

# 0724-small\_hybrid\_model\_v3

July 25, 2023

```
[23]: import torch
import torch.nn as nn
import torch.optim as optim
```

```
[24]: import numpy as np
```

```
[25]: import sys
sys.path.append('.')

from my_code import functions as f
```

## 1 Data

```
[26]: file_path = '../data/energies/Trial/Strings_Energies_4_aa.txt' # Replace with
↳ the actual path to your 'data.txt' file
string_list, number_list = f.read_data_file(file_path)
score_list = np.array(number_list)/100
angles_list = np.array([f.string_to_numbers(string) for string in string_list])
```

```
[27]: X, Y, X_validation, Y_validation = f.create_validating_set(angles_list,
↳ score_list, percentage=0.1)
```

```
[28]: # Define the dataset
input_data = torch.tensor(X, dtype=torch.float32)
target_data = torch.tensor(Y, dtype=torch.float32).view(-1, 1)

# Define the validation set
input_validation = torch.tensor(X_validation, dtype=torch.float32)
target_validation = torch.tensor(Y_validation, dtype=torch.float32).view(-1, 1)
```

## 2 Quantum node

```
[29]: def qml_RZZ(params, wires):
    """
    RZZ gate.
    """
```

```

qml.CNOT(wires=wires)
qml.RZ(params, wires=wires[1])
qml.CNOT(wires=wires)

```

```

[30]: import pennylane as qml

n_qubits = 4
n_layers_block = 5
n_layers_embedding = 3
n_layers = n_layers_block + n_layers_embedding
n_params = 5
dev = qml.device("default.qubit", wires=n_qubits)

@qml.qnode(dev)
def qnode(inputs, weights):

    # state preparation (we create an embedding with 3 layers, paper: 2001.
    ↪03622)
    for i in range(n_layers_embedding):

        # angle embedding for each qubit
        qml.AngleEmbedding(inputs, wires=range(n_qubits))

        # ZZ rotation for neighboring qubits
        for x in range(2):
            for j in range(x, n_qubits, 2):
                qml_RZZ(weights[i, j, 0], wires=[j, (j+1)%n_qubits])

        # rotations for each qubit
        for j in range(n_qubits):
            qml.RY(weights[i, j, 1], wires=j)

        # last angle embedding
        qml.AngleEmbedding(inputs, wires=range(n_qubits))

    #layers
    for i in range(n_layers_embedding, n_layers):
        # rotations for each qubit
        for j in range(n_qubits):
            qml.RX(weights[i, j, 2], wires=j)
            qml.RZ(weights[i, j, 3], wires=j)

        # ZZ rotation for neighboring qubits
        for x in range(2):
            for j in range(x, n_qubits, 2):
                qml_RZZ(weights[i, j, 4], wires=[j, (j+1)%n_qubits])

```

```

# rotations for each qubit
for j in range(n_qubits):
    qml.RX(weights[i,j,0], wires=j)
    qml.RZ(weights[i,j,1], wires=j)

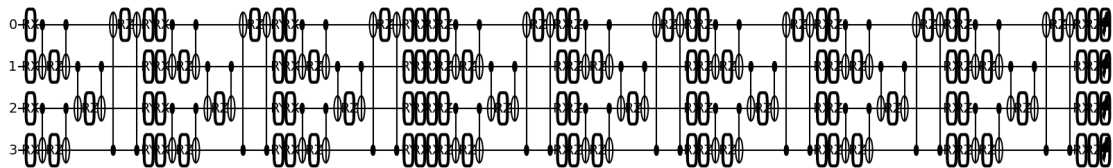
# measurement
return [qml.expval(qml.PauliZ(wires=i)) for i in range(n_qubits)]

```

```

[31]: qml.drawer.use_style("black_white")
fig, ax = qml.draw_mpl(qnode, expansion_strategy="device")([i for i in
    ↪range(n_qubits)], np.zeros((n_layers, n_qubits, n_params)))
fig.set_size_inches((16,3))

```



```

[32]: weight_shapes = {"weights": (n_layers, n_qubits, n_params)}

```

```

[33]: qlayer = qml.qnn.TorchLayer(qnode, weight_shapes)

```

### 3 Hybrid model

```

[34]: input_dim = input_data.size(1)

layers = [nn.Linear(input_dim*1, input_dim*2), nn.ReLU()]
layers += [nn.Linear(input_dim*2, input_dim*3), nn.ReLU()]
layers += [nn.Linear(input_dim*3, input_dim*3), nn.ReLU()]
layers += [nn.Linear(input_dim*3, input_dim*2), nn.ReLU()]
layers += [nn.Linear(input_dim*2, input_dim*1)]
layers += [qlayer]
layers += [nn.Linear(input_dim*1, input_dim*1)]
layers += [nn.Linear(input_dim*1, input_dim*1), nn.ReLU()] * 2
layers += [nn.Linear(input_dim*1, 1)]
Net = nn.Sequential(*layers)

```

```

[35]: # Create an instance of the network
model = Net

```

```

[36]: import time

```

```

[37]: # time
start_time = time.time()

# Define the loss function and optimizer
criterion = nn.MSELoss() # Mean Squared Error loss
# optimizer = optim.Adam(model.parameters(), lr=0.001) # Adam optimizer with
↳ learning rate 0.001
optimizer = optim.SGD(model.parameters(), lr=0.01)

# Training loop
num_epochs = 10
batch_size = 32

losses = []
losses_epochs = []

for epoch in range(num_epochs):
    # Shuffle the dataset
    indices = torch.randperm(input_data.size(0))
    input_data = input_data[indices]
    target_data = target_data[indices]

    losses_epochs.append(0)

    # Mini-batch training
    for i in range(0, input_data.size(0), batch_size):
        inputs = input_data[i:i+batch_size]
        targets = target_data[i:i+batch_size]

        # Forward pass
        outputs = model(inputs)

        # Compute the loss
        loss = criterion(outputs, targets)

        # Backward pass and optimization
        optimizer.zero_grad()
        loss.backward()
        optimizer.step()

        # Store the loss
        losses.append(loss.item())

    print('- Epoch [{}/{}], i: [{}/{}], Loss: {:.4f}'.format(epoch+1,
↳ num_epochs, i, input_data.size(0), loss.item()), end='\r')

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```

    # add to the epoch loss
    losses_epochs[-1] += loss.item() / (input_data.size(0) / batch_size)

# time
# Compute elapsed time and remaining time
elapsed_time = time.time() - start_time
avg_time_per_epoch = elapsed_time / (epoch + 1)
remaining_epochs = num_epochs - (epoch + 1)
estimated_remaining_time = avg_time_per_epoch * remaining_epochs

# Convert remaining time to hours, minutes, and seconds for better
↳readability
hours, remainder = divmod(estimated_remaining_time, 3600)
minutes, seconds = divmod(remainder, 60)

# Print the loss and remaining time for this epoch
print('Epoch [{}/{}], Loss: {:.4f}, Time remaining: ~{}h {}m {:.0f}s'.
↳format(
    epoch+1, num_epochs, losses_epochs[-1], hours, minutes, seconds))

```

```

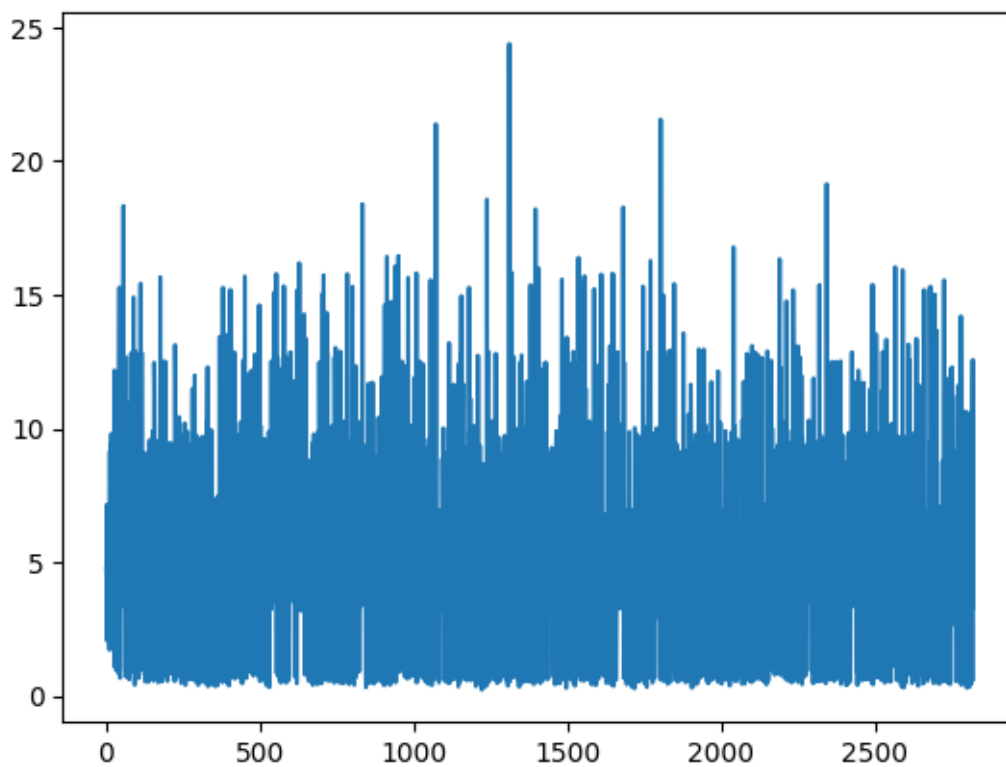
Epoch [1/10], Loss: 5.5088, Time remaining: ~0.0h 8.0m 7s
Epoch [2/10], Loss: 5.4456, Time remaining: ~0.0h 7.0m 4s
Epoch [3/10], Loss: 5.4457, Time remaining: ~0.0h 6.0m 3s
Epoch [4/10], Loss: 5.4450, Time remaining: ~0.0h 5.0m 13s
Epoch [5/10], Loss: 5.4480, Time remaining: ~0.0h 4.0m 24s
Epoch [6/10], Loss: 5.4482, Time remaining: ~0.0h 3.0m 34s
Epoch [7/10], Loss: 5.4466, Time remaining: ~0.0h 2.0m 42s
Epoch [8/10], Loss: 5.4765, Time remaining: ~0.0h 1.0m 49s
Epoch [9/10], Loss: 5.4735, Time remaining: ~0.0h 0.0m 54s
Epoch [10/10], Loss: 5.2648, Time remaining: ~0.0h 0.0m 0s

```

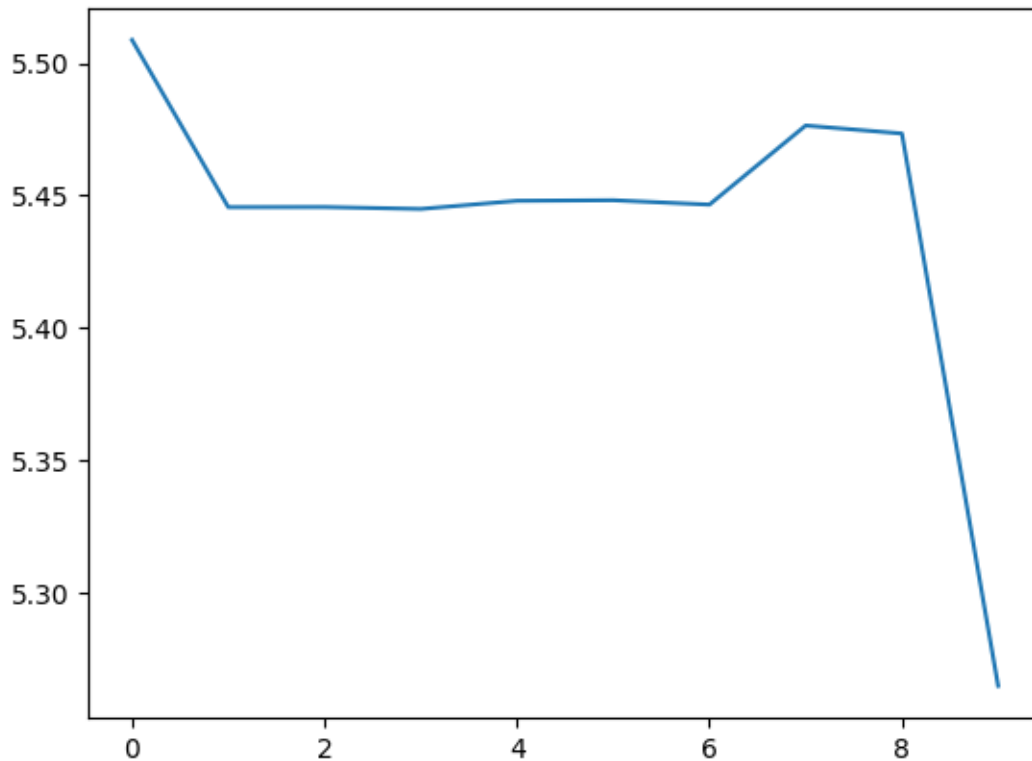
```

[38]: #plot the loss
import matplotlib.pyplot as plt
plt.plot(losses)
plt.show()

```



```
[39]: #plot the loss  
import matplotlib.pyplot as plt  
plt.plot(losses_epochs)  
plt.show()
```



```
[40]: avg_loss = 0
for x, (i, t) in enumerate(zip((input_validation), target_validation)):
    loss = criterion(model(i), t)
    avg_loss += loss/len(target_validation)
    print('i: {}, target: {:.3f}, output: {:.3f}, loss: {:.3f}'.format(x, t,
    ↪item(), model(i).item(), loss))

print('Average loss: {:.3f}'.format(avg_loss))
```

```
i: 0, target: -0.865, output: -0.945, loss: 0.006
i: 1, target: -0.386, output: 0.166, loss: 0.305
i: 2, target: -0.604, output: 0.071, loss: 0.456
i: 3, target: -1.217, output: -0.179, loss: 1.077
i: 4, target: -0.517, output: -0.233, loss: 0.080
i: 5, target: -0.552, output: -0.087, loss: 0.216
i: 6, target: -1.031, output: -0.759, loss: 0.074
i: 7, target: -0.732, output: 0.165, loss: 0.806
i: 8, target: -0.855, output: 0.168, loss: 1.046
i: 9, target: -0.624, output: -0.489, loss: 0.018
i: 10, target: -0.823, output: -1.087, loss: 0.070
i: 11, target: -1.471, output: -0.892, loss: 0.336
i: 12, target: -2.016, output: -1.117, loss: 0.808
```

i: 13, target: -0.321, output: -1.139, loss: 0.670  
i: 14, target: -1.408, output: -0.942, loss: 0.218  
i: 15, target: -1.620, output: -1.175, loss: 0.198  
i: 16, target: -1.156, output: -0.069, loss: 1.182  
i: 17, target: -0.265, output: 0.165, loss: 0.185  
i: 18, target: -0.409, output: -0.465, loss: 0.003  
i: 19, target: -0.442, output: 0.165, loss: 0.369  
i: 20, target: -2.087, output: -0.867, loss: 1.489  
i: 21, target: -0.813, output: -0.883, loss: 0.005  
i: 22, target: -0.700, output: -0.855, loss: 0.024  
i: 23, target: -0.946, output: -0.345, loss: 0.361  
i: 24, target: -0.416, output: -0.794, loss: 0.143  
i: 25, target: -1.360, output: 0.166, loss: 2.328  
i: 26, target: -0.564, output: -0.886, loss: 0.103  
i: 27, target: -1.588, output: -0.057, loss: 2.345  
i: 28, target: -0.333, output: 0.165, loss: 0.248  
i: 29, target: -0.563, output: -1.008, loss: 0.198  
i: 30, target: 9.245, output: 0.166, loss: 82.424  
i: 31, target: -0.671, output: -0.910, loss: 0.057  
i: 32, target: -0.558, output: 0.167, loss: 0.526  
i: 33, target: -0.523, output: -1.201, loss: 0.460  
i: 34, target: -1.153, output: -1.056, loss: 0.009  
i: 35, target: -1.544, output: -0.974, loss: 0.325  
i: 36, target: -1.912, output: -0.947, loss: 0.931  
i: 37, target: -0.765, output: -0.849, loss: 0.007  
i: 38, target: -0.927, output: -1.196, loss: 0.072  
i: 39, target: -0.409, output: -0.940, loss: 0.283  
i: 40, target: -1.511, output: -1.139, loss: 0.138  
i: 41, target: -0.366, output: -1.119, loss: 0.567  
i: 42, target: -0.590, output: -1.091, loss: 0.251  
i: 43, target: -2.023, output: -1.179, loss: 0.711  
i: 44, target: -1.018, output: 0.166, loss: 1.402  
i: 45, target: -1.637, output: -0.967, loss: 0.448  
i: 46, target: -0.907, output: -0.138, loss: 0.592  
i: 47, target: 9.622, output: 0.167, loss: 89.397  
i: 48, target: -1.616, output: -0.860, loss: 0.572  
i: 49, target: -0.487, output: -1.207, loss: 0.518  
i: 50, target: -0.772, output: -0.199, loss: 0.329  
i: 51, target: -1.707, output: -0.880, loss: 0.684  
i: 52, target: -1.209, output: -1.036, loss: 0.030  
i: 53, target: -1.163, output: -0.960, loss: 0.041  
i: 54, target: 0.001, output: 0.165, loss: 0.027  
i: 55, target: -0.567, output: -0.992, loss: 0.181  
i: 56, target: -1.273, output: -0.863, loss: 0.168  
i: 57, target: -2.228, output: 0.166, loss: 5.731  
i: 58, target: -0.969, output: -1.194, loss: 0.050  
i: 59, target: -0.831, output: -1.201, loss: 0.137  
i: 60, target: -0.888, output: 0.166, loss: 1.109



i: 61, target: -1.713, output: 0.165, loss: 3.529  
i: 62, target: 8.843, output: 0.168, loss: 75.264  
i: 63, target: -1.217, output: 0.165, loss: 1.910  
i: 64, target: -0.594, output: 0.166, loss: 0.578  
i: 65, target: -1.426, output: -0.903, loss: 0.273  
i: 66, target: -2.259, output: -0.872, loss: 1.923  
i: 67, target: -0.464, output: -1.184, loss: 0.517  
i: 68, target: 9.004, output: 0.165, loss: 78.115  
i: 69, target: -1.567, output: -1.136, loss: 0.185  
i: 70, target: -0.577, output: -0.856, loss: 0.078  
i: 71, target: -0.755, output: -0.844, loss: 0.008  
i: 72, target: -1.238, output: 0.142, loss: 1.905  
i: 73, target: -1.098, output: -0.586, loss: 0.262  
i: 74, target: -0.593, output: 0.166, loss: 0.576  
i: 75, target: -1.784, output: -1.185, loss: 0.359  
i: 76, target: -0.771, output: 0.165, loss: 0.877  
i: 77, target: -0.727, output: -0.853, loss: 0.016  
i: 78, target: -1.332, output: -1.063, loss: 0.072  
i: 79, target: -1.955, output: -1.055, loss: 0.809  
i: 80, target: -0.772, output: -1.053, loss: 0.079  
i: 81, target: 9.206, output: 0.165, loss: 81.740  
i: 82, target: -1.311, output: -1.003, loss: 0.095  
i: 83, target: -0.539, output: -1.106, loss: 0.321  
i: 84, target: -3.030, output: -0.799, loss: 4.979  
i: 85, target: -0.854, output: -0.926, loss: 0.005  
i: 86, target: -0.447, output: -1.144, loss: 0.486  
i: 87, target: -0.939, output: -0.856, loss: 0.007  
i: 88, target: -1.469, output: -0.450, loss: 1.038  
i: 89, target: -2.184, output: -0.596, loss: 2.520  
i: 90, target: -1.324, output: -1.190, loss: 0.018  
i: 91, target: -2.341, output: -0.955, loss: 1.921  
i: 92, target: -2.514, output: -1.095, loss: 2.015  
i: 93, target: -1.411, output: -1.167, loss: 0.059  
i: 94, target: -0.318, output: 0.166, loss: 0.234  
i: 95, target: -1.386, output: -1.124, loss: 0.069  
i: 96, target: -0.249, output: -0.596, loss: 0.120  
i: 97, target: -1.414, output: -1.199, loss: 0.046  
i: 98, target: -1.454, output: -0.838, loss: 0.380  
i: 99, target: 9.568, output: 0.166, loss: 88.398  
i: 100, target: -1.555, output: -0.160, loss: 1.944  
i: 101, target: -1.174, output: -1.040, loss: 0.018  
i: 102, target: -1.522, output: -0.904, loss: 0.381  
i: 103, target: -1.436, output: 0.121, loss: 2.424  
i: 104, target: -0.532, output: -1.167, loss: 0.404  
i: 105, target: 8.954, output: 0.167, loss: 77.222  
i: 106, target: 0.431, output: 0.166, loss: 0.070  
i: 107, target: -1.511, output: -1.063, loss: 0.201  
i: 108, target: -0.293, output: 0.167, loss: 0.211

i: 109, target: -0.578, output: 0.131, loss: 0.503  
i: 110, target: -1.248, output: -0.847, loss: 0.161  
i: 111, target: -1.613, output: -0.825, loss: 0.620  
i: 112, target: -0.748, output: -0.836, loss: 0.008  
i: 113, target: -0.702, output: -1.033, loss: 0.109  
i: 114, target: -1.497, output: 0.165, loss: 2.765  
i: 115, target: -2.252, output: -1.169, loss: 1.172  
i: 116, target: -0.799, output: -0.856, loss: 0.003  
i: 117, target: -0.952, output: -1.115, loss: 0.026  
i: 118, target: -0.398, output: 0.165, loss: 0.318  
i: 119, target: -0.783, output: 0.166, loss: 0.899  
i: 120, target: -0.841, output: -1.010, loss: 0.029  
i: 121, target: -0.768, output: -0.690, loss: 0.006  
i: 122, target: 0.474, output: 0.165, loss: 0.095  
i: 123, target: -0.838, output: -0.794, loss: 0.002  
i: 124, target: -1.138, output: -1.154, loss: 0.000  
i: 125, target: -0.575, output: -0.992, loss: 0.174  
i: 126, target: -0.497, output: -1.176, loss: 0.462  
i: 127, target: -0.462, output: -0.425, loss: 0.001  
i: 128, target: 0.001, output: -1.195, loss: 1.429  
i: 129, target: -0.452, output: -0.863, loss: 0.169  
i: 130, target: -1.227, output: -0.397, loss: 0.689  
i: 131, target: 0.790, output: 0.165, loss: 0.390  
i: 132, target: -1.851, output: -1.083, loss: 0.589  
i: 133, target: -1.423, output: -0.890, loss: 0.285  
i: 134, target: -1.174, output: -1.148, loss: 0.001  
i: 135, target: -0.428, output: -1.169, loss: 0.550  
i: 136, target: 9.253, output: 0.123, loss: 83.348  
i: 137, target: -0.682, output: -0.192, loss: 0.240  
i: 138, target: -1.417, output: -0.925, loss: 0.243  
i: 139, target: -0.801, output: -1.049, loss: 0.061  
i: 140, target: -0.743, output: -0.084, loss: 0.435  
i: 141, target: -1.257, output: -1.187, loss: 0.005  
i: 142, target: -0.749, output: -1.098, loss: 0.122  
i: 143, target: -0.765, output: 0.166, loss: 0.866  
i: 144, target: -1.046, output: -1.169, loss: 0.015  
i: 145, target: -0.628, output: -0.827, loss: 0.040  
i: 146, target: -1.065, output: -1.050, loss: 0.000  
i: 147, target: -1.645, output: -0.886, loss: 0.576  
i: 148, target: -2.208, output: 0.166, loss: 5.637  
i: 149, target: 0.286, output: 0.166, loss: 0.014  
i: 150, target: -0.171, output: -0.859, loss: 0.474  
i: 151, target: 0.485, output: 0.165, loss: 0.103  
i: 152, target: -0.495, output: -0.873, loss: 0.143  
i: 153, target: -1.077, output: -0.894, loss: 0.034  
i: 154, target: -0.801, output: 0.143, loss: 0.892  
i: 155, target: -0.655, output: -0.847, loss: 0.037  
i: 156, target: -0.032, output: 0.166, loss: 0.039

i: 157, target: 0.536, output: 0.166, loss: 0.137  
i: 158, target: -2.023, output: -1.095, loss: 0.861  
i: 159, target: -0.988, output: -1.092, loss: 0.011  
i: 160, target: -0.701, output: -0.975, loss: 0.075  
i: 161, target: -0.594, output: -0.293, loss: 0.091  
i: 162, target: -2.286, output: -1.169, loss: 1.249  
i: 163, target: -1.323, output: -0.904, loss: 0.176  
i: 164, target: -1.567, output: -0.417, loss: 1.323  
i: 165, target: -0.651, output: -0.884, loss: 0.054  
i: 166, target: -1.090, output: -0.019, loss: 1.148  
i: 167, target: 0.265, output: -1.142, loss: 1.980  
i: 168, target: -1.544, output: -0.975, loss: 0.324  
i: 169, target: 8.807, output: 0.165, loss: 74.678  
i: 170, target: -0.768, output: -1.195, loss: 0.182  
i: 171, target: -1.048, output: -0.082, loss: 0.933  
i: 172, target: -0.895, output: -0.870, loss: 0.001  
i: 173, target: -2.384, output: -0.931, loss: 2.110  
i: 174, target: -1.132, output: -1.147, loss: 0.000  
i: 175, target: -0.857, output: -1.197, loss: 0.115  
i: 176, target: -0.972, output: -0.856, loss: 0.013  
i: 177, target: -0.464, output: 0.162, loss: 0.393  
i: 178, target: -0.678, output: -0.807, loss: 0.017  
i: 179, target: -1.208, output: -0.855, loss: 0.125  
i: 180, target: -0.962, output: -1.004, loss: 0.002  
i: 181, target: -1.434, output: -1.167, loss: 0.071  
i: 182, target: -0.633, output: -1.199, loss: 0.320  
i: 183, target: -1.817, output: -1.142, loss: 0.455  
i: 184, target: -0.969, output: -0.050, loss: 0.845  
i: 185, target: -1.128, output: -0.991, loss: 0.019  
i: 186, target: -1.631, output: -1.039, loss: 0.351  
i: 187, target: -0.713, output: -1.162, loss: 0.202  
i: 188, target: -0.192, output: 0.167, loss: 0.129  
i: 189, target: -2.196, output: -1.121, loss: 1.155  
i: 190, target: -1.279, output: -0.353, loss: 0.857  
i: 191, target: -1.412, output: 0.166, loss: 2.490  
i: 192, target: -0.688, output: -0.805, loss: 0.014  
i: 193, target: 9.902, output: 0.165, loss: 94.800  
i: 194, target: -1.771, output: -1.014, loss: 0.573  
i: 195, target: -1.302, output: -0.732, loss: 0.325  
i: 196, target: -1.979, output: -0.945, loss: 1.069  
i: 197, target: -1.253, output: -0.957, loss: 0.088  
i: 198, target: -1.413, output: -0.449, loss: 0.929  
i: 199, target: -1.669, output: -1.180, loss: 0.238  
i: 200, target: 9.461, output: 0.166, loss: 86.395  
i: 201, target: 0.036, output: 0.165, loss: 0.017  
i: 202, target: -1.263, output: -1.106, loss: 0.024  
i: 203, target: -0.740, output: -0.306, loss: 0.188  
i: 204, target: -2.264, output: 0.058, loss: 5.391

i: 205, target: -0.531, output: -0.388, loss: 0.020  
i: 206, target: -1.339, output: -0.869, loss: 0.221  
i: 207, target: -1.443, output: -1.180, loss: 0.069  
i: 208, target: -0.483, output: -0.927, loss: 0.198  
i: 209, target: -0.589, output: -0.864, loss: 0.076  
i: 210, target: -1.086, output: -1.193, loss: 0.011  
i: 211, target: 9.319, output: 0.065, loss: 85.631  
i: 212, target: -0.627, output: -0.845, loss: 0.048  
i: 213, target: -1.057, output: 0.165, loss: 1.495  
i: 214, target: -1.225, output: -1.132, loss: 0.009  
i: 215, target: -1.739, output: -0.842, loss: 0.804  
i: 216, target: -1.323, output: -1.180, loss: 0.020  
i: 217, target: -0.681, output: -1.147, loss: 0.218  
i: 218, target: -0.985, output: -0.983, loss: 0.000  
i: 219, target: -0.575, output: -0.837, loss: 0.068  
i: 220, target: 9.678, output: 0.165, loss: 90.490  
i: 221, target: -0.607, output: -0.858, loss: 0.063  
i: 222, target: 8.818, output: 0.166, loss: 74.857  
i: 223, target: -1.087, output: -0.117, loss: 0.941  
i: 224, target: -0.690, output: -0.927, loss: 0.056  
i: 225, target: -1.022, output: -0.798, loss: 0.050  
i: 226, target: -0.573, output: -1.198, loss: 0.391  
i: 227, target: 0.438, output: 0.166, loss: 0.074  
i: 228, target: -0.819, output: -1.034, loss: 0.046  
i: 229, target: -1.348, output: -1.195, loss: 0.023  
i: 230, target: -0.577, output: -1.203, loss: 0.392  
i: 231, target: -0.714, output: 0.169, loss: 0.779  
i: 232, target: -1.206, output: -0.857, loss: 0.122  
i: 233, target: -1.424, output: -1.095, loss: 0.108  
i: 234, target: -1.119, output: -1.171, loss: 0.003  
i: 235, target: 0.514, output: 0.165, loss: 0.122  
i: 236, target: 9.740, output: 0.085, loss: 93.209  
i: 237, target: -1.521, output: -0.892, loss: 0.396  
i: 238, target: -1.439, output: -1.026, loss: 0.171  
i: 239, target: -0.100, output: -0.856, loss: 0.572  
i: 240, target: 1.034, output: 0.167, loss: 0.752  
i: 241, target: -1.503, output: -0.937, loss: 0.321  
i: 242, target: -0.920, output: 0.165, loss: 1.179  
i: 243, target: -1.307, output: -0.828, loss: 0.230  
i: 244, target: -1.057, output: -0.976, loss: 0.007  
i: 245, target: -1.246, output: -0.844, loss: 0.162  
i: 246, target: -0.618, output: -1.189, loss: 0.326  
i: 247, target: -1.057, output: -1.141, loss: 0.007  
i: 248, target: -1.529, output: -0.216, loss: 1.725  
i: 249, target: -0.731, output: -0.859, loss: 0.016  
i: 250, target: -1.736, output: -0.861, loss: 0.765  
i: 251, target: -2.129, output: -0.155, loss: 3.898  
i: 252, target: -1.362, output: -1.181, loss: 0.033

i: 253, target: -0.237, output: -1.196, loss: 0.921  
i: 254, target: -0.856, output: -0.850, loss: 0.000  
i: 255, target: 9.608, output: 0.166, loss: 89.148  
i: 256, target: -0.344, output: -1.028, loss: 0.469  
i: 257, target: -0.503, output: -0.861, loss: 0.128  
i: 258, target: -0.542, output: 0.165, loss: 0.500  
i: 259, target: -2.148, output: -0.992, loss: 1.335  
i: 260, target: -0.365, output: -0.400, loss: 0.001  
i: 261, target: -1.603, output: -0.884, loss: 0.517  
i: 262, target: -2.479, output: -1.094, loss: 1.918  
i: 263, target: -1.093, output: -1.111, loss: 0.000  
i: 264, target: -1.444, output: -1.195, loss: 0.062  
i: 265, target: -0.904, output: -0.710, loss: 0.038  
i: 266, target: -0.514, output: -0.861, loss: 0.120  
i: 267, target: -0.005, output: -1.196, loss: 1.418  
i: 268, target: -0.697, output: -1.186, loss: 0.240  
i: 269, target: -1.380, output: -1.162, loss: 0.047  
i: 270, target: -0.395, output: -0.968, loss: 0.329  
i: 271, target: -0.616, output: -0.816, loss: 0.040  
i: 272, target: -1.157, output: 0.167, loss: 1.752  
i: 273, target: -1.195, output: 0.166, loss: 1.851  
i: 274, target: -0.609, output: 0.166, loss: 0.602  
i: 275, target: -1.060, output: -0.176, loss: 0.782  
i: 276, target: -1.107, output: -1.048, loss: 0.003  
i: 277, target: -0.959, output: -0.488, loss: 0.222  
i: 278, target: -1.988, output: -1.002, loss: 0.971  
i: 279, target: -0.649, output: -0.875, loss: 0.051  
i: 280, target: -0.691, output: 0.157, loss: 0.719  
i: 281, target: -0.524, output: -0.853, loss: 0.108  
i: 282, target: -0.725, output: -1.129, loss: 0.163  
i: 283, target: 0.556, output: 0.165, loss: 0.153  
i: 284, target: -1.482, output: -1.195, loss: 0.082  
i: 285, target: -1.910, output: -0.857, loss: 1.109  
i: 286, target: -0.472, output: -0.968, loss: 0.246  
i: 287, target: -0.566, output: -0.907, loss: 0.116  
i: 288, target: -1.606, output: -1.116, loss: 0.240  
i: 289, target: 9.691, output: 0.165, loss: 90.750  
i: 290, target: -1.011, output: -0.868, loss: 0.020  
i: 291, target: -1.324, output: -1.179, loss: 0.021  
i: 292, target: -0.921, output: -0.872, loss: 0.002  
i: 293, target: 0.289, output: 0.165, loss: 0.015  
i: 294, target: -1.865, output: -0.897, loss: 0.937  
i: 295, target: -0.921, output: -0.855, loss: 0.004  
i: 296, target: -1.039, output: -0.394, loss: 0.416  
i: 297, target: -1.330, output: -1.122, loss: 0.043  
i: 298, target: -1.475, output: -0.952, loss: 0.273  
i: 299, target: -1.051, output: -0.950, loss: 0.010  
i: 300, target: -1.077, output: -0.061, loss: 1.033

i: 301, target: -0.629, output: -0.979, loss: 0.123  
i: 302, target: -0.933, output: -0.871, loss: 0.004  
i: 303, target: -0.218, output: 0.166, loss: 0.147  
i: 304, target: -1.282, output: -1.047, loss: 0.055  
i: 305, target: -0.305, output: -0.724, loss: 0.176  
i: 306, target: -1.231, output: -0.252, loss: 0.959  
i: 307, target: -0.366, output: -0.031, loss: 0.112  
i: 308, target: 9.032, output: 0.166, loss: 78.595  
i: 309, target: -0.540, output: 0.163, loss: 0.493  
i: 310, target: -0.621, output: -0.137, loss: 0.234  
i: 311, target: -0.370, output: -0.886, loss: 0.266  
i: 312, target: -0.988, output: -0.320, loss: 0.446  
i: 313, target: -2.350, output: -1.137, loss: 1.469  
i: 314, target: 0.503, output: 0.166, loss: 0.114  
i: 315, target: -1.281, output: -1.151, loss: 0.017  
i: 316, target: -0.734, output: -1.141, loss: 0.166  
i: 317, target: -1.548, output: -1.010, loss: 0.289  
i: 318, target: -1.033, output: 0.166, loss: 1.437  
i: 319, target: -1.574, output: -0.447, loss: 1.269  
i: 320, target: -1.130, output: -1.141, loss: 0.000  
i: 321, target: -1.121, output: -1.116, loss: 0.000  
i: 322, target: -1.165, output: -1.206, loss: 0.002  
i: 323, target: -1.255, output: -0.129, loss: 1.268  
i: 324, target: -1.803, output: -0.927, loss: 0.768  
i: 325, target: -0.409, output: -0.875, loss: 0.216  
i: 326, target: -1.723, output: -0.291, loss: 2.048  
i: 327, target: -1.877, output: -1.141, loss: 0.542  
i: 328, target: -1.051, output: -1.203, loss: 0.023  
i: 329, target: -1.898, output: -0.909, loss: 0.977  
i: 330, target: -1.313, output: -1.035, loss: 0.077  
i: 331, target: 9.330, output: 0.106, loss: 85.079  
i: 332, target: -0.404, output: 0.106, loss: 0.260  
i: 333, target: -0.859, output: 0.169, loss: 1.057  
i: 334, target: -0.930, output: -0.923, loss: 0.000  
i: 335, target: -0.785, output: -1.197, loss: 0.170  
i: 336, target: -1.399, output: -0.724, loss: 0.454  
i: 337, target: -1.416, output: -1.204, loss: 0.045  
i: 338, target: -0.726, output: -1.182, loss: 0.208  
i: 339, target: -0.802, output: -0.984, loss: 0.033  
i: 340, target: 0.693, output: -0.024, loss: 0.514  
i: 341, target: -0.578, output: -0.417, loss: 0.026  
i: 342, target: -0.357, output: -0.206, loss: 0.023  
i: 343, target: -1.350, output: -0.771, loss: 0.335  
i: 344, target: 0.484, output: 0.165, loss: 0.102  
i: 345, target: -0.520, output: -0.752, loss: 0.054  
i: 346, target: -0.714, output: -0.129, loss: 0.342  
i: 347, target: -1.622, output: -1.094, loss: 0.278  
i: 348, target: 8.684, output: 0.166, loss: 72.556

i: 349, target: -1.877, output: -1.039, loss: 0.703  
i: 350, target: -1.267, output: 0.167, loss: 2.055  
i: 351, target: -1.180, output: -1.119, loss: 0.004  
i: 352, target: -1.904, output: -1.160, loss: 0.554  
i: 353, target: -0.357, output: 0.141, loss: 0.248  
i: 354, target: -0.725, output: -0.917, loss: 0.037  
i: 355, target: -1.721, output: -1.062, loss: 0.435  
i: 356, target: -0.840, output: 0.165, loss: 1.010  
i: 357, target: 0.340, output: 0.166, loss: 0.030  
i: 358, target: -0.905, output: -1.157, loss: 0.063  
i: 359, target: 8.930, output: 0.165, loss: 76.818  
i: 360, target: -0.565, output: -1.169, loss: 0.365  
i: 361, target: -0.722, output: -0.807, loss: 0.007  
i: 362, target: -0.808, output: -0.988, loss: 0.032  
i: 363, target: -1.914, output: -0.998, loss: 0.839  
i: 364, target: -0.537, output: -1.085, loss: 0.301  
i: 365, target: -1.429, output: 0.110, loss: 2.369  
i: 366, target: -1.341, output: -0.928, loss: 0.171  
i: 367, target: -1.935, output: -0.907, loss: 1.058  
i: 368, target: 9.791, output: 0.166, loss: 92.655  
i: 369, target: -0.682, output: -1.129, loss: 0.200  
i: 370, target: -0.928, output: -0.824, loss: 0.011  
i: 371, target: -0.946, output: -1.178, loss: 0.054  
i: 372, target: -0.645, output: -0.890, loss: 0.060  
i: 373, target: -1.675, output: 0.167, loss: 3.393  
i: 374, target: -1.333, output: -0.977, loss: 0.126  
i: 375, target: -1.323, output: -1.057, loss: 0.070  
i: 376, target: -0.871, output: -0.917, loss: 0.002  
i: 377, target: -0.564, output: -0.799, loss: 0.055  
i: 378, target: -1.267, output: -0.549, loss: 0.516  
i: 379, target: -1.506, output: 0.147, loss: 2.733  
i: 380, target: 0.354, output: 0.166, loss: 0.035  
i: 381, target: -0.637, output: -0.091, loss: 0.298  
i: 382, target: -0.460, output: -0.856, loss: 0.157  
i: 383, target: -1.838, output: -1.198, loss: 0.411  
i: 384, target: -0.168, output: 0.165, loss: 0.111  
i: 385, target: -0.841, output: -0.287, loss: 0.308  
i: 386, target: -1.133, output: 0.152, loss: 1.653  
i: 387, target: -0.677, output: -0.893, loss: 0.046  
i: 388, target: -0.999, output: -1.134, loss: 0.018  
i: 389, target: -1.421, output: -0.997, loss: 0.180  
i: 390, target: -0.536, output: -0.988, loss: 0.204  
i: 391, target: -0.741, output: -0.920, loss: 0.032  
i: 392, target: 0.351, output: 0.165, loss: 0.034  
i: 393, target: -1.551, output: -0.997, loss: 0.307  
i: 394, target: -0.424, output: -0.859, loss: 0.189  
i: 395, target: -0.658, output: -0.866, loss: 0.043  
i: 396, target: -1.099, output: -1.183, loss: 0.007

i: 397, target: -0.465, output: -0.306, loss: 0.025  
i: 398, target: -0.598, output: 0.168, loss: 0.586  
i: 399, target: -0.760, output: -0.910, loss: 0.022  
i: 400, target: 0.184, output: 0.168, loss: 0.000  
i: 401, target: -2.168, output: -0.931, loss: 1.531  
i: 402, target: -0.921, output: -1.200, loss: 0.078  
i: 403, target: -0.844, output: 0.090, loss: 0.872  
i: 404, target: -0.665, output: -0.817, loss: 0.023  
i: 405, target: -1.674, output: -0.856, loss: 0.670  
i: 406, target: -0.549, output: -0.974, loss: 0.180  
i: 407, target: -0.702, output: -0.880, loss: 0.032  
i: 408, target: -1.260, output: 0.166, loss: 2.034  
i: 409, target: -0.453, output: -0.898, loss: 0.198  
i: 410, target: -0.645, output: -0.987, loss: 0.117  
i: 411, target: -0.411, output: -1.199, loss: 0.620  
i: 412, target: -1.026, output: 0.165, loss: 1.419  
i: 413, target: -0.086, output: 0.165, loss: 0.063  
i: 414, target: -0.789, output: -1.133, loss: 0.118  
i: 415, target: -0.992, output: -0.041, loss: 0.903  
i: 416, target: -0.228, output: 0.078, loss: 0.094  
i: 417, target: -0.733, output: -0.452, loss: 0.079  
i: 418, target: -0.554, output: -1.078, loss: 0.274  
i: 419, target: -0.663, output: 0.036, loss: 0.488  
i: 420, target: -1.179, output: -0.975, loss: 0.041  
i: 421, target: -0.478, output: -1.042, loss: 0.318  
i: 422, target: -0.706, output: -1.055, loss: 0.122  
i: 423, target: -1.595, output: -0.880, loss: 0.510  
i: 424, target: -1.150, output: -1.056, loss: 0.009  
i: 425, target: -0.785, output: -0.866, loss: 0.007  
i: 426, target: -1.192, output: -0.047, loss: 1.311  
i: 427, target: -0.562, output: -0.015, loss: 0.299  
i: 428, target: -0.540, output: -0.528, loss: 0.000  
i: 429, target: -1.478, output: -0.877, loss: 0.362  
i: 430, target: -1.076, output: -1.135, loss: 0.004  
i: 431, target: 0.411, output: 0.165, loss: 0.060  
i: 432, target: -1.648, output: -1.199, loss: 0.201  
i: 433, target: -1.069, output: -0.880, loss: 0.036  
i: 434, target: -1.401, output: -1.113, loss: 0.083  
i: 435, target: -0.893, output: 0.151, loss: 1.091  
i: 436, target: -1.432, output: -1.088, loss: 0.119  
i: 437, target: -0.752, output: 0.166, loss: 0.843  
i: 438, target: -1.035, output: -1.177, loss: 0.020  
i: 439, target: -1.407, output: -0.855, loss: 0.305  
i: 440, target: -1.407, output: -0.320, loss: 1.183  
i: 441, target: -0.946, output: 0.045, loss: 0.983  
i: 442, target: -2.095, output: -0.951, loss: 1.310  
i: 443, target: -0.389, output: -0.925, loss: 0.288  
i: 444, target: -2.049, output: -1.056, loss: 0.987



i: 445, target: -0.566, output: -0.593, loss: 0.001  
i: 446, target: -0.448, output: 0.168, loss: 0.379  
i: 447, target: -0.452, output: -0.876, loss: 0.180  
i: 448, target: 8.672, output: 0.167, loss: 72.337  
i: 449, target: 9.248, output: 0.168, loss: 82.453  
i: 450, target: -2.466, output: -1.030, loss: 2.064  
i: 451, target: -1.636, output: -0.908, loss: 0.529  
i: 452, target: -0.844, output: 0.165, loss: 1.020  
i: 453, target: -0.647, output: -0.503, loss: 0.021  
i: 454, target: -1.498, output: -1.162, loss: 0.113  
i: 455, target: -1.603, output: -0.871, loss: 0.535  
i: 456, target: -1.481, output: -0.859, loss: 0.388  
i: 457, target: -0.939, output: -0.340, loss: 0.358  
i: 458, target: -0.468, output: -0.154, loss: 0.098  
i: 459, target: -1.526, output: -0.585, loss: 0.886  
i: 460, target: -0.696, output: -0.965, loss: 0.072  
i: 461, target: -0.794, output: 0.076, loss: 0.758  
i: 462, target: -0.123, output: -0.928, loss: 0.648  
i: 463, target: -0.605, output: -0.539, loss: 0.004  
i: 464, target: 9.569, output: 0.168, loss: 88.380  
i: 465, target: -0.747, output: -0.854, loss: 0.011  
i: 466, target: -1.125, output: -0.836, loss: 0.083  
i: 467, target: 8.565, output: 0.168, loss: 70.506  
i: 468, target: -1.117, output: 0.167, loss: 1.648  
i: 469, target: -0.824, output: -0.436, loss: 0.150  
i: 470, target: -0.489, output: -0.859, loss: 0.137  
i: 471, target: -1.027, output: -1.017, loss: 0.000  
i: 472, target: -0.727, output: 0.046, loss: 0.598  
i: 473, target: -1.755, output: -0.315, loss: 2.075  
i: 474, target: -1.222, output: -1.022, loss: 0.040  
i: 475, target: -2.230, output: -0.927, loss: 1.699  
i: 476, target: -0.917, output: 0.128, loss: 1.094  
i: 477, target: -0.721, output: -0.056, loss: 0.442  
i: 478, target: -1.059, output: -0.361, loss: 0.487  
i: 479, target: -1.344, output: -0.938, loss: 0.165  
i: 480, target: -1.405, output: -1.058, loss: 0.120  
i: 481, target: -0.967, output: 0.030, loss: 0.994  
i: 482, target: -2.018, output: 0.166, loss: 4.767  
i: 483, target: -0.402, output: -0.226, loss: 0.031  
i: 484, target: -0.892, output: -0.523, loss: 0.136  
i: 485, target: -1.241, output: -0.516, loss: 0.526  
i: 486, target: -0.871, output: -0.155, loss: 0.513  
i: 487, target: -1.454, output: 0.166, loss: 2.623  
i: 488, target: 8.700, output: 0.061, loss: 74.630  
i: 489, target: -1.392, output: -1.183, loss: 0.043  
i: 490, target: -1.295, output: -0.861, loss: 0.188  
i: 491, target: -0.616, output: -0.919, loss: 0.092  
i: 492, target: 0.999, output: -0.945, loss: 3.777

i: 493, target: -1.458, output: -1.140, loss: 0.101  
i: 494, target: -2.241, output: -1.006, loss: 1.525  
i: 495, target: -1.350, output: -1.088, loss: 0.068  
i: 496, target: -0.461, output: -0.182, loss: 0.078  
i: 497, target: -0.527, output: -0.773, loss: 0.060  
i: 498, target: -2.071, output: -1.012, loss: 1.123  
i: 499, target: -0.441, output: -0.863, loss: 0.178  
i: 500, target: -0.168, output: -0.365, loss: 0.039  
i: 501, target: -1.479, output: -0.909, loss: 0.325  
i: 502, target: -0.997, output: -1.050, loss: 0.003  
i: 503, target: -0.277, output: -0.302, loss: 0.001  
i: 504, target: 9.369, output: 0.167, loss: 84.681  
i: 505, target: 0.449, output: 0.166, loss: 0.080  
i: 506, target: -0.568, output: -0.119, loss: 0.201  
i: 507, target: -0.110, output: -0.991, loss: 0.776  
i: 508, target: 0.680, output: 0.165, loss: 0.265  
i: 509, target: -1.639, output: -0.893, loss: 0.555  
i: 510, target: -0.741, output: -0.891, loss: 0.023  
i: 511, target: -0.713, output: -0.131, loss: 0.339  
i: 512, target: -0.811, output: 0.166, loss: 0.954  
i: 513, target: -1.760, output: -0.433, loss: 1.762  
i: 514, target: 8.263, output: 0.165, loss: 65.570  
i: 515, target: -0.794, output: -0.942, loss: 0.022  
i: 516, target: -0.739, output: -0.866, loss: 0.016  
i: 517, target: -0.571, output: -0.682, loss: 0.012  
i: 518, target: -0.918, output: -0.828, loss: 0.008  
i: 519, target: -0.416, output: 0.166, loss: 0.338  
i: 520, target: -1.766, output: -0.829, loss: 0.878  
i: 521, target: -0.460, output: -0.903, loss: 0.196  
i: 522, target: -0.809, output: -0.148, loss: 0.437  
i: 523, target: -2.234, output: -0.836, loss: 1.955  
i: 524, target: -0.739, output: -1.172, loss: 0.188  
i: 525, target: -0.869, output: -1.200, loss: 0.109  
i: 526, target: -0.480, output: -0.869, loss: 0.152  
i: 527, target: -1.568, output: -1.150, loss: 0.175  
i: 528, target: -1.660, output: -1.178, loss: 0.232  
i: 529, target: -0.928, output: 0.027, loss: 0.911  
i: 530, target: -0.895, output: 0.053, loss: 0.899  
i: 531, target: -1.138, output: -1.182, loss: 0.002  
i: 532, target: 9.476, output: 0.168, loss: 86.637  
i: 533, target: -0.619, output: -1.177, loss: 0.312  
i: 534, target: -1.278, output: 0.165, loss: 2.083  
i: 535, target: -0.745, output: 0.168, loss: 0.833  
i: 536, target: -0.700, output: -1.202, loss: 0.252  
i: 537, target: -1.165, output: 0.009, loss: 1.378  
i: 538, target: 0.091, output: 0.014, loss: 0.006  
i: 539, target: -0.239, output: -1.065, loss: 0.683  
i: 540, target: -0.974, output: 0.165, loss: 1.299

i: 541, target: -1.217, output: -0.065, loss: 1.326  
i: 542, target: -1.542, output: -0.802, loss: 0.548  
i: 543, target: -1.477, output: -1.091, loss: 0.150  
i: 544, target: -1.577, output: -1.072, loss: 0.254  
i: 545, target: 7.896, output: 0.166, loss: 59.765  
i: 546, target: -1.006, output: 0.165, loss: 1.371  
i: 547, target: -0.708, output: -0.863, loss: 0.024  
i: 548, target: 9.473, output: 0.166, loss: 86.622  
i: 549, target: -2.040, output: -1.088, loss: 0.907  
i: 550, target: -1.175, output: -1.017, loss: 0.025  
i: 551, target: -0.768, output: -0.968, loss: 0.040  
i: 552, target: 8.998, output: 0.069, loss: 79.728  
i: 553, target: -1.285, output: -1.097, loss: 0.035  
i: 554, target: -0.526, output: -0.940, loss: 0.172  
i: 555, target: -0.918, output: -1.084, loss: 0.027  
i: 556, target: 9.557, output: 0.166, loss: 88.185  
i: 557, target: -1.339, output: -0.870, loss: 0.220  
i: 558, target: 0.641, output: -1.197, loss: 3.379  
i: 559, target: -1.935, output: -0.844, loss: 1.191  
i: 560, target: -1.087, output: -0.913, loss: 0.031  
i: 561, target: -1.120, output: -1.127, loss: 0.000  
i: 562, target: -0.784, output: -0.872, loss: 0.008  
i: 563, target: -2.325, output: -1.118, loss: 1.458  
i: 564, target: -1.176, output: 0.166, loss: 1.802  
i: 565, target: -0.521, output: -0.745, loss: 0.050  
i: 566, target: -1.706, output: -1.101, loss: 0.367  
i: 567, target: -0.624, output: -0.954, loss: 0.109  
i: 568, target: 8.420, output: 0.165, loss: 68.138  
i: 569, target: -1.222, output: 0.083, loss: 1.704  
i: 570, target: -1.568, output: -0.584, loss: 0.967  
i: 571, target: 9.618, output: 0.167, loss: 89.323  
i: 572, target: -0.616, output: 0.167, loss: 0.613  
i: 573, target: -0.517, output: -0.111, loss: 0.165  
i: 574, target: -0.186, output: -0.920, loss: 0.540  
i: 575, target: -0.434, output: -1.148, loss: 0.509  
i: 576, target: -0.648, output: -1.042, loss: 0.155  
i: 577, target: -0.614, output: 0.167, loss: 0.611  
i: 578, target: -1.234, output: -0.862, loss: 0.139  
i: 579, target: -0.593, output: -0.879, loss: 0.082  
i: 580, target: -0.325, output: 0.165, loss: 0.240  
i: 581, target: -1.409, output: -0.856, loss: 0.306  
i: 582, target: -0.981, output: -0.855, loss: 0.016  
i: 583, target: -1.584, output: -1.177, loss: 0.166  
i: 584, target: -0.276, output: -0.742, loss: 0.217  
i: 585, target: -1.172, output: -0.843, loss: 0.108  
i: 586, target: -1.318, output: -0.968, loss: 0.123  
i: 587, target: -0.660, output: 0.165, loss: 0.680  
i: 588, target: -1.475, output: -0.869, loss: 0.368

i: 589, target: 0.943, output: 0.165, loss: 0.604  
i: 590, target: -0.604, output: -0.902, loss: 0.089  
i: 591, target: -0.559, output: -0.903, loss: 0.118  
i: 592, target: -0.663, output: -0.868, loss: 0.042  
i: 593, target: -1.200, output: -0.883, loss: 0.100  
i: 594, target: -0.187, output: 0.165, loss: 0.124  
i: 595, target: 9.275, output: 0.167, loss: 82.955  
i: 596, target: -1.104, output: -0.415, loss: 0.475  
i: 597, target: -0.819, output: -0.826, loss: 0.000  
i: 598, target: -0.866, output: -1.188, loss: 0.104  
i: 599, target: -0.654, output: 0.166, loss: 0.672  
i: 600, target: -1.283, output: -1.129, loss: 0.024  
i: 601, target: -1.487, output: -1.204, loss: 0.080  
i: 602, target: -0.902, output: -1.001, loss: 0.010  
i: 603, target: -2.349, output: -0.921, loss: 2.042  
i: 604, target: -1.100, output: -0.984, loss: 0.013  
i: 605, target: -0.410, output: -0.839, loss: 0.183  
i: 606, target: -0.662, output: -1.197, loss: 0.286  
i: 607, target: -2.117, output: -1.069, loss: 1.098  
i: 608, target: -1.029, output: -1.148, loss: 0.014  
i: 609, target: -1.978, output: -1.160, loss: 0.670  
i: 610, target: -0.223, output: -0.176, loss: 0.002  
i: 611, target: -1.188, output: -0.918, loss: 0.073  
i: 612, target: -0.971, output: -1.095, loss: 0.015  
i: 613, target: 8.929, output: 0.165, loss: 76.795  
i: 614, target: -0.546, output: -0.715, loss: 0.029  
i: 615, target: -0.920, output: -1.000, loss: 0.006  
i: 616, target: -1.332, output: -1.199, loss: 0.018  
i: 617, target: 1.136, output: -0.861, loss: 3.985  
i: 618, target: -1.917, output: -0.876, loss: 1.085  
i: 619, target: -1.653, output: -1.195, loss: 0.209  
i: 620, target: -1.193, output: -0.833, loss: 0.129  
i: 621, target: -1.464, output: -1.038, loss: 0.181  
i: 622, target: -0.307, output: -1.085, loss: 0.604  
i: 623, target: -0.874, output: -1.194, loss: 0.103  
i: 624, target: -0.352, output: -0.873, loss: 0.272  
i: 625, target: -1.161, output: -0.278, loss: 0.780  
i: 626, target: -0.474, output: -0.865, loss: 0.153  
i: 627, target: -1.337, output: -1.193, loss: 0.021  
i: 628, target: 0.660, output: 0.002, loss: 0.434  
i: 629, target: -0.453, output: 0.112, loss: 0.319  
i: 630, target: -0.890, output: -1.048, loss: 0.025  
i: 631, target: -1.264, output: -0.235, loss: 1.059  
i: 632, target: -0.878, output: -0.014, loss: 0.746  
i: 633, target: -1.376, output: 0.165, loss: 2.374  
i: 634, target: -1.393, output: -0.840, loss: 0.306  
i: 635, target: -1.190, output: -1.171, loss: 0.000  
i: 636, target: -1.364, output: -1.147, loss: 0.047

i: 637, target: -2.755, output: -1.200, loss: 2.418  
i: 638, target: -1.262, output: 0.169, loss: 2.047  
i: 639, target: -0.552, output: -1.160, loss: 0.369  
i: 640, target: -0.462, output: 0.166, loss: 0.394  
i: 641, target: -0.725, output: 0.166, loss: 0.795  
i: 642, target: -1.785, output: -1.047, loss: 0.545  
i: 643, target: -0.531, output: -0.839, loss: 0.095  
i: 644, target: -0.579, output: -0.968, loss: 0.151  
i: 645, target: 0.217, output: 0.165, loss: 0.003  
i: 646, target: -0.507, output: 0.168, loss: 0.456  
i: 647, target: -0.585, output: -1.009, loss: 0.179  
i: 648, target: -1.064, output: 0.166, loss: 1.513  
i: 649, target: -0.481, output: 0.119, loss: 0.360  
i: 650, target: -1.201, output: -0.358, loss: 0.711  
i: 651, target: 8.867, output: 0.167, loss: 75.701  
i: 652, target: -1.630, output: -0.897, loss: 0.538  
i: 653, target: -0.701, output: -1.201, loss: 0.250  
i: 654, target: -1.122, output: -0.963, loss: 0.025  
i: 655, target: -0.544, output: -0.118, loss: 0.182  
i: 656, target: -1.420, output: 0.166, loss: 2.515  
i: 657, target: -1.411, output: -0.833, loss: 0.334  
i: 658, target: -1.345, output: -0.846, loss: 0.249  
i: 659, target: -0.982, output: 0.167, loss: 1.321  
i: 660, target: -2.509, output: -1.012, loss: 2.239  
i: 661, target: -0.697, output: -1.185, loss: 0.239  
i: 662, target: -0.661, output: 0.130, loss: 0.625  
i: 663, target: -1.600, output: -1.108, loss: 0.242  
i: 664, target: -1.779, output: -1.078, loss: 0.491  
i: 665, target: -1.080, output: -0.456, loss: 0.390  
i: 666, target: -0.429, output: 0.167, loss: 0.355  
i: 667, target: -1.397, output: -0.974, loss: 0.179  
i: 668, target: -0.438, output: -0.544, loss: 0.011  
i: 669, target: -2.915, output: -1.042, loss: 3.507  
i: 670, target: -0.082, output: -0.858, loss: 0.602  
i: 671, target: -0.712, output: -0.890, loss: 0.032  
i: 672, target: -2.547, output: -1.050, loss: 2.241  
i: 673, target: -0.439, output: -1.196, loss: 0.572  
i: 674, target: 8.797, output: 0.115, loss: 75.389  
i: 675, target: -1.758, output: -1.013, loss: 0.556  
i: 676, target: -1.163, output: -0.873, loss: 0.084  
i: 677, target: -2.103, output: -0.452, loss: 2.724  
i: 678, target: -1.146, output: -0.067, loss: 1.164  
i: 679, target: 8.666, output: 0.165, loss: 72.265  
i: 680, target: -0.426, output: -0.904, loss: 0.228  
i: 681, target: 9.468, output: 0.167, loss: 86.511  
i: 682, target: 9.622, output: 0.167, loss: 89.397  
i: 683, target: -1.392, output: -0.079, loss: 1.724  
i: 684, target: -1.157, output: -0.913, loss: 0.059

i: 685, target: -0.696, output: -0.860, loss: 0.027  
i: 686, target: -0.824, output: -0.874, loss: 0.003  
i: 687, target: -1.552, output: -0.992, loss: 0.314  
i: 688, target: -1.498, output: -1.192, loss: 0.094  
i: 689, target: -0.519, output: -1.193, loss: 0.454  
i: 690, target: 9.060, output: 0.165, loss: 79.117  
i: 691, target: -1.567, output: -0.148, loss: 2.013  
i: 692, target: -1.104, output: -0.868, loss: 0.056  
i: 693, target: -0.801, output: -0.248, loss: 0.306  
i: 694, target: -2.292, output: -1.019, loss: 1.620  
i: 695, target: -0.557, output: -1.170, loss: 0.377  
i: 696, target: 0.567, output: 0.165, loss: 0.161  
i: 697, target: -1.853, output: -1.032, loss: 0.674  
i: 698, target: -0.383, output: -0.846, loss: 0.214  
i: 699, target: -1.637, output: -1.087, loss: 0.303  
i: 700, target: -1.503, output: 0.167, loss: 2.791  
i: 701, target: -1.953, output: -1.150, loss: 0.646  
i: 702, target: -1.196, output: -0.833, loss: 0.132  
i: 703, target: -0.780, output: -0.867, loss: 0.007  
i: 704, target: -0.714, output: -0.899, loss: 0.034  
i: 705, target: -0.409, output: -1.129, loss: 0.518  
i: 706, target: -1.250, output: -0.847, loss: 0.163  
i: 707, target: -1.966, output: -0.303, loss: 2.764  
i: 708, target: -1.252, output: -1.129, loss: 0.015  
i: 709, target: -0.799, output: -0.117, loss: 0.465  
i: 710, target: -1.373, output: -0.931, loss: 0.196  
i: 711, target: -0.509, output: 0.166, loss: 0.456  
i: 712, target: -0.739, output: -0.203, loss: 0.288  
i: 713, target: -0.695, output: -0.836, loss: 0.020  
i: 714, target: -1.022, output: -0.241, loss: 0.610  
i: 715, target: -0.742, output: -1.200, loss: 0.210  
i: 716, target: -1.320, output: -0.927, loss: 0.155  
i: 717, target: -1.919, output: -1.166, loss: 0.567  
i: 718, target: -1.371, output: -1.127, loss: 0.060  
i: 719, target: -0.779, output: 0.167, loss: 0.895  
i: 720, target: -1.094, output: -0.032, loss: 1.127  
i: 721, target: -1.345, output: -1.181, loss: 0.027  
i: 722, target: 9.796, output: 0.077, loss: 94.460  
i: 723, target: -0.357, output: -0.339, loss: 0.000  
i: 724, target: -1.139, output: 0.161, loss: 1.691  
i: 725, target: -0.553, output: -1.190, loss: 0.406  
i: 726, target: -0.982, output: -1.175, loss: 0.037  
i: 727, target: -0.410, output: -0.888, loss: 0.228  
i: 728, target: -0.788, output: -0.828, loss: 0.002  
i: 729, target: -1.154, output: -0.048, loss: 1.224  
i: 730, target: -0.726, output: -1.193, loss: 0.218  
i: 731, target: -1.008, output: -0.026, loss: 0.963  
i: 732, target: -1.345, output: -0.880, loss: 0.217

i: 733, target: -1.340, output: -0.936, loss: 0.164  
i: 734, target: -0.666, output: -1.202, loss: 0.287  
i: 735, target: -0.278, output: 0.166, loss: 0.198  
i: 736, target: -0.832, output: -0.955, loss: 0.015  
i: 737, target: -0.255, output: -1.120, loss: 0.749  
i: 738, target: -1.865, output: -0.923, loss: 0.886  
i: 739, target: -0.592, output: -0.028, loss: 0.318  
i: 740, target: -0.742, output: -0.244, loss: 0.248  
i: 741, target: -1.428, output: -0.267, loss: 1.350  
i: 742, target: -0.883, output: 0.168, loss: 1.105  
i: 743, target: -0.809, output: 0.165, loss: 0.950  
i: 744, target: -1.395, output: -0.975, loss: 0.177  
i: 745, target: -1.970, output: -0.957, loss: 1.026  
i: 746, target: -0.624, output: -0.461, loss: 0.027  
i: 747, target: -1.025, output: -1.100, loss: 0.006  
i: 748, target: -0.823, output: -0.584, loss: 0.057  
i: 749, target: -1.570, output: -1.143, loss: 0.183  
i: 750, target: -1.369, output: -0.845, loss: 0.274  
i: 751, target: -0.829, output: -0.988, loss: 0.025  
i: 752, target: -1.379, output: -1.181, loss: 0.039  
i: 753, target: -2.820, output: -1.071, loss: 3.058  
i: 754, target: -1.261, output: -0.873, loss: 0.150  
i: 755, target: -0.791, output: -0.220, loss: 0.326  
i: 756, target: -1.401, output: -1.028, loss: 0.139  
i: 757, target: -1.308, output: -1.201, loss: 0.011  
i: 758, target: -1.580, output: -0.986, loss: 0.354  
i: 759, target: -1.574, output: -0.516, loss: 1.121  
i: 760, target: 9.443, output: 0.165, loss: 86.073  
i: 761, target: -0.879, output: 0.168, loss: 1.096  
i: 762, target: -0.779, output: -0.304, loss: 0.226  
i: 763, target: -0.763, output: -0.412, loss: 0.123  
i: 764, target: -0.686, output: -0.962, loss: 0.076  
i: 765, target: -0.446, output: -0.854, loss: 0.166  
i: 766, target: -2.137, output: 0.168, loss: 5.312  
i: 767, target: -1.342, output: -1.125, loss: 0.047  
i: 768, target: -1.349, output: -1.184, loss: 0.027  
i: 769, target: -0.488, output: -0.705, loss: 0.047  
i: 770, target: 0.402, output: 0.166, loss: 0.056  
i: 771, target: -1.395, output: -1.022, loss: 0.139  
i: 772, target: -0.716, output: -1.093, loss: 0.142  
i: 773, target: -1.335, output: -1.164, loss: 0.029  
i: 774, target: -0.933, output: -0.871, loss: 0.004  
i: 775, target: 0.867, output: -0.030, loss: 0.804  
i: 776, target: -1.422, output: -1.150, loss: 0.074  
i: 777, target: -0.475, output: -0.851, loss: 0.141  
i: 778, target: -1.433, output: -0.978, loss: 0.206  
i: 779, target: -1.190, output: -0.881, loss: 0.095  
i: 780, target: -1.315, output: -0.738, loss: 0.333

i: 781, target: -0.468, output: -0.815, loss: 0.121  
i: 782, target: -1.321, output: -0.061, loss: 1.587  
i: 783, target: -0.874, output: -0.808, loss: 0.004  
i: 784, target: -0.914, output: -1.013, loss: 0.010  
i: 785, target: -1.473, output: -0.050, loss: 2.024  
i: 786, target: -1.758, output: -0.241, loss: 2.302  
i: 787, target: -0.759, output: -1.054, loss: 0.087  
i: 788, target: -1.229, output: -1.097, loss: 0.017  
i: 789, target: -2.333, output: -1.028, loss: 1.702  
i: 790, target: -1.440, output: -0.094, loss: 1.812  
i: 791, target: -0.007, output: 0.166, loss: 0.030  
i: 792, target: -0.468, output: -0.875, loss: 0.166  
i: 793, target: 1.308, output: -0.861, loss: 4.704  
i: 794, target: -0.819, output: -1.166, loss: 0.121  
i: 795, target: 9.072, output: 0.165, loss: 79.332  
i: 796, target: -0.561, output: -0.869, loss: 0.095  
i: 797, target: -0.496, output: -0.437, loss: 0.004  
i: 798, target: -0.703, output: -0.941, loss: 0.056  
i: 799, target: -0.764, output: 0.167, loss: 0.866  
i: 800, target: -1.433, output: -1.195, loss: 0.056  
i: 801, target: 9.740, output: 0.085, loss: 93.209  
i: 802, target: -0.336, output: -0.239, loss: 0.009  
i: 803, target: -1.401, output: -0.828, loss: 0.328  
i: 804, target: -0.681, output: -1.031, loss: 0.122  
i: 805, target: -0.800, output: -1.145, loss: 0.119  
i: 806, target: -0.576, output: -1.195, loss: 0.383  
i: 807, target: -1.305, output: -0.843, loss: 0.214  
i: 808, target: -0.647, output: -1.125, loss: 0.229  
i: 809, target: -0.410, output: -1.195, loss: 0.616  
i: 810, target: -0.446, output: -1.192, loss: 0.556  
i: 811, target: 9.004, output: 0.165, loss: 78.125  
i: 812, target: -0.893, output: -1.123, loss: 0.053  
i: 813, target: -0.992, output: -1.122, loss: 0.017  
i: 814, target: -0.472, output: 0.169, loss: 0.410  
i: 815, target: -0.657, output: -0.438, loss: 0.048  
i: 816, target: -0.496, output: -0.819, loss: 0.104  
i: 817, target: 0.248, output: 0.165, loss: 0.007  
i: 818, target: -0.494, output: -0.878, loss: 0.147  
i: 819, target: -2.150, output: -0.876, loss: 1.621  
i: 820, target: -1.166, output: -1.127, loss: 0.002  
i: 821, target: -1.404, output: -1.204, loss: 0.040  
i: 822, target: -1.255, output: -0.059, loss: 1.430  
i: 823, target: -0.744, output: -1.046, loss: 0.091  
i: 824, target: -2.024, output: -1.079, loss: 0.892  
i: 825, target: -2.436, output: -0.899, loss: 2.362  
i: 826, target: -0.576, output: -0.722, loss: 0.021  
i: 827, target: -0.692, output: -0.869, loss: 0.031  
i: 828, target: -0.671, output: -1.077, loss: 0.165



i: 829, target: -0.674, output: -0.936, loss: 0.069  
i: 830, target: -0.635, output: -1.163, loss: 0.280  
i: 831, target: -1.596, output: -0.873, loss: 0.522  
i: 832, target: -2.066, output: -1.110, loss: 0.914  
i: 833, target: -0.755, output: -1.171, loss: 0.173  
i: 834, target: -0.774, output: -1.122, loss: 0.121  
i: 835, target: -1.636, output: -0.959, loss: 0.459  
i: 836, target: -2.016, output: -1.197, loss: 0.671  
i: 837, target: -0.838, output: -0.943, loss: 0.011  
i: 838, target: -0.606, output: 0.167, loss: 0.596  
i: 839, target: -1.513, output: -0.395, loss: 1.250  
i: 840, target: -1.674, output: -1.091, loss: 0.340  
i: 841, target: -0.585, output: 0.006, loss: 0.349  
i: 842, target: -1.147, output: -0.422, loss: 0.525  
i: 843, target: 8.857, output: 0.168, loss: 75.486  
i: 844, target: -0.853, output: -1.128, loss: 0.076  
i: 845, target: -0.757, output: -1.178, loss: 0.178  
i: 846, target: -0.850, output: -0.956, loss: 0.011  
i: 847, target: -0.815, output: -0.800, loss: 0.000  
i: 848, target: -1.372, output: -0.627, loss: 0.556  
i: 849, target: -1.222, output: -1.131, loss: 0.008  
i: 850, target: -1.988, output: -1.197, loss: 0.626  
i: 851, target: -1.331, output: -0.419, loss: 0.832  
i: 852, target: -1.270, output: -0.858, loss: 0.170  
i: 853, target: -1.498, output: -0.224, loss: 1.624  
i: 854, target: -1.886, output: -1.085, loss: 0.643  
i: 855, target: -1.016, output: 0.168, loss: 1.401  
i: 856, target: 9.034, output: 0.166, loss: 78.646  
i: 857, target: -0.580, output: -0.384, loss: 0.038  
i: 858, target: -0.701, output: -0.547, loss: 0.024  
i: 859, target: -0.657, output: -0.563, loss: 0.009  
i: 860, target: -1.395, output: -0.901, loss: 0.244  
i: 861, target: 0.365, output: 0.168, loss: 0.039  
i: 862, target: -0.772, output: 0.166, loss: 0.879  
i: 863, target: -0.820, output: -0.856, loss: 0.001  
i: 864, target: 9.626, output: 0.035, loss: 91.998  
i: 865, target: -0.770, output: -1.168, loss: 0.158  
i: 866, target: -1.198, output: -0.860, loss: 0.115  
i: 867, target: -1.639, output: -1.126, loss: 0.263  
i: 868, target: -1.280, output: -1.176, loss: 0.011  
i: 869, target: -0.493, output: -0.898, loss: 0.164  
i: 870, target: -0.450, output: -0.945, loss: 0.245  
i: 871, target: -1.392, output: -0.878, loss: 0.264  
i: 872, target: -1.374, output: -1.044, loss: 0.109  
i: 873, target: 0.099, output: 0.166, loss: 0.005  
i: 874, target: -1.410, output: -0.889, loss: 0.271  
i: 875, target: -1.397, output: -1.183, loss: 0.046  
i: 876, target: -1.073, output: -0.938, loss: 0.018

i: 877, target: -0.370, output: -1.157, loss: 0.620  
i: 878, target: 9.230, output: 0.147, loss: 82.501  
i: 879, target: -0.973, output: -1.168, loss: 0.038  
i: 880, target: -0.635, output: -0.007, loss: 0.394  
i: 881, target: -0.893, output: -1.191, loss: 0.089  
i: 882, target: -0.619, output: -0.092, loss: 0.278  
i: 883, target: 0.266, output: -1.198, loss: 2.144  
i: 884, target: -0.608, output: -1.177, loss: 0.323  
i: 885, target: -1.461, output: -0.003, loss: 2.124  
i: 886, target: -1.199, output: -0.917, loss: 0.080  
i: 887, target: -1.007, output: -1.166, loss: 0.025  
i: 888, target: -0.436, output: -0.139, loss: 0.088  
i: 889, target: 0.622, output: -0.853, loss: 2.174  
i: 890, target: -2.203, output: 0.168, loss: 5.618  
i: 891, target: -0.571, output: -0.895, loss: 0.105  
i: 892, target: -0.043, output: -0.325, loss: 0.080  
i: 893, target: -0.831, output: -0.848, loss: 0.000  
i: 894, target: -0.981, output: -1.100, loss: 0.014  
i: 895, target: -0.756, output: 0.130, loss: 0.784  
i: 896, target: 0.232, output: 0.165, loss: 0.004  
i: 897, target: -0.475, output: 0.165, loss: 0.410  
i: 898, target: -0.390, output: -0.936, loss: 0.299  
i: 899, target: -0.383, output: -0.862, loss: 0.230  
i: 900, target: -1.612, output: -0.803, loss: 0.655  
i: 901, target: -1.423, output: -1.002, loss: 0.177  
i: 902, target: -0.691, output: 0.166, loss: 0.734  
i: 903, target: -0.675, output: -0.851, loss: 0.031  
i: 904, target: -0.389, output: -0.887, loss: 0.248  
i: 905, target: 9.463, output: 0.166, loss: 86.433  
i: 906, target: -2.386, output: -1.067, loss: 1.739  
i: 907, target: -0.865, output: -1.004, loss: 0.020  
i: 908, target: -0.995, output: -1.181, loss: 0.035  
i: 909, target: -1.903, output: -1.013, loss: 0.793  
i: 910, target: -1.269, output: -1.130, loss: 0.019  
i: 911, target: -2.107, output: -0.927, loss: 1.394  
i: 912, target: -0.784, output: -0.044, loss: 0.547  
i: 913, target: -0.163, output: 0.165, loss: 0.107  
i: 914, target: -0.410, output: -0.839, loss: 0.183  
i: 915, target: -0.529, output: -1.200, loss: 0.450  
i: 916, target: -1.893, output: 0.010, loss: 3.621  
i: 917, target: -1.433, output: -1.151, loss: 0.080  
i: 918, target: 9.653, output: 0.167, loss: 89.986  
i: 919, target: -1.236, output: 0.166, loss: 1.965  
i: 920, target: -1.122, output: 0.169, loss: 1.666  
i: 921, target: -0.381, output: -0.304, loss: 0.006  
i: 922, target: -1.268, output: -0.545, loss: 0.523  
i: 923, target: -0.899, output: 0.166, loss: 1.134  
i: 924, target: -1.106, output: -0.909, loss: 0.039

i: 925, target: -0.777, output: -0.083, loss: 0.482  
i: 926, target: -1.242, output: -1.120, loss: 0.015  
i: 927, target: -0.679, output: -0.373, loss: 0.094  
i: 928, target: -0.656, output: -0.868, loss: 0.045  
i: 929, target: -1.385, output: -0.858, loss: 0.278  
i: 930, target: -0.476, output: -0.351, loss: 0.016  
i: 931, target: -1.522, output: -1.182, loss: 0.116  
i: 932, target: -1.134, output: -0.930, loss: 0.041  
i: 933, target: -1.545, output: -0.827, loss: 0.516  
i: 934, target: -2.433, output: -1.037, loss: 1.950  
i: 935, target: -1.171, output: 0.167, loss: 1.788  
i: 936, target: -1.230, output: -1.133, loss: 0.009  
i: 937, target: -1.713, output: -0.921, loss: 0.629  
i: 938, target: -0.431, output: 0.169, loss: 0.359  
i: 939, target: -0.663, output: -0.125, loss: 0.290  
i: 940, target: -0.214, output: 0.165, loss: 0.143  
i: 941, target: -1.676, output: -0.330, loss: 1.811  
i: 942, target: -0.607, output: 0.167, loss: 0.599  
i: 943, target: -0.655, output: -1.179, loss: 0.274  
i: 944, target: -1.161, output: 0.111, loss: 1.618  
i: 945, target: 9.815, output: 0.167, loss: 93.084  
i: 946, target: -1.765, output: -1.171, loss: 0.352  
i: 947, target: -0.635, output: -0.786, loss: 0.023  
i: 948, target: -1.502, output: -0.845, loss: 0.431  
i: 949, target: -0.540, output: -0.585, loss: 0.002  
i: 950, target: -1.153, output: -0.271, loss: 0.778  
i: 951, target: -0.357, output: -0.865, loss: 0.259  
i: 952, target: -1.304, output: -1.093, loss: 0.044  
i: 953, target: 9.334, output: 0.166, loss: 84.049  
i: 954, target: -2.145, output: -1.059, loss: 1.179  
i: 955, target: -1.354, output: 0.018, loss: 1.882  
i: 956, target: -1.354, output: -0.562, loss: 0.627  
i: 957, target: -0.729, output: 0.166, loss: 0.801  
i: 958, target: -2.047, output: -0.617, loss: 2.043  
i: 959, target: -1.044, output: -0.506, loss: 0.289  
i: 960, target: -0.866, output: -1.171, loss: 0.093  
i: 961, target: 0.525, output: 0.167, loss: 0.128  
i: 962, target: -1.477, output: -0.236, loss: 1.540  
i: 963, target: 9.693, output: 0.166, loss: 90.761  
i: 964, target: -1.384, output: -0.168, loss: 1.478  
i: 965, target: -0.577, output: -0.636, loss: 0.004  
i: 966, target: -0.667, output: -0.236, loss: 0.186  
i: 967, target: -2.086, output: -1.037, loss: 1.100  
i: 968, target: -1.276, output: -1.173, loss: 0.011  
i: 969, target: -1.880, output: -0.497, loss: 1.913  
i: 970, target: -0.709, output: -0.876, loss: 0.028  
i: 971, target: -0.686, output: -1.044, loss: 0.128  
i: 972, target: -0.565, output: -0.166, loss: 0.159

```
i: 973, target: -0.839, output: -0.428, loss: 0.169
i: 974, target: -0.687, output: -0.867, loss: 0.032
i: 975, target: -2.096, output: -1.195, loss: 0.812
i: 976, target: -0.466, output: -1.065, loss: 0.360
i: 977, target: -1.149, output: -0.855, loss: 0.087
i: 978, target: 9.599, output: 0.167, loss: 88.962
i: 979, target: -0.613, output: -0.011, loss: 0.362
i: 980, target: -1.944, output: -0.326, loss: 2.618
i: 981, target: -1.369, output: -0.853, loss: 0.266
i: 982, target: -0.880, output: -1.049, loss: 0.029
i: 983, target: -1.166, output: -1.151, loss: 0.000
i: 984, target: -0.835, output: -1.006, loss: 0.029
i: 985, target: -1.201, output: -1.190, loss: 0.000
i: 986, target: -1.637, output: -0.856, loss: 0.611
i: 987, target: -1.762, output: -1.097, loss: 0.442
i: 988, target: -0.502, output: 0.166, loss: 0.446
i: 989, target: -1.290, output: -1.197, loss: 0.009
i: 990, target: -0.554, output: -0.904, loss: 0.123
i: 991, target: -0.855, output: -0.717, loss: 0.019
i: 992, target: -1.321, output: 0.124, loss: 2.089
i: 993, target: -0.816, output: -0.219, loss: 0.356
i: 994, target: 0.582, output: 0.166, loss: 0.173
i: 995, target: -0.656, output: -1.199, loss: 0.295
i: 996, target: -1.028, output: -0.130, loss: 0.806
i: 997, target: -1.365, output: -0.877, loss: 0.238
i: 998, target: -1.485, output: -1.000, loss: 0.235
i: 999, target: -0.479, output: -1.092, loss: 0.376
Average loss: 5.365
```

## 4 Save the Notebook as a PDF

```
[41]: # SAVE THE NOTEBOOK

from IPython.display import Javascript

# Define the function to save the notebook
def save_notebook():
    display(Javascript('IPython.notebook.save_notebook()'))

# Call the save_notebook function to save the notebook
save_notebook()
```

<IPython.core.display.Javascript object>

```
[42]: import subprocess
import os
```

```

name_notebook = "0724-small_hybrid_model_v3.ipynb"

output_filename = "results/" + name_notebook[:4] + "/" + name_notebook[: -6] + "_0.
↳pdf"

#check if the output file already exists
while os.path.exists(output_filename):
    print("The file {} already exists".format(output_filename))
    output_filename = output_filename[: -5] + str(int(output_filename[-5]) + 1)
↳+ ".pdf"
    print("Trying to save the file as {}".format(output_filename))

subprocess.run(["jupyter", "nbconvert", "--to", "pdf", "--output",
↳output_filename, name_notebook])

```

The file results/0724/0724-small\_hybrid\_model\_v3\_0.pdf already exists  
Trying to save the file as results/0724/0724-small\_hybrid\_model\_v3\_1.pdf

```

[42]: CompletedProcess(args=['jupyter', 'nbconvert', '--to', 'pdf', '--output',
'results/0724/0724-small_hybrid_model_v3_1.pdf',
'0724-small_hybrid_model_v3.ipynb'], returncode=0)

```

[ ]: