

# Learned\_Fingerprint\_Generation

May 14, 2021

```
[1]: import torch
import os
import random
import numpy as np
import cv2
import matplotlib.pyplot as plt
import torchvision
import pandas as pd
import torchvision.utils as vutils
import torch.nn as nn

import torch.nn.functional as F
import torch.optim as optim
```

```
[2]: from google.colab import drive
drive.mount('/content/gdrive')
```

Mounted at /content/gdrive

```
[ ]: !cp '/content/gdrive/My Drive/Diss/Yu/train_data.zip' '/content/train_data.zip'
```

```
[ ]: !unzip 'train_data.zip'
```

Archive: train\_data.zip

```
[3]: import sys
sys.path.append('/content/gdrive/My Drive/')
import model_architectures as ma
import fp_utilities as fp_util
```

## 1 Autoencoder Training

```
[ ]: partition = {}
partition['training data'] = ['{}_img_{}'.format(source, num) for source in_
→ ['gan_1', 'gan_2', 'gan_3', 'real'] for num in range(1,10001)]
```

```
partition['validation data'] = ['{}_img_{}'.format(source, num) for source in_
→ ['gan_1', 'gan_2', 'gan_3', 'real'] for num in range(10001, 15001)]
```

```
[ ]: img_to_labels_dict = {}
label_mapping = {'real':0, 'gan_1':1, 'gan_2':2, 'gan_3':3}
for num in range(1, 150001):
    for source in label_mapping.keys():
        img_to_labels_dict['{}_img_{}'.format(source, num)] = label_mapping[source]
```

```
[ ]: class AutoEncoderDataset(torch.utils.data.Dataset):
    def __init__(self, list_IDs, labels):
        self.labels = labels
        self.list_IDs = list_IDs

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

    def __getitem__(self, index):
        ID = self.list_IDs[index]
        img = torch.from_numpy(np.load('/content/train_data/' + ID + '.npy'))

        label = self.labels[ID]

        return img, label
```

```
[ ]: device = torch.device("cuda:0" if torch.cuda.is_available() else "cpu")
autoEnc = ma.Autoencoder()
autoEnc.to(device)
```

```
[ ]: Autoencoder(
    (conv1): Conv2d(1, 16, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (conv2): Conv2d(16, 4, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (maxPool): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1,
ceil_mode=False)
    (convTr1): ConvTranspose2d(4, 16, kernel_size=(2, 2), stride=(2, 2))
    (convTr2): ConvTranspose2d(16, 1, kernel_size=(2, 2), stride=(2, 2))
)
```

```
[ ]: manualSeed = 650

torch.manual_seed(manualSeed)
random.seed(manualSeed)
np.random.seed(manualSeed)

#initialise the learned fingerprints as random vectors
real_fp = torch.randn(784, requires_grad=True, device=device)
gan1_fp = torch.randn(784, requires_grad=True, device=device)
gan2_fp = torch.randn(784, requires_grad=True, device=device)
gan3_fp = torch.randn(784, requires_grad=True, device=device)
```

```
fps = [real_fp, gan1_fp, gan2_fp, gan3_fp]
```

```
[ ]: from itertools import chain
```

```
optimizer = optim.Adam(chain(autoEnc.parameters(), iter(fps)))
```

```
[ ]: # implementation of the loss component termed L_cls in the dissertation
```

```
def custom_loss(output, target, source):
```

```
    output_vec = torch.reshape(output, (-1, 784)) #flatten batch of matrices to  
    →batch of vectors
```

```
    target_vec = torch.reshape(target, (-1, 784)) #flatten batch of matrices to  
    →batch of vectors
```

```
    img_fps_vec = target_vec - output_vec #get fingerprint
```

```
    img_fps_vec_norm = F.normalize(img_fps_vec - torch.mean(img_fps_vec, dim=1).  
    →unsqueeze(1), dim=1) #normalize fingerprint for each image in batch
```

```
    fps_vec_norm = [F.normalize(fp - torch.mean(fp), dim=0) for fp in fps]  
    →#normalize each model fingerprint
```

```
    cov_vecs = [(torch.mv(img_fps_vec_norm, fp_vec_norm)) for fp_vec_norm in  
    →fps_vec_norm] #get covariance of each image with each fingerprint
```

```
    ce_loss_criterion = nn.CrossEntropyLoss()
```

```
    ce_loss = ce_loss_criterion(torch.stack(cov_vecs, dim=1), source)
```

```
    return ce_loss
```

```
[ ]: params = {'batch_size': 256,  
              'shuffle': True,  
              'num_workers': 6}
```

```
#separate data into training and validation sets
```

```
training_set = AutoEncoderDataset(partition['training data'],  
    →img_to_labels_dict)
```

```
training_generator = torch.utils.data.DataLoader(training_set, **params)
```

```
validation_set = AutoEncoderDataset(partition['validation data'],  
    →img_to_labels_dict)
```

```
validation_generator = torch.utils.data.DataLoader(validation_set, **params)
```

```
/usr/local/lib/python3.7/dist-packages/torch/utils/data/dataloader.py:477:  
UserWarning: This DataLoader will create 6 worker processes in total. Our  
suggested max number of worker in current system is 2, which is smaller than  
what this DataLoader is going to create. Please be aware that excessive worker  
creation might get DataLoader running slow or even freeze, lower the worker  
number to avoid potential slowness/freeze if necessary.  
cpuset_checked))
```

```
[ ]: #track loss values at the end of every epoch for early stopping
```

```

mse_train_losses = []
fp_train_losses = []
mse_val_losses = []
fp_val_losses = []

mseCriterion = nn.MSELoss()

```

```

[:]: def train_autoenc(start_epoch, end_epoch):
    for epoch in range(start_epoch, end_epoch):
        print("Starting epoch {}".format(epoch))
        # Training
        mse_loss_sum = 0
        fp_loss_sum = 0
        for i, (local_batch, local_labels) in enumerate(training_generator):

            local_batch, local_labels = local_batch.to(device), local_labels.
→to(device)
            optimizer.zero_grad()
            output = autoEnc(local_batch)

            mse_loss = mseCriterion(output, local_batch)
            fp_loss = custom_loss(output, local_batch, local_labels)

            cum_loss = 5*mse_loss + 2*fp_loss
            cum_loss.backward()
            optimizer.step()

            mse_loss_sum += mse_loss.item()
            fp_loss_sum += fp_loss.item()
            if i % 50 == 0:
                print('[%d/%d] [%d/%d]\tTrain Reconstruction Loss %.4f\t Train_
→Correlation Loss %.4f'
                    % (epoch, end_epoch, i, len(training_generator), mse_loss.item(),
→fp_loss.item()))

            mse_train_losses.append(mse_loss_sum/len(training_generator))
            fp_train_losses.append(fp_loss_sum//len(training_generator))

        # Validation
        mse_loss_sum = 0
        fp_loss_sum = 0
        with torch.set_grad_enabled(False):
            for local_batch, local_labels in validation_generator:
                local_batch, local_labels = local_batch.to(device), local_labels.
→to(device)
                output = autoEnc(local_batch)

```

```

        mse_loss = mseCriterion(output, local_batch)
        fp_loss = custom_loss(output, local_batch, local_labels)

        mse_loss_sum += mse_loss.item()
        fp_loss_sum += fp_loss.item()

    avg_mse_loss = mse_loss_sum/len(validation_generator)
    avg_fp_loss = fp_loss_sum/len(validation_generator)
    print("Val Reconstruction Loss %.4f\t Val Correlation Loss %.
→4f"%(avg_mse_loss, avg_fp_loss))
    mse_val_losses.append(avg_mse_loss)
    fp_val_losses.append(avg_fp_loss)

```

```

[ ]: def create_checkpoint():
    torch.save({
        'model_state_dict': autoEnc.state_dict(),
        'optim_state_dict': optimizer.state_dict(),
        'mse_train_losses': mse_train_losses,
        'fp_train_losses': fp_train_losses,
        'mse_val_losses': mse_val_losses,
        'fp_val_losses': fp_val_losses
    }, 'gdrive/My Drive/Diss/trained_models/Autoencoder')
    np.save('gdrive/My Drive/Diss/Yu/Fingerprints/print_real', real_fp.to('cpu').
→detach().numpy())
    np.save('gdrive/My Drive/Diss/Yu/Fingerprints/print_GAN_1', gan1_fp.to('cpu').
→detach().numpy())
    np.save('gdrive/My Drive/Diss/Yu/Fingerprints/print_GAN_2', gan2_fp.to('cpu').
→detach().numpy())
    np.save('gdrive/My Drive/Diss/Yu/Fingerprints/print_GAN_3', gan3_fp.to('cpu').
→detach().numpy())

```

```

[ ]: train_autoenc(0, 100)

```

Starting epoch 0

```

/usr/local/lib/python3.6/dist-packages/torch/nn/functional.py:1639: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
  warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")

```

```

[0/100][0/157]  Train Reconstruction Loss 0.1610          Train Correlation Loss
1.3865
[0/100][50/157] Train Reconstruction Loss 0.1419          Train Correlation Loss
1.3865
[0/100][100/157]      Train Reconstruction Loss 0.0975          Train
Correlation Loss 1.3851
[0/100][150/157]      Train Reconstruction Loss 0.0482          Train
Correlation Loss 1.3859

```

Val Reconstruction Loss 0.0445    Val Correlation Loss 1.3851  
 Starting epoch 1  
 [1/100][0/157]    Train Reconstruction Loss 0.0433                      Train Correlation Loss  
 1.3837  
 [1/100][50/157]    Train Reconstruction Loss 0.0281                      Train Correlation Loss  
 1.3828  
 [1/100][100/157]                      Train Reconstruction Loss 0.0237                      Train  
 Correlation Loss 1.3814  
 [1/100][150/157]                      Train Reconstruction Loss 0.0220                      Train  
 Correlation Loss 1.3818  
 Val Reconstruction Loss 0.0218    Val Correlation Loss 1.3811  
 Starting epoch 2  
 [2/100][0/157]    Train Reconstruction Loss 0.0222                      Train Correlation Loss  
 1.3785  
 [2/100][50/157]    Train Reconstruction Loss 0.0203                      Train Correlation Loss  
 1.3788  
 [2/100][100/157]                      Train Reconstruction Loss 0.0206                      Train  
 Correlation Loss 1.3801  
 [2/100][150/157]                      Train Reconstruction Loss 0.0194                      Train  
 Correlation Loss 1.3801  
 Val Reconstruction Loss 0.0199    Val Correlation Loss 1.3773  
 Starting epoch 3  
 [3/100][0/157]    Train Reconstruction Loss 0.0196                      Train Correlation Loss  
 1.3750  
 [3/100][50/157]    Train Reconstruction Loss 0.0192                      Train Correlation Loss  
 1.3776  
 [3/100][100/157]                      Train Reconstruction Loss 0.0197                      Train  
 Correlation Loss 1.3760  
 [3/100][150/157]                      Train Reconstruction Loss 0.0192                      Train  
 Correlation Loss 1.3714  
 Val Reconstruction Loss 0.0190    Val Correlation Loss 1.3729  
 Starting epoch 4  
 [4/100][0/157]    Train Reconstruction Loss 0.0196                      Train Correlation Loss  
 1.3706  
 [4/100][50/157]    Train Reconstruction Loss 0.0187                      Train Correlation Loss  
 1.3730  
 [4/100][100/157]                      Train Reconstruction Loss 0.0187                      Train  
 Correlation Loss 1.3698  
 [4/100][150/157]                      Train Reconstruction Loss 0.0186                      Train  
 Correlation Loss 1.3660  
 Val Reconstruction Loss 0.0186    Val Correlation Loss 1.3678  
 Starting epoch 5  
 [5/100][0/157]    Train Reconstruction Loss 0.0183                      Train Correlation Loss  
 1.3664  
 [5/100][50/157]    Train Reconstruction Loss 0.0189                      Train Correlation Loss  
 1.3648  
 [5/100][100/157]                      Train Reconstruction Loss 0.0179                      Train  
 Correlation Loss 1.3653

[5/100][150/157] Train Reconstruction Loss 0.0187 Train  
 Correlation Loss 1.3624  
 Val Reconstruction Loss 0.0184 Val Correlation Loss 1.3619  
 Starting epoch 6  
 [6/100][0/157] Train Reconstruction Loss 0.0191 Train Correlation Loss  
 1.3554  
 [6/100][50/157] Train Reconstruction Loss 0.0185 Train Correlation Loss  
 1.3579  
 [6/100][100/157] Train Reconstruction Loss 0.0182 Train  
 Correlation Loss 1.3617  
 [6/100][150/157] Train Reconstruction Loss 0.0184 Train  
 Correlation Loss 1.3551  
 Val Reconstruction Loss 0.0185 Val Correlation Loss 1.3553  
 Starting epoch 7  
 [7/100][0/157] Train Reconstruction Loss 0.0179 Train Correlation Loss  
 1.3508  
 [7/100][50/157] Train Reconstruction Loss 0.0192 Train Correlation Loss  
 1.3556  
 [7/100][100/157] Train Reconstruction Loss 0.0189 Train  
 Correlation Loss 1.3489  
 [7/100][150/157] Train Reconstruction Loss 0.0186 Train  
 Correlation Loss 1.3504  
 Val Reconstruction Loss 0.0187 Val Correlation Loss 1.3480  
 Starting epoch 8  
 [8/100][0/157] Train Reconstruction Loss 0.0187 Train Correlation Loss  
 1.3531  
 [8/100][50/157] Train Reconstruction Loss 0.0181 Train Correlation Loss  
 1.3528  
 [8/100][100/157] Train Reconstruction Loss 0.0180 Train  
 Correlation Loss 1.3342  
 [8/100][150/157] Train Reconstruction Loss 0.0188 Train  
 Correlation Loss 1.3413  
 Val Reconstruction Loss 0.0190 Val Correlation Loss 1.3405  
 Starting epoch 9  
 [9/100][0/157] Train Reconstruction Loss 0.0199 Train Correlation Loss  
 1.3432  
 [9/100][50/157] Train Reconstruction Loss 0.0190 Train Correlation Loss  
 1.3388  
 [9/100][100/157] Train Reconstruction Loss 0.0197 Train  
 Correlation Loss 1.3390  
 [9/100][150/157] Train Reconstruction Loss 0.0191 Train  
 Correlation Loss 1.3307  
 Val Reconstruction Loss 0.0194 Val Correlation Loss 1.3325  
 Starting epoch 10  
 [10/100][0/157] Train Reconstruction Loss 0.0199 Train Correlation Loss  
 1.3327  
 [10/100][50/157] Train Reconstruction Loss 0.0195 Train  
 Correlation Loss 1.3291

[10/100] [100/157] Train Reconstruction Loss 0.0193 Train  
 Correlation Loss 1.3324  
 [10/100] [150/157] Train Reconstruction Loss 0.0193 Train  
 Correlation Loss 1.3161  
 Val Reconstruction Loss 0.0196 Val Correlation Loss 1.3240  
 Starting epoch 11  
 [11/100] [0/157] Train Reconstruction Loss 0.0206 Train Correlation Loss  
 1.3216  
 [11/100] [50/157] Train Reconstruction Loss 0.0200 Train  
 Correlation Loss 1.3255  
 [11/100] [100/157] Train Reconstruction Loss 0.0193 Train  
 Correlation Loss 1.3192  
 [11/100] [150/157] Train Reconstruction Loss 0.0202 Train  
 Correlation Loss 1.3130  
 Val Reconstruction Loss 0.0201 Val Correlation Loss 1.3172  
 Starting epoch 12  
 [12/100] [0/157] Train Reconstruction Loss 0.0203 Train Correlation Loss  
 1.3166  
 [12/100] [50/157] Train Reconstruction Loss 0.0199 Train  
 Correlation Loss 1.3112  
 [12/100] [100/157] Train Reconstruction Loss 0.0201 Train  
 Correlation Loss 1.3124  
 [12/100] [150/157] Train Reconstruction Loss 0.0207 Train  
 Correlation Loss 1.3008  
 Val Reconstruction Loss 0.0204 Val Correlation Loss 1.3085  
 Starting epoch 13  
 [13/100] [0/157] Train Reconstruction Loss 0.0211 Train Correlation Loss  
 1.3004  
 [13/100] [50/157] Train Reconstruction Loss 0.0208 Train  
 Correlation Loss 1.3058  
 [13/100] [100/157] Train Reconstruction Loss 0.0211 Train  
 Correlation Loss 1.3016  
 [13/100] [150/157] Train Reconstruction Loss 0.0215 Train  
 Correlation Loss 1.2872  
 Val Reconstruction Loss 0.0215 Val Correlation Loss 1.3066  
 Starting epoch 14  
 [14/100] [0/157] Train Reconstruction Loss 0.0211 Train Correlation Loss  
 1.3072  
 [14/100] [50/157] Train Reconstruction Loss 0.0220 Train  
 Correlation Loss 1.3012  
 [14/100] [100/157] Train Reconstruction Loss 0.0217 Train  
 Correlation Loss 1.2858  
 [14/100] [150/157] Train Reconstruction Loss 0.0215 Train  
 Correlation Loss 1.2974  
 Val Reconstruction Loss 0.0213 Val Correlation Loss 1.2949  
 Starting epoch 15  
 [15/100] [0/157] Train Reconstruction Loss 0.0208 Train Correlation Loss  
 1.2956



[15/100] [50/157] Train Reconstruction Loss 0.0218 Train  
 Correlation Loss 1.2930  
 [15/100] [100/157] Train Reconstruction Loss 0.0212 Train  
 Correlation Loss 1.2880  
 [15/100] [150/157] Train Reconstruction Loss 0.0225 Train  
 Correlation Loss 1.2772  
 Val Reconstruction Loss 0.0217 Val Correlation Loss 1.2886  
 Starting epoch 16  
 [16/100] [0/157] Train Reconstruction Loss 0.0216 Train Correlation Loss  
 1.2855  
 [16/100] [50/157] Train Reconstruction Loss 0.0221 Train  
 Correlation Loss 1.2635  
 [16/100] [100/157] Train Reconstruction Loss 0.0225 Train  
 Correlation Loss 1.2766  
 [16/100] [150/157] Train Reconstruction Loss 0.0228 Train  
 Correlation Loss 1.2753  
 Val Reconstruction Loss 0.0222 Val Correlation Loss 1.2829  
 Starting epoch 17  
 [17/100] [0/157] Train Reconstruction Loss 0.0224 Train Correlation Loss  
 1.2872  
 [17/100] [50/157] Train Reconstruction Loss 0.0220 Train  
 Correlation Loss 1.2761  
 [17/100] [100/157] Train Reconstruction Loss 0.0223 Train  
 Correlation Loss 1.2793  
 [17/100] [150/157] Train Reconstruction Loss 0.0232 Train  
 Correlation Loss 1.2804  
 Val Reconstruction Loss 0.0229 Val Correlation Loss 1.2797  
 Starting epoch 18  
 [18/100] [0/157] Train Reconstruction Loss 0.0219 Train Correlation Loss  
 1.2727  
 [18/100] [50/157] Train Reconstruction Loss 0.0229 Train  
 Correlation Loss 1.2628  
 [18/100] [100/157] Train Reconstruction Loss 0.0234 Train  
 Correlation Loss 1.2922  
 [18/100] [150/157] Train Reconstruction Loss 0.0235 Train  
 Correlation Loss 1.2711  
 Val Reconstruction Loss 0.0230 Val Correlation Loss 1.2726  
 Starting epoch 19  
 [19/100] [0/157] Train Reconstruction Loss 0.0223 Train Correlation Loss  
 1.2532  
 [19/100] [50/157] Train Reconstruction Loss 0.0227 Train  
 Correlation Loss 1.2652  
 [19/100] [100/157] Train Reconstruction Loss 0.0230 Train  
 Correlation Loss 1.2579  
 [19/100] [150/157] Train Reconstruction Loss 0.0235 Train  
 Correlation Loss 1.2630  
 Val Reconstruction Loss 0.0237 Val Correlation Loss 1.2716  
 Starting epoch 20

[20/100] [0/157] Train Reconstruction Loss 0.0241 Train Correlation Loss  
 1.2635  
 [20/100] [50/157] Train Reconstruction Loss 0.0232 Train  
 Correlation Loss 1.2718  
 [20/100] [100/157] Train Reconstruction Loss 0.0231 Train  
 Correlation Loss 1.2610  
 [20/100] [150/157] Train Reconstruction Loss 0.0235 Train  
 Correlation Loss 1.2653  
 Val Reconstruction Loss 0.0240 Val Correlation Loss 1.2686  
 Starting epoch 21  
 [21/100] [0/157] Train Reconstruction Loss 0.0248 Train Correlation Loss  
 1.2599  
 [21/100] [50/157] Train Reconstruction Loss 0.0234 Train  
 Correlation Loss 1.2528  
 [21/100] [100/157] Train Reconstruction Loss 0.0235 Train  
 Correlation Loss 1.2720  
 [21/100] [150/157] Train Reconstruction Loss 0.0237 Train  
 Correlation Loss 1.2613  
 Val Reconstruction Loss 0.0240 Val Correlation Loss 1.2625  
 Starting epoch 22  
 [22/100] [0/157] Train Reconstruction Loss 0.0251 Train Correlation Loss  
 1.2609  
 [22/100] [50/157] Train Reconstruction Loss 0.0233 Train  
 Correlation Loss 1.2601  
 [22/100] [100/157] Train Reconstruction Loss 0.0247 Train  
 Correlation Loss 1.2507  
 [22/100] [150/157] Train Reconstruction Loss 0.0240 Train  
 Correlation Loss 1.2492  
 Val Reconstruction Loss 0.0240 Val Correlation Loss 1.2587  
 Starting epoch 23  
 [23/100] [0/157] Train Reconstruction Loss 0.0237 Train Correlation Loss  
 1.2665  
 [23/100] [50/157] Train Reconstruction Loss 0.0240 Train  
 Correlation Loss 1.2602  
 [23/100] [100/157] Train Reconstruction Loss 0.0241 Train  
 Correlation Loss 1.2628  
 [23/100] [150/157] Train Reconstruction Loss 0.0246 Train  
 Correlation Loss 1.2469  
 Val Reconstruction Loss 0.0242 Val Correlation Loss 1.2559  
 Starting epoch 24  
 [24/100] [0/157] Train Reconstruction Loss 0.0248 Train Correlation Loss  
 1.2676  
 [24/100] [50/157] Train Reconstruction Loss 0.0243 Train  
 Correlation Loss 1.2547  
 [24/100] [100/157] Train Reconstruction Loss 0.0245 Train  
 Correlation Loss 1.2422  
 [24/100] [150/157] Train Reconstruction Loss 0.0255 Train  
 Correlation Loss 1.2399

Val Reconstruction Loss 0.0246    Val Correlation Loss 1.2567  
 Starting epoch 25  
 [25/100] [0/157] Train Reconstruction Loss 0.0253                      Train Correlation Loss 1.2581  
 [25/100] [50/157]                      Train Reconstruction Loss 0.0246                      Train Correlation Loss 1.2432  
 [25/100] [100/157]                      Train Reconstruction Loss 0.0236                      Train Correlation Loss 1.2426  
 [25/100] [150/157]                      Train Reconstruction Loss 0.0245                      Train Correlation Loss 1.2490  
 Val Reconstruction Loss 0.0247    Val Correlation Loss 1.2499  
 Starting epoch 26  
 [26/100] [0/157] Train Reconstruction Loss 0.0241                      Train Correlation Loss 1.2514  
 [26/100] [50/157]                      Train Reconstruction Loss 0.0246                      Train Correlation Loss 1.2485  
 [26/100] [100/157]                      Train Reconstruction Loss 0.0246                      Train Correlation Loss 1.2511  
 [26/100] [150/157]                      Train Reconstruction Loss 0.0249                      Train Correlation Loss 1.2387  
 Val Reconstruction Loss 0.0248    Val Correlation Loss 1.2488  
 Starting epoch 27  
 [27/100] [0/157] Train Reconstruction Loss 0.0237                      Train Correlation Loss 1.2419  
 [27/100] [50/157]                      Train Reconstruction Loss 0.0255                      Train Correlation Loss 1.2466  
 [27/100] [100/157]                      Train Reconstruction Loss 0.0250                      Train Correlation Loss 1.2476  
 [27/100] [150/157]                      Train Reconstruction Loss 0.0259                      Train Correlation Loss 1.2416  
 Val Reconstruction Loss 0.0251    Val Correlation Loss 1.2501  
 Starting epoch 28  
 [28/100] [0/157] Train Reconstruction Loss 0.0261                      Train Correlation Loss 1.2519  
 [28/100] [50/157]                      Train Reconstruction Loss 0.0250                      Train Correlation Loss 1.2437  
 [28/100] [100/157]                      Train Reconstruction Loss 0.0248                      Train Correlation Loss 1.2484  
 [28/100] [150/157]                      Train Reconstruction Loss 0.0254                      Train Correlation Loss 1.2505  
 Val Reconstruction Loss 0.0250    Val Correlation Loss 1.2454  
 Starting epoch 29  
 [29/100] [0/157] Train Reconstruction Loss 0.0249                      Train Correlation Loss 1.2467  
 [29/100] [50/157]                      Train Reconstruction Loss 0.0259                      Train Correlation Loss 1.2381  
 [29/100] [100/157]                      Train Reconstruction Loss 0.0249                      Train Correlation Loss 1.2300

[29/100] [150/157] Train Reconstruction Loss 0.0247 Train  
 Correlation Loss 1.2448  
 Val Reconstruction Loss 0.0250 Val Correlation Loss 1.2437  
 Starting epoch 30  
 [30/100] [0/157] Train Reconstruction Loss 0.0257 Train Correlation Loss  
 1.2302  
 [30/100] [50/157] Train Reconstruction Loss 0.0255 Train  
 Correlation Loss 1.2348  
 [30/100] [100/157] Train Reconstruction Loss 0.0258 Train  
 Correlation Loss 1.2260  
 [30/100] [150/157] Train Reconstruction Loss 0.0260 Train  
 Correlation Loss 1.2374  
 Val Reconstruction Loss 0.0251 Val Correlation Loss 1.2421  
 Starting epoch 31  
 [31/100] [0/157] Train Reconstruction Loss 0.0257 Train Correlation Loss  
 1.2436  
 [31/100] [50/157] Train Reconstruction Loss 0.0256 Train  
 Correlation Loss 1.2409  
 [31/100] [100/157] Train Reconstruction Loss 0.0250 Train  
 Correlation Loss 1.2400  
 [31/100] [150/157] Train Reconstruction Loss 0.0258 Train  
 Correlation Loss 1.2251  
 Val Reconstruction Loss 0.0253 Val Correlation Loss 1.2406  
 Starting epoch 32  
 [32/100] [0/157] Train Reconstruction Loss 0.0265 Train Correlation Loss  
 1.2214  
 [32/100] [50/157] Train Reconstruction Loss 0.0253 Train  
 Correlation Loss 1.2469  
 [32/100] [100/157] Train Reconstruction Loss 0.0247 Train  
 Correlation Loss 1.2574  
 [32/100] [150/157] Train Reconstruction Loss 0.0260 Train  
 Correlation Loss 1.2289  
 Val Reconstruction Loss 0.0253 Val Correlation Loss 1.2400  
 Starting epoch 33  
 [33/100] [0/157] Train Reconstruction Loss 0.0263 Train Correlation Loss  
 1.2232  
 [33/100] [50/157] Train Reconstruction Loss 0.0260 Train  
 Correlation Loss 1.2410  
 [33/100] [100/157] Train Reconstruction Loss 0.0249 Train  
 Correlation Loss 1.2436  
 [33/100] [150/157] Train Reconstruction Loss 0.0249 Train  
 Correlation Loss 1.2303  
 Val Reconstruction Loss 0.0252 Val Correlation Loss 1.2375  
 Starting epoch 34  
 [34/100] [0/157] Train Reconstruction Loss 0.0252 Train Correlation Loss  
 1.2211  
 [34/100] [50/157] Train Reconstruction Loss 0.0253 Train  
 Correlation Loss 1.2260

[34/100] [100/157] Train Reconstruction Loss 0.0246 Train  
 Correlation Loss 1.2342  
 [34/100] [150/157] Train Reconstruction Loss 0.0268 Train  
 Correlation Loss 1.2358  
 Val Reconstruction Loss 0.0256 Val Correlation Loss 1.2382  
 Starting epoch 35  
 [35/100] [0/157] Train Reconstruction Loss 0.0257 Train Correlation Loss  
 1.2439  
 [35/100] [50/157] Train Reconstruction Loss 0.0246 Train  
 Correlation Loss 1.2285  
 [35/100] [100/157] Train Reconstruction Loss 0.0264 Train  
 Correlation Loss 1.2337  
 [35/100] [150/157] Train Reconstruction Loss 0.0259 Train  
 Correlation Loss 1.2281  
 Val Reconstruction Loss 0.0258 Val Correlation Loss 1.2358  
 Starting epoch 36  
 [36/100] [0/157] Train Reconstruction Loss 0.0257 Train Correlation Loss  
 1.2396  
 [36/100] [50/157] Train Reconstruction Loss 0.0255 Train  
 Correlation Loss 1.2336  
 [36/100] [100/157] Train Reconstruction Loss 0.0258 Train  
 Correlation Loss 1.2293  
 [36/100] [150/157] Train Reconstruction Loss 0.0246 Train  
 Correlation Loss 1.2362  
 Val Reconstruction Loss 0.0258 Val Correlation Loss 1.2397  
 Starting epoch 37  
 [37/100] [0/157] Train Reconstruction Loss 0.0266 Train Correlation Loss  
 1.2381  
 [37/100] [50/157] Train Reconstruction Loss 0.0246 Train  
 Correlation Loss 1.2530  
 [37/100] [100/157] Train Reconstruction Loss 0.0245 Train  
 Correlation Loss 1.2460  
 [37/100] [150/157] Train Reconstruction Loss 0.0255 Train  
 Correlation Loss 1.2308  
 Val Reconstruction Loss 0.0256 Val Correlation Loss 1.2323  
 Starting epoch 38  
 [38/100] [0/157] Train Reconstruction Loss 0.0267 Train Correlation Loss  
 1.2236  
 [38/100] [50/157] Train Reconstruction Loss 0.0260 Train  
 Correlation Loss 1.2241  
 [38/100] [100/157] Train Reconstruction Loss 0.0260 Train  
 Correlation Loss 1.2357  
 [38/100] [150/157] Train Reconstruction Loss 0.0264 Train  
 Correlation Loss 1.2253  
 Val Reconstruction Loss 0.0255 Val Correlation Loss 1.2316  
 Starting epoch 39  
 [39/100] [0/157] Train Reconstruction Loss 0.0254 Train Correlation Loss  
 1.2333

[39/100] [50/157] Train Reconstruction Loss 0.0257 Train  
 Correlation Loss 1.2247  
 [39/100] [100/157] Train Reconstruction Loss 0.0265 Train  
 Correlation Loss 1.2281  
 [39/100] [150/157] Train Reconstruction Loss 0.0259 Train  
 Correlation Loss 1.2253  
 Val Reconstruction Loss 0.0256 Val Correlation Loss 1.2307  
 Starting epoch 40  
 [40/100] [0/157] Train Reconstruction Loss 0.0256 Train Correlation Loss  
 1.2321  
 [40/100] [50/157] Train Reconstruction Loss 0.0262 Train  
 Correlation Loss 1.2344  
 [40/100] [100/157] Train Reconstruction Loss 0.0257 Train  
 Correlation Loss 1.2394  
 [40/100] [150/157] Train Reconstruction Loss 0.0262 Train  
 Correlation Loss 1.2245  
 Val Reconstruction Loss 0.0258 Val Correlation Loss 1.2291  
 Starting epoch 41  
 [41/100] [0/157] Train Reconstruction Loss 0.0258 Train Correlation Loss  
 1.2286  
 [41/100] [50/157] Train Reconstruction Loss 0.0269 Train  
 Correlation Loss 1.2430  
 [41/100] [100/157] Train Reconstruction Loss 0.0258 Train  
 Correlation Loss 1.2351  
 [41/100] [150/157] Train Reconstruction Loss 0.0262 Train  
 Correlation Loss 1.2309  
 Val Reconstruction Loss 0.0258 Val Correlation Loss 1.2282  
 Starting epoch 42  
 [42/100] [0/157] Train Reconstruction Loss 0.0261 Train Correlation Loss  
 1.2208  
 [42/100] [50/157] Train Reconstruction Loss 0.0261 Train  
 Correlation Loss 1.2269  
 [42/100] [100/157] Train Reconstruction Loss 0.0260 Train  
 Correlation Loss 1.2204  
 [42/100] [150/157] Train Reconstruction Loss 0.0263 Train  
 Correlation Loss 1.2214  
 Val Reconstruction Loss 0.0258 Val Correlation Loss 1.2267  
 Starting epoch 43  
 [43/100] [0/157] Train Reconstruction Loss 0.0252 Train Correlation Loss  
 1.2295  
 [43/100] [50/157] Train Reconstruction Loss 0.0267 Train  
 Correlation Loss 1.2301  
 [43/100] [100/157] Train Reconstruction Loss 0.0267 Train  
 Correlation Loss 1.2413  
 [43/100] [150/157] Train Reconstruction Loss 0.0255 Train  
 Correlation Loss 1.2344  
 Val Reconstruction Loss 0.0258 Val Correlation Loss 1.2263  
 Starting epoch 44

[44/100] [0/157] Train Reconstruction Loss 0.0261      Train Correlation Loss  
 1.2338  
 [44/100] [50/157]      Train Reconstruction Loss 0.0258      Train  
 Correlation Loss 1.2286  
 [44/100] [100/157]      Train Reconstruction Loss 0.0253      Train  
 Correlation Loss 1.2209  
 [44/100] [150/157]      Train Reconstruction Loss 0.0262      Train  
 Correlation Loss 1.2274  
 Val Reconstruction Loss 0.0259      Val Correlation Loss 1.2237  
 Starting epoch 45  
 [45/100] [0/157] Train Reconstruction Loss 0.0263      Train Correlation Loss  
 1.2090  
 [45/100] [50/157]      Train Reconstruction Loss 0.0263      Train  
 Correlation Loss 1.2289  
 [45/100] [100/157]      Train Reconstruction Loss 0.0263      Train  
 Correlation Loss 1.2275  
 [45/100] [150/157]      Train Reconstruction Loss 0.0259      Train  
 Correlation Loss 1.2129  
 Val Reconstruction Loss 0.0261      Val Correlation Loss 1.2265  
 Starting epoch 46  
 [46/100] [0/157] Train Reconstruction Loss 0.0252      Train Correlation Loss  
 1.2289  
 [46/100] [50/157]      Train Reconstruction Loss 0.0252      Train  
 Correlation Loss 1.2156  
 [46/100] [100/157]      Train Reconstruction Loss 0.0250      Train  
 Correlation Loss 1.2302  
 [46/100] [150/157]      Train Reconstruction Loss 0.0263      Train  
 Correlation Loss 1.2102  
 Val Reconstruction Loss 0.0260      Val Correlation Loss 1.2218  
 Starting epoch 47  
 [47/100] [0/157] Train Reconstruction Loss 0.0265      Train Correlation Loss  
 1.2184  
 [47/100] [50/157]      Train Reconstruction Loss 0.0268      Train  
 Correlation Loss 1.2151  
 [47/100] [100/157]      Train Reconstruction Loss 0.0262      Train  
 Correlation Loss 1.2211  
 [47/100] [150/157]      Train Reconstruction Loss 0.0259      Train  
 Correlation Loss 1.2287  
 Val Reconstruction Loss 0.0262      Val Correlation Loss 1.2202  
 Starting epoch 48  
 [48/100] [0/157] Train Reconstruction Loss 0.0265      Train Correlation Loss  
 1.2234  
 [48/100] [50/157]      Train Reconstruction Loss 0.0258      Train  
 Correlation Loss 1.2156  
 [48/100] [100/157]      Train Reconstruction Loss 0.0259      Train  
 Correlation Loss 1.2254  
 [48/100] [150/157]      Train Reconstruction Loss 0.0269      Train  
 Correlation Loss 1.2306

Val Reconstruction Loss 0.0262    Val Correlation Loss 1.2196  
 Starting epoch 49  
 [49/100] [0/157] Train Reconstruction Loss 0.0267    Train Correlation Loss 1.2123  
 [49/100] [50/157]    Train Reconstruction Loss 0.0268    Train Correlation Loss 1.2225  
 [49/100] [100/157]    Train Reconstruction Loss 0.0271    Train Correlation Loss 1.2175  
 [49/100] [150/157]    Train Reconstruction Loss 0.0254    Train Correlation Loss 1.2124  
 Val Reconstruction Loss 0.0267    Val Correlation Loss 1.2199  
 Starting epoch 50  
 [50/100] [0/157] Train Reconstruction Loss 0.0263    Train Correlation Loss 1.2222  
 [50/100] [50/157]    Train Reconstruction Loss 0.0274    Train Correlation Loss 1.2117  
 [50/100] [100/157]    Train Reconstruction Loss 0.0262    Train Correlation Loss 1.1990  
 [50/100] [150/157]    Train Reconstruction Loss 0.0263    Train Correlation Loss 1.2039  
 Val Reconstruction Loss 0.0264    Val Correlation Loss 1.2180  
 Starting epoch 51  
 [51/100] [0/157] Train Reconstruction Loss 0.0259    Train Correlation Loss 1.2228  
 [51/100] [50/157]    Train Reconstruction Loss 0.0261    Train Correlation Loss 1.2176  
 [51/100] [100/157]    Train Reconstruction Loss 0.0263    Train Correlation Loss 1.2061  
 [51/100] [150/157]    Train Reconstruction Loss 0.0255    Train Correlation Loss 1.2101  
 Val Reconstruction Loss 0.0264    Val Correlation Loss 1.2165  
 Starting epoch 52  
 [52/100] [0/157] Train Reconstruction Loss 0.0271    Train Correlation Loss 1.2122  
 [52/100] [50/157]    Train Reconstruction Loss 0.0266    Train Correlation Loss 1.2202  
 [52/100] [100/157]    Train Reconstruction Loss 0.0268    Train Correlation Loss 1.2245  
 [52/100] [150/157]    Train Reconstruction Loss 0.0266    Train Correlation Loss 1.2027  
 Val Reconstruction Loss 0.0266    Val Correlation Loss 1.2155  
 Starting epoch 53  
 [53/100] [0/157] Train Reconstruction Loss 0.0281    Train Correlation Loss 1.2048  
 [53/100] [50/157]    Train Reconstruction Loss 0.0266    Train Correlation Loss 1.2262  
 [53/100] [100/157]    Train Reconstruction Loss 0.0275    Train Correlation Loss 1.1946



[53/100] [150/157] Train Reconstruction Loss 0.0264 Train  
 Correlation Loss 1.2130  
 Val Reconstruction Loss 0.0271 Val Correlation Loss 1.2150  
 Starting epoch 54  
 [54/100] [0/157] Train Reconstruction Loss 0.0268 Train Correlation Loss  
 1.2181  
 [54/100] [50/157] Train Reconstruction Loss 0.0273 Train  
 Correlation Loss 1.1910  
 [54/100] [100/157] Train Reconstruction Loss 0.0262 Train  
 Correlation Loss 1.2121  
 [54/100] [150/157] Train Reconstruction Loss 0.0275 Train  
 Correlation Loss 1.2216  
 Val Reconstruction Loss 0.0269 Val Correlation Loss 1.2116  
 Starting epoch 55  
 [55/100] [0/157] Train Reconstruction Loss 0.0274 Train Correlation Loss  
 1.2380  
 [55/100] [50/157] Train Reconstruction Loss 0.0267 Train  
 Correlation Loss 1.2048  
 [55/100] [100/157] Train Reconstruction Loss 0.0262 Train  
 Correlation Loss 1.2009  
 [55/100] [150/157] Train Reconstruction Loss 0.0278 Train  
 Correlation Loss 1.2057  
 Val Reconstruction Loss 0.0268 Val Correlation Loss 1.2102  
 Starting epoch 56  
 [56/100] [0/157] Train Reconstruction Loss 0.0269 Train Correlation Loss  
 1.2141  
 [56/100] [50/157] Train Reconstruction Loss 0.0271 Train  
 Correlation Loss 1.2041  
 [56/100] [100/157] Train Reconstruction Loss 0.0271 Train  
 Correlation Loss 1.2013  
 [56/100] [150/157] Train Reconstruction Loss 0.0269 Train  
 Correlation Loss 1.2051  
 Val Reconstruction Loss 0.0269 Val Correlation Loss 1.2073  
 Starting epoch 57  
 [57/100] [0/157] Train Reconstruction Loss 0.0264 Train Correlation Loss  
 1.2029  
 [57/100] [50/157] Train Reconstruction Loss 0.0275 Train  
 Correlation Loss 1.2044  
 [57/100] [100/157] Train Reconstruction Loss 0.0278 Train  
 Correlation Loss 1.1846  
 [57/100] [150/157] Train Reconstruction Loss 0.0285 Train  
 Correlation Loss 1.1995  
 Val Reconstruction Loss 0.0272 Val Correlation Loss 1.2059  
 Starting epoch 58  
 [58/100] [0/157] Train Reconstruction Loss 0.0276 Train Correlation Loss  
 1.2138  
 [58/100] [50/157] Train Reconstruction Loss 0.0277 Train  
 Correlation Loss 1.2135

[58/100] [100/157] Train Reconstruction Loss 0.0266 Train  
 Correlation Loss 1.2006  
 [58/100] [150/157] Train Reconstruction Loss 0.0286 Train  
 Correlation Loss 1.1898  
 Val Reconstruction Loss 0.0272 Val Correlation Loss 1.2055  
 Starting epoch 59  
 [59/100] [0/157] Train Reconstruction Loss 0.0280 Train Correlation Loss  
 1.2001  
 [59/100] [50/157] Train Reconstruction Loss 0.0281 Train  
 Correlation Loss 1.1912  
 [59/100] [100/157] Train Reconstruction Loss 0.0266 Train  
 Correlation Loss 1.2051  
 [59/100] [150/157] Train Reconstruction Loss 0.0280 Train  
 Correlation Loss 1.1889  
 Val Reconstruction Loss 0.0274 Val Correlation Loss 1.2030  
 Starting epoch 60  
 [60/100] [0/157] Train Reconstruction Loss 0.0283 Train Correlation Loss  
 1.1920  
 [60/100] [50/157] Train Reconstruction Loss 0.0278 Train  
 Correlation Loss 1.2049  
 [60/100] [100/157] Train Reconstruction Loss 0.0279 Train  
 Correlation Loss 1.2045  
 [60/100] [150/157] Train Reconstruction Loss 0.0266 Train  
 Correlation Loss 1.2038  
 Val Reconstruction Loss 0.0273 Val Correlation Loss 1.2017  
 Starting epoch 61  
 [61/100] [0/157] Train Reconstruction Loss 0.0272 Train Correlation Loss  
 1.1971  
 [61/100] [50/157] Train Reconstruction Loss 0.0277 Train  
 Correlation Loss 1.2016  
 [61/100] [100/157] Train Reconstruction Loss 0.0278 Train  
 Correlation Loss 1.1932  
 [61/100] [150/157] Train Reconstruction Loss 0.0271 Train  
 Correlation Loss 1.2087  
 Val Reconstruction Loss 0.0275 Val Correlation Loss 1.2017  
 Starting epoch 62  
 [62/100] [0/157] Train Reconstruction Loss 0.0281 Train Correlation Loss  
 1.1995  
 [62/100] [50/157] Train Reconstruction Loss 0.0270 Train  
 Correlation Loss 1.1989  
 [62/100] [100/157] Train Reconstruction Loss 0.0284 Train  
 Correlation Loss 1.1960  
 [62/100] [150/157] Train Reconstruction Loss 0.0271 Train  
 Correlation Loss 1.1883  
 Val Reconstruction Loss 0.0278 Val Correlation Loss 1.1984  
 Starting epoch 63  
 [63/100] [0/157] Train Reconstruction Loss 0.0285 Train Correlation Loss  
 1.2038

[63/100] [50/157] Train Reconstruction Loss 0.0281 Train  
 Correlation Loss 1.1857  
 [63/100] [100/157] Train Reconstruction Loss 0.0266 Train  
 Correlation Loss 1.1899  
 [63/100] [150/157] Train Reconstruction Loss 0.0284 Train  
 Correlation Loss 1.2017  
 Val Reconstruction Loss 0.0277 Val Correlation Loss 1.1982  
 Starting epoch 64  
 [64/100] [0/157] Train Reconstruction Loss 0.0274 Train Correlation Loss  
 1.1967  
 [64/100] [50/157] Train Reconstruction Loss 0.0278 Train  
 Correlation Loss 1.1996  
 [64/100] [100/157] Train Reconstruction Loss 0.0287 Train  
 Correlation Loss 1.1793  
 [64/100] [150/157] Train Reconstruction Loss 0.0279 Train  
 Correlation Loss 1.1860  
 Val Reconstruction Loss 0.0283 Val Correlation Loss 1.1990  
 Starting epoch 65  
 [65/100] [0/157] Train Reconstruction Loss 0.0279 Train Correlation Loss  
 1.2009  
 [65/100] [50/157] Train Reconstruction Loss 0.0284 Train  
 Correlation Loss 1.1954  
 [65/100] [100/157] Train Reconstruction Loss 0.0293 Train  
 Correlation Loss 1.1871  
 [65/100] [150/157] Train Reconstruction Loss 0.0285 Train  
 Correlation Loss 1.1886  
 Val Reconstruction Loss 0.0279 Val Correlation Loss 1.1935  
 Starting epoch 66  
 [66/100] [0/157] Train Reconstruction Loss 0.0281 Train Correlation Loss  
 1.1800  
 [66/100] [50/157] Train Reconstruction Loss 0.0278 Train  
 Correlation Loss 1.1869  
 [66/100] [100/157] Train Reconstruction Loss 0.0279 Train  
 Correlation Loss 1.1978  
 [66/100] [150/157] Train Reconstruction Loss 0.0282 Train  
 Correlation Loss 1.1910  
 Val Reconstruction Loss 0.0286 Val Correlation Loss 1.1976  
 Starting epoch 67  
 [67/100] [0/157] Train Reconstruction Loss 0.0283 Train Correlation Loss  
 1.1897  
 [67/100] [50/157] Train Reconstruction Loss 0.0280 Train  
 Correlation Loss 1.2040  
 [67/100] [100/157] Train Reconstruction Loss 0.0282 Train  
 Correlation Loss 1.2010  
 [67/100] [150/157] Train Reconstruction Loss 0.0291 Train  
 Correlation Loss 1.1902  
 Val Reconstruction Loss 0.0282 Val Correlation Loss 1.1905  
 Starting epoch 68

[68/100] [0/157] Train Reconstruction Loss 0.0278      Train Correlation Loss  
 1.1858  
 [68/100] [50/157]      Train Reconstruction Loss 0.0283      Train  
 Correlation Loss 1.1864  
 [68/100] [100/157]      Train Reconstruction Loss 0.0285      Train  
 Correlation Loss 1.1872  
 [68/100] [150/157]      Train Reconstruction Loss 0.0283      Train  
 Correlation Loss 1.1941  
 Val Reconstruction Loss 0.0284      Val Correlation Loss 1.1890  
 Starting epoch 69  
 [69/100] [0/157] Train Reconstruction Loss 0.0283      Train Correlation Loss  
 1.1917  
 [69/100] [50/157]      Train Reconstruction Loss 0.0287      Train  
 Correlation Loss 1.2025  
 [69/100] [100/157]      Train Reconstruction Loss 0.0289      Train  
 Correlation Loss 1.1843  
 [69/100] [150/157]      Train Reconstruction Loss 0.0284      Train  
 Correlation Loss 1.1935  
 Val Reconstruction Loss 0.0286      Val Correlation Loss 1.1892  
 Starting epoch 70  
 [70/100] [0/157] Train Reconstruction Loss 0.0288      Train Correlation Loss  
 1.1869  
 [70/100] [50/157]      Train Reconstruction Loss 0.0281      Train  
 Correlation Loss 1.1892  
 [70/100] [100/157]      Train Reconstruction Loss 0.0285      Train  
 Correlation Loss 1.1964  
 [70/100] [150/157]      Train Reconstruction Loss 0.0292      Train  
 Correlation Loss 1.1930  
 Val Reconstruction Loss 0.0287      Val Correlation Loss 1.1842  
 Starting epoch 71  
 [71/100] [0/157] Train Reconstruction Loss 0.0286      Train Correlation Loss  
 1.1913  
 [71/100] [50/157]      Train Reconstruction Loss 0.0286      Train  
 Correlation Loss 1.1793  
 [71/100] [100/157]      Train Reconstruction Loss 0.0289      Train  
 Correlation Loss 1.1742  
 [71/100] [150/157]      Train Reconstruction Loss 0.0285      Train  
 Correlation Loss 1.1855  
 Val Reconstruction Loss 0.0291      Val Correlation Loss 1.1878  
 Starting epoch 72  
 [72/100] [0/157] Train Reconstruction Loss 0.0292      Train Correlation Loss  
 1.1849  
 [72/100] [50/157]      Train Reconstruction Loss 0.0282      Train  
 Correlation Loss 1.1844  
 [72/100] [100/157]      Train Reconstruction Loss 0.0297      Train  
 Correlation Loss 1.1827  
 [72/100] [150/157]      Train Reconstruction Loss 0.0277      Train  
 Correlation Loss 1.1801

Val Reconstruction Loss 0.0289    Val Correlation Loss 1.1810  
 Starting epoch 73  
 [73/100] [0/157] Train Reconstruction Loss 0.0287                      Train Correlation Loss 1.1822  
 [73/100] [50/157]                      Train Reconstruction Loss 0.0283                      Train Correlation Loss 1.1797  
 [73/100] [100/157]                      Train Reconstruction Loss 0.0298                      Train Correlation Loss 1.1886  
 [73/100] [150/157]                      Train Reconstruction Loss 0.0286                      Train Correlation Loss 1.1621  
 Val Reconstruction Loss 0.0293    Val Correlation Loss 1.1824  
 Starting epoch 74  
 [74/100] [0/157] Train Reconstruction Loss 0.0282                      Train Correlation Loss 1.1783  
 [74/100] [50/157]                      Train Reconstruction Loss 0.0288                      Train Correlation Loss 1.1783  
 [74/100] [100/157]                      Train Reconstruction Loss 0.0290                      Train Correlation Loss 1.1655  
 [74/100] [150/157]                      Train Reconstruction Loss 0.0290                      Train Correlation Loss 1.1805  
 Val Reconstruction Loss 0.0296    Val Correlation Loss 1.1794  
 Starting epoch 75  
 [75/100] [0/157] Train Reconstruction Loss 0.0284                      Train Correlation Loss 1.1769  
 [75/100] [50/157]                      Train Reconstruction Loss 0.0277                      Train Correlation Loss 1.1877  
 [75/100] [100/157]                      Train Reconstruction Loss 0.0305                      Train Correlation Loss 1.1707  
 [75/100] [150/157]                      Train Reconstruction Loss 0.0304                      Train Correlation Loss 1.1573  
 Val Reconstruction Loss 0.0293    Val Correlation Loss 1.1756  
 Starting epoch 76  
 [76/100] [0/157] Train Reconstruction Loss 0.0293                      Train Correlation Loss 1.1616  
 [76/100] [50/157]                      Train Reconstruction Loss 0.0283                      Train Correlation Loss 1.1648  
 [76/100] [100/157]                      Train Reconstruction Loss 0.0305                      Train Correlation Loss 1.1634  
 [76/100] [150/157]                      Train Reconstruction Loss 0.0300                      Train Correlation Loss 1.1675  
 Val Reconstruction Loss 0.0295    Val Correlation Loss 1.1729  
 Starting epoch 77  
 [77/100] [0/157] Train Reconstruction Loss 0.0294                      Train Correlation Loss 1.1735  
 [77/100] [50/157]                      Train Reconstruction Loss 0.0323                      Train Correlation Loss 1.1685  
 [77/100] [100/157]                      Train Reconstruction Loss 0.0298                      Train Correlation Loss 1.1589

[77/100] [150/157] Train Reconstruction Loss 0.0297 Train  
 Correlation Loss 1.1663  
 Val Reconstruction Loss 0.0297 Val Correlation Loss 1.1717  
 Starting epoch 78  
 [78/100] [0/157] Train Reconstruction Loss 0.0287 Train Correlation Loss  
 1.1779  
 [78/100] [50/157] Train Reconstruction Loss 0.0308 Train  
 Correlation Loss 1.1613  
 [78/100] [100/157] Train Reconstruction Loss 0.0299 Train  
 Correlation Loss 1.1795  
 [78/100] [150/157] Train Reconstruction Loss 0.0308 Train  
 Correlation Loss 1.1647  
 Val Reconstruction Loss 0.0298 Val Correlation Loss 1.1695  
 Starting epoch 79  
 [79/100] [0/157] Train Reconstruction Loss 0.0297 Train Correlation Loss  
 1.1669  
 [79/100] [50/157] Train Reconstruction Loss 0.0291 Train  
 Correlation Loss 1.1691  
 [79/100] [100/157] Train Reconstruction Loss 0.0307 Train  
 Correlation Loss 1.1476  
 [79/100] [150/157] Train Reconstruction Loss 0.0293 Train  
 Correlation Loss 1.1525  
 Val Reconstruction Loss 0.0303 Val Correlation Loss 1.1718  
 Starting epoch 80  
 [80/100] [0/157] Train Reconstruction Loss 0.0298 Train Correlation Loss  
 1.1806  
 [80/100] [50/157] Train Reconstruction Loss 0.0296 Train  
 Correlation Loss 1.1757  
 [80/100] [100/157] Train Reconstruction Loss 0.0299 Train  
 Correlation Loss 1.1655  
 [80/100] [150/157] Train Reconstruction Loss 0.0306 Train  
 Correlation Loss 1.1569  
 Val Reconstruction Loss 0.0305 Val Correlation Loss 1.1703  
 Starting epoch 81  
 [81/100] [0/157] Train Reconstruction Loss 0.0306 Train Correlation Loss  
 1.1578  
 [81/100] [50/157] Train Reconstruction Loss 0.0316 Train  
 Correlation Loss 1.1583  
 [81/100] [100/157] Train Reconstruction Loss 0.0294 Train  
 Correlation Loss 1.1686  
 [81/100] [150/157] Train Reconstruction Loss 0.0303 Train  
 Correlation Loss 1.1733  
 Val Reconstruction Loss 0.0304 Val Correlation Loss 1.1645  
 Starting epoch 82  
 [82/100] [0/157] Train Reconstruction Loss 0.0302 Train Correlation Loss  
 1.1534  
 [82/100] [50/157] Train Reconstruction Loss 0.0300 Train  
 Correlation Loss 1.1732

[82/100] [100/157] Train Reconstruction Loss 0.0312 Train  
 Correlation Loss 1.1460  
 [82/100] [150/157] Train Reconstruction Loss 0.0301 Train  
 Correlation Loss 1.1689  
 Val Reconstruction Loss 0.0308 Val Correlation Loss 1.1643  
 Starting epoch 83  
 [83/100] [0/157] Train Reconstruction Loss 0.0309 Train Correlation Loss  
 1.1585  
 [83/100] [50/157] Train Reconstruction Loss 0.0316 Train  
 Correlation Loss 1.1660  
 [83/100] [100/157] Train Reconstruction Loss 0.0303 Train  
 Correlation Loss 1.1590  
 [83/100] [150/157] Train Reconstruction Loss 0.0298 Train  
 Correlation Loss 1.1687  
 Val Reconstruction Loss 0.0310 Val Correlation Loss 1.1677  
 Starting epoch 84  
 [84/100] [0/157] Train Reconstruction Loss 0.0312 Train Correlation Loss  
 1.1628  
 [84/100] [50/157] Train Reconstruction Loss 0.0305 Train  
 Correlation Loss 1.1617  
 [84/100] [100/157] Train Reconstruction Loss 0.0305 Train  
 Correlation Loss 1.1646  
 [84/100] [150/157] Train Reconstruction Loss 0.0306 Train  
 Correlation Loss 1.1626  
 Val Reconstruction Loss 0.0308 Val Correlation Loss 1.1579  
 Starting epoch 85  
 [85/100] [0/157] Train Reconstruction Loss 0.0307 Train Correlation Loss  
 1.1468  
 [85/100] [50/157] Train Reconstruction Loss 0.0310 Train  
 Correlation Loss 1.1599  
 [85/100] [100/157] Train Reconstruction Loss 0.0312 Train  
 Correlation Loss 1.1522  
 [85/100] [150/157] Train Reconstruction Loss 0.0309 Train  
 Correlation Loss 1.1588  
 Val Reconstruction Loss 0.0310 Val Correlation Loss 1.1559  
 Starting epoch 86  
 [86/100] [0/157] Train Reconstruction Loss 0.0318 Train Correlation Loss  
 1.1520  
 [86/100] [50/157] Train Reconstruction Loss 0.0315 Train  
 Correlation Loss 1.1650  
 [86/100] [100/157] Train Reconstruction Loss 0.0315 Train  
 Correlation Loss 1.1489  
 [86/100] [150/157] Train Reconstruction Loss 0.0308 Train  
 Correlation Loss 1.1593  
 Val Reconstruction Loss 0.0312 Val Correlation Loss 1.1542  
 Starting epoch 87  
 [87/100] [0/157] Train Reconstruction Loss 0.0307 Train Correlation Loss  
 1.1482

[87/100] [50/157] Train Reconstruction Loss 0.0306 Train  
 Correlation Loss 1.1658  
 [87/100] [100/157] Train Reconstruction Loss 0.0313 Train  
 Correlation Loss 1.1370  
 [87/100] [150/157] Train Reconstruction Loss 0.0322 Train  
 Correlation Loss 1.1452  
 Val Reconstruction Loss 0.0313 Val Correlation Loss 1.1528  
 Starting epoch 88  
 [88/100] [0/157] Train Reconstruction Loss 0.0333 Train Correlation Loss  
 1.1396  
 [88/100] [50/157] Train Reconstruction Loss 0.0306 Train  
 Correlation Loss 1.1414  
 [88/100] [100/157] Train Reconstruction Loss 0.0324 Train  
 Correlation Loss 1.1424  
 [88/100] [150/157] Train Reconstruction Loss 0.0324 Train  
 Correlation Loss 1.1398  
 Val Reconstruction Loss 0.0315 Val Correlation Loss 1.1509  
 Starting epoch 89  
 [89/100] [0/157] Train Reconstruction Loss 0.0323 Train Correlation Loss  
 1.1436  
 [89/100] [50/157] Train Reconstruction Loss 0.0304 Train  
 Correlation Loss 1.1492  
 [89/100] [100/157] Train Reconstruction Loss 0.0324 Train  
 Correlation Loss 1.1402  
 [89/100] [150/157] Train Reconstruction Loss 0.0325 Train  
 Correlation Loss 1.1476  
 Val Reconstruction Loss 0.0318 Val Correlation Loss 1.1554  
 Starting epoch 90  
 [90/100] [0/157] Train Reconstruction Loss 0.0324 Train Correlation Loss  
 1.1495  
 [90/100] [50/157] Train Reconstruction Loss 0.0329 Train  
 Correlation Loss 1.1380  
 [90/100] [100/157] Train Reconstruction Loss 0.0312 Train  
 Correlation Loss 1.1424  
 [90/100] [150/157] Train Reconstruction Loss 0.0315 Train  
 Correlation Loss 1.1543  
 Val Reconstruction Loss 0.0321 Val Correlation Loss 1.1524  
 Starting epoch 91  
 [91/100] [0/157] Train Reconstruction Loss 0.0332 Train Correlation Loss  
 1.1335  
 [91/100] [50/157] Train Reconstruction Loss 0.0326 Train  
 Correlation Loss 1.1408  
 [91/100] [100/157] Train Reconstruction Loss 0.0312 Train  
 Correlation Loss 1.1560  
 [91/100] [150/157] Train Reconstruction Loss 0.0316 Train  
 Correlation Loss 1.1339  
 Val Reconstruction Loss 0.0318 Val Correlation Loss 1.1462  
 Starting epoch 92



[92/100] [0/157] Train Reconstruction Loss 0.0319      Train Correlation Loss  
 1.1502  
 [92/100] [50/157]      Train Reconstruction Loss 0.0305      Train  
 Correlation Loss 1.1411  
 [92/100] [100/157]      Train Reconstruction Loss 0.0323      Train  
 Correlation Loss 1.1499  
 [92/100] [150/157]      Train Reconstruction Loss 0.0325      Train  
 Correlation Loss 1.1327  
 Val Reconstruction Loss 0.0321      Val Correlation Loss 1.1448  
 Starting epoch 93  
 [93/100] [0/157] Train Reconstruction Loss 0.0326      Train Correlation Loss  
 1.1453  
 [93/100] [50/157]      Train Reconstruction Loss 0.0326      Train  
 Correlation Loss 1.1402  
 [93/100] [100/157]      Train Reconstruction Loss 0.0336      Train  
 Correlation Loss 1.1381  
 [93/100] [150/157]      Train Reconstruction Loss 0.0322      Train  
 Correlation Loss 1.1362  
 Val Reconstruction Loss 0.0322      Val Correlation Loss 1.1449  
 Starting epoch 94  
 [94/100] [0/157] Train Reconstruction Loss 0.0323      Train Correlation Loss  
 1.1421  
 [94/100] [50/157]      Train Reconstruction Loss 0.0327      Train  
 Correlation Loss 1.1440  
 [94/100] [100/157]      Train Reconstruction Loss 0.0318      Train  
 Correlation Loss 1.1315  
 [94/100] [150/157]      Train Reconstruction Loss 0.0325      Train  
 Correlation Loss 1.1470  
 Val Reconstruction Loss 0.0323      Val Correlation Loss 1.1428  
 Starting epoch 95  
 [95/100] [0/157] Train Reconstruction Loss 0.0314      Train Correlation Loss  
 1.1394  
 [95/100] [50/157]      Train Reconstruction Loss 0.0325      Train  
 Correlation Loss 1.1525  
 [95/100] [100/157]      Train Reconstruction Loss 0.0332      Train  
 Correlation Loss 1.1451  
 [95/100] [150/157]      Train Reconstruction Loss 0.0316      Train  
 Correlation Loss 1.1383  
 Val Reconstruction Loss 0.0328      Val Correlation Loss 1.1434  
 Starting epoch 96  
 [96/100] [0/157] Train Reconstruction Loss 0.0332      Train Correlation Loss  
 1.1328  
 [96/100] [50/157]      Train Reconstruction Loss 0.0320      Train  
 Correlation Loss 1.1409  
 [96/100] [100/157]      Train Reconstruction Loss 0.0328      Train  
 Correlation Loss 1.1227  
 [96/100] [150/157]      Train Reconstruction Loss 0.0318      Train  
 Correlation Loss 1.1369

```

Val Reconstruction Loss 0.0327   Val Correlation Loss 1.1405
Starting epoch 97
[97/100] [0/157] Train Reconstruction Loss 0.0320           Train Correlation Loss
1.1298
[97/100] [50/157]           Train Reconstruction Loss 0.0325           Train
Correlation Loss 1.1244
[97/100] [100/157]          Train Reconstruction Loss 0.0323           Train
Correlation Loss 1.1412
[97/100] [150/157]          Train Reconstruction Loss 0.0335           Train
Correlation Loss 1.1471
Val Reconstruction Loss 0.0329   Val Correlation Loss 1.1406
Starting epoch 98
[98/100] [0/157] Train Reconstruction Loss 0.0344           Train Correlation Loss
1.1394
[98/100] [50/157]           Train Reconstruction Loss 0.0326           Train
Correlation Loss 1.1225
[98/100] [100/157]          Train Reconstruction Loss 0.0321           Train
Correlation Loss 1.1270
[98/100] [150/157]          Train Reconstruction Loss 0.0327           Train
Correlation Loss 1.1304
Val Reconstruction Loss 0.0330   Val Correlation Loss 1.1390
Starting epoch 99
[99/100] [0/157] Train Reconstruction Loss 0.0335           Train Correlation Loss
1.1352
[99/100] [50/157]           Train Reconstruction Loss 0.0333           Train
Correlation Loss 1.1348
[99/100] [100/157]          Train Reconstruction Loss 0.0329           Train
Correlation Loss 1.1282
[99/100] [150/157]          Train Reconstruction Loss 0.0319           Train
Correlation Loss 1.1314
Val Reconstruction Loss 0.0328   Val Correlation Loss 1.1341

```

```
[ ]: create_checkpoint()
```

```
[ ]: train_autoenc(100,150)
```

```
Starting epoch 100
```

```
/usr/local/lib/python3.6/dist-packages/torch/nn/functional.py:1639: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
```

```
warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")
```

```

[100/150] [0/157]           Train Reconstruction Loss 0.0329           Train
Correlation Loss 1.1122
[100/150] [50/157]          Train Reconstruction Loss 0.0321           Train
Correlation Loss 1.1391
[100/150] [100/157]         Train Reconstruction Loss 0.0326           Train

```

Correlation Loss 1.1267		
[100/150] [150/157]	Train Reconstruction Loss 0.0315	Train
Correlation Loss 1.1210		
Val Reconstruction Loss 0.0327	Val Correlation Loss 1.1319	
Starting epoch 101		
[101/150] [0/157]	Train Reconstruction Loss 0.0328	Train
Correlation Loss 1.1243		
[101/150] [50/157]	Train Reconstruction Loss 0.0323	Train
Correlation Loss 1.1427		
[101/150] [100/157]	Train Reconstruction Loss 0.0328	Train
Correlation Loss 1.1305		
[101/150] [150/157]	Train Reconstruction Loss 0.0328	Train
Correlation Loss 1.1274		
Val Reconstruction Loss 0.0331	Val Correlation Loss 1.1345	
Starting epoch 102		
[102/150] [0/157]	Train Reconstruction Loss 0.0325	Train
Correlation Loss 1.1422		
[102/150] [50/157]	Train Reconstruction Loss 0.0320	Train
Correlation Loss 1.1355		
[102/150] [100/157]	Train Reconstruction Loss 0.0329	Train
Correlation Loss 1.1283		
[102/150] [150/157]	Train Reconstruction Loss 0.0342	Train
Correlation Loss 1.1221		
Val Reconstruction Loss 0.0331	Val Correlation Loss 1.1279	
Starting epoch 103		
[103/150] [0/157]	Train Reconstruction Loss 0.0332	Train
Correlation Loss 1.1179		
[103/150] [50/157]	Train Reconstruction Loss 0.0331	Train
Correlation Loss 1.1247		
[103/150] [100/157]	Train Reconstruction Loss 0.0325	Train
Correlation Loss 1.1321		
[103/150] [150/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.1131		
Val Reconstruction Loss 0.0331	Val Correlation Loss 1.1301	
Starting epoch 104		
[104/150] [0/157]	Train Reconstruction Loss 0.0333	Train
Correlation Loss 1.1415		
[104/150] [50/157]	Train Reconstruction Loss 0.0324	Train
Correlation Loss 1.1156		
[104/150] [100/157]	Train Reconstruction Loss 0.0315	Train
Correlation Loss 1.1356		
[104/150] [150/157]	Train Reconstruction Loss 0.0331	Train
Correlation Loss 1.1253		
Val Reconstruction Loss 0.0333	Val Correlation Loss 1.1249	
Starting epoch 105		
[105/150] [0/157]	Train Reconstruction Loss 0.0332	Train
Correlation Loss 1.1437		
[105/150] [50/157]	Train Reconstruction Loss 0.0318	Train

Correlation Loss 1.1302		
[105/150] [100/157]	Train Reconstruction Loss 0.0329	Train
Correlation Loss 1.1432		
[105/150] [150/157]	Train Reconstruction Loss 0.0343	Train
Correlation Loss 1.1202		
Val Reconstruction Loss 0.0334		Val Correlation Loss 1.1238
Starting epoch 106		
[106/150] [0/157]	Train Reconstruction Loss 0.0335	Train
Correlation Loss 1.1142		
[106/150] [50/157]	Train Reconstruction Loss 0.0339	Train
Correlation Loss 1.1287		
[106/150] [100/157]	Train Reconstruction Loss 0.0327	Train
Correlation Loss 1.1247		
[106/150] [150/157]	Train Reconstruction Loss 0.0331	Train
Correlation Loss 1.1134		
Val Reconstruction Loss 0.0336		Val Correlation Loss 1.1227
Starting epoch 107		
[107/150] [0/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.1107		
[107/150] [50/157]	Train Reconstruction Loss 0.0341	Train
Correlation Loss 1.1062		
[107/150] [100/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.1086		
[107/150] [150/157]	Train Reconstruction Loss 0.0337	Train
Correlation Loss 1.1292		
Val Reconstruction Loss 0.0335		Val Correlation Loss 1.1211
Starting epoch 108		
[108/150] [0/157]	Train Reconstruction Loss 0.0347	Train
Correlation Loss 1.1225		
[108/150] [50/157]	Train Reconstruction Loss 0.0335	Train
Correlation Loss 1.1107		
[108/150] [100/157]	Train Reconstruction Loss 0.0343	Train
Correlation Loss 1.1168		
[108/150] [150/157]	Train Reconstruction Loss 0.0333	Train
Correlation Loss 1.1248		
Val Reconstruction Loss 0.0336		Val Correlation Loss 1.1203
Starting epoch 109		
[109/150] [0/157]	Train Reconstruction Loss 0.0336	Train
Correlation Loss 1.1063		
[109/150] [50/157]	Train Reconstruction Loss 0.0333	Train
Correlation Loss 1.1167		
[109/150] [100/157]	Train Reconstruction Loss 0.0331	Train
Correlation Loss 1.1191		
[109/150] [150/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.1017		
Val Reconstruction Loss 0.0338		Val Correlation Loss 1.1183
Starting epoch 110		
[110/150] [0/157]	Train Reconstruction Loss 0.0324	Train

Correlation Loss 1.1202		
[110/150] [50/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.1070		
[110/150] [100/157]	Train Reconstruction Loss 0.0331	Train
Correlation Loss 1.1049		
[110/150] [150/157]	Train Reconstruction Loss 0.0342	Train
Correlation Loss 1.1190		
Val Reconstruction Loss 0.0338    Val Correlation Loss 1.1174		
Starting epoch 111		
[111/150] [0/157]	Train Reconstruction Loss 0.0326	Train
Correlation Loss 1.1236		
[111/150] [50/157]	Train Reconstruction Loss 0.0332	Train
Correlation Loss 1.1144		
[111/150] [100/157]	Train Reconstruction Loss 0.0335	Train
Correlation Loss 1.1272		
[111/150] [150/157]	Train Reconstruction Loss 0.0338	Train
Correlation Loss 1.1246		
Val Reconstruction Loss 0.0338    Val Correlation Loss 1.1166		
Starting epoch 112		
[112/150] [0/157]	Train Reconstruction Loss 0.0336	Train
Correlation Loss 1.1026		
[112/150] [50/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.1207		
[112/150] [100/157]	Train Reconstruction Loss 0.0346	Train
Correlation Loss 1.1176		
[112/150] [150/157]	Train Reconstruction Loss 0.0336	Train
Correlation Loss 1.1389		
Val Reconstruction Loss 0.0343    Val Correlation Loss 1.1178		
Starting epoch 113		
[113/150] [0/157]	Train Reconstruction Loss 0.0328	Train
Correlation Loss 1.1117		
[113/150] [50/157]	Train Reconstruction Loss 0.0336	Train
Correlation Loss 1.1195		
[113/150] [100/157]	Train Reconstruction Loss 0.0331	Train
Correlation Loss 1.1082		
[113/150] [150/157]	Train Reconstruction Loss 0.0352	Train
Correlation Loss 1.1108		
Val Reconstruction Loss 0.0338    Val Correlation Loss 1.1153		
Starting epoch 114		
[114/150] [0/157]	Train Reconstruction Loss 0.0319	Train
Correlation Loss 1.1313		
[114/150] [50/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.0961		
[114/150] [100/157]	Train Reconstruction Loss 0.0346	Train
Correlation Loss 1.1070		
[114/150] [150/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.1196		
Val Reconstruction Loss 0.0343    Val Correlation Loss 1.1127		

Starting epoch 115

[115/150] [0/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.1073		
[115/150] [50/157]	Train Reconstruction Loss 0.0337	Train
Correlation Loss 1.1073		
[115/150] [100/157]	Train Reconstruction Loss 0.0346	Train
Correlation Loss 1.1020		
[115/150] [150/157]	Train Reconstruction Loss 0.0336	Train
Correlation Loss 1.1073		
Val Reconstruction Loss 0.0342	Val Correlation Loss 1.1112	

Starting epoch 116

[116/150] [0/157]	Train Reconstruction Loss 0.0337	Train
Correlation Loss 1.1191		
[116/150] [50/157]	Train Reconstruction Loss 0.0333	Train
Correlation Loss 1.1183		
[116/150] [100/157]	Train Reconstruction Loss 0.0361	Train
Correlation Loss 1.1132		
[116/150] [150/157]	Train Reconstruction Loss 0.0343	Train
Correlation Loss 1.1069		
Val Reconstruction Loss 0.0342	Val Correlation Loss 1.1114	

Starting epoch 117

[117/150] [0/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.1157		
[117/150] [50/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0905		
[117/150] [100/157]	Train Reconstruction Loss 0.0346	Train
Correlation Loss 1.1073		
[117/150] [150/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.1015		
Val Reconstruction Loss 0.0345	Val Correlation Loss 1.1094	

Starting epoch 118

[118/150] [0/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.1003		
[118/150] [50/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.0976		
[118/150] [100/157]	Train Reconstruction Loss 0.0327	Train
Correlation Loss 1.1094		
[118/150] [150/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0983		
Val Reconstruction Loss 0.0345	Val Correlation Loss 1.1084	

Starting epoch 119

[119/150] [0/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.1040		
[119/150] [50/157]	Train Reconstruction Loss 0.0334	Train
Correlation Loss 1.1187		
[119/150] [100/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.1175		
[119/150] [150/157]	Train Reconstruction Loss 0.0335	Train

Correlation Loss 1.1186  
Val Reconstruction Loss 0.0343    Val Correlation Loss 1.1072  
Starting epoch 120  
[120/150] [0/157]    Train Reconstruction Loss 0.0325    Train  
Correlation Loss 1.1095  
[120/150] [50/157]    Train Reconstruction Loss 0.0333    Train  
Correlation Loss 1.1164  
[120/150] [100/157]    Train Reconstruction Loss 0.0329    Train  
Correlation Loss 1.1158  
[120/150] [150/157]    Train Reconstruction Loss 0.0347    Train  
Correlation Loss 1.1136  
Val Reconstruction Loss 0.0345    Val Correlation Loss 1.1112  
Starting epoch 121  
[121/150] [0/157]    Train Reconstruction Loss 0.0338    Train  
Correlation Loss 1.1088  
[121/150] [50/157]    Train Reconstruction Loss 0.0332    Train  
Correlation Loss 1.1164  
[121/150] [100/157]    Train Reconstruction Loss 0.0352    Train  
Correlation Loss 1.0939  
[121/150] [150/157]    Train Reconstruction Loss 0.0339    Train  
Correlation Loss 1.1101  
Val Reconstruction Loss 0.0346    Val Correlation Loss 1.1081  
Starting epoch 122  
[122/150] [0/157]    Train Reconstruction Loss 0.0323    Train  
Correlation Loss 1.1128  
[122/150] [50/157]    Train Reconstruction Loss 0.0337    Train  
Correlation Loss 1.1065  
[122/150] [100/157]    Train Reconstruction Loss 0.0348    Train  
Correlation Loss 1.0984  
[122/150] [150/157]    Train Reconstruction Loss 0.0337    Train  
Correlation Loss 1.1067  
Val Reconstruction Loss 0.0347    Val Correlation Loss 1.1054  
Starting epoch 123  
[123/150] [0/157]    Train Reconstruction Loss 0.0340    Train  
Correlation Loss 1.1010  
[123/150] [50/157]    Train Reconstruction Loss 0.0349    Train  
Correlation Loss 1.1015  
[123/150] [100/157]    Train Reconstruction Loss 0.0358    Train  
Correlation Loss 1.0936  
[123/150] [150/157]    Train Reconstruction Loss 0.0341    Train  
Correlation Loss 1.1112  
Val Reconstruction Loss 0.0348    Val Correlation Loss 1.1052  
Starting epoch 124  
[124/150] [0/157]    Train Reconstruction Loss 0.0343    Train  
Correlation Loss 1.1145  
[124/150] [50/157]    Train Reconstruction Loss 0.0352    Train  
Correlation Loss 1.1154  
[124/150] [100/157]    Train Reconstruction Loss 0.0345    Train

Correlation Loss 1.1077		
[124/150] [150/157]	Train Reconstruction Loss 0.0338	Train
Correlation Loss 1.1204		
Val Reconstruction Loss 0.0347	Val Correlation Loss 1.1050	
Starting epoch 125		
[125/150] [0/157]	Train Reconstruction Loss 0.0352	Train
Correlation Loss 1.0973		
[125/150] [50/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.1054		
[125/150] [100/157]	Train Reconstruction Loss 0.0350	Train
Correlation Loss 1.1090		
[125/150] [150/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.1098		
Val Reconstruction Loss 0.0346	Val Correlation Loss 1.1025	
Starting epoch 126		
[126/150] [0/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0912		
[126/150] [50/157]	Train Reconstruction Loss 0.0343	Train
Correlation Loss 1.0954		
[126/150] [100/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.1000		
[126/150] [150/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.1037		
Val Reconstruction Loss 0.0347	Val Correlation Loss 1.1017	
Starting epoch 127		
[127/150] [0/157]	Train Reconstruction Loss 0.0342	Train
Correlation Loss 1.1031		
[127/150] [50/157]	Train Reconstruction Loss 0.0341	Train
Correlation Loss 1.1006		
[127/150] [100/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.1040		
[127/150] [150/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.0914		
Val Reconstruction Loss 0.0345	Val Correlation Loss 1.1008	
Starting epoch 128		
[128/150] [0/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.1007		
[128/150] [50/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0902		
[128/150] [100/157]	Train Reconstruction Loss 0.0336	Train
Correlation Loss 1.0904		
[128/150] [150/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.1119		
Val Reconstruction Loss 0.0352	Val Correlation Loss 1.1050	
Starting epoch 129		
[129/150] [0/157]	Train Reconstruction Loss 0.0359	Train
Correlation Loss 1.1093		
[129/150] [50/157]	Train Reconstruction Loss 0.0344	Train



Correlation Loss 1.1034		
[129/150] [100/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0953		
[129/150] [150/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0953		
Val Reconstruction Loss 0.0350	Val Correlation Loss 1.1011	
Starting epoch 130		
[130/150] [0/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0910		
[130/150] [50/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.1103		
[130/150] [100/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.1056		
[130/150] [150/157]	Train Reconstruction Loss 0.0338	Train
Correlation Loss 1.0933		
Val Reconstruction Loss 0.0351	Val Correlation Loss 1.1009	
Starting epoch 131		
[131/150] [0/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.0926		
[131/150] [50/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0959		
[131/150] [100/157]	Train Reconstruction Loss 0.0341	Train
Correlation Loss 1.0965		
[131/150] [150/157]	Train Reconstruction Loss 0.0338	Train
Correlation Loss 1.1021		
Val Reconstruction Loss 0.0348	Val Correlation Loss 1.0977	
Starting epoch 132		
[132/150] [0/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0924		
[132/150] [50/157]	Train Reconstruction Loss 0.0361	Train
Correlation Loss 1.0839		
[132/150] [100/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.1121		
[132/150] [150/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.1103		
Val Reconstruction Loss 0.0349	Val Correlation Loss 1.0981	
Starting epoch 133		
[133/150] [0/157]	Train Reconstruction Loss 0.0338	Train
Correlation Loss 1.0977		
[133/150] [50/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0970		
[133/150] [100/157]	Train Reconstruction Loss 0.0357	Train
Correlation Loss 1.0936		
[133/150] [150/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0851		
Val Reconstruction Loss 0.0351	Val Correlation Loss 1.0959	
Starting epoch 134		
[134/150] [0/157]	Train Reconstruction Loss 0.0352	Train

Correlation Loss 1.0839		
[134/150] [50/157]	Train Reconstruction Loss 0.0339	Train
Correlation Loss 1.0907		
[134/150] [100/157]	Train Reconstruction Loss 0.0352	Train
Correlation Loss 1.0886		
[134/150] [150/157]	Train Reconstruction Loss 0.0357	Train
Correlation Loss 1.0783		
Val Reconstruction Loss 0.0352	Val Correlation Loss 1.0946	
Starting epoch 135		
[135/150] [0/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.0919		
[135/150] [50/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.1051		
[135/150] [100/157]	Train Reconstruction Loss 0.0347	Train
Correlation Loss 1.1014		
[135/150] [150/157]	Train Reconstruction Loss 0.0346	Train
Correlation Loss 1.0904		
Val Reconstruction Loss 0.0353	Val Correlation Loss 1.0952	
Starting epoch 136		
[136/150] [0/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0951		
[136/150] [50/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0966		
[136/150] [100/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.0981		
[136/150] [150/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.1043		
Val Reconstruction Loss 0.0354	Val Correlation Loss 1.0960	
Starting epoch 137		
[137/150] [0/157]	Train Reconstruction Loss 0.0361	Train
Correlation Loss 1.0850		
[137/150] [50/157]	Train Reconstruction Loss 0.0361	Train
Correlation Loss 1.0994		
[137/150] [100/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0854		
[137/150] [150/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.1019		
Val Reconstruction Loss 0.0349	Val Correlation Loss 1.0940	
Starting epoch 138		
[138/150] [0/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.0912		
[138/150] [50/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.0894		
[138/150] [100/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.0874		
[138/150] [150/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0832		
Val Reconstruction Loss 0.0350	Val Correlation Loss 1.0932	

Starting epoch 139

[139/150] [0/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0850		
[139/150] [50/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0809		
[139/150] [100/157]	Train Reconstruction Loss 0.0343	Train
Correlation Loss 1.0905		
[139/150] [150/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.1092		
Val Reconstruction Loss 0.0349	Val Correlation Loss 1.0924	

Starting epoch 140

[140/150] [0/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.0975		
[140/150] [50/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0911		
[140/150] [100/157]	Train Reconstruction Loss 0.0339	Train
Correlation Loss 1.0876		
[140/150] [150/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0938		
Val Reconstruction Loss 0.0352	Val Correlation Loss 1.0912	

Starting epoch 141

[141/150] [0/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.1024		
[141/150] [50/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.0849		
[141/150] [100/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.0987		
[141/150] [150/157]	Train Reconstruction Loss 0.0359	Train
Correlation Loss 1.0841		
Val Reconstruction Loss 0.0353	Val Correlation Loss 1.0911	

Starting epoch 142

[142/150] [0/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.1028		
[142/150] [50/157]	Train Reconstruction Loss 0.0357	Train
Correlation Loss 1.0865		
[142/150] [100/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0826		
[142/150] [150/157]	Train Reconstruction Loss 0.0367	Train
Correlation Loss 1.0818		
Val Reconstruction Loss 0.0353	Val Correlation Loss 1.0914	

Starting epoch 143

[143/150] [0/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.0933		
[143/150] [50/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.0899		
[143/150] [100/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0882		
[143/150] [150/157]	Train Reconstruction Loss 0.0343	Train

Correlation Loss 1.0932  
Val Reconstruction Loss 0.0351    Val Correlation Loss 1.0899  
Starting epoch 144  
[144/150] [0/157]    Train Reconstruction Loss 0.0361    Train  
Correlation Loss 1.0930  
[144/150] [50/157]    Train Reconstruction Loss 0.0344    Train  
Correlation Loss 1.0908  
[144/150] [100/157]    Train Reconstruction Loss 0.0357    Train  
Correlation Loss 1.0892  
[144/150] [150/157]    Train Reconstruction Loss 0.0345    Train  
Correlation Loss 1.0829  
Val Reconstruction Loss 0.0352    Val Correlation Loss 1.0981  
Starting epoch 145  
[145/150] [0/157]    Train Reconstruction Loss 0.0338    Train  
Correlation Loss 1.1095  
[145/150] [50/157]    Train Reconstruction Loss 0.0336    Train  
Correlation Loss 1.0844  
[145/150] [100/157]    Train Reconstruction Loss 0.0359    Train  
Correlation Loss 1.0774  
[145/150] [150/157]    Train Reconstruction Loss 0.0350    Train  
Correlation Loss 1.0906  
Val Reconstruction Loss 0.0354    Val Correlation Loss 1.0880  
Starting epoch 146  
[146/150] [0/157]    Train Reconstruction Loss 0.0368    Train  
Correlation Loss 1.0712  
[146/150] [50/157]    Train Reconstruction Loss 0.0350    Train  
Correlation Loss 1.0899  
[146/150] [100/157]    Train Reconstruction Loss 0.0369    Train  
Correlation Loss 1.0816  
[146/150] [150/157]    Train Reconstruction Loss 0.0362    Train  
Correlation Loss 1.0745  
Val Reconstruction Loss 0.0353    Val Correlation Loss 1.0876  
Starting epoch 147  
[147/150] [0/157]    Train Reconstruction Loss 0.0342    Train  
Correlation Loss 1.0848  
[147/150] [50/157]    Train Reconstruction Loss 0.0343    Train  
Correlation Loss 1.0913  
[147/150] [100/157]    Train Reconstruction Loss 0.0346    Train  
Correlation Loss 1.0914  
[147/150] [150/157]    Train Reconstruction Loss 0.0372    Train  
Correlation Loss 1.0780  
Val Reconstruction Loss 0.0353    Val Correlation Loss 1.0868  
Starting epoch 148  
[148/150] [0/157]    Train Reconstruction Loss 0.0344    Train  
Correlation Loss 1.0877  
[148/150] [50/157]    Train Reconstruction Loss 0.0337    Train  
Correlation Loss 1.0893  
[148/150] [100/157]    Train Reconstruction Loss 0.0355    Train

```

Correlation Loss 1.0826
[148/150] [150/157]      Train Reconstruction Loss 0.0351      Train
Correlation Loss 1.0915
Val Reconstruction Loss 0.0351   Val Correlation Loss 1.0867
Starting epoch 149
[149/150] [0/157]        Train Reconstruction Loss 0.0375      Train
Correlation Loss 1.0800
[149/150] [50/157]       Train Reconstruction Loss 0.0362      Train
Correlation Loss 1.0785
[149/150] [100/157]      Train Reconstruction Loss 0.0346      Train
Correlation Loss 1.0877
[149/150] [150/157]      Train Reconstruction Loss 0.0355      Train
Correlation Loss 1.0855
Val Reconstruction Loss 0.0354   Val Correlation Loss 1.0930

```

```
[ ]: create_checkpoint()
```

```
[ ]: train_autoenc(150,200)
```

Starting epoch 150

```

/usr/local/lib/python3.6/dist-packages/torch/nn/functional.py:1639: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.

```

```

    warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")

```

```

[150/200] [0/157]        Train Reconstruction Loss 0.0351      Train
Correlation Loss 1.0771
[150/200] [50/157]       Train Reconstruction Loss 0.0362      Train
Correlation Loss 1.0813
[150/200] [100/157]      Train Reconstruction Loss 0.0374      Train
Correlation Loss 1.0911
[150/200] [150/157]      Train Reconstruction Loss 0.0363      Train
Correlation Loss 1.0828
Val Reconstruction Loss 0.0355   Val Correlation Loss 1.0842
Starting epoch 151
[151/200] [0/157]        Train Reconstruction Loss 0.0358      Train
Correlation Loss 1.0750
[151/200] [50/157]       Train Reconstruction Loss 0.0367      Train
Correlation Loss 1.0875
[151/200] [100/157]      Train Reconstruction Loss 0.0363      Train
Correlation Loss 1.0781
[151/200] [150/157]      Train Reconstruction Loss 0.0340      Train
Correlation Loss 1.0939
Val Reconstruction Loss 0.0356   Val Correlation Loss 1.0871
Starting epoch 152
[152/200] [0/157]        Train Reconstruction Loss 0.0348      Train
Correlation Loss 1.0954

```

[152/200] [50/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0728		
[152/200] [100/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0787		
[152/200] [150/157]	Train Reconstruction Loss 0.0352	Train
Correlation Loss 1.0727		
Val Reconstruction Loss 0.0358	Val Correlation Loss 1.0845	
Starting epoch 153		
[153/200] [0/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0794		
[153/200] [50/157]	Train Reconstruction Loss 0.0343	Train
Correlation Loss 1.0833		
[153/200] [100/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0862		
[153/200] [150/157]	Train Reconstruction Loss 0.0341	Train
Correlation Loss 1.0815		
Val Reconstruction Loss 0.0354	Val Correlation Loss 1.0882	
Starting epoch 154		
[154/200] [0/157]	Train Reconstruction Loss 0.0337	Train
Correlation Loss 1.0830		
[154/200] [50/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0886		
[154/200] [100/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0751		
[154/200] [150/157]	Train Reconstruction Loss 0.0352	Train
Correlation Loss 1.0750		
Val Reconstruction Loss 0.0355	Val Correlation Loss 1.0823	
Starting epoch 155		
[155/200] [0/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0751		
[155/200] [50/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0787		
[155/200] [100/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0880		
[155/200] [150/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.0873		
Val Reconstruction Loss 0.0358	Val Correlation Loss 1.0827	
Starting epoch 156		
[156/200] [0/157]	Train Reconstruction Loss 0.0357	Train
Correlation Loss 1.0754		
[156/200] [50/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0722		
[156/200] [100/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0756		
[156/200] [150/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0835		
Val Reconstruction Loss 0.0361	Val Correlation Loss 1.0856	
Starting epoch 157		

[157/200] [0/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0766		
[157/200] [50/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0725		
[157/200] [100/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.0748		
[157/200] [150/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0864		
Val Reconstruction Loss 0.0355	Val Correlation Loss 1.0803	
Starting epoch 158		
[158/200] [0/157]	Train Reconstruction Loss 0.0359	Train
Correlation Loss 1.0732		
[158/200] [50/157]	Train Reconstruction Loss 0.0347	Train
Correlation Loss 1.0933		
[158/200] [100/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0789		
[158/200] [150/157]	Train Reconstruction Loss 0.0359	Train
Correlation Loss 1.0829		
Val Reconstruction Loss 0.0355	Val Correlation Loss 1.0813	
Starting epoch 159		
[159/200] [0/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0860		
[159/200] [50/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0830		
[159/200] [100/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0717		
[159/200] [150/157]	Train Reconstruction Loss 0.0349	Train
Correlation Loss 1.0857		
Val Reconstruction Loss 0.0356	Val Correlation Loss 1.0810	
Starting epoch 160		
[160/200] [0/157]	Train Reconstruction Loss 0.0341	Train
Correlation Loss 1.0931		
[160/200] [50/157]	Train Reconstruction Loss 0.0335	Train
Correlation Loss 1.0791		
[160/200] [100/157]	Train Reconstruction Loss 0.0339	Train
Correlation Loss 1.0949		
[160/200] [150/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0754		
Val Reconstruction Loss 0.0356	Val Correlation Loss 1.0866	
Starting epoch 161		
[161/200] [0/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0796		
[161/200] [50/157]	Train Reconstruction Loss 0.0353	Train
Correlation Loss 1.0945		
[161/200] [100/157]	Train Reconstruction Loss 0.0347	Train
Correlation Loss 1.0724		
[161/200] [150/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0731		

Val Reconstruction Loss	0.0363	Val Correlation Loss	1.0829
Starting epoch 162			
[162/200] [0/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0804		
[162/200] [50/157]	Train Reconstruction Loss	0.0359	Train
Correlation Loss	1.0764		
[162/200] [100/157]	Train Reconstruction Loss	0.0358	Train
Correlation Loss	1.0755		
[162/200] [150/157]	Train Reconstruction Loss	0.0363	Train
Correlation Loss	1.0782		
Val Reconstruction Loss	0.0362	Val Correlation Loss	1.0823
Starting epoch 163			
[163/200] [0/157]	Train Reconstruction Loss	0.0379	Train
Correlation Loss	1.0596		
[163/200] [50/157]	Train Reconstruction Loss	0.0350	Train
Correlation Loss	1.0797		
[163/200] [100/157]	Train Reconstruction Loss	0.0359	Train
Correlation Loss	1.0842		
[163/200] [150/157]	Train Reconstruction Loss	0.0345	Train
Correlation Loss	1.0838		
Val Reconstruction Loss	0.0358	Val Correlation Loss	1.0776
Starting epoch 164			
[164/200] [0/157]	Train Reconstruction Loss	0.0371	Train
Correlation Loss	1.0776		
[164/200] [50/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0743		
[164/200] [100/157]	Train Reconstruction Loss	0.0359	Train
Correlation Loss	1.0750		
[164/200] [150/157]	Train Reconstruction Loss	0.0355	Train
Correlation Loss	1.0701		
Val Reconstruction Loss	0.0357	Val Correlation Loss	1.0768
Starting epoch 165			
[165/200] [0/157]	Train Reconstruction Loss	0.0357	Train
Correlation Loss	1.0746		
[165/200] [50/157]	Train Reconstruction Loss	0.0344	Train
Correlation Loss	1.0771		
[165/200] [100/157]	Train Reconstruction Loss	0.0336	Train
Correlation Loss	1.0842		
[165/200] [150/157]	Train Reconstruction Loss	0.0351	Train
Correlation Loss	1.0681		
Val Reconstruction Loss	0.0360	Val Correlation Loss	1.0748
Starting epoch 166			
[166/200] [0/157]	Train Reconstruction Loss	0.0375	Train
Correlation Loss	1.0575		
[166/200] [50/157]	Train Reconstruction Loss	0.0351	Train
Correlation Loss	1.0896		
[166/200] [100/157]	Train Reconstruction Loss	0.0343	Train
Correlation Loss	1.0800		



[166/200] [150/157]	Train Reconstruction Loss 0.0357	Train
Correlation Loss 1.0841		
Val Reconstruction Loss 0.0359	Val Correlation Loss 1.0804	
Starting epoch 167		
[167/200] [0/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0838		
[167/200] [50/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0656		
[167/200] [100/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0676		
[167/200] [150/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0650		
Val Reconstruction Loss 0.0357	Val Correlation Loss 1.0786	
Starting epoch 168		
[168/200] [0/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0827		
[168/200] [50/157]	Train Reconstruction Loss 0.0350	Train
Correlation Loss 1.0744		
[168/200] [100/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.0689		
[168/200] [150/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0727		
Val Reconstruction Loss 0.0361	Val Correlation Loss 1.0769	
Starting epoch 169		
[169/200] [0/157]	Train Reconstruction Loss 0.0350	Train
Correlation Loss 1.0842		
[169/200] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0631		
[169/200] [100/157]	Train Reconstruction Loss 0.0355	Train
Correlation Loss 1.0680		
[169/200] [150/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0704		
Val Reconstruction Loss 0.0360	Val Correlation Loss 1.0734	
Starting epoch 170		
[170/200] [0/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0761		
[170/200] [50/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0714		
[170/200] [100/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0689		
[170/200] [150/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0704		
Val Reconstruction Loss 0.0358	Val Correlation Loss 1.0763	
Starting epoch 171		
[171/200] [0/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0659		
[171/200] [50/157]	Train Reconstruction Loss 0.0358	Train
Correlation Loss 1.0759		

[171/200] [100/157]	Train Reconstruction Loss 0.0357	Train
Correlation Loss 1.0724		
[171/200] [150/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0695		
Val Reconstruction Loss 0.0364	Val Correlation Loss 1.0735	
Starting epoch 172		
[172/200] [0/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0672		
[172/200] [50/157]	Train Reconstruction Loss 0.0348	Train
Correlation Loss 1.0803		
[172/200] [100/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0698		
[172/200] [150/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0635		
Val Reconstruction Loss 0.0362	Val Correlation Loss 1.0734	
Starting epoch 173		
[173/200] [0/157]	Train Reconstruction Loss 0.0361	Train
Correlation Loss 1.0884		
[173/200] [50/157]	Train Reconstruction Loss 0.0367	Train
Correlation Loss 1.0686		
[173/200] [100/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0718		
[173/200] [150/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0687		
Val Reconstruction Loss 0.0364	Val Correlation Loss 1.0732	
Starting epoch 174		
[174/200] [0/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0736		
[174/200] [50/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.0782		
[174/200] [100/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0775		
[174/200] [150/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0693		
Val Reconstruction Loss 0.0361	Val Correlation Loss 1.0709	
Starting epoch 175		
[175/200] [0/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0733		
[175/200] [50/157]	Train Reconstruction Loss 0.0350	Train
Correlation Loss 1.0804		
[175/200] [100/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0767		
[175/200] [150/157]	Train Reconstruction Loss 0.0354	Train
Correlation Loss 1.0625		
Val Reconstruction Loss 0.0361	Val Correlation Loss 1.0732	
Starting epoch 176		
[176/200] [0/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0663		

[176/200] [50/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0693		
[176/200] [100/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0662		
[176/200] [150/157]	Train Reconstruction Loss 0.0358	Train
Correlation Loss 1.0703		
Val Reconstruction Loss 0.0366	Val Correlation Loss 1.0739	
Starting epoch 177		
[177/200] [0/157]	Train Reconstruction Loss 0.0356	Train
Correlation Loss 1.0746		
[177/200] [50/157]	Train Reconstruction Loss 0.0350	Train
Correlation Loss 1.0827		
[177/200] [100/157]	Train Reconstruction Loss 0.0344	Train
Correlation Loss 1.0787		
[177/200] [150/157]	Train Reconstruction Loss 0.0367	Train
Correlation Loss 1.0589		
Val Reconstruction Loss 0.0363	Val Correlation Loss 1.0740	
Starting epoch 178		
[178/200] [0/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0616		
[178/200] [50/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0716		
[178/200] [100/157]	Train Reconstruction Loss 0.0359	Train
Correlation Loss 1.0841		
[178/200] [150/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0569		
Val Reconstruction Loss 0.0366	Val Correlation Loss 1.0680	
Starting epoch 179		
[179/200] [0/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0683		
[179/200] [50/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0560		
[179/200] [100/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0597		
[179/200] [150/157]	Train Reconstruction Loss 0.0358	Train
Correlation Loss 1.0701		
Val Reconstruction Loss 0.0365	Val Correlation Loss 1.0683	
Starting epoch 180		
[180/200] [0/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0632		
[180/200] [50/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0563		
[180/200] [100/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0499		
[180/200] [150/157]	Train Reconstruction Loss 0.0376	Train
Correlation Loss 1.0564		
Val Reconstruction Loss 0.0369	Val Correlation Loss 1.0747	
Starting epoch 181		

[181/200] [0/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0651		
[181/200] [50/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0584		
[181/200] [100/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0676		
[181/200] [150/157]	Train Reconstruction Loss 0.0395	Train
Correlation Loss 1.0495		
Val Reconstruction Loss 0.0363	Val Correlation Loss 1.0677	
Starting epoch 182		
[182/200] [0/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0715		
[182/200] [50/157]	Train Reconstruction Loss 0.0376	Train
Correlation Loss 1.0583		
[182/200] [100/157]	Train Reconstruction Loss 0.0351	Train
Correlation Loss 1.0654		
[182/200] [150/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0700		
Val Reconstruction Loss 0.0362	Val Correlation Loss 1.0716	
Starting epoch 183		
[183/200] [0/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0639		
[183/200] [50/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0639		
[183/200] [100/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0684		
[183/200] [150/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0768		
Val Reconstruction Loss 0.0360	Val Correlation Loss 1.0669	
Starting epoch 184		
[184/200] [0/157]	Train Reconstruction Loss 0.0346	Train
Correlation Loss 1.0689		
[184/200] [50/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0753		
[184/200] [100/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0617		
[184/200] [150/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0659		
Val Reconstruction Loss 0.0367	Val Correlation Loss 1.0661	
Starting epoch 185		
[185/200] [0/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0705		
[185/200] [50/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0639		
[185/200] [100/157]	Train Reconstruction Loss 0.0340	Train
Correlation Loss 1.0734		
[185/200] [150/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0590		

Val Reconstruction Loss	0.0361	Val Correlation Loss	1.0659
Starting epoch 186			
[186/200] [0/157]	Train Reconstruction Loss	0.0382	Train
Correlation Loss	1.0671		
[186/200] [50/157]	Train Reconstruction Loss	0.0367	Train
Correlation Loss	1.0582		
[186/200] [100/157]	Train Reconstruction Loss	0.0359	Train
Correlation Loss	1.0739		
[186/200] [150/157]	Train Reconstruction Loss	0.0373	Train
Correlation Loss	1.0600		
Val Reconstruction Loss	0.0363	Val Correlation Loss	1.0668
Starting epoch 187			
[187/200] [0/157]	Train Reconstruction Loss	0.0367	Train
Correlation Loss	1.0608		
[187/200] [50/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0616		
[187/200] [100/157]	Train Reconstruction Loss	0.0375	Train
Correlation Loss	1.0607		
[187/200] [150/157]	Train Reconstruction Loss	0.0389	Train
Correlation Loss	1.0570		
Val Reconstruction Loss	0.0367	Val Correlation Loss	1.0644
Starting epoch 188			
[188/200] [0/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0621		
[188/200] [50/157]	Train Reconstruction Loss	0.0367	Train
Correlation Loss	1.0593		
[188/200] [100/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0629		
[188/200] [150/157]	Train Reconstruction Loss	0.0351	Train
Correlation Loss	1.0685		
Val Reconstruction Loss	0.0366	Val Correlation Loss	1.0642
Starting epoch 189			
[189/200] [0/157]	Train Reconstruction Loss	0.0370	Train
Correlation Loss	1.0574		
[189/200] [50/157]	Train Reconstruction Loss	0.0365	Train
Correlation Loss	1.0630		
[189/200] [100/157]	Train Reconstruction Loss	0.0378	Train
Correlation Loss	1.0663		
[189/200] [150/157]	Train Reconstruction Loss	0.0363	Train
Correlation Loss	1.0546		
Val Reconstruction Loss	0.0359	Val Correlation Loss	1.0687
Starting epoch 190			
[190/200] [0/157]	Train Reconstruction Loss	0.0358	Train
Correlation Loss	1.0712		
[190/200] [50/157]	Train Reconstruction Loss	0.0382	Train
Correlation Loss	1.0381		
[190/200] [100/157]	Train Reconstruction Loss	0.0369	Train
Correlation Loss	1.0525		

[190/200] [150/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0539		
Val Reconstruction Loss 0.0365	Val Correlation Loss 1.0633	
Starting epoch 191		
[191/200] [0/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0671		
[191/200] [50/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0563		
[191/200] [100/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0532		
[191/200] [150/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.0690		
Val Reconstruction Loss 0.0363	Val Correlation Loss 1.0649	
Starting epoch 192		
[192/200] [0/157]	Train Reconstruction Loss 0.0337	Train
Correlation Loss 1.0898		
[192/200] [50/157]	Train Reconstruction Loss 0.0345	Train
Correlation Loss 1.0764		
[192/200] [100/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0542		
[192/200] [150/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0605		
Val Reconstruction Loss 0.0369	Val Correlation Loss 1.0629	
Starting epoch 193		
[193/200] [0/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0689		
[193/200] [50/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0608		
[193/200] [100/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0558		
[193/200] [150/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0601		
Val Reconstruction Loss 0.0367	Val Correlation Loss 1.0622	
Starting epoch 194		
[194/200] [0/157]	Train Reconstruction Loss 0.0358	Train
Correlation Loss 1.0634		
[194/200] [50/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0629		
[194/200] [100/157]	Train Reconstruction Loss 0.0352	Train
Correlation Loss 1.0716		
[194/200] [150/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0628		
Val Reconstruction Loss 0.0376	Val Correlation Loss 1.0623	
Starting epoch 195		
[195/200] [0/157]	Train Reconstruction Loss 0.0398	Train
Correlation Loss 1.0592		
[195/200] [50/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0630		

```

[195/200][100/157]      Train Reconstruction Loss 0.0366      Train
Correlation Loss 1.0578
[195/200][150/157]      Train Reconstruction Loss 0.0382      Train
Correlation Loss 1.0619
Val Reconstruction Loss 0.0369   Val Correlation Loss 1.0607
Starting epoch 196
[196/200][0/157]        Train Reconstruction Loss 0.0367      Train
Correlation Loss 1.0567
[196/200][50/157]       Train Reconstruction Loss 0.0351      Train
Correlation Loss 1.0678
[196/200][100/157]      Train Reconstruction Loss 0.0381      Train
Correlation Loss 1.0505
[196/200][150/157]      Train Reconstruction Loss 0.0379      Train
Correlation Loss 1.0574
Val Reconstruction Loss 0.0364   Val Correlation Loss 1.0675
Starting epoch 197
[197/200][0/157]        Train Reconstruction Loss 0.0353      Train
Correlation Loss 1.0650
[197/200][50/157]       Train Reconstruction Loss 0.0363      Train
Correlation Loss 1.0530
[197/200][100/157]      Train Reconstruction Loss 0.0356      Train
Correlation Loss 1.0637
[197/200][150/157]      Train Reconstruction Loss 0.0364      Train
Correlation Loss 1.0670
Val Reconstruction Loss 0.0370   Val Correlation Loss 1.0595
Starting epoch 198
[198/200][0/157]        Train Reconstruction Loss 0.0355      Train
Correlation Loss 1.0580
[198/200][50/157]       Train Reconstruction Loss 0.0375      Train
Correlation Loss 1.0651
[198/200][100/157]      Train Reconstruction Loss 0.0377      Train
Correlation Loss 1.0596
[198/200][150/157]      Train Reconstruction Loss 0.0380      Train
Correlation Loss 1.0471
Val Reconstruction Loss 0.0369   Val Correlation Loss 1.0595
Starting epoch 199
[199/200][0/157]        Train Reconstruction Loss 0.0367      Train
Correlation Loss 1.0570
[199/200][50/157]       Train Reconstruction Loss 0.0351      Train
Correlation Loss 1.0666
[199/200][100/157]      Train Reconstruction Loss 0.0372      Train
Correlation Loss 1.0650
[199/200][150/157]      Train Reconstruction Loss 0.0376      Train
Correlation Loss 1.0636
Val Reconstruction Loss 0.0373   Val Correlation Loss 1.0604

```

```
[ ]: create_checkpoint()
```

```
[ ]: train_autoenc(200,250)
```

Starting epoch 200

/usr/local/lib/python3.6/dist-packages/torch/nn/functional.py:1639: UserWarning:  
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.

warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid  
instead.")

[200/250] [0/157] Train Reconstruction Loss 0.0374 Train  
Correlation Loss 1.0498

[200/250] [50/157] Train Reconstruction Loss 0.0375 Train  
Correlation Loss 1.0639

[200/250] [100/157] Train Reconstruction Loss 0.0364 Train  
Correlation Loss 1.0567

[200/250] [150/157] Train Reconstruction Loss 0.0366 Train  
Correlation Loss 1.0540

Val Reconstruction Loss 0.0372 Val Correlation Loss 1.0588

Starting epoch 201

[201/250] [0/157] Train Reconstruction Loss 0.0360 Train  
Correlation Loss 1.0547

[201/250] [50/157] Train Reconstruction Loss 0.0376 Train  
Correlation Loss 1.0458

[201/250] [100/157] Train Reconstruction Loss 0.0368 Train  
Correlation Loss 1.0544

[201/250] [150/157] Train Reconstruction Loss 0.0385 Train  
Correlation Loss 1.0622

Val Reconstruction Loss 0.0371 Val Correlation Loss 1.0579

Starting epoch 202

[202/250] [0/157] Train Reconstruction Loss 0.0367 Train  
Correlation Loss 1.0534

[202/250] [50/157] Train Reconstruction Loss 0.0357 Train  
Correlation Loss 1.0602

[202/250] [100/157] Train Reconstruction Loss 0.0353 Train  
Correlation Loss 1.0499

[202/250] [150/157] Train Reconstruction Loss 0.0367 Train  
Correlation Loss 1.0533

Val Reconstruction Loss 0.0373 Val Correlation Loss 1.0600

Starting epoch 203

[203/250] [0/157] Train Reconstruction Loss 0.0374 Train  
Correlation Loss 1.0640

[203/250] [50/157] Train Reconstruction Loss 0.0388 Train  
Correlation Loss 1.0424

[203/250] [100/157] Train Reconstruction Loss 0.0362 Train  
Correlation Loss 1.0626

[203/250] [150/157] Train Reconstruction Loss 0.0368 Train  
Correlation Loss 1.0638

Val Reconstruction Loss 0.0374 Val Correlation Loss 1.0574



Starting epoch 204

[204/250] [0/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0437		
[204/250] [50/157]	Train Reconstruction Loss 0.0392	Train
Correlation Loss 1.0480		
[204/250] [100/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0462		
[204/250] [150/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0680		
Val Reconstruction Loss 0.0371	Val Correlation Loss 1.0579	

Starting epoch 205

[205/250] [0/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0509		
[205/250] [50/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0553		
[205/250] [100/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0513		
[205/250] [150/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0455		
Val Reconstruction Loss 0.0372	Val Correlation Loss 1.0574	

Starting epoch 206

[206/250] [0/157]	Train Reconstruction Loss 0.0367	Train
Correlation Loss 1.0489		
[206/250] [50/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0523		
[206/250] [100/157]	Train Reconstruction Loss 0.0402	Train
Correlation Loss 1.0448		
[206/250] [150/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0631		
Val Reconstruction Loss 0.0369	Val Correlation Loss 1.0571	

Starting epoch 207

[207/250] [0/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0556		
[207/250] [50/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0489		
[207/250] [100/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0540		
[207/250] [150/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0606		
Val Reconstruction Loss 0.0377	Val Correlation Loss 1.0556	

Starting epoch 208

[208/250] [0/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0472		
[208/250] [50/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0636		
[208/250] [100/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0657		
[208/250] [150/157]	Train Reconstruction Loss 0.0377	Train

Correlation Loss 1.0596  
Val Reconstruction Loss 0.0375    Val Correlation Loss 1.0556  
Starting epoch 209  
[209/250] [0/157]            Train Reconstruction Loss 0.0374            Train  
Correlation Loss 1.0478  
[209/250] [50/157]           Train Reconstruction Loss 0.0385           Train  
Correlation Loss 1.0539  
[209/250] [100/157]           Train Reconstruction Loss 0.0379           Train  
Correlation Loss 1.0443  
[209/250] [150/157]           Train Reconstruction Loss 0.0374           Train  
Correlation Loss 1.0604  
Val Reconstruction Loss 0.0384    Val Correlation Loss 1.0575  
Starting epoch 210  
[210/250] [0/157]            Train Reconstruction Loss 0.0380           Train  
Correlation Loss 1.0538  
[210/250] [50/157]           Train Reconstruction Loss 0.0363           Train  
Correlation Loss 1.0561  
[210/250] [100/157]           Train Reconstruction Loss 0.0372           Train  
Correlation Loss 1.0568  
[210/250] [150/157]           Train Reconstruction Loss 0.0376           Train  
Correlation Loss 1.0556  
Val Reconstruction Loss 0.0378    Val Correlation Loss 1.0560  
Starting epoch 211  
[211/250] [0/157]            Train Reconstruction Loss 0.0376           Train  
Correlation Loss 1.0515  
[211/250] [50/157]           Train Reconstruction Loss 0.0365           Train  
Correlation Loss 1.0486  
[211/250] [100/157]           Train Reconstruction Loss 0.0373           Train  
Correlation Loss 1.0648  
[211/250] [150/157]           Train Reconstruction Loss 0.0377           Train  
Correlation Loss 1.0506  
Val Reconstruction Loss 0.0382    Val Correlation Loss 1.0535  
Starting epoch 212  
[212/250] [0/157]            Train Reconstruction Loss 0.0386           Train  
Correlation Loss 1.0364  
[212/250] [50/157]           Train Reconstruction Loss 0.0375           Train  
Correlation Loss 1.0468  
[212/250] [100/157]           Train Reconstruction Loss 0.0376           Train  
Correlation Loss 1.0606  
[212/250] [150/157]           Train Reconstruction Loss 0.0363           Train  
Correlation Loss 1.0663  
Val Reconstruction Loss 0.0378    Val Correlation Loss 1.0528  
Starting epoch 213  
[213/250] [0/157]            Train Reconstruction Loss 0.0386           Train  
Correlation Loss 1.0344  
[213/250] [50/157]           Train Reconstruction Loss 0.0388           Train  
Correlation Loss 1.0498  
[213/250] [100/157]           Train Reconstruction Loss 0.0391           Train

Correlation Loss 1.0518		
[213/250] [150/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0610		
Val Reconstruction Loss 0.0373	Val Correlation Loss 1.0536	
Starting epoch 214		
[214/250] [0/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0591		
[214/250] [50/157]	Train Reconstruction Loss 0.0367	Train
Correlation Loss 1.0594		
[214/250] [100/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0438		
[214/250] [150/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0584		
Val Reconstruction Loss 0.0373	Val Correlation Loss 1.0540	
Starting epoch 215		
[215/250] [0/157]	Train Reconstruction Loss 0.0376	Train
Correlation Loss 1.0513		
[215/250] [50/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0666		
[215/250] [100/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0413		
[215/250] [150/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0624		
Val Reconstruction Loss 0.0378	Val Correlation Loss 1.0526	
Starting epoch 216		
[216/250] [0/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0543		
[216/250] [50/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0484		
[216/250] [100/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0538		
[216/250] [150/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0486		
Val Reconstruction Loss 0.0377	Val Correlation Loss 1.0616	
Starting epoch 217		
[217/250] [0/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0505		
[217/250] [50/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0583		
[217/250] [100/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0618		
[217/250] [150/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0601		
Val Reconstruction Loss 0.0378	Val Correlation Loss 1.0519	
Starting epoch 218		
[218/250] [0/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0571		
[218/250] [50/157]	Train Reconstruction Loss 0.0372	Train

Correlation Loss 1.0446		
[218/250] [100/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0555		
[218/250] [150/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0691		
Val Reconstruction Loss 0.0373	Val Correlation Loss 1.0532	
Starting epoch 219		
[219/250] [0/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0653		
[219/250] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0409		
[219/250] [100/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0649		
[219/250] [150/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0462		
Val Reconstruction Loss 0.0379	Val Correlation Loss 1.0525	
Starting epoch 220		
[220/250] [0/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0630		
[220/250] [50/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0525		
[220/250] [100/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0497		
[220/250] [150/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0593		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0510	
Starting epoch 221		
[221/250] [0/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0561		
[221/250] [50/157]	Train Reconstruction Loss 0.0367	Train
Correlation Loss 1.0458		
[221/250] [100/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0554		
[221/250] [150/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0448		
Val Reconstruction Loss 0.0378	Val Correlation Loss 1.0501	
Starting epoch 222		
[222/250] [0/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0484		
[222/250] [50/157]	Train Reconstruction Loss 0.0376	Train
Correlation Loss 1.0402		
[222/250] [100/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0491		
[222/250] [150/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0384		
Val Reconstruction Loss 0.0378	Val Correlation Loss 1.0504	
Starting epoch 223		
[223/250] [0/157]	Train Reconstruction Loss 0.0371	Train

Correlation Loss 1.0424		
[223/250] [50/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0514		
[223/250] [100/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0401		
[223/250] [150/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0682		
Val Reconstruction Loss 0.0377	Val Correlation Loss 1.0500	
Starting epoch 224		
[224/250] [0/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0414		
[224/250] [50/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0595		
[224/250] [100/157]	Train Reconstruction Loss 0.0394	Train
Correlation Loss 1.0330		
[224/250] [150/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0494		
Val Reconstruction Loss 0.0378	Val Correlation Loss 1.0500	
Starting epoch 225		
[225/250] [0/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0477		
[225/250] [50/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0562		
[225/250] [100/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0467		
[225/250] [150/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0569		
Val Reconstruction Loss 0.0377	Val Correlation Loss 1.0517	
Starting epoch 226		
[226/250] [0/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0459		
[226/250] [50/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0451		
[226/250] [100/157]	Train Reconstruction Loss 0.0395	Train
Correlation Loss 1.0422		
[226/250] [150/157]	Train Reconstruction Loss 0.0361	Train
Correlation Loss 1.0581		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0475	
Starting epoch 227		
[227/250] [0/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0498		
[227/250] [50/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0418		
[227/250] [100/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0456		
[227/250] [150/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0552		
Val Reconstruction Loss 0.0392	Val Correlation Loss 1.0494	

Starting epoch 228

[228/250] [0/157]	Train Reconstruction Loss 0.0396	Train
Correlation Loss 1.0451		
[228/250] [50/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0453		
[228/250] [100/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0553		
[228/250] [150/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0619		
Val Reconstruction Loss 0.0384	Val Correlation Loss 1.0490	

Starting epoch 229

[229/250] [0/157]	Train Reconstruction Loss 0.0392	Train
Correlation Loss 1.0484		
[229/250] [50/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0595		
[229/250] [100/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0497		
[229/250] [150/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0380		
Val Reconstruction Loss 0.0379	Val Correlation Loss 1.0498	

Starting epoch 230

[230/250] [0/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0485		
[230/250] [50/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0424		
[230/250] [100/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0436		
[230/250] [150/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0604		
Val Reconstruction Loss 0.0373	Val Correlation Loss 1.0491	

Starting epoch 231

[231/250] [0/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0488		
[231/250] [50/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0431		
[231/250] [100/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0510		
[231/250] [150/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0604		
Val Reconstruction Loss 0.0381	Val Correlation Loss 1.0502	

Starting epoch 232

[232/250] [0/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0431		
[232/250] [50/157]	Train Reconstruction Loss 0.0376	Train
Correlation Loss 1.0505		
[232/250] [100/157]	Train Reconstruction Loss 0.0366	Train
Correlation Loss 1.0480		
[232/250] [150/157]	Train Reconstruction Loss 0.0385	Train

Correlation Loss 1.0330  
Val Reconstruction Loss 0.0381    Val Correlation Loss 1.0473  
Starting epoch 233  
[233/250] [0/157]            Train Reconstruction Loss 0.0376            Train  
Correlation Loss 1.0415  
[233/250] [50/157]           Train Reconstruction Loss 0.0372           Train  
Correlation Loss 1.0535  
[233/250] [100/157]           Train Reconstruction Loss 0.0388           Train  
Correlation Loss 1.0501  
[233/250] [150/157]          Train Reconstruction Loss 0.0369           Train  
Correlation Loss 1.0651  
Val Reconstruction Loss 0.0388    Val Correlation Loss 1.0447  
Starting epoch 234  
[234/250] [0/157]            Train Reconstruction Loss 0.0391           Train  
Correlation Loss 1.0581  
[234/250] [50/157]           Train Reconstruction Loss 0.0370           Train  
Correlation Loss 1.0455  
[234/250] [100/157]          Train Reconstruction Loss 0.0370           Train  
Correlation Loss 1.0614  
[234/250] [150/157]          Train Reconstruction Loss 0.0394           Train  
Correlation Loss 1.0527  
Val Reconstruction Loss 0.0381    Val Correlation Loss 1.0459  
Starting epoch 235  
[235/250] [0/157]            Train Reconstruction Loss 0.0381           Train  
Correlation Loss 1.0398  
[235/250] [50/157]           Train Reconstruction Loss 0.0374           Train  
Correlation Loss 1.0500  
[235/250] [100/157]          Train Reconstruction Loss 0.0383           Train  
Correlation Loss 1.0422  
[235/250] [150/157]          Train Reconstruction Loss 0.0382           Train  
Correlation Loss 1.0532  
Val Reconstruction Loss 0.0377    Val Correlation Loss 1.0486  
Starting epoch 236  
[236/250] [0/157]            Train Reconstruction Loss 0.0364           Train  
Correlation Loss 1.0459  
[236/250] [50/157]           Train Reconstruction Loss 0.0380           Train  
Correlation Loss 1.0318  
[236/250] [100/157]          Train Reconstruction Loss 0.0376           Train  
Correlation Loss 1.0389  
[236/250] [150/157]          Train Reconstruction Loss 0.0371           Train  
Correlation Loss 1.0415  
Val Reconstruction Loss 0.0377    Val Correlation Loss 1.0536  
Starting epoch 237  
[237/250] [0/157]            Train Reconstruction Loss 0.0382           Train  
Correlation Loss 1.0555  
[237/250] [50/157]           Train Reconstruction Loss 0.0371           Train  
Correlation Loss 1.0540  
[237/250] [100/157]          Train Reconstruction Loss 0.0367           Train

Correlation Loss 1.0597		
[237/250] [150/157]	Train Reconstruction Loss 0.0392	Train
Correlation Loss 1.0360		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0456	
Starting epoch 238		
[238/250] [0/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0427		
[238/250] [50/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0448		
[238/250] [100/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0249		
[238/250] [150/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0512		
Val Reconstruction Loss 0.0387	Val Correlation Loss 1.0436	
Starting epoch 239		
[239/250] [0/157]	Train Reconstruction Loss 0.0395	Train
Correlation Loss 1.0399		
[239/250] [50/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0506		
[239/250] [100/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0487		
[239/250] [150/157]	Train Reconstruction Loss 0.0360	Train
Correlation Loss 1.0547		
Val Reconstruction Loss 0.0377	Val Correlation Loss 1.0455	
Starting epoch 240		
[240/250] [0/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0543		
[240/250] [50/157]	Train Reconstruction Loss 0.0389	Train
Correlation Loss 1.0392		
[240/250] [100/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0398		
[240/250] [150/157]	Train Reconstruction Loss 0.0395	Train
Correlation Loss 1.0341		
Val Reconstruction Loss 0.0383	Val Correlation Loss 1.0437	
Starting epoch 241		
[241/250] [0/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0480		
[241/250] [50/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0415		
[241/250] [100/157]	Train Reconstruction Loss 0.0401	Train
Correlation Loss 1.0377		
[241/250] [150/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0512		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0450	
Starting epoch 242		
[242/250] [0/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0411		
[242/250] [50/157]	Train Reconstruction Loss 0.0380	Train



Correlation Loss 1.0468		
[242/250] [100/157]	Train Reconstruction Loss 0.0396	Train
Correlation Loss 1.0339		
[242/250] [150/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0355		
Val Reconstruction Loss 0.0387	Val Correlation Loss 1.0425	
Starting epoch 243		
[243/250] [0/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0447		
[243/250] [50/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0476		
[243/250] [100/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0466		
[243/250] [150/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0339		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0476	
Starting epoch 244		
[244/250] [0/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0510		
[244/250] [50/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0450		
[244/250] [100/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0390		
[244/250] [150/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0563		
Val Reconstruction Loss 0.0378	Val Correlation Loss 1.0470	
Starting epoch 245		
[245/250] [0/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0415		
[245/250] [50/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0350		
[245/250] [100/157]	Train Reconstruction Loss 0.0417	Train
Correlation Loss 1.0402		
[245/250] [150/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0447		
Val Reconstruction Loss 0.0389	Val Correlation Loss 1.0418	
Starting epoch 246		
[246/250] [0/157]	Train Reconstruction Loss 0.0394	Train
Correlation Loss 1.0399		
[246/250] [50/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0511		
[246/250] [100/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0412		
[246/250] [150/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0257		
Val Reconstruction Loss 0.0384	Val Correlation Loss 1.0422	
Starting epoch 247		
[247/250] [0/157]	Train Reconstruction Loss 0.0368	Train

```

Correlation Loss 1.0502
[247/250] [50/157]      Train Reconstruction Loss 0.0368      Train
Correlation Loss 1.0436
[247/250] [100/157]     Train Reconstruction Loss 0.0394      Train
Correlation Loss 1.0268
[247/250] [150/157]     Train Reconstruction Loss 0.0389      Train
Correlation Loss 1.0390
Val Reconstruction Loss 0.0378   Val Correlation Loss 1.0470
Starting epoch 248
[248/250] [0/157]       Train Reconstruction Loss 0.0373      Train
Correlation Loss 1.0507
[248/250] [50/157]     Train Reconstruction Loss 0.0385      Train
Correlation Loss 1.0481
[248/250] [100/157]    Train Reconstruction Loss 0.0385      Train
Correlation Loss 1.0353
[248/250] [150/157]    Train Reconstruction Loss 0.0387      Train
Correlation Loss 1.0429
Val Reconstruction Loss 0.0383   Val Correlation Loss 1.0431
Starting epoch 249
[249/250] [0/157]       Train Reconstruction Loss 0.0375      Train
Correlation Loss 1.0465
[249/250] [50/157]     Train Reconstruction Loss 0.0381      Train
Correlation Loss 1.0370
[249/250] [100/157]    Train Reconstruction Loss 0.0386      Train
Correlation Loss 1.0440
[249/250] [150/157]    Train Reconstruction Loss 0.0385      Train
Correlation Loss 1.0453
Val Reconstruction Loss 0.0384   Val Correlation Loss 1.0442

```

```
[ ]: create_checkpoint()
```

```
[ ]: train_autoenc(250,300)
```

Starting epoch 250

```

/usr/local/lib/python3.6/dist-packages/torch/nn/functional.py:1639: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
  warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")

```

```

[250/300] [0/157]       Train Reconstruction Loss 0.0391      Train
Correlation Loss 1.0322
[250/300] [50/157]     Train Reconstruction Loss 0.0384      Train
Correlation Loss 1.0370
[250/300] [100/157]    Train Reconstruction Loss 0.0386      Train
Correlation Loss 1.0420
[250/300] [150/157]    Train Reconstruction Loss 0.0371      Train
Correlation Loss 1.0304

```

Val Reconstruction Loss	0.0384	Val Correlation Loss	1.0477
Starting epoch 251			
[251/300] [0/157]	Train Reconstruction Loss	0.0383	Train
Correlation Loss	1.0547		
[251/300] [50/157]	Train Reconstruction Loss	0.0376	Train
Correlation Loss	1.0449		
[251/300] [100/157]	Train Reconstruction Loss	0.0391	Train
Correlation Loss	1.0379		
[251/300] [150/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0493		
Val Reconstruction Loss	0.0386	Val Correlation Loss	1.0416
Starting epoch 252			
[252/300] [0/157]	Train Reconstruction Loss	0.0392	Train
Correlation Loss	1.0348		
[252/300] [50/157]	Train Reconstruction Loss	0.0376	Train
Correlation Loss	1.0334		
[252/300] [100/157]	Train Reconstruction Loss	0.0393	Train
Correlation Loss	1.0343		
[252/300] [150/157]	Train Reconstruction Loss	0.0391	Train
Correlation Loss	1.0406		
Val Reconstruction Loss	0.0387	Val Correlation Loss	1.0421
Starting epoch 253			
[253/300] [0/157]	Train Reconstruction Loss	0.0391	Train
Correlation Loss	1.0389		
[253/300] [50/157]	Train Reconstruction Loss	0.0379	Train
Correlation Loss	1.0514		
[253/300] [100/157]	Train Reconstruction Loss	0.0380	Train
Correlation Loss	1.0481		
[253/300] [150/157]	Train Reconstruction Loss	0.0364	Train
Correlation Loss	1.0468		
Val Reconstruction Loss	0.0383	Val Correlation Loss	1.0421
Starting epoch 254			
[254/300] [0/157]	Train Reconstruction Loss	0.0397	Train
Correlation Loss	1.0237		
[254/300] [50/157]	Train Reconstruction Loss	0.0378	Train
Correlation Loss	1.0466		
[254/300] [100/157]	Train Reconstruction Loss	0.0382	Train
Correlation Loss	1.0408		
[254/300] [150/157]	Train Reconstruction Loss	0.0363	Train
Correlation Loss	1.0579		
Val Reconstruction Loss	0.0380	Val Correlation Loss	1.0414
Starting epoch 255			
[255/300] [0/157]	Train Reconstruction Loss	0.0368	Train
Correlation Loss	1.0399		
[255/300] [50/157]	Train Reconstruction Loss	0.0400	Train
Correlation Loss	1.0292		
[255/300] [100/157]	Train Reconstruction Loss	0.0394	Train
Correlation Loss	1.0195		

[255/300] [150/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0448		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0426	
Starting epoch 256		
[256/300] [0/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0351		
[256/300] [50/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0448		
[256/300] [100/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0451		
[256/300] [150/157]	Train Reconstruction Loss 0.0392	Train
Correlation Loss 1.0415		
Val Reconstruction Loss 0.0386	Val Correlation Loss 1.0416	
Starting epoch 257		
[257/300] [0/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0423		
[257/300] [50/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0387		
[257/300] [100/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0391		
[257/300] [150/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0471		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0407	
Starting epoch 258		
[258/300] [0/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0544		
[258/300] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0421		
[258/300] [100/157]	Train Reconstruction Loss 0.0395	Train
Correlation Loss 1.0309		
[258/300] [150/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0386		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0398	
Starting epoch 259		
[259/300] [0/157]	Train Reconstruction Loss 0.0395	Train
Correlation Loss 1.0386		
[259/300] [50/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0285		
[259/300] [100/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0427		
[259/300] [150/157]	Train Reconstruction Loss 0.0397	Train
Correlation Loss 1.0382		
Val Reconstruction Loss 0.0389	Val Correlation Loss 1.0386	
Starting epoch 260		
[260/300] [0/157]	Train Reconstruction Loss 0.0394	Train
Correlation Loss 1.0383		
[260/300] [50/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0505		

[260/300] [100/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0293		
[260/300] [150/157]	Train Reconstruction Loss 0.0375	Train
Correlation Loss 1.0383		
Val Reconstruction Loss 0.0391	Val Correlation Loss 1.0433	
Starting epoch 261		
[261/300] [0/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0310		
[261/300] [50/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0327		
[261/300] [100/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0508		
[261/300] [150/157]	Train Reconstruction Loss 0.0398	Train
Correlation Loss 1.0279		
Val Reconstruction Loss 0.0384	Val Correlation Loss 1.0406	
Starting epoch 262		
[262/300] [0/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0457		
[262/300] [50/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0344		
[262/300] [100/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0433		
[262/300] [150/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0441		
Val Reconstruction Loss 0.0388	Val Correlation Loss 1.0387	
Starting epoch 263		
[263/300] [0/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0363		
[263/300] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0397		
[263/300] [100/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0348		
[263/300] [150/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0380		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0402	
Starting epoch 264		
[264/300] [0/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0472		
[264/300] [50/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0347		
[264/300] [100/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0463		
[264/300] [150/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0462		
Val Reconstruction Loss 0.0384	Val Correlation Loss 1.0388	
Starting epoch 265		
[265/300] [0/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0379		

[265/300] [50/157]	Train Reconstruction Loss 0.0399	Train
Correlation Loss 1.0191		
[265/300] [100/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0460		
[265/300] [150/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0446		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0400	
Starting epoch 266		
[266/300] [0/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0334		
[266/300] [50/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0383		
[266/300] [100/157]	Train Reconstruction Loss 0.0389	Train
Correlation Loss 1.0326		
[266/300] [150/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0451		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0379	
Starting epoch 267		
[267/300] [0/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0215		
[267/300] [50/157]	Train Reconstruction Loss 0.0392	Train
Correlation Loss 1.0306		
[267/300] [100/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0295		
[267/300] [150/157]	Train Reconstruction Loss 0.0400	Train
Correlation Loss 1.0222		
Val Reconstruction Loss 0.0392	Val Correlation Loss 1.0435	
Starting epoch 268		
[268/300] [0/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0500		
[268/300] [50/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0395		
[268/300] [100/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0442		
[268/300] [150/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0385		
Val Reconstruction Loss 0.0392	Val Correlation Loss 1.0375	
Starting epoch 269		
[269/300] [0/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0408		
[269/300] [50/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0403		
[269/300] [100/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0516		
[269/300] [150/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0354		
Val Reconstruction Loss 0.0387	Val Correlation Loss 1.0395	
Starting epoch 270		

[270/300] [0/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0566		
[270/300] [50/157]	Train Reconstruction Loss 0.0363	Train
Correlation Loss 1.0467		
[270/300] [100/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0338		
[270/300] [150/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0382		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0377	
Starting epoch 271		
[271/300] [0/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0296		
[271/300] [50/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0511		
[271/300] [100/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0341		
[271/300] [150/157]	Train Reconstruction Loss 0.0397	Train
Correlation Loss 1.0286		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0366	
Starting epoch 272		
[272/300] [0/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0433		
[272/300] [50/157]	Train Reconstruction Loss 0.0389	Train
Correlation Loss 1.0372		
[272/300] [100/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0390		
[272/300] [150/157]	Train Reconstruction Loss 0.0390	Train
Correlation Loss 1.0377		
Val Reconstruction Loss 0.0389	Val Correlation Loss 1.0360	
Starting epoch 273		
[273/300] [0/157]	Train Reconstruction Loss 0.0393	Train
Correlation Loss 1.0182		
[273/300] [50/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0469		
[273/300] [100/157]	Train Reconstruction Loss 0.0382	Train
Correlation Loss 1.0333		
[273/300] [150/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0307		
Val Reconstruction Loss 0.0389	Val Correlation Loss 1.0436	
Starting epoch 274		
[274/300] [0/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0490		
[274/300] [50/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0403		
[274/300] [100/157]	Train Reconstruction Loss 0.0389	Train
Correlation Loss 1.0387		
[274/300] [150/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0354		

Val Reconstruction Loss	0.0386	Val Correlation Loss	1.0350
Starting epoch 275			
[275/300] [0/157]	Train Reconstruction Loss	0.0367	Train
Correlation Loss	1.0390		
[275/300] [50/157]	Train Reconstruction Loss	0.0384	Train
Correlation Loss	1.0223		
[275/300] [100/157]	Train Reconstruction Loss	0.0376	Train
Correlation Loss	1.0272		
[275/300] [150/157]	Train Reconstruction Loss	0.0397	Train
Correlation Loss	1.0341		
Val Reconstruction Loss	0.0378	Val Correlation Loss	1.0400
Starting epoch 276			
[276/300] [0/157]	Train Reconstruction Loss	0.0390	Train
Correlation Loss	1.0235		
[276/300] [50/157]	Train Reconstruction Loss	0.0370	Train
Correlation Loss	1.0548		
[276/300] [100/157]	Train Reconstruction Loss	0.0380	Train
Correlation Loss	1.0315		
[276/300] [150/157]	Train Reconstruction Loss	0.0393	Train
Correlation Loss	1.0311		
Val Reconstruction Loss	0.0382	Val Correlation Loss	1.0382
Starting epoch 277			
[277/300] [0/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0420		
[277/300] [50/157]	Train Reconstruction Loss	0.0394	Train
Correlation Loss	1.0354		
[277/300] [100/157]	Train Reconstruction Loss	0.0364	Train
Correlation Loss	1.0420		
[277/300] [150/157]	Train Reconstruction Loss	0.0378	Train
Correlation Loss	1.0366		
Val Reconstruction Loss	0.0384	Val Correlation Loss	1.0362
Starting epoch 278			
[278/300] [0/157]	Train Reconstruction Loss	0.0407	Train
Correlation Loss	1.0148		
[278/300] [50/157]	Train Reconstruction Loss	0.0400	Train
Correlation Loss	1.0308		
[278/300] [100/157]	Train Reconstruction Loss	0.0366	Train
Correlation Loss	1.0393		
[278/300] [150/157]	Train Reconstruction Loss	0.0393	Train
Correlation Loss	1.0298		
Val Reconstruction Loss	0.0387	Val Correlation Loss	1.0378
Starting epoch 279			
[279/300] [0/157]	Train Reconstruction Loss	0.0391	Train
Correlation Loss	1.0302		
[279/300] [50/157]	Train Reconstruction Loss	0.0385	Train
Correlation Loss	1.0314		
[279/300] [100/157]	Train Reconstruction Loss	0.0386	Train
Correlation Loss	1.0302		



[279/300] [150/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0385		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0355	
Starting epoch 280		
[280/300] [0/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0411		
[280/300] [50/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0443		
[280/300] [100/157]	Train Reconstruction Loss 0.0400	Train
Correlation Loss 1.0412		
[280/300] [150/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0224		
Val Reconstruction Loss 0.0392	Val Correlation Loss 1.0335	
Starting epoch 281		
[281/300] [0/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0436		
[281/300] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0415		
[281/300] [100/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0194		
[281/300] [150/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0250		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0373	
Starting epoch 282		
[282/300] [0/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0501		
[282/300] [50/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0337		
[282/300] [100/157]	Train Reconstruction Loss 0.0378	Train
Correlation Loss 1.0438		
[282/300] [150/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0525		
Val Reconstruction Loss 0.0391	Val Correlation Loss 1.0379	
Starting epoch 283		
[283/300] [0/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0440		
[283/300] [50/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0530		
[283/300] [100/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0326		
[283/300] [150/157]	Train Reconstruction Loss 0.0396	Train
Correlation Loss 1.0406		
Val Reconstruction Loss 0.0381	Val Correlation Loss 1.0349	
Starting epoch 284		
[284/300] [0/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0393		
[284/300] [50/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0351		

[284/300] [100/157]	Train Reconstruction Loss 0.0393	Train
Correlation Loss 1.0376		
[284/300] [150/157]	Train Reconstruction Loss 0.0401	Train
Correlation Loss 1.0311		
Val Reconstruction Loss 0.0386	Val Correlation Loss 1.0349	
Starting epoch 285		
[285/300] [0/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0350		
[285/300] [50/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0396		
[285/300] [100/157]	Train Reconstruction Loss 0.0392	Train
Correlation Loss 1.0155		
[285/300] [150/157]	Train Reconstruction Loss 0.0372	Train
Correlation Loss 1.0395		
Val Reconstruction Loss 0.0382	Val Correlation Loss 1.0343	
Starting epoch 286		
[286/300] [0/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0289		
[286/300] [50/157]	Train Reconstruction Loss 0.0389	Train
Correlation Loss 1.0303		
[286/300] [100/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0447		
[286/300] [150/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0186		
Val Reconstruction Loss 0.0383	Val Correlation Loss 1.0351	
Starting epoch 287		
[287/300] [0/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0205		
[287/300] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0268		
[287/300] [100/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0384		
[287/300] [150/157]	Train Reconstruction Loss 0.0379	Train
Correlation Loss 1.0291		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0353	
Starting epoch 288		
[288/300] [0/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0333		
[288/300] [50/157]	Train Reconstruction Loss 0.0394	Train
Correlation Loss 1.0318		
[288/300] [100/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0381		
[288/300] [150/157]	Train Reconstruction Loss 0.0394	Train
Correlation Loss 1.0246		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0332	
Starting epoch 289		
[289/300] [0/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0432		

[289/300] [50/157]	Train Reconstruction Loss 0.0393	Train
Correlation Loss 1.0325		
[289/300] [100/157]	Train Reconstruction Loss 0.0402	Train
Correlation Loss 1.0227		
[289/300] [150/157]	Train Reconstruction Loss 0.0362	Train
Correlation Loss 1.0404		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0346	
Starting epoch 290		
[290/300] [0/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0098		
[290/300] [50/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0382		
[290/300] [100/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0377		
[290/300] [150/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0388		
Val Reconstruction Loss 0.0386	Val Correlation Loss 1.0320	
Starting epoch 291		
[291/300] [0/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0297		
[291/300] [50/157]	Train Reconstruction Loss 0.0365	Train
Correlation Loss 1.0338		
[291/300] [100/157]	Train Reconstruction Loss 0.0371	Train
Correlation Loss 1.0328		
[291/300] [150/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0313		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0318	
Starting epoch 292		
[292/300] [0/157]	Train Reconstruction Loss 0.0387	Train
Correlation Loss 1.0302		
[292/300] [50/157]	Train Reconstruction Loss 0.0386	Train
Correlation Loss 1.0328		
[292/300] [100/157]	Train Reconstruction Loss 0.0388	Train
Correlation Loss 1.0320		
[292/300] [150/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0328		
Val Reconstruction Loss 0.0380	Val Correlation Loss 1.0321	
Starting epoch 293		
[293/300] [0/157]	Train Reconstruction Loss 0.0405	Train
Correlation Loss 1.0280		
[293/300] [50/157]	Train Reconstruction Loss 0.0373	Train
Correlation Loss 1.0356		
[293/300] [100/157]	Train Reconstruction Loss 0.0398	Train
Correlation Loss 1.0364		
[293/300] [150/157]	Train Reconstruction Loss 0.0377	Train
Correlation Loss 1.0382		
Val Reconstruction Loss 0.0384	Val Correlation Loss 1.0326	
Starting epoch 294		

[294/300] [0/157]	Train Reconstruction Loss 0.0391	Train
Correlation Loss 1.0221		
[294/300] [50/157]	Train Reconstruction Loss 0.0397	Train
Correlation Loss 1.0329		
[294/300] [100/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0436		
[294/300] [150/157]	Train Reconstruction Loss 0.0383	Train
Correlation Loss 1.0334		
Val Reconstruction Loss 0.0385	Val Correlation Loss 1.0324	
Starting epoch 295		
[295/300] [0/157]	Train Reconstruction Loss 0.0384	Train
Correlation Loss 1.0298		
[295/300] [50/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0376		
[295/300] [100/157]	Train Reconstruction Loss 0.0385	Train
Correlation Loss 1.0384		
[295/300] [150/157]	Train Reconstruction Loss 0.0364	Train
Correlation Loss 1.0255		
Val Reconstruction Loss 0.0389	Val Correlation Loss 1.0299	
Starting epoch 296		
[296/300] [0/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0379		
[296/300] [50/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0343		
[296/300] [100/157]	Train Reconstruction Loss 0.0369	Train
Correlation Loss 1.0356		
[296/300] [150/157]	Train Reconstruction Loss 0.0380	Train
Correlation Loss 1.0276		
Val Reconstruction Loss 0.0383	Val Correlation Loss 1.0311	
Starting epoch 297		
[297/300] [0/157]	Train Reconstruction Loss 0.0370	Train
Correlation Loss 1.0399		
[297/300] [50/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0282		
[297/300] [100/157]	Train Reconstruction Loss 0.0393	Train
Correlation Loss 1.0287		
[297/300] [150/157]	Train Reconstruction Loss 0.0374	Train
Correlation Loss 1.0521		
Val Reconstruction Loss 0.0381	Val Correlation Loss 1.0343	
Starting epoch 298		
[298/300] [0/157]	Train Reconstruction Loss 0.0368	Train
Correlation Loss 1.0342		
[298/300] [50/157]	Train Reconstruction Loss 0.0389	Train
Correlation Loss 1.0287		
[298/300] [100/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0342		
[298/300] [150/157]	Train Reconstruction Loss 0.0381	Train
Correlation Loss 1.0271		

```

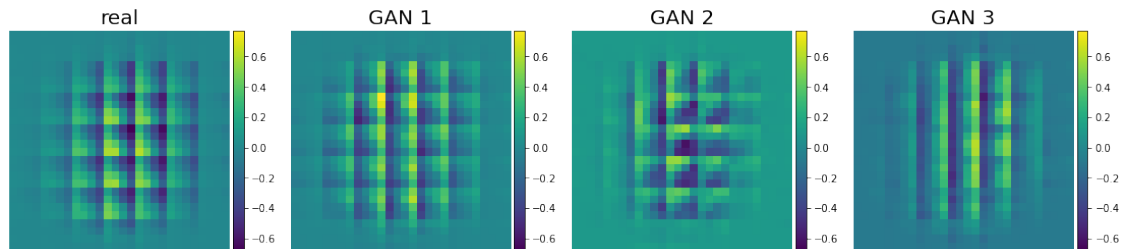
Val Reconstruction Loss 0.0379   Val Correlation Loss 1.0353
Starting epoch 299
[299/300] [0/157]           Train Reconstruction Loss 0.0384           Train
Correlation Loss 1.0285
[299/300] [50/157]          Train Reconstruction Loss 0.0389           Train
Correlation Loss 1.0284
[299/300] [100/157]          Train Reconstruction Loss 0.0389           Train
Correlation Loss 1.0186
[299/300] [150/157]          Train Reconstruction Loss 0.0375           Train
Correlation Loss 1.0470
Val Reconstruction Loss 0.0378   Val Correlation Loss 1.0320

```

```
[ ]: create_checkpoint()
```

## 2 Visualise Learned Fingerprints

```
[ ]: plot_util.plot_fingerprints('Yu')
```



## 3 Investigate similarity between fingerprints

```
[ ]: #calculate pairwise Pearson correlation coefficients between fingerprints
fps = fp_util.load_fingerprints('Yu')
fps_vectorised = np.reshape(fps, (4,-1))
np.corrcoef(fps_vectorised)
```

```
[ ]: array([[ 1.          , -0.92077759,  0.12037477, -0.7580798 ],
          [-0.92077759,  1.          , -0.39481841,  0.80243455],
          [ 0.12037477, -0.39481841,  1.          , -0.68748347],
          [-0.7580798 ,  0.80243455, -0.68748347,  1.          ]])
```

## 4 Plot loss evolution graphs

```
[ ]: autoEnc_dict = torch.load('/content/gdrive/My Drive/Diss/trained_models/
    →Autoencoder', map_location=torch.device('cpu'))

fp_train_losses = autoEnc_dict['fp_train_losses']
fp_val_losses = autoEnc_dict['fp_val_losses']
mse_train_losses = autoEnc_dict['mse_train_losses']
mse_val_losses = autoEnc_dict['mse_val_losses']

total_train_losses = [sum(i) for i in zip([2*e for e in fp_train_losses], [5*e
    →for e in mse_train_losses])]
total_val_losses = [sum(i) for i in zip([2*e for e in fp_val_losses], [5*e for
    →e in mse_val_losses])]

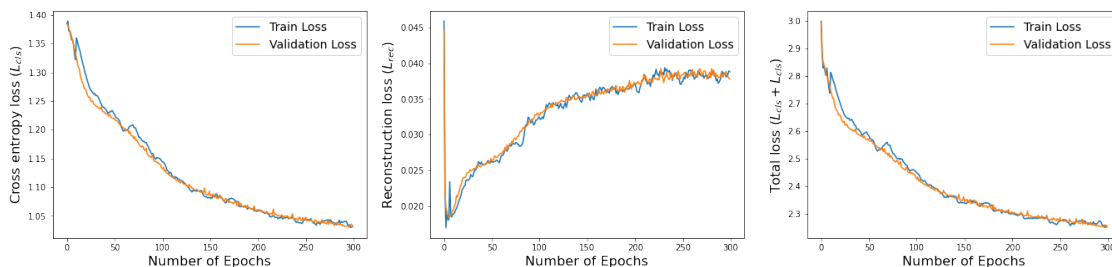
[ ]: def plot_loss_evolution(ax, train_losses, val_losses, loss_type):
    ax.plot(train_losses, label = "Train Loss")
    ax.plot(val_losses, label = "Validation Loss")

    ax.set_xlabel("Number of Epochs")
    ax.set_ylabel(loss_type)
    ax.legend()

[ ]: plt.rcParams['axes.labelsize'] = 16
plt.rcParams['legend.fontsize'] = 14
plt.rcParams['text.usetex'] = False

fig, ax = plt.subplots(1,3, figsize = (23,5))
plot_loss_evolution(ax[0], fp_train_losses, fp_val_losses, 'Cross entropy loss
    →( $L_{cls}$ )')
plot_loss_evolution(ax[1], mse_train_losses, mse_val_losses, 'Reconstruction
    →loss ( $L_{rec}$ )')
plot_loss_evolution(ax[2], total_train_losses, total_val_losses, 'Total loss
    →( $L_{cls}$  +  $L_{cls}$ )')

plt.savefig('autoenc_losses.pdf', bbox_inches = 'tight')
```



## 5 Get Autoencoder reconstructions for Appendix

```
[55]: import random

start_index = random.randint(0,995)
num_samples = 5

real_imgs = fp_util.load_test_images(0)[start_index: start_index+num_samples]
gan1_imgs = fp_util.load_test_images(1)[start_index: start_index+num_samples]
gan2_imgs = fp_util.load_test_images(2)[start_index: start_index+num_samples]
gan3_imgs = fp_util.load_test_images(3)[start_index: start_index+num_samples]

[48]: def plot_autoencoded_images(original_imgs):
    num_samples = len(original_imgs)
    fig, ax = plt.subplots(2, num_samples, figsize=(10,4))

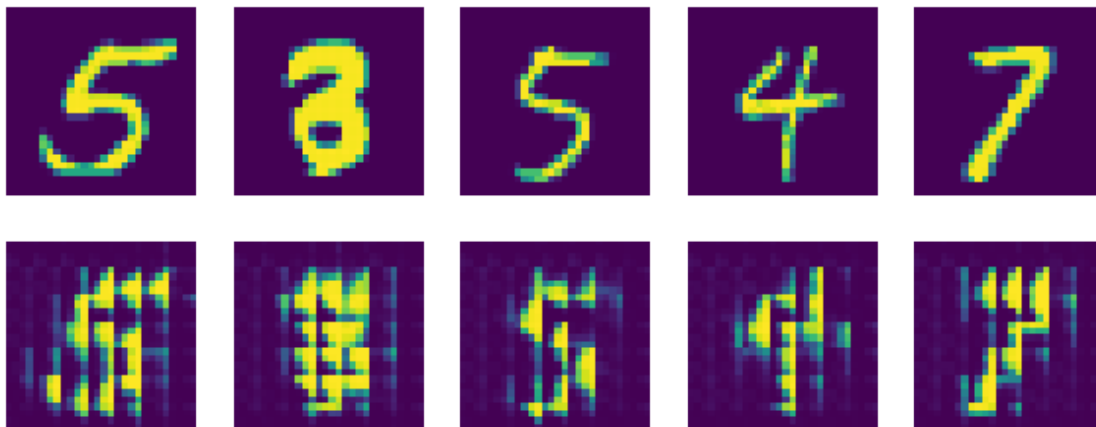
    autoencoder_output = fp_util.autoEnc(torch.from_numpy(original_imgs.
→reshape(num_samples,1,28,28))).detach().numpy().reshape(num_samples,28,28)

    for i in range(num_samples):
        ax[0,i].imshow(original_imgs[i])
        ax[0,i].axis('off')

        ax[1,i].imshow(autoencoder_output[i])
        ax[1,i].axis('off')

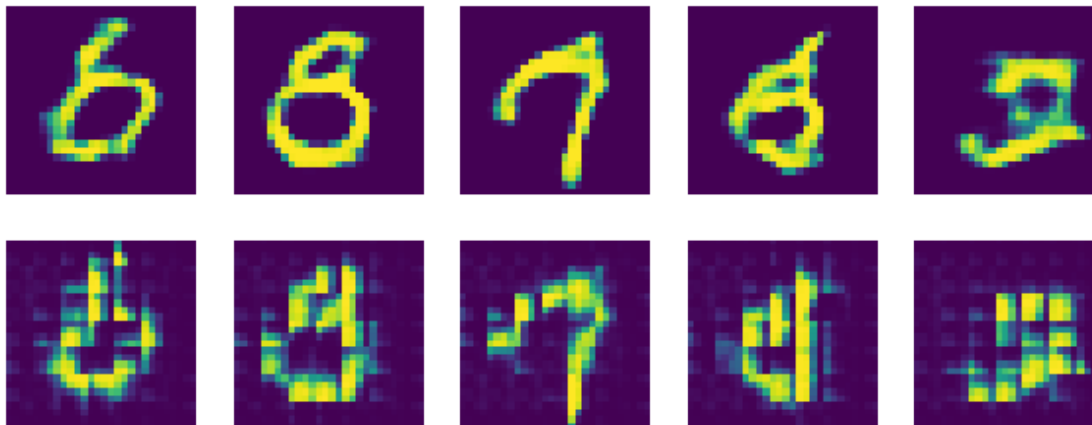
[61]: plot_autoencoded_images(real_imgs)
plt.savefig('real_imgs_autoenc.png', bbox_inches='tight')
```

```
/usr/local/lib/python3.7/dist-packages/torch/nn/functional.py:1709: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
  warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")
```



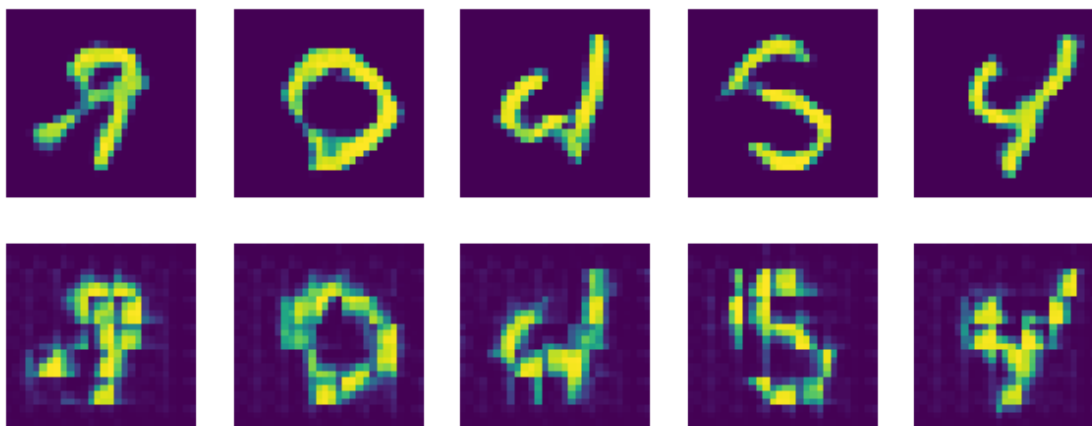
```
[62]: plot_autoencoded_images(gan1_imgs)
plt.savefig('gan1_imgs_autoenc.png', bbox_inches='tight')
```

```
/usr/local/lib/python3.7/dist-packages/torch/nn/functional.py:1709: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
  warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")
```



```
[63]: plot_autoencoded_images(gan2_imgs)
plt.savefig('gan2_imgs_autoenc.png', bbox_inches='tight')
```

```
/usr/local/lib/python3.7/dist-packages/torch/nn/functional.py:1709: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
  warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")
```





```
[64]: plot_autoencoded_images(gan3_imgs)
plt.savefig('gan3_imgs_autoenc.png', bbox_inches='tight')
```

```
/usr/local/lib/python3.7/dist-packages/torch/nn/functional.py:1709: UserWarning:
nn.functional.sigmoid is deprecated. Use torch.sigmoid instead.
```

```
warnings.warn("nn.functional.sigmoid is deprecated. Use torch.sigmoid
instead.")
```

