基于MNIST实现生成对抗网络

```
import numpy as np
import torch
import torch.nn as nn
import torchvision
from torch.utils.data import DataLoader # 用于加载数据,可实例化
```

```
image_size = [1,28,28]
latent_dim = 96
batch_size = 64
use_gpu = torch.cuda.is_available()
```

- # 无论是实现什么类型的GAN,都是先实现生成器和判别器,然后构建数据,然后实例化两个optimizer,
- # 以及loss function, 然后分别训练生成器和优化器(只训练各自的参数)

```
class Generator(nn.Module):
   def __init__(self): # 定义一些模块
       super(Generator, self).__init__() # 对父类实例化,因为是继承自nn.Module
       # 用Sequential来装网络层
       self.model = nn.Sequential(
          # 堆很多全连接层
          # 将参数in_dim(图片大小)写明成torch.prod(image_size,dtype=torch.int32)
          nn.Linear(latent_dim, 128),
          # 引入batchnorm可以提高收敛速度,具体做法是在生成器的Linear层后面添加
BatchNorm1d,
           # 最后一层除外, 判别器不要加
          torch.nn.BatchNorm1d(128),
           torch.nn.GELU(), # 将激活函数ReLU换成GELU效果更好
           nn.Linear(128, 256),
           torch.nn.BatchNorm1d(256),
           torch.nn.GELU(),
           nn.Linear(256, 512),
           torch.nn.BatchNorm1d(512),
           torch.nn.GELU(),
           nn.Linear(512, 1024),
           torch.nn.BatchNorm1d(1024),
           torch.nn.GELU(),
           nn.Linear(1024, np.prod(image_size, dtype=np.int32)), # 映射成图片大小
(输出)
           # nn.Tanh(),
           nn.Sigmoid(),
   def forward(self,z): # 将以上模块串联起来
       # z就是高斯噪声, shape of z:[batchsize, latent_dim]
       output = self.model(z)
```

```
image = output.reshape(z.shape[0],*image_size) # image_size是一个列表,加*变成元组
return image
```

```
class Discriminator(nn.Module): # 判别器接受一张图片作为输入,输出是经Sigmoid后的概率值
   def __init__(self):
       super(Discriminator, self).__init__() # 对父类实例化,因为是继承自nn.Module
       # 用Sequential来装网络层
       self.model = nn.Sequential(
           # 堆很多全连接层
           nn.Linear(np.prod(image_size,dtype=np.int32),512), # 输入是图片
           torch.nn.GELU(),
           nn.Linear(512, 256),
           torch.nn.GELU(),
           nn.Linear(256, 128),
           torch.nn.GELU(),
           nn.Linear(128, 64),
           torch.nn.GELU(),
           nn.Linear(64, 32),
           torch.nn.GELU(),
           nn.Linear(32, 1),
           nn.Sigmoid(),
       )
   def forward(self,image): # 将以上模块串联起来
       # shape of image:[batchsize,1,28,28]
       prob = self.model(image.reshape(image.shape[0],-1)) # reshape 4维成2维
的,-1表示其他的放在一维
       return prob
```

```
# Training
# 真实图片
dataset = torchvision.datasets.MNIST("mnist_data",train=True,download=False,
                                  transform = torchvision.transforms.Compose([
                                      torchvision.transforms.Resize(28),
                                      torchvision.transforms.ToTensor(), # 将
PIL转换Tensor
                                      # 实际算出来的mean和std的效果不如0.5,0.5(也可
以不用做归一化的transform)
                                        torchvision.transforms.Normalize(mean=
[0.5], std=[0.5]),
                                  ]))
# print(len(dataset))
# for i in range(len(dataset)):
     if i<5:
         print(dataset[i][0].shape) # 每个样本大小是1*28*28, 1为通道数
     else:
```

```
# break

# DataLoder的作用就是将dataset中数据构成mimi_batch来做批训练

# 当你使用了batch normalization的时候,如果batch_size设置得不合适,又没有使用 drop_last

= true,易出错

dataloader = DataLoader(dataset,batch_size=batch_size,shuffle=True,drop_last=True)

# 2022.07.14注意这里是batch_size=batch_size(即64)
```

```
# 先实例化,因为后面优化器中要求参数是迭代器
generator = Generator()
discriminator = Discriminator()

# betas表示参数β,weight_decay表示权重衰减(正则化)
g_optimizer = torch.optim.Adam(generator.parameters(), lr=0.0003, betas=(0.4, 0.8), weight_decay=0.0001)
d_optimizer = torch.optim.Adam(discriminator.parameters(), lr=0.0003, betas=(0.4, 0.8), weight_decay=0.0001)

loss_fn = nn.BCELoss()
labels_one = torch.ones(batch_size, 1)
labels_zero = torch.zeros(batch_size, 1)
```

```
if use_qpu: # 有cuda
   print("use gpu for training")
   generator = generator.cuda()
   discriminator = discriminator.cuda()
   loss_fn = loss_fn.cuda()
   labels_one = labels_one.to("cuda")
   labels_zero = labels_zero.to("cuda")
num\_epoch = 200
# 对照论文写博客
for epoch in range(num_epoch):
   for i,mimi_batch in enumerate(dataloader):
       qt_images,_ = mimi_batch # 真实图片, label就不要了,写成_
       z = torch.randn(batch_size, latent_dim) # 随机生成高斯变量, latent_dim表示隐变
量维度
       if use_gpu:
           gt_images = gt_images.to("cuda")
           z = z.to("cuda")
       pred_images = generator(z) # 预测出的图片
       g_optimizer.zero_grad() # 先置零
         print(len(qt_images))
#
         print(len(pred_images))
       recons_loss = torch.abs(pred_images-gt_images).mean()
       # 把预测出的图片送入discriminator,即论文中的 D(G(z))
       g_loss = recons_loss*0.05 + loss_fn(discriminator(pred_images),
labels_one) # 对生成器为进行优化,即生成的图片越接近真实的越好,所以target为1
       g_loss.backward()
```

```
g_optimizer.step()
       d_optimizer.zero_grad()
       # 对照论文的优化目标函数来理解
#
         d_loss = 0.5*(loss_fn(discriminator(gt_images)
                         ,torch.ones(batch_size,1)) # 因为是BCELoss, 所以要传入标
签,希望判别器是能够把真实的图片判别为1
# + loss_fn(discriminator(pred_images.detach()) # 因为计算d_loss不需要计算生成器部分的
梯度,所以detach,从计算图中分离
                        ,torch.zeros(batch_size,1))) # 此时希望判别器将真实图片判别
为0
       # 为了方便观察判别器是否训练好,应该看以下两个loss
       # real_loss基于真实图片, fake_loss基于生成图片
       # 观察real_loss与fake_loss同时下降且同时达到最小值,并且差不多大,说明判别器已经稳
定
       real_loss = loss_fn(discriminator(gt_images), labels_one)
       fake_loss = loss_fn(discriminator(pred_images.detach()),labels_zero)
       d_loss = 0.5*(real_loss + fake_loss)
       d_loss.backward()
       d_optimizer.step()
       # 建议引入loss打印语句
       if i % 50 == 0:
           print(f"step:{len(dataloader)*epoch+i}, recons_loss:
{recons_loss.item()}, g_loss:{g_loss.item()}, d_loss:{d_loss.item()},real_loss:
{real_loss.item()}, fake_loss:{fake_loss.item()}")
       if i % 400 == 0:
           image = pred_images[:16].data
           torchvision.utils.save_image(image,
f"image_{len(dataloader)*epoch+i}.png", nrow=4)
use gpu for training
```

```
use gpu for training
step:0, recons_loss:0.4736882448196411, g_loss:0.6996345520019531,
d_loss:0.6932847499847412,real_loss:0.6759243011474609,fake_loss:0.7106451988220
215
step:50, recons_loss:0.13849864900112152, g_loss:0.973850429058075,
d_loss:0.5187704563140869,real_loss:0.5283604264259338,fake_loss:0.5091804265975
952
step:100, recons_loss:0.16004204750061035, g_loss:0.8906609416007996,
d_loss:0.6890159249305725,real_loss:0.8434861898422241,fake_loss:0.5345456600189
209
step:150, recons_loss:0.15330849587917328, g_loss:0.8175380229949951,
d_loss:0.6969562768936157,real_loss:0.7842477560043335,fake_loss:0.6096647381782
532
step:200, recons_loss:0.15032292902469635, g_loss:0.6678354740142822,
d_loss:0.7043204307556152,real_loss:0.6118291020393372,fake_loss:0.7968118190765
381
step:250, recons_loss:0.14618299901485443, g_loss:0.6567710041999817,
d_loss:0.6591843366622925,real_loss:0.564181387424469,fake_loss:0.75418722629547
12
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step:300, recons_loss:0.14482729136943817, g_loss:0.7453327178955078,
d_loss:0.6694599986076355,real_loss:0.6768627166748047,fake_loss:0.6620572805404
663
step:350, recons_loss:0.15316936373710632, g_loss:0.9588468670845032,
d_loss:0.6431106925010681,real_loss:0.791209876537323,fake_loss:0.49501147866249
step:400, recons_loss:0.16514848172664642, g_loss:0.5987626910209656,
d_loss:0.6497397422790527,real_loss:0.4520273208618164,fake_loss:0.8474521636962
891
step:450, recons_loss:0.15563872456550598, g_loss:0.870925784111023,
d_loss:0.6454678773880005,real_loss:0.7344961166381836,fake_loss:0.5564396977424
622
step:500, recons_loss:0.15411455929279327, g_loss:0.5904036164283752,
d_loss:0.6873852014541626,real_loss:0.5322575569152832,fake_loss:0.8425128459930
42
step:550, recons_loss:0.15850520133972168, g_loss:0.9125420451164246,
d_loss:0.6595782041549683,real_loss:0.7928367257118225,fake_loss:0.5263196825981
14
step:600, recons_loss:0.15440520644187927, g_loss:0.8576751947402954,
d_loss:0.6922413110733032,real_loss:0.820837140083313,fake_loss:0.56364548206329
step:650, recons_loss:0.1556476503610611, g_loss:0.7924470901489258,
d_loss:0.6714234352111816,real_loss:0.7101911902427673,fake_loss:0.6326557397842
step:700, recons_loss:0.16336119174957275, g_loss:0.6897699236869812,
d_loss:0.6456262469291687,real_loss:0.5725484490394592,fake_loss:0.7187040448188
step:750, recons_loss:0.16230246424674988, g_loss:0.7276152968406677,
d_loss:0.6461730003356934,real_loss:0.5084032416343689,fake_loss:0.7839428186416
step:800, recons_loss:0.1647028625011444, g_loss:0.8605344891548157,
d_loss:0.6626418828964233,real_loss:0.7611862421035767,fake_loss:0.5640975832939
step:850, recons_loss:0.1564607173204422, g_loss:0.7735947966575623,
d_loss:0.6740784645080566,real_loss:0.707273006439209,fake_loss:0.64088392257690
43
step:900, recons_loss:0.1601848006248474, g_loss:0.7020807862281799,
d_loss:0.6618391275405884,real_loss:0.6189980506896973,fake_loss:0.7046802043914
795
step:937, recons_loss:0.16142284870147705, g_loss:0.8372852206230164,
d_loss:0.6932288408279419,real_loss:0.8034467101097107,fake_loss:0.5830109119415
283
step:987, recons_loss:0.15456809103488922, g_loss:0.6292603611946106,
d_loss:0.6261818408966064,real_loss:0.44632285833358765,fake_loss:0.806040823459
6252
step:1037, recons_loss:0.16303622722625732, g_loss:0.8335666060447693,
d_loss:0.6756172776222229,real_loss:0.7580170035362244,fake_loss:0.5932175517082
214
step:1087, recons_loss:0.16164597868919373, g_loss:0.8317930698394775,
d_loss:0.6373620629310608,real_loss:0.6667433381080627,fake_loss:0.6079807877540
step:1137, recons_loss:0.16823266446590424, g_loss:0.6635526418685913,
d_loss:0.7069135904312134,real_loss:0.6625860929489136,fake_loss:0.7512411475181
58
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step:1187, recons_loss:0.15647181868553162, g_loss:0.6396658420562744,
d_loss:0.6824581027030945,real_loss:0.6000757217407227,fake_loss:0.7648404836654
663
step:1237, recons_loss:0.17080456018447876, g_loss:0.7450656294822693,
d_loss:0.7014026641845703,real_loss:0.7439797520637512,fake_loss:0.6588255167007
step:1287, recons_loss:0.17719709873199463, g_loss:0.7845789194107056,
d_loss:0.6510298252105713,real_loss:0.6707226037979126,fake_loss:0.6313371062278
748
step:1337, recons_loss:0.1607804000377655, g_loss:0.7750511169433594,
d_loss:0.6559741497039795,real_loss:0.672809898853302,fake_loss:0.63913840055465
step:1387, recons_loss:0.1513853669166565, g_loss:1.0030711889266968,
d_loss:0.6479688882827759,real_loss:0.8208487033843994,fake_loss:0.4750890135765
0757
step:1437, recons_loss:0.15329168736934662, g_loss:0.8688822984695435,
d_loss:0.5956748723983765,real_loss:0.611513078212738,fake_loss:0.57983666658401
49
step:1487, recons_loss:0.15964090824127197, g_loss:0.7016503810882568,
d_loss:0.6658945679664612,real_loss:0.6289491653442383,fake_loss:0.7028399705886
step:1537, recons_loss:0.15545648336410522, g_loss:0.6288150548934937,
d_loss:0.6972624659538269,real_loss:0.591362714767456,fake_loss:0.80316221714019
step:1587, recons_loss:0.16076111793518066, g_loss:0.793747067451477,
d_loss:0.6712539792060852,real_loss:0.7205781936645508,fake_loss:0.6219297647476
196
step:1637, recons_loss:0.16130204498767853, g_loss:0.6595103740692139,
d_loss:0.609365701675415,real_loss:0.4693141579627991,fake_loss:0.74941718578338
step:1687, recons_loss:0.14884281158447266, g_loss:0.6557759046554565,
d_loss:0.6903994083404541,real_loss:0.6213518381118774,fake_loss:0.7594469785690
step:1737, recons_loss:0.16804154217243195, g_loss:0.9041731953620911,
d_loss:0.6633186340332031,real_loss:0.7840334177017212,fake_loss:0.5426038503646
851
step:1787, recons_loss:0.15091432631015778, g_loss:0.7659988403320312,
d_loss:0.6397426128387451,real_loss:0.6347079873085022,fake_loss:0.6447771787643
433
step:1837, recons_loss:0.1642574816942215, g_loss:0.7408553957939148,
d_loss:0.6732069253921509,real_loss:0.6722020506858826,fake_loss:0.6742117404937
744
step:1874, recons_loss:0.1637437343597412, g_loss:0.6344335079193115,
d_loss:0.6662784218788147,real_loss:0.5601187944412231,fake_loss:0.7724380493164
062
step:1924, recons_loss:0.15623298287391663, g_loss:0.9063805341720581,
d_loss:0.6015720367431641,real_loss:0.6722216010093689,fake_loss:0.5309224128723
145
step:1974, recons_loss:0.15783856809139252, g_loss:0.7129713892936707,
d_loss:0.650708794593811,real_loss:0.6100262403488159,fake_loss:0.69139140844345
step:2024, recons_loss:0.17499828338623047, g_loss:0.6858403086662292,
d_loss:0.6921089887619019,real_loss:0.6569986939430237,fake_loss:0.7272193431854
248
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step:2074, recons_loss:0.16522866487503052, g_loss:0.9238389730453491,
d_loss:0.6400018930435181,real_loss:0.7552399039268494,fake_loss:0.5247638225555
42
step:2124, recons_loss:0.16193275153636932, g_loss:0.7748368978500366,
d_loss:0.6633262634277344,real_loss:0.6862939596176147,fake_loss:0.6403585076332
step:2174, recons_loss:0.15278975665569305, g_loss:0.9291233420372009,
d_loss:0.654631495475769,real_loss:0.7766035795211792,fake_loss:0.53265941143035
step:2224, recons_loss:0.1583091914653778, g_loss:0.6849861145019531,
d_loss:0.6682772636413574,real_loss:0.6129379868507385,fake_loss:0.7236166000366
211
step:2274, recons_loss:0.1657065898180008, g_loss:0.9320001602172852,
d_loss:0.6752195358276367,real_loss:0.8256675004959106,fake_loss:0.5247716307640
076
step:2324, recons_loss:0.15930293500423431, g_loss:0.842348575592041,
d_loss:0.6587810516357422,real_loss:0.7262853384017944,fake_loss:0.5912768244743
347
step:2374, recons_loss:0.166170135140419, g_loss:0.7474555969238281,
d_loss:0.657342255115509,real_loss:0.6457623243331909,fake_loss:0.66892218589782
71
step:2424, recons_loss:0.1694435179233551, g_loss:0.6298056244850159,
d_loss:0.6738572120666504,real_loss:0.5305626392364502,fake_loss:0.8171518445014
step:2474, recons_loss:0.16390332579612732, g_loss:0.9546455144882202,
d_loss:0.6610949039459229,real_loss:0.8129827976226807,fake_loss:0.5092070698738
098
step:2524, recons_loss:0.1659080535173416, g_loss:0.6019406318664551,
d_loss:0.7157830595970154,real_loss:0.5387226343154907,fake_loss:0.8928434848785
step:2574, recons_loss:0.16132687032222748, g_loss:0.7510290741920471,
d_loss:0.6508373022079468,real_loss:0.6193102598190308,fake_loss:0.6823643445968
step:2624, recons_loss:0.1712551862001419, g_loss:0.6594095826148987,
d_loss:0.6726174354553223,real_loss:0.578229546546936,fake_loss:0.76700532436370
step:2674, recons_loss:0.1581360399723053, g_loss:0.9735592603683472,
d_loss:0.5544180274009705,real_loss:0.5780049562454224,fake_loss:0.5308310985565
186
step:2724, recons_loss:0.160291850566864, g_loss:0.7311055064201355,
d_loss:0.6583056449890137,real_loss:0.634132981300354,fake_loss:0.68247830867767
33
step:2774, recons_loss:0.15361088514328003, g_loss:0.6928738355636597,
d_loss:0.6606008410453796,real_loss:0.5833621025085449,fake_loss:0.7378395795822
144
step:2811, recons_loss:0.16055847704410553, g_loss:0.7968485355377197,
d_loss:0.6686897277832031,real_loss:0.7155161499977112,fake_loss:0.6218632459640
503
step:2861, recons_loss:0.16753816604614258, g_loss:0.7733556032180786,
d_loss:0.6466711759567261,real_loss:0.6532362103462219,fake_loss:0.6401061415672
302
step:2911, recons_loss:0.17534607648849487, g_loss:0.8179513812065125,
d_loss:0.6376026272773743,real_loss:0.6662580966949463,fake_loss:0.6089471578598
022
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step:2961, recons_loss:0.15774251520633698, g_loss:0.753756046295166,
d_loss:0.6532894372940063,real_loss:0.545987069606781,fake_loss:0.76059186458587
65
step:3011, recons_loss:0.1507265865802765, g_loss:0.7250035405158997,
d_loss:0.6731455326080322,real_loss:0.6636461615562439,fake_loss:0.6826448440551
step:3061, recons_loss:0.16191457211971283, g_loss:0.9094497561454773,
d_loss:0.6763775944709778,real_loss:0.8116985559463501,fake_loss:0.5410566329956
055
step:3111, recons_loss:0.1588621735572815, g_loss:1.0735368728637695,
d_loss:0.6045718789100647,real_loss:0.7673240900039673,fake_loss:0.4418196678161
621
step:3161, recons_loss:0.16757820546627045, g_loss:0.5466610193252563,
d_loss:0.6896566152572632,real_loss:0.3212162256240845,fake_loss:1.0580970048904
42
step:3211, recons_loss:0.16016291081905365, g_loss:0.7244572043418884,
d_loss:0.6467565298080444,real_loss:0.601821780204773,fake_loss:0.69169127941131
59
step:3261, recons_loss:0.15630021691322327, g_loss:0.6750497817993164,
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367
step:3311, recons_loss:0.1572457253932953, g_loss:0.7919155955314636,
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479
step:3561, recons_loss:0.16013599932193756, g_loss:0.7203863859176636,
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step:3611, recons_loss:0.16360849142074585, g_loss:0.7062162756919861,
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step:3661, recons_loss:0.16189894080162048, g_loss:0.9977878928184509,
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step:3711, recons_loss:0.16392436623573303, g_loss:0.9106156826019287,
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622
step:3748, recons_loss:0.165492445230484, g_loss:0.9701476693153381,
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step:3798, recons_loss:0.168157696723938, g_loss:1.322824478149414,
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9526
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step:3898, recons_loss:0.16060462594032288, g_loss:1.0115134716033936,
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step:3998, recons_loss:0.16269628703594208, g_loss:0.817773163318634,
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step:4148, recons_loss:0.1700187772512436, g_loss:0.8216649293899536,
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step:4398, recons_loss:0.1566489040851593, g_loss:0.6597942113876343,
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step:4448, recons_loss:0.1593388468027115, g_loss:0.9173277616500854,
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13
step:4598, recons_loss:0.165309876203537, g_loss:0.8608354330062866,
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step:4648, recons_loss:0.16292501986026764, g_loss:1.1102616786956787,
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527
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step:4785, recons_loss:0.16852355003356934, g_loss:0.7787689566612244,
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step:4885, recons_loss:0.16679434478282928, g_loss:0.8628746867179871,
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step:5385, recons_loss:0.16532573103904724, g_loss:0.7532697319984436,
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step:5485, recons_loss:0.16526535153388977, g_loss:0.6548857688903809,
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step:5535, recons_loss:0.1658816784620285, g_loss:0.9567904472351074,
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step:5585, recons_loss:0.16748209297657013, g_loss:1.144288182258606,
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6963
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step:6422, recons_loss:0.1629534512758255, g_loss:1.1088892221450806,
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371
step:6472, recons_loss:0.16982950270175934, g_loss:0.9292050004005432,
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8
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step:6809, recons_loss:0.16732434928417206, g_loss:1.092223048210144,
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step:7059, recons_loss:0.1637030988931656, g_loss:1.3856524229049683,
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step:7109, recons_loss:0.16654309630393982, g_loss:1.2731006145477295,
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step:7309, recons_loss:0.17442812025547028, g_loss:1.05008864402771,
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step:7359, recons_loss:0.17582958936691284, g_loss:1.3352993726730347,
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2639
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step:8146, recons_loss:0.16159206628799438, g_loss:1.1186615228652954,
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step:8246, recons_loss:0.15787310898303986, g_loss:1.1504768133163452,
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step:8296, recons_loss:0.1588030755519867, g_loss:1.0617127418518066,
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621
step:8346, recons_loss:0.17130237817764282, g_loss:1.36257004737854,
d_loss:0.5442055463790894,real_loss:0.7621080875396729,fake_loss:0.3263030648231
step:8396, recons_loss:0.1661149263381958, g_loss:0.9297735095024109,
d_loss:0.5094040632247925,real_loss:0.3490937650203705,fake_loss:0.6697143316268
921
step:8433, recons_loss:0.16416911780834198, g_loss:1.1527373790740967,
d_loss:0.4766678810119629,real_loss:0.46132299304008484,fake_loss:0.492012739181
51855
step:8483, recons_loss:0.16589263081550598, g_loss:1.1072356700897217,
d_loss:0.4724791347980499,real_loss:0.3727537989616394,fake_loss:0.5722044706344
604
step:8533, recons_loss:0.158174067735672, g_loss:1.1038795709609985,
d_loss:0.5112043619155884,real_loss:0.5509876608848572,fake_loss:0.4714210927486
4197
step:8583, recons_loss:0.16651983559131622, g_loss:0.7187243103981018,
d_loss:0.6813151240348816,real_loss:0.36340758204460144,fake_loss:0.999222636222
8394
step:8633, recons_loss:0.16072222590446472, g_loss:1.2917852401733398,
d_loss:0.4886762201786041,real_loss:0.588984489440918,fake_loss:0.38836795091629
step:8683, recons_loss:0.16006596386432648, g_loss:1.1636162996292114,
d_loss:0.4429100751876831,real_loss:0.40739911794662476,fake_loss:0.478421002626
41907
step:8733, recons_loss:0.16896380484104156, g_loss:1.0953552722930908,
d_loss:0.5987412333488464,real_loss:0.6813284158706665,fake_loss:0.5161540508270
step:8783, recons_loss:0.16256576776504517, g_loss:1.5070521831512451,
d_loss:0.39909273386001587,real_loss:0.5144795179367065,fake_loss:0.283705979585
6476
step:8833, recons_loss:0.16403038799762726, g_loss:1.6117032766342163,
d_loss:0.39029309153556824,real_loss:0.51514732837677,fake_loss:0.26543885469436
646
step:8883, recons_loss:0.16523316502571106, g_loss:1.4955716133117676,
d_loss:0.5163192749023438,real_loss:0.7155821919441223,fake_loss:0.3170563578605
652
step:8933, recons_loss:0.15837925672531128, g_loss:1.5527667999267578,
d_loss:0.44989922642707825,real_loss:0.6318908929824829,fake_loss:0.267907559871
6736
step:8983, recons_loss:0.15674419701099396, g_loss:1.1327942609786987,
d_loss:0.47770190238952637,real_loss:0.275115966796875,fake_loss:0.6802878379821
777
step:9033, recons_loss:0.16047368943691254, g_loss:1.141722559928894,
d_loss:0.5703086853027344,real_loss:0.4649590253829956,fake_loss:0.6756582856178
284
step:9083, recons_loss:0.16253814101219177, g_loss:1.1748846769332886,
d_loss:0.5972745418548584,real_loss:0.7257488965988159,fake_loss:0.4688001573085
785
step:9133, recons_loss:0.15805308520793915, g_loss:1.315604567527771,
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1426
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56
step:9233, recons_loss:0.15868528187274933, g_loss:1.080175757408142,
d_loss:0.5682581067085266,real_loss:0.5811864733695984,fake_loss:0.5553297400474
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step:9333, recons_loss:0.1577572375535965, g_loss:1.0585503578186035,
d_loss:0.5643426179885864,real_loss:0.609127402305603,fake_loss:0.51955783367156
98
step:9370, recons_loss:0.15229679644107819, g_loss:1.3297431468963623,
d_loss:0.443545937538147,real_loss:0.4836377203464508,fake_loss:0.40345412492752
075
step:9420, recons_loss:0.16010712087154388, g_loss:1.3376377820968628,
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8064
step:9470, recons_loss:0.155816450715065, g_loss:1.0277515649795532,
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26562
step:9520, recons_loss:0.1563522070646286, g_loss:1.2400318384170532,
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step:9720, recons_loss:0.16555100679397583, g_loss:1.7238202095031738,
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248
step:9770, recons_loss:0.16981597244739532, g_loss:1.3709697723388672,
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step:9820, recons_loss:0.1638992428779602, g_loss:1.1734974384307861,
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step:9870, recons_loss:0.16709992289543152, g_loss:1.3960909843444824,
d_loss:0.4368293583393097,real_loss:0.5060567855834961,fake_loss:0.3676019310951
233
step:9920, recons_loss:0.15175579488277435, g_loss:1.1402931213378906,
d_loss:0.4437996745109558,real_loss:0.2978295385837555,fake_loss:0.5897698402404
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step:9970, recons_loss:0.16166597604751587, g_loss:1.3872658014297485,
d_loss:0.4921060800552368,real_loss:0.6462951898574829,fake_loss:0.3379169404506
6833
step:10020, recons_loss:0.1506958305835724, g_loss:1.1394720077514648,
d_loss:0.5631844997406006,real_loss:0.5294935703277588,fake_loss:0.5968754291534
424
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step:10070, recons_loss:0.1580430567264557, g_loss:1.1000268459320068,
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step:10120, recons_loss:0.15760935842990875, g_loss:1.21493101111999512,
d_loss:0.49065837264060974,real_loss:0.5827732086181641,fake_loss:0.398543536663
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step:10220, recons_loss:0.1691734492778778, g_loss:1.1126203536987305,
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step:10270, recons_loss:0.1653549075126648, g_loss:1.5759607553482056,
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step:10307, recons_loss:0.16502675414085388, g_loss:1.1644123792648315,
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step:10357, recons_loss:0.15392017364501953, g_loss:1.5461034774780273,
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step:10757, recons_loss:0.17145253717899323, g_loss:1.3385357856750488,
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step:10807, recons_loss:0.16496162116527557, g_loss:1.5751547813415527,
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step:10857, recons_loss:0.1593637764453888, g_loss:1.3873989582061768,
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step:10907, recons_loss:0.16012045741081238, g_loss:1.0188182592391968,
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5088
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80
step:11007, recons_loss:0.15941298007965088, g_loss:1.3190665245056152,
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345
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step:11544, recons_loss:0.16475677490234375, g_loss:1.5017948150634766,
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step:11594, recons_loss:0.1637936532497406, g_loss:1.455262541770935,
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step:11644, recons_loss:0.16979852318763733, g_loss:1.260571002960205,
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step:11694, recons_loss:0.16254298388957977, g_loss:1.2668217420578003,
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step:11744, recons_loss:0.159042090177536, g_loss:1.2630215883255005,
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771
step:11794, recons_loss:0.16236552596092224, g_loss:1.1167372465133667,
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0669
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step:11844, recons_loss:0.1609117090702057, g_loss:1.0973057746887207,
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31
step:11894, recons_loss:0.15662232041358948, g_loss:1.6050825119018555,
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step:11994, recons_loss:0.15663830935955048, g_loss:1.7661162614822388,
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step:12044, recons_loss:0.1674720197916031, g_loss:1.755111813545227,
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step:12094, recons_loss:0.157927468419075, g_loss:1.3250941038131714,
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step:12431, recons_loss:0.16023655235767365, g_loss:1.3334400653839111,
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step:12481, recons_loss:0.1598362922668457, g_loss:1.2297039031982422,
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70587
step:12531, recons_loss:0.1547703742980957, g_loss:1.5097858905792236,
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step:12581, recons_loss:0.154485285282135, g_loss:1.3702493906021118,
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step:12631, recons_loss:0.1521334946155548, g_loss:1.2639802694320679,
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step:12681, recons_loss:0.16088803112506866, g_loss:1.3240841627120972,
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007
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step:12731, recons_loss:0.1611548364162445, g_loss:1.350865125656128,
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step:12781, recons_loss:0.16384287178516388, g_loss:1.1866601705551147,
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1387
step:12881, recons_loss:0.15881924331188202, g_loss:1.4799050092697144,
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5645
step:12931, recons_loss:0.16222359240055084, g_loss:1.260381817817688,
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66
step:12981, recons_loss:0.1598920077085495, g_loss:1.382664442062378,
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114
step:13031, recons_loss:0.16603738069534302, g_loss:1.3091520071029663,
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step:13081, recons_loss:0.15355844795703888, g_loss:1.487978458404541,
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89746
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step:13368, recons_loss:0.1541394144296646, g_loss:1.3082536458969116,
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step:13418, recons_loss:0.16367371380329132, g_loss:1.225372076034546,
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step:13468, recons_loss:0.14928403496742249, g_loss:1.429319143295288,
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step:13518, recons_loss:0.16435889899730682, g_loss:1.2283639907836914,
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step:13568, recons_loss:0.16303125023841858, g_loss:1.4695665836334229,
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6685
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step:13768, recons_loss:0.15592551231384277, g_loss:1.2836458683013916,
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step:13868, recons_loss:0.15309342741966248, g_loss:1.3436943292617798,
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step:13918, recons_loss:0.16296078264713287, g_loss:1.695522427558899,
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step:14455, recons_loss:0.1703089028596878, g_loss:1.6209913492202759,
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9706
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step:15292, recons_loss:0.16327381134033203, g_loss:1.0410889387130737,
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step:15342, recons_loss:0.1632649302482605, g_loss:1.475724220275879,
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step:16179, recons_loss:0.16763165593147278, g_loss:1.6046843528747559,
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step:17016, recons_loss:0.15426693856716156, g_loss:1.1310745477676392,
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step:17066, recons_loss:0.16582946479320526, g_loss:1.3540315628051758,
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step:17116, recons_loss:0.1574098765850067, g_loss:1.664903163909912,
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step:18303, recons_loss:0.15513768792152405, g_loss:1.1679532527923584,
d_loss:0.5099836587905884,real_loss:0.5356069803237915,fake_loss:0.4843603968620
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step:18353, recons_loss:0.1622409075498581, g_loss:1.3156977891921997,
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step:18403, recons_loss:0.15397576987743378, g_loss:1.5320031642913818,
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step:18453, recons_loss:0.15334366261959076, g_loss:1.1367944478988647,
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step:18603, recons_loss:0.1565156877040863, g_loss:1.3312684297561646,
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step:18653, recons_loss:0.158413827419281, g_loss:1.5535916090011597,
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115
step:18703, recons_loss:0.1637963205575943, g_loss:1.4872099161148071,
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step:18740, recons_loss:0.1649925410747528, g_loss:1.2901161909103394,
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step:18790, recons_loss:0.1633613258600235, g_loss:1.2724559307098389,
d_loss:0.46919867396354675,real_loss:0.5064772367477417,fake_loss:0.431920111179
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step:18840, recons_loss:0.15295670926570892, g_loss:1.5047541856765747,
d_loss:0.5308532118797302,real_loss:0.6222909092903137,fake_loss:0.4394155144691
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step:18890, recons_loss:0.15784944593906403, g_loss:1.3989726305007935,
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9507
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step:18940, recons_loss:0.1535177230834961, g_loss:1.5789856910705566,
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step:18990, recons_loss:0.16403034329414368, g_loss:1.6778483390808105,
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step:19090, recons_loss:0.16701115667819977, g_loss:1.2076127529144287,
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step:19190, recons_loss:0.1568671017885208, g_loss:1.3456759452819824,
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step:19290, recons_loss:0.16040357947349548, g_loss:1.6270763874053955,
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step:19540, recons_loss:0.16570013761520386, g_loss:1.1954162120819092,
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27
step:19590, recons_loss:0.1597200334072113, g_loss:1.2892640829086304,
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step:19677, recons_loss:0.15796677768230438, g_loss:1.4951107501983643,
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step:19727, recons_loss:0.16367857158184052, g_loss:1.5862910747528076,
d_loss:0.4820442497730255,real_loss:0.6689124703407288,fake_loss:0.2951760292053
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step:19777, recons_loss:0.15587282180786133, g_loss:1.3120818138122559,
d_loss:0.49345678091049194,real_loss:0.5726847648620605,fake_loss:0.414228767156
60095
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step:19877, recons_loss:0.16839592158794403, g_loss:1.3382816314697266,
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113
step:19977, recons_loss:0.1681808978319168, g_loss:1.2752734422683716,
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step:20077, recons_loss:0.15947836637496948, g_loss:1.725013256072998,
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step:20127, recons_loss:0.15695694088935852, g_loss:1.302350401878357,
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step:20377, recons_loss:0.16969415545463562, g_loss:1.0702683925628662,
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step:20477, recons_loss:0.1544068604707718, g_loss:1.376855731010437,
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step:20527, recons_loss:0.1645956039428711, g_loss:1.3089423179626465,
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step:20577, recons_loss:0.16320523619651794, g_loss:1.3212987184524536,
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step:20614, recons_loss:0.15618199110031128, g_loss:1.444069743156433,
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step:20664, recons_loss:0.16520391404628754, g_loss:1.4151962995529175,
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step:20764, recons_loss:0.1582748293876648, g_loss:1.0306469202041626,
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step:21164, recons_loss:0.16614875197410583, g_loss:1.2211716175079346,
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step:21314, recons_loss:0.1575484722852707, g_loss:1.5387024879455566,
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step:21364, recons_loss:0.1552676111459732, g_loss:1.3798695802688599,
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step:21464, recons_loss:0.16100358963012695, g_loss:1.3396742343902588,
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step:21514, recons_loss:0.15358899533748627, g_loss:1.3074564933776855,
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step:21551, recons_loss:0.1570909470319748, g_loss:1.468993902206421,
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363
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step:21601, recons_loss:0.14938804507255554, g_loss:1.420893669128418,
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step:21651, recons_loss:0.15867088735103607, g_loss:1.5626157522201538,
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step:21801, recons_loss:0.1640547662973404, g_loss:1.598268747329712,
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step:21901, recons_loss:0.1633647233247757, g_loss:1.3803960084915161,
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step:21951, recons_loss:0.16226701438426971, g_loss:1.432384729385376,
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step:22001, recons_loss:0.15654867887496948, g_loss:1.3100398778915405,
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step:22251, recons_loss:0.16884201765060425, g_loss:1.3376357555389404,
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step:22351, recons_loss:0.16246461868286133, g_loss:1.3319331407546997,
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step:22401, recons_loss:0.16055336594581604, g_loss:1.104235053062439,
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526
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707
step:22538, recons_loss:0.1601727157831192, g_loss:0.9216988682746887,
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step:22638, recons_loss:0.16856150329113007, g_loss:1.3273979425430298,
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44
step:22688, recons_loss:0.17243042588233948, g_loss:1.2104476690292358,
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step:22788, recons_loss:0.16394133865833282, g_loss:1.1630408763885498,
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step:22838, recons_loss:0.16242896020412445, g_loss:1.1148037910461426,
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6816
step:22888, recons_loss:0.16396424174308777, g_loss:1.3620531558990479,
d_loss:2.0142056941986084,real_loss:0.5009812116622925,fake_loss:3.5274300575256
348
step:22938, recons_loss:0.1595374345779419, g_loss:1.4918041229248047,
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675
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step:23288, recons_loss:0.15921643376350403, g_loss:1.3833446502685547,
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4326
step:23338, recons_loss:0.1628652811050415, g_loss:1.2542284727096558,
d_loss:0.5083374381065369,real_loss:0.6122424602508545,fake_loss:0.4044323861598
9685
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36
step:23425, recons_loss:0.1634744554758072, g_loss:0.9771801233291626,
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step:23525, recons_loss:0.15945561230182648, g_loss:1.4771190881729126,
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step:23675, recons_loss:0.17103296518325806, g_loss:1.2636229991912842,
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step:23725, recons_loss:0.16312366724014282, g_loss:1.1775391101837158,
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step:23825, recons_loss:0.1642792969942093, g_loss:1.5749785900115967,
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step:23975, recons_loss:0.15642458200454712, g_loss:1.1778167486190796,
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step:24025, recons_loss:0.16105155646800995, g_loss:1.2273932695388794,
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step:24075, recons_loss:0.17293396592140198, g_loss:1.3616852760314941,
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step:24125, recons_loss:0.15746472775936127, g_loss:1.191468596458435,
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706
step:24175, recons_loss:0.16213804483413696, g_loss:1.14076828956604,
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78
step:24225, recons_loss:0.16722561419010162, g_loss:1.4866315126419067,
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7815
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step:24412, recons_loss:0.1589871048927307, g_loss:1.3036768436431885,
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step:24612, recons_loss:0.16506704688072205, g_loss:1.3725306987762451,
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step:24912, recons_loss:0.16103072464466095, g_loss:1.3327125310897827,
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step:24962, recons_loss:0.1589093655347824, g_loss:1.5217151641845703,
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step:25012, recons_loss:0.16535085439682007, g_loss:1.301477074623108,
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step:25112, recons_loss:0.16022230684757233, g_loss:1.5414481163024902,
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78
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step:25212, recons_loss:0.15230688452720642, g_loss:1.0074769258499146,
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step:25749, recons_loss:0.17128391563892365, g_loss:1.269621729850769,
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step:25899, recons_loss:0.16115376353263855, g_loss:1.1526521444320679,
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step:25949, recons_loss:0.1644957810640335, g_loss:1.5468734502792358,
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step:26099, recons_loss:0.1620861291885376, g_loss:1.434206247329712,
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step:26836, recons_loss:0.1620103418827057, g_loss:1.4467487335205078,
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step:26886, recons_loss:0.16636857390403748, g_loss:1.2937616109848022,
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198
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step:28460, recons_loss:0.16414132714271545, g_loss:1.5481994152069092,
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18
step:28510, recons_loss:0.15732450783252716, g_loss:1.1105036735534668,
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step:28560, recons_loss:0.1640796661376953, g_loss:1.0981754064559937,
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step:28610, recons_loss:0.16182832419872284, g_loss:1.596235752105713,
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step:28660, recons_loss:0.15981708467006683, g_loss:1.020639181137085,
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054
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step:28860, recons_loss:0.17450670897960663, g_loss:1.077065348625183,
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step:28910, recons_loss:0.15950150787830353, g_loss:1.1969770193099976,
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step:28960, recons_loss:0.16484692692756653, g_loss:1.312840223312378,
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step:29010, recons_loss:0.16812554001808167, g_loss:0.9788402915000916,
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step:29047, recons_loss:0.16730856895446777, g_loss:1.2553105354309082,
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step:29247, recons_loss:0.15274439752101898, g_loss:1.09142005443573,
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step:29397, recons_loss:0.15955358743667603, g_loss:1.1779234409332275,
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94556
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step:29947, recons_loss:0.17102770507335663, g_loss:1.175549030303955,
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step:30284, recons_loss:0.16275367140769958, g_loss:1.5537269115447998,
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step:30334, recons_loss:0.1647491753101349, g_loss:1.1043208837509155,
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step:30384, recons_loss:0.16703899204730988, g_loss:1.3210880756378174,
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step:30434, recons_loss:0.16880494356155396, g_loss:1.2594358921051025,
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167
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step:31121, recons_loss:0.15981905162334442, g_loss:1.3287400007247925,
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step:31171, recons_loss:0.16552461683750153, g_loss:1.5388550758361816,
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step:31321, recons_loss:0.1637723445892334, g_loss:1.3282313346862793,
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step:32208, recons_loss:0.15769895911216736, g_loss:1.2311409711837769,
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666
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step:32558, recons_loss:0.16101597249507904, g_loss:1.4478521347045898,
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11
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967
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step:33295, recons_loss:0.16286751627922058, g_loss:1.4585578441619873,
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step:38380, recons_loss:0.16557477414608002, g_loss:1.2679857015609741,
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step:38417, recons_loss:0.16512052714824677, g_loss:1.0915263891220093,
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4785
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step:38467, recons_loss:0.15527357161045074, g_loss:1.2365851402282715,
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step:38517, recons_loss:0.1618644893169403, g_loss:0.8332043290138245,
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step:38567, recons_loss:0.16084299981594086, g_loss:1.3322372436523438,
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step:38617, recons_loss:0.1591455042362213, g_loss:1.1899101734161377,
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step:38667, recons_loss:0.1564410775899887, g_loss:1.025306224822998,
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step:38717, recons_loss:0.16292917728424072, g_loss:1.2225350141525269,
d_loss:0.4432389736175537,real_loss:0.4423648715019226,fake_loss:0.4441130757331
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step:38767, recons_loss:0.16743719577789307, g_loss:1.1178770065307617,
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step:38817, recons_loss:0.17131970822811127, g_loss:1.4001561403274536,
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step:38917, recons_loss:0.16312165558338165, g_loss:1.3882777690887451,
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step:39067, recons_loss:0.15753096342086792, g_loss:1.3782902956008911,
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step:39117, recons_loss:0.16462421417236328, g_loss:1.196528673171997,
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step:39167, recons_loss:0.1673242449760437, g_loss:1.0516445636749268,
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step:39217, recons_loss:0.16733044385910034, g_loss:1.2499592304229736,
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step:39267, recons_loss:0.15786166489124298, g_loss:1.477142333984375,
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step:39317, recons_loss:0.17315568029880524, g_loss:1.1434953212738037,
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8765
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step:39404, recons_loss:0.1582217812538147, g_loss:1.1774357557296753,
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step:39504, recons_loss:0.1704423874616623, g_loss:1.0022039413452148,
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step:39554, recons_loss:0.16372917592525482, g_loss:1.2564290761947632,
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step:39604, recons_loss:0.16393053531646729, g_loss:1.3440927267074585,
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step:39654, recons_loss:0.16566091775894165, g_loss:1.1281582117080688,
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step:39704, recons_loss:0.15687070786952972, g_loss:1.303870677947998,
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step:39804, recons_loss:0.16836391389369965, g_loss:1.2382501363754272,
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step:40004, recons_loss:0.16910912096500397, g_loss:1.6277318000793457,
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step:40104, recons_loss:0.15422435104846954, g_loss:1.1592564582824707,
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step:40154, recons_loss:0.16550102829933167, g_loss:1.0379054546356201,
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step:40204, recons_loss:0.1686752885580063, g_loss:1.01092529296875,
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77
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step:40391, recons_loss:0.1587696224451065, g_loss:1.200080394744873,
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step:40491, recons_loss:0.15604998171329498, g_loss:1.213355302810669,
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step:40541, recons_loss:0.15877558290958405, g_loss:1.1553395986557007,
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step:40841, recons_loss:0.1674100160598755, g_loss:1.238704800605774,
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step:40891, recons_loss:0.171054407954216, g_loss:1.2680851221084595,
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72
step:40941, recons_loss:0.16317126154899597, g_loss:0.985769510269165,
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477
step:40991, recons_loss:0.16659362614154816, g_loss:1.090324878692627,
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step:41041, recons_loss:0.15919825434684753, g_loss:1.4338067770004272,
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step:41091, recons_loss:0.16199302673339844, g_loss:1.4379931688308716,
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224
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step:41141, recons_loss:0.16921840608119965, g_loss:1.213666319847107,
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325
step:41191, recons_loss:0.17112474143505096, g_loss:1.2048460245132446,
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step:41278, recons_loss:0.16145439445972443, g_loss:1.2362388372421265,
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step:41828, recons_loss:0.16429153084754944, g_loss:1.056923508644104,
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step:41978, recons_loss:0.16162535548210144, g_loss:1.2257258892059326,
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308
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step:42078, recons_loss:0.15939779579639435, g_loss:1.237612009048462,
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step:42165, recons_loss:0.16412660479545593, g_loss:1.3838590383529663,
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step:42315, recons_loss:0.16959279775619507, g_loss:1.1186984777450562,
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793
step:42765, recons_loss:0.16456681489944458, g_loss:1.000180721282959,
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56
step:42815, recons_loss:0.16490492224693298, g_loss:1.2854104042053223,
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step:42865, recons_loss:0.17023895680904388, g_loss:1.0938291549682617,
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303
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step:43102, recons_loss:0.16371677815914154, g_loss:1.0078601837158203,
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d_loss:0.6059205532073975,real_loss:0.7461496591567993,fake_loss:0.4656915068626
step:43352, recons_loss:0.15976807475090027, g_loss:1.1933295726776123,
d_loss:0.5876142978668213,real_loss:0.6819185614585876,fake_loss:0.4933100342750
step:43402, recons_loss:0.16492795944213867, g_loss:1.1170234680175781,
d_loss:0.47050249576568604,real_loss:0.4254195988178253,fake_loss:0.515585422515
8691
step:43452, recons_loss:0.16144780814647675, g_loss:1.0816748142242432,
d_loss:0.4309960603713989,real_loss:0.36402636766433716,fake_loss:0.497965782880
7831
step:43502, recons_loss:0.1540285050868988, g_loss:1.0478724241256714,
d_loss:0.5386135578155518,real_loss:0.48175936937332153,fake_loss:0.595467805862
4268
step:43552, recons_loss:0.1656949371099472, g_loss:1.4124680757522583,
d_loss:0.5646504163742065,real_loss:0.7688021659851074,fake_loss:0.3604987263679
5044
step:43602, recons_loss:0.16398966312408447, g_loss:1.2032926082611084,
d_loss:0.4895611107349396,real_loss:0.483303427696228,fake_loss:0.49581879377365
11
step:43652, recons_loss:0.1675354242324829, g_loss:1.0520868301391602,
d_loss:0.49364808201789856,real_loss:0.48856261372566223,fake_loss:0.49873355031
01349
step:43702, recons_loss:0.1591913104057312, g_loss:1.3284924030303955,
d_loss:0.5468088388442993,real_loss:0.6906825304031372,fake_loss:0.4029351472854
614
step:43752, recons_loss:0.16115206480026245, g_loss:1.1348695755004883,
d_loss:0.5466934442520142,real_loss:0.6117609739303589,fake_loss:0.4816259145736
6943
```

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step:43802, recons_loss:0.15406376123428345, g_loss:1.3482462167739868,
d_loss:0.5225739479064941,real_loss:0.6767399907112122,fake_loss:0.3684079349040
985
step:43852, recons_loss:0.1667368859052658, g_loss:1.2040252685546875,
d_loss:0.5373305082321167,real_loss:0.538421094417572,fake_loss:0.53623998165130
step:43902, recons_loss:0.16708576679229736, g_loss:1.1651275157928467,
d_loss:0.5147638320922852,real_loss:0.5234681367874146,fake_loss:0.5060595273971
558
step:43952, recons_loss:0.16446352005004883, g_loss:1.0650829076766968,
d_loss:0.6023388504981995,real_loss:0.5918983221054077,fake_loss:0.6127793788909
912
step:44002, recons_loss:0.1561647355556488, g_loss:1.1850314140319824,
d_loss:0.48286521434783936,real_loss:0.4961041510105133,fake_loss:0.469626277685
1654
step:44039, recons_loss:0.1582423746585846, g_loss:1.056929349899292,
d_loss:0.5273017883300781,real_loss:0.47590872645378113,fake_loss:0.578694820404
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step:44089, recons_loss:0.16607506573200226, g_loss:1.0260570049285889,
d_loss:0.5118730068206787,real_loss:0.4915550947189331,fake_loss:0.5321909189224
step:44139, recons_loss:0.1685599982738495, g_loss:1.0070258378982544,
d_loss:0.5331525802612305,real_loss:0.47511428594589233,fake_loss:0.591190814971
step:44189, recons_loss:0.16748064756393433, g_loss:1.404924750328064,
d_loss:0.5455855131149292,real_loss:0.7076996564865112,fake_loss:0.3834714293479
step:44239, recons_loss:0.16050010919570923, g_loss:1.20475172996521,
d_loss:0.5584768652915955,real_loss:0.6299535632133484,fake_loss:0.4870001971721
step:44289, recons_loss:0.16196571290493011, g_loss:1.4883891344070435,
d_loss:0.49986714124679565,real_loss:0.6014989614486694,fake_loss:0.398235350847
24426
step:44339, recons_loss:0.15878373384475708, g_loss:1.1619256734848022,
d_loss:0.47909340262413025,real_loss:0.44906556606292725,fake_loss:0.50912123918
53333
step:44389, recons_loss:0.1587262749671936, g_loss:1.354241132736206,
d_loss:0.5810513496398926,real_loss:0.747715950012207,fake_loss:0.41438671946525
574
step:44439, recons_loss:0.1674373894929886, g_loss:1.1228420734405518,
d_loss:0.658415675163269,real_loss:0.7404707670211792,fake_loss:0.57636052370071
41
step:44489, recons_loss:0.16463030874729156, g_loss:1.138769507408142,
d_loss:0.4625259339809418,real_loss:0.4432242512702942,fake_loss:0.4818276166915
8936
step:44539, recons_loss:0.1666603833436966, g_loss:1.2824217081069946,
d_loss:0.4847474694252014,real_loss:0.5953422784805298,fake_loss:0.3741526603698
7305
step:44589, recons_loss:0.16728299856185913, g_loss:1.1834897994995117,
d_loss:0.5198346376419067,real_loss:0.5414581894874573,fake_loss:0.4982111454010
step:44639, recons_loss:0.15133875608444214, g_loss:1.091252088546753,
d_loss:0.4761039614677429,real_loss:0.38316479325294495,fake_loss:0.569043159484
8633
```

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step:44689, recons_loss:0.1695958375930786, g_loss:1.0514899492263794,
d_loss:0.576635479927063,real_loss:0.5850425958633423,fake_loss:0.56822830438613
step:44739, recons_loss:0.16407562792301178, g_loss:1.5375733375549316,
d_loss:0.6474841833114624,real_loss:0.9294689893722534,fake_loss:0.3654993176460
step:44789, recons_loss:0.15907980501651764, g_loss:1.053648829460144,
d_loss:0.5048787593841553,real_loss:0.4800102412700653,fake_loss:0.5297473073005
676
step:44839, recons_loss:0.155827134847641, g_loss:1.1058367490768433,
d_loss:0.591521143913269,real_loss:0.5949189066886902,fake_loss:0.58812344074249
27
step:44889, recons_loss:0.16414763033390045, g_loss:0.9609979391098022,
d_loss:0.5512511134147644,real_loss:0.4711591899394989,fake_loss:0.6313430070877
075
step:44939, recons_loss:0.1549811065196991, g_loss:1.0707014799118042,
d_loss:0.5581157207489014,real_loss:0.5475900173187256,fake_loss:0.5686414837837
219
step:44976, recons_loss:0.16133414208889008, g_loss:1.2243144512176514,
d_loss:0.4591977000236511,real_loss:0.48095136880874634,fake_loss:0.437444061040
8783
step:45026, recons_loss:0.16462309658527374, g_loss:1.1284233331680298,
d_loss:0.4760962724685669,real_loss:0.42710819840431213,fake_loss:0.525084376335
step:45076, recons_loss:0.15747462213039398, g_loss:1.1918216943740845,
d_loss:0.46249711513519287,real_loss:0.45421403646469116,fake_loss:0.47078022360
801697
step:45126, recons_loss:0.16593271493911743, g_loss:1.124077558517456,
d_loss:0.5562715530395508,real_loss:0.5967993140220642,fake_loss:0.5157438516616
step:45176, recons_loss:0.16566060483455658, g_loss:1.2122055292129517,
d_loss:0.48477476835250854,real_loss:0.5012145042419434,fake_loss:0.468335062265
3961
step:45226, recons_loss:0.16209927201271057, g_loss:1.3498649597167969,
d_loss:0.5121399760246277,real_loss:0.6599264740943909,fake_loss:0.3643534779548
645
step:45276, recons_loss:0.16652387380599976, g_loss:1.1187289953231812,
d_loss:0.5389703512191772,real_loss:0.48382675647735596,fake_loss:0.594114005565
6433
step:45326, recons_loss:0.15466760098934174, g_loss:1.0019001960754395,
d_loss:0.49006688594818115,real_loss:0.3828270435333252,fake_loss:0.597306728363
0371
step:45376, recons_loss:0.1672012209892273, g_loss:1.059525489807129,
d_loss:0.504267156124115,real_loss:0.4921804368495941,fake_loss:0.51635384559631
35
step:45426, recons_loss:0.1687934398651123, g_loss:1.2779444456100464,
d_loss:0.49712643027305603,real_loss:0.5847817659378052,fake_loss:0.409471094608
3069
step:45476, recons_loss:0.15800350904464722, g_loss:1.198578953742981,
d_loss:0.49804383516311646,real_loss:0.506556510925293,fake_loss:0.4895311594009
3994
step:45526, recons_loss:0.16309235990047455, g_loss:1.17098867893219,
d_loss:0.48280128836631775,real_loss:0.47509485483169556,fake_loss:0.49050772190
093994
```

```
step:45576, recons_loss:0.16781030595302582, g_loss:1.1991690397262573,
d_loss:0.5570144653320312,real_loss:0.6656476259231567,fake_loss:0.4483813047409
0576
step:45626, recons_loss:0.16802331805229187, g_loss:1.3738949298858643,
d_loss:0.5169374346733093,real_loss:0.6309735178947449,fake_loss:0.4029013216495
step:45676, recons_loss:0.16416822373867035, g_loss:1.3124454021453857,
d_loss:0.4635602533817291,real_loss:0.5141270756721497,fake_loss:0.4129934310913
086
step:45726, recons_loss:0.15926021337509155, g_loss:1.2769572734832764,
d_loss:0.45191967487335205,real_loss:0.4697609841823578,fake_loss:0.434078335762
0239
step:45776, recons_loss:0.1651155799627304, g_loss:1.307407259941101,
d_loss:0.5491771697998047,real_loss:0.6875104904174805,fake_loss:0.4108437895774
8413
step:45826, recons_loss:0.1652849167585373, g_loss:0.9761868119239807,
d_loss:0.5067199468612671,real_loss:0.38758981227874756,fake_loss:0.625850081443
7866
step:45876, recons_loss:0.16398359835147858, g_loss:1.1540288925170898,
d_loss:0.4762294292449951,real_loss:0.5167708396911621,fake_loss:0.4356880187988
step:45913, recons_loss:0.16272398829460144, g_loss:1.1959940195083618,
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d_loss:0.49021491408348083,real_loss:0.49577975273132324,fake_loss:0.48465007543
56384
step:46013, recons_loss:0.16148675978183746, g_loss:1.4786521196365356,
d_loss:0.5086693167686462,real_loss:0.6954256296157837,fake_loss:0.3219130337238
step:46063, recons_loss:0.1626308560371399, g_loss:1.1454678773880005,
d_loss:0.4836776852607727,real_loss:0.4822039008140564,fake_loss:0.4851514697074
step:46113, recons_loss:0.1597098410129547, g_loss:0.9860217571258545,
d_loss:0.524610161781311,real_loss:0.4445497393608093,fake_loss:0.60467064380645
75
step:46163, recons_loss:0.1665438860654831, g_loss:1.1937345266342163,
d_loss:0.4844262897968292,real_loss:0.5190790891647339,fake_loss:0.4497734904289
2456
step:46213, recons_loss:0.1645931899547577, g_loss:1.3306384086608887,
d_loss:0.5613602995872498,real_loss:0.5793763399124146,fake_loss:0.5433442592620
85
step:46263, recons_loss:0.15619629621505737, g_loss:1.1857887506484985,
d_loss:0.5371503829956055,real_loss:0.6117912530899048,fake_loss:0.4625095725059
509
step:46313, recons_loss:0.16209284961223602, g_loss:1.242416501045227,
d_loss:0.47279465198516846,real_loss:0.5093227028846741,fake_loss:0.436266630887
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step:46363, recons_loss:0.16055186092853546, g_loss:1.1842477321624756,
d_loss:0.47708070278167725,real_loss:0.4953749477863312,fake_loss:0.458786427974
7009
step:46413, recons_loss:0.17152346670627594, g_loss:1.34866464138031,
d_loss:0.5435581207275391,real_loss:0.6609878540039062,fake_loss:0.4261283874511
719
```

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step:46463, recons_loss:0.1634044200181961, g_loss:1.1645945310592651,
d_loss:0.5142166614532471,real_loss:0.4666444659233093,fake_loss:0.5617888569831
848
step:46513, recons_loss:0.15997639298439026, g_loss:0.981421709060669,
d_loss:0.5069137811660767,real_loss:0.4356178045272827,fake_loss:0.5782098174095
step:46563, recons_loss:0.15932372212409973, g_loss:1.2295382022857666,
d_loss:0.5008784532546997,real_loss:0.5095469951629639,fake_loss:0.4922099113464
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step:46613, recons_loss:0.16221728920936584, g_loss:1.1940866708755493,
d_loss:0.5599356889724731,real_loss:0.6396810412406921,fake_loss:0.4801903665065
7654
step:46663, recons_loss:0.1674373298883438, g_loss:1.2029974460601807,
d_loss:0.4829140901565552,real_loss:0.4553365707397461,fake_loss:0.5104916095733
643
step:46713, recons_loss:0.16152897477149963, g_loss:1.0018162727355957,
d_loss:0.518041729927063,real_loss:0.41616278886795044,fake_loss:0.6199207305908
203
step:46763, recons_loss:0.15415658056735992, g_loss:1.529225468635559,
d_loss:0.5474956035614014,real_loss:0.7232856750488281,fake_loss:0.3717055916786
194
step:46813, recons_loss:0.15765976905822754, g_loss:1.0591869354248047,
d_loss:0.5527076721191406,real_loss:0.4606975317001343,fake_loss:0.6447178721427
step:46850, recons_loss:0.1591624915599823, g_loss:1.1607264280319214,
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step:46900, recons_loss:0.15958194434642792, g_loss:1.2140296697616577,
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step:47000, recons_loss:0.15807421505451202, g_loss:1.0984832048416138,
d_loss:0.5300177931785583,real_loss:0.47215232253074646,fake_loss:0.587883234024
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step:47050, recons_loss:0.16153103113174438, g_loss:1.0598784685134888,
d_loss:0.675169825553894,real_loss:0.5820367336273193,fake_loss:0.76830297708511
35
step:47100, recons_loss:0.15887823700904846, g_loss:1.373926043510437,
d_loss:0.4520590901374817,real_loss:0.5154848098754883,fake_loss:0.3886333405971
527
step:47150, recons_loss:0.16549332439899445, g_loss:1.2604767084121704,
d_loss:0.44548118114471436,real_loss:0.42559969425201416,fake_loss:0.46536269783
973694
```

```
KeyboardInterrupt Traceback (most recent call last)

Input In [8], in <cell line: 12>()
    43 real_loss = loss_fn(discriminator(gt_images),labels_one)
    44 fake_loss = loss_fn(discriminator(pred_images.detach()),labels_zero)
---> 45 d_loss = 0.5*(real_loss + fake_loss)
    47 d_loss.backward()
    48 d_optimizer.step()
```

KeyboardInterrupt: