loss= 0.8267	mean_G_loss= 4.3881
[epoch=7/16	iter= 151]	mean_D_loss= 0.6921	mean_G_loss= 4.2590
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[epoch=7/16	iter= 301]	mean_D_loss= 0.7110	mean_G_loss= 4.2918
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[epoch=7/16	iter= 451]	mean_D_loss= 0.6113	mean_G_loss= 5.1237
[epoch=7/16	iter= 501]	mean_D_loss= 0.7695	mean_G_loss= 5.1720
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[epoch=8/16	iter= 51]	mean_D_loss= 0.6965	mean_G_loss= 4.5829
[epoch=8/16	iter= 101]	mean_D_loss= 0.6875	mean_G_loss= 4.5900
[epoch=8/16	iter= 151]	mean_D_loss= 0.6436	mean_G_loss= 4.6101
[epoch=8/16	iter= 201]	mean_D_loss= 0.7333	mean_G_loss= 4.4493
[epoch=8/16	iter= 251]	mean_D_loss= 0.7449	mean_G_loss= 4.4667
[epoch=8/16	iter= 301]	mean_D_loss= 0.7238	mean_G_loss= 4.2635
[epoch=8/16	iter= 351]	mean_D_loss= 0.6542	mean_G_loss= 4.3146
[epoch=8/16	iter= 401]	mean_D_loss= 0.5924	mean_G_loss= 4.3344
[epoch=8/16	iter= 451]	mean_D_loss= 0.6465	mean_G_loss= 4.5202
[epoch=8/16	iter= 501]	mean_D_loss= 0.6581	mean_G_loss= 5.2642
[epoch=9/16	iter= 1]	mean_D_loss= 0.4071	mean_G_loss= 6.2043
[epoch=9/16	iter= 51]	mean_D_loss= 0.6655	mean_G_loss= 4.9812
[epoch=9/16	iter= 101]	mean_D_loss= 0.6799	mean_G_loss= 4.7107
[epoch=9/16	iter= 151]	mean_D_loss= 0.7659	mean_G_loss= 4.5006
[epoch=9/16	iter= 201]	mean_D_loss= 0.5864	mean_G_loss= 4.1875
[epoch=9/16	iter= 251]	mean_D_loss= 0.5232	mean_G_loss= 4.6112
[epoch=9/16	iter= 301]	mean_D_loss= 0.6768	mean_G_loss= 4.9657
[epoch=9/16	iter= 351]	mean_D_loss= 0.5664	mean_G_loss= 4.4800
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[epoch=10/16	iter= 1]	mean_D_loss= 1.1648	mean_G_loss= 9.3572
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[epoch=10/16	iter= 101]	mean_D_loss= 0.4955	mean_G_loss= 4.8785
[epoch=10/16	iter= 151]	mean_D_loss= 0.6684	mean_G_loss= 4.9249
[epoch=10/16	iter= 201]	mean_D_loss= 0.6879	mean_G_loss= 4.7946
[epoch=10/16	iter= 251]	mean_D_loss= 0.6362	mean_G_loss= 4.6617
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[epoch=10/16	iter= 351]	mean_D_loss= 0.6750	mean_G_loss= 4.5910
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[epoch=11/16	iter= 101]	mean_D_loss= 0.5837	mean_G_loss= 5.1214
[epoch=11/16	iter= 151]	mean_D_loss= 0.5192	mean_G_loss= 4.7820
[epoch=11/16	iter= 201]	mean_D_loss= 0.5962	mean_G_loss= 4.9656

[epoch=11/16	iter= 251]	mean_D_loss= 0.5245	mean_G_loss= 5.1864
[epoch=11/16	iter= 301]	mean_D_loss= 0.5229	mean_G_loss= 5.0319
[epoch=11/16	iter= 351]	mean_D_loss= 0.6799	mean_G_loss= 4.9683
[epoch=11/16	iter= 401]	mean_D_loss= 0.5621	mean_G_loss= 5.1859
[epoch=11/16	iter= 451]	mean_D_loss= 0.6478	mean_G_loss= 5.0970
[epoch=11/16	iter= 501]	mean_D_loss= 0.5704	mean_G_loss= 4.8915
[epoch=12/16	iter= 1]	mean_D_loss= 0.4126	mean_G_loss= 7.3939
[epoch=12/16	iter= 51]	mean_D_loss= 0.5537	mean_G_loss= 4.7356
[epoch=12/16	iter= 101]	mean_D_loss= 0.5622	mean_G_loss= 5.3665
[epoch=12/16	iter= 151]	mean_D_loss= 0.5551	mean_G_loss= 4.9726
[epoch=12/16	iter= 201]	mean_D_loss= 0.4988	mean_G_loss= 5.2365
[epoch=12/16	iter= 251]	mean_D_loss= 0.5313	mean_G_loss= 5.4341
[epoch=12/16	iter= 301]	mean_D_loss= 0.5670	mean_G_loss= 5.1613
[epoch=12/16	iter= 351]	mean_D_loss= 0.4572	mean_G_loss= 5.1757
[epoch=12/16	iter= 401]	mean_D_loss= 0.4724	mean_G_loss= 5.6391
[epoch=12/16	iter= 451]	mean_D_loss= 0.6964	mean_G_loss= 5.6744
[epoch=12/16	iter= 501]	mean_D_loss= 0.4964	mean_G_loss= 4.8338
[epoch=13/16	iter= 1]	mean_D_loss= 0.0323	mean_G_loss= 5.6353
[epoch=13/16	iter= 51]	mean_D_loss= 0.3591	mean_G_loss= 5.0621
[epoch=13/16	iter= 101]	mean_D_loss= 0.5173	mean_G_loss= 6.0949
[epoch=13/16	iter= 151]	mean_D_loss= 0.4607	mean_G_loss= 6.0651
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[epoch=13/16	iter= 451]	mean_D_loss= 0.4185	mean_G_loss= 5.5432
[epoch=13/16	iter= 501]	mean_D_loss= 0.3733	mean_G_loss= 6.7683
[epoch=14/16	iter= 1]	mean_D_loss= 0.6483	mean_G_loss=10.5195
[epoch=14/16	iter= 51]	mean_D_loss= 0.3021	mean_G_loss= 6.3646
[epoch=14/16	iter= 101]	mean_D_loss= 0.4212	mean_G_loss= 6.5981
[epoch=14/16	iter= 151]	mean_D_loss= 0.3100	mean_G_loss= 6.4380
[epoch=14/16	iter= 201]	mean_D_loss= 0.3791	mean_G_loss= 6.0517
[epoch=14/16	iter= 251]	mean_D_loss= 0.3597	mean_G_loss= 6.5333
[epoch=14/16	iter= 301]	mean_D_loss= 0.2760	mean_G_loss= 7.0308
[epoch=14/16	iter= 351]	mean_D_loss= 0.2417	mean_G_loss= 6.0197
[epoch=14/16	iter= 401]	mean_D_loss= 0.5051	mean_G_loss= 7.7113
[epoch=14/16	iter= 451]	mean_D_loss= 0.3391	mean_G_loss= 7.0999
[epoch=14/16	iter= 501]	mean_D_loss= 0.2577	mean_G_loss= 7.9251
[epoch=15/16	iter= 1]	mean_D_loss= 0.0747	mean_G_loss= 6.4691
[epoch=15/16	iter= 51]	mean_D_loss= 0.2779	mean_G_loss= 7.4391
[epoch=15/16	iter= 101]	mean_D_loss= 0.4107	mean_G_loss= 6.7510
[epoch=15/16	iter= 151]	mean_D_loss= 0.2855	mean_G_loss= 7.5266
[epoch=15/16	iter= 201]	mean_D_loss= 0.1980	mean_G_loss= 7.2186
[epoch=15/16	iter= 251]	mean_D_loss= 0.2418	mean_G_loss= 8.2546
[epoch=15/16	iter= 301]	mean_D_loss= 0.2899	mean_G_loss= 7.9029
[epoch=15/16	iter= 351]	mean_D_loss= 0.3117	mean_G_loss= 7.1403
[epoch=15/16	iter= 401]	mean_D_loss= 0.1985	mean_G_loss= 6.8155

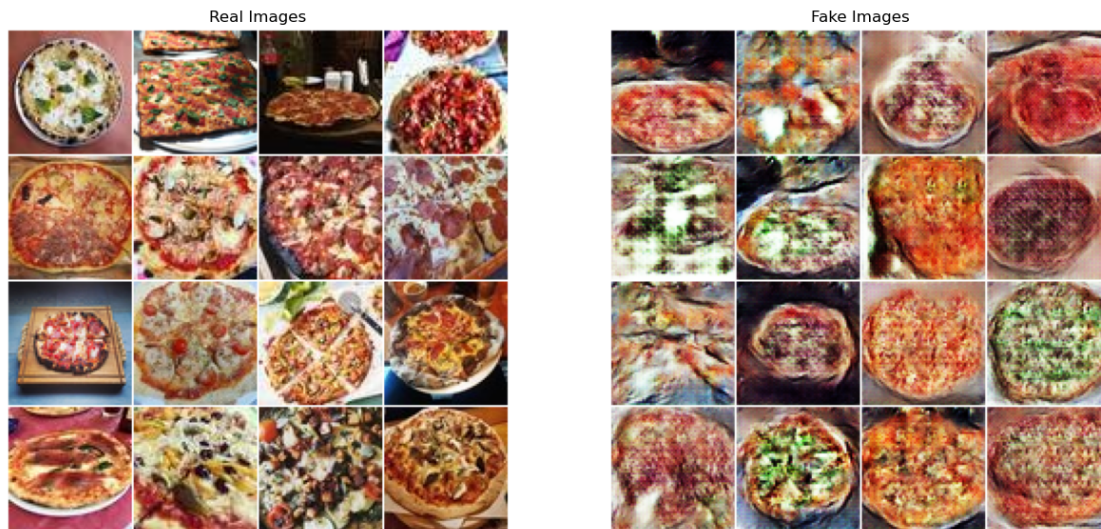
[epoch=15/16	iter= 451]	mean_D_loss= 0.5203	mean_G_loss= 8.1413
[epoch=15/16	iter= 501]	mean_D_loss= 0.2642	mean_G_loss= 6.7430
[epoch=16/16	iter= 1]	mean_D_loss= 0.2162	mean_G_loss= 6.1750
[epoch=16/16	iter= 51]	mean_D_loss= 0.3906	mean_G_loss= 7.5826
[epoch=16/16	iter= 101]	mean_D_loss= 0.2727	mean_G_loss= 6.8932
[epoch=16/16	iter= 151]	mean_D_loss= 0.3366	mean_G_loss= 6.9971
[epoch=16/16	iter= 201]	mean_D_loss= 0.2413	mean_G_loss= 7.5216
[epoch=16/16	iter= 251]	mean_D_loss= 0.1567	mean_G_loss= 7.1755
[epoch=16/16	iter= 301]	mean_D_loss= 0.1611	mean_G_loss= 8.6073
[epoch=16/16	iter= 351]	mean_D_loss= 0.1357	mean_G_loss= 7.1189
[epoch=16/16	iter= 401]	mean_D_loss= 0.3681	mean_G_loss= 8.5101
[epoch=16/16	iter= 451]	mean_D_loss= 0.4809	mean_G_loss= 8.9286
[epoch=16/16	iter= 501]	mean_D_loss= 0.2385	mean_G_loss= 6.7054

Training concluded in 416.8331310749054 seconds

```
[18]: plot_losses(lossD, lossG, epochs, gan_type="Discriminator")
```



```
[26]: plot_fake_real_images(image_list, trainloader)
```

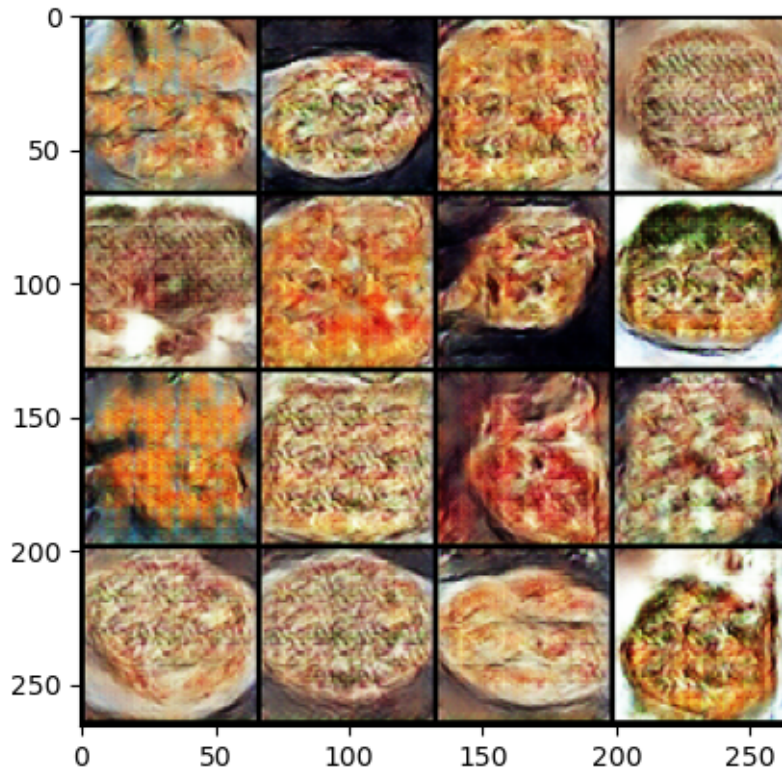


Evaluation

```
[27]: num_images = 1000
validation_noise = torch.randn(num_images, 100, 1, 1, device=device)
netG.load_state_dict(torch.load(os.path.join(path_to_model, "dcgan_generator.
    ↪pt")))
netG.eval()

generated_fake_images = netG(validation_noise)
fake_images = generated_fake_images.detach().cpu()
plt.imshow(np.transpose(torchvision.utils.make_grid(fake_images[:batch_size],
    ↪padding=2, nrow=4, normalize=True), (1,2,0)))
```

```
[27]: <matplotlib.image.AxesImage at 0x2b8a6600c190>
```



```
[28]: # Saving all the fake images
path_to_fakes = r"/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/fakes_dcgan"
for ibx in range(len(fake_images)):
    image = transform_tensor_to_PIL(fake_images[ibx] / 2 + 0.5)
    image.save(os.path.join(path_to_fakes, str(ibx)+".jpg"))
```

```
[29]: fake_paths = [os.path.join(path_to_fakes, filename) for filename in os.
    ↳listdir(path_to_fakes)]

path_to_eval = os.path.join(eval_dir, "pizza")
real_paths = [os.path.join(path_to_eval, filename) for filename in os.
    ↳listdir(path_to_eval)]
```

```
[30]: dcgan_fid = compute_fid_score(fake_paths, real_paths, dims=2048)
```

```
100%|      | 20/20 [00:04<00:00, 4.94it/s]
```

```
100%|      | 20/20 [00:01<00:00, 12.28it/s]
```

```
FID: 122.00
```

0.3.2 Wasser GAN

Train

```
[19]: # Parameters for training Wasser GAN
lr = 1e-3 # Learning Rate
betas = (0.5, 0.999) # Betas factor
epochs = 250 # Number of epochs to train
netG = Generator()
netC = Critic()
LAMBDA = 10
optimizerG = torch.optim.Adam(netG.parameters(), lr=lr, betas=betas) # Adam
    ↪Optimizer for Generator
optimizerC = torch.optim.Adam(netC.parameters(), lr=lr, betas=betas) # Adam
    ↪Optimizer for Critic

[20]: def compute_gradient_penalty(netC, real_images_in_batch, fake_images):
    epsilon = torch.rand(1).cuda()
    interpolates = epsilon * real_images_in_batch + ((1 - epsilon) *
    ↪fake_images)
    interpolates = interpolates.requires_grad_(True).cuda()
    critic_interpolates = netC(interpolates)
    gradients = torch.autograd.grad(outputs=critic_interpolates,
    ↪inputs=interpolates,
                                grad_outputs=torch.ones(critic_interpolates.
    ↪size()).cuda(),
                                create_graph=True, retain_graph=True,
    ↪only_inputs=True)[0]
    gradient_penalty = ((gradients.norm(2, dim=1) - 1) ** 2).mean() * LAMBDA
    return gradient_penalty

[21]: def WGAN_train(netC, netG, trainloader):
    nz = 100 # Set the number of channels for the 1x1 input noise vectors for
    ↪the Generator

    # Push networks to GPU and apply weights initialized
    netC = netC.to(device)
    netC.apply(weights_init)

    netG = netG.to(device)
    netG.apply(weights_init)

    # Use the same noise batch to check on the progress made for the Generator
    fixed_noise = torch.randn(batch_size, nz, 1, 1, device=device)

    # To train the Critic, label=1 is assigned to the actual training images
    ↪and label=-1 assigned to the fake images produced by the Generator
    one = torch.tensor([1], dtype=torch.float).to(device)
    minus_one = torch.tensor([-1], dtype=torch.float).to(device)
```



```

# Store all the results during training
image_list = []
lossesG = []
lossesC = []
iters = 0
gen_iterations = 0

print(f"Training started at time {datetime.datetime.now().time()}")
start_time = time.time()

for epoch in range(1, epochs+1):
    data_iter = iter(trainloader)
    batch_idx, ncritic = 0, 5

    # A minimization of the Wasserstein distance between the distribution
    → that describes the training data
    # and the distribution that has been learned so far by the Generator
    → can be translated into a maximization
    # of the difference of the average outputs of a 1-Lipschitz function as
    → applied to the training images
    # and as applied to the output of the Generator. Learning this
    → 1-Lipschitz function is the job of the critic

    # Since the Critic and the Generator parameters must be updated
    → independently, we start by turning on the
    # requires_grad property of the Critic parameters

    while(batch_idx < len(trainloader)):
        for p in netC.parameters():
            p.requires_grad = True
            ic = 0

        """
        The following while loop is used to compute the equation:

        Critic Loss      =      
$$E_{y \sim Q} \left[ \frac{1}{\sqrt{2}} \left( |C(y)| - |C(x)| \right) \right] - E_{x \sim P} \left[ \frac{1}{\sqrt{2}} |C(x)| \right]$$


        =      
$$E_{z \sim p_z} \left[ \frac{1}{\sqrt{2}} |C(G(z))| \right] - E_{x \sim P} \left[ \frac{1}{\sqrt{2}} |C(x)| \right]$$

        →

```



```

"""
while(ic < ncritic and batch_idx < len(trainloader)):
    ic += 1
    ## The maximization needed for training the critic as shown in
    →the above equation consists of three parts

    ### Part 1 - Apply the Critic network to the training images
    →with each image subject to a
    ### gradient target of -1
    netC.zero_grad()
    real_images_in_batch, _ = next(data_iter)
    batch_idx += 1
    real_images_in_batch = real_images_in_batch.to(device)

    assert batch_size == real_images_in_batch.size(0), "The batch_
    →size are not equal"
    critic_for_reals_mean = netC(real_images_in_batch)
    critic_for_reals_mean.backward(minus_one)

    ### Part 2 - Apply the Critic to the images produced by the
    →generator for a fresh batch of
    ### input noise vectors. The output of the Critic for these
    →images must be subject to the target 1
    noise = torch.randn(batch_size, nz, 1, 1, device=device)
    fake_images = netG(noise)

    critic_for_fakes_mean = netC(fake_images.detach())
    critic_for_fakes_mean.backward(one)

    ### Part 3 - Estimate the Gradient Penalty of the function
    →being learned by the Critics with respect to the input to the function
    gradient_penalty = compute_gradient_penalty(netC,
    →real_images_in_batch, fake_images)
    gradient_penalty.backward()
    wasser_dist = critic_for_reals_mean - critic_for_fakes_mean
    loss_critic = -wasser_dist + gradient_penalty

    optimizerC.step()

    # Training the Generator
    ## Training the Generator through the minimization required by the
    →minmax objective in the equation:
    """

```

$$\min_x E[C(x)] - \max_z E[C(G(z))]$$

↪

$$G: \mathcal{P} \rightarrow \mathcal{X} \quad z \sim p_Z$$

```

"""
# First turn off the requires_grad of the Critic parameters since
↪the Critic and Generator must be
# updated independently
for p in netC.parameters():
    p.requires_grad = False
netG.zero_grad()

noise = torch.randn(batch_size, nz, 1, 1, device=device)
fake_images = netG(noise)
critic_for_fakes_mean = netC(fake_images)
loss_gen = critic_for_fakes_mean
loss_gen.backward(minus_one)

optimizerG.step()
gen_iterations += 1

if batch_idx % (ncritic * 20) == 0:
    print("[epoch=%d/%d  batch_idx=%4d]      loss_critic=%7.4f  ↪
↪loss_gen=%7.4f  Wasserstein_dist=%7.4f" % ↪
↪(epoch, epochs, batch_idx, loss_critic.data[0], loss_gen.data[0], wasser_dist.
↪data[0]))
    torch.save(netC.state_dict(), os.path.join(path_to_model, ↪
↪"wgan_critic.pt"))
    torch.save(netG.state_dict(), os.path.join(path_to_model, ↪
↪"wgan_generator.pt"))

    lossesG.append(loss_gen.data[0].item())
    lossesC.append(loss_critic.data[0].item())

    if((iters % 500 == 0) or ((epoch == epochs) and (batch_idx == ↪
↪len(trainloader)-1))):
        with torch.no_grad():
            fake = netG(fixed_noise).detach().cpu()
            image_list.append(torchvision.utils.make_grid(fake, padding=1, ↪
↪pad_value=1, nrow=4, normalize=True))
            iters += 1

print("Training concluded in %s seconds" % (time.time() - start_time))
return lossesC, lossesG, image_list

```

```
[22]: lossC, lossG, image_list = WGAN_train(netC, netG, trainloader)
```

```
Training started at time 22:46:07.645344
[epoch=1/250  batch_idx= 100]      loss_critic=-1967016.0000
loss_gen=-6488790.0000  Wasserstein_dist=2677181.5000
[epoch=1/250  batch_idx= 200]      loss_critic=-6438153.0000
loss_gen=-249809.5469   Wasserstein_dist=8539776.0000
[epoch=1/250  batch_idx= 300]      loss_critic=-3537409.5000
loss_gen=-2259114.5000  Wasserstein_dist=5267549.5000
[epoch=1/250  batch_idx= 400]      loss_critic=-1344158.0000
loss_gen=-6731146.0000  Wasserstein_dist=1643505.5000
[epoch=1/250  batch_idx= 500]      loss_critic=-6659457.5000
loss_gen=9509967.0000   Wasserstein_dist=10510848.0000
[epoch=2/250  batch_idx= 100]      loss_critic=-8008658.0000
loss_gen=-3498859.0000  Wasserstein_dist=11045224.0000
[epoch=2/250  batch_idx= 200]      loss_critic=-4844988.0000
loss_gen=14892770.0000  Wasserstein_dist=7910914.0000
[epoch=2/250  batch_idx= 300]      loss_critic=-4326864.0000
loss_gen=15880936.0000  Wasserstein_dist=8258891.0000
[epoch=2/250  batch_idx= 400]      loss_critic=-6160366.0000
loss_gen=10425052.0000  Wasserstein_dist=9401474.0000
[epoch=2/250  batch_idx= 500]      loss_critic=-3558246.5000
loss_gen=7483861.5000   Wasserstein_dist=8764717.0000
[epoch=3/250  batch_idx= 100]      loss_critic=-4960503.0000
loss_gen=21843498.0000  Wasserstein_dist=9453346.0000
[epoch=3/250  batch_idx= 200]      loss_critic=-4984524.5000
loss_gen=11115536.0000  Wasserstein_dist=8982230.0000
[epoch=3/250  batch_idx= 300]      loss_critic=-12027786.0000
loss_gen=12166783.0000  Wasserstein_dist=17743806.0000
[epoch=3/250  batch_idx= 400]      loss_critic=-2840974.5000
loss_gen=21540694.0000  Wasserstein_dist=6478364.0000
[epoch=3/250  batch_idx= 500]      loss_critic=-3662231.5000
loss_gen=14208480.0000  Wasserstein_dist=5934094.0000
[epoch=4/250  batch_idx= 100]      loss_critic=-1748087.0000
loss_gen=14778793.0000  Wasserstein_dist=4052296.0000
[epoch=4/250  batch_idx= 200]      loss_critic=-3114909.5000
loss_gen=9202693.0000   Wasserstein_dist=5404614.0000
[epoch=4/250  batch_idx= 300]      loss_critic=-3570363.7500
loss_gen=6035410.0000   Wasserstein_dist=6156493.5000
[epoch=4/250  batch_idx= 400]      loss_critic=-2491825.0000
loss_gen=9150388.0000   Wasserstein_dist=5129179.0000
[epoch=4/250  batch_idx= 500]      loss_critic=-2452837.2500
loss_gen=30317380.0000  Wasserstein_dist=5315696.0000
[epoch=5/250  batch_idx= 100]      loss_critic=-2501955.5000
loss_gen=16983220.0000  Wasserstein_dist=4534406.0000
[epoch=5/250  batch_idx= 200]      loss_critic=-1127560.7500
loss_gen=14640465.0000  Wasserstein_dist=3026260.0000
```

```

[epoch=5/250  batch_idx= 300]      loss_critic=-2604368.0000
loss_gen=24900538.0000  Wasserstein_dist=4287084.0000
[epoch=5/250  batch_idx= 400]      loss_critic=-2381336.2500
loss_gen=9887966.0000   Wasserstein_dist=3689545.0000
[epoch=5/250  batch_idx= 500]      loss_critic=-3316104.7500
loss_gen=35230248.0000   Wasserstein_dist=5554750.0000
[epoch=6/250  batch_idx= 100]      loss_critic=-2721632.2500
loss_gen=5301932.0000    Wasserstein_dist=4305626.0000
[epoch=6/250  batch_idx= 200]      loss_critic=-3207953.2500
loss_gen=28021696.0000   Wasserstein_dist=5713600.0000
[epoch=6/250  batch_idx= 300]      loss_critic=-2272965.0000
loss_gen=24842148.0000   Wasserstein_dist=4096310.0000
[epoch=6/250  batch_idx= 400]      loss_critic=-1520455.6250
loss_gen=14534090.0000   Wasserstein_dist=2869192.0000
[epoch=6/250  batch_idx= 500]      loss_critic=-1543101.5000
loss_gen=5776482.0000    Wasserstein_dist=2876145.0000
[epoch=7/250  batch_idx= 100]      loss_critic=-1712456.6250
loss_gen=17710212.0000   Wasserstein_dist=3096086.0000
[epoch=7/250  batch_idx= 200]      loss_critic=-1975354.3750
loss_gen=19791386.0000   Wasserstein_dist=3281634.0000
[epoch=7/250  batch_idx= 300]      loss_critic=-1041316.8750
loss_gen=14347923.0000   Wasserstein_dist=3124310.0000
[epoch=7/250  batch_idx= 400]      loss_critic=-1242963.5000
loss_gen=-7639058.5000    Wasserstein_dist=2668229.5000
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loss_gen=23512516.0000   Wasserstein_dist=3188054.0000
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loss_gen=-10064166.0000   Wasserstein_dist=4272525.5000
[epoch=8/250  batch_idx= 200]      loss_critic=-2015994.7500
loss_gen=9012036.0000    Wasserstein_dist=3352462.0000
[epoch=8/250  batch_idx= 300]      loss_critic=-1726809.7500
loss_gen=6872219.0000    Wasserstein_dist=2864892.0000
[epoch=8/250  batch_idx= 400]      loss_critic=-1642252.8750
loss_gen=8428010.0000    Wasserstein_dist=2722248.0000
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loss_gen=23414952.0000   Wasserstein_dist=3253432.0000
[epoch=9/250  batch_idx= 100]      loss_critic=-145225.7500
loss_gen=14287372.0000   Wasserstein_dist=1480239.0000
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loss_gen=-233856.7500    Wasserstein_dist=2323707.2500
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loss_gen=22254080.0000   Wasserstein_dist=3157060.0000
[epoch=9/250  batch_idx= 400]      loss_critic=-1677762.3750
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[epoch=9/250  batch_idx= 500]      loss_critic=-1888158.2500
loss_gen=16354146.0000   Wasserstein_dist=3085259.0000
[epoch=10/250 batch_idx= 100]      loss_critic=-1189775.8750
loss_gen=21399556.0000   Wasserstein_dist=2756234.0000

```

```

[epoch=10/250  batch_idx= 200]      loss_critic=-2093101.3750
loss_gen=24666664.0000  Wasserstein_dist=3339674.0000
[epoch=10/250  batch_idx= 300]      loss_critic=-1764224.5000
loss_gen=13521662.0000  Wasserstein_dist=2749794.0000
[epoch=10/250  batch_idx= 400]      loss_critic=-1961906.5000
loss_gen=8581384.0000   Wasserstein_dist=3171468.0000
[epoch=10/250  batch_idx= 500]      loss_critic=-1056818.6250
loss_gen=18108964.0000  Wasserstein_dist=2760010.0000
[epoch=11/250  batch_idx= 100]      loss_critic=-1121083.6250
loss_gen=13321118.0000  Wasserstein_dist=2398236.0000
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loss_gen=11737414.0000  Wasserstein_dist=2470203.0000
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loss_gen=8161552.0000   Wasserstein_dist=2961086.0000
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loss_gen=13456782.0000  Wasserstein_dist=2609468.0000
[epoch=11/250  batch_idx= 500]      loss_critic=-2595856.2500
loss_gen=7214008.0000   Wasserstein_dist=4038590.0000
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loss_gen=15480053.0000  Wasserstein_dist=2413058.0000
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loss_gen=2331608.0000   Wasserstein_dist=1826347.0000
[epoch=13/250  batch_idx= 300]      loss_critic=-1589944.5000
loss_gen=18288336.0000  Wasserstein_dist=3005084.0000
[epoch=13/250  batch_idx= 400]      loss_critic=-1945351.6250
loss_gen=12654932.0000  Wasserstein_dist=3068306.0000
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loss_gen=-1883168.2500  Wasserstein_dist=3191064.2500
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loss_gen=32969598.0000  Wasserstein_dist=4859746.0000
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loss_gen=15025804.0000  Wasserstein_dist=2365758.0000
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loss_gen=12180218.0000  Wasserstein_dist=2398576.0000
[epoch=14/250  batch_idx= 400]      loss_critic=-1652548.1250
loss_gen=8126350.0000   Wasserstein_dist=2690798.0000
[epoch=14/250  batch_idx= 500]      loss_critic=-1514288.7500
loss_gen=2829780.0000   Wasserstein_dist=2542074.2500

```

```

[epoch=15/250  batch_idx= 100]      loss_critic=-963109.8750
loss_gen=15464351.0000  Wasserstein_dist=2332478.0000
[epoch=15/250  batch_idx= 200]      loss_critic=-1629527.2500
loss_gen=9224507.0000  Wasserstein_dist=2989388.0000
[epoch=15/250  batch_idx= 300]      loss_critic=-920436.5000
loss_gen=-5652142.0000  Wasserstein_dist=2103993.0000
[epoch=15/250  batch_idx= 400]      loss_critic=-674503.2500
loss_gen=996401.9375   Wasserstein_dist=1745335.7500
[epoch=15/250  batch_idx= 500]      loss_critic=-342815.2500
loss_gen=15549511.0000  Wasserstein_dist=1607628.0000
[epoch=16/250  batch_idx= 100]      loss_critic=-1863195.1250
loss_gen=2212223.2500  Wasserstein_dist=3354433.2500
[epoch=16/250  batch_idx= 200]      loss_critic=-1387358.0000
loss_gen=12120494.0000  Wasserstein_dist=2344584.0000
[epoch=16/250  batch_idx= 300]      loss_critic=-993054.7500
loss_gen=10920782.0000  Wasserstein_dist=2334408.0000
[epoch=16/250  batch_idx= 400]      loss_critic=-1763233.0000
loss_gen=6903457.5000  Wasserstein_dist=2790356.0000
[epoch=16/250  batch_idx= 500]      loss_critic=-3488943.5000
loss_gen=20844240.0000  Wasserstein_dist=4953724.0000
[epoch=17/250  batch_idx= 100]      loss_critic=-1105923.8750
loss_gen=-3707295.2500  Wasserstein_dist=2196954.0000
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loss_gen=-8606157.0000  Wasserstein_dist=2159337.0000
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loss_gen=6696603.5000  Wasserstein_dist=2728173.0000
[epoch=17/250  batch_idx= 400]      loss_critic=-4279009.0000
loss_gen=16499474.0000  Wasserstein_dist=6182467.0000
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loss_gen=5443077.0000  Wasserstein_dist=2241275.5000
[epoch=18/250  batch_idx= 100]      loss_critic=-2724730.5000
loss_gen=13862457.0000  Wasserstein_dist=3872298.0000
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loss_gen=9704996.0000  Wasserstein_dist=2193684.0000
[epoch=18/250  batch_idx= 300]      loss_critic=-1473566.2500
loss_gen=16211706.0000  Wasserstein_dist=2542136.0000
[epoch=18/250  batch_idx= 400]      loss_critic=199647.5625
loss_gen=9223154.0000  Wasserstein_dist=673350.0000
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loss_gen=7024748.0000  Wasserstein_dist=2161209.5000
[epoch=19/250  batch_idx= 100]      loss_critic=-1339184.0000
loss_gen=-4718638.0000  Wasserstein_dist=2373460.0000
[epoch=19/250  batch_idx= 200]      loss_critic=-1205506.0000
loss_gen=2089216.5000  Wasserstein_dist=2132982.2500
[epoch=19/250  batch_idx= 300]      loss_critic=-657341.7500
loss_gen=5871194.0000  Wasserstein_dist=1730057.0000
[epoch=19/250  batch_idx= 400]      loss_critic=-1507372.1250
loss_gen=4433582.0000  Wasserstein_dist=2574821.0000

```

```

[epoch=19/250  batch_idx= 500]      loss_critic=-1160952.6250
loss_gen=2933630.0000  Wasserstein_dist=2037479.0000
[epoch=20/250  batch_idx= 100]      loss_critic=-699189.6875
loss_gen=-7668405.0000  Wasserstein_dist=1701700.0000
[epoch=20/250  batch_idx= 200]      loss_critic=-1608670.2500
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loss_gen=-166326.8281  Wasserstein_dist=1487839.5000
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loss_gen=3289658.0000  Wasserstein_dist=1849319.5000
[epoch=21/250  batch_idx= 100]      loss_critic=-1389450.8750
loss_gen=1916279.5000  Wasserstein_dist=2446270.7500
[epoch=21/250  batch_idx= 200]      loss_critic=-1418479.0000
loss_gen=-9077916.0000  Wasserstein_dist=2382564.0000
[epoch=21/250  batch_idx= 300]      loss_critic=-1336238.8750
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loss_gen=-1657206.1250  Wasserstein_dist=2016797.1250
[epoch=22/250  batch_idx= 200]      loss_critic=-1028277.7500
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loss_gen=8379978.0000  Wasserstein_dist=2013307.0000
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loss_gen=11531588.0000  Wasserstein_dist=2155554.0000
[epoch=23/250  batch_idx= 100]      loss_critic=-1113675.0000
loss_gen=901516.0000  Wasserstein_dist=1890730.2500
[epoch=23/250  batch_idx= 200]      loss_critic=-713087.1250
loss_gen=1907437.5000  Wasserstein_dist=1343720.8750
[epoch=23/250  batch_idx= 300]      loss_critic=-1743424.6250
loss_gen=-3477289.5000  Wasserstein_dist=2619423.5000
[epoch=23/250  batch_idx= 400]      loss_critic=-743828.0000
loss_gen=279287.2188  Wasserstein_dist=1564321.1250
[epoch=23/250  batch_idx= 500]      loss_critic=-1258632.0000
loss_gen=3194188.2500  Wasserstein_dist=2102877.0000
[epoch=24/250  batch_idx= 100]      loss_critic=-974753.0000
loss_gen=-2078896.2500  Wasserstein_dist=1759358.2500
[epoch=24/250  batch_idx= 200]      loss_critic=-784960.3750
loss_gen=1138364.6250  Wasserstein_dist=1607474.1250
[epoch=24/250  batch_idx= 300]      loss_critic=20707.6875
loss_gen=-5867478.0000  Wasserstein_dist=807375.5000

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[epoch=24/250  batch_idx= 400]      loss_critic=-1158468.5000
loss_gen=560143.5000  Wasserstein_dist=1927191.0000
[epoch=24/250  batch_idx= 500]      loss_critic=-1079605.8750
loss_gen=3144804.5000  Wasserstein_dist=1812471.0000
[epoch=25/250  batch_idx= 100]      loss_critic=-981718.6875
loss_gen=-3269932.2500  Wasserstein_dist=1760275.5000
[epoch=25/250  batch_idx= 200]      loss_critic=-1132301.0000
loss_gen=7237220.0000  Wasserstein_dist=1899530.0000
[epoch=25/250  batch_idx= 300]      loss_critic=-820371.1875
loss_gen=12724652.0000  Wasserstein_dist=1620234.0000
[epoch=25/250  batch_idx= 400]      loss_critic=-1294950.7500
loss_gen=-682204.6875  Wasserstein_dist=2162118.5000
[epoch=25/250  batch_idx= 500]      loss_critic=-1087481.7500
loss_gen=5503493.0000  Wasserstein_dist=1841835.0000
[epoch=26/250  batch_idx= 100]      loss_critic=-877895.2500
loss_gen=3515947.0000  Wasserstein_dist=1592016.2500
[epoch=26/250  batch_idx= 200]      loss_critic=-1274831.0000
loss_gen=6558392.5000  Wasserstein_dist=2013237.0000
[epoch=26/250  batch_idx= 300]      loss_critic=-929950.2500
loss_gen=573230.2500  Wasserstein_dist=1644226.3750
[epoch=26/250  batch_idx= 400]      loss_critic=-1489375.8750
loss_gen=-6654295.0000  Wasserstein_dist=2433548.5000
[epoch=26/250  batch_idx= 500]      loss_critic=-3007171.5000
loss_gen=12982216.0000  Wasserstein_dist=4164256.0000
[epoch=27/250  batch_idx= 100]      loss_critic=-1791989.5000
loss_gen=5408884.0000  Wasserstein_dist=2379866.0000
[epoch=27/250  batch_idx= 200]      loss_critic=-2851830.2500
loss_gen=-13731300.0000  Wasserstein_dist=3962051.0000
[epoch=27/250  batch_idx= 300]      loss_critic=-373133.1250
loss_gen=-1589730.0000  Wasserstein_dist=1161344.3750
[epoch=27/250  batch_idx= 400]      loss_critic=-1586186.5000
loss_gen=-3663194.5000  Wasserstein_dist=2296584.7500
[epoch=27/250  batch_idx= 500]      loss_critic=-872854.7500
loss_gen=6060820.0000  Wasserstein_dist=1526874.5000
[epoch=28/250  batch_idx= 100]      loss_critic=-667374.5000
loss_gen=586974.7500  Wasserstein_dist=1355922.0000
[epoch=28/250  batch_idx= 200]      loss_critic=-925489.0000
loss_gen=6381535.0000  Wasserstein_dist=1565974.5000
[epoch=28/250  batch_idx= 300]      loss_critic=-1185098.0000
loss_gen=5015589.5000  Wasserstein_dist=1876200.0000
[epoch=28/250  batch_idx= 400]      loss_critic=-1261085.3750
loss_gen=2853409.2500  Wasserstein_dist=1816642.0000
[epoch=28/250  batch_idx= 500]      loss_critic=131659.0000
loss_gen=7273263.5000  Wasserstein_dist=718313.5000
[epoch=29/250  batch_idx= 100]      loss_critic=-709054.0000
loss_gen=-5340605.0000  Wasserstein_dist=1379272.0000
[epoch=29/250  batch_idx= 200]      loss_critic=-1099421.3750
loss_gen=-3311122.5000  Wasserstein_dist=1676657.0000

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[epoch=29/250  batch_idx= 300]      loss_critic=-2385223.5000
loss_gen=-7463267.0000  Wasserstein_dist=3908646.2500
[epoch=29/250  batch_idx= 400]      loss_critic=2749.7500
loss_gen=10209951.0000  Wasserstein_dist=671930.0000
[epoch=29/250  batch_idx= 500]      loss_critic=-2051158.3750
loss_gen=-4059403.2500  Wasserstein_dist=2770597.7500
[epoch=30/250  batch_idx= 100]      loss_critic=-693743.9375
loss_gen=849316.5000   Wasserstein_dist=1200861.5000
[epoch=30/250  batch_idx= 200]      loss_critic=-1103413.5000
loss_gen=922961.3750   Wasserstein_dist=1602418.7500
[epoch=30/250  batch_idx= 300]      loss_critic=-1139067.6250
loss_gen=-8970440.0000  Wasserstein_dist=1688864.0000
[epoch=30/250  batch_idx= 400]      loss_critic=-491295.2500
loss_gen=2267992.0000  Wasserstein_dist=1115499.7500
[epoch=30/250  batch_idx= 500]      loss_critic=-969548.4375
loss_gen=-2467510.7500  Wasserstein_dist=1783508.7500
[epoch=31/250  batch_idx= 100]      loss_critic=-1583843.0000
loss_gen=-2186744.7500  Wasserstein_dist=2205955.2500
[epoch=31/250  batch_idx= 200]      loss_critic=-1525170.6250
loss_gen=4366189.0000  Wasserstein_dist=2321602.0000
[epoch=31/250  batch_idx= 300]      loss_critic=-1870785.0000
loss_gen=9347661.0000  Wasserstein_dist=2870150.0000
[epoch=31/250  batch_idx= 400]      loss_critic=-671577.8750
loss_gen=1987060.0000  Wasserstein_dist=1237526.2500
[epoch=31/250  batch_idx= 500]      loss_critic=-873161.1875
loss_gen=5796257.5000  Wasserstein_dist=1442737.5000
[epoch=32/250  batch_idx= 100]      loss_critic=-516060.8750
loss_gen=6012056.0000  Wasserstein_dist=1173933.5000
[epoch=32/250  batch_idx= 200]      loss_critic=-1411051.5000
loss_gen=3845633.0000  Wasserstein_dist=2054311.0000
[epoch=32/250  batch_idx= 300]      loss_critic=-1364448.0000
loss_gen=-663434.5625  Wasserstein_dist=1963179.7500
[epoch=32/250  batch_idx= 400]      loss_critic=-884446.3750
loss_gen=1418869.0000  Wasserstein_dist=1557851.1250
[epoch=32/250  batch_idx= 500]      loss_critic=-798698.5000
loss_gen=1960995.7500  Wasserstein_dist=1386026.5000
[epoch=33/250  batch_idx= 100]      loss_critic=-439669.9375
loss_gen=681504.4375   Wasserstein_dist=934734.8750
[epoch=33/250  batch_idx= 200]      loss_critic=-1336628.1250
loss_gen=254160.7031   Wasserstein_dist=2042247.5000
[epoch=33/250  batch_idx= 300]      loss_critic=-1471668.3750
loss_gen=-1975795.6250  Wasserstein_dist=2181574.7500
[epoch=33/250  batch_idx= 400]      loss_critic=-1258243.3750
loss_gen=-2635612.0000  Wasserstein_dist=1945170.2500
[epoch=33/250  batch_idx= 500]      loss_critic=-475749.0000
loss_gen=1021117.0000  Wasserstein_dist=1035645.8750
[epoch=34/250  batch_idx= 100]      loss_critic=-828873.1250
loss_gen=-25355.0781   Wasserstein_dist=1437154.0000

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[epoch=34/250  batch_idx= 200]      loss_critic=-1806595.5000
loss_gen=5464996.0000  Wasserstein_dist=2357949.5000
[epoch=34/250  batch_idx= 300]      loss_critic=-605837.3750
loss_gen=2487673.2500  Wasserstein_dist=1200772.2500
[epoch=34/250  batch_idx= 400]      loss_critic=-872170.6250
loss_gen=668640.6250   Wasserstein_dist=1499206.5000
[epoch=34/250  batch_idx= 500]      loss_critic=-632852.9375
loss_gen=4332869.5000  Wasserstein_dist=1185440.5000
[epoch=35/250  batch_idx= 100]      loss_critic=-1095714.5000
loss_gen=1967511.2500  Wasserstein_dist=1721580.7500
[epoch=35/250  batch_idx= 200]      loss_critic=-926518.0000
loss_gen=2616413.7500  Wasserstein_dist=1568061.2500
[epoch=35/250  batch_idx= 300]      loss_critic=-829386.3125
loss_gen=267328.1250   Wasserstein_dist=1484668.2500
[epoch=35/250  batch_idx= 400]      loss_critic=-585234.4375
loss_gen=3075479.7500  Wasserstein_dist=1198157.0000
[epoch=35/250  batch_idx= 500]      loss_critic=-779791.6250
loss_gen=746641.3750   Wasserstein_dist=1419763.5000
[epoch=36/250  batch_idx= 100]      loss_critic=-1129110.7500
loss_gen=3116529.5000  Wasserstein_dist=1770754.0000
[epoch=36/250  batch_idx= 200]      loss_critic=-1281716.5000
loss_gen=5843831.0000  Wasserstein_dist=2050912.0000
[epoch=36/250  batch_idx= 300]      loss_critic=-887177.5625
loss_gen=-1542488.0000  Wasserstein_dist=1463271.8750
[epoch=36/250  batch_idx= 400]      loss_critic=-879696.0000
loss_gen=786953.1875   Wasserstein_dist=1445121.0000
[epoch=36/250  batch_idx= 500]      loss_critic=-1542708.3750
loss_gen=13345096.0000  Wasserstein_dist=2350024.0000
[epoch=37/250  batch_idx= 100]      loss_critic=-753875.3125
loss_gen=4613423.5000  Wasserstein_dist=1359213.5000
[epoch=37/250  batch_idx= 200]      loss_critic=-617042.5625
loss_gen=5276157.5000  Wasserstein_dist=1188690.5000
[epoch=37/250  batch_idx= 300]      loss_critic=-786337.7500
loss_gen=-38324.5703   Wasserstein_dist=1402384.2500
[epoch=37/250  batch_idx= 400]      loss_critic=-763425.6875
loss_gen=4140264.5000  Wasserstein_dist=1525202.0000
[epoch=37/250  batch_idx= 500]      loss_critic=-966636.2500
loss_gen=2082387.5000  Wasserstein_dist=1673948.7500
[epoch=38/250  batch_idx= 100]      loss_critic=-1113184.5000
loss_gen=1302438.2500  Wasserstein_dist=1951974.5000
[epoch=38/250  batch_idx= 200]      loss_critic=-941890.6250
loss_gen=2699302.7500  Wasserstein_dist=1559359.5000
[epoch=38/250  batch_idx= 300]      loss_critic=-898721.3750
loss_gen=2514456.2500  Wasserstein_dist=1518308.0000
[epoch=38/250  batch_idx= 400]      loss_critic=-1118145.6250
loss_gen=1729985.2500  Wasserstein_dist=1849347.5000
[epoch=38/250  batch_idx= 500]      loss_critic=-555504.6875
loss_gen=-1201786.1250  Wasserstein_dist=1167407.7500

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[epoch=39/250  batch_idx= 100]      loss_critic=826867.0000
loss_gen=3836582.0000  Wasserstein_dist=-109391.5000
[epoch=39/250  batch_idx= 200]      loss_critic=-1392611.8750
loss_gen=-2798277.0000  Wasserstein_dist=2116922.0000
[epoch=39/250  batch_idx= 300]      loss_critic=-926005.9375
loss_gen=3424675.5000  Wasserstein_dist=1572593.5000
[epoch=39/250  batch_idx= 400]      loss_critic=-672902.3750
loss_gen=5853841.0000  Wasserstein_dist=1249415.0000
[epoch=39/250  batch_idx= 500]      loss_critic=-980611.1875
loss_gen=4073217.0000  Wasserstein_dist=1621367.5000
[epoch=40/250  batch_idx= 100]      loss_critic=-791013.0625
loss_gen=3913730.0000  Wasserstein_dist=1354787.5000
[epoch=40/250  batch_idx= 200]      loss_critic=-786061.2500
loss_gen=3808589.0000  Wasserstein_dist=1365613.2500
[epoch=40/250  batch_idx= 300]      loss_critic=-482307.0000
loss_gen=528653.3750  Wasserstein_dist=1125677.8750
[epoch=40/250  batch_idx= 400]      loss_critic=-335329.6250
loss_gen=4883376.0000  Wasserstein_dist=868083.5000
[epoch=40/250  batch_idx= 500]      loss_critic=-910555.9375
loss_gen=970662.6250  Wasserstein_dist=1461089.7500
[epoch=41/250  batch_idx= 100]      loss_critic=-679091.1875
loss_gen=1683458.5000  Wasserstein_dist=1273819.0000
[epoch=41/250  batch_idx= 200]      loss_critic=-1205147.5000
loss_gen=-1695567.0000  Wasserstein_dist=1928153.2500
[epoch=41/250  batch_idx= 300]      loss_critic=-420093.6250
loss_gen=3763946.5000  Wasserstein_dist=990337.0000
[epoch=41/250  batch_idx= 400]      loss_critic=-701117.1875
loss_gen=-467270.2500  Wasserstein_dist=1220166.2500
[epoch=41/250  batch_idx= 500]      loss_critic=-915954.6875
loss_gen=2456978.5000  Wasserstein_dist=1451715.8750
[epoch=42/250  batch_idx= 100]      loss_critic=-327260.1250
loss_gen=2174231.2500  Wasserstein_dist=1096660.3750
[epoch=42/250  batch_idx= 200]      loss_critic=-997716.3750
loss_gen=543291.5000  Wasserstein_dist=1505307.0000
[epoch=42/250  batch_idx= 300]      loss_critic=-265391.6250
loss_gen=-723470.7500  Wasserstein_dist=957430.3125
[epoch=42/250  batch_idx= 400]      loss_critic=-710361.8125
loss_gen=4631808.0000  Wasserstein_dist=1343649.5000
[epoch=42/250  batch_idx= 500]      loss_critic=-720641.8125
loss_gen=4668740.0000  Wasserstein_dist=1210834.0000
[epoch=43/250  batch_idx= 100]      loss_critic=-319409.3125
loss_gen=-1018795.7500  Wasserstein_dist=1074836.2500
[epoch=43/250  batch_idx= 200]      loss_critic=-915613.5625
loss_gen=972152.2500  Wasserstein_dist=1510602.3750
[epoch=43/250  batch_idx= 300]      loss_critic=-1443708.3750
loss_gen=4127290.0000  Wasserstein_dist=2087716.5000
[epoch=43/250  batch_idx= 400]      loss_critic=-656218.4375
loss_gen=1862874.0000  Wasserstein_dist=1237068.2500

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[epoch=43/250  batch_idx= 500]      loss_critic=-671086.2500
loss_gen=1498505.0000  Wasserstein_dist=1175047.5000
[epoch=44/250  batch_idx= 100]      loss_critic=-705854.7500
loss_gen=3617684.5000  Wasserstein_dist=1380343.2500
[epoch=44/250  batch_idx= 200]      loss_critic=-762233.6250
loss_gen=-936618.0000  Wasserstein_dist=1462591.0000
[epoch=44/250  batch_idx= 300]      loss_critic=-441579.8750
loss_gen=2340594.0000  Wasserstein_dist=1094482.5000
[epoch=44/250  batch_idx= 400]      loss_critic=-182998.3750
loss_gen=3623747.7500  Wasserstein_dist=773919.0000
[epoch=44/250  batch_idx= 500]      loss_critic=-765574.8125
loss_gen=1894540.0000  Wasserstein_dist=1382633.5000
[epoch=45/250  batch_idx= 100]      loss_critic=-755736.3750
loss_gen=2063964.2500  Wasserstein_dist=1290707.0000
[epoch=45/250  batch_idx= 200]      loss_critic=-1055410.1250
loss_gen=1432912.0000  Wasserstein_dist=1629455.2500
[epoch=45/250  batch_idx= 300]      loss_critic=-926446.2500
loss_gen=161820.6406   Wasserstein_dist=1608465.0000
[epoch=45/250  batch_idx= 400]      loss_critic=-670014.1250
loss_gen=2599997.5000  Wasserstein_dist=1189465.2500
[epoch=45/250  batch_idx= 500]      loss_critic=-762524.5000
loss_gen=1678620.5000  Wasserstein_dist=1242678.5000
[epoch=46/250  batch_idx= 100]      loss_critic=-742263.3750
loss_gen=-670977.1250  Wasserstein_dist=1403252.0000
[epoch=46/250  batch_idx= 200]      loss_critic=-466569.6250
loss_gen=5292321.0000  Wasserstein_dist=1127728.5000
[epoch=46/250  batch_idx= 300]      loss_critic=-889587.5625
loss_gen=1728781.5000  Wasserstein_dist=1467327.7500
[epoch=46/250  batch_idx= 400]      loss_critic=-950350.5625
loss_gen=1701209.7500  Wasserstein_dist=1613174.0000
[epoch=46/250  batch_idx= 500]      loss_critic=-1471534.5000
loss_gen=2905867.0000  Wasserstein_dist=2259287.0000
[epoch=47/250  batch_idx= 100]      loss_critic=-625664.3750
loss_gen=3323594.2500  Wasserstein_dist=1221606.5000
[epoch=47/250  batch_idx= 200]      loss_critic=-763711.7500
loss_gen=1930055.5000  Wasserstein_dist=1302659.0000
[epoch=47/250  batch_idx= 300]      loss_critic=-531359.2500
loss_gen=5101535.0000  Wasserstein_dist=1184749.0000
[epoch=47/250  batch_idx= 400]      loss_critic=-720459.5625
loss_gen=42618.1250   Wasserstein_dist=1303080.0000
[epoch=47/250  batch_idx= 500]      loss_critic=-791601.3750
loss_gen=849740.1250  Wasserstein_dist=1503250.2500
[epoch=48/250  batch_idx= 100]      loss_critic=-648942.0000
loss_gen=1471304.0000  Wasserstein_dist=1276289.7500
[epoch=48/250  batch_idx= 200]      loss_critic=-881363.6875
loss_gen=636353.9375  Wasserstein_dist=1377927.6250
[epoch=48/250  batch_idx= 300]      loss_critic=-710445.7500
loss_gen=1443105.8750  Wasserstein_dist=1270675.7500

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[epoch=48/250  batch_idx= 400]      loss_critic=-706444.4375
loss_gen=3031981.2500  Wasserstein_dist=1380303.5000
[epoch=48/250  batch_idx= 500]      loss_critic=-785318.3125
loss_gen=5122648.0000  Wasserstein_dist=1391304.5000
[epoch=49/250  batch_idx= 100]      loss_critic=-1477383.6250
loss_gen=-3542316.5000  Wasserstein_dist=2057721.0000
[epoch=49/250  batch_idx= 200]      loss_critic=-543001.3750
loss_gen=794074.2500   Wasserstein_dist=1148742.8750
[epoch=49/250  batch_idx= 300]      loss_critic=-1282618.5000
loss_gen=-1438778.1250  Wasserstein_dist=1869504.1250
[epoch=49/250  batch_idx= 400]      loss_critic=-1273845.7500
loss_gen=3172923.0000  Wasserstein_dist=1941509.5000
[epoch=49/250  batch_idx= 500]      loss_critic=-1146157.7500
loss_gen=-1487317.3750  Wasserstein_dist=1805393.2500
[epoch=50/250  batch_idx= 100]      loss_critic=-377590.1875
loss_gen=-2510690.7500  Wasserstein_dist=989105.7500
[epoch=50/250  batch_idx= 200]      loss_critic=-803772.0000
loss_gen=2104184.0000   Wasserstein_dist=1445536.5000
[epoch=50/250  batch_idx= 300]      loss_critic=-445581.0000
loss_gen=2808919.0000  Wasserstein_dist=1017377.7500
[epoch=50/250  batch_idx= 400]      loss_critic=-514086.0000
loss_gen=3827796.2500  Wasserstein_dist=1080906.5000
[epoch=50/250  batch_idx= 500]      loss_critic=-404259.4688
loss_gen=-596218.6250  Wasserstein_dist=875361.3125
[epoch=51/250  batch_idx= 100]      loss_critic=-1253187.7500
loss_gen=7350880.0000   Wasserstein_dist=2058234.0000
[epoch=51/250  batch_idx= 200]      loss_critic=-364038.0000
loss_gen=2202756.0000  Wasserstein_dist=891951.3750
[epoch=51/250  batch_idx= 300]      loss_critic=-926400.1250
loss_gen=-591056.8750  Wasserstein_dist=1544903.8750
[epoch=51/250  batch_idx= 400]      loss_critic=-635351.0000
loss_gen=401091.4688   Wasserstein_dist=1197792.0000
[epoch=51/250  batch_idx= 500]      loss_critic=-1050591.0000
loss_gen=-1740983.8750  Wasserstein_dist=1498594.1250
[epoch=52/250  batch_idx= 100]      loss_critic=-634740.0625
loss_gen=2830590.2500  Wasserstein_dist=1177009.7500
[epoch=52/250  batch_idx= 200]      loss_critic=-634237.3750
loss_gen=4172979.0000  Wasserstein_dist=1140981.0000
[epoch=52/250  batch_idx= 300]      loss_critic=-566744.3125
loss_gen=5034855.0000  Wasserstein_dist=1218720.0000
[epoch=52/250  batch_idx= 400]      loss_critic=-857834.2500
loss_gen=4959578.0000  Wasserstein_dist=1344697.5000
[epoch=52/250  batch_idx= 500]      loss_critic=-241850.1562
loss_gen=413468.9062   Wasserstein_dist=763483.1250
[epoch=53/250  batch_idx= 100]      loss_critic=-449086.0625
loss_gen=-2594749.0000  Wasserstein_dist=1098253.2500
[epoch=53/250  batch_idx= 200]      loss_critic=-406724.4375
loss_gen=1041811.0625  Wasserstein_dist=873381.9375

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[epoch=53/250  batch_idx= 300]      loss_critic=-1017471.1250
loss_gen=-250222.0938  Wasserstein_dist=1600870.0000
[epoch=53/250  batch_idx= 400]      loss_critic=-916535.3750
loss_gen=-368138.4062  Wasserstein_dist=1459059.7500
[epoch=53/250  batch_idx= 500]      loss_critic=-284557.3750
loss_gen=5404113.0000  Wasserstein_dist=881590.0000
[epoch=54/250  batch_idx= 100]      loss_critic=-539502.1875
loss_gen=3854570.7500  Wasserstein_dist=979519.0000
[epoch=54/250  batch_idx= 200]      loss_critic=-1092844.1250
loss_gen=1169200.7500  Wasserstein_dist=1547474.0000
[epoch=54/250  batch_idx= 300]      loss_critic=-325254.6875
loss_gen=817399.1250  Wasserstein_dist=1006127.5000
[epoch=54/250  batch_idx= 400]      loss_critic=-946791.8750
loss_gen=-3526484.0000  Wasserstein_dist=1504694.7500
[epoch=54/250  batch_idx= 500]      loss_critic=-1143891.0000
loss_gen=1530848.5000  Wasserstein_dist=1602794.7500
[epoch=55/250  batch_idx= 100]      loss_critic=-1962463.3750
loss_gen=5096020.0000  Wasserstein_dist=2734734.5000
[epoch=55/250  batch_idx= 200]      loss_critic=-320626.0625
loss_gen=2824589.0000  Wasserstein_dist=751436.7500
[epoch=55/250  batch_idx= 300]      loss_critic=-800760.6250
loss_gen=3588763.5000  Wasserstein_dist=1344326.5000
[epoch=55/250  batch_idx= 400]      loss_critic=-702034.0000
loss_gen=4487688.0000  Wasserstein_dist=1466266.0000
[epoch=55/250  batch_idx= 500]      loss_critic=-1017998.1250
loss_gen=-1492868.5000  Wasserstein_dist=1528897.7500
[epoch=56/250  batch_idx= 100]      loss_critic=-399787.2500
loss_gen=3661869.0000  Wasserstein_dist=924452.7500
[epoch=56/250  batch_idx= 200]      loss_critic=-697686.6250
loss_gen=3708013.5000  Wasserstein_dist=1181503.5000
[epoch=56/250  batch_idx= 300]      loss_critic=-631213.1250
loss_gen=4049854.0000  Wasserstein_dist=1223070.2500
[epoch=56/250  batch_idx= 400]      loss_critic=-707412.1875
loss_gen=1035228.7500  Wasserstein_dist=1349777.2500
[epoch=56/250  batch_idx= 500]      loss_critic=-519110.3750
loss_gen=827236.5000  Wasserstein_dist=961599.2500
[epoch=57/250  batch_idx= 100]      loss_critic=-740626.5625
loss_gen=-646162.3750  Wasserstein_dist=1281319.8750
[epoch=57/250  batch_idx= 200]      loss_critic=-925664.3750
loss_gen=825214.6250  Wasserstein_dist=1446496.7500
[epoch=57/250  batch_idx= 300]      loss_critic=-410576.6875
loss_gen=-1853576.6250  Wasserstein_dist=1004597.3750
[epoch=57/250  batch_idx= 400]      loss_critic=-556746.2500
loss_gen=1253332.5000  Wasserstein_dist=1008386.6250
[epoch=57/250  batch_idx= 500]      loss_critic=-1614924.5000
loss_gen=1692393.7500  Wasserstein_dist=2389132.5000
[epoch=58/250  batch_idx= 100]      loss_critic=-1042266.4375
loss_gen=2041418.2500  Wasserstein_dist=1581383.2500

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[epoch=58/250  batch_idx= 200]      loss_critic=-648896.1250
loss_gen=678111.3750  Wasserstein_dist=1143646.2500
[epoch=58/250  batch_idx= 300]      loss_critic=-297971.5000
loss_gen=4426436.0000  Wasserstein_dist=912833.0000
[epoch=58/250  batch_idx= 400]      loss_critic=-797326.5000
loss_gen=3808514.5000  Wasserstein_dist=1412757.2500
[epoch=58/250  batch_idx= 500]      loss_critic=-1268667.1250
loss_gen=3810550.5000  Wasserstein_dist=1907611.7500
[epoch=59/250  batch_idx= 100]      loss_critic=-257102.9688
loss_gen=3376634.5000  Wasserstein_dist=781255.0000
[epoch=59/250  batch_idx= 200]      loss_critic=-1004615.2500
loss_gen=6288423.0000  Wasserstein_dist=1525425.0000
[epoch=59/250  batch_idx= 300]      loss_critic=-873893.6250
loss_gen=1660620.0000  Wasserstein_dist=1386486.0000
[epoch=59/250  batch_idx= 400]      loss_critic=-263996.6875
loss_gen=693116.1250  Wasserstein_dist=870588.7500
[epoch=59/250  batch_idx= 500]      loss_critic=-957550.5000
loss_gen=860436.5625  Wasserstein_dist=1512765.7500
[epoch=60/250  batch_idx= 100]      loss_critic=-853716.1875
loss_gen=1597961.3750  Wasserstein_dist=1355144.0000
[epoch=60/250  batch_idx= 200]      loss_critic=-802319.6250
loss_gen=-1601721.7500  Wasserstein_dist=1422953.6250
[epoch=60/250  batch_idx= 300]      loss_critic=-694486.3125
loss_gen=2648251.2500  Wasserstein_dist=1133571.0000
[epoch=60/250  batch_idx= 400]      loss_critic=-402076.6562
loss_gen=638717.9375  Wasserstein_dist=847904.6250
[epoch=60/250  batch_idx= 500]      loss_critic=-807771.5000
loss_gen=3852441.0000  Wasserstein_dist=1272369.5000
[epoch=61/250  batch_idx= 100]      loss_critic=-633304.3125
loss_gen=2792777.0000  Wasserstein_dist=1124220.2500
[epoch=61/250  batch_idx= 200]      loss_critic=-614088.2500
loss_gen=3585261.5000  Wasserstein_dist=1136241.5000
[epoch=61/250  batch_idx= 300]      loss_critic=-273649.1875
loss_gen=2867343.5000  Wasserstein_dist=809427.0000
[epoch=61/250  batch_idx= 400]      loss_critic=-202469.3125
loss_gen=-2220046.2500  Wasserstein_dist=715492.7500
[epoch=61/250  batch_idx= 500]      loss_critic=-86233.0000
loss_gen=6446025.0000  Wasserstein_dist=599066.0000
[epoch=62/250  batch_idx= 100]      loss_critic=-532423.5625
loss_gen=4061033.0000  Wasserstein_dist=995023.7500
[epoch=62/250  batch_idx= 200]      loss_critic=-721842.5000
loss_gen=3477199.5000  Wasserstein_dist=1178405.5000
[epoch=62/250  batch_idx= 300]      loss_critic=-734424.0625
loss_gen=3149919.7500  Wasserstein_dist=1221587.5000
[epoch=62/250  batch_idx= 400]      loss_critic=-881546.8125
loss_gen=-109309.3750  Wasserstein_dist=1372555.2500
[epoch=62/250  batch_idx= 500]      loss_critic=-59038.1875
loss_gen=2870528.0000  Wasserstein_dist=492579.2500

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[epoch=63/250  batch_idx= 100]      loss_critic=-729098.6875
loss_gen=2879336.5000  Wasserstein_dist=1202145.0000
[epoch=63/250  batch_idx= 200]      loss_critic=-985168.0000
loss_gen=2281053.0000  Wasserstein_dist=1536142.5000
[epoch=63/250  batch_idx= 300]      loss_critic=-547354.3750
loss_gen=3020040.0000  Wasserstein_dist=1018439.0000
[epoch=63/250  batch_idx= 400]      loss_critic=-888343.7500
loss_gen=594024.1875  Wasserstein_dist=1364485.2500
[epoch=63/250  batch_idx= 500]      loss_critic=-465004.0312
loss_gen=1921900.2500  Wasserstein_dist=841313.2500
[epoch=64/250  batch_idx= 100]      loss_critic=-1076938.7500
loss_gen=1912095.0000  Wasserstein_dist=1532144.5000
[epoch=64/250  batch_idx= 200]      loss_critic=-772447.8125
loss_gen=3954422.0000  Wasserstein_dist=1248545.0000
[epoch=64/250  batch_idx= 300]      loss_critic=-430717.0312
loss_gen=1297754.5000  Wasserstein_dist=916931.3750
[epoch=64/250  batch_idx= 400]      loss_critic=-612846.0000
loss_gen=-1083856.7500  Wasserstein_dist=1058631.3750
[epoch=64/250  batch_idx= 500]      loss_critic=-352231.8125
loss_gen=537019.6875  Wasserstein_dist=719021.5625
[epoch=65/250  batch_idx= 100]      loss_critic=-665251.0000
loss_gen=-68858.3594  Wasserstein_dist=1118385.5000
[epoch=65/250  batch_idx= 200]      loss_critic=-800819.3750
loss_gen=927000.2500  Wasserstein_dist=1484736.3750
[epoch=65/250  batch_idx= 300]      loss_critic=-529647.6875
loss_gen=3305210.0000  Wasserstein_dist=932362.0000
[epoch=65/250  batch_idx= 400]      loss_critic=-371565.5938
loss_gen=3053842.2500  Wasserstein_dist=836521.5000
[epoch=65/250  batch_idx= 500]      loss_critic=-381552.9375
loss_gen=7954325.5000  Wasserstein_dist=896999.5000
[epoch=66/250  batch_idx= 100]      loss_critic=-840277.2500
loss_gen=3963959.0000  Wasserstein_dist=1333447.5000
[epoch=66/250  batch_idx= 200]      loss_critic=-867599.4375
loss_gen=-105164.3125  Wasserstein_dist=1352767.0000
[epoch=66/250  batch_idx= 300]      loss_critic=-393038.7500
loss_gen=4145683.2500  Wasserstein_dist=815983.7500
[epoch=66/250  batch_idx= 400]      loss_critic=-800086.5000
loss_gen=3715149.0000  Wasserstein_dist=1339528.0000
[epoch=66/250  batch_idx= 500]      loss_critic=-556093.2500
loss_gen=858583.8750  Wasserstein_dist=973905.8750
[epoch=67/250  batch_idx= 100]      loss_critic=-327383.6250
loss_gen=-683175.5000  Wasserstein_dist=757054.2500
[epoch=67/250  batch_idx= 200]      loss_critic=-616287.5000
loss_gen=-780191.3125  Wasserstein_dist=1049062.2500
[epoch=67/250  batch_idx= 300]      loss_critic=-543472.7500
loss_gen=-439264.2812  Wasserstein_dist=1049966.6250
[epoch=67/250  batch_idx= 400]      loss_critic=-871550.3125
loss_gen=-2209632.5000  Wasserstein_dist=1425673.1250

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[epoch=67/250  batch_idx= 500]      loss_critic=12651.3750
loss_gen=291190.8125  Wasserstein_dist=403443.2500
[epoch=68/250  batch_idx= 100]      loss_critic=-640717.9375
loss_gen=1706556.2500  Wasserstein_dist=1141783.5000
[epoch=68/250  batch_idx= 200]      loss_critic=-653964.1250
loss_gen=1496968.5000  Wasserstein_dist=1072783.5000
[epoch=68/250  batch_idx= 300]      loss_critic=-960703.1875
loss_gen=2178904.5000  Wasserstein_dist=1494573.5000
[epoch=68/250  batch_idx= 400]      loss_critic=-374097.4375
loss_gen=3084870.0000  Wasserstein_dist=819349.2500
[epoch=68/250  batch_idx= 500]      loss_critic=-202323.0625
loss_gen=2205931.0000  Wasserstein_dist=701335.0000
[epoch=69/250  batch_idx= 100]      loss_critic=-1432319.5000
loss_gen=5754045.0000  Wasserstein_dist=1908460.5000
[epoch=69/250  batch_idx= 200]      loss_critic=-519954.6250
loss_gen=2763354.5000  Wasserstein_dist=1053185.0000
[epoch=69/250  batch_idx= 300]      loss_critic=-751209.6875
loss_gen=7156097.0000  Wasserstein_dist=1242715.0000
[epoch=69/250  batch_idx= 400]      loss_critic=-178188.1875
loss_gen=5020189.0000  Wasserstein_dist=693982.0000
[epoch=69/250  batch_idx= 500]      loss_critic=-512546.7500
loss_gen=1962497.1250  Wasserstein_dist=978529.7500
[epoch=70/250  batch_idx= 100]      loss_critic=-1195219.2500
loss_gen=5503477.0000  Wasserstein_dist=1609523.5000
[epoch=70/250  batch_idx= 200]      loss_critic=443885.3750
loss_gen=1893199.7500  Wasserstein_dist=189686.2500
[epoch=70/250  batch_idx= 300]      loss_critic=-165227.4688
loss_gen=3275740.2500  Wasserstein_dist=574039.0000
[epoch=70/250  batch_idx= 400]      loss_critic=-585548.1250
loss_gen=-152826.4375  Wasserstein_dist=1009674.5000
[epoch=70/250  batch_idx= 500]      loss_critic=-641432.0625
loss_gen=1663103.7500  Wasserstein_dist=1080736.5000
[epoch=71/250  batch_idx= 100]      loss_critic=-679953.6875
loss_gen=2157596.5000  Wasserstein_dist=1135367.0000
[epoch=71/250  batch_idx= 200]      loss_critic=-313412.0000
loss_gen=2551113.0000  Wasserstein_dist=889311.7500
[epoch=71/250  batch_idx= 300]      loss_critic=-888352.9375
loss_gen=4878085.5000  Wasserstein_dist=1364532.0000
[epoch=71/250  batch_idx= 400]      loss_critic=-351638.9375
loss_gen=3108309.2500  Wasserstein_dist=742925.0000
[epoch=71/250  batch_idx= 500]      loss_critic=-786353.3125
loss_gen=2198478.2500  Wasserstein_dist=1263059.5000
[epoch=72/250  batch_idx= 100]      loss_critic=-401630.9062
loss_gen=3765882.0000  Wasserstein_dist=854257.0000
[epoch=72/250  batch_idx= 200]      loss_critic=8871.8125
loss_gen=1761257.7500  Wasserstein_dist=438688.0000
[epoch=72/250  batch_idx= 300]      loss_critic=-644607.0000
loss_gen=4567056.0000  Wasserstein_dist=1070960.0000

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[epoch=72/250 batch_idx= 400] loss_critic=-727504.1250
loss_gen=841709.1250 Wasserstein_dist=1209593.1250
[epoch=72/250 batch_idx= 500] loss_critic=-1491452.8750
loss_gen=-1288214.7500 Wasserstein_dist=1940482.5000
[epoch=73/250 batch_idx= 100] loss_critic=-680665.8750
loss_gen=1459690.5000 Wasserstein_dist=1107790.7500
[epoch=73/250 batch_idx= 200] loss_critic=-796624.1250
loss_gen=-2834331.7500 Wasserstein_dist=1244023.2500
[epoch=73/250 batch_idx= 300] loss_critic=-360801.5625
loss_gen=1390322.1250 Wasserstein_dist=842134.6250
[epoch=73/250 batch_idx= 400] loss_critic=-585925.1250
loss_gen=5616196.0000 Wasserstein_dist=1029485.0000
[epoch=73/250 batch_idx= 500] loss_critic=-705931.0000
loss_gen=5356897.0000 Wasserstein_dist=1101488.0000
[epoch=74/250 batch_idx= 100] loss_critic=-695236.1250
loss_gen=-113490.1406 Wasserstein_dist=1126742.8750
[epoch=74/250 batch_idx= 200] loss_critic=-790896.7500
loss_gen=2928070.0000 Wasserstein_dist=1276827.5000
[epoch=74/250 batch_idx= 300] loss_critic=-365129.3750
loss_gen=6586160.0000 Wasserstein_dist=969319.5000
[epoch=74/250 batch_idx= 400] loss_critic=-498295.9375
loss_gen=1764202.5000 Wasserstein_dist=867812.5000
[epoch=74/250 batch_idx= 500] loss_critic=-265182.6250
loss_gen=-62026.5000 Wasserstein_dist=722653.5000
[epoch=75/250 batch_idx= 100] loss_critic=-236037.6250
loss_gen=3437496.7500 Wasserstein_dist=684999.5000
[epoch=75/250 batch_idx= 200] loss_critic=-469636.8125
loss_gen=4004621.5000 Wasserstein_dist=939926.7500
[epoch=75/250 batch_idx= 300] loss_critic=-270831.5938
loss_gen=2090556.2500 Wasserstein_dist=651948.7500
[epoch=75/250 batch_idx= 400] loss_critic=-804117.6875
loss_gen=4617911.0000 Wasserstein_dist=1213785.0000
[epoch=75/250 batch_idx= 500] loss_critic=-681343.9375
loss_gen=655103.5000 Wasserstein_dist=1092622.1250
[epoch=76/250 batch_idx= 100] loss_critic=-694249.5625
loss_gen=2203131.7500 Wasserstein_dist=1100310.5000
[epoch=76/250 batch_idx= 200] loss_critic=-110872.0625
loss_gen=419738.8438 Wasserstein_dist=448265.8750
[epoch=76/250 batch_idx= 300] loss_critic=-2776.6250
loss_gen=2283110.7500 Wasserstein_dist=418819.5000
[epoch=76/250 batch_idx= 400] loss_critic=-1160839.7500
loss_gen=7183766.0000 Wasserstein_dist=1627327.0000
[epoch=76/250 batch_idx= 500] loss_critic=-287462.1562
loss_gen=1593495.5000 Wasserstein_dist=753025.2500
[epoch=77/250 batch_idx= 100] loss_critic=-1642726.0000
loss_gen=10575150.0000 Wasserstein_dist=2299078.0000
[epoch=77/250 batch_idx= 200] loss_critic=-381575.3125
loss_gen=3214942.7500 Wasserstein_dist=806671.5000

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[epoch=77/250  batch_idx= 300]      loss_critic=-515662.5000
loss_gen=2820408.0000  Wasserstein_dist=910918.5000
[epoch=77/250  batch_idx= 400]      loss_critic=-341901.3750
loss_gen=2102349.2500  Wasserstein_dist=802361.3750
[epoch=77/250  batch_idx= 500]      loss_critic=-314930.0625
loss_gen=5037710.5000  Wasserstein_dist=761873.0000
[epoch=78/250  batch_idx= 100]      loss_critic=-245660.3750
loss_gen=1362847.0000  Wasserstein_dist=587906.8750
[epoch=78/250  batch_idx= 200]      loss_critic=63556.3125
loss_gen=3525440.5000  Wasserstein_dist=461756.7500
[epoch=78/250  batch_idx= 300]      loss_critic=-766558.0000
loss_gen=-519844.1875  Wasserstein_dist=1245470.5000
[epoch=78/250  batch_idx= 400]      loss_critic=-831470.0000
loss_gen=1643526.2500  Wasserstein_dist=1255923.6250
[epoch=78/250  batch_idx= 500]      loss_critic=-925978.0000
loss_gen=3098524.5000  Wasserstein_dist=1390719.7500
[epoch=79/250  batch_idx= 100]      loss_critic=-563518.0000
loss_gen=2368013.5000  Wasserstein_dist=1001298.5000
[epoch=79/250  batch_idx= 200]      loss_critic=-549198.5000
loss_gen=2571816.0000  Wasserstein_dist=883799.5000
[epoch=79/250  batch_idx= 300]      loss_critic=-493738.3125
loss_gen=2941142.5000  Wasserstein_dist=1172806.7500
[epoch=79/250  batch_idx= 400]      loss_critic=-418642.6250
loss_gen=674211.0000  Wasserstein_dist=762560.7500
[epoch=79/250  batch_idx= 500]      loss_critic=-273068.2188
loss_gen=1008808.4375  Wasserstein_dist=708419.0000
[epoch=80/250  batch_idx= 100]      loss_critic=-795873.7500
loss_gen=3692642.5000  Wasserstein_dist=1148949.0000
[epoch=80/250  batch_idx= 200]      loss_critic=87656.3750
loss_gen=6319572.0000  Wasserstein_dist=437897.0000
[epoch=80/250  batch_idx= 300]      loss_critic=-1059249.6250
loss_gen=3049428.2500  Wasserstein_dist=1493707.7500
[epoch=80/250  batch_idx= 400]      loss_critic=-932358.3750
loss_gen=2164371.2500  Wasserstein_dist=1384534.7500
[epoch=80/250  batch_idx= 500]      loss_critic=-69577.5938
loss_gen=4494885.0000  Wasserstein_dist=501956.5000
[epoch=81/250  batch_idx= 100]      loss_critic=-1518991.5000
loss_gen=7365953.0000  Wasserstein_dist=2049241.5000
[epoch=81/250  batch_idx= 200]      loss_critic=-573807.6250
loss_gen=1094602.5000  Wasserstein_dist=1022463.5000
[epoch=81/250  batch_idx= 300]      loss_critic=-422011.6562
loss_gen=1344724.5000  Wasserstein_dist=815661.5000
[epoch=81/250  batch_idx= 400]      loss_critic=39014.0625
loss_gen=5403099.0000  Wasserstein_dist=449405.0000
[epoch=81/250  batch_idx= 500]      loss_critic=-421849.1875
loss_gen=940874.8125  Wasserstein_dist=805711.7500
[epoch=82/250  batch_idx= 100]      loss_critic=-505793.3125
loss_gen=4438235.0000  Wasserstein_dist=897100.5000

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[epoch=82/250  batch_idx= 200]      loss_critic=-951857.1250
loss_gen=-1210953.0000  Wasserstein_dist=1443613.3750
[epoch=82/250  batch_idx= 300]      loss_critic=-329559.1875
loss_gen=3925393.5000  Wasserstein_dist=723817.2500
[epoch=82/250  batch_idx= 400]      loss_critic=-414596.9375
loss_gen=2696796.0000  Wasserstein_dist=778552.5000
[epoch=82/250  batch_idx= 500]      loss_critic=-86608.1875
loss_gen=3467552.7500  Wasserstein_dist=469024.5000
[epoch=83/250  batch_idx= 100]      loss_critic=-357319.6875
loss_gen=2480581.0000  Wasserstein_dist=773167.2500
[epoch=83/250  batch_idx= 200]      loss_critic=-45261.7500
loss_gen=2496134.2500  Wasserstein_dist=408192.0000
[epoch=83/250  batch_idx= 300]      loss_critic=-129314.7500
loss_gen=-347230.0625  Wasserstein_dist=571039.3750
[epoch=83/250  batch_idx= 400]      loss_critic=-315200.5625
loss_gen=-361967.0312  Wasserstein_dist=736487.1875
[epoch=83/250  batch_idx= 500]      loss_critic=-406404.4688
loss_gen=1086117.2500  Wasserstein_dist=727544.1250
[epoch=84/250  batch_idx= 100]      loss_critic=-380674.4375
loss_gen=1319809.6250  Wasserstein_dist=675265.5000
[epoch=84/250  batch_idx= 200]      loss_critic=104115.9375
loss_gen=3094265.5000  Wasserstein_dist=240606.5000
[epoch=84/250  batch_idx= 300]      loss_critic=-180227.3750
loss_gen=1778358.2500  Wasserstein_dist=513739.2500
[epoch=84/250  batch_idx= 400]      loss_critic=-1057436.0000
loss_gen=1885196.0000  Wasserstein_dist=1465402.2500
[epoch=84/250  batch_idx= 500]      loss_critic=-630670.0000
loss_gen=2002600.2500  Wasserstein_dist=1055622.5000
[epoch=85/250  batch_idx= 100]      loss_critic=-439045.8750
loss_gen=1234285.0000  Wasserstein_dist=788188.6250
[epoch=85/250  batch_idx= 200]      loss_critic=-381912.4375
loss_gen=1430153.0000  Wasserstein_dist=753443.3750
[epoch=85/250  batch_idx= 300]      loss_critic=-1126131.2500
loss_gen=-572940.3125  Wasserstein_dist=1845970.0000
[epoch=85/250  batch_idx= 400]      loss_critic=-494175.6250
loss_gen=1589973.1250  Wasserstein_dist=855146.2500
[epoch=85/250  batch_idx= 500]      loss_critic=-518179.1875
loss_gen=650547.4375  Wasserstein_dist=847197.3750
[epoch=86/250  batch_idx= 100]      loss_critic=-612208.5625
loss_gen=2241054.0000  Wasserstein_dist=1012095.2500
[epoch=86/250  batch_idx= 200]      loss_critic=-520269.7500
loss_gen=2736623.0000  Wasserstein_dist=845892.2500
[epoch=86/250  batch_idx= 300]      loss_critic=55726.2188
loss_gen=3120183.7500  Wasserstein_dist=415486.0000
[epoch=86/250  batch_idx= 400]      loss_critic=-1181503.7500
loss_gen=-3584118.0000  Wasserstein_dist=1598621.5000
[epoch=86/250  batch_idx= 500]      loss_critic=-982663.6875
loss_gen=3185726.2500  Wasserstein_dist=1399725.0000

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[epoch=87/250  batch_idx= 100]      loss_critic=-549738.2500
loss_gen=7628672.0000  Wasserstein_dist=1038974.5000
[epoch=87/250  batch_idx= 200]      loss_critic=-1175209.1250
loss_gen=3073735.2500  Wasserstein_dist=1656703.7500
[epoch=87/250  batch_idx= 300]      loss_critic=-476940.1562
loss_gen=599046.5625  Wasserstein_dist=775829.5000
[epoch=87/250  batch_idx= 400]      loss_critic=-257416.8750
loss_gen=4075266.0000  Wasserstein_dist=657162.0000
[epoch=87/250  batch_idx= 500]      loss_critic=-319720.4375
loss_gen=-2418918.2500  Wasserstein_dist=722242.2500
[epoch=88/250  batch_idx= 100]      loss_critic=-157162.0938
loss_gen=3259738.0000  Wasserstein_dist=500556.0000
[epoch=88/250  batch_idx= 200]      loss_critic=-548644.5000
loss_gen=2160253.7500  Wasserstein_dist=890285.7500
[epoch=88/250  batch_idx= 300]      loss_critic=-555058.5625
loss_gen=2247658.0000  Wasserstein_dist=871180.5000
[epoch=88/250  batch_idx= 400]      loss_critic=-511042.1562
loss_gen=2097778.5000  Wasserstein_dist=825880.7500
[epoch=88/250  batch_idx= 500]      loss_critic=92241.3750
loss_gen=2934090.0000  Wasserstein_dist=368725.5000
[epoch=89/250  batch_idx= 100]      loss_critic=-348273.4062
loss_gen=4116538.5000  Wasserstein_dist=754163.2500
[epoch=89/250  batch_idx= 200]      loss_critic=-250467.7500
loss_gen=451429.5625  Wasserstein_dist=610973.8750
[epoch=89/250  batch_idx= 300]      loss_critic=-388634.4375
loss_gen=1660626.8750  Wasserstein_dist=756980.7500
[epoch=89/250  batch_idx= 400]      loss_critic=-248590.6562
loss_gen=3664924.5000  Wasserstein_dist=631023.0000
[epoch=89/250  batch_idx= 500]      loss_critic=1074964.2500
loss_gen=1013400.9375  Wasserstein_dist=-571726.5000
[epoch=90/250  batch_idx= 100]      loss_critic=-284225.9375
loss_gen=-151385.1719  Wasserstein_dist=577444.5000
[epoch=90/250  batch_idx= 200]      loss_critic=-222872.0000
loss_gen=1312926.5000  Wasserstein_dist=544259.5000
[epoch=90/250  batch_idx= 300]      loss_critic=-619605.8125
loss_gen=3986238.2500  Wasserstein_dist=1056338.5000
[epoch=90/250  batch_idx= 400]      loss_critic=-882812.5000
loss_gen=328877.5938  Wasserstein_dist=1339569.6250
[epoch=90/250  batch_idx= 500]      loss_critic=-242910.8125
loss_gen=3042541.0000  Wasserstein_dist=712701.7500
[epoch=91/250  batch_idx= 100]      loss_critic=-625240.0625
loss_gen=1785541.6250  Wasserstein_dist=990242.0000
[epoch=91/250  batch_idx= 200]      loss_critic=-809287.1875
loss_gen=3265435.2500  Wasserstein_dist=1189664.0000
[epoch=91/250  batch_idx= 300]      loss_critic=-809325.1250
loss_gen=807402.2500  Wasserstein_dist=1111218.0000
[epoch=91/250  batch_idx= 400]      loss_critic=-350883.6875
loss_gen=2252504.0000  Wasserstein_dist=725106.5000

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[epoch=91/250  batch_idx= 500]      loss_critic=-459855.8750
loss_gen=22133.2773  Wasserstein_dist=762623.6250
[epoch=92/250  batch_idx= 100]      loss_critic=-899246.5625
loss_gen=3409740.0000  Wasserstein_dist=1331621.0000
[epoch=92/250  batch_idx= 200]      loss_critic=-577261.7500
loss_gen=2424556.5000  Wasserstein_dist=899854.2500
[epoch=92/250  batch_idx= 300]      loss_critic=-725127.3750
loss_gen=31065.9375  Wasserstein_dist=1092115.5000
[epoch=92/250  batch_idx= 400]      loss_critic=-524312.5000
loss_gen=1200726.6250  Wasserstein_dist=819760.5000
[epoch=92/250  batch_idx= 500]      loss_critic=-395278.6875
loss_gen=3727756.2500  Wasserstein_dist=810396.5000
[epoch=93/250  batch_idx= 100]      loss_critic=-250560.3438
loss_gen=-483477.0312  Wasserstein_dist=573716.7500
[epoch=93/250  batch_idx= 200]      loss_critic=-510693.4375
loss_gen=4020615.7500  Wasserstein_dist=841810.0000
[epoch=93/250  batch_idx= 300]      loss_critic=104512.9062
loss_gen=2538300.2500  Wasserstein_dist=275438.0000
[epoch=93/250  batch_idx= 400]      loss_critic=-607328.6250
loss_gen=-549410.1875  Wasserstein_dist=930979.0000
[epoch=93/250  batch_idx= 500]      loss_critic=215731.8750
loss_gen=3889517.2500  Wasserstein_dist=293752.5000
[epoch=94/250  batch_idx= 100]      loss_critic=-481495.6875
loss_gen=-2803496.2500  Wasserstein_dist=975511.8750
[epoch=94/250  batch_idx= 200]      loss_critic=-359276.4375
loss_gen=1962916.0000  Wasserstein_dist=640148.5000
[epoch=94/250  batch_idx= 300]      loss_critic=-91007.9375
loss_gen=5221922.0000  Wasserstein_dist=460556.0000
[epoch=94/250  batch_idx= 400]      loss_critic=-342389.5000
loss_gen=-429670.2500  Wasserstein_dist=731217.5000
[epoch=94/250  batch_idx= 500]      loss_critic=-907150.3750
loss_gen=3609665.5000  Wasserstein_dist=1301787.5000
[epoch=95/250  batch_idx= 100]      loss_critic=-890395.7500
loss_gen=2147723.5000  Wasserstein_dist=1269406.2500
[epoch=95/250  batch_idx= 200]      loss_critic=-316211.5625
loss_gen=2687873.0000  Wasserstein_dist=626991.5000
[epoch=95/250  batch_idx= 300]      loss_critic=-413050.3438
loss_gen=3579838.5000  Wasserstein_dist=703676.0000
[epoch=95/250  batch_idx= 400]      loss_critic=-779162.8125
loss_gen=3249344.0000  Wasserstein_dist=1184880.2500
[epoch=95/250  batch_idx= 500]      loss_critic=-478319.6562
loss_gen=1384623.5000  Wasserstein_dist=873654.8125
[epoch=96/250  batch_idx= 100]      loss_critic=-655643.7500
loss_gen=4882958.0000  Wasserstein_dist=1012756.0000
[epoch=96/250  batch_idx= 200]      loss_critic=-809504.3750
loss_gen=1784275.6250  Wasserstein_dist=1153649.7500
[epoch=96/250  batch_idx= 300]      loss_critic=-313263.6250
loss_gen=450979.3750  Wasserstein_dist=685472.5000

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[epoch=96/250  batch_idx= 400]      loss_critic=-235615.0000
loss_gen=1954214.1250  Wasserstein_dist=565292.5000
[epoch=96/250  batch_idx= 500]      loss_critic=-310457.3750
loss_gen=2237459.5000  Wasserstein_dist=671145.5000
[epoch=97/250  batch_idx= 100]      loss_critic=-513135.0938
loss_gen=1815185.5000  Wasserstein_dist=825878.5000
[epoch=97/250  batch_idx= 200]      loss_critic=-815507.0000
loss_gen=2621782.0000  Wasserstein_dist=1132011.7500
[epoch=97/250  batch_idx= 300]      loss_critic=-650886.8750
loss_gen=368502.6250   Wasserstein_dist=965468.0000
[epoch=97/250  batch_idx= 400]      loss_critic=-1172234.0000
loss_gen=-254562.8594  Wasserstein_dist=1555701.7500
[epoch=97/250  batch_idx= 500]      loss_critic=-130594.4375
loss_gen=1615634.0000  Wasserstein_dist=443248.7500
[epoch=98/250  batch_idx= 100]      loss_critic=55535.4688
loss_gen=3997312.2500  Wasserstein_dist=278473.7500
[epoch=98/250  batch_idx= 200]      loss_critic=-429144.5625
loss_gen=1417823.0000  Wasserstein_dist=746784.2500
[epoch=98/250  batch_idx= 300]      loss_critic=-224876.8438
loss_gen=-737405.6250  Wasserstein_dist=537079.0000
[epoch=98/250  batch_idx= 400]      loss_critic=-220744.5312
loss_gen=3729370.5000  Wasserstein_dist=534152.5000
[epoch=98/250  batch_idx= 500]      loss_critic=-1221904.8750
loss_gen=3118045.5000  Wasserstein_dist=1530108.5000
[epoch=99/250  batch_idx= 100]      loss_critic=-600011.8750
loss_gen=9972586.0000  Wasserstein_dist=1227160.0000
[epoch=99/250  batch_idx= 200]      loss_critic=-1220000.3750
loss_gen=5828602.5000  Wasserstein_dist=1762033.5000
[epoch=99/250  batch_idx= 300]      loss_critic=-1048060.6250
loss_gen=6000248.0000  Wasserstein_dist=1564082.0000
[epoch=99/250  batch_idx= 400]      loss_critic=1479997.7500
loss_gen=-14605572.0000 Wasserstein_dist=-449389.0000
[epoch=99/250  batch_idx= 500]      loss_critic=-774410.0625
loss_gen=10702938.0000 Wasserstein_dist=1303585.0000
[epoch=100/250 batch_idx= 100]      loss_critic=84920.2500
loss_gen=-3145526.0000 Wasserstein_dist=157384.0000
[epoch=100/250 batch_idx= 200]      loss_critic=-298278.1562
loss_gen=270292.1875   Wasserstein_dist=535199.2500
[epoch=100/250 batch_idx= 300]      loss_critic=-350080.7500
loss_gen=9003346.0000  Wasserstein_dist=803031.0000
[epoch=100/250 batch_idx= 400]      loss_critic=-1027407.8125
loss_gen=-3885884.2500 Wasserstein_dist=1372545.2500
[epoch=100/250 batch_idx= 500]      loss_critic=-670554.3125
loss_gen=-5871417.0000 Wasserstein_dist=908617.5000
[epoch=101/250 batch_idx= 100]      loss_critic=-404221.1875
loss_gen=232484.0469   Wasserstein_dist=686444.7500
[epoch=101/250 batch_idx= 200]      loss_critic=-733845.7500
loss_gen=-2157094.5000 Wasserstein_dist=1081582.2500

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[epoch=101/250 batch_idx= 300] loss_critic=-125178.0000
loss_gen=-657293.5000 Wasserstein_dist=340044.1250
[epoch=101/250 batch_idx= 400] loss_critic=-128409.9375
loss_gen=2187476.7500 Wasserstein_dist=473027.1250
[epoch=101/250 batch_idx= 500] loss_critic=-15642.6406
loss_gen=1199017.7500 Wasserstein_dist=229426.6250
[epoch=102/250 batch_idx= 100] loss_critic=64390.6562
loss_gen=2854537.2500 Wasserstein_dist=206837.5000
[epoch=102/250 batch_idx= 200] loss_critic=-311210.6875
loss_gen=567007.1250 Wasserstein_dist=585148.5625
[epoch=102/250 batch_idx= 300] loss_critic=-888042.6250
loss_gen=726097.3750 Wasserstein_dist=1137973.8750
[epoch=102/250 batch_idx= 400] loss_critic=-612979.0000
loss_gen=1544271.5000 Wasserstein_dist=875605.7500
[epoch=102/250 batch_idx= 500] loss_critic=-634662.6250
loss_gen=2012138.5000 Wasserstein_dist=918394.5000
[epoch=103/250 batch_idx= 100] loss_critic=-444522.7500
loss_gen=2858337.0000 Wasserstein_dist=739643.5000
[epoch=103/250 batch_idx= 200] loss_critic=-223292.0000
loss_gen=1197511.7500 Wasserstein_dist=500277.5000
[epoch=103/250 batch_idx= 300] loss_critic=-917697.5000
loss_gen=-710742.7500 Wasserstein_dist=1266084.0000
[epoch=103/250 batch_idx= 400] loss_critic=-352886.0000
loss_gen=903261.8750 Wasserstein_dist=653821.1875
[epoch=103/250 batch_idx= 500] loss_critic=-756526.8125
loss_gen=3043943.0000 Wasserstein_dist=1082943.0000
[epoch=104/250 batch_idx= 100] loss_critic=-187823.0938
loss_gen=-790738.2500 Wasserstein_dist=466567.9375
[epoch=104/250 batch_idx= 200] loss_critic=74648.6875
loss_gen=-668714.1250 Wasserstein_dist=272199.3125
[epoch=104/250 batch_idx= 300] loss_critic=-2391.6250
loss_gen=3093278.0000 Wasserstein_dist=324443.5000
[epoch=104/250 batch_idx= 400] loss_critic=-89969.1250
loss_gen=1562014.7500 Wasserstein_dist=362751.6250
[epoch=104/250 batch_idx= 500] loss_critic=-266216.6250
loss_gen=4044309.0000 Wasserstein_dist=562615.5000
[epoch=105/250 batch_idx= 100] loss_critic=-800272.4375
loss_gen=1463584.2500 Wasserstein_dist=1216171.1250
[epoch=105/250 batch_idx= 200] loss_critic=-730255.0000
loss_gen=1569402.7500 Wasserstein_dist=1079886.5000
[epoch=105/250 batch_idx= 300] loss_critic=-431038.9375
loss_gen=1546652.0000 Wasserstein_dist=741638.7500
[epoch=105/250 batch_idx= 400] loss_critic=-374082.3125
loss_gen=3554173.0000 Wasserstein_dist=649421.5000
[epoch=105/250 batch_idx= 500] loss_critic=-241395.0000
loss_gen=1677210.6250 Wasserstein_dist=576275.0000
[epoch=106/250 batch_idx= 100] loss_critic=-430217.6562
loss_gen=2870784.2500 Wasserstein_dist=709398.5000


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[epoch=106/250  batch_idx= 200]      loss_critic=-458267.3125
loss_gen=2453183.2500  Wasserstein_dist=763765.2500
[epoch=106/250  batch_idx= 300]      loss_critic=-546468.7500
loss_gen=1028187.5000  Wasserstein_dist=845845.0000
[epoch=106/250  batch_idx= 400]      loss_critic=-560546.2500
loss_gen=-619192.5000  Wasserstein_dist=869532.2500
[epoch=106/250  batch_idx= 500]      loss_critic=-283116.8125
loss_gen=780127.8750  Wasserstein_dist=598416.0625
[epoch=107/250  batch_idx= 100]      loss_critic=-315538.1250
loss_gen=3351551.5000  Wasserstein_dist=660891.0000
[epoch=107/250  batch_idx= 200]      loss_critic=-592260.0000
loss_gen=2015332.5000  Wasserstein_dist=875798.7500
[epoch=107/250  batch_idx= 300]      loss_critic=-506674.4375
loss_gen=1844721.6250  Wasserstein_dist=798864.5000
[epoch=107/250  batch_idx= 400]      loss_critic=-352605.0312
loss_gen=-113902.9531  Wasserstein_dist=656266.1250
[epoch=107/250  batch_idx= 500]      loss_critic=-518129.7500
loss_gen=1443229.8750  Wasserstein_dist=829157.0000
[epoch=108/250  batch_idx= 100]      loss_critic=-328306.6250
loss_gen=2032567.0000  Wasserstein_dist=660098.5000
[epoch=108/250  batch_idx= 200]      loss_critic=-34621.7500
loss_gen=3173633.0000  Wasserstein_dist=382770.7500
[epoch=108/250  batch_idx= 300]      loss_critic=-455286.0000
loss_gen=1682706.0000  Wasserstein_dist=794819.0000
[epoch=108/250  batch_idx= 400]      loss_critic=-231265.3750
loss_gen=632995.4375  Wasserstein_dist=507832.9375
[epoch=108/250  batch_idx= 500]      loss_critic=-708093.5000
loss_gen=-875425.1250  Wasserstein_dist=1085031.1250
[epoch=109/250  batch_idx= 100]      loss_critic=-841787.3750
loss_gen=3699516.5000  Wasserstein_dist=1168372.5000
[epoch=109/250  batch_idx= 200]      loss_critic=-548327.8750
loss_gen=289044.8125  Wasserstein_dist=802613.9375
[epoch=109/250  batch_idx= 300]      loss_critic=-400352.3438
loss_gen=4579245.0000  Wasserstein_dist=725411.7500
[epoch=109/250  batch_idx= 400]      loss_critic=-619984.3750
loss_gen=1523905.3750  Wasserstein_dist=872211.2500
[epoch=109/250  batch_idx= 500]      loss_critic=-420679.9375
loss_gen=-393780.2500  Wasserstein_dist=766486.1875
[epoch=110/250  batch_idx= 100]      loss_critic=-552690.2500
loss_gen=4169963.0000  Wasserstein_dist=1005706.5000
[epoch=110/250  batch_idx= 200]      loss_critic=-360279.7500
loss_gen=-81156.8125  Wasserstein_dist=636704.6250
[epoch=110/250  batch_idx= 300]      loss_critic=-1190685.8750
loss_gen=1337155.6250  Wasserstein_dist=1526003.2500
[epoch=110/250  batch_idx= 400]      loss_critic=-910949.1250
loss_gen=141396.1875  Wasserstein_dist=1189847.2500
[epoch=110/250  batch_idx= 500]      loss_critic=-540041.1250
loss_gen=1105561.0000  Wasserstein_dist=1018755.7500

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[epoch=111/250  batch_idx= 100]      loss_critic=-162488.0625
loss_gen=980104.0000  Wasserstein_dist=439247.2500
[epoch=111/250  batch_idx= 200]      loss_critic=-208060.9688
loss_gen=2327310.0000  Wasserstein_dist=500507.5000
[epoch=111/250  batch_idx= 300]      loss_critic=-200481.4062
loss_gen=2812502.7500  Wasserstein_dist=476063.2500
[epoch=111/250  batch_idx= 400]      loss_critic=-1110584.5000
loss_gen=5535987.0000  Wasserstein_dist=1533976.5000
[epoch=111/250  batch_idx= 500]      loss_critic=-471528.5312
loss_gen=-1103713.5000  Wasserstein_dist=793812.0000
[epoch=112/250  batch_idx= 100]      loss_critic=-322955.7188
loss_gen=1713766.7500  Wasserstein_dist=613815.1250
[epoch=112/250  batch_idx= 200]      loss_critic=-353649.1875
loss_gen=2864670.5000  Wasserstein_dist=713894.7500
[epoch=112/250  batch_idx= 300]      loss_critic=-286144.9688
loss_gen=910757.8750  Wasserstein_dist=612674.3750
[epoch=112/250  batch_idx= 400]      loss_critic=-481456.1250
loss_gen=2906903.0000  Wasserstein_dist=810361.5000
[epoch=112/250  batch_idx= 500]      loss_critic=-546777.5625
loss_gen=1768853.6250  Wasserstein_dist=804518.7500
[epoch=113/250  batch_idx= 100]      loss_critic=-205424.5938
loss_gen=490582.6250  Wasserstein_dist=526471.7500
[epoch=113/250  batch_idx= 200]      loss_critic=-332862.2188
loss_gen=3364648.2500  Wasserstein_dist=653097.5000
[epoch=113/250  batch_idx= 300]      loss_critic=-480417.4375
loss_gen=177353.1562  Wasserstein_dist=775445.8750
[epoch=113/250  batch_idx= 400]      loss_critic=-101939.9688
loss_gen=1683451.7500  Wasserstein_dist=407021.0000
[epoch=113/250  batch_idx= 500]      loss_critic=-858854.1250
loss_gen=1374881.5000  Wasserstein_dist=1156971.0000
[epoch=114/250  batch_idx= 100]      loss_critic=-465481.7188
loss_gen=904814.8750  Wasserstein_dist=791396.8750
[epoch=114/250  batch_idx= 200]      loss_critic=-272385.8750
loss_gen=3973538.7500  Wasserstein_dist=598732.0000
[epoch=114/250  batch_idx= 300]      loss_critic=-583099.0625
loss_gen=4986362.0000  Wasserstein_dist=967251.0000
[epoch=114/250  batch_idx= 400]      loss_critic=-267137.8750
loss_gen=1760455.8750  Wasserstein_dist=551480.6250
[epoch=114/250  batch_idx= 500]      loss_critic=-289234.7500
loss_gen=2637213.0000  Wasserstein_dist=625583.0000
[epoch=115/250  batch_idx= 100]      loss_critic=-422550.8125
loss_gen=1102135.0000  Wasserstein_dist=715202.0000
[epoch=115/250  batch_idx= 200]      loss_critic=-270012.3125
loss_gen=129880.3672  Wasserstein_dist=613250.1250
[epoch=115/250  batch_idx= 300]      loss_critic=629298.5000
loss_gen=2379182.5000  Wasserstein_dist=-180210.5000
[epoch=115/250  batch_idx= 400]      loss_critic=-250611.0000
loss_gen=1565657.2500  Wasserstein_dist=525112.5000

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[epoch=115/250  batch_idx= 500]      loss_critic=-485351.6250
loss_gen=1278952.0000  Wasserstein_dist=778343.3750
[epoch=116/250  batch_idx= 100]      loss_critic=-160617.2188
loss_gen=2200576.0000  Wasserstein_dist=470717.5000
[epoch=116/250  batch_idx= 200]      loss_critic=-791559.5000
loss_gen=-973045.4375  Wasserstein_dist=1142269.6250
[epoch=116/250  batch_idx= 300]      loss_critic=10970.6875
loss_gen=206665.5312  Wasserstein_dist=389668.2188
[epoch=116/250  batch_idx= 400]      loss_critic=-317948.2500
loss_gen=1963395.7500  Wasserstein_dist=610098.2500
[epoch=116/250  batch_idx= 500]      loss_critic=-231554.9062
loss_gen=2667238.0000  Wasserstein_dist=524921.5000
[epoch=117/250  batch_idx= 100]      loss_critic=-367383.0625
loss_gen=2037936.8750  Wasserstein_dist=705824.2500
[epoch=117/250  batch_idx= 200]      loss_critic=-232396.4062
loss_gen=2648117.5000  Wasserstein_dist=499618.5000
[epoch=117/250  batch_idx= 300]      loss_critic=-166694.2500
loss_gen=1141528.0000  Wasserstein_dist=417611.1250
[epoch=117/250  batch_idx= 400]      loss_critic=-515008.3125
loss_gen=1216846.7500  Wasserstein_dist=798898.1250
[epoch=117/250  batch_idx= 500]      loss_critic=-366168.4688
loss_gen=2631273.0000  Wasserstein_dist=637839.7500
[epoch=118/250  batch_idx= 100]      loss_critic=-285708.9062
loss_gen=2613216.2500  Wasserstein_dist=592234.5000
[epoch=118/250  batch_idx= 200]      loss_critic=-511180.7812
loss_gen=-217510.5781  Wasserstein_dist=832094.5625
[epoch=118/250  batch_idx= 300]      loss_critic=75071.9375
loss_gen=5326527.5000  Wasserstein_dist=250978.5000
[epoch=118/250  batch_idx= 400]      loss_critic=-411620.8750
loss_gen=748756.2500  Wasserstein_dist=725635.2500
[epoch=118/250  batch_idx= 500]      loss_critic=-387070.1875
loss_gen=2189914.0000  Wasserstein_dist=662864.0000
[epoch=119/250  batch_idx= 100]      loss_critic=-374069.8125
loss_gen=2676088.5000  Wasserstein_dist=635816.0000
[epoch=119/250  batch_idx= 200]      loss_critic=199653.0938
loss_gen=3228347.0000  Wasserstein_dist=178798.0000
[epoch=119/250  batch_idx= 300]      loss_critic=-106441.8750
loss_gen=1909823.7500  Wasserstein_dist=467456.1250
[epoch=119/250  batch_idx= 400]      loss_critic=-463131.6250
loss_gen=2474748.7500  Wasserstein_dist=747388.2500
[epoch=119/250  batch_idx= 500]      loss_critic=-332656.7812
loss_gen=789522.1250  Wasserstein_dist=606536.1250
[epoch=120/250  batch_idx= 100]      loss_critic=-254369.2500
loss_gen=1382477.5000  Wasserstein_dist=493485.0000
[epoch=120/250  batch_idx= 200]      loss_critic=127981.1250
loss_gen=8762924.0000  Wasserstein_dist=499948.0000
[epoch=120/250  batch_idx= 300]      loss_critic=-415765.7188
loss_gen=-3062885.0000  Wasserstein_dist=623637.8750

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[epoch=120/250  batch_idx= 400]      loss_critic=-345475.6250
loss_gen=-913266.6875  Wasserstein_dist=708842.5625
[epoch=120/250  batch_idx= 500]      loss_critic=-380763.1875
loss_gen=2059872.5000  Wasserstein_dist=607756.8750
[epoch=121/250  batch_idx= 100]      loss_critic=-562163.3750
loss_gen=2024084.6250  Wasserstein_dist=872363.1250
[epoch=121/250  batch_idx= 200]      loss_critic=-750249.0625
loss_gen=-277442.3125  Wasserstein_dist=1063909.2500
[epoch=121/250  batch_idx= 300]      loss_critic=-1043419.8750
loss_gen=4687494.0000  Wasserstein_dist=1332038.0000
[epoch=121/250  batch_idx= 400]      loss_critic=347061.1875
loss_gen=986414.0000  Wasserstein_dist=-84688.2500
[epoch=121/250  batch_idx= 500]      loss_critic=-58575.0625
loss_gen=-57925.2734  Wasserstein_dist=401728.8750
[epoch=122/250  batch_idx= 100]      loss_critic=-1002303.6875
loss_gen=3387606.0000  Wasserstein_dist=1286627.0000
[epoch=122/250  batch_idx= 200]      loss_critic=-506194.0000
loss_gen=576060.1250  Wasserstein_dist=842975.5000
[epoch=122/250  batch_idx= 300]      loss_critic=-818248.5625
loss_gen=3057341.7500  Wasserstein_dist=1144831.2500
[epoch=122/250  batch_idx= 400]      loss_critic=-367236.2812
loss_gen=-173159.4688  Wasserstein_dist=727992.8750
[epoch=122/250  batch_idx= 500]      loss_critic=-378748.5938
loss_gen=2918034.7500  Wasserstein_dist=706148.0000
[epoch=123/250  batch_idx= 100]      loss_critic=-554291.8125
loss_gen=981911.0000  Wasserstein_dist=816292.2500
[epoch=123/250  batch_idx= 200]      loss_critic=-556308.0625
loss_gen=5113410.0000  Wasserstein_dist=862497.2500
[epoch=123/250  batch_idx= 300]      loss_critic=-802266.3750
loss_gen=560907.1250  Wasserstein_dist=1062083.1250
[epoch=123/250  batch_idx= 400]      loss_critic=-14710.4688
loss_gen=1790252.1250  Wasserstein_dist=305012.3750
[epoch=123/250  batch_idx= 500]      loss_critic=-183167.8750
loss_gen=3132719.0000  Wasserstein_dist=481959.7500
[epoch=124/250  batch_idx= 100]      loss_critic=-316229.5312
loss_gen=4276790.5000  Wasserstein_dist=627277.0000
[epoch=124/250  batch_idx= 200]      loss_critic=5853.9062
loss_gen=2452789.0000  Wasserstein_dist=262883.2500
[epoch=124/250  batch_idx= 300]      loss_critic=-254524.1250
loss_gen=4123319.5000  Wasserstein_dist=537566.0000
[epoch=124/250  batch_idx= 400]      loss_critic=-693550.5000
loss_gen=3011516.2500  Wasserstein_dist=983560.7500
[epoch=124/250  batch_idx= 500]      loss_critic=-369637.7188
loss_gen=2894653.5000  Wasserstein_dist=607249.2500
[epoch=125/250  batch_idx= 100]      loss_critic=-339584.5938
loss_gen=2512610.0000  Wasserstein_dist=622709.2500
[epoch=125/250  batch_idx= 200]      loss_critic=-412247.6875
loss_gen=1790738.3750  Wasserstein_dist=682976.2500

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[epoch=125/250  batch_idx= 300]      loss_critic=118206.8438
loss_gen=1823563.0000  Wasserstein_dist=178817.5000
[epoch=125/250  batch_idx= 400]      loss_critic=277764.0938
loss_gen=-896805.2500  Wasserstein_dist=55527.3125
[epoch=125/250  batch_idx= 500]      loss_critic=-695379.8750
loss_gen=182667.2500  Wasserstein_dist=1005182.2500
[epoch=126/250  batch_idx= 100]      loss_critic=-446430.3750
loss_gen=4764471.0000  Wasserstein_dist=786576.0000
[epoch=126/250  batch_idx= 200]      loss_critic=100457.8750
loss_gen=1299840.3750  Wasserstein_dist=187412.1250
[epoch=126/250  batch_idx= 300]      loss_critic=-293769.1875
loss_gen=1403907.2500  Wasserstein_dist=589443.0000
[epoch=126/250  batch_idx= 400]      loss_critic=-198362.4688
loss_gen=-322007.5625  Wasserstein_dist=512664.4062
[epoch=126/250  batch_idx= 500]      loss_critic=-278439.7500
loss_gen=2615936.5000  Wasserstein_dist=579376.0000
[epoch=127/250  batch_idx= 100]      loss_critic=162263.4375
loss_gen=4940235.0000  Wasserstein_dist=235344.0000
[epoch=127/250  batch_idx= 200]      loss_critic=-424774.6250
loss_gen=1875371.7500  Wasserstein_dist=750256.0000
[epoch=127/250  batch_idx= 300]      loss_critic=-605229.1250
loss_gen=2991337.5000  Wasserstein_dist=860522.5000
[epoch=127/250  batch_idx= 400]      loss_critic=-615282.3750
loss_gen=-1537790.5000  Wasserstein_dist=1071095.3750
[epoch=127/250  batch_idx= 500]      loss_critic=-449112.5000
loss_gen=801635.6875  Wasserstein_dist=739966.1875
[epoch=128/250  batch_idx= 100]      loss_critic=-501628.6562
loss_gen=1506495.5000  Wasserstein_dist=810856.0000
[epoch=128/250  batch_idx= 200]      loss_critic=-930200.6875
loss_gen=3528868.0000  Wasserstein_dist=1230520.5000
[epoch=128/250  batch_idx= 300]      loss_critic=-530830.8750
loss_gen=298820.9688  Wasserstein_dist=851258.3750
[epoch=128/250  batch_idx= 400]      loss_critic=-600270.8125
loss_gen=-2094688.5000  Wasserstein_dist=1014585.3750
[epoch=128/250  batch_idx= 500]      loss_critic=-367246.1562
loss_gen=1731802.5000  Wasserstein_dist=650017.5000
[epoch=129/250  batch_idx= 100]      loss_critic=563920.5000
loss_gen=-1442055.1250  Wasserstein_dist=-105006.8750
[epoch=129/250  batch_idx= 200]      loss_critic=-375572.9062
loss_gen=976574.1250  Wasserstein_dist=653210.0625
[epoch=129/250  batch_idx= 300]      loss_critic=-851177.7500
loss_gen=2362365.2500  Wasserstein_dist=1163369.2500
[epoch=129/250  batch_idx= 400]      loss_critic=-451010.3750
loss_gen=2185233.0000  Wasserstein_dist=731351.5000
[epoch=129/250  batch_idx= 500]      loss_critic=-446625.8125
loss_gen=400889.9688  Wasserstein_dist=723592.8750
[epoch=130/250  batch_idx= 100]      loss_critic=14884.0625
loss_gen=861531.1875  Wasserstein_dist=298111.1250

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[epoch=130/250  batch_idx= 200]      loss_critic=-646257.9375
loss_gen=1504544.7500  Wasserstein_dist=894221.6250
[epoch=130/250  batch_idx= 300]      loss_critic=-388858.9062
loss_gen=3060704.5000  Wasserstein_dist=713180.0000
[epoch=130/250  batch_idx= 400]      loss_critic=-365979.8125
loss_gen=1891505.8750  Wasserstein_dist=625389.5000
[epoch=130/250  batch_idx= 500]      loss_critic=-94297.1250
loss_gen=860545.5000  Wasserstein_dist=420265.7500
[epoch=131/250  batch_idx= 100]      loss_critic=-537515.6875
loss_gen=2118215.7500  Wasserstein_dist=787865.2500
[epoch=131/250  batch_idx= 200]      loss_critic=-232191.5938
loss_gen=2193317.0000  Wasserstein_dist=494136.7500
[epoch=131/250  batch_idx= 300]      loss_critic=-488739.1250
loss_gen=3385694.5000  Wasserstein_dist=773601.5000
[epoch=131/250  batch_idx= 400]      loss_critic=-487231.1250
loss_gen=1560573.8750  Wasserstein_dist=764494.1250
[epoch=131/250  batch_idx= 500]      loss_critic=-511005.6562
loss_gen=1150931.6250  Wasserstein_dist=850185.0000
[epoch=132/250  batch_idx= 100]      loss_critic=-78921.5938
loss_gen=2678641.5000  Wasserstein_dist=389325.0000
[epoch=132/250  batch_idx= 200]      loss_critic=-422409.7188
loss_gen=3038554.0000  Wasserstein_dist=763988.0000
[epoch=132/250  batch_idx= 300]      loss_critic=-734798.3750
loss_gen=685129.3125  Wasserstein_dist=1073409.8750
[epoch=132/250  batch_idx= 400]      loss_critic=-661799.1250
loss_gen=-1224599.5000  Wasserstein_dist=945200.7500
[epoch=132/250  batch_idx= 500]      loss_critic=-460011.4062
loss_gen=1009881.0000  Wasserstein_dist=707412.2500
[epoch=133/250  batch_idx= 100]      loss_critic=-170029.6562
loss_gen=4603786.0000  Wasserstein_dist=511634.5000
[epoch=133/250  batch_idx= 200]      loss_critic=-110767.3125
loss_gen=1236842.7500  Wasserstein_dist=493916.3750
[epoch=133/250  batch_idx= 300]      loss_critic=-182223.3750
loss_gen=2673416.2500  Wasserstein_dist=467882.5000
[epoch=133/250  batch_idx= 400]      loss_critic=-758758.7500
loss_gen=716450.7500  Wasserstein_dist=1046471.6875
[epoch=133/250  batch_idx= 500]      loss_critic=-441546.8125
loss_gen=-97608.8125  Wasserstein_dist=788260.4375
[epoch=134/250  batch_idx= 100]      loss_critic=292857.4688
loss_gen=2590103.5000  Wasserstein_dist=21721.2500
[epoch=134/250  batch_idx= 200]      loss_critic=-647427.0625
loss_gen=941130.7500  Wasserstein_dist=891109.2500
[epoch=134/250  batch_idx= 300]      loss_critic=214369.1250
loss_gen=1082001.2500  Wasserstein_dist=86982.5000
[epoch=134/250  batch_idx= 400]      loss_critic=-455448.3125
loss_gen=990027.8750  Wasserstein_dist=773233.0000
[epoch=134/250  batch_idx= 500]      loss_critic=-862578.0625
loss_gen=1339869.0000  Wasserstein_dist=1182366.3750

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[epoch=135/250  batch_idx= 100]      loss_critic=711223.5625
loss_gen=-5478218.5000  Wasserstein_dist=-305054.5000
[epoch=135/250  batch_idx= 200]      loss_critic=-530625.0000
loss_gen=2155446.5000  Wasserstein_dist=876289.7500
[epoch=135/250  batch_idx= 300]      loss_critic=-461931.4688
loss_gen=3451365.0000  Wasserstein_dist=792971.7500
[epoch=135/250  batch_idx= 400]      loss_critic=-68309.4375
loss_gen=3062258.0000  Wasserstein_dist=346851.0000
[epoch=135/250  batch_idx= 500]      loss_critic=-612825.5000
loss_gen=4919998.5000  Wasserstein_dist=970520.0000
[epoch=136/250  batch_idx= 100]      loss_critic=-614114.8125
loss_gen=1668120.0000  Wasserstein_dist=883175.1250
[epoch=136/250  batch_idx= 200]      loss_critic=-339159.5625
loss_gen=1149353.0000  Wasserstein_dist=641626.8125
[epoch=136/250  batch_idx= 300]      loss_critic=-429255.1250
loss_gen=885372.5000  Wasserstein_dist=760401.8750
[epoch=136/250  batch_idx= 400]      loss_critic=-607998.2500
loss_gen=788029.5000  Wasserstein_dist=966690.6250
[epoch=136/250  batch_idx= 500]      loss_critic=-69006.6875
loss_gen=-1783885.0000  Wasserstein_dist=346776.2500
[epoch=137/250  batch_idx= 100]      loss_critic=-259822.5000
loss_gen=1579396.7500  Wasserstein_dist=610009.5000
[epoch=137/250  batch_idx= 200]      loss_critic=203355.0312
loss_gen=2395185.0000  Wasserstein_dist=164110.2500
[epoch=137/250  batch_idx= 300]      loss_critic=-382497.6875
loss_gen=932799.3750  Wasserstein_dist=686325.7500
[epoch=137/250  batch_idx= 400]      loss_critic=-444148.1875
loss_gen=433854.0625  Wasserstein_dist=742392.6250
[epoch=137/250  batch_idx= 500]      loss_critic=-883826.7500
loss_gen=2459897.2500  Wasserstein_dist=1146810.7500
[epoch=138/250  batch_idx= 100]      loss_critic=-610549.8750
loss_gen=1904301.6250  Wasserstein_dist=904585.7500
[epoch=138/250  batch_idx= 200]      loss_critic=-424273.8750
loss_gen=635371.3750  Wasserstein_dist=747572.5000
[epoch=138/250  batch_idx= 300]      loss_critic=-9930.3125
loss_gen=1663583.3750  Wasserstein_dist=270317.3750
[epoch=138/250  batch_idx= 400]      loss_critic=87559.4688
loss_gen=3349571.0000  Wasserstein_dist=206441.0000
[epoch=138/250  batch_idx= 500]      loss_critic=-813647.2500
loss_gen=5634179.0000  Wasserstein_dist=1176001.5000
[epoch=139/250  batch_idx= 100]      loss_critic=-261984.7188
loss_gen=34704.3594  Wasserstein_dist=556248.0000
[epoch=139/250  batch_idx= 200]      loss_critic=-365539.3125
loss_gen=407777.2812  Wasserstein_dist=670723.5625
[epoch=139/250  batch_idx= 300]      loss_critic=-90098.8750
loss_gen=580547.3750  Wasserstein_dist=402818.4375
[epoch=139/250  batch_idx= 400]      loss_critic=-77676.0312
loss_gen=2704518.7500  Wasserstein_dist=375584.7500

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[epoch=139/250  batch_idx= 500]      loss_critic=-90805.9375
loss_gen=1161971.1250  Wasserstein_dist=368349.5000
[epoch=140/250  batch_idx= 100]      loss_critic=-307616.8750
loss_gen=2832267.0000  Wasserstein_dist=626573.0000
[epoch=140/250  batch_idx= 200]      loss_critic=-600628.8750
loss_gen=-538775.8125  Wasserstein_dist=889042.1250
[epoch=140/250  batch_idx= 300]      loss_critic=-305345.1562
loss_gen=2243719.0000  Wasserstein_dist=601814.5000
[epoch=140/250  batch_idx= 400]      loss_critic=-221150.0625
loss_gen=-13236.6875  Wasserstein_dist=510090.1875
[epoch=140/250  batch_idx= 500]      loss_critic=-299805.0625
loss_gen=2704262.0000  Wasserstein_dist=616485.7500
[epoch=141/250  batch_idx= 100]      loss_critic=-360133.5000
loss_gen=994764.1250  Wasserstein_dist=808638.1250
[epoch=141/250  batch_idx= 200]      loss_critic=-274307.3750
loss_gen=365712.1250  Wasserstein_dist=656900.8750
[epoch=141/250  batch_idx= 300]      loss_critic=-109241.0000
loss_gen=1886041.2500  Wasserstein_dist=350045.0000
[epoch=141/250  batch_idx= 400]      loss_critic=-394517.0625
loss_gen=2489261.2500  Wasserstein_dist=660310.5000
[epoch=141/250  batch_idx= 500]      loss_critic=-473029.5938
loss_gen=3753765.0000  Wasserstein_dist=745631.5000
[epoch=142/250  batch_idx= 100]      loss_critic=821321.9375
loss_gen=-7380348.5000  Wasserstein_dist=-311869.5000
[epoch=142/250  batch_idx= 200]      loss_critic=-1094455.1250
loss_gen=-2744571.5000  Wasserstein_dist=1411167.8750
[epoch=142/250  batch_idx= 300]      loss_critic=-656226.9375
loss_gen=164306.9688  Wasserstein_dist=945426.7500
[epoch=142/250  batch_idx= 400]      loss_critic=-126635.9375
loss_gen=-1564898.5000  Wasserstein_dist=507402.0000
[epoch=142/250  batch_idx= 500]      loss_critic=-438745.8438
loss_gen=-128512.4844  Wasserstein_dist=750852.6250
[epoch=143/250  batch_idx= 100]      loss_critic=-603583.0625
loss_gen=59044.0859  Wasserstein_dist=886811.3750
[epoch=143/250  batch_idx= 200]      loss_critic=-566579.3750
loss_gen=3467870.5000  Wasserstein_dist=883240.7500
[epoch=143/250  batch_idx= 300]      loss_critic=-378673.3438
loss_gen=3216346.5000  Wasserstein_dist=708889.2500
[epoch=143/250  batch_idx= 400]      loss_critic=-174444.9375
loss_gen=475468.5000  Wasserstein_dist=471275.3125
[epoch=143/250  batch_idx= 500]      loss_critic=-814578.1250
loss_gen=1591045.8750  Wasserstein_dist=1145250.2500
[epoch=144/250  batch_idx= 100]      loss_critic=-408214.3125
loss_gen=2852421.0000  Wasserstein_dist=687104.2500
[epoch=144/250  batch_idx= 200]      loss_critic=-349684.4688
loss_gen=1130478.0000  Wasserstein_dist=627502.6250
[epoch=144/250  batch_idx= 300]      loss_critic=-509745.7188
loss_gen=753365.0625  Wasserstein_dist=831206.6250

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[epoch=144/250  batch_idx= 400]      loss_critic=-568981.0000
loss_gen=-915876.8750  Wasserstein_dist=867725.5000
[epoch=144/250  batch_idx= 500]      loss_critic=-218540.3750
loss_gen=2927333.0000  Wasserstein_dist=523855.5000
[epoch=145/250  batch_idx= 100]      loss_critic=-365410.1250
loss_gen=-1225303.5000  Wasserstein_dist=693359.0000
[epoch=145/250  batch_idx= 200]      loss_critic=-253617.3750
loss_gen=465919.4375  Wasserstein_dist=561783.7500
[epoch=145/250  batch_idx= 300]      loss_critic=-463226.0000
loss_gen=4437966.0000  Wasserstein_dist=758463.2500
[epoch=145/250  batch_idx= 400]      loss_critic=-377381.0625
loss_gen=2120005.0000  Wasserstein_dist=669415.3750
[epoch=145/250  batch_idx= 500]      loss_critic=-471475.0625
loss_gen=757240.4375  Wasserstein_dist=815729.7500
[epoch=146/250  batch_idx= 100]      loss_critic=-286906.0000
loss_gen=1901018.5000  Wasserstein_dist=556522.7500
[epoch=146/250  batch_idx= 200]      loss_critic=-385610.3125
loss_gen=2275011.0000  Wasserstein_dist=678733.2500
[epoch=146/250  batch_idx= 300]      loss_critic=-606689.3750
loss_gen=2062558.1250  Wasserstein_dist=899999.2500
[epoch=146/250  batch_idx= 400]      loss_critic=-441676.2812
loss_gen=2369931.5000  Wasserstein_dist=734885.3750
[epoch=146/250  batch_idx= 500]      loss_critic=-838035.3750
loss_gen=-1541499.7500  Wasserstein_dist=1190293.7500
[epoch=147/250  batch_idx= 100]      loss_critic=205222.0938
loss_gen=1527176.5000  Wasserstein_dist=109958.2500
[epoch=147/250  batch_idx= 200]      loss_critic=-842461.2500
loss_gen=-1207340.1250  Wasserstein_dist=1209125.0000
[epoch=147/250  batch_idx= 300]      loss_critic=-371759.0625
loss_gen=1181833.2500  Wasserstein_dist=663436.7500
[epoch=147/250  batch_idx= 400]      loss_critic=-294862.7500
loss_gen=2479823.0000  Wasserstein_dist=588348.2500
[epoch=147/250  batch_idx= 500]      loss_critic=-928957.8125
loss_gen=-2273317.5000  Wasserstein_dist=1288823.3750
[epoch=148/250  batch_idx= 100]      loss_critic=-1011571.0625
loss_gen=-3098958.2500  Wasserstein_dist=1294772.8750
[epoch=148/250  batch_idx= 200]      loss_critic=-557525.1250
loss_gen=3213889.0000  Wasserstein_dist=886464.5000
[epoch=148/250  batch_idx= 300]      loss_critic=-375969.4375
loss_gen=232379.9062  Wasserstein_dist=667271.7500
[epoch=148/250  batch_idx= 400]      loss_critic=366057.7812
loss_gen=210858.0938  Wasserstein_dist=-31775.3438
[epoch=148/250  batch_idx= 500]      loss_critic=-600630.6875
loss_gen=-35405.8320  Wasserstein_dist=977282.4375
[epoch=149/250  batch_idx= 100]      loss_critic=-475210.3438
loss_gen=3229360.2500  Wasserstein_dist=784351.7500
[epoch=149/250  batch_idx= 200]      loss_critic=-204406.0625
loss_gen=2150175.7500  Wasserstein_dist=506691.8750

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[epoch=149/250  batch_idx= 300]      loss_critic=-570341.5000
loss_gen=3472367.5000  Wasserstein_dist=891006.2500
[epoch=149/250  batch_idx= 400]      loss_critic=-73414.5000
loss_gen=2889611.0000  Wasserstein_dist=391371.7500
[epoch=149/250  batch_idx= 500]      loss_critic=-308044.4688
loss_gen=1157205.5000  Wasserstein_dist=623636.2500
[epoch=150/250  batch_idx= 100]      loss_critic=-461398.5625
loss_gen=1609301.8750  Wasserstein_dist=766672.0000
[epoch=150/250  batch_idx= 200]      loss_critic=-669359.1250
loss_gen=924818.7500   Wasserstein_dist=966011.6250
[epoch=150/250  batch_idx= 300]      loss_critic=-195174.2500
loss_gen=18310.3984   Wasserstein_dist=543448.1250
[epoch=150/250  batch_idx= 400]      loss_critic=-241907.3438
loss_gen=1915850.7500  Wasserstein_dist=542145.5000
[epoch=150/250  batch_idx= 500]      loss_critic=-605990.7500
loss_gen=-329036.1562  Wasserstein_dist=946792.8750
[epoch=151/250  batch_idx= 100]      loss_critic=-332556.9375
loss_gen=2006292.5000  Wasserstein_dist=623881.2500
[epoch=151/250  batch_idx= 200]      loss_critic=-171933.8750
loss_gen=3601007.0000  Wasserstein_dist=499868.2500
[epoch=151/250  batch_idx= 300]      loss_critic=256693.9062
loss_gen=4201995.5000  Wasserstein_dist=132135.0000
[epoch=151/250  batch_idx= 400]      loss_critic=-228561.1562
loss_gen=606475.8750   Wasserstein_dist=600037.2500
[epoch=151/250  batch_idx= 500]      loss_critic=-355472.1250
loss_gen=1099131.5000  Wasserstein_dist=683645.5000
[epoch=152/250  batch_idx= 100]      loss_critic=-565520.7500
loss_gen=3707712.5000  Wasserstein_dist=896742.5000
[epoch=152/250  batch_idx= 200]      loss_critic=-532429.6875
loss_gen=1956040.5000  Wasserstein_dist=887580.6250
[epoch=152/250  batch_idx= 300]      loss_critic=-12564.4062
loss_gen=19461.5000   Wasserstein_dist=351934.6562
[epoch=152/250  batch_idx= 400]      loss_critic=-859582.8750
loss_gen=1558039.1250  Wasserstein_dist=1197573.5000
[epoch=152/250  batch_idx= 500]      loss_critic=-342994.8438
loss_gen=2070185.2500  Wasserstein_dist=646493.7500
[epoch=153/250  batch_idx= 100]      loss_critic=-252770.3438
loss_gen=1028160.3750  Wasserstein_dist=576633.1250
[epoch=153/250  batch_idx= 200]      loss_critic=-526222.5000
loss_gen=791327.8750   Wasserstein_dist=865168.6250
[epoch=153/250  batch_idx= 300]      loss_critic=-153112.7188
loss_gen=1757970.0000  Wasserstein_dist=470479.3750
[epoch=153/250  batch_idx= 400]      loss_critic=-56913.4688
loss_gen=3911480.5000  Wasserstein_dist=419986.0000
[epoch=153/250  batch_idx= 500]      loss_critic=-459148.4062
loss_gen=-2564123.5000  Wasserstein_dist=818210.3125
[epoch=154/250  batch_idx= 100]      loss_critic=-493482.2188
loss_gen=677582.0000   Wasserstein_dist=915550.0000

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[epoch=154/250  batch_idx= 200]      loss_critic=327653.9375
loss_gen=-557270.4375  Wasserstein_dist=-5203.1562
[epoch=154/250  batch_idx= 300]      loss_critic=36705.6875
loss_gen=1760301.5000  Wasserstein_dist=286843.7500
[epoch=154/250  batch_idx= 400]      loss_critic=-727273.7500
loss_gen=2349638.0000  Wasserstein_dist=1031206.2500
[epoch=154/250  batch_idx= 500]      loss_critic=-319161.3750
loss_gen=2061848.6250  Wasserstein_dist=626216.0000
[epoch=155/250  batch_idx= 100]      loss_critic=-227911.8125
loss_gen=403300.5312  Wasserstein_dist=570076.3750
[epoch=155/250  batch_idx= 200]      loss_critic=-571710.5625
loss_gen=703441.9375  Wasserstein_dist=902996.1250
[epoch=155/250  batch_idx= 300]      loss_critic=-79658.2812
loss_gen=2143288.5000  Wasserstein_dist=427012.0000
[epoch=155/250  batch_idx= 400]      loss_critic=-379505.6875
loss_gen=1247890.8750  Wasserstein_dist=752513.8750
[epoch=155/250  batch_idx= 500]      loss_critic=-292430.2500
loss_gen=-46887.4688  Wasserstein_dist=846458.7500
[epoch=156/250  batch_idx= 100]      loss_critic=-606973.3750
loss_gen=725598.0000  Wasserstein_dist=919042.6875
[epoch=156/250  batch_idx= 200]      loss_critic=-632234.5000
loss_gen=2020162.1250  Wasserstein_dist=947163.7500
[epoch=156/250  batch_idx= 300]      loss_critic=-395099.7500
loss_gen=4214164.5000  Wasserstein_dist=789457.0000
[epoch=156/250  batch_idx= 400]      loss_critic=-264481.2812
loss_gen=2036339.2500  Wasserstein_dist=619575.5000
[epoch=156/250  batch_idx= 500]      loss_critic=-356525.5625
loss_gen=1728592.8750  Wasserstein_dist=682172.3750
[epoch=157/250  batch_idx= 100]      loss_critic=-456348.8750
loss_gen=2523220.2500  Wasserstein_dist=768953.7500
[epoch=157/250  batch_idx= 200]      loss_critic=-194250.5625
loss_gen=4119546.5000  Wasserstein_dist=571981.5000
[epoch=157/250  batch_idx= 300]      loss_critic=-83725.3750
loss_gen=649601.0625  Wasserstein_dist=452266.5000
[epoch=157/250  batch_idx= 400]      loss_critic=343763.5938
loss_gen=3502552.7500  Wasserstein_dist=157820.0000
[epoch=157/250  batch_idx= 500]      loss_critic=-425380.0312
loss_gen=1381270.0000  Wasserstein_dist=737032.5000
[epoch=158/250  batch_idx= 100]      loss_critic=-293207.0938
loss_gen=1792172.0000  Wasserstein_dist=601918.5000
[epoch=158/250  batch_idx= 200]      loss_critic=-808293.5625
loss_gen=404846.5625  Wasserstein_dist=1149670.7500
[epoch=158/250  batch_idx= 300]      loss_critic=-769958.3750
loss_gen=210717.2500  Wasserstein_dist=1147732.7500
[epoch=158/250  batch_idx= 400]      loss_critic=57337.3125
loss_gen=3536572.2500  Wasserstein_dist=304807.7500
[epoch=158/250  batch_idx= 500]      loss_critic=-283371.7188
loss_gen=2694882.0000  Wasserstein_dist=610152.0000

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[epoch=159/250  batch_idx= 100]      loss_critic=-161339.2500
loss_gen=2603094.5000  Wasserstein_dist=514064.0000
[epoch=159/250  batch_idx= 200]      loss_critic=-227709.0000
loss_gen=-392004.5312  Wasserstein_dist=598988.6875
[epoch=159/250  batch_idx= 300]      loss_critic=-368171.6250
loss_gen=225621.8750  Wasserstein_dist=728653.2500
[epoch=159/250  batch_idx= 400]      loss_critic=-868959.8750
loss_gen=328603.5000  Wasserstein_dist=1260666.0000
[epoch=159/250  batch_idx= 500]      loss_critic=-313887.3750
loss_gen=1627778.2500  Wasserstein_dist=618096.3750
[epoch=160/250  batch_idx= 100]      loss_critic=-401204.6250
loss_gen=3602567.7500  Wasserstein_dist=869100.0000
[epoch=160/250  batch_idx= 200]      loss_critic=149859.3125
loss_gen=-5411343.0000  Wasserstein_dist=459321.0000
[epoch=160/250  batch_idx= 300]      loss_critic=-320249.5625
loss_gen=271980.8125  Wasserstein_dist=661010.1250
[epoch=160/250  batch_idx= 400]      loss_critic=-455846.1562
loss_gen=1429127.0000  Wasserstein_dist=772916.5000
[epoch=160/250  batch_idx= 500]      loss_critic=-419346.9062
loss_gen=2357133.7500  Wasserstein_dist=765323.5000
[epoch=161/250  batch_idx= 100]      loss_critic=-480757.6250
loss_gen=3115311.0000  Wasserstein_dist=836164.5000
[epoch=161/250  batch_idx= 200]      loss_critic=-514742.0625
loss_gen=2241778.7500  Wasserstein_dist=883503.8750
[epoch=161/250  batch_idx= 300]      loss_critic=-486584.5625
loss_gen=-490204.0625  Wasserstein_dist=873776.8750
[epoch=161/250  batch_idx= 400]      loss_critic=-110888.7500
loss_gen=4334879.0000  Wasserstein_dist=541710.0000
[epoch=161/250  batch_idx= 500]      loss_critic=-575216.9375
loss_gen=861274.2500  Wasserstein_dist=940428.8750
[epoch=162/250  batch_idx= 100]      loss_critic=-40725.3750
loss_gen=977052.0625  Wasserstein_dist=522939.7500
[epoch=162/250  batch_idx= 200]      loss_critic=-444790.3125
loss_gen=1451737.0000  Wasserstein_dist=754952.7500
[epoch=162/250  batch_idx= 300]      loss_critic=-688787.1875
loss_gen=2804475.0000  Wasserstein_dist=1074983.5000
[epoch=162/250  batch_idx= 400]      loss_critic=-605274.1250
loss_gen=1044426.2500  Wasserstein_dist=945466.7500
[epoch=162/250  batch_idx= 500]      loss_critic=-187383.7812
loss_gen=1817662.7500  Wasserstein_dist=516959.8750
[epoch=163/250  batch_idx= 100]      loss_critic=235613.8125
loss_gen=1467970.3750  Wasserstein_dist=134747.6250
[epoch=163/250  batch_idx= 200]      loss_critic=-88105.8125
loss_gen=-1580609.8750  Wasserstein_dist=505524.7500
[epoch=163/250  batch_idx= 300]      loss_critic=-546880.8750
loss_gen=2580418.5000  Wasserstein_dist=860654.0000
[epoch=163/250  batch_idx= 400]      loss_critic=-170090.8438
loss_gen=2140380.7500  Wasserstein_dist=480479.0000

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[epoch=163/250  batch_idx= 500]      loss_critic=-187068.0938
loss_gen=4997703.0000  Wasserstein_dist=611479.5000
[epoch=164/250  batch_idx= 100]      loss_critic=-564088.3750
loss_gen=2444832.2500  Wasserstein_dist=881904.6250
[epoch=164/250  batch_idx= 200]      loss_critic=-133791.6875
loss_gen=1614700.7500  Wasserstein_dist=496991.6250
[epoch=164/250  batch_idx= 300]      loss_critic=-250675.3438
loss_gen=705636.7500  Wasserstein_dist=613793.0000
[epoch=164/250  batch_idx= 400]      loss_critic=-122521.2188
loss_gen=4972993.0000  Wasserstein_dist=613827.0000
[epoch=164/250  batch_idx= 500]      loss_critic=-28886.8750
loss_gen=-1965050.5000  Wasserstein_dist=351763.5000
[epoch=165/250  batch_idx= 100]      loss_critic=-260985.9688
loss_gen=2612728.0000  Wasserstein_dist=565441.0000
[epoch=165/250  batch_idx= 200]      loss_critic=-527295.1875
loss_gen=2297596.5000  Wasserstein_dist=850726.0000
[epoch=165/250  batch_idx= 300]      loss_critic=-269055.2812
loss_gen=1840884.8750  Wasserstein_dist=576528.7500
[epoch=165/250  batch_idx= 400]      loss_critic=-370064.4375
loss_gen=1600580.2500  Wasserstein_dist=772211.0000
[epoch=165/250  batch_idx= 500]      loss_critic=-521319.6250
loss_gen=-526399.3750  Wasserstein_dist=875387.7500
[epoch=166/250  batch_idx= 100]      loss_critic=-530235.2500
loss_gen=-2029057.8750  Wasserstein_dist=960292.7500
[epoch=166/250  batch_idx= 200]      loss_critic=-267958.4062
loss_gen=1572800.3750  Wasserstein_dist=606443.8750
[epoch=166/250  batch_idx= 300]      loss_critic=-49904.5000
loss_gen=989958.0000  Wasserstein_dist=403086.6250
[epoch=166/250  batch_idx= 400]      loss_critic=-226615.1875
loss_gen=1276431.0000  Wasserstein_dist=539363.7500
[epoch=166/250  batch_idx= 500]      loss_critic=-492407.5000
loss_gen=1894473.5000  Wasserstein_dist=839595.7500
[epoch=167/250  batch_idx= 100]      loss_critic=-261155.4062
loss_gen=1391481.7500  Wasserstein_dist=697067.2500
[epoch=167/250  batch_idx= 200]      loss_critic=-458347.4688
loss_gen=-358203.6250  Wasserstein_dist=821688.2500
[epoch=167/250  batch_idx= 300]      loss_critic=-86022.2500
loss_gen=1279552.7500  Wasserstein_dist=449947.8750
[epoch=167/250  batch_idx= 400]      loss_critic=-58274.2500
loss_gen=1162428.8750  Wasserstein_dist=433683.8750
[epoch=167/250  batch_idx= 500]      loss_critic=-1205282.5000
loss_gen=3658276.0000  Wasserstein_dist=1595976.0000
[epoch=168/250  batch_idx= 100]      loss_critic=-412615.4375
loss_gen=922349.3750  Wasserstein_dist=781986.6250
[epoch=168/250  batch_idx= 200]      loss_critic=-436753.4375
loss_gen=1787705.0000  Wasserstein_dist=808750.3750
[epoch=168/250  batch_idx= 300]      loss_critic=-567292.4375
loss_gen=1548428.8750  Wasserstein_dist=892169.7500

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[epoch=168/250 batch_idx= 400] loss_critic=-153802.6250
loss_gen=724461.2500 Wasserstein_dist=538219.5000
[epoch=168/250 batch_idx= 500] loss_critic=-801768.2500
loss_gen=-1448620.5000 Wasserstein_dist=1348061.5000
[epoch=169/250 batch_idx= 100] loss_critic=-561536.5000
loss_gen=770619.0625 Wasserstein_dist=959797.5000
[epoch=169/250 batch_idx= 200] loss_critic=-383725.2500
loss_gen=3501612.0000 Wasserstein_dist=779232.5000
[epoch=169/250 batch_idx= 300] loss_critic=-506668.3125
loss_gen=2106658.5000 Wasserstein_dist=850951.5000
[epoch=169/250 batch_idx= 400] loss_critic=-601823.2500
loss_gen=4563106.5000 Wasserstein_dist=999505.7500
[epoch=169/250 batch_idx= 500] loss_critic=-612436.1250
loss_gen=2967377.5000 Wasserstein_dist=1035056.5000
[epoch=170/250 batch_idx= 100] loss_critic=-506244.9062
loss_gen=120525.9453 Wasserstein_dist=874118.6250
[epoch=170/250 batch_idx= 200] loss_critic=-620297.4375
loss_gen=2698863.2500 Wasserstein_dist=979528.8750
[epoch=170/250 batch_idx= 300] loss_critic=-282210.3125
loss_gen=218133.6875 Wasserstein_dist=650538.3750
[epoch=170/250 batch_idx= 400] loss_critic=-484617.9062
loss_gen=800639.0000 Wasserstein_dist=930435.5625
[epoch=170/250 batch_idx= 500] loss_critic=-235967.0938
loss_gen=2901548.7500 Wasserstein_dist=634375.2500
[epoch=171/250 batch_idx= 100] loss_critic=-285932.9062
loss_gen=1713030.5000 Wasserstein_dist=622095.2500
[epoch=171/250 batch_idx= 200] loss_critic=-489362.7500
loss_gen=711252.3750 Wasserstein_dist=904738.0000
[epoch=171/250 batch_idx= 300] loss_critic=-712512.3125
loss_gen=865368.3125 Wasserstein_dist=1068921.7500
[epoch=171/250 batch_idx= 400] loss_critic=-684814.7500
loss_gen=1885900.3750 Wasserstein_dist=1043511.5000
[epoch=171/250 batch_idx= 500] loss_critic=-293281.2188
loss_gen=-154007.8750 Wasserstein_dist=669826.0625
[epoch=172/250 batch_idx= 100] loss_critic=-613086.6875
loss_gen=550764.7500 Wasserstein_dist=1027908.3750
[epoch=172/250 batch_idx= 200] loss_critic=-426952.0312
loss_gen=828501.1250 Wasserstein_dist=777730.6250
[epoch=172/250 batch_idx= 300] loss_critic=-68736.3438
loss_gen=1861196.2500 Wasserstein_dist=473697.7500
[epoch=172/250 batch_idx= 400] loss_critic=-585268.3125
loss_gen=3771502.5000 Wasserstein_dist=1012234.5000
[epoch=172/250 batch_idx= 500] loss_critic=-819068.3750
loss_gen=-1935896.0000 Wasserstein_dist=1180323.5000
[epoch=173/250 batch_idx= 100] loss_critic=-45381.4375
loss_gen=1628684.3750 Wasserstein_dist=380639.2500
[epoch=173/250 batch_idx= 200] loss_critic=-121505.1875
loss_gen=1791535.7500 Wasserstein_dist=497605.0000

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[epoch=173/250  batch_idx= 300]      loss_critic=-1078855.7500
loss_gen=-1887815.0000  Wasserstein_dist=1531212.0000
[epoch=173/250  batch_idx= 400]      loss_critic=10682.6250
loss_gen=-598323.1250  Wasserstein_dist=366825.5312
[epoch=173/250  batch_idx= 500]      loss_critic=-213464.4688
loss_gen=120548.5703  Wasserstein_dist=551146.5000
[epoch=174/250  batch_idx= 100]      loss_critic=-619380.6250
loss_gen=1237198.2500  Wasserstein_dist=1021628.0000
[epoch=174/250  batch_idx= 200]      loss_critic=-409554.6250
loss_gen=-2566090.2500  Wasserstein_dist=853030.0000
[epoch=174/250  batch_idx= 300]      loss_critic=-350810.0625
loss_gen=1203123.0000  Wasserstein_dist=684452.6250
[epoch=174/250  batch_idx= 400]      loss_critic=-580775.7500
loss_gen=597739.9375  Wasserstein_dist=902619.4375
[epoch=174/250  batch_idx= 500]      loss_critic=-460154.9375
loss_gen=1891591.0000  Wasserstein_dist=824669.2500
[epoch=175/250  batch_idx= 100]      loss_critic=70688.8750
loss_gen=2823354.7500  Wasserstein_dist=344737.7500
[epoch=175/250  batch_idx= 200]      loss_critic=-547324.8125
loss_gen=799102.2500  Wasserstein_dist=961092.1875
[epoch=175/250  batch_idx= 300]      loss_critic=82486.6875
loss_gen=161687.0156  Wasserstein_dist=332719.4062
[epoch=175/250  batch_idx= 400]      loss_critic=-226091.4375
loss_gen=2911862.5000  Wasserstein_dist=636789.5000
[epoch=175/250  batch_idx= 500]      loss_critic=-621342.1875
loss_gen=888136.3750  Wasserstein_dist=1023023.5000
[epoch=176/250  batch_idx= 100]      loss_critic=-186211.0000
loss_gen=5331250.5000  Wasserstein_dist=630412.0000
[epoch=176/250  batch_idx= 200]      loss_critic=-356468.4062
loss_gen=1993335.5000  Wasserstein_dist=710683.2500
[epoch=176/250  batch_idx= 300]      loss_critic=-485039.6875
loss_gen=1935699.5000  Wasserstein_dist=837973.2500
[epoch=176/250  batch_idx= 400]      loss_critic=-300174.5000
loss_gen=3070473.5000  Wasserstein_dist=678069.7500
[epoch=176/250  batch_idx= 500]      loss_critic=315876.5625
loss_gen=352063.4375  Wasserstein_dist=84916.8750
[epoch=177/250  batch_idx= 100]      loss_critic=-407170.0625
loss_gen=3012691.5000  Wasserstein_dist=880083.2500
[epoch=177/250  batch_idx= 200]      loss_critic=-269009.5938
loss_gen=3590358.7500  Wasserstein_dist=607483.5000
[epoch=177/250  batch_idx= 300]      loss_critic=-692939.7500
loss_gen=4408155.0000  Wasserstein_dist=1241589.5000
[epoch=177/250  batch_idx= 400]      loss_critic=-135771.9375
loss_gen=1232934.2500  Wasserstein_dist=469254.2500
[epoch=177/250  batch_idx= 500]      loss_critic=-689598.1875
loss_gen=3421315.0000  Wasserstein_dist=1015366.0000
[epoch=178/250  batch_idx= 100]      loss_critic=-365677.2812
loss_gen=1719197.2500  Wasserstein_dist=736357.1250

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[epoch=178/250  batch_idx= 200]      loss_critic=-537775.8750
loss_gen=1380652.5000  Wasserstein_dist=942776.0000
[epoch=178/250  batch_idx= 300]      loss_critic=-594452.3125
loss_gen=3788370.5000  Wasserstein_dist=984106.0000
[epoch=178/250  batch_idx= 400]      loss_critic=-346946.8125
loss_gen=1238649.8750  Wasserstein_dist=755140.5000
[epoch=178/250  batch_idx= 500]      loss_critic=-335650.1250
loss_gen=2880631.2500  Wasserstein_dist=729137.2500
[epoch=179/250  batch_idx= 100]      loss_critic=-318199.0625
loss_gen=1104999.2500  Wasserstein_dist=669796.6250
[epoch=179/250  batch_idx= 200]      loss_critic=-305728.0938
loss_gen=2101082.5000  Wasserstein_dist=662658.2500
[epoch=179/250  batch_idx= 300]      loss_critic=-575808.0000
loss_gen=1726713.5000  Wasserstein_dist=947733.5000
[epoch=179/250  batch_idx= 400]      loss_critic=-323600.7500
loss_gen=3220986.5000  Wasserstein_dist=702606.0000
[epoch=179/250  batch_idx= 500]      loss_critic=-40090.8438
loss_gen=407297.0000   Wasserstein_dist=373986.5000
[epoch=180/250  batch_idx= 100]      loss_critic=-755823.3125
loss_gen=-14230.2832   Wasserstein_dist=1134216.7500
[epoch=180/250  batch_idx= 200]      loss_critic=-114935.7500
loss_gen=1421068.8750  Wasserstein_dist=500872.2500
[epoch=180/250  batch_idx= 300]      loss_critic=-430576.3125
loss_gen=1989103.5000  Wasserstein_dist=766724.3750
[epoch=180/250  batch_idx= 400]      loss_critic=-604524.1250
loss_gen=3749892.0000  Wasserstein_dist=953555.0000
[epoch=180/250  batch_idx= 500]      loss_critic=-377225.0938
loss_gen=3339052.5000  Wasserstein_dist=804562.2500
[epoch=181/250  batch_idx= 100]      loss_critic=-576811.6250
loss_gen=1907803.2500  Wasserstein_dist=935708.1250
[epoch=181/250  batch_idx= 200]      loss_critic=27863.2500
loss_gen=-1327592.7500 Wasserstein_dist=500020.9375
[epoch=181/250  batch_idx= 300]      loss_critic=-334269.4062
loss_gen=58797.2891    Wasserstein_dist=833471.6250
[epoch=181/250  batch_idx= 400]      loss_critic=-380950.3750
loss_gen=2662086.0000  Wasserstein_dist=868512.2500
[epoch=181/250  batch_idx= 500]      loss_critic=-458087.1562
loss_gen=809430.9375   Wasserstein_dist=736651.7500
[epoch=182/250  batch_idx= 100]      loss_critic=-269461.6562
loss_gen=964175.0000   Wasserstein_dist=637240.1250
[epoch=182/250  batch_idx= 200]      loss_critic=-694877.5000
loss_gen=1675423.7500  Wasserstein_dist=1068005.5000
[epoch=182/250  batch_idx= 300]      loss_critic=-326119.1875
loss_gen=1675293.0000  Wasserstein_dist=667287.5000
[epoch=182/250  batch_idx= 400]      loss_critic=7900.5938
loss_gen=3185440.5000  Wasserstein_dist=388590.5000
[epoch=182/250  batch_idx= 500]      loss_critic=-540114.3125
loss_gen=30489.3203    Wasserstein_dist=890566.1250

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[epoch=183/250  batch_idx= 100]      loss_critic=110607.3750
loss_gen=3275121.5000  Wasserstein_dist=364067.0000
[epoch=183/250  batch_idx= 200]      loss_critic=-233295.4375
loss_gen=2358295.2500  Wasserstein_dist=650383.5000
[epoch=183/250  batch_idx= 300]      loss_critic=-388509.7188
loss_gen=532156.5625  Wasserstein_dist=749898.3125
[epoch=183/250  batch_idx= 400]      loss_critic=-491750.1562
loss_gen=948210.2500  Wasserstein_dist=859155.9375
[epoch=183/250  batch_idx= 500]      loss_critic=-640543.0625
loss_gen=1758077.5000  Wasserstein_dist=1009951.7500
[epoch=184/250  batch_idx= 100]      loss_critic=-54121.4688
loss_gen=2420837.0000  Wasserstein_dist=435559.0000
[epoch=184/250  batch_idx= 200]      loss_critic=-219602.3125
loss_gen=2198915.5000  Wasserstein_dist=672336.7500
[epoch=184/250  batch_idx= 300]      loss_critic=-203368.9688
loss_gen=3292870.7500  Wasserstein_dist=605511.0000
[epoch=184/250  batch_idx= 400]      loss_critic=-548478.0000
loss_gen=3587567.5000  Wasserstein_dist=980757.5000
[epoch=184/250  batch_idx= 500]      loss_critic=532131.0000
loss_gen=463105.3438  Wasserstein_dist=-72971.0000
[epoch=185/250  batch_idx= 100]      loss_critic=-664313.4375
loss_gen=2917133.7500  Wasserstein_dist=1043351.5000
[epoch=185/250  batch_idx= 200]      loss_critic=-35388.9062
loss_gen=227359.6562  Wasserstein_dist=485733.0000
[epoch=185/250  batch_idx= 300]      loss_critic=-159669.6250
loss_gen=3962553.0000  Wasserstein_dist=583102.5000
[epoch=185/250  batch_idx= 400]      loss_critic=-203785.8125
loss_gen=2457158.0000  Wasserstein_dist=608984.0000
[epoch=185/250  batch_idx= 500]      loss_critic=-872556.3125
loss_gen=2862740.7500  Wasserstein_dist=1269655.0000
[epoch=186/250  batch_idx= 100]      loss_critic=-984563.1250
loss_gen=2848774.5000  Wasserstein_dist=1384816.7500
[epoch=186/250  batch_idx= 200]      loss_critic=-563645.2500
loss_gen=1346820.5000  Wasserstein_dist=958728.5000
[epoch=186/250  batch_idx= 300]      loss_critic=-250950.4062
loss_gen=1599779.1250  Wasserstein_dist=657450.2500
[epoch=186/250  batch_idx= 400]      loss_critic=228639.9375
loss_gen=1543656.0000  Wasserstein_dist=215880.0000
[epoch=186/250  batch_idx= 500]      loss_critic=-303555.6562
loss_gen=-523499.9375  Wasserstein_dist=655754.2500
[epoch=187/250  batch_idx= 100]      loss_critic=-554604.7500
loss_gen=1990889.3750  Wasserstein_dist=911102.2500
[epoch=187/250  batch_idx= 200]      loss_critic=-475423.5625
loss_gen=2857012.5000  Wasserstein_dist=856378.0000
[epoch=187/250  batch_idx= 300]      loss_critic=-1115495.0000
loss_gen=4403588.5000  Wasserstein_dist=1581006.5000
[epoch=187/250  batch_idx= 400]      loss_critic=-97814.1562
loss_gen=3272483.0000  Wasserstein_dist=568674.0000

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[epoch=187/250  batch_idx= 500]      loss_critic=-136492.7188
loss_gen=2907306.0000  Wasserstein_dist=515302.7500
[epoch=188/250  batch_idx= 100]      loss_critic=-817831.5625
loss_gen=827564.3750  Wasserstein_dist=1233539.1250
[epoch=188/250  batch_idx= 200]      loss_critic=-540012.0000
loss_gen=-527921.4375  Wasserstein_dist=960555.2500
[epoch=188/250  batch_idx= 300]      loss_critic=-148746.3438
loss_gen=2668747.7500  Wasserstein_dist=561038.5000
[epoch=188/250  batch_idx= 400]      loss_critic=-945333.6250
loss_gen=879694.8750  Wasserstein_dist=1412259.5000
[epoch=188/250  batch_idx= 500]      loss_critic=338645.1562
loss_gen=1607281.6250  Wasserstein_dist=95118.0000
[epoch=189/250  batch_idx= 100]      loss_critic=35958.1875
loss_gen=2204581.0000  Wasserstein_dist=470198.0000
[epoch=189/250  batch_idx= 200]      loss_critic=-456511.2812
loss_gen=430614.0000  Wasserstein_dist=865129.8750
[epoch=189/250  batch_idx= 300]      loss_critic=366202.5312
loss_gen=876547.4375  Wasserstein_dist=79731.3750
[epoch=189/250  batch_idx= 400]      loss_critic=-568669.1250
loss_gen=4169013.5000  Wasserstein_dist=1010407.0000
[epoch=189/250  batch_idx= 500]      loss_critic=-267328.2812
loss_gen=2175270.0000  Wasserstein_dist=686306.7500
[epoch=190/250  batch_idx= 100]      loss_critic=-359188.9688
loss_gen=-68212.1250  Wasserstein_dist=733488.3750
[epoch=190/250  batch_idx= 200]      loss_critic=-510767.8125
loss_gen=-894357.6875  Wasserstein_dist=945495.0000
[epoch=190/250  batch_idx= 300]      loss_critic=-362783.4375
loss_gen=5018612.0000  Wasserstein_dist=877043.5000
[epoch=190/250  batch_idx= 400]      loss_critic=-358868.9375
loss_gen=2769695.0000  Wasserstein_dist=767963.2500
[epoch=190/250  batch_idx= 500]      loss_critic=-697273.6250
loss_gen=905043.6250  Wasserstein_dist=1086715.6250
[epoch=191/250  batch_idx= 100]      loss_critic=-528724.7500
loss_gen=267561.0625  Wasserstein_dist=912971.4375
[epoch=191/250  batch_idx= 200]      loss_critic=-355605.7188
loss_gen=-281651.2188  Wasserstein_dist=832704.0000
[epoch=191/250  batch_idx= 300]      loss_critic=-99069.0938
loss_gen=1632088.0000  Wasserstein_dist=501891.1250
[epoch=191/250  batch_idx= 400]      loss_critic=-534820.6250
loss_gen=352618.7500  Wasserstein_dist=1031609.7500
[epoch=191/250  batch_idx= 500]      loss_critic=-93413.0000
loss_gen=1237340.3750  Wasserstein_dist=554415.6250
[epoch=192/250  batch_idx= 100]      loss_critic=-274154.2500
loss_gen=-473922.5625  Wasserstein_dist=754996.4375
[epoch=192/250  batch_idx= 200]      loss_critic=205091.2812
loss_gen=370409.8125  Wasserstein_dist=245026.5938
[epoch=192/250  batch_idx= 300]      loss_critic=-527869.0625
loss_gen=633182.3750  Wasserstein_dist=903379.4375

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[epoch=192/250  batch_idx= 400]      loss_critic=-560460.9375
loss_gen=2234750.5000  Wasserstein_dist=960841.7500
[epoch=192/250  batch_idx= 500]      loss_critic=-823719.1250
loss_gen=2662008.0000  Wasserstein_dist=1219763.2500
[epoch=193/250  batch_idx= 100]       loss_critic=-1210105.1250
loss_gen=4012986.5000  Wasserstein_dist=1649769.5000
[epoch=193/250  batch_idx= 200]       loss_critic=-615742.5625
loss_gen=-1103189.5000  Wasserstein_dist=1028220.0625
[epoch=193/250  batch_idx= 300]       loss_critic=-573487.0625
loss_gen=-667336.3750  Wasserstein_dist=1000575.8125
[epoch=193/250  batch_idx= 400]       loss_critic=-441589.3750
loss_gen=692176.3750  Wasserstein_dist=857676.8750
[epoch=193/250  batch_idx= 500]       loss_critic=-159272.6875
loss_gen=2034263.2500  Wasserstein_dist=559299.0000
[epoch=194/250  batch_idx= 100]       loss_critic=-472030.4688
loss_gen=479317.0000  Wasserstein_dist=920816.2500
[epoch=194/250  batch_idx= 200]       loss_critic=-1095831.3750
loss_gen=1628951.7500  Wasserstein_dist=1501849.7500
[epoch=194/250  batch_idx= 300]       loss_critic=-156420.7812
loss_gen=2122986.5000  Wasserstein_dist=561400.0000
[epoch=194/250  batch_idx= 400]       loss_critic=-908800.5000
loss_gen=2650147.5000  Wasserstein_dist=1322163.7500
[epoch=194/250  batch_idx= 500]       loss_critic=-886309.5625
loss_gen=3278808.0000  Wasserstein_dist=1312337.5000
[epoch=195/250  batch_idx= 100]       loss_critic=69734.0938
loss_gen=828526.4375  Wasserstein_dist=290186.8750
[epoch=195/250  batch_idx= 200]       loss_critic=-253666.0000
loss_gen=1261484.0000  Wasserstein_dist=652184.7500
[epoch=195/250  batch_idx= 300]       loss_critic=-50696.9375
loss_gen=3153119.0000  Wasserstein_dist=522767.5000
[epoch=195/250  batch_idx= 400]       loss_critic=-262093.0000
loss_gen=1047135.2500  Wasserstein_dist=656072.2500
[epoch=195/250  batch_idx= 500]       loss_critic=-551906.5625
loss_gen=1619635.7500  Wasserstein_dist=917224.0000
[epoch=196/250  batch_idx= 100]       loss_critic=-706186.1250
loss_gen=1458334.0000  Wasserstein_dist=1140914.6250
[epoch=196/250  batch_idx= 200]       loss_critic=-617379.7500
loss_gen=-499439.1875  Wasserstein_dist=1010168.3750
[epoch=196/250  batch_idx= 300]       loss_critic=-635732.2500
loss_gen=703348.0000  Wasserstein_dist=1010091.2500
[epoch=196/250  batch_idx= 400]       loss_critic=-648112.7500
loss_gen=1811418.3750  Wasserstein_dist=1134026.5000
[epoch=196/250  batch_idx= 500]       loss_critic=-423102.0312
loss_gen=2331398.0000  Wasserstein_dist=933364.5000
[epoch=197/250  batch_idx= 100]       loss_critic=-642336.0625
loss_gen=2797765.7500  Wasserstein_dist=1131484.5000
[epoch=197/250  batch_idx= 200]       loss_critic=-184042.5312
loss_gen=1642405.2500  Wasserstein_dist=631314.2500

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[epoch=197/250  batch_idx= 300]      loss_critic=-753817.2500
loss_gen=1605896.0000  Wasserstein_dist=1178998.7500
[epoch=197/250  batch_idx= 400]      loss_critic=235059.7500
loss_gen=1269388.5000  Wasserstein_dist=198101.5000
[epoch=197/250  batch_idx= 500]      loss_critic=46191.6875
loss_gen=2008536.3750  Wasserstein_dist=392121.7500
[epoch=198/250  batch_idx= 100]      loss_critic=-362418.9062
loss_gen=579006.0000  Wasserstein_dist=839157.0000
[epoch=198/250  batch_idx= 200]      loss_critic=-689990.6250
loss_gen=874714.4375  Wasserstein_dist=1154987.7500
[epoch=198/250  batch_idx= 300]      loss_critic=-724831.1875
loss_gen=1455620.8750  Wasserstein_dist=1107400.0000
[epoch=198/250  batch_idx= 400]      loss_critic=-441442.1250
loss_gen=1013723.5625  Wasserstein_dist=873621.2500
[epoch=198/250  batch_idx= 500]      loss_critic=-505343.3125
loss_gen=1693430.5000  Wasserstein_dist=885191.5000
[epoch=199/250  batch_idx= 100]      loss_critic=-562518.1250
loss_gen=784347.3750  Wasserstein_dist=997912.0000
[epoch=199/250  batch_idx= 200]      loss_critic=-605729.2500
loss_gen=23914.1758  Wasserstein_dist=1065201.3750
[epoch=199/250  batch_idx= 300]      loss_critic=-832346.5000
loss_gen=383047.6562  Wasserstein_dist=1282404.1250
[epoch=199/250  batch_idx= 400]      loss_critic=-72064.8125
loss_gen=1499813.7500  Wasserstein_dist=505524.1250
[epoch=199/250  batch_idx= 500]      loss_critic=-472567.9688
loss_gen=1907621.3750  Wasserstein_dist=901408.2500
[epoch=200/250  batch_idx= 100]      loss_critic=-773504.3750
loss_gen=2145510.0000  Wasserstein_dist=1185873.5000
[epoch=200/250  batch_idx= 200]      loss_critic=-485346.3438
loss_gen=1347303.8750  Wasserstein_dist=908789.0000
[epoch=200/250  batch_idx= 300]      loss_critic=-488171.0312
loss_gen=1323966.6250  Wasserstein_dist=950215.7500
[epoch=200/250  batch_idx= 400]      loss_critic=-737131.6875
loss_gen=1852509.2500  Wasserstein_dist=1220729.5000
[epoch=200/250  batch_idx= 500]      loss_critic=-194192.6562
loss_gen=3003356.0000  Wasserstein_dist=651488.7500
[epoch=201/250  batch_idx= 100]      loss_critic=-671505.2500
loss_gen=931642.6250  Wasserstein_dist=1113196.6250
[epoch=201/250  batch_idx= 200]      loss_critic=-546189.2500
loss_gen=2629304.0000  Wasserstein_dist=942474.2500
[epoch=201/250  batch_idx= 300]      loss_critic=-564401.6250
loss_gen=-332349.7812  Wasserstein_dist=1007531.5000
[epoch=201/250  batch_idx= 400]      loss_critic=-794098.1875
loss_gen=1349028.2500  Wasserstein_dist=1193288.0000
[epoch=201/250  batch_idx= 500]      loss_critic=-477735.4688
loss_gen=2026930.7500  Wasserstein_dist=943236.2500
[epoch=202/250  batch_idx= 100]      loss_critic=-389230.2188
loss_gen=1959274.2500  Wasserstein_dist=865832.2500

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[epoch=202/250  batch_idx= 200]      loss_critic=63754.6875
loss_gen=4779033.0000  Wasserstein_dist=455996.0000
[epoch=202/250  batch_idx= 300]      loss_critic=-127890.6875
loss_gen=2449356.7500  Wasserstein_dist=670267.5000
[epoch=202/250  batch_idx= 400]      loss_critic=-702876.0000
loss_gen=-1032292.2500  Wasserstein_dist=1157683.5000
[epoch=202/250  batch_idx= 500]      loss_critic=-549475.8750
loss_gen=3308290.2500  Wasserstein_dist=958486.0000
[epoch=203/250  batch_idx= 100]      loss_critic=-335405.9375
loss_gen=201212.3906   Wasserstein_dist=802333.5625
[epoch=203/250  batch_idx= 200]      loss_critic=-77072.0625
loss_gen=-191987.8125  Wasserstein_dist=586330.2500
[epoch=203/250  batch_idx= 300]      loss_critic=-835329.1875
loss_gen=-543027.9375  Wasserstein_dist=1245997.8750
[epoch=203/250  batch_idx= 400]      loss_critic=117892.7500
loss_gen=2820113.5000  Wasserstein_dist=382437.5000
[epoch=203/250  batch_idx= 500]      loss_critic=-794038.7500
loss_gen=816501.0000   Wasserstein_dist=1208107.1250
[epoch=204/250  batch_idx= 100]      loss_critic=-978346.3750
loss_gen=2157464.0000  Wasserstein_dist=1387173.8750
[epoch=204/250  batch_idx= 200]      loss_critic=-469528.5312
loss_gen=2046935.1250  Wasserstein_dist=940359.0000
[epoch=204/250  batch_idx= 300]      loss_critic=-603710.5625
loss_gen=1540977.2500  Wasserstein_dist=1075315.0000
[epoch=204/250  batch_idx= 400]      loss_critic=-75113.7500
loss_gen=541352.9375   Wasserstein_dist=561255.3125
[epoch=204/250  batch_idx= 500]      loss_critic=-784837.5625
loss_gen=2315784.5000  Wasserstein_dist=1232667.8750
[epoch=205/250  batch_idx= 100]      loss_critic=-585653.4375
loss_gen=1760324.0000  Wasserstein_dist=1072515.2500
[epoch=205/250  batch_idx= 200]      loss_critic=-306340.5312
loss_gen=1714528.1250  Wasserstein_dist=705492.8750
[epoch=205/250  batch_idx= 300]      loss_critic=-439622.1875
loss_gen=343203.5000   Wasserstein_dist=862677.4375
[epoch=205/250  batch_idx= 400]      loss_critic=-59222.4375
loss_gen=479459.9375   Wasserstein_dist=507506.5625
[epoch=205/250  batch_idx= 500]      loss_critic=-1020459.6250
loss_gen=-2678802.5000  Wasserstein_dist=1480252.2500
[epoch=206/250  batch_idx= 100]      loss_critic=-526775.9375
loss_gen=-544561.0000  Wasserstein_dist=961567.2500
[epoch=206/250  batch_idx= 200]      loss_critic=-787954.8750
loss_gen=2402256.2500  Wasserstein_dist=1256228.0000
[epoch=206/250  batch_idx= 300]      loss_critic=-676225.8750
loss_gen=1345288.2500  Wasserstein_dist=1212718.2500
[epoch=206/250  batch_idx= 400]      loss_critic=-937906.8125
loss_gen=874817.3750   Wasserstein_dist=1366723.2500
[epoch=206/250  batch_idx= 500]      loss_critic=-190222.2500
loss_gen=232002.5156   Wasserstein_dist=665670.3125

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[epoch=207/250  batch_idx= 100]      loss_critic=-324330.5625
loss_gen=2302657.2500  Wasserstein_dist=820957.0000
[epoch=207/250  batch_idx= 200]      loss_critic=-292603.9062
loss_gen=1005418.7500  Wasserstein_dist=720080.0000
[epoch=207/250  batch_idx= 300]      loss_critic=-91130.7812
loss_gen=3377829.5000  Wasserstein_dist=569118.7500
[epoch=207/250  batch_idx= 400]      loss_critic=-357043.7500
loss_gen=2542444.5000  Wasserstein_dist=806090.5000
[epoch=207/250  batch_idx= 500]      loss_critic=-110840.2500
loss_gen=2430302.0000  Wasserstein_dist=532500.0000
[epoch=208/250  batch_idx= 100]      loss_critic=-672724.8750
loss_gen=900158.4375  Wasserstein_dist=1104034.3750
[epoch=208/250  batch_idx= 200]      loss_critic=-978085.4375
loss_gen=203892.0000  Wasserstein_dist=1397827.6250
[epoch=208/250  batch_idx= 300]      loss_critic=-562368.5000
loss_gen=1434227.0000  Wasserstein_dist=974136.0000
[epoch=208/250  batch_idx= 400]      loss_critic=-233980.7500
loss_gen=392825.3125  Wasserstein_dist=773270.5000
[epoch=208/250  batch_idx= 500]      loss_critic=-453516.7188
loss_gen=736334.2500  Wasserstein_dist=929030.9375
[epoch=209/250  batch_idx= 100]      loss_critic=-1123047.5000
loss_gen=-422615.8438  Wasserstein_dist=1674947.5000
[epoch=209/250  batch_idx= 200]      loss_critic=-415260.9375
loss_gen=3127003.7500  Wasserstein_dist=892593.7500
[epoch=209/250  batch_idx= 300]      loss_critic=-284740.7500
loss_gen=1624804.1250  Wasserstein_dist=735033.6250
[epoch=209/250  batch_idx= 400]      loss_critic=-638293.0000
loss_gen=685816.0000  Wasserstein_dist=1139857.7500
[epoch=209/250  batch_idx= 500]      loss_critic=-219506.3125
loss_gen=1373541.7500  Wasserstein_dist=736846.5625
[epoch=210/250  batch_idx= 100]      loss_critic=-12556.6250
loss_gen=3929494.5000  Wasserstein_dist=585036.0000
[epoch=210/250  batch_idx= 200]      loss_critic=-471822.1875
loss_gen=581851.2500  Wasserstein_dist=889636.6250
[epoch=210/250  batch_idx= 300]      loss_critic=-392880.7500
loss_gen=1919419.3750  Wasserstein_dist=831144.2500
[epoch=210/250  batch_idx= 400]      loss_critic=-452040.7500
loss_gen=2038350.7500  Wasserstein_dist=857101.7500
[epoch=210/250  batch_idx= 500]      loss_critic=-378874.3750
loss_gen=254323.5625  Wasserstein_dist=853150.2500
[epoch=211/250  batch_idx= 100]      loss_critic=-643251.6875
loss_gen=1806745.2500  Wasserstein_dist=1078586.7500
[epoch=211/250  batch_idx= 200]      loss_critic=-700412.3750
loss_gen=832156.6875  Wasserstein_dist=1199156.0000
[epoch=211/250  batch_idx= 300]      loss_critic=-445068.5312
loss_gen=1805551.8750  Wasserstein_dist=906332.1250
[epoch=211/250  batch_idx= 400]      loss_critic=-672155.7500
loss_gen=1674573.0000  Wasserstein_dist=1130606.3750

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[epoch=211/250 batch_idx= 500] loss_critic=-383438.0625
loss_gen=1476112.0000 Wasserstein_dist=850801.5000
[epoch=212/250 batch_idx= 100] loss_critic=-1407643.0000
loss_gen=1381798.8750 Wasserstein_dist=1972966.3750
[epoch=212/250 batch_idx= 200] loss_critic=-392596.5625
loss_gen=2129071.0000 Wasserstein_dist=857378.1250
[epoch=212/250 batch_idx= 300] loss_critic=-416200.0625
loss_gen=1318429.2500 Wasserstein_dist=854731.5000
[epoch=212/250 batch_idx= 400] loss_critic=-251960.2500
loss_gen=1684427.3750 Wasserstein_dist=674160.5000
[epoch=212/250 batch_idx= 500] loss_critic=-619205.0000
loss_gen=1285981.7500 Wasserstein_dist=1027047.0000
[epoch=213/250 batch_idx= 100] loss_critic=-718450.8125
loss_gen=1741381.5000 Wasserstein_dist=1133618.1250
[epoch=213/250 batch_idx= 200] loss_critic=-484659.7812
loss_gen=2128232.2500 Wasserstein_dist=960642.7500
[epoch=213/250 batch_idx= 300] loss_critic=-248422.7188
loss_gen=1993601.7500 Wasserstein_dist=685534.1250
[epoch=213/250 batch_idx= 400] loss_critic=-462142.3750
loss_gen=1751759.2500 Wasserstein_dist=916561.7500
[epoch=213/250 batch_idx= 500] loss_critic=-136146.4062
loss_gen=-768596.7500 Wasserstein_dist=588745.0000
[epoch=214/250 batch_idx= 100] loss_critic=-39168.1875
loss_gen=678608.4375 Wasserstein_dist=564145.3750
[epoch=214/250 batch_idx= 200] loss_critic=-537556.1875
loss_gen=1949582.0000 Wasserstein_dist=987661.7500
[epoch=214/250 batch_idx= 300] loss_critic=-505036.0000
loss_gen=654181.3750 Wasserstein_dist=945786.0000
[epoch=214/250 batch_idx= 400] loss_critic=349006.4062
loss_gen=3200177.5000 Wasserstein_dist=167500.0000
[epoch=214/250 batch_idx= 500] loss_critic=1166060.5000
loss_gen=2475257.0000 Wasserstein_dist=-506917.0000
[epoch=215/250 batch_idx= 100] loss_critic=-515001.1875
loss_gen=1286829.1250 Wasserstein_dist=983471.3750
[epoch=215/250 batch_idx= 200] loss_critic=-653110.4375
loss_gen=2869496.0000 Wasserstein_dist=1115874.0000
[epoch=215/250 batch_idx= 300] loss_critic=-493867.2500
loss_gen=-901611.5625 Wasserstein_dist=970204.1250
[epoch=215/250 batch_idx= 400] loss_critic=-298994.9375
loss_gen=1982529.8750 Wasserstein_dist=729143.5000
[epoch=215/250 batch_idx= 500] loss_critic=-514802.2188
loss_gen=769954.1250 Wasserstein_dist=959244.2500
[epoch=216/250 batch_idx= 100] loss_critic=-669745.6250
loss_gen=2096510.5000 Wasserstein_dist=1100802.5000
[epoch=216/250 batch_idx= 200] loss_critic=-554583.3750
loss_gen=1397243.3750 Wasserstein_dist=1066516.2500
[epoch=216/250 batch_idx= 300] loss_critic=-181463.2500
loss_gen=1149734.5000 Wasserstein_dist=654611.3125

```

[epoch=216/250  batch_idx= 400]      loss_critic=-587396.3750
loss_gen=944027.5000  Wasserstein_dist=1046328.0000
[epoch=216/250  batch_idx= 500]      loss_critic=-543678.0000
loss_gen=2938753.7500  Wasserstein_dist=987818.0000
[epoch=217/250  batch_idx= 100]      loss_critic=-863555.2500
loss_gen=1155086.6250  Wasserstein_dist=1479812.2500
[epoch=217/250  batch_idx= 200]      loss_critic=-345132.2500
loss_gen=1566806.0000  Wasserstein_dist=807568.3750
[epoch=217/250  batch_idx= 300]      loss_critic=-176180.4375
loss_gen=1588576.6250  Wasserstein_dist=644757.0000
[epoch=217/250  batch_idx= 400]      loss_critic=-555448.1875
loss_gen=-426613.8125  Wasserstein_dist=1042349.5000
[epoch=217/250  batch_idx= 500]      loss_critic=-709993.1875
loss_gen=1637761.7500  Wasserstein_dist=1190907.5000
[epoch=218/250  batch_idx= 100]      loss_critic=-157947.9375
loss_gen=2048596.7500  Wasserstein_dist=674084.7500
[epoch=218/250  batch_idx= 200]      loss_critic=-14689.8438
loss_gen=1020678.5625  Wasserstein_dist=515694.8125
[epoch=218/250  batch_idx= 300]      loss_critic=-507860.0625
loss_gen=2400377.2500  Wasserstein_dist=962107.2500
[epoch=218/250  batch_idx= 400]      loss_critic=-716829.8750
loss_gen=3657050.2500  Wasserstein_dist=1432626.0000
[epoch=218/250  batch_idx= 500]      loss_critic=-765425.4375
loss_gen=49908.9062  Wasserstein_dist=1262392.0000
[epoch=219/250  batch_idx= 100]      loss_critic=-536407.6875
loss_gen=-51337.0391  Wasserstein_dist=1066297.6250
[epoch=219/250  batch_idx= 200]      loss_critic=-509153.3750
loss_gen=2273400.7500  Wasserstein_dist=1066968.5000
[epoch=219/250  batch_idx= 300]      loss_critic=-103224.1875
loss_gen=-466664.8125  Wasserstein_dist=618550.7500
[epoch=219/250  batch_idx= 400]      loss_critic=-331880.8125
loss_gen=911403.6250  Wasserstein_dist=826967.6250
[epoch=219/250  batch_idx= 500]      loss_critic=-771437.8125
loss_gen=528420.7500  Wasserstein_dist=1244568.2500
[epoch=220/250  batch_idx= 100]      loss_critic=-435946.2500
loss_gen=1811475.7500  Wasserstein_dist=955194.0000
[epoch=220/250  batch_idx= 200]      loss_critic=-931822.4375
loss_gen=1108368.5000  Wasserstein_dist=1410874.0000
[epoch=220/250  batch_idx= 300]      loss_critic=-689545.5000
loss_gen=2235576.0000  Wasserstein_dist=1141103.0000
[epoch=220/250  batch_idx= 400]      loss_critic=-368235.3125
loss_gen=1841789.7500  Wasserstein_dist=855856.5000
[epoch=220/250  batch_idx= 500]      loss_critic=-837690.6875
loss_gen=-23060.1465  Wasserstein_dist=1324911.8750
[epoch=221/250  batch_idx= 100]      loss_critic=-422181.5000
loss_gen=-201785.6719  Wasserstein_dist=890780.8125
[epoch=221/250  batch_idx= 200]      loss_critic=-433804.5000
loss_gen=7982.6719  Wasserstein_dist=946502.3750

```



```

[epoch=221/250  batch_idx= 300]      loss_critic=788240.0625
loss_gen=943691.5625  Wasserstein_dist=-266271.0000
[epoch=221/250  batch_idx= 400]      loss_critic=-586337.8125
loss_gen=1978699.7500  Wasserstein_dist=1076574.2500
[epoch=221/250  batch_idx= 500]      loss_critic=-508543.0000
loss_gen=353316.5625  Wasserstein_dist=964019.5625
[epoch=222/250  batch_idx= 100]      loss_critic=-1208618.8750
loss_gen=993785.9375  Wasserstein_dist=1724743.7500
[epoch=222/250  batch_idx= 200]      loss_critic=-121458.5625
loss_gen=-893750.6250  Wasserstein_dist=776680.1250
[epoch=222/250  batch_idx= 300]      loss_critic=-878615.5000
loss_gen=4018745.0000  Wasserstein_dist=1539346.0000
[epoch=222/250  batch_idx= 400]      loss_critic=-649658.6250
loss_gen=4143486.0000  Wasserstein_dist=1148730.5000
[epoch=222/250  batch_idx= 500]      loss_critic=-824619.0625
loss_gen=-12210.2188  Wasserstein_dist=1317754.0000
[epoch=223/250  batch_idx= 100]      loss_critic=-253142.9375
loss_gen=2173831.0000  Wasserstein_dist=720035.5000
[epoch=223/250  batch_idx= 200]      loss_critic=-560531.6250
loss_gen=2410890.5000  Wasserstein_dist=1031185.2500
[epoch=223/250  batch_idx= 300]      loss_critic=-549058.1875
loss_gen=476550.0625  Wasserstein_dist=998898.6250
[epoch=223/250  batch_idx= 400]      loss_critic=-687223.0625
loss_gen=3601832.0000  Wasserstein_dist=1237464.0000
[epoch=223/250  batch_idx= 500]      loss_critic=-793424.8750
loss_gen=1626598.6250  Wasserstein_dist=1236991.0000
[epoch=224/250  batch_idx= 100]      loss_critic=-317764.3750
loss_gen=1080094.5000  Wasserstein_dist=827033.7500
[epoch=224/250  batch_idx= 200]      loss_critic=-1027810.4375
loss_gen=2444301.0000  Wasserstein_dist=1499948.5000
[epoch=224/250  batch_idx= 300]      loss_critic=-659004.3125
loss_gen=1637300.3750  Wasserstein_dist=1210596.2500
[epoch=224/250  batch_idx= 400]      loss_critic=-221218.5312
loss_gen=1603488.2500  Wasserstein_dist=738185.2500
[epoch=224/250  batch_idx= 500]      loss_critic=-1247820.0000
loss_gen=461727.1562  Wasserstein_dist=1769766.6250
[epoch=225/250  batch_idx= 100]      loss_critic=-806035.6250
loss_gen=324863.1875  Wasserstein_dist=1246363.0000
[epoch=225/250  batch_idx= 200]      loss_critic=-1096892.5000
loss_gen=7545.5703  Wasserstein_dist=1565761.2500
[epoch=225/250  batch_idx= 300]      loss_critic=-630013.0625
loss_gen=519984.9375  Wasserstein_dist=1117585.6250
[epoch=225/250  batch_idx= 400]      loss_critic=-569239.1875
loss_gen=1605939.5000  Wasserstein_dist=1063476.7500
[epoch=225/250  batch_idx= 500]      loss_critic=-405262.4375
loss_gen=1612610.7500  Wasserstein_dist=919780.0000
[epoch=226/250  batch_idx= 100]      loss_critic=-488636.9688
loss_gen=1332609.2500  Wasserstein_dist=970803.3750

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```

[epoch=226/250  batch_idx= 200]      loss_critic=-314891.7188
loss_gen=2619466.5000  Wasserstein_dist=747407.5000
[epoch=226/250  batch_idx= 300]      loss_critic=-696650.8750
loss_gen=3487537.7500  Wasserstein_dist=1211781.2500
[epoch=226/250  batch_idx= 400]      loss_critic=-545227.7500
loss_gen=78908.2969   Wasserstein_dist=1016068.6250
[epoch=226/250  batch_idx= 500]      loss_critic=-435881.0625
loss_gen=-232508.3125  Wasserstein_dist=974422.8750
[epoch=227/250  batch_idx= 100]      loss_critic=-723444.7500
loss_gen=1298793.5000  Wasserstein_dist=1229313.5000
[epoch=227/250  batch_idx= 200]      loss_critic=-241947.9375
loss_gen=695777.8750  Wasserstein_dist=784710.8750
[epoch=227/250  batch_idx= 300]      loss_critic=-778723.2500
loss_gen=351725.5938  Wasserstein_dist=1456134.5000
[epoch=227/250  batch_idx= 400]      loss_critic=-1166880.0000
loss_gen=4549444.0000  Wasserstein_dist=1765618.5000
[epoch=227/250  batch_idx= 500]      loss_critic=-291923.0000
loss_gen=3883364.5000  Wasserstein_dist=850622.0000
[epoch=228/250  batch_idx= 100]      loss_critic=-714392.6875
loss_gen=-375986.0312  Wasserstein_dist=1338686.2500
[epoch=228/250  batch_idx= 200]      loss_critic=-417830.9375
loss_gen=1373235.5000  Wasserstein_dist=1007177.9375
[epoch=228/250  batch_idx= 300]      loss_critic=-575950.5625
loss_gen=1504547.6250  Wasserstein_dist=1029623.6250
[epoch=228/250  batch_idx= 400]      loss_critic=-698301.3125
loss_gen=1944733.2500  Wasserstein_dist=1173278.2500
[epoch=228/250  batch_idx= 500]      loss_critic=-512282.8125
loss_gen=1356918.0000  Wasserstein_dist=1019998.1250
[epoch=229/250  batch_idx= 100]      loss_critic=-674033.0625
loss_gen=854414.6875   Wasserstein_dist=1247021.2500
[epoch=229/250  batch_idx= 200]      loss_critic=-811927.7500
loss_gen=612011.0625   Wasserstein_dist=1340289.0000
[epoch=229/250  batch_idx= 300]      loss_critic=-70943.2500
loss_gen=2910439.0000  Wasserstein_dist=586502.0000
[epoch=229/250  batch_idx= 400]      loss_critic=-504500.9375
loss_gen=1171921.5000  Wasserstein_dist=967437.0000
[epoch=229/250  batch_idx= 500]      loss_critic=165993.6250
loss_gen=5850534.5000  Wasserstein_dist=390255.0000
[epoch=230/250  batch_idx= 100]      loss_critic=-536769.3125
loss_gen=700350.3750   Wasserstein_dist=1235174.6250
[epoch=230/250  batch_idx= 200]      loss_critic=-492730.4375
loss_gen=2702678.0000  Wasserstein_dist=1326198.5000
[epoch=230/250  batch_idx= 300]      loss_critic=-703680.7500
loss_gen=-3113609.7500  Wasserstein_dist=1353190.5000
[epoch=230/250  batch_idx= 400]      loss_critic=-286663.2812
loss_gen=1311413.7500  Wasserstein_dist=797321.2500
[epoch=230/250  batch_idx= 500]      loss_critic=-581482.6875
loss_gen=2224053.5000  Wasserstein_dist=1008200.2500

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```

[epoch=231/250  batch_idx= 100]      loss_critic=-1163653.8750
loss_gen=2590180.2500  Wasserstein_dist=1629721.0000
[epoch=231/250  batch_idx= 200]      loss_critic=-265288.7500
loss_gen=3362256.0000  Wasserstein_dist=707862.7500
[epoch=231/250  batch_idx= 300]      loss_critic=-925707.0625
loss_gen=780836.4375  Wasserstein_dist=1417202.2500
[epoch=231/250  batch_idx= 400]      loss_critic=-38574.1250
loss_gen=1673638.7500  Wasserstein_dist=511352.3750
[epoch=231/250  batch_idx= 500]      loss_critic=-1513524.6250
loss_gen=-1359200.1250  Wasserstein_dist=2097278.0000
[epoch=232/250  batch_idx= 100]      loss_critic=-528787.1875
loss_gen=644608.6875  Wasserstein_dist=1008338.5000
[epoch=232/250  batch_idx= 200]      loss_critic=-518280.0625
loss_gen=-1312451.6250  Wasserstein_dist=1105890.0000
[epoch=232/250  batch_idx= 300]      loss_critic=-29928.3438
loss_gen=2517539.0000  Wasserstein_dist=511283.5000
[epoch=232/250  batch_idx= 400]      loss_critic=-934222.6250
loss_gen=1286716.0000  Wasserstein_dist=1432048.7500
[epoch=232/250  batch_idx= 500]      loss_critic=-165763.2500
loss_gen=425160.4375  Wasserstein_dist=687671.7500
[epoch=233/250  batch_idx= 100]      loss_critic=-1138022.7500
loss_gen=1025526.4375  Wasserstein_dist=1621995.1250
[epoch=233/250  batch_idx= 200]      loss_critic=-400458.3750
loss_gen=-511814.0625  Wasserstein_dist=892196.4375
[epoch=233/250  batch_idx= 300]      loss_critic=-729929.5625
loss_gen=1688941.3750  Wasserstein_dist=1193114.7500
[epoch=233/250  batch_idx= 400]      loss_critic=-735037.1250
loss_gen=2349509.0000  Wasserstein_dist=1242123.5000
[epoch=233/250  batch_idx= 500]      loss_critic=40336.1875
loss_gen=2104977.7500  Wasserstein_dist=556739.5000
[epoch=234/250  batch_idx= 100]      loss_critic=-600019.4375
loss_gen=1087157.8750  Wasserstein_dist=1136411.2500
[epoch=234/250  batch_idx= 200]      loss_critic=-730705.0625
loss_gen=2632266.0000  Wasserstein_dist=1264920.0000
[epoch=234/250  batch_idx= 300]      loss_critic=-429235.1250
loss_gen=3198637.0000  Wasserstein_dist=984467.5000
[epoch=234/250  batch_idx= 400]      loss_critic=-550622.9375
loss_gen=2273074.2500  Wasserstein_dist=1057944.5000
[epoch=234/250  batch_idx= 500]      loss_critic=-307202.7812
loss_gen=2742563.2500  Wasserstein_dist=815664.5000
[epoch=235/250  batch_idx= 100]      loss_critic=-273486.1250
loss_gen=2125388.0000  Wasserstein_dist=804763.2500
[epoch=235/250  batch_idx= 200]      loss_critic=586900.6875
loss_gen=2312859.5000  Wasserstein_dist=31896.2500
[epoch=235/250  batch_idx= 300]      loss_critic=-132774.9375
loss_gen=4174963.7500  Wasserstein_dist=709045.5000
[epoch=235/250  batch_idx= 400]      loss_critic=-1160370.2500
loss_gen=543098.5000  Wasserstein_dist=1706099.3750

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```

[epoch=235/250  batch_idx= 500]      loss_critic=-445837.6250
loss_gen=1868679.1250  Wasserstein_dist=1017323.3750
[epoch=236/250  batch_idx= 100]      loss_critic=-941656.5000
loss_gen=-950834.7500  Wasserstein_dist=1513479.1250
[epoch=236/250  batch_idx= 200]      loss_critic=-936795.0000
loss_gen=574993.1250  Wasserstein_dist=1536532.1250
[epoch=236/250  batch_idx= 300]      loss_critic=-717740.5000
loss_gen=2387335.0000  Wasserstein_dist=1293057.7500
[epoch=236/250  batch_idx= 400]      loss_critic=-467823.2188
loss_gen=1131022.2500  Wasserstein_dist=986295.2500
[epoch=236/250  batch_idx= 500]      loss_critic=-404910.1250
loss_gen=2323458.0000  Wasserstein_dist=956017.2500
[epoch=237/250  batch_idx= 100]      loss_critic=-1080343.2500
loss_gen=3939275.7500  Wasserstein_dist=1631266.0000
[epoch=237/250  batch_idx= 200]      loss_critic=-741072.8750
loss_gen=-402917.0938  Wasserstein_dist=1350571.2500
[epoch=237/250  batch_idx= 300]      loss_critic=-662834.7500
loss_gen=2936971.0000  Wasserstein_dist=1305613.0000
[epoch=237/250  batch_idx= 400]      loss_critic=-797664.7500
loss_gen=1508399.8750  Wasserstein_dist=1311182.3750
[epoch=237/250  batch_idx= 500]      loss_critic=-550579.6250
loss_gen=1080804.7500  Wasserstein_dist=1095926.7500
[epoch=238/250  batch_idx= 100]      loss_critic=-347701.5000
loss_gen=2015313.7500  Wasserstein_dist=908595.0000
[epoch=238/250  batch_idx= 200]      loss_critic=-1112446.1250
loss_gen=2276139.5000  Wasserstein_dist=1731762.0000
[epoch=238/250  batch_idx= 300]      loss_critic=-594169.0000
loss_gen=2363853.5000  Wasserstein_dist=1211697.7500
[epoch=238/250  batch_idx= 400]      loss_critic=-466659.5625
loss_gen=1742630.8750  Wasserstein_dist=1016622.6250
[epoch=238/250  batch_idx= 500]      loss_critic=196425.1250
loss_gen=4441029.0000  Wasserstein_dist=494316.0000
[epoch=239/250  batch_idx= 100]      loss_critic=-581485.2500
loss_gen=1877262.8750  Wasserstein_dist=1173641.1250
[epoch=239/250  batch_idx= 200]      loss_critic=302121.8125
loss_gen=2215472.2500  Wasserstein_dist=294876.0000
[epoch=239/250  batch_idx= 300]      loss_critic=-912421.5000
loss_gen=3235593.0000  Wasserstein_dist=1463807.2500
[epoch=239/250  batch_idx= 400]      loss_critic=-953813.3750
loss_gen=2745968.7500  Wasserstein_dist=1471496.2500
[epoch=239/250  batch_idx= 500]      loss_critic=-197227.6250
loss_gen=352598.3125  Wasserstein_dist=835110.3750
[epoch=240/250  batch_idx= 100]      loss_critic=-306797.5000
loss_gen=2697260.0000  Wasserstein_dist=870011.5000
[epoch=240/250  batch_idx= 200]      loss_critic=-601503.6875
loss_gen=-345234.9688  Wasserstein_dist=1146803.2500
[epoch=240/250  batch_idx= 300]      loss_critic=-730512.6250
loss_gen=1351132.3750  Wasserstein_dist=1241911.8750

```

```

[epoch=240/250  batch_idx= 400]      loss_critic=-668378.3125
loss_gen=617318.7500  Wasserstein_dist=1217205.7500
[epoch=240/250  batch_idx= 500]      loss_critic=-803400.9375
loss_gen=2829781.0000  Wasserstein_dist=1443001.2500
[epoch=241/250  batch_idx= 100]      loss_critic=-403755.7500
loss_gen=1431745.0000  Wasserstein_dist=955841.1250
[epoch=241/250  batch_idx= 200]      loss_critic=-857725.3125
loss_gen=1433312.5000  Wasserstein_dist=1446397.5000
[epoch=241/250  batch_idx= 300]      loss_critic=-509133.9375
loss_gen=2246128.0000  Wasserstein_dist=1082409.5000
[epoch=241/250  batch_idx= 400]      loss_critic=-597165.1250
loss_gen=2457931.7500  Wasserstein_dist=1282518.5000
[epoch=241/250  batch_idx= 500]      loss_critic=-565844.3125
loss_gen=2533207.2500  Wasserstein_dist=1114390.2500
[epoch=242/250  batch_idx= 100]      loss_critic=-737693.5000
loss_gen=725326.2500  Wasserstein_dist=1338053.7500
[epoch=242/250  batch_idx= 200]      loss_critic=-375564.6875
loss_gen=2174480.0000  Wasserstein_dist=1003868.7500
[epoch=242/250  batch_idx= 300]      loss_critic=-318682.0000
loss_gen=1198893.1250  Wasserstein_dist=858065.0000
[epoch=242/250  batch_idx= 400]      loss_critic=-326374.2500
loss_gen=1896048.1250  Wasserstein_dist=857619.7500
[epoch=242/250  batch_idx= 500]      loss_critic=-339964.1250
loss_gen=1196900.7500  Wasserstein_dist=864242.2500
[epoch=243/250  batch_idx= 100]      loss_critic=-550898.8125
loss_gen=416796.6562  Wasserstein_dist=1071340.7500
[epoch=243/250  batch_idx= 200]      loss_critic=-504429.6875
loss_gen=188234.7500  Wasserstein_dist=1143346.0000
[epoch=243/250  batch_idx= 300]      loss_critic=293224.5000
loss_gen=3071279.0000  Wasserstein_dist=328905.7500
[epoch=243/250  batch_idx= 400]      loss_critic=-1240480.3750
loss_gen=4714065.5000  Wasserstein_dist=1924945.5000
[epoch=243/250  batch_idx= 500]      loss_critic=-792155.0625
loss_gen=10893.4062  Wasserstein_dist=1384347.5000
[epoch=244/250  batch_idx= 100]      loss_critic=-797048.6250
loss_gen=3274794.2500  Wasserstein_dist=1357093.5000
[epoch=244/250  batch_idx= 200]      loss_critic=-731235.7500
loss_gen=-619623.6250  Wasserstein_dist=1347869.5000
[epoch=244/250  batch_idx= 300]      loss_critic=-589879.1250
loss_gen=2248118.0000  Wasserstein_dist=1179290.1250
[epoch=244/250  batch_idx= 400]      loss_critic=-673775.8750
loss_gen=1623599.2500  Wasserstein_dist=1243851.7500
[epoch=244/250  batch_idx= 500]      loss_critic=-529378.0625
loss_gen=1637723.3750  Wasserstein_dist=1120606.2500
[epoch=245/250  batch_idx= 100]      loss_critic=12186.1250
loss_gen=1379051.7500  Wasserstein_dist=584652.2500
[epoch=245/250  batch_idx= 200]      loss_critic=-782814.6875
loss_gen=525871.3125  Wasserstein_dist=1359215.3750

```

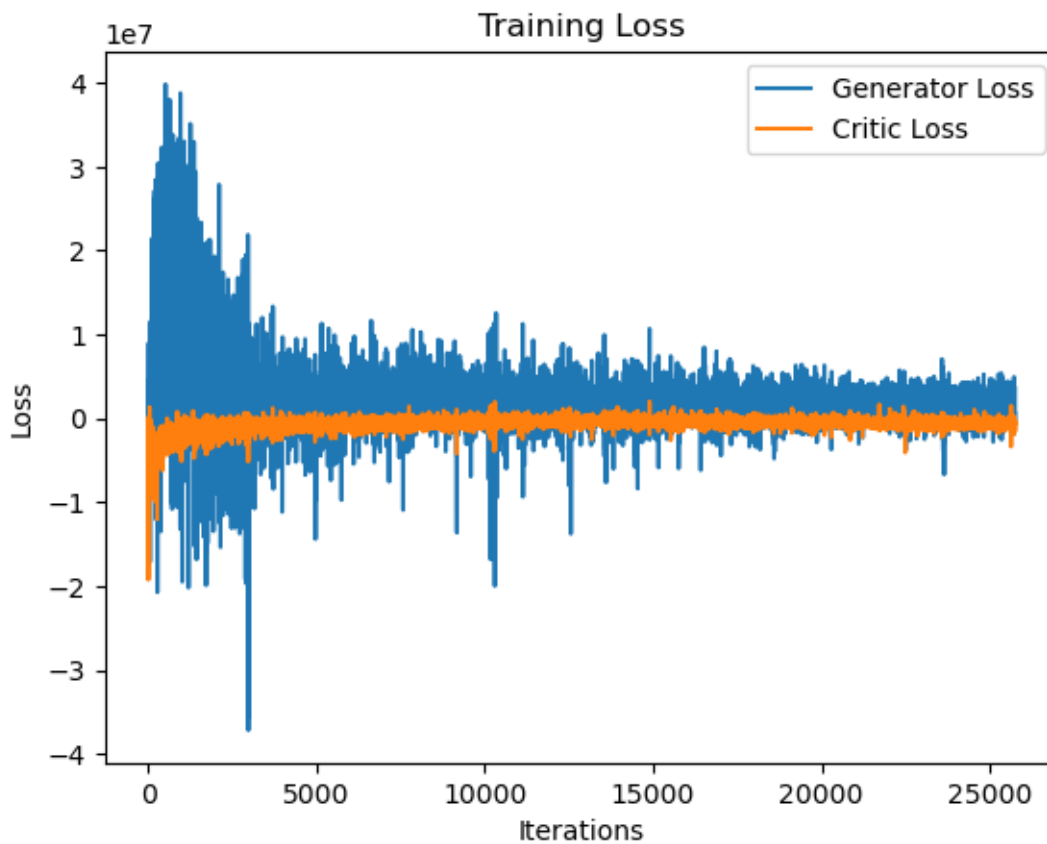
```

[epoch=245/250  batch_idx= 300]      loss_critic=-602579.6250
loss_gen=1888553.2500  Wasserstein_dist=1184167.8750
[epoch=245/250  batch_idx= 400]      loss_critic=-702306.8750
loss_gen=1633482.0000  Wasserstein_dist=1297401.6250
[epoch=245/250  batch_idx= 500]      loss_critic=-453051.8125
loss_gen=3077352.5000  Wasserstein_dist=1034564.2500
[epoch=246/250  batch_idx= 100]      loss_critic=-1004795.0000
loss_gen=313743.3125  Wasserstein_dist=1593819.1250
[epoch=246/250  batch_idx= 200]      loss_critic=-969037.3750
loss_gen=-145737.8125  Wasserstein_dist=1622991.8750
[epoch=246/250  batch_idx= 300]      loss_critic=-449483.6875
loss_gen=734615.9375  Wasserstein_dist=1072858.0000
[epoch=246/250  batch_idx= 400]      loss_critic=-1085668.5000
loss_gen=1895329.7500  Wasserstein_dist=1741631.7500
[epoch=246/250  batch_idx= 500]      loss_critic=-324771.5625
loss_gen=-691616.3750  Wasserstein_dist=1001151.0000
[epoch=247/250  batch_idx= 100]      loss_critic=-325264.0625
loss_gen=-1203279.8750  Wasserstein_dist=1001250.4375
[epoch=247/250  batch_idx= 200]      loss_critic=-638675.3750
loss_gen=523316.8125  Wasserstein_dist=1216873.6250
[epoch=247/250  batch_idx= 300]      loss_critic=-872738.9375
loss_gen=3187249.5000  Wasserstein_dist=1458753.7500
[epoch=247/250  batch_idx= 400]      loss_critic=-668966.5000
loss_gen=-783201.3750  Wasserstein_dist=1323619.7500
[epoch=247/250  batch_idx= 500]      loss_critic=-565062.5000
loss_gen=1691542.7500  Wasserstein_dist=1181533.0000
[epoch=248/250  batch_idx= 100]      loss_critic=-603727.6250
loss_gen=1283738.2500  Wasserstein_dist=1183078.0000
[epoch=248/250  batch_idx= 200]      loss_critic=-707944.8125
loss_gen=1826144.7500  Wasserstein_dist=1309082.2500
[epoch=248/250  batch_idx= 300]      loss_critic=-733836.4375
loss_gen=2620761.0000  Wasserstein_dist=1337054.5000
[epoch=248/250  batch_idx= 400]      loss_critic=-899651.5000
loss_gen=2901555.5000  Wasserstein_dist=1486625.2500
[epoch=248/250  batch_idx= 500]      loss_critic=-547085.8125
loss_gen=3320112.5000  Wasserstein_dist=1146740.0000
[epoch=249/250  batch_idx= 100]      loss_critic=-373381.5625
loss_gen=3035229.2500  Wasserstein_dist=1034730.0000
[epoch=249/250  batch_idx= 200]      loss_critic=-506058.0000
loss_gen=3166976.5000  Wasserstein_dist=1183893.7500
[epoch=249/250  batch_idx= 300]      loss_critic=-835459.8750
loss_gen=1852194.8750  Wasserstein_dist=1484080.7500
[epoch=249/250  batch_idx= 400]      loss_critic=-78374.3750
loss_gen=516771.5312  Wasserstein_dist=733861.7500
[epoch=249/250  batch_idx= 500]      loss_critic=-1229318.2500
loss_gen=2016410.0000  Wasserstein_dist=1827487.2500
[epoch=250/250  batch_idx= 100]      loss_critic=-468205.2500
loss_gen=-279151.7812  Wasserstein_dist=1181974.3750

```

```
[epoch=250/250  batch_idx= 200]      loss_critic=-773792.0625
loss_gen=-46107.4609  Wasserstein_dist=1373887.5000
[epoch=250/250  batch_idx= 300]      loss_critic=-911202.6250
loss_gen=1682617.3750  Wasserstein_dist=1517892.0000
[epoch=250/250  batch_idx= 400]      loss_critic=-626314.0625
loss_gen=1493964.8750  Wasserstein_dist=1198558.3750
[epoch=250/250  batch_idx= 500]      loss_critic=-1567882.3750
loss_gen=-352762.0625  Wasserstein_dist=2252538.5000
Training concluded in 5261.528266666832 seconds
```

```
[23]: plot_losses(lossC, lossG, epochs, gan_type="Critic")
```



```
[42]: plot_fake_real_images(image_list, trainloader)
```

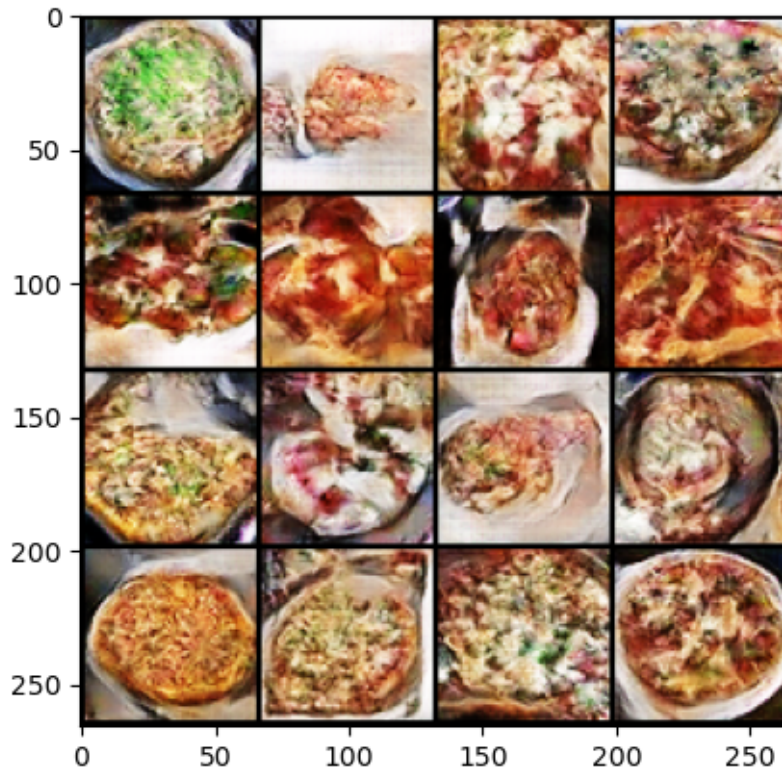


Evaluation

```
[43]: num_images = 1000
validation_noise = torch.randn(num_images, 100, 1, 1, device=device)
netG.load_state_dict(torch.load(os.path.join(path_to_model, "wgan_generator.
    ↪pt")))
netG.eval()

generated_fake_images = netG(validation_noise)
fake_images = generated_fake_images.detach().cpu()
plt.imshow(np.transpose(torchvision.utils.make_grid(fake_images[:batch_size],
    ↪padding=2, nrow=4, normalize=True), (1,2,0)))
```

```
[43]: <matplotlib.image.AxesImage at 0x2b4c6d9419a0>
```

```
[44]: # Saving all the fake images
path_to_fakes = r"/scratch/gilbreth/dfarache/ece60146/Nikita/hw07/fakes_wgan"
for ibx in range(len(fake_images)):
    image = transform_tensor_to_PIL(fake_images[ibx] / 2 + 0.5)
    image.save(os.path.join(path_to_fakes, str(ibx)+".jpg"))
```

```
[45]: fake_paths = [os.path.join(path_to_fakes, filename) for filename in os.
    ↳listdir(path_to_fakes)]

path_to_eval = os.path.join(eval_dir, "pizza")
real_paths = [os.path.join(path_to_eval, filename) for filename in os.
    ↳listdir(path_to_eval)]
```

```
[46]: wgan_fid = compute_fid_score(fake_paths, real_paths, dims=2048)
```

```
100%|      | 20/20 [00:04<00:00, 4.94it/s]
```

```
100%|      | 20/20 [00:01<00:00, 12.22it/s]
```

```
FID: 94.07
```

4 Evaluation

After implementing both the DCGAN and the WGAN, the results indicate that the images generated by the latter GAN was significantly better qualitatively and quantitatively as shown by the FID score of 94.07 as opposed to 122.00. Furthermore, with the WGAN, the toppings on the pizza are a lot more visible than in the outputs generated by the DCGAN. Also the images generated by the DCGAN were slightly more blurry than the images generated by the WGAN. Therefore, the WGAN is the better GAN option of the two methods for this particular case.

References

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