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3.55 MB ...



Painting with StyleGAN 🎨

Hello 🙌 welcome to the painting with stylegan notebook. This notebook is intended to

1. Help explore stylegan's latent space using variational autoencoders as a sort of filter and
2. Produce animations interpolating through stylegan's latent space using VAE "palettes" as a way to more graphically interface with the complicated space

The code below will train a VAE to represent portions of SG's 512-D latent space in 2-D. This representation will be plotted on a regular x/y axis for you to explore, and provides the optional injection of 'color' to your palette to explore less likely sections of the space. Once happy with a palette, get to painting! Draw a line through the space to interp from one image to another, draw a curve to pass through a third section, or draw a circle to create an interp that starts in one location and circles away and around back to the beginning to create loops. Hope you have fun painting! -@jmoso13

Tutorial Video: <https://youtu.be/pkYHMPoZrkg>

Download Things

```
In [1]: !nvidia-smi -L
```

GPU 0: Tesla T4 (UUID: GPU-d406c2da-79e9-44c8-bbdc-0b0085a27245)

```
In [2]: #@title Choose StyleGAN and Tensor Package Versions
import re
import os

supported_versions = 'stylegan3 | pytorch' #@param ['stylegan2 | tensorflow', 'stylegan3 | pytorch']
stylegan_version = int(re.findall('[0-9]+', supported_versions)[0])
tensor_pkg_version = supported_versions.split(' | ')[-1]

print(f'using\nstylegan version: {stylegan_version}\ntensor package version: {tensor_pkg_version}')
```

```
print(' using stylegan version: {stylegan_version} tensor package version: {tensor_pkg_version} /
```

```
using
stylegan version: 3
tensor package version: pytorch
```

In [3]:

```
##@title Ensure Version Compatibility
if os.getcwd() == '/content':
    if tensor_pkg_version == 'tensorflow':
        %tensorflow_version 1.x
        !pip install h5py==2.10.0
    elif tensor_pkg_version == 'pytorch':
        !pip install Ninja opensimplex
```

Looking in indexes: <https://pypi.org/simple>, <https://us-python.pkg.dev/colab-wheels/public/simple/>

Collecting Ninja

Downloading ninja-1.10.2.4-py2.py3-none-manylinux_2_5_x86_64.manylinux1_x86_64.whl (120 kB)

|██| 120 kB 29.0 MB/s

Collecting opensimplex

Downloading opensimplex-0.4.2-py3-none-any.whl (17 kB)

Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.7/dist-packages (from opensimplex) (1.21.6)

Installing collected packages: opensimplex, Ninja

Successfully installed Ninja-1.10.2.4 opensimplex-0.4.2

In [4]:

```
##@title Clone Repos
%%capture
if os.getcwd() == '/content':
    !git clone https://github.com/jmoso13/mod-drawing-tool.git
    !git clone https://github.com/jmoso13/StyleGAN2-Latent-Tool.git
    if stylegan_version == 2:
        !git clone https://github.com/pbaylies/stylegan2-ada.git
        %cd /content/stylegan2-ada/
    elif stylegan_version == 3:
        !git clone https://github.com/dvschultz/stylegan3
        %cd stylegan3

    !pip install -e /content/StyleGAN2-Latent-Tool/
    %mv /content/StyleGAN2-Latent-Tool/latent_utils .
    %mv /content/StyleGAN2-Latent-Tool/js_latent_utils.egg-info .
    %mv /content/mod-drawing-tool/mods .
```

Import Things

import things

```
In [5]: if tensor_pkg_version == 'tensorflow':
import tensorflow as tf
print(tf.__version__)
from latent_utils.latent_utils import get_vae_dict, build_decoder, make_decoder_input, decode_pic, get_model_ca
from latent_utils.gan_utils import convertZtoW
elif tensor_pkg_version == 'pytorch':
import torch
import torch.nn as nn
import torch.nn.functional as F
import torch.optim as optim
from torch.utils.data import DataLoader, TensorDataset
import legacy
from latent_utils.latent_utils_torch import VAE
import dnnlib
import requests
import pickle as pkl
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt
from mods.paths import CirclePath, LinePath
from mods.modulated_path import ModulatedPath
from mods import receivers, translators, voices
```

Load Model

Here is where you can specify location of a stylegan2 pretrained pkl from file or from url

```
In [6]: ##@title Point to location of network-snapshot pkl
use_drive = True ##@param{type: 'boolean'}
##@markdown Leave this ^^ checked to connect to google drive
if use_drive:
    from google.colab import drive
    drive.mount('/content/drive')
    root_path = '/content/drive/MyDrive/AI/StyleGan_Drawing'
else:
    root_path = os.getcwd()

def createPath(filepath):
    os.makedirs(filepath, exist_ok=True)
```

```

model_path = f'{root_path}/models'
createPath(model_path)
palette_path = f'{model_path}/vae_palettes'
createPath(palette_path)
network_pkl_path = f'{model_path}/network_pkls'
createPath(network_pkl_path)
sketches_path = f'{root_path}/sketches_out'
createPath(sketches_path)
reel_path = f'{root_path}/reel'
createPath(reel_path)

network_pkl = "https://api.ngc.nvidia.com/v2/models/nvidia/research/stylegan3/versions/1/files/stylegan3-t-metfaces-1024x1024.pkl"

if stylegan_version == 2:
    # Start TF session and load network_pkl
    dnnlib.tflib.init_tf()
    with dnnlib.util.open_url(network_pkl) as fp:
        _G, _D, Gs = pkl.load(fp)
    # Some setup
    noise_vars = [var for name, var in Gs.components.synthesis.vars.items() if name.startswith('noise')]
    Gs_kwargs = dnnlib.EasyDict()
    Gs_kwargs.randomize_noise = False
    Gs_kwargs.output_transform = dict(func=dnnlib.tflib.convert_images_to_uint8, nchw_to_nhwc=True)
elif stylegan_version == 3:
    device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
    print(f'torch_device: {device}')
    with dnnlib.util.open_url(network_pkl) as f:
        G = legacy.load_network_pkl(f)['G_ema'].to(device)

```

Mounted at /content/drive

torch_device: cuda

Downloading https://api.ngc.nvidia.com/v2/models/nvidia/research/stylegan3/versions/1/files/stylegan3-t-metfaces-1024x1024.pkl ... done

Create VAE Palette

In [7]:

```

#@title Build Train/Test Data for our VAE,
#@markdown sampled from normal Z space (mean==0, std==1)
#@markdown then converted to GAN disentangled W space
truncation_psi = 0.7#@param{type:'number'}
truncation_cutoff = False#@param{type:'boolean'}
if truncation_cutoff:

```

```

if truncation_cutoff:
    truncation_cutoff_val = 100#@param{type:'number'}
else:
    truncation_cutoff_val = None
print(truncation_cutoff_val)
#@markdown these parameters have to do with bounding the GAN space, leave at defaults or try lowering/raising the

# Build val data set from 15000 random samples of Z space
val_data_z = np.random.randn(15000, 512)
val_data = list()
i = 0

# Convert to W space
if tensor_pkg_version == 'tensorflow':
    print('building val set...')
    for vi in val_data_z:
        if i % 5000 == 0:
            print(i, ' datapoints built')
            latent = vi.reshape(1,-1)
            val_data.append(convertZtoW(Gs, latent)[: , 0][0])
            i += 1
    val_data = np.array(val_data)
elif tensor_pkg_version == 'pytorch':
    zs = torch.from_numpy(val_data_z).to(device)
    ws = G.mapping(z=zs, c=None, truncation_psi=truncation_psi, truncation_cutoff=truncation_cutoff_val)
    _ = G.synthesis(ws[:1]) # warm up
    val_data = ws[:, 0, :].detach().cpu().numpy()

# Build train dataset from 100000 random samples of Z space
train_data_z = np.random.randn(100000, 512)
train_data = list()
i = 0

# Convert to W space
if tensor_pkg_version == 'tensorflow':
    print('building train set...')
    for ti in train_data_z:
        if i % 5000 == 0:
            print(i, ' datapoints built')
            latent = ti.reshape(1,-1)
            train_data.append(convertZtoW(Gs, latent)[: , 0][0])
            i += 1
    train_data = np.array(train_data)
elif tensor_pkg_version == 'pytorch':
    zs = torch.from_numpy(train_data_z).to(device)
    ws = G.mapping(z=zs, c=None, truncation_psi=truncation_psi, truncation_cutoff=truncation_cutoff_val)

```

```

_ = G.synthesis(ws[:1]) # warm up
train_data = ws[:, 0, :].detach().cpu().numpy()

# Inspect
print(f"Train Size: {train_data.shape}\nVal Size: {val_data.shape}")

```

None

Setting up PyTorch plugin "bias_act_plugin"... Done.
 Setting up PyTorch plugin "filtered_lrelu_plugin"... Done.
 Train Size: (100000, 512)
 Val Size: (15000, 512)

In [8]:

```

##title Setup for VAE
model_name = 'styleGAN_VAE' ##param{type: 'string'}
nn_vae = False ##param{type: 'boolean'}
##markdown nn_vae is a variant on a vae only usable with tensorflow

if tensor_pkg_version == 'tensorflow':
    hidden_layers = 8
    lowest_dim = 2

    vae_dict = get_vae_dict(512, hidden_layers, lowest_dim, model_name, batch_norm=True, nn_vae=nn_vae)
    vae = vae_dict['vae']
    encoder = vae_dict['encoder']

elif tensor_pkg_version == 'pytorch':
    vae = VAE().to(device)
    optimizer = optim.Adam(vae.parameters(), lr=1e-4)
    train_tensor = torch.Tensor(train_data).to(device)
    train_dataset = TensorDataset(train_tensor)
    val_tensor = torch.Tensor(val_data).to(device)
    print(vae)

```

VAE(

```

  (fc1): Linear(in_features=512, out_features=506, bias=True)
  (fc2): Linear(in_features=506, out_features=487, bias=True)
  (fc3): Linear(in_features=487, out_features=455, bias=True)
  (fc4): Linear(in_features=455, out_features=411, bias=True)
  (fc5): Linear(in_features=411, out_features=355, bias=True)
  (fc6): Linear(in_features=355, out_features=285, bias=True)
  (fc7): Linear(in_features=285, out_features=203, bias=True)
  (fc8): Linear(in_features=203, out_features=109, bias=True)
  (fc_mu): Linear(in_features=109, out_features=2, bias=True)
  (fc_var): Linear(in_features=109, out_features=2, bias=True)
  (fcr8): Linear(in_features=2, out_features=109, bias=True)

```

```

(fcr7): Linear(in_features=109, out_features=203, bias=True)
(fcr6): Linear(in_features=203, out_features=285, bias=True)
(fcr5): Linear(in_features=285, out_features=355, bias=True)
(fcr4): Linear(in_features=355, out_features=411, bias=True)
(fcr3): Linear(in_features=411, out_features=455, bias=True)
(fcr2): Linear(in_features=455, out_features=487, bias=True)
(fcr1): Linear(in_features=487, out_features=506, bias=True)
(fcr_out): Linear(in_features=506, out_features=512, bias=True)
(bn1): BatchNorm1d(506, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn2): BatchNorm1d(487, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn3): BatchNorm1d(455, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn4): BatchNorm1d(411, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn5): BatchNorm1d(355, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn6): BatchNorm1d(285, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn7): BatchNorm1d(203, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bn8): BatchNorm1d(109, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr1): BatchNorm1d(506, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr2): BatchNorm1d(487, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr3): BatchNorm1d(455, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr4): BatchNorm1d(411, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr5): BatchNorm1d(355, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr6): BatchNorm1d(285, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr7): BatchNorm1d(203, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(bnr8): BatchNorm1d(109, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
)

```

In [9]:

```

#@title Train VAE Palette
mode = 'train' #@param['train', 'load']
load_palette_path = '' #@param{type: 'string'}
#@markdown Load_palette_path - if mode == load, load palette from this path instead of training. this parameter

#@markdown Hyperparameters (shouldn't need to tweak unless interested)
batch_size = 256 #@param{type: 'number'}
epochs = 3000 #@param{type: 'number'}
kld_weight = 0.6 #@param{type: 'number'}
recons_weight = 0.4 #@param{type: 'number'}
patience = 15 #@param{type: 'number'}
#@markdown batch size - how many training examples per batch, more means faster epochs but slower convergence

#@markdown epochs - how many times the training will loop through the entire dataset, interacts with patience

#@markdown kld_weight - controls how much the latent space will be normally distributed (should be a value between 0 and 1)

#@markdown patience - controls how many epochs VAE will continue to train for without improvement before ending

```



```

if mode == 'train':
    if tensor_pkg_version == 'tensorflow':
        # Train
        es,mc = get_model_callbacks(model_name, patience=patience, model_dir_path=palette_path) # Patience determines
        vae.fit(train_data,
                epochs=epochs,
                batch_size=batch_size,
                shuffle=True,
                validation_data=(val_data ,None),
                callbacks=[es, mc])

    elif tensor_pkg_version == 'pytorch':
        dataloader = DataLoader(train_dataset, batch_size = batch_size, shuffle = True)
        p_count = 0
        smallest_v_loss = 1000000000

        for epoch in range(epochs):
            running_loss = 0.0
            vae.train()
            for i, data in enumerate(dataloader):
                # get the inputs; data is a list of [inputs, labels]
                inputs = data[0]

                # zero the parameter gradients
                optimizer.zero_grad()

                # forward + backward + optimize
                outputs, mu, log_var = vae(inputs)
                recons_loss = F.mse_loss(outputs, inputs)*512
                kld_loss = -0.5 * torch.sum(1 + log_var - mu ** 2 - log_var.exp(), dim = -1)
                loss = torch.mean(recons_weight*recons_loss + kld_weight*kld_loss)
                loss.backward()
                optimizer.step()

                # print statistics
                running_loss += loss.item()
                if i % 40 == 39: # print every 2000 mini-batches
                    print(f'[{epoch + 1}, {i + 1:5d}] loss: {running_loss / 40:.3f}, kld_loss: {torch.mean(kld_loss)}, re
                        running_loss = 0.0
            vae.eval()
            p_count += 1
            with torch.no_grad():
                v_outputs, v_mu, v_log_var = vae(val_tensor)
                v_recons_loss = F.mse_loss(v_outputs, val_tensor)*512
                v_kld_loss = -0.5 * torch.sum(1 + v_log_var - v_mu ** 2 - v_log_var.exp(), dim = -1)

```

```

v_loss = torch.mean(recons_weight*v_recons_loss + kld_weight*v_kld_loss)
if v_loss < smallest_v_loss:
    smallest_v_loss = v_loss
    p_count = 0
    torch.save(vae.state_dict(), f'{palette_path}/best_{model_name}.pt')
print(f'\n\n EPOCH: {epoch + 1} | VAL LOSS: {v_loss} | PATIENCE COUNT: {p_count}\n')
if p_count > patience:
    print(f'Patience reached at {epoch} epochs')
    break

if tensor_pkg_version == 'tensorflow':
    vae.load_weights(f'{palette_path}/best_{model_name}.h5')
elif tensor_pkg_version == 'pytorch':
    vae.load_state_dict(torch.load(f'{palette_path}/best_{model_name}.pt'))
    vae.eval()
elif mode == 'load':
    if tensor_pkg_version == 'tensorflow':
        vae.load_weights(load_palette_path)
    elif tensor_pkg_version == 'pytorch':
        vae.load_state_dict(torch.load(load_palette_path))
        vae.eval()
else:
    print('mode must be either train or load')

inject_image = False

```

```

[1, 40] loss: 76.129, kld_loss: 0.2903570532798767, recons_loss: 0.2964455783367157
[1, 80] loss: 58.422, kld_loss: 0.2554685175418854, recons_loss: 0.27546292543411255
[1, 120] loss: 56.821, kld_loss: 0.2197161465883255, recons_loss: 0.27393144369125366
[1, 160] loss: 56.252, kld_loss: 0.21578630805015564, recons_loss: 0.2735563814640045
[1, 200] loss: 56.016, kld_loss: 0.17220744490623474, recons_loss: 0.2734901010990143
[1, 240] loss: 55.822, kld_loss: 0.15580639243125916, recons_loss: 0.27110785245895386
[1, 280] loss: 55.795, kld_loss: 0.13266590237617493, recons_loss: 0.27072009444236755
[1, 320] loss: 55.707, kld_loss: 0.12994398176670074, recons_loss: 0.27399173378944397
[1, 360] loss: 55.692, kld_loss: 0.1313321590423584, recons_loss: 0.2721732258796692

```

EPOCH: 1 | VAL LOSS: 55.557559967041016 | PATIENCE COUNT: 0

```

[2, 40] loss: 55.597, kld_loss: 0.11260807514190674, recons_loss: 0.2711668610572815
[2, 80] loss: 55.601, kld_loss: 0.1158970519900322, recons_loss: 0.27207082509994507
[2, 120] loss: 55.702, kld_loss: 0.0984077900648117, recons_loss: 0.27059292793273926
[2, 160] loss: 55.507, kld_loss: 0.09109094738960266, recons_loss: 0.2731536030769348
[2, 200] loss: 55.558, kld_loss: 0.10085563361644745, recons_loss: 0.2710857391357422
[2, 240] loss: 55.620, kld_loss: 0.08932552486658096, recons_loss: 0.27039170265197754
[2, 280] loss: 55.540, kld_loss: 0.08288046717643738, recons_loss: 0.2743988633155823

```

```
-----
[2, 320] loss: 55.561, kld_loss: 0.08486554771661758, recons_loss: 0.2733725309371948
[2, 360] loss: 55.402, kld_loss: 0.08704642206430435, recons_loss: 0.2668405771255493
```

EPOCH: 2 | VAL LOSS: 55.425968170166016 | PATIENCE COUNT: 0

```
[3, 40] loss: 55.447, kld_loss: 0.08538511395454407, recons_loss: 0.2689729332923889
[3, 80] loss: 55.475, kld_loss: 0.07409688830375671, recons_loss: 0.2710746228694916
[3, 120] loss: 55.455, kld_loss: 0.07390269637107849, recons_loss: 0.27161088585853577
[3, 160] loss: 55.500, kld_loss: 0.0760793536901474, recons_loss: 0.2722087800502777
[3, 200] loss: 55.537, kld_loss: 0.0765325054526329, recons_loss: 0.2680805027484894
[3, 240] loss: 55.572, kld_loss: 0.07642684876918793, recons_loss: 0.2702779769897461
[3, 280] loss: 55.345, kld_loss: 0.06952685117721558, recons_loss: 0.27043288946151733
[3, 320] loss: 55.384, kld_loss: 0.06605124473571777, recons_loss: 0.27566713094711304
[3, 360] loss: 55.517, kld_loss: 0.07015229016542435, recons_loss: 0.27417653799057007
```

EPOCH: 3 | VAL LOSS: 55.369140625 | PATIENCE COUNT: 0

```
[4, 40] loss: 55.496, kld_loss: 0.07571302354335785, recons_loss: 0.2730618119239807
[4, 80] loss: 55.437, kld_loss: 0.08280851691961288, recons_loss: 0.2698575258255005
[4, 120] loss: 55.404, kld_loss: 0.09213213622570038, recons_loss: 0.27669334411621094
[4, 160] loss: 55.413, kld_loss: 0.1030568927526474, recons_loss: 0.2700595259666443
[4, 200] loss: 55.405, kld_loss: 0.10271427035331726, recons_loss: 0.27271586656570435
[4, 240] loss: 55.473, kld_loss: 0.12748520076274872, recons_loss: 0.27047672867774963
[4, 280] loss: 55.284, kld_loss: 0.16022226214408875, recons_loss: 0.26707878708839417
[4, 320] loss: 55.346, kld_loss: 0.20656771957874298, recons_loss: 0.2689785063266754
[4, 360] loss: 55.495, kld_loss: 0.25362884998321533, recons_loss: 0.27051979303359985
```

EPOCH: 4 | VAL LOSS: 55.263999938964844 | PATIENCE COUNT: 0

```
[5, 40] loss: 55.432, kld_loss: 0.3308942914009094, recons_loss: 0.2698929011821747
[5, 80] loss: 55.193, kld_loss: 0.3876503109931946, recons_loss: 0.2672460079193115
[5, 120] loss: 55.213, kld_loss: 0.42608749866485596, recons_loss: 0.2660976052284241
[5, 160] loss: 55.246, kld_loss: 0.43858978152275085, recons_loss: 0.26961085200309753
[5, 200] loss: 55.278, kld_loss: 0.43350136280059814, recons_loss: 0.26573991775512695
[5, 240] loss: 55.278, kld_loss: 0.47544968128204346, recons_loss: 0.2678936719894409
[5, 280] loss: 55.120, kld_loss: 0.47536227107048035, recons_loss: 0.26232999563217163
[5, 320] loss: 55.268, kld_loss: 0.4637698531150818, recons_loss: 0.2669902741909027
[5, 360] loss: 55.133, kld_loss: 0.5053991079330444, recons_loss: 0.2680676281452179
```

EPOCH: 5 | VAL LOSS: 55.102657318115234 | PATIENCE COUNT: 0

```
[6, 40] loss: 55.197, kld_loss: 0.5488476157188416, recons_loss: 0.26834040880203247
[6, 80] loss: 55.133, kld_loss: 0.5108091831207275, recons_loss: 0.26619797945022583
[6, 120] loss: 55.112, kld_loss: 0.5206454992294312, recons_loss: 0.2679968476295471
[6, 160] loss: 55.097, kld_loss: 0.5093793272972107, recons_loss: 0.26759395003318787
[6, 200] loss: 55.226, kld_loss: 0.5290747284889221, recons_loss: 0.26602789759635925
[6, 240] loss: 55.073, kld_loss: 0.5543684363365173, recons_loss: 0.26863667368888855
[6, 280] loss: 55.126, kld_loss: 0.5530951023101807, recons_loss: 0.26542726159095764
[6, 320] loss: 55.225, kld_loss: 0.5555958151817322, recons_loss: 0.26905691623687744
[6, 360] loss: 55.057, kld_loss: 0.5555928945541382, recons_loss: 0.264222651720047
```

EPOCH: 6 | VAL LOSS: 55.062774658203125 | PATIENCE COUNT: 0

```
[7, 40] loss: 55.148, kld_loss: 0.5620707869529724, recons_loss: 0.2682502865791321
[7, 80] loss: 55.195, kld_loss: 0.5357046127319336, recons_loss: 0.26712173223495483
[7, 120] loss: 55.092, kld_loss: 0.5654489994049072, recons_loss: 0.2666131556034088
[7, 160] loss: 55.061, kld_loss: 0.5575853586196899, recons_loss: 0.26699721813201904
[7, 200] loss: 55.136, kld_loss: 0.5718612670898438, recons_loss: 0.2648574709892273
[7, 240] loss: 55.101, kld_loss: 0.5785601139068604, recons_loss: 0.26548025012016296
[7, 280] loss: 55.084, kld_loss: 0.5616102814674377, recons_loss: 0.26966503262519836
[7, 320] loss: 55.019, kld_loss: 0.5454025268554688, recons_loss: 0.2660474181175232
[7, 360] loss: 55.102, kld_loss: 0.5854383707046509, recons_loss: 0.2677463889122009
```

EPOCH: 7 | VAL LOSS: 55.036067962646484 | PATIENCE COUNT: 0

```
[8, 40] loss: 55.149, kld_loss: 0.5653578042984009, recons_loss: 0.2712545096874237
[8, 80] loss: 54.978, kld_loss: 0.572188138961792, recons_loss: 0.2692674398422241
[8, 120] loss: 55.066, kld_loss: 0.5436451435089111, recons_loss: 0.27065637707710266
[8, 160] loss: 55.007, kld_loss: 0.6302865743637085, recons_loss: 0.26925647258758545
[8, 200] loss: 55.164, kld_loss: 0.5843955874443054, recons_loss: 0.26967018842697144
[8, 240] loss: 55.024, kld_loss: 0.5825904607772827, recons_loss: 0.2686079442501068
[8, 280] loss: 55.111, kld_loss: 0.6031419634819031, recons_loss: 0.2659909725189209
[8, 320] loss: 55.128, kld_loss: 0.5612936019897461, recons_loss: 0.2682812213897705
[8, 360] loss: 54.987, kld_loss: 0.5861684679985046, recons_loss: 0.2658705711364746
```

EPOCH: 8 | VAL LOSS: 54.99734115600586 | PATIENCE COUNT: 0

```
[9, 40] loss: 55.077, kld_loss: 0.6364258527755737, recons_loss: 0.26603659987449646
[9, 80] loss: 55.019, kld_loss: 0.6231245398521423, recons_loss: 0.2640683054924011
[9, 120] loss: 55.102, kld_loss: 0.6412173509597778, recons_loss: 0.26635777950286865
[9, 160] loss: 55.129, kld_loss: 0.6814014315605164, recons_loss: 0.26642996072769165
[9, 200] loss: 54.973, kld_loss: 0.6782513856887817, recons_loss: 0.26383936405181885
[9, 240] loss: 55.110, kld_loss: 0.6949008107185364, recons_loss: 0.26772069931030273
[9, 280] loss: 54.954, kld_loss: 0.7160824537277222, recons_loss: 0.26361867785453796
```

```
[9, 320] loss: 55.053, kld_loss: 0.7467042207717896, recons_loss: 0.26874351501464844
[9, 360] loss: 54.898, kld_loss: 0.7146860361099243, recons_loss: 0.2675425708293915
```

EPOCH: 9 | VAL LOSS: 54.9125862121582 | PATIENCE COUNT: 0

```
[10, 40] loss: 54.862, kld_loss: 0.7886832356452942, recons_loss: 0.2660544812679291
[10, 80] loss: 54.991, kld_loss: 0.8071591258049011, recons_loss: 0.26654666662216187
[10, 120] loss: 54.926, kld_loss: 0.815834641456604, recons_loss: 0.2676157057285309
[10, 160] loss: 54.971, kld_loss: 0.8238487243652344, recons_loss: 0.26946601271629333
[10, 200] loss: 55.024, kld_loss: 0.8268731236457825, recons_loss: 0.26226329803466797
[10, 240] loss: 55.052, kld_loss: 0.8747811317443848, recons_loss: 0.2656984329223633
[10, 280] loss: 54.913, kld_loss: 0.8913027048110962, recons_loss: 0.267099529504776
[10, 320] loss: 54.964, kld_loss: 0.8906019926071167, recons_loss: 0.2636944651603699
[10, 360] loss: 54.971, kld_loss: 0.8941373825073242, recons_loss: 0.26796871423721313
```

EPOCH: 10 | VAL LOSS: 54.882598876953125 | PATIENCE COUNT: 0

```
[11, 40] loss: 54.873, kld_loss: 0.904236376285553, recons_loss: 0.2641531527042389
[11, 80] loss: 54.987, kld_loss: 0.9510788917541504, recons_loss: 0.263633131980896
[11, 120] loss: 54.901, kld_loss: 0.9330838918685913, recons_loss: 0.26677176356315613
[11, 160] loss: 54.923, kld_loss: 0.9327523708343506, recons_loss: 0.2660965323448181
[11, 200] loss: 54.956, kld_loss: 0.9585268497467041, recons_loss: 0.26606321334838867
[11, 240] loss: 54.881, kld_loss: 0.9534385204315186, recons_loss: 0.26703011989593506
[11, 280] loss: 54.949, kld_loss: 0.9775246381759644, recons_loss: 0.26414528489112854
[11, 320] loss: 54.943, kld_loss: 0.9750174880027771, recons_loss: 0.26737213134765625
[11, 360] loss: 54.965, kld_loss: 0.9783371090888977, recons_loss: 0.26603394746780396
```

EPOCH: 11 | VAL LOSS: 54.82971954345703 | PATIENCE COUNT: 0

```
[12, 40] loss: 54.946, kld_loss: 0.9415304064750671, recons_loss: 0.2644885182380676
[12, 80] loss: 54.995, kld_loss: 1.0001705884933472, recons_loss: 0.26292964816093445
[12, 120] loss: 54.855, kld_loss: 0.9990819096565247, recons_loss: 0.2674914002418518
[12, 160] loss: 54.843, kld_loss: 1.0113457441329956, recons_loss: 0.2616955637931824
[12, 200] loss: 54.817, kld_loss: 1.0387428998947144, recons_loss: 0.2654232680797577
[12, 240] loss: 54.918, kld_loss: 0.9941197633743286, recons_loss: 0.2677932381629944
[12, 280] loss: 54.871, kld_loss: 1.0130655765533447, recons_loss: 0.26704931259155273
[12, 320] loss: 54.939, kld_loss: 1.03344444046020508, recons_loss: 0.2637174427509308
[12, 360] loss: 54.916, kld_loss: 1.0641515254974365, recons_loss: 0.26730483770370483
```

EPOCH: 12 | VAL LOSS: 54.80390930175781 | PATIENCE COUNT: 0

```
[13, 40] loss: 54.882, kld_loss: 1.0001705884933472, recons_loss: 0.26292964816093445
[13, 80] loss: 54.855, kld_loss: 0.9990819096565247, recons_loss: 0.2674914002418518
[13, 120] loss: 54.843, kld_loss: 1.0113457441329956, recons_loss: 0.2616955637931824
[13, 160] loss: 54.817, kld_loss: 1.0387428998947144, recons_loss: 0.2654232680797577
[13, 200] loss: 54.918, kld_loss: 0.9941197633743286, recons_loss: 0.2677932381629944
[13, 280] loss: 54.871, kld_loss: 1.0130655765533447, recons_loss: 0.26704931259155273
[13, 320] loss: 54.939, kld_loss: 1.03344444046020508, recons_loss: 0.2637174427509308
[13, 360] loss: 54.916, kld_loss: 1.0641515254974365, recons_loss: 0.26730483770370483
```

```
[13, 40] loss: 54.980, kld_loss: 1.089191198348999, recons_loss: 0.2656051218509674
[13, 80] loss: 54.847, kld_loss: 1.099196195602417, recons_loss: 0.26642733812332153
[13, 120] loss: 54.847, kld_loss: 1.1023728847503662, recons_loss: 0.2619068920612335
[13, 160] loss: 54.797, kld_loss: 1.1067484617233276, recons_loss: 0.2631186246871948
[13, 200] loss: 54.936, kld_loss: 1.1483182907104492, recons_loss: 0.2668784260749817
[13, 240] loss: 54.885, kld_loss: 1.1193692684173584, recons_loss: 0.2641102075576782
[13, 280] loss: 54.891, kld_loss: 1.1143068075180054, recons_loss: 0.26162534952163696
[13, 320] loss: 54.852, kld_loss: 1.1516132354736328, recons_loss: 0.26194867491722107
[13, 360] loss: 54.887, kld_loss: 1.1535227298736572, recons_loss: 0.2630313038825989
```

EPOCH: 13 | VAL LOSS: 54.773250579833984 | PATIENCE COUNT: 0

```
[14, 40] loss: 54.829, kld_loss: 1.1210051774978638, recons_loss: 0.265893816947937
[14, 80] loss: 54.767, kld_loss: 1.1297496557235718, recons_loss: 0.26690584421157837
[14, 120] loss: 54.858, kld_loss: 1.1497455835342407, recons_loss: 0.2640554904937744
[14, 160] loss: 54.826, kld_loss: 1.1389753818511963, recons_loss: 0.2642887830734253
[14, 200] loss: 54.895, kld_loss: 1.1639745235443115, recons_loss: 0.261797159910202
[14, 240] loss: 54.807, kld_loss: 1.1647284030914307, recons_loss: 0.2629055976867676
[14, 280] loss: 54.850, kld_loss: 1.1461372375488281, recons_loss: 0.26541125774383545
[14, 320] loss: 54.876, kld_loss: 1.1861079931259155, recons_loss: 0.26354479789733887
[14, 360] loss: 54.877, kld_loss: 1.1803724765777588, recons_loss: 0.2663358747959137
```

EPOCH: 14 | VAL LOSS: 54.77650451660156 | PATIENCE COUNT: 1

```
[15, 40] loss: 54.765, kld_loss: 1.150761604309082, recons_loss: 0.26411765813827515
[15, 80] loss: 54.891, kld_loss: 1.1217859983444214, recons_loss: 0.2660219371318817
[15, 120] loss: 54.787, kld_loss: 1.1922612190246582, recons_loss: 0.262820839881897
[15, 160] loss: 54.811, kld_loss: 1.1153843402862549, recons_loss: 0.2635597884654999
[15, 200] loss: 54.838, kld_loss: 1.170520544052124, recons_loss: 0.2657421827316284
[15, 240] loss: 54.733, kld_loss: 1.192702054977417, recons_loss: 0.2610844075679779
[15, 280] loss: 54.852, kld_loss: 1.148789405822754, recons_loss: 0.26696065068244934
[15, 320] loss: 54.885, kld_loss: 1.1471645832061768, recons_loss: 0.2644035220146179
[15, 360] loss: 54.726, kld_loss: 1.1161919832229614, recons_loss: 0.26460498571395874
```

EPOCH: 15 | VAL LOSS: 54.728267669677734 | PATIENCE COUNT: 0

```
[16, 40] loss: 54.717, kld_loss: 1.156426191329956, recons_loss: 0.26425230503082275
[16, 80] loss: 54.788, kld_loss: 1.1842947006225586, recons_loss: 0.2604192793369293
[16, 120] loss: 54.840, kld_loss: 1.1718635559082031, recons_loss: 0.26424747705459595
[16, 160] loss: 54.805, kld_loss: 1.1625770330429077, recons_loss: 0.26467567682266235
[16, 200] loss: 54.892, kld_loss: 1.193540334701538, recons_loss: 0.26474395394325256
[16, 240] loss: 54.816, kld_loss: 1.2012840509414673, recons_loss: 0.2656288743019104
[16, 280] loss: 54.751, kld_loss: 1.1970336437225342, recons_loss: 0.26140114665031433
```

```
[16, 320] loss: 54.720, kld_loss: 1.2047784328460693, recons_loss: 0.2605174779891968
[16, 360] loss: 54.732, kld_loss: 1.229169487953186, recons_loss: 0.2620075047016144
```

EPOCH: 16 | VAL LOSS: 54.67573928833008 | PATIENCE COUNT: 0

```
[17, 40] loss: 54.769, kld_loss: 1.2717177867889404, recons_loss: 0.2629839777946472
[17, 80] loss: 54.856, kld_loss: 1.2804644107818604, recons_loss: 0.2595332860946655
[17, 120] loss: 54.725, kld_loss: 1.2456254959106445, recons_loss: 0.2671574354171753
[17, 160] loss: 54.829, kld_loss: 1.2759344577789307, recons_loss: 0.2653038203716278
[17, 200] loss: 54.691, kld_loss: 1.2664482593536377, recons_loss: 0.26539361476898193
[17, 240] loss: 54.758, kld_loss: 1.3011218309402466, recons_loss: 0.2633209526538849
[17, 280] loss: 54.640, kld_loss: 1.2914321422576904, recons_loss: 0.26248592138290405
[17, 320] loss: 54.697, kld_loss: 1.2946972846984863, recons_loss: 0.26543599367141724
[17, 360] loss: 54.749, kld_loss: 1.3036545515060425, recons_loss: 0.26352089643478394
```

EPOCH: 17 | VAL LOSS: 54.65449905395508 | PATIENCE COUNT: 0

```
[18, 40] loss: 54.726, kld_loss: 1.344821572303772, recons_loss: 0.2629914879798889
[18, 80] loss: 54.736, kld_loss: 1.303686499595642, recons_loss: 0.2650293707847595
[18, 120] loss: 54.690, kld_loss: 1.3671143054962158, recons_loss: 0.2635141909122467
[18, 160] loss: 54.602, kld_loss: 1.3677165508270264, recons_loss: 0.26050275564193726
[18, 200] loss: 54.783, kld_loss: 1.331455945968628, recons_loss: 0.2604734003543854
[18, 240] loss: 54.786, kld_loss: 1.4066197872161865, recons_loss: 0.25947415828704834
[18, 280] loss: 54.615, kld_loss: 1.3546862602233887, recons_loss: 0.2629448175430298
[18, 320] loss: 54.624, kld_loss: 1.4003973007202148, recons_loss: 0.26291781663894653
[18, 360] loss: 54.723, kld_loss: 1.3460911512374878, recons_loss: 0.2643050253391266
```

EPOCH: 18 | VAL LOSS: 54.62595748901367 | PATIENCE COUNT: 0

```
[19, 40] loss: 54.716, kld_loss: 1.3825767040252686, recons_loss: 0.26303887367248535
[19, 80] loss: 54.735, kld_loss: 1.3639209270477295, recons_loss: 0.2668646574020386
[19, 120] loss: 54.700, kld_loss: 1.413382887840271, recons_loss: 0.2610642910003662
[19, 160] loss: 54.641, kld_loss: 1.4260942935943604, recons_loss: 0.2639000117778778
[19, 200] loss: 54.681, kld_loss: 1.3804844617843628, recons_loss: 0.26614129543304443
[19, 240] loss: 54.685, kld_loss: 1.3703649044036865, recons_loss: 0.26150256395339966
[19, 280] loss: 54.711, kld_loss: 1.368502140045166, recons_loss: 0.2637301981449127
[19, 320] loss: 54.651, kld_loss: 1.3893488645553589, recons_loss: 0.2650429606437683
[19, 360] loss: 54.699, kld_loss: 1.3788156509399414, recons_loss: 0.2632720470428467
```

EPOCH: 19 | VAL LOSS: 54.624549865722656 | PATIENCE COUNT: 0

```
[20, 40] loss: 54.757, kld_loss: 1.4200000000000002, recons_loss: 0.26060000000000004
```



```
[20, 40] loss: 54.757, kld_loss: 1.4390299320220947, recons_loss: 0.26063936948776245
[20, 80] loss: 54.549, kld_loss: 1.4113833904266357, recons_loss: 0.2618648409843445
[20, 120] loss: 54.742, kld_loss: 1.412584662437439, recons_loss: 0.26284849643707275
[20, 160] loss: 54.673, kld_loss: 1.4019620418548584, recons_loss: 0.26351088285446167
[20, 200] loss: 54.646, kld_loss: 1.3842899799346924, recons_loss: 0.2633635401725769
[20, 240] loss: 54.694, kld_loss: 1.3824094533920288, recons_loss: 0.2658344805240631
[20, 280] loss: 54.706, kld_loss: 1.407529592514038, recons_loss: 0.26168400049209595
[20, 320] loss: 54.726, kld_loss: 1.398099660873413, recons_loss: 0.2671496868133545
[20, 360] loss: 54.626, kld_loss: 1.4419941902160645, recons_loss: 0.26422521471977234
```

EPOCH: 20 | VAL LOSS: 54.619659423828125 | PATIENCE COUNT: 0

```
[21, 40] loss: 54.733, kld_loss: 1.4549834728240967, recons_loss: 0.26074838638305664
[21, 80] loss: 54.654, kld_loss: 1.4535984992980957, recons_loss: 0.26567816734313965
[21, 120] loss: 54.596, kld_loss: 1.422400951385498, recons_loss: 0.2612171769142151
[21, 160] loss: 54.549, kld_loss: 1.4085835218429565, recons_loss: 0.2591494917869568
[21, 200] loss: 54.718, kld_loss: 1.435110092163086, recons_loss: 0.25998616218566895
[21, 240] loss: 54.675, kld_loss: 1.4033899307250977, recons_loss: 0.26443061232566833
[21, 280] loss: 54.725, kld_loss: 1.4190170764923096, recons_loss: 0.26635488867759705
[21, 320] loss: 54.754, kld_loss: 1.4125843048095703, recons_loss: 0.26483839750289917
[21, 360] loss: 54.675, kld_loss: 1.414240837097168, recons_loss: 0.26003116369247437
```

EPOCH: 21 | VAL LOSS: 54.61104965209961 | PATIENCE COUNT: 0

```
[22, 40] loss: 54.758, kld_loss: 1.4813408851623535, recons_loss: 0.26498615741729736
[22, 80] loss: 54.651, kld_loss: 1.4372928142547607, recons_loss: 0.2629409432411194
[22, 120] loss: 54.640, kld_loss: 1.4666380882263184, recons_loss: 0.26106661558151245
[22, 160] loss: 54.653, kld_loss: 1.432497501373291, recons_loss: 0.2603597342967987
[22, 200] loss: 54.701, kld_loss: 1.447143793106079, recons_loss: 0.2582917809486389
[22, 240] loss: 54.642, kld_loss: 1.4353314638137817, recons_loss: 0.2645011246204376
[22, 280] loss: 54.558, kld_loss: 1.4520759582519531, recons_loss: 0.2618606388568878
[22, 320] loss: 54.767, kld_loss: 1.4430738687515259, recons_loss: 0.26325905323028564
[22, 360] loss: 54.678, kld_loss: 1.4521937370300293, recons_loss: 0.26210999488830566
```

EPOCH: 22 | VAL LOSS: 54.60084915161133 | PATIENCE COUNT: 0

```
[23, 40] loss: 54.761, kld_loss: 1.4426900148391724, recons_loss: 0.26236259937286377
[23, 80] loss: 54.533, kld_loss: 1.4367774724960327, recons_loss: 0.2580389380455017
[23, 120] loss: 54.674, kld_loss: 1.4475164413452148, recons_loss: 0.2648698389530182
[23, 160] loss: 54.692, kld_loss: 1.4129867553710938, recons_loss: 0.25962144136428833
[23, 200] loss: 54.726, kld_loss: 1.44163978099823, recons_loss: 0.2625040113925934
[23, 240] loss: 54.748, kld_loss: 1.433539628982544, recons_loss: 0.2681136131286621
[23, 280] loss: 54.666, kld_loss: 1.4781479835510254, recons_loss: 0.26467081904411316
```



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[23, 320] loss: 54.616, kld_loss: 1.4677907228469849, recons_loss: 0.2628389894962311
[23, 360] loss: 54.643, kld_loss: 1.4543700218200684, recons_loss: 0.26371926069259644
```

EPOCH: 23 | VAL LOSS: 54.5838737487793 | PATIENCE COUNT: 0

```
[24, 40] loss: 54.580, kld_loss: 1.4839563369750977, recons_loss: 0.26240748167037964
[24, 80] loss: 54.613, kld_loss: 1.456923484802246, recons_loss: 0.26209884881973267
[24, 120] loss: 54.605, kld_loss: 1.46392822265625, recons_loss: 0.25852176547050476
[24, 160] loss: 54.628, kld_loss: 1.4507548809051514, recons_loss: 0.26455336809158325
[24, 200] loss: 54.612, kld_loss: 1.444177508354187, recons_loss: 0.25994980335235596
[24, 240] loss: 54.742, kld_loss: 1.5729126930236816, recons_loss: 0.26279276609420776
[24, 280] loss: 54.815, kld_loss: 1.4832072257995605, recons_loss: 0.26478803157806396
[24, 320] loss: 54.777, kld_loss: 1.4727694988250732, recons_loss: 0.2640310525894165
[24, 360] loss: 54.725, kld_loss: 1.4822728633880615, recons_loss: 0.26306262612342834
```

EPOCH: 24 | VAL LOSS: 54.60857391357422 | PATIENCE COUNT: 1

```
[25, 40] loss: 54.670, kld_loss: 1.4538148641586304, recons_loss: 0.26197096705436707
[25, 80] loss: 54.559, kld_loss: 1.4573441743850708, recons_loss: 0.2627076506614685
[25, 120] loss: 54.779, kld_loss: 1.4688681364059448, recons_loss: 0.26555943489074707
[25, 160] loss: 54.727, kld_loss: 1.5158404111862183, recons_loss: 0.2607273459434509
[25, 200] loss: 54.645, kld_loss: 1.4815258979797363, recons_loss: 0.26179367303848267
[25, 240] loss: 54.641, kld_loss: 1.5028839111328125, recons_loss: 0.2624695897102356
[25, 280] loss: 54.759, kld_loss: 1.4429960250854492, recons_loss: 0.263759046792984
[25, 320] loss: 54.682, kld_loss: 1.473264455795288, recons_loss: 0.26197925209999084
[25, 360] loss: 54.513, kld_loss: 1.4799020290374756, recons_loss: 0.2628743052482605
```

EPOCH: 25 | VAL LOSS: 54.56996154785156 | PATIENCE COUNT: 0

```
[26, 40] loss: 54.664, kld_loss: 1.5003483295440674, recons_loss: 0.260407030582428
[26, 80] loss: 54.621, kld_loss: 1.4715272188186646, recons_loss: 0.2639020085334778
[26, 120] loss: 54.708, kld_loss: 1.4906129837036133, recons_loss: 0.25875890254974365
[26, 160] loss: 54.681, kld_loss: 1.491668939590454, recons_loss: 0.26521778106689453
[26, 200] loss: 54.699, kld_loss: 1.456507682800293, recons_loss: 0.26425057649612427
[26, 240] loss: 54.688, kld_loss: 1.4813752174377441, recons_loss: 0.260614275932312
[26, 280] loss: 54.587, kld_loss: 1.4919333457946777, recons_loss: 0.260497510433197
[26, 320] loss: 54.667, kld_loss: 1.4791196584701538, recons_loss: 0.26244914531707764
[26, 360] loss: 54.499, kld_loss: 1.4663689136505127, recons_loss: 0.25924843549728394
```

EPOCH: 26 | VAL LOSS: 54.59524917602539 | PATIENCE COUNT: 1

```
[27, 40] loss: 54.517, kld_loss: 1.4851160040428477, recons_loss: 0.26204511556625266
```

```
[27, 40] loss: 54.517, kld_loss: 1.4651100049458477, recons_loss: 0.26294511530025500
[27, 80] loss: 54.618, kld_loss: 1.488783836364746, recons_loss: 0.2671004831790924
[27, 120] loss: 54.672, kld_loss: 1.5274462699890137, recons_loss: 0.2617075741291046
[27, 160] loss: 54.677, kld_loss: 1.4904427528381348, recons_loss: 0.2626801133155823
[27, 200] loss: 54.811, kld_loss: 1.5057435035705566, recons_loss: 0.26152515411376953
[27, 240] loss: 54.644, kld_loss: 1.4824706315994263, recons_loss: 0.26474472880363464
[27, 280] loss: 54.588, kld_loss: 1.4993610382080078, recons_loss: 0.26340267062187195
[27, 320] loss: 54.671, kld_loss: 1.51658296585083, recons_loss: 0.26282423734664917
[27, 360] loss: 54.654, kld_loss: 1.503509283065796, recons_loss: 0.262319952249527
```

EPOCH: 27 | VAL LOSS: 54.58172607421875 | PATIENCE COUNT: 2

```
[28, 40] loss: 54.591, kld_loss: 1.4974253177642822, recons_loss: 0.2653277516365051
[28, 80] loss: 54.696, kld_loss: 1.4829115867614746, recons_loss: 0.26486945152282715
[28, 120] loss: 54.680, kld_loss: 1.5352517366409302, recons_loss: 0.268157958984375
[28, 160] loss: 54.651, kld_loss: 1.498180627822876, recons_loss: 0.26755261421203613
[28, 200] loss: 54.749, kld_loss: 1.5156022310256958, recons_loss: 0.2639910578727722
[28, 240] loss: 54.724, kld_loss: 1.5246556997299194, recons_loss: 0.2642930746078491
[28, 280] loss: 54.557, kld_loss: 1.4892812967300415, recons_loss: 0.264512836933136
[28, 320] loss: 54.561, kld_loss: 1.5010488033294678, recons_loss: 0.2589278519153595
[28, 360] loss: 54.691, kld_loss: 1.5207579135894775, recons_loss: 0.2666669189929962
```

EPOCH: 28 | VAL LOSS: 54.56633377075195 | PATIENCE COUNT: 0

```
[29, 40] loss: 54.670, kld_loss: 1.512557864189148, recons_loss: 0.2595984637737274
[29, 80] loss: 54.648, kld_loss: 1.5252102613449097, recons_loss: 0.26323482394218445
[29, 120] loss: 54.785, kld_loss: 1.482304334640503, recons_loss: 0.2650430202484131
[29, 160] loss: 54.714, kld_loss: 1.5113184452056885, recons_loss: 0.2628225088119507
[29, 200] loss: 54.696, kld_loss: 1.50662100315094, recons_loss: 0.26488757133483887
[29, 240] loss: 54.587, kld_loss: 1.4930628538131714, recons_loss: 0.2634428143501282
[29, 280] loss: 54.532, kld_loss: 1.5198595523834229, recons_loss: 0.2610825002193451
[29, 320] loss: 54.548, kld_loss: 1.5037238597869873, recons_loss: 0.26220494508743286
[29, 360] loss: 54.567, kld_loss: 1.4982589483261108, recons_loss: 0.2636195421218872
```

EPOCH: 29 | VAL LOSS: 54.57314682006836 | PATIENCE COUNT: 1

```
[30, 40] loss: 54.601, kld_loss: 1.4861600399017334, recons_loss: 0.26210469007492065
[30, 80] loss: 54.669, kld_loss: 1.5055971145629883, recons_loss: 0.2644044756889343
[30, 120] loss: 54.567, kld_loss: 1.509820818901062, recons_loss: 0.2620607018470764
[30, 160] loss: 54.532, kld_loss: 1.480214238166809, recons_loss: 0.26247239112854004
[30, 200] loss: 54.643, kld_loss: 1.4820817708969116, recons_loss: 0.2626113295555115
[30, 240] loss: 54.701, kld_loss: 1.5290873050689697, recons_loss: 0.26437097787857056
[30, 280] loss: 54.619, kld_loss: 1.5287542343139648, recons_loss: 0.259091317653656
```

```
[30, 320] loss: 54.643, kld_loss: 1.5027332305908203, recons_loss: 0.2656446695327759
[30, 360] loss: 54.667, kld_loss: 1.530503511428833, recons_loss: 0.26878511905670166
```

EPOCH: 30 | VAL LOSS: 54.5518913269043 | PATIENCE COUNT: 0

```
[31, 40] loss: 54.580, kld_loss: 1.5318233966827393, recons_loss: 0.25995758175849915
[31, 80] loss: 54.772, kld_loss: 1.4953041076660156, recons_loss: 0.26431578397750854
[31, 120] loss: 54.540, kld_loss: 1.5294570922851562, recons_loss: 0.26162809133529663
[31, 160] loss: 54.703, kld_loss: 1.5634956359863281, recons_loss: 0.2663109302520752
[31, 200] loss: 54.456, kld_loss: 1.5426169633865356, recons_loss: 0.2609992027282715
[31, 240] loss: 54.680, kld_loss: 1.5388115644454956, recons_loss: 0.2622643709182739
[31, 280] loss: 54.686, kld_loss: 1.4905602931976318, recons_loss: 0.2609167695045471
[31, 320] loss: 54.692, kld_loss: 1.5439316034317017, recons_loss: 0.2650209069252014
[31, 360] loss: 54.637, kld_loss: 1.5251678228378296, recons_loss: 0.2635486125946045
```

EPOCH: 31 | VAL LOSS: 54.54916763305664 | PATIENCE COUNT: 0

```
[32, 40] loss: 54.569, kld_loss: 1.521068811416626, recons_loss: 0.2625786066055298
[32, 80] loss: 54.623, kld_loss: 1.5218907594680786, recons_loss: 0.26289719343185425
[32, 120] loss: 54.629, kld_loss: 1.5215861797332764, recons_loss: 0.26099759340286255
[32, 160] loss: 54.550, kld_loss: 1.5709534883499146, recons_loss: 0.2606944143772125
[32, 200] loss: 54.554, kld_loss: 1.5411179065704346, recons_loss: 0.26159578561782837
[32, 240] loss: 54.662, kld_loss: 1.5584468841552734, recons_loss: 0.2576211988925934
[32, 280] loss: 54.657, kld_loss: 1.5704646110534668, recons_loss: 0.2640787363052368
[32, 320] loss: 54.665, kld_loss: 1.5955753326416016, recons_loss: 0.25886470079421997
[32, 360] loss: 54.605, kld_loss: 1.6096148490905762, recons_loss: 0.26036277413368225
```

EPOCH: 32 | VAL LOSS: 54.550437927246094 | PATIENCE COUNT: 1

```
[33, 40] loss: 54.604, kld_loss: 1.5639280080795288, recons_loss: 0.26194462180137634
[33, 80] loss: 54.692, kld_loss: 1.578167200088501, recons_loss: 0.2607179284095764
[33, 120] loss: 54.660, kld_loss: 1.579084873199463, recons_loss: 0.2632485032081604
[33, 160] loss: 54.531, kld_loss: 1.585995078086853, recons_loss: 0.2612125873565674
[33, 200] loss: 54.582, kld_loss: 1.5931153297424316, recons_loss: 0.2668248414993286
[33, 240] loss: 54.654, kld_loss: 1.591130256652832, recons_loss: 0.26386380195617676
[33, 280] loss: 54.619, kld_loss: 1.585771083831787, recons_loss: 0.26190727949142456
[33, 320] loss: 54.583, kld_loss: 1.5395402908325195, recons_loss: 0.26050418615341187
[33, 360] loss: 54.638, kld_loss: 1.6173290014266968, recons_loss: 0.2599644362926483
```

EPOCH: 33 | VAL LOSS: 54.55160903930664 | PATIENCE COUNT: 2

```
[34, 40] loss: 54.591, kld_loss: 1.6194641590118408, recons_loss: 0.2607994079589844
```

```
[34, 40] loss: 54.551, kld_loss: 1.6174741330110700, recons_loss: 0.2607334073303877
[34, 80] loss: 54.676, kld_loss: 1.5949537754058838, recons_loss: 0.26400649547576904
[34, 120] loss: 54.649, kld_loss: 1.6087446212768555, recons_loss: 0.26421090960502625
[34, 160] loss: 54.593, kld_loss: 1.6173598766326904, recons_loss: 0.2607383131980896
[34, 200] loss: 54.565, kld_loss: 1.6341246366500854, recons_loss: 0.2577138841152191
[34, 240] loss: 54.606, kld_loss: 1.6628525257110596, recons_loss: 0.26351192593574524
[34, 280] loss: 54.632, kld_loss: 1.6634538173675537, recons_loss: 0.26063209772109985
[34, 320] loss: 54.508, kld_loss: 1.640099048614502, recons_loss: 0.2642784118652344
[34, 360] loss: 54.553, kld_loss: 1.648545503616333, recons_loss: 0.26312392950057983
```

EPOCH: 34 | VAL LOSS: 54.547767639160156 | PATIENCE COUNT: 0

```
[35, 40] loss: 54.705, kld_loss: 1.663178563117981, recons_loss: 0.26403382420539856
[35, 80] loss: 54.505, kld_loss: 1.6359262466430664, recons_loss: 0.2635481655597687
[35, 120] loss: 54.511, kld_loss: 1.6668713092803955, recons_loss: 0.2600424289703369
[35, 160] loss: 54.626, kld_loss: 1.6691927909851074, recons_loss: 0.2637474536895752
[35, 200] loss: 54.561, kld_loss: 1.6679136753082275, recons_loss: 0.2612228989601135
[35, 240] loss: 54.500, kld_loss: 1.6622403860092163, recons_loss: 0.25818437337875366
[35, 280] loss: 54.759, kld_loss: 1.650139331817627, recons_loss: 0.26545006036758423
[35, 320] loss: 54.626, kld_loss: 1.6633021831512451, recons_loss: 0.2622336149215698
[35, 360] loss: 54.603, kld_loss: 1.6307952404022217, recons_loss: 0.26071661710739136
```

EPOCH: 35 | VAL LOSS: 54.51414108276367 | PATIENCE COUNT: 0

```
[36, 40] loss: 54.648, kld_loss: 1.6539638042449951, recons_loss: 0.26160386204719543
[36, 80] loss: 54.593, kld_loss: 1.6541621685028076, recons_loss: 0.26010966300964355
[36, 120] loss: 54.599, kld_loss: 1.657895565032959, recons_loss: 0.2642609179019928
[36, 160] loss: 54.575, kld_loss: 1.6858363151550293, recons_loss: 0.26128846406936646
[36, 200] loss: 54.598, kld_loss: 1.681037187576294, recons_loss: 0.2591593861579895
[36, 240] loss: 54.721, kld_loss: 1.656632661819458, recons_loss: 0.2625301778316498
[36, 280] loss: 54.726, kld_loss: 1.6826603412628174, recons_loss: 0.26281654834747314
[36, 320] loss: 54.600, kld_loss: 1.6735053062438965, recons_loss: 0.2610361576080322
[36, 360] loss: 54.604, kld_loss: 1.6399240493774414, recons_loss: 0.26021283864974976
```

EPOCH: 36 | VAL LOSS: 54.54899597167969 | PATIENCE COUNT: 1

```
[37, 40] loss: 54.534, kld_loss: 1.6667126417160034, recons_loss: 0.26093992590904236
[37, 80] loss: 54.627, kld_loss: 1.6825215816497803, recons_loss: 0.26342904567718506
[37, 120] loss: 54.541, kld_loss: 1.6620917320251465, recons_loss: 0.26126325130462646
[37, 160] loss: 54.629, kld_loss: 1.6795518398284912, recons_loss: 0.2656176686286926
[37, 200] loss: 54.678, kld_loss: 1.7058964967727661, recons_loss: 0.26155781745910645
[37, 240] loss: 54.496, kld_loss: 1.6558411121368408, recons_loss: 0.26081350445747375
[37, 280] loss: 54.678, kld_loss: 1.6859691143035889, recons_loss: 0.26397666335105896
```

```
[37, 320] loss: 54.613, kld_loss: 1.6779178380966187, recons_loss: 0.26197031140327454
[37, 360] loss: 54.512, kld_loss: 1.6780534982681274, recons_loss: 0.262035995721817
```

EPOCH: 37 | VAL LOSS: 54.5235595703125 | PATIENCE COUNT: 2

```
[38, 40] loss: 54.593, kld_loss: 1.6654679775238037, recons_loss: 0.26042383909225464
[38, 80] loss: 54.489, kld_loss: 1.6770541667938232, recons_loss: 0.2609257102012634
[38, 120] loss: 54.474, kld_loss: 1.7614572048187256, recons_loss: 0.26225438714027405
[38, 160] loss: 54.604, kld_loss: 1.7179763317108154, recons_loss: 0.2608814239501953
[38, 200] loss: 54.607, kld_loss: 1.7012181282043457, recons_loss: 0.263535737991333
[38, 240] loss: 54.571, kld_loss: 1.70798659324646, recons_loss: 0.25911641120910645
[38, 280] loss: 54.700, kld_loss: 1.7307355403900146, recons_loss: 0.26407545804977417
[38, 320] loss: 54.524, kld_loss: 1.7140634059906006, recons_loss: 0.2599301040172577
[38, 360] loss: 54.651, kld_loss: 1.7090665102005005, recons_loss: 0.2620217800140381
```

EPOCH: 38 | VAL LOSS: 54.50033950805664 | PATIENCE COUNT: 0

```
[39, 40] loss: 54.593, kld_loss: 1.7257375717163086, recons_loss: 0.262401282787323
[39, 80] loss: 54.552, kld_loss: 1.730002999305725, recons_loss: 0.2621908187866211
[39, 120] loss: 54.511, kld_loss: 1.7129604816436768, recons_loss: 0.2620847225189209
[39, 160] loss: 54.590, kld_loss: 1.7383264303207397, recons_loss: 0.26248791813850403
[39, 200] loss: 54.648, kld_loss: 1.747859001159668, recons_loss: 0.26142415404319763
[39, 240] loss: 54.597, kld_loss: 1.7507219314575195, recons_loss: 0.2604943513870239
[39, 280] loss: 54.470, kld_loss: 1.7627286911010742, recons_loss: 0.25961610674858093
[39, 320] loss: 54.653, kld_loss: 1.7317562103271484, recons_loss: 0.26104605197906494
[39, 360] loss: 54.563, kld_loss: 1.7724635601043701, recons_loss: 0.2579724192619324
```

EPOCH: 39 | VAL LOSS: 54.50215148925781 | PATIENCE COUNT: 1

```
[40, 40] loss: 54.611, kld_loss: 1.7398185729980469, recons_loss: 0.26380404829978943
[40, 80] loss: 54.460, kld_loss: 1.758487582206726, recons_loss: 0.25901108980178833
[40, 120] loss: 54.638, kld_loss: 1.747170329093933, recons_loss: 0.2615574896335602
[40, 160] loss: 54.553, kld_loss: 1.7501022815704346, recons_loss: 0.2566670775413513
[40, 200] loss: 54.629, kld_loss: 1.7989271879196167, recons_loss: 0.26445475220680237
[40, 240] loss: 54.542, kld_loss: 1.7703793048858643, recons_loss: 0.26039761304855347
[40, 280] loss: 54.516, kld_loss: 1.7591326236724854, recons_loss: 0.2601829469203949
[40, 320] loss: 54.466, kld_loss: 1.752884864807129, recons_loss: 0.2607579827308655
[40, 360] loss: 54.609, kld_loss: 1.7784216403961182, recons_loss: 0.2577085793018341
```

EPOCH: 40 | VAL LOSS: 54.506675720214844 | PATIENCE COUNT: 2

```
[41, 40] loss: 54.504, kld_loss: 1.7667925357818604, recons_loss: 0.2585294246673584
```

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[41, 40] loss: 54.584, kld_loss: 1.77087253702007, recons_loss: 0.2533257270073307
[41, 80] loss: 54.604, kld_loss: 1.772042155265808, recons_loss: 0.2654178738594055
[41, 120] loss: 54.643, kld_loss: 1.7792086601257324, recons_loss: 0.2643168270587921
[41, 160] loss: 54.555, kld_loss: 1.7799832820892334, recons_loss: 0.26338517665863037
[41, 200] loss: 54.485, kld_loss: 1.809592604637146, recons_loss: 0.2564660310745239
[41, 240] loss: 54.519, kld_loss: 1.791047215461731, recons_loss: 0.2601524591445923
[41, 280] loss: 54.522, kld_loss: 1.7804615497589111, recons_loss: 0.2611277103424072
[41, 320] loss: 54.579, kld_loss: 1.7965965270996094, recons_loss: 0.2602068781852722
[41, 360] loss: 54.619, kld_loss: 1.7791894674301147, recons_loss: 0.2626304030418396
```

EPOCH: 41 | VAL LOSS: 54.50315856933594 | PATIENCE COUNT: 3

```
[42, 40] loss: 54.539, kld_loss: 1.7826648950576782, recons_loss: 0.26189255714416504
[42, 80] loss: 54.498, kld_loss: 1.8114968538284302, recons_loss: 0.26304811239242554
[42, 120] loss: 54.655, kld_loss: 1.7966103553771973, recons_loss: 0.261074960231781
[42, 160] loss: 54.660, kld_loss: 1.792506217956543, recons_loss: 0.26229268312454224
[42, 200] loss: 54.537, kld_loss: 1.8222551345825195, recons_loss: 0.2598590850830078
[42, 240] loss: 54.569, kld_loss: 1.8062413930892944, recons_loss: 0.25965479016304016
[42, 280] loss: 54.449, kld_loss: 1.775486946105957, recons_loss: 0.2603183090686798
[42, 320] loss: 54.500, kld_loss: 1.7984683513641357, recons_loss: 0.2606305480003357
[42, 360] loss: 54.568, kld_loss: 1.8041319847106934, recons_loss: 0.2585369646549225
```

EPOCH: 42 | VAL LOSS: 54.479209899902344 | PATIENCE COUNT: 0

```
[43, 40] loss: 54.527, kld_loss: 1.7801430225372314, recons_loss: 0.2607726454734802
[43, 80] loss: 54.573, kld_loss: 1.8242895603179932, recons_loss: 0.2606083154678345
[43, 120] loss: 54.586, kld_loss: 1.8144654035568237, recons_loss: 0.2569723427295685
[43, 160] loss: 54.607, kld_loss: 1.8397666215896606, recons_loss: 0.2589896023273468
[43, 200] loss: 54.518, kld_loss: 1.8032746315002441, recons_loss: 0.25807511806488037
[43, 240] loss: 54.549, kld_loss: 1.805081844329834, recons_loss: 0.26191335916519165
[43, 280] loss: 54.508, kld_loss: 1.7672587633132935, recons_loss: 0.2610965669155121
[43, 320] loss: 54.548, kld_loss: 1.8437284231185913, recons_loss: 0.26504045724868774
[43, 360] loss: 54.514, kld_loss: 1.7916063070297241, recons_loss: 0.26336807012557983
```

EPOCH: 43 | VAL LOSS: 54.473060607910156 | PATIENCE COUNT: 0

```
[44, 40] loss: 54.490, kld_loss: 1.8295634984970093, recons_loss: 0.25896313786506653
[44, 80] loss: 54.612, kld_loss: 1.8591805696487427, recons_loss: 0.2641870677471161
[44, 120] loss: 54.533, kld_loss: 1.8372701406478882, recons_loss: 0.26143884658813477
[44, 160] loss: 54.513, kld_loss: 1.8298487663269043, recons_loss: 0.258658766746521
[44, 200] loss: 54.472, kld_loss: 1.8332569599151611, recons_loss: 0.2577727138996124
[44, 240] loss: 54.538, kld_loss: 1.8273965120315552, recons_loss: 0.2596854567527771
[44, 280] loss: 54.600, kld_loss: 1.835727334022522, recons_loss: 0.2600853145122528
```



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[44, 320] loss: 54.498, kld_loss: 1.842020869255066, recons_loss: 0.2623099684715271
[44, 360] loss: 54.603, kld_loss: 1.8445141315460205, recons_loss: 0.2646230459213257
```

EPOCH: 44 | VAL LOSS: 54.475608825683594 | PATIENCE COUNT: 1

```
[45, 40] loss: 54.492, kld_loss: 1.8408589363098145, recons_loss: 0.2599605619907379
[45, 80] loss: 54.548, kld_loss: 1.8334193229675293, recons_loss: 0.262256920337677
[45, 120] loss: 54.483, kld_loss: 1.8416812419891357, recons_loss: 0.2633587121963501
[45, 160] loss: 54.613, kld_loss: 1.8573358058929443, recons_loss: 0.25959742069244385
[45, 200] loss: 54.632, kld_loss: 1.8553589582443237, recons_loss: 0.2633555829524994
[45, 240] loss: 54.531, kld_loss: 1.8272454738616943, recons_loss: 0.25970837473869324
[45, 280] loss: 54.592, kld_loss: 1.8524284362792969, recons_loss: 0.2601736783981323
[45, 320] loss: 54.490, kld_loss: 1.8454103469848633, recons_loss: 0.2557433247566223
[45, 360] loss: 54.444, kld_loss: 1.8743603229522705, recons_loss: 0.26191508769989014
```

EPOCH: 45 | VAL LOSS: 54.468265533447266 | PATIENCE COUNT: 0

```
[46, 40] loss: 54.532, kld_loss: 1.8600246906280518, recons_loss: 0.25934821367263794
[46, 80] loss: 54.574, kld_loss: 1.8475452661514282, recons_loss: 0.26001399755477905
[46, 120] loss: 54.506, kld_loss: 1.8737390041351318, recons_loss: 0.2594452500343323
[46, 160] loss: 54.484, kld_loss: 1.8567795753479004, recons_loss: 0.2583959102630615
[46, 200] loss: 54.562, kld_loss: 1.8322749137878418, recons_loss: 0.25931960344314575
[46, 240] loss: 54.587, kld_loss: 1.8219718933105469, recons_loss: 0.2639349102973938
[46, 280] loss: 54.552, kld_loss: 1.8370178937911987, recons_loss: 0.25896087288856506
[46, 320] loss: 54.485, kld_loss: 1.828061819076538, recons_loss: 0.2638244032859802
[46, 360] loss: 54.597, kld_loss: 1.8205643892288208, recons_loss: 0.264776349067688
```

EPOCH: 46 | VAL LOSS: 54.47626876831055 | PATIENCE COUNT: 1

```
[47, 40] loss: 54.536, kld_loss: 1.8558602333068848, recons_loss: 0.2613632082939148
[47, 80] loss: 54.633, kld_loss: 1.8416147232055664, recons_loss: 0.26380017399787903
[47, 120] loss: 54.591, kld_loss: 1.8527666330337524, recons_loss: 0.26073694229125977
[47, 160] loss: 54.556, kld_loss: 1.8684297800064087, recons_loss: 0.26172176003456116
[47, 200] loss: 54.415, kld_loss: 1.823556900024414, recons_loss: 0.26135873794555664
[47, 240] loss: 54.543, kld_loss: 1.863546371459961, recons_loss: 0.2652408182621002
[47, 280] loss: 54.506, kld_loss: 1.8595046997070312, recons_loss: 0.25896069407463074
[47, 320] loss: 54.526, kld_loss: 1.8737142086029053, recons_loss: 0.25809937715530396
[47, 360] loss: 54.563, kld_loss: 1.8759396076202393, recons_loss: 0.26080256700515747
```

EPOCH: 47 | VAL LOSS: 54.466129302978516 | PATIENCE COUNT: 0

```
[48, 40] loss: 54.458, kld_loss: 1.844616413116455, recons_loss: 0.26354682445526123
```

```
[48, 80] loss: 54.560, kld_loss: 1.8578758239746094, recons_loss: 0.26136964559555054
[48, 120] loss: 54.542, kld_loss: 1.876900315284729, recons_loss: 0.2600799798965454
[48, 160] loss: 54.601, kld_loss: 1.8583261966705322, recons_loss: 0.2607697546482086
[48, 200] loss: 54.524, kld_loss: 1.891352891921997, recons_loss: 0.25780266523361206
[48, 240] loss: 54.542, kld_loss: 1.8663325309753418, recons_loss: 0.261727511882782
[48, 280] loss: 54.640, kld_loss: 1.8449970483779907, recons_loss: 0.2627424895763397
[48, 320] loss: 54.449, kld_loss: 1.8767439126968384, recons_loss: 0.2582036554813385
[48, 360] loss: 54.506, kld_loss: 1.849196434020996, recons_loss: 0.2621522843837738
```

EPOCH: 48 | VAL LOSS: 54.466548919677734 | PATIENCE COUNT: 1

```
[49, 40] loss: 54.647, kld_loss: 1.8762295246124268, recons_loss: 0.2599261403083801
[49, 80] loss: 54.513, kld_loss: 1.8736767768859863, recons_loss: 0.26008763909339905
[49, 120] loss: 54.475, kld_loss: 1.8826918601989746, recons_loss: 0.262827068567276
[49, 160] loss: 54.477, kld_loss: 1.8690375089645386, recons_loss: 0.2560385465621948
[49, 200] loss: 54.375, kld_loss: 1.8741704225540161, recons_loss: 0.26011350750923157
[49, 240] loss: 54.520, kld_loss: 1.8510959148406982, recons_loss: 0.25978517532348633
[49, 280] loss: 54.646, kld_loss: 1.8946809768676758, recons_loss: 0.25849449634552
[49, 320] loss: 54.568, kld_loss: 1.9076449871063232, recons_loss: 0.26097381114959717
[49, 360] loss: 54.604, kld_loss: 1.8839011192321777, recons_loss: 0.2631150782108307
```

EPOCH: 49 | VAL LOSS: 54.453983306884766 | PATIENCE COUNT: 0

```
[50, 40] loss: 54.495, kld_loss: 1.8998816013336182, recons_loss: 0.26011359691619873
[50, 80] loss: 54.501, kld_loss: 1.882662296295166, recons_loss: 0.25830310583114624
[50, 120] loss: 54.536, kld_loss: 1.8944244384765625, recons_loss: 0.2614084482192993
[50, 160] loss: 54.369, kld_loss: 1.884492278099906, recons_loss: 0.2594728469848633
[50, 200] loss: 54.556, kld_loss: 1.88814115524292, recons_loss: 0.26368701457977295
[50, 240] loss: 54.501, kld_loss: 1.9167351722717285, recons_loss: 0.2610558271408081
[50, 280] loss: 54.605, kld_loss: 1.911956548690796, recons_loss: 0.2625845670700073
[50, 320] loss: 54.627, kld_loss: 1.8854115009307861, recons_loss: 0.2616308629512787
[50, 360] loss: 54.577, kld_loss: 1.915069580078125, recons_loss: 0.2640172839164734
```

EPOCH: 50 | VAL LOSS: 54.44032669067383 | PATIENCE COUNT: 0

```
[51, 40] loss: 54.603, kld_loss: 1.9006268978118896, recons_loss: 0.26503509283065796
[51, 80] loss: 54.545, kld_loss: 1.8885496854782104, recons_loss: 0.26176905632019043
[51, 120] loss: 54.553, kld_loss: 1.9319803714752197, recons_loss: 0.2607940435409546
[51, 160] loss: 54.417, kld_loss: 1.912719488143921, recons_loss: 0.26281431317329407
[51, 200] loss: 54.481, kld_loss: 1.9076446294784546, recons_loss: 0.25545328855514526
[51, 240] loss: 54.656, kld_loss: 1.9081885814666748, recons_loss: 0.25994205474853516
[51, 280] loss: 54.446, kld_loss: 1.9430656433105469, recons_loss: 0.2601872682571411
```



```
[51, 320] loss: 54.534, kld_loss: 1.8527451753616333, recons_loss: 0.26050370931625366
[51, 360] loss: 54.590, kld_loss: 1.874272108078003, recons_loss: 0.26098477840423584
```

EPOCH: 51 | VAL LOSS: 54.44463348388672 | PATIENCE COUNT: 1

```
[52, 40] loss: 54.645, kld_loss: 1.9315351247787476, recons_loss: 0.25717684626579285
[52, 80] loss: 54.450, kld_loss: 1.9218170642852783, recons_loss: 0.26150473952293396
[52, 120] loss: 54.487, kld_loss: 1.9011081457138062, recons_loss: 0.26256996393203735
[52, 160] loss: 54.513, kld_loss: 1.9063152074813843, recons_loss: 0.26332199573516846
[52, 200] loss: 54.541, kld_loss: 1.9117445945739746, recons_loss: 0.2577996551990509
[52, 240] loss: 54.552, kld_loss: 1.9306929111480713, recons_loss: 0.2561630606651306
[52, 280] loss: 54.593, kld_loss: 1.916239619255066, recons_loss: 0.2607443928718567
[52, 320] loss: 54.507, kld_loss: 1.912132740020752, recons_loss: 0.26140496134757996
[52, 360] loss: 54.500, kld_loss: 1.9124574661254883, recons_loss: 0.2583954334259033
```

EPOCH: 52 | VAL LOSS: 54.44140625 | PATIENCE COUNT: 2

```
[53, 40] loss: 54.451, kld_loss: 1.9193754196166992, recons_loss: 0.26056668162345886
[53, 80] loss: 54.528, kld_loss: 1.930624008178711, recons_loss: 0.25951701402664185
[53, 120] loss: 54.648, kld_loss: 1.9449596405029297, recons_loss: 0.26048988103866577
[53, 160] loss: 54.507, kld_loss: 1.927441120147705, recons_loss: 0.2620588541030884
[53, 200] loss: 54.534, kld_loss: 1.89421808719635, recons_loss: 0.2637518644332886
[53, 240] loss: 54.581, kld_loss: 1.8854023218154907, recons_loss: 0.26054155826568604
[53, 280] loss: 54.476, kld_loss: 1.9260797500610352, recons_loss: 0.2609506845474243
[53, 320] loss: 54.505, kld_loss: 1.9207701683044434, recons_loss: 0.2592771649360657
[53, 360] loss: 54.431, kld_loss: 1.9094033241271973, recons_loss: 0.2616273760795593
```

EPOCH: 53 | VAL LOSS: 54.443931579589844 | PATIENCE COUNT: 3

```
[54, 40] loss: 54.494, kld_loss: 1.9091179370880127, recons_loss: 0.2604767382144928
[54, 80] loss: 54.476, kld_loss: 1.8917381763458252, recons_loss: 0.2607906460762024
[54, 120] loss: 54.442, kld_loss: 1.9349994659423828, recons_loss: 0.26391369104385376
[54, 160] loss: 54.573, kld_loss: 1.9218924045562744, recons_loss: 0.2595980167388916
[54, 200] loss: 54.461, kld_loss: 1.9142975807189941, recons_loss: 0.2604964077472687
[54, 240] loss: 54.544, kld_loss: 1.898919701576233, recons_loss: 0.2594408392906189
[54, 280] loss: 54.457, kld_loss: 1.9123178720474243, recons_loss: 0.2616668939590454
[54, 320] loss: 54.690, kld_loss: 1.9077258110046387, recons_loss: 0.2636417746543884
[54, 360] loss: 54.428, kld_loss: 1.9108054637908936, recons_loss: 0.2607673406600952
```

EPOCH: 54 | VAL LOSS: 54.43730545043945 | PATIENCE COUNT: 0

```
[55, 40] loss: 54.522, kld_loss: 1.8724727630615234, recons_loss: 0.2616821527481079
```

```
[55, 80] loss: 54.501, kld_loss: 1.8954284191131592, recons_loss: 0.2593845725059509
[55, 120] loss: 54.471, kld_loss: 1.9060168266296387, recons_loss: 0.2606176435947418
[55, 160] loss: 54.511, kld_loss: 1.926958441734314, recons_loss: 0.2611755132675171
[55, 200] loss: 54.613, kld_loss: 1.8963178396224976, recons_loss: 0.25971484184265137
[55, 240] loss: 54.405, kld_loss: 1.916593313217163, recons_loss: 0.2600772976875305
[55, 280] loss: 54.449, kld_loss: 1.9182379245758057, recons_loss: 0.26199084520339966
[55, 320] loss: 54.565, kld_loss: 1.927007794380188, recons_loss: 0.2620810568332672
[55, 360] loss: 54.607, kld_loss: 1.9246060848236084, recons_loss: 0.261997789144516
```

EPOCH: 55 | VAL LOSS: 54.521297454833984 | PATIENCE COUNT: 1

```
[56, 40] loss: 54.438, kld_loss: 1.9462753534317017, recons_loss: 0.2590511739253998
[56, 80] loss: 54.628, kld_loss: 1.9151644706726074, recons_loss: 0.2595405578613281
[56, 120] loss: 54.493, kld_loss: 1.9540882110595703, recons_loss: 0.2611541748046875
[56, 160] loss: 54.492, kld_loss: 1.9532382488250732, recons_loss: 0.2627255916595459
[56, 200] loss: 54.585, kld_loss: 1.998239278793335, recons_loss: 0.262109637260437
[56, 240] loss: 54.557, kld_loss: 1.9771568775177002, recons_loss: 0.25852787494659424
[56, 280] loss: 54.594, kld_loss: 1.9785656929016113, recons_loss: 0.25805896520614624
[56, 320] loss: 54.496, kld_loss: 1.9588587284088135, recons_loss: 0.2602301836013794
[56, 360] loss: 54.555, kld_loss: 1.962742567062378, recons_loss: 0.26008376479148865
```

EPOCH: 56 | VAL LOSS: 54.440860748291016 | PATIENCE COUNT: 2

```
[57, 40] loss: 54.641, kld_loss: 1.9792689085006714, recons_loss: 0.2605195641517639
[57, 80] loss: 54.323, kld_loss: 1.955764889717102, recons_loss: 0.25654757022857666
[57, 120] loss: 54.508, kld_loss: 1.9359769821166992, recons_loss: 0.2585676908493042
[57, 160] loss: 54.482, kld_loss: 1.94287109375, recons_loss: 0.26214614510536194
[57, 200] loss: 54.528, kld_loss: 1.9834080934524536, recons_loss: 0.26106685400009155
[57, 240] loss: 54.489, kld_loss: 1.9380488395690918, recons_loss: 0.25918203592300415
[57, 280] loss: 54.565, kld_loss: 1.9705835580825806, recons_loss: 0.2666715979576111
[57, 320] loss: 54.545, kld_loss: 1.955947756767273, recons_loss: 0.26083359122276306
[57, 360] loss: 54.538, kld_loss: 1.9607815742492676, recons_loss: 0.2596980929374695
```

EPOCH: 57 | VAL LOSS: 54.45107650756836 | PATIENCE COUNT: 3

```
[58, 40] loss: 54.486, kld_loss: 1.9438704252243042, recons_loss: 0.2577996551990509
[58, 80] loss: 54.380, kld_loss: 1.9377305507659912, recons_loss: 0.2592872381210327
[58, 120] loss: 54.542, kld_loss: 1.9515535831451416, recons_loss: 0.25798743963241577
[58, 160] loss: 54.546, kld_loss: 1.9525482654571533, recons_loss: 0.2574119567871094
[58, 200] loss: 54.520, kld_loss: 1.9569612741470337, recons_loss: 0.2576483190059662
[58, 240] loss: 54.439, kld_loss: 1.9662460088729858, recons_loss: 0.25861525535583496
[58, 280] loss: 54.630, kld_loss: 1.9765238761901855, recons_loss: 0.25983142852783203
```

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[58, 320] loss: 54.544, kld_loss: 1.9512584209442139, recons_loss: 0.26316499/1008301  
[58, 360] loss: 54.430, kld_loss: 1.9693470001220703, recons_loss: 0.2639641761779785
```

EPOCH: 58 | VAL LOSS: 54.42961883544922 | PATIENCE COUNT: 0

```
[59, 40] loss: 54.532, kld_loss: 1.9372153282165527, recons_loss: 0.25868797302246094  
[59, 80] loss: 54.575, kld_loss: 1.9339449405670166, recons_loss: 0.2620588541030884  
[59, 120] loss: 54.543, kld_loss: 1.936706781387329, recons_loss: 0.2612650990486145  
[59, 160] loss: 54.591, kld_loss: 1.9355930089950562, recons_loss: 0.25707271695137024  
[59, 200] loss: 54.494, kld_loss: 1.9257102012634277, recons_loss: 0.2639472782611847  
[59, 240] loss: 54.478, kld_loss: 1.953122854232788, recons_loss: 0.2619251608848572  
[59, 280] loss: 54.406, kld_loss: 1.9639021158218384, recons_loss: 0.25856274366378784  
[59, 320] loss: 54.519, kld_loss: 1.9473131895065308, recons_loss: 0.26300495862960815  
[59, 360] loss: 54.492, kld_loss: 1.9682633876800537, recons_loss: 0.25858622789382935
```

EPOCH: 59 | VAL LOSS: 54.43544387817383 | PATIENCE COUNT: 1

```
[60, 40] loss: 54.552, kld_loss: 1.9639545679092407, recons_loss: 0.26277297735214233  
[60, 80] loss: 54.556, kld_loss: 1.949430227279663, recons_loss: 0.26023316383361816  
[60, 120] loss: 54.552, kld_loss: 1.9251601696014404, recons_loss: 0.2617458701133728  
[60, 160] loss: 54.479, kld_loss: 1.9628934860229492, recons_loss: 0.2634360194206238  
[60, 200] loss: 54.467, kld_loss: 1.9504566192626953, recons_loss: 0.2614781856536865  
[60, 240] loss: 54.501, kld_loss: 1.9620752334594727, recons_loss: 0.2614665627479553  
[60, 280] loss: 54.510, kld_loss: 1.9690603017807007, recons_loss: 0.261043906211853  
[60, 320] loss: 54.420, kld_loss: 1.955737590789795, recons_loss: 0.2613411545753479  
[60, 360] loss: 54.561, kld_loss: 1.9708967208862305, recons_loss: 0.26151764392852783
```

EPOCH: 60 | VAL LOSS: 54.42259979248047 | PATIENCE COUNT: 0

```
[61, 40] loss: 54.480, kld_loss: 1.9581718444824219, recons_loss: 0.2617208957672119  
[61, 80] loss: 54.361, kld_loss: 1.9534008502960205, recons_loss: 0.2631528675556183  
[61, 120] loss: 54.580, kld_loss: 1.9304542541503906, recons_loss: 0.25955069065093994  
[61, 160] loss: 54.581, kld_loss: 1.9567228555679321, recons_loss: 0.26110678911209106  
[61, 200] loss: 54.414, kld_loss: 1.9857109785079956, recons_loss: 0.2610625624656677  
[61, 240] loss: 54.577, kld_loss: 1.9642254114151, recons_loss: 0.2595885694026947  
[61, 280] loss: 54.573, kld_loss: 2.001436710357666, recons_loss: 0.26150158047676086  
[61, 320] loss: 54.496, kld_loss: 1.9699523448944092, recons_loss: 0.2597644031047821  
[61, 360] loss: 54.586, kld_loss: 1.9704327583312988, recons_loss: 0.2621535658836365
```

EPOCH: 61 | VAL LOSS: 54.4345703125 | PATIENCE COUNT: 1

```
[62, 40] loss: 54.473, kld_loss: 1.9390918016433716, recons_loss: 0.2594623863697052
```

```
[62, 80] loss: 54.586, kld_loss: 1.9702749252319336, recons_loss: 0.25888141989707947
[62, 120] loss: 54.529, kld_loss: 1.9919099807739258, recons_loss: 0.25807178020477295
[62, 160] loss: 54.398, kld_loss: 1.9571329355239868, recons_loss: 0.2571561634540558
[62, 200] loss: 54.494, kld_loss: 1.9839951992034912, recons_loss: 0.26103270053863525
[62, 240] loss: 54.425, kld_loss: 1.9704164266586304, recons_loss: 0.2591133117675781
[62, 280] loss: 54.484, kld_loss: 1.9282904863357544, recons_loss: 0.2624482810497284
[62, 320] loss: 54.643, kld_loss: 1.984875202178955, recons_loss: 0.2621491551399231
[62, 360] loss: 54.581, kld_loss: 1.9904899597167969, recons_loss: 0.26291197538375854
```

EPOCH: 62 | VAL LOSS: 54.44182586669922 | PATIENCE COUNT: 2

```
[63, 40] loss: 54.645, kld_loss: 1.9706250429153442, recons_loss: 0.2625432312488556
[63, 80] loss: 54.485, kld_loss: 1.9676885604858398, recons_loss: 0.2597581744194031
[63, 120] loss: 54.481, kld_loss: 1.9799764156341553, recons_loss: 0.2595822215080261
[63, 160] loss: 54.541, kld_loss: 1.9389007091522217, recons_loss: 0.2616499066352844
[63, 200] loss: 54.485, kld_loss: 1.9966390132904053, recons_loss: 0.26112669706344604
[63, 240] loss: 54.361, kld_loss: 1.9694157838821411, recons_loss: 0.25946107506752014
[63, 280] loss: 54.565, kld_loss: 1.9490385055541992, recons_loss: 0.26262766122817993
[63, 320] loss: 54.446, kld_loss: 1.9706655740737915, recons_loss: 0.2585022747516632
[63, 360] loss: 54.508, kld_loss: 1.9657611846923828, recons_loss: 0.25938934087753296
```

EPOCH: 63 | VAL LOSS: 54.414852142333984 | PATIENCE COUNT: 0

```
[64, 40] loss: 54.473, kld_loss: 2.000563621520996, recons_loss: 0.2581733465194702
[64, 80] loss: 54.520, kld_loss: 1.9874032735824585, recons_loss: 0.2580193877220154
[64, 120] loss: 54.438, kld_loss: 1.9538822174072266, recons_loss: 0.2588817775249481
[64, 160] loss: 54.503, kld_loss: 1.984135389328003, recons_loss: 0.2624477744102478
[64, 200] loss: 54.627, kld_loss: 1.980185627937317, recons_loss: 0.2610119879245758
[64, 240] loss: 54.492, kld_loss: 1.9695971012115479, recons_loss: 0.25998467206954956
[64, 280] loss: 54.450, kld_loss: 1.956087350845337, recons_loss: 0.26197975873947144
[64, 320] loss: 54.441, kld_loss: 1.9686483144760132, recons_loss: 0.25941765308380127
[64, 360] loss: 54.492, kld_loss: 1.9665203094482422, recons_loss: 0.26012447476387024
```

EPOCH: 64 | VAL LOSS: 54.43708419799805 | PATIENCE COUNT: 1

```
[65, 40] loss: 54.357, kld_loss: 1.987041711807251, recons_loss: 0.25773754715919495
[65, 80] loss: 54.615, kld_loss: 1.9801338911056519, recons_loss: 0.2634850740432739
[65, 120] loss: 54.468, kld_loss: 1.9559425115585327, recons_loss: 0.26094210147857666
[65, 160] loss: 54.557, kld_loss: 1.9520416259765625, recons_loss: 0.26187199354171753
[65, 200] loss: 54.421, kld_loss: 1.9811158180236816, recons_loss: 0.25824734568595886
[65, 240] loss: 54.514, kld_loss: 1.9647941589355469, recons_loss: 0.2605171203613281
[65, 280] loss: 54.611, kld_loss: 1.9540009498596191, recons_loss: 0.26085466146469116
[65, 320] loss: 54.455, kld_loss: 1.9730000000000000, recons_loss: 0.25827222266265286
[65, 360] loss: 54.455, kld_loss: 1.9730000000000000, recons_loss: 0.25827222266265286
```

```
[65, 320] loss: 54.455, kld_loss: 1.9729803800582886, recons_loss: 0.25837233662605286  
[65, 360] loss: 54.553, kld_loss: 1.9886449575424194, recons_loss: 0.2620358169078827
```

EPOCH: 65 | VAL LOSS: 54.4238166809082 | PATIENCE COUNT: 2

```
[66, 40] loss: 54.574, kld_loss: 1.9774093627929688, recons_loss: 0.2613331973552704  
[66, 80] loss: 54.455, kld_loss: 2.001044511795044, recons_loss: 0.260525107383728  
[66, 120] loss: 54.508, kld_loss: 2.0173280239105225, recons_loss: 0.2635798752307892  
[66, 160] loss: 54.502, kld_loss: 2.0073494911193848, recons_loss: 0.26131194829940796  
[66, 200] loss: 54.559, kld_loss: 2.0110697746276855, recons_loss: 0.2626003921031952  
[66, 240] loss: 54.499, kld_loss: 1.9538555145263672, recons_loss: 0.262492835521698  
[66, 280] loss: 54.427, kld_loss: 1.9793530702590942, recons_loss: 0.26128077507019043  
[66, 320] loss: 54.400, kld_loss: 1.975281000137329, recons_loss: 0.2607572674751282  
[66, 360] loss: 54.566, kld_loss: 1.9812932014465332, recons_loss: 0.26131388545036316
```

EPOCH: 66 | VAL LOSS: 54.42784881591797 | PATIENCE COUNT: 3

```
[67, 40] loss: 54.588, kld_loss: 1.9969134330749512, recons_loss: 0.2617124617099762  
[67, 80] loss: 54.465, kld_loss: 1.9903852939605713, recons_loss: 0.26116231083869934  
[67, 120] loss: 54.627, kld_loss: 2.029491424560547, recons_loss: 0.2611468434333801  
[67, 160] loss: 54.440, kld_loss: 2.009215831756592, recons_loss: 0.25972533226013184  
[67, 200] loss: 54.405, kld_loss: 2.0255537033081055, recons_loss: 0.2582867741584778  
[67, 240] loss: 54.435, kld_loss: 2.0147197246551514, recons_loss: 0.2608020007610321  
[67, 280] loss: 54.512, kld_loss: 2.0013458728790283, recons_loss: 0.2627856731414795  
[67, 320] loss: 54.498, kld_loss: 2.0241634845733643, recons_loss: 0.2571977376937866  
[67, 360] loss: 54.490, kld_loss: 1.9971256256103516, recons_loss: 0.25791364908218384
```

EPOCH: 67 | VAL LOSS: 54.43320846557617 | PATIENCE COUNT: 4

```
[68, 40] loss: 54.626, kld_loss: 1.9990066289901733, recons_loss: 0.2640824019908905  
[68, 80] loss: 54.495, kld_loss: 2.0101423263549805, recons_loss: 0.26071399450302124  
[68, 120] loss: 54.540, kld_loss: 1.9668179750442505, recons_loss: 0.26125195622444153  
[68, 160] loss: 54.529, kld_loss: 1.9989802837371826, recons_loss: 0.2588927149772644  
[68, 200] loss: 54.352, kld_loss: 1.9799801111221313, recons_loss: 0.2601335048675537  
[68, 240] loss: 54.523, kld_loss: 2.005265474319458, recons_loss: 0.2615605294704437  
[68, 280] loss: 54.459, kld_loss: 1.957703709602356, recons_loss: 0.26340383291244507  
[68, 320] loss: 54.462, kld_loss: 1.9610800743103027, recons_loss: 0.2564530372619629  
[68, 360] loss: 54.468, kld_loss: 1.9534832239151, recons_loss: 0.264445960521698
```

EPOCH: 68 | VAL LOSS: 54.43270492553711 | PATIENCE COUNT: 5

```
[69, 40] loss: 54.596, kld_loss: 1.9639259576797485, recons_loss: 0.25869253277778625
```

```
[69, 80] loss: 54.386, kld_loss: 1.9619312286376953, recons_loss: 0.26129764318466187
[69, 120] loss: 54.508, kld_loss: 1.9809387922286987, recons_loss: 0.25814196467399597
[69, 160] loss: 54.479, kld_loss: 1.9636898040771484, recons_loss: 0.25954270362854004
[69, 200] loss: 54.447, kld_loss: 1.997416377067566, recons_loss: 0.260364830493927
[69, 240] loss: 54.460, kld_loss: 1.9533579349517822, recons_loss: 0.2566621005535126
[69, 280] loss: 54.467, kld_loss: 1.968752384185791, recons_loss: 0.26146942377090454
[69, 320] loss: 54.475, kld_loss: 1.999272346496582, recons_loss: 0.26134446263313293
[69, 360] loss: 54.562, kld_loss: 1.9901676177978516, recons_loss: 0.2585712671279907
```

EPOCH: 69 | VAL LOSS: 54.42823028564453 | PATIENCE COUNT: 6

```
[70, 40] loss: 54.536, kld_loss: 1.9987304210662842, recons_loss: 0.25533467531204224
[70, 80] loss: 54.494, kld_loss: 1.9662680625915527, recons_loss: 0.2600056529045105
[70, 120] loss: 54.391, kld_loss: 2.0145435333251953, recons_loss: 0.2598540186882019
[70, 160] loss: 54.558, kld_loss: 1.972806453704834, recons_loss: 0.25850674510002136
[70, 200] loss: 54.502, kld_loss: 1.9773147106170654, recons_loss: 0.25916779041290283
[70, 240] loss: 54.520, kld_loss: 1.96415376663208, recons_loss: 0.25953561067581177
[70, 280] loss: 54.533, kld_loss: 2.0120620727539062, recons_loss: 0.26142197847366333
[70, 320] loss: 54.395, kld_loss: 2.0165257453918457, recons_loss: 0.260263055562973
[70, 360] loss: 54.549, kld_loss: 2.0266971588134766, recons_loss: 0.2612610459327698
```

EPOCH: 70 | VAL LOSS: 54.42208480834961 | PATIENCE COUNT: 7

```
[71, 40] loss: 54.535, kld_loss: 1.988947868347168, recons_loss: 0.26011043787002563
[71, 80] loss: 54.495, kld_loss: 1.9948104619979858, recons_loss: 0.2586125135421753
[71, 120] loss: 54.578, kld_loss: 2.0202016830444336, recons_loss: 0.26342129707336426
[71, 160] loss: 54.442, kld_loss: 2.0164878368377686, recons_loss: 0.25794142484664917
[71, 200] loss: 54.505, kld_loss: 2.006688356399536, recons_loss: 0.26147520542144775
[71, 240] loss: 54.417, kld_loss: 2.018362045288086, recons_loss: 0.26122239232063293
[71, 280] loss: 54.474, kld_loss: 1.983494520187378, recons_loss: 0.25659048557281494
[71, 320] loss: 54.523, kld_loss: 1.9930789470672607, recons_loss: 0.2630666196346283
[71, 360] loss: 54.502, kld_loss: 1.9771406650543213, recons_loss: 0.2591654658317566
```

EPOCH: 71 | VAL LOSS: 54.432106018066406 | PATIENCE COUNT: 8

```
[72, 40] loss: 54.572, kld_loss: 2.0098257064819336, recons_loss: 0.2627013027667999
[72, 80] loss: 54.476, kld_loss: 1.9880921840667725, recons_loss: 0.2594732344150543
[72, 120] loss: 54.555, kld_loss: 2.0359747409820557, recons_loss: 0.2575387954711914
[72, 160] loss: 54.417, kld_loss: 2.0114634037017822, recons_loss: 0.263136088848114
[72, 200] loss: 54.504, kld_loss: 2.016124725341797, recons_loss: 0.2595369517803192
[72, 240] loss: 54.509, kld_loss: 2.0444164276123047, recons_loss: 0.2618914544582367
[72, 280] loss: 54.499, kld_loss: 2.015007972717285, recons_loss: 0.26219671964645386
[72, 320] loss: 54.444, kld_loss: 2.0060406022562256, recons_loss: 0.25728707012507656
[72, 360] loss: 54.411, kld_loss: 2.0060406022562256, recons_loss: 0.25728707012507656
```



```
[72, 320] loss: 54.444, kld_loss: 2.0009400052502250, recons_loss: 0.25728797912597050  
[72, 360] loss: 54.649, kld_loss: 1.9890377521514893, recons_loss: 0.2605743110179901
```

EPOCH: 72 | VAL LOSS: 54.44083023071289 | PATIENCE COUNT: 9

```
[73, 40] loss: 54.435, kld_loss: 1.974853277206421, recons_loss: 0.25867247581481934  
[73, 80] loss: 54.446, kld_loss: 1.994062900543213, recons_loss: 0.26176053285598755  
[73, 120] loss: 54.488, kld_loss: 2.0005288124084473, recons_loss: 0.2575426995754242  
[73, 160] loss: 54.446, kld_loss: 2.019463062286377, recons_loss: 0.26001614332199097  
[73, 200] loss: 54.459, kld_loss: 2.006049394607544, recons_loss: 0.26162439584732056  
[73, 240] loss: 54.475, kld_loss: 1.984682321548462, recons_loss: 0.25979340076446533  
[73, 280] loss: 54.541, kld_loss: 1.981606125831604, recons_loss: 0.2591542601585388  
[73, 320] loss: 54.510, kld_loss: 1.996201992034912, recons_loss: 0.26288706064224243  
[73, 360] loss: 54.591, kld_loss: 1.990103006362915, recons_loss: 0.2643350660800934
```

EPOCH: 73 | VAL LOSS: 54.4155158996582 | PATIENCE COUNT: 10

```
[74, 40] loss: 54.424, kld_loss: 1.9808752536773682, recons_loss: 0.2593236565589905  
[74, 80] loss: 54.492, kld_loss: 2.018136739730835, recons_loss: 0.26075106859207153  
[74, 120] loss: 54.542, kld_loss: 1.9961189031600952, recons_loss: 0.2644558846950531  
[74, 160] loss: 54.494, kld_loss: 1.9987001419067383, recons_loss: 0.2595009207725525  
[74, 200] loss: 54.447, kld_loss: 1.9804012775421143, recons_loss: 0.26003068685531616  
[74, 240] loss: 54.565, kld_loss: 1.9958158731460571, recons_loss: 0.26106032729148865  
[74, 280] loss: 54.443, kld_loss: 2.003652572631836, recons_loss: 0.2582266330718994  
[74, 320] loss: 54.545, kld_loss: 2.019318103790283, recons_loss: 0.25663548707962036  
[74, 360] loss: 54.419, kld_loss: 1.997069239616394, recons_loss: 0.2574378550052643
```

EPOCH: 74 | VAL LOSS: 54.4349479675293 | PATIENCE COUNT: 11

```
[75, 40] loss: 54.490, kld_loss: 2.0068936347961426, recons_loss: 0.26397088170051575  
[75, 80] loss: 54.591, kld_loss: 1.9814565181732178, recons_loss: 0.2576567828655243  
[75, 120] loss: 54.572, kld_loss: 2.0325417518615723, recons_loss: 0.259517103433609  
[75, 160] loss: 54.377, kld_loss: 2.0288376808166504, recons_loss: 0.2581249475479126  
[75, 200] loss: 54.586, kld_loss: 1.9921481609344482, recons_loss: 0.2579750716686249  
[75, 240] loss: 54.450, kld_loss: 2.0233547687530518, recons_loss: 0.2591466009616852  
[75, 280] loss: 54.454, kld_loss: 1.9904625415802002, recons_loss: 0.26328665018081665  
[75, 320] loss: 54.474, kld_loss: 1.9959142208099365, recons_loss: 0.25927844643592834  
[75, 360] loss: 54.482, kld_loss: 2.015625, recons_loss: 0.2599373161792755
```

EPOCH: 75 | VAL LOSS: 54.42679214477539 | PATIENCE COUNT: 12

```
[76, 40] loss: 54.458, kld_loss: 2.0091147422790527, recons_loss: 0.25780850648880005
```

```
[76, 80] loss: 54.501, kld_loss: 2.0096943378448486, recons_loss: 0.260011225938797
[76, 120] loss: 54.412, kld_loss: 2.038280487060547, recons_loss: 0.2589142918586731
[76, 160] loss: 54.458, kld_loss: 2.015878200531006, recons_loss: 0.2569173574447632
[76, 200] loss: 54.586, kld_loss: 2.023024082183838, recons_loss: 0.2603070139884949
[76, 240] loss: 54.478, kld_loss: 2.023771047592163, recons_loss: 0.25876206159591675
[76, 280] loss: 54.516, kld_loss: 1.9901247024536133, recons_loss: 0.2620091438293457
[76, 320] loss: 54.474, kld_loss: 1.997725248336792, recons_loss: 0.2606896162033081
[76, 360] loss: 54.519, kld_loss: 2.0295543670654297, recons_loss: 0.2619803547859192
```

EPOCH: 76 | VAL LOSS: 54.41851043701172 | PATIENCE COUNT: 13

```
[77, 40] loss: 54.442, kld_loss: 1.999536156654358, recons_loss: 0.2595981955528259
[77, 80] loss: 54.556, kld_loss: 2.022214412689209, recons_loss: 0.2597173750400543
[77, 120] loss: 54.479, kld_loss: 2.0043087005615234, recons_loss: 0.2624627947807312
[77, 160] loss: 54.440, kld_loss: 2.0304360389709473, recons_loss: 0.2612311840057373
[77, 200] loss: 54.481, kld_loss: 2.036252498626709, recons_loss: 0.2600131332874298
[77, 240] loss: 54.521, kld_loss: 2.0341079235076904, recons_loss: 0.26056134700775146
[77, 280] loss: 54.582, kld_loss: 2.0126051902770996, recons_loss: 0.26143717765808105
[77, 320] loss: 54.538, kld_loss: 2.03829026222229, recons_loss: 0.2599998414516449
[77, 360] loss: 54.397, kld_loss: 1.9796292781829834, recons_loss: 0.26266413927078247
```

EPOCH: 77 | VAL LOSS: 54.42593765258789 | PATIENCE COUNT: 14

```
[78, 40] loss: 54.509, kld_loss: 2.02778697013855, recons_loss: 0.25839507579803467
[78, 80] loss: 54.585, kld_loss: 2.0255160331726074, recons_loss: 0.2595946192741394
[78, 120] loss: 54.507, kld_loss: 2.0111026763916016, recons_loss: 0.25872448086738586
[78, 160] loss: 54.384, kld_loss: 2.0525801181793213, recons_loss: 0.25910425186157227
[78, 200] loss: 54.517, kld_loss: 2.0139036178588867, recons_loss: 0.25925326347351074
[78, 240] loss: 54.559, kld_loss: 1.9812229871749878, recons_loss: 0.26214125752449036
[78, 280] loss: 54.605, kld_loss: 2.058255195617676, recons_loss: 0.2595732808113098
[78, 320] loss: 54.423, kld_loss: 2.016726493835449, recons_loss: 0.26020002365112305
[78, 360] loss: 54.438, kld_loss: 1.98714017868042, recons_loss: 0.2602982521057129
```

EPOCH: 78 | VAL LOSS: 54.42508316040039 | PATIENCE COUNT: 15

```
[79, 40] loss: 54.538, kld_loss: 2.020620346069336, recons_loss: 0.26027342677116394
[79, 80] loss: 54.611, kld_loss: 2.0106008052825928, recons_loss: 0.25897249579429626
[79, 120] loss: 54.512, kld_loss: 2.012932300567627, recons_loss: 0.2610608637332916
[79, 160] loss: 54.621, kld_loss: 2.0288712978363037, recons_loss: 0.2579233646392822
[79, 200] loss: 54.539, kld_loss: 2.0424249172210693, recons_loss: 0.25942978262901306
[79, 240] loss: 54.551, kld_loss: 2.0122921466827393, recons_loss: 0.2618436813354492
[79, 280] loss: 54.461, kld_loss: 2.022181510925293, recons_loss: 0.25492286682128906
[79, 320] loss: 54.437, kld_loss: 2.041597604751587, recons_loss: 0.25908392667770386
[79, 360] loss: 54.437, kld_loss: 2.041597604751587, recons_loss: 0.25908392667770386
```



```
[75, 320] loss: 54.457, kld_loss: 2.04133700751987, recons_loss: 0.2550833200770300
[79, 360] loss: 54.462, kld_loss: 2.0016403198242188, recons_loss: 0.2588389813899994
```

EPOCH: 79 | VAL LOSS: 54.44435501098633 | PATIENCE COUNT: 16

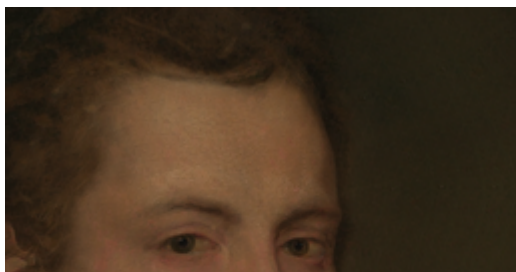
Patience reached at 78 epochs

Inject Image - (Optional)

```
In [16]: #@title Inject Image - (Optional)
noise = 0.0
inject_image = True#@param{type:'boolean'}
#@markdown **inject_image** - color your latent space palette with a randomly sampled image. re-run this cell until
image_weight = 0.6#@param{type:'number'}
#@markdown **image_weight** - how far you want to skew your palette towards the injected image. a value of 0 make

if inject_image:
    if tensor_pkg_version == 'tensorflow':
        num_w = Gs.components.synthesis.input_shape[1]
        rint = np.random.randint(100000)
        noise = train_data[[rint]]
        noise = np.repeat(noise, num_w, axis=0).reshape(1, num_w, -1)
        img = Gs.components.synthesis.run(noise, **Gs_kwargs)[0]
    elif tensor_pkg_version == 'pytorch':
        num_w = G.synthesis.num_ws
        rint = np.random.randint(100000)
        noise = train_data[[rint]]
        noise = np.repeat(noise, num_w, axis=0).reshape(1, num_w, -1)
        img = G.synthesis(ws = torch.tensor(noise).to(device), noise_mode='const')[0]
        img = (img.permute(1, 2, 0) * 127.5 + 128).clamp(0, 255).detach().cpu().numpy()

im = Image.fromarray(img.astype('uint8')).resize((256, 256), Image.LANCZOS)
display(im)
```





Display Palette

In [17]:

```

#@title Display Latent Space Palette
dim = 2#@param{type: 'number'}
#@markdown **dim** - controls how zoomed out you are on the VAE latent space. zoom in and out, see what you find!
num = 10#@param{type: 'number'}
#@markdown **num** - controls how many images are displayed per side of your grid. more will show finer differences

if tensor_pkg_version == 'tensorflow':
    decoder_input = make_decoder_input(2)
    decoder = build_decoder(vae, decoder_input)
    pic_size = Gs.output_shape[-1]
    num_w = Gs.components.synthesis.input_shape[1]
    points = np.linspace(-dim, dim, num)
    full_pic = np.zeros((pic_size*len(points), pic_size*len(points), 3))
    for i, y in enumerate(points):
        for j, x in enumerate(points):
            # print(x, y)
            if inject_image:
                img = decode_pic(decoder, x, y, num_w, Gs, Gs_kwargs, noise=noise, noise_weight=image_weight)
            else:
                img = decode_pic(decoder, x, y, num_w, Gs, Gs_kwargs)
            full_pic[pic_size*len(points)-(i*pic_size+pic_size):pic_size*len(points)-i*pic_size, j*pic_size:j*pic_size+pic_size] = img
elif tensor_pkg_version == 'pytorch':
    vae.eval()
    pic_size = G.synthesis(ws[:1]).shape[-1]
    num_w = G.synthesis.num_ws
    points = np.linspace(-dim, dim, num)
    full_pic = np.zeros((pic_size*len(points), pic_size*len(points), 3))
    for i, y in enumerate(points):
        for j, x in enumerate(points):
            # print(x, y)
            zij = vae.decode(torch.tensor(np.array([[x,y]]).astype('float32')).to(device))
            zij = np.repeat(zij.detach().cpu().numpy(), num_w, axis=0).reshape(1, num_w, -1)

```

```

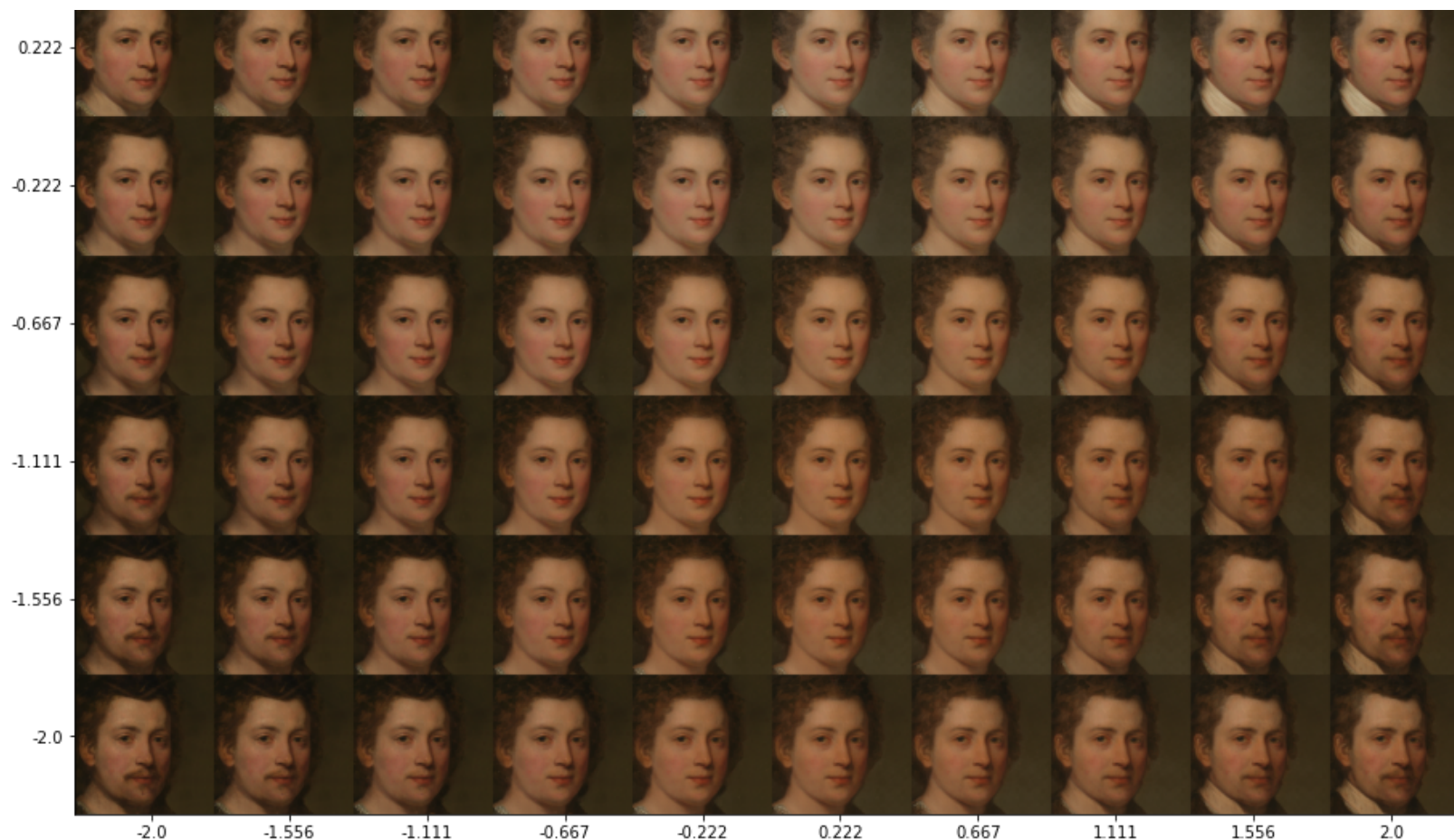
if inject_image:
    zij += image_weight*noise
img = G.synthesis(ws = torch.tensor(zij).to(device), noise_mode='const')[0]
img = (img.permute(1, 2, 0) * 127.5 + 128).clamp(0, 255).detach().cpu().numpy()
full_pic[pic_size*len(points)-(i*pic_size+pic_size):pic_size*len(points)-i*pic_size, j*pic_size:j*pic_size+

im = Image.fromarray(full_pic.astype('uint8')).resize((2048, 2048), Image.LANCZOS)

display_size = 'medium'#@param['small', 'medium', 'large', 'xlarge']
fgs_dict = dict(small=10, medium=16, large=26, xlarge=40)
fgs = fgs_dict[display_size]
fig, ax = plt.subplots(figsize=(fgs,fgs))
ax.imshow(im, extent=[-dim,dim,-dim,dim])
label_list = [round(p, 3) for p in points]
mn = points.min()
mx = points.max()
sz = mx-mn
diff = sz/(len(points)-1)
ax_points = np.linspace(mn+diff/2, (mx-diff)+diff/2, num)
ax.set_xticks(ax_points)
ax.set_xticklabels(label_list)
ax.set_yticks(ax_points)
ax.set_yticklabels(label_list)
plt.show()

```





In [18]:

```

#@title Save Palette
save_palette = True#@param{type:'boolean'}
save_name = 'palette_1'#@param{type:'string'}

if save_palette:
    if tensor_pkg_version == 'tensorflow':
        vae.save_weights(f'{palette_path}/{model_name}_{save_name}.h5')
    elif tensor_pkg_version == 'pytorch':
        torch.save(vae.state_dict(), f'{palette_path}/{model_name}_{save_name}.pt')

```

Paint with VAE Palette

```

In [25]: #@title Start and End Points
#@markdown Pick a start point and end point to draw through the 2D palette. Can choose line, curve, or circle pat
start_point_x = 0#@param{type:'number'}
start_point_y = 0#@param{type:'number'}

#@markdown -----

end_point_x = 1.7#@param{type:'number'}
end_point_y = 1.7#@param{type:'number'}

#@markdown -----

fps = 59.94#@param{type:'number'}
seconds = 8#@param{type:'number'}
path = 'curve'#@param['line', 'curve', 'circle']
curve_intensity = 2.0#@param{type:'number'}
frames = int(fps*seconds)
flip_curve = False#@param{type:'boolean'}
circle_radius = 1#@param{type:'number'}

if path == 'line':
    l = LinePath((start_point_x, start_point_y), (end_point_x, end_point_y), frames)
    iter(l)
elif path == 'curve':
    ll = LinePath((start_point_x, start_point_y), (end_point_x, end_point_y), frames)
    c = CirclePath(frames=frames, rotations=0.5, center=(start_point_x, start_point_y), radius=curve_intensity)
    va = receivers.vec_avg
    if not flip_curve:
        cd = translators.PathTranslator(c, 'direc')
    else:
        cd = translators.CMultiplyTranslator(translators.PathTranslator(c, 'direc'), -1.0)
    mod = [(cd, va, 'direc')]
    l = ModulatedPath(ll, *mod)
    iter(l)
elif path == 'circle':
    l = CirclePath(frames=frames, rotations=1, center=(start_point_x, start_point_y), radius=circle_radius)
    iter(l)

xs = list()
ys = list()
for tick in range(frames):
    x,y = next(l)
    xs.append(x)
    ys.append(y)

```



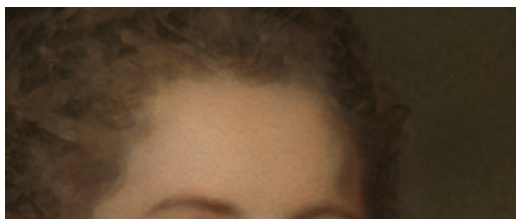
```

m = 'Start'
for x, y in [(xs[0], ys[0]), (xs[-1], ys[-1])]:
    if tensor_pkg_version == 'tensorflow':
        if inject_image:
            img = decode_pic(decoder, x, y, num_w, Gs, Gs_kwargs, noise=noise, noise_weight=image_weight)
        else:
            img = decode_pic(decoder, x, y, num_w, Gs, Gs_kwargs)
    elif tensor_pkg_version == 'pytorch':
        vae.eval()
        zij = vae.decode(torch.tensor(np.array([[x,y]]).astype('float32')).to(device))
        zij = np.repeat(zij.detach().cpu().numpy(), num_w, axis=0).reshape(1, num_w, -1)
        if inject_image:
            zij += image_weight*noise
        img = G.synthesis(ws = torch.tensor(zij).to(device), noise_mode='const')[0]
        img = (img.permute(1, 2, 0) * 127.5 + 128).clamp(0, 255).detach().cpu().numpy()
    print(f'\n\n{m} Pic:\n\n')
    display(Image.fromarray(img.astype('uint8'), 'RGB').resize((256,256), Image.LANCZOS))
    m = 'End'

print('\n\nPath Preview:\n\n')
figs = fgs_dict[display_size]
fig, ax = plt.subplots(figsize=(figs,figs))
ax.imshow(im, extent=[-dim,dim,-dim,dim])
label_list = [round(p, 3) for p in points]
mn = points.min()
mx = points.max()
sz = mx-mn
diff = sz/(len(points)-1)
ax_points = np.linspace(mn+diff/2, (mx-diff)+diff/2, num)
ax.set_xticks(ax_points)
ax.set_xticklabels(label_list)
ax.set_yticks(ax_points)
ax.set_yticklabels(label_list)
plt.scatter(x=xs, y=ys, c='teal', alpha=0.7, marker='o', s=100)
plt.show()

```

Start Pic:





End Pic:



Path Preview:





In [26]:

```

#@title Save Sketch
sketch_name = 'sketch_1' #@param{type:'string'}
if os.path.exists(f'{sketches_path}/{model_name}_{sketch_name}.mov'):
    print(f'\n{model_name}_{sketch_name}.mov already exists, please rename!!\n\n')
    raise Exception()
iter(1)

for tick in range(frames):
    x, y = next(1)

```



```

print(f'Generating x:{x}, y:{y}')
if tensor_pkg_version == 'tensorflow':
    if inject_image:
        img = decode_pic(decoder, x, y, num_w, Gs, Gs_kwargs, noise=noise, noise_weight=image_weight)
    else:
        img = decode_pic(decoder, x, y, num_w, Gs, Gs_kwargs)
elif tensor_pkg_version == 'pytorch':
    vae.eval()
    zij = vae.decode(torch.tensor(np.array([[x,y]]).astype('float32')).to(device))
    zij = np.repeat(zij.detach().cpu().numpy(), num_w, axis=0).reshape(1, num_w, -1)
    if inject_image:
        zij += image_weight*noise
    img = G.synthesis(ws = torch.tensor(zij).to(device), noise_mode='const')[0]
    img = (img.permute(1, 2, 0) * 127.5 + 128).clamp(0, 255).detach().cpu().numpy()
    Image.fromarray(img.astype('uint8'), 'RGB').save(f'{reel_path}/reel_{tick:09d}.png')

print(f'Making Sketch and Saving to {sketches_path}')
os.system(f'ffmpeg -framerate {fps} -pattern_type glob -i '{reel_path}/*.png' -f mov -pix_fmt yuv420p {sketches_p
os.system(f'rm {reel_path}/*.png')

```

```

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Making Sketch and Saving to /content/drive/MyDrive/AI/StyleGan_Drawing/sketches_out
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Out[26]: