

# 0726-small\_hybrid\_model\_1q\_measurement

July 26, 2023

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

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

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

from my_code import functions as f
```

## 1 Data

```
[4]: 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)/1000
vector_list = np.array([f.string_to_vector(string) for string in string_list])
    ↳ # one hot encoding
```

```
[5]: n_aminoacids = len(string_list[0])
```

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

```
[7]: X = X.reshape(X.shape[0], X.shape[1]*X.shape[2]) # flatten
X_validation = X_validation.reshape(X_validation.shape[0], X_validation.
    ↳ shape[1]*X_validation.shape[2]) # flatten
```

```
[8]: # 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

```
[9]: import pennylane as qml

[10]: def qml_RZZ(params, wires):
    """
    RZZ gate.
    """
    qml.CNOT(wires=wires)
    qml.RZ(params, wires=wires[1])
    qml.CNOT(wires=wires)

[11]: n_qubits = n_aminoacids
    n_layers_block = 25
    n_layers_embedding = 3
    dev = qml.device("default.qubit", wires=n_qubits)

[12]: shape_weights_embedding = (n_layers_embedding, n_qubits, 2)
    shape_weights_block_1 = (n_layers_block, n_qubits, 2)
    shape_weights_block_2 = (n_layers_block, n_qubits//2, 2)

[13]: # size_weights = np.product(shape_weights_embedding) + np.
    ↪ product(shape_weights_block_1) + np.product(shape_weights_block_2)
    size_weights = np.product(shape_weights_block_1) + np.
    ↪ product(shape_weights_block_2)

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

        # weights
        # weights_embedding = weights[:np.product(shape_weights_embedding)].
        ↪ reshape(shape_weights_embedding)
        # weights_block_1 = weights[np.product(shape_weights_embedding):np.
        ↪ product(shape_weights_embedding)+np.product(shape_weights_block_1)].
        ↪ reshape(shape_weights_block_1)
        # weights_block_2 = weights[np.product(shape_weights_embedding)+np.
        ↪ product(shape_weights_block_1):].reshape(shape_weights_block_2)

        weights_block_1 = weights[:np.product(shape_weights_block_1)].
        ↪ reshape(shape_weights_block_1)
        weights_block_2 = weights[np.product(shape_weights_block_1):].
        ↪ reshape(shape_weights_block_2)

        # 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_embedding[i, j, 0], wires=[j, (j+1)%n_qubits])

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

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

#block
for i in range(n_layers_block):
    # rotations for each qubit
    for j in range(n_qubits):
        qml.RY(weights_block_1[i, j, 0], wires=j)
        qml.RZ(weights_block_1[i, j, 1], wires=j)

    # ZZ rotation for neighboring qubits
    for j in range(0, n_qubits, 2):
        qml.CNOT(wires=[j, (j+1)])

    # rotations for some qubits
    for j, w in enumerate(range(1, n_qubits, 4)):
        qml.RY(weights_block_2[i, j, 0], wires=w)
        qml.RZ(weights_block_2[i, j, 1], wires=w)
        qml.RY(weights_block_2[i, j+1, 0], wires=w+1)
        qml.RZ(weights_block_2[i, j+1, 1], wires=w+1)
        qml.CNOT(wires=[w, (w+1)])

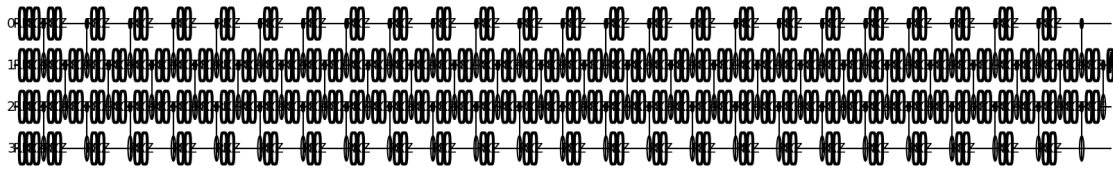
# measurement
return [qml.expval(qml.PauliZ(wires=1))]

```

```

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

```



```
[16]: weight_shapes = {"weights": (size_weights,)}
```

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

### 3 Hybrid model

```
[18]: input_dim = input_data.size(1)
```

```
[19]: n_pre_classical_layers = 4
layers_dim = np.linspace(n_qubits, input_dim, 4).astype(int)
```

```
[20]: layers = []
for i in range(1, len(layers_dim)):
    layers += [nn.Linear(layers_dim[-1*i], layers_dim[-1*(i+1)]), nn.ReLU()]
layers += [nn.Linear(layers_dim[0], layers_dim[0])]
layers += [qlayer]
# layers += [nn.Linear(1, 1)]
# layers += [nn.Linear(2, 4), nn.ReLU()]
# layers += [nn.Linear(4, 1)]

Net = nn.Sequential(*layers)
```

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

```
[22]: import time
```

```
[23]: # time
start_time = time.time()

# Define the loss function and optimizer
criterion = nn.MSELoss() # Mean Squared Error loss
optimizer = optim.Adam(model.parameters(), lr=0.05) # Adam optimizer with
↳ learning rate 0.001
# optimizer = optim.SGD(model.parameters(), lr=0.05)
```

```

# Training loop
num_epochs = 10
batch_size = 32

losses = []
losses_epochs = [0]

losses_epochs[-1] = criterion(model(input_data), target_data).item()
print('Epoch [{} / {}], Loss: {:.4f}'.format(0, num_epochs, losses_epochs[-1]))

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')

        # add to the epoch loss
        losses_epochs[-1] += loss.item()

    # divide the epoch loss by the number of batches, to get the average loss
    losses_epochs[-1] /= (input_data.size(0)/batch_size)

```

```

# Validation
for x, (i, t) in enumerate(zip((input_validation[:3]), target_validation[:
↪3]])):
    loss = criterion(model(i), t)
    print('i: {}, \t target: {:.3f}, \t output: {:.3f}, \t loss: {:.3f}'.
↪format(x, t.item(), model(i).item(), loss))

# 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 [0/10], Loss: 0.0870

i: 0,	target: -0.007,	output: -0.105,	loss: 0.010
i: 1,	target: -0.197,	output: -0.101,	loss: 0.009
i: 2,	target: 0.964,	output: -0.105,	loss: 1.142

Epoch [1/10], Loss: 0.0563, Time remaining: ~0.0h 18.0m 36s

i: 0,	target: -0.007,	output: -0.010,	loss: 0.000
i: 1,	target: -0.197,	output: -0.003,	loss: 0.037
i: 2,	target: 0.964,	output: -0.008,	loss: 0.946

Epoch [2/10], Loss: 0.0565, Time remaining: ~0.0h 16.0m 46s

i: 0,	target: -0.007,	output: -0.001,	loss: 0.000
i: 1,	target: -0.197,	output: 0.007,	loss: 0.041
i: 2,	target: 0.964,	output: 0.003,	loss: 0.923

Epoch [3/10], Loss: 0.0560, Time remaining: ~0.0h 14.0m 41s

i: 0,	target: -0.007,	output: -0.093,	loss: 0.007
i: 1,	target: -0.197,	output: -0.083,	loss: 0.013
i: 2,	target: 0.964,	output: -0.079,	loss: 1.087

Epoch [4/10], Loss: 0.0550, Time remaining: ~0.0h 12.0m 46s

i: 0,	target: -0.007,	output: -0.094,	loss: 0.008
i: 1,	target: -0.197,	output: -0.086,	loss: 0.012
i: 2,	target: 0.964,	output: -0.030,	loss: 0.989

Epoch [5/10], Loss: 0.0521, Time remaining: ~0.0h 10.0m 40s

i: 0,	target: -0.007,	output: -0.060,	loss: 0.003
i: 1,	target: -0.197,	output: -0.100,	loss: 0.009

```

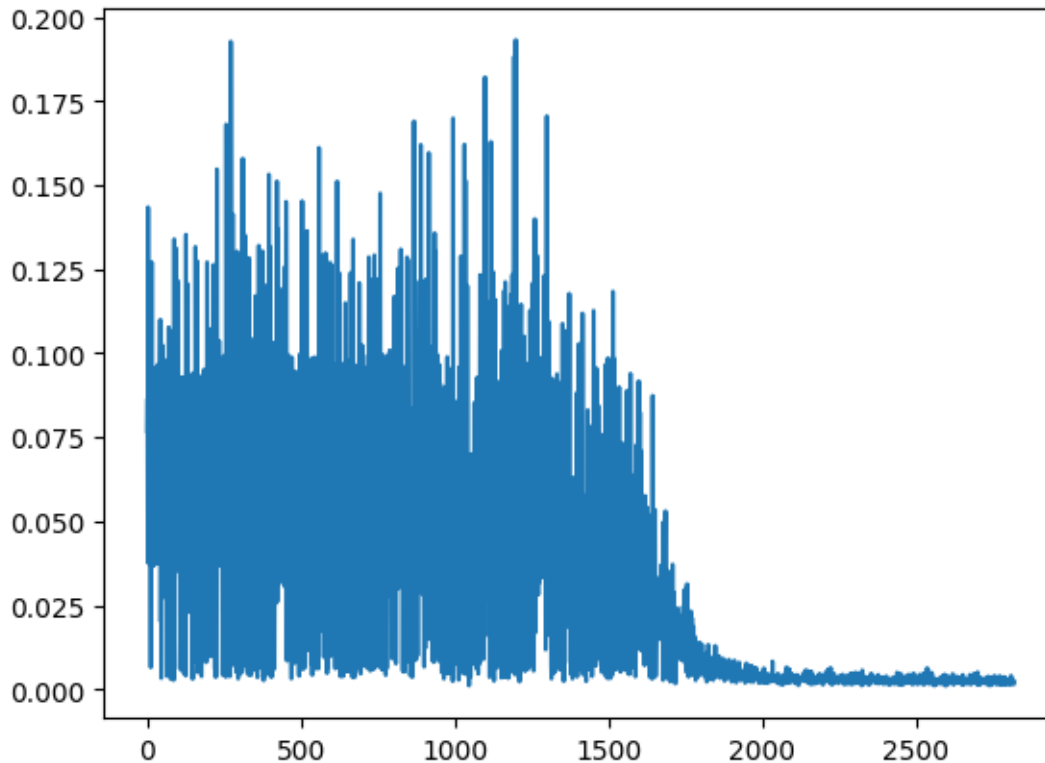
i: 2,      target: 0.964,          output: 0.377,          loss: 0.345
Epoch [6/10], Loss: 0.0369, Time remaining: ~0.0h 8.0m 27s
i: 0,      target: -0.007,         output: -0.019,         loss: 0.000
i: 1,      target: -0.197,         output: -0.094,         loss: 0.010
i: 2,      target: 0.964,          output: 0.854,          loss: 0.012
Epoch [7/10], Loss: 0.0086, Time remaining: ~0.0h 6.0m 17s
i: 0,      target: -0.007,         output: -0.062,         loss: 0.003
i: 1,      target: -0.197,         output: -0.127,         loss: 0.005
i: 2,      target: 0.964,          output: 0.912,          loss: 0.003
Epoch [8/10], Loss: 0.0031, Time remaining: ~0.0h 4.0m 10s
i: 0,      target: -0.007,         output: -0.074,         loss: 0.005
i: 1,      target: -0.197,         output: -0.166,         loss: 0.001
i: 2,      target: 0.964,          output: 0.924,          loss: 0.002
Epoch [9/10], Loss: 0.0026, Time remaining: ~0.0h 2.0m 5s
i: 0,      target: -0.007,         output: 0.002,          loss: 0.000
i: 1,      target: -0.197,         output: -0.105,         loss: 0.008
i: 2,      target: 0.964,          output: 0.954,          loss: 0.000
Epoch [10/10], Loss: 0.0024, Time remaining: ~0.0h 0.0m 0s

```

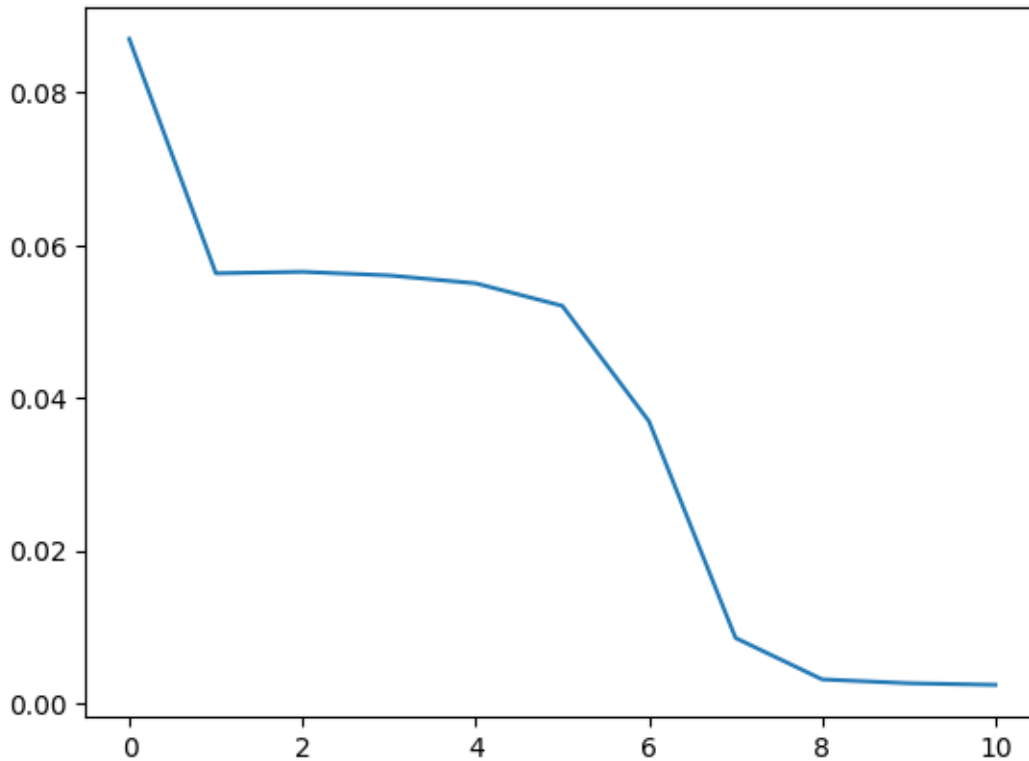
```

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

```



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



```
[26]: 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: {}, \t target: {:.3f}, \t output: {:.3f}, \t loss: {:.3f}'.
          format(x, t.item(), model(i).item(), loss))

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

i: 0,	target: -0.007,	output: 0.002,	loss: 0.000
i: 1,	target: -0.197,	output: -0.105,	loss: 0.008
i: 2,	target: 0.964,	output: 0.954,	loss: 0.000
i: 3,	target: 0.919,	output: 0.916,	loss: 0.000
i: 4,	target: -0.146,	output: -0.105,	loss: 0.002
i: 5,	target: -0.044,	output: -0.028,	loss: 0.000
i: 6,	target: -0.122,	output: -0.084,	loss: 0.001



i: 7,	target: -0.093,	output: -0.105,	loss: 0.000
i: 8,	target: -0.044,	output: -0.068,	loss: 0.001
i: 9,	target: -0.150,	output: -0.040,	loss: 0.012
i: 10,	target: -0.131,	output: -0.105,	loss: 0.001
i: 11,	target: -0.067,	output: -0.055,	loss: 0.000
i: 12,	target: -0.127,	output: -0.105,	loss: 0.000
i: 13,	target: -0.142,	output: -0.104,	loss: 0.001
i: 14,	target: -0.072,	output: -0.105,	loss: 0.001
i: 15,	target: -0.131,	output: -0.105,	loss: 0.001
i: 16,	target: -0.144,	output: -0.105,	loss: 0.001
i: 17,	target: -0.108,	output: -0.105,	loss: 0.000
i: 18,	target: -0.166,	output: -0.105,	loss: 0.004
i: 19,	target: -0.052,	output: -0.105,	loss: 0.003
i: 20,	target: 0.069,	output: 0.087,	loss: 0.000
i: 21,	target: -0.145,	output: -0.105,	loss: 0.002
i: 22,	target: -0.066,	output: -0.105,	loss: 0.002
i: 23,	target: 0.951,	output: 0.950,	loss: 0.000
i: 24,	target: -0.181,	output: -0.105,	loss: 0.006
i: 25,	target: -0.092,	output: -0.016,	loss: 0.006
i: 26,	target: -0.110,	output: -0.046,	loss: 0.004
i: 27,	target: 0.024,	output: 0.121,	loss: 0.010
i: 28,	target: -0.053,	output: -0.016,	loss: 0.001
i: 29,	target: -0.110,	output: -0.105,	loss: 0.000
i: 30,	target: -0.066,	output: -0.089,	loss: 0.001
i: 31,	target: -0.112,	output: -0.105,	loss: 0.000
i: 32,	target: 0.887,	output: 0.923,	loss: 0.001
i: 33,	target: -0.086,	output: -0.012,	loss: 0.005
i: 34,	target: 0.970,	output: 0.940,	loss: 0.001
i: 35,	target: -0.012,	output: 0.008,	loss: 0.000
i: 36,	target: -0.102,	output: -0.105,	loss: 0.000
i: 37,	target: 0.880,	output: 0.913,	loss: 0.001
i: 38,	target: -0.131,	output: -0.105,	loss: 0.001
i: 39,	target: -0.087,	output: -0.105,	loss: 0.000
i: 40,	target: -0.111,	output: -0.105,	loss: 0.000
i: 41,	target: -0.065,	output: -0.054,	loss: 0.000
i: 42,	target: -0.176,	output: -0.105,	loss: 0.005
i: 43,	target: -0.097,	output: -0.105,	loss: 0.000
i: 44,	target: -0.169,	output: -0.105,	loss: 0.004
i: 45,	target: -0.156,	output: -0.105,	loss: 0.003
i: 46,	target: -0.057,	output: -0.050,	loss: 0.000
i: 47,	target: -0.096,	output: -0.105,	loss: 0.000
i: 48,	target: -0.043,	output: 0.042,	loss: 0.007
i: 49,	target: -0.097,	output: -0.105,	loss: 0.000
i: 50,	target: -0.075,	output: -0.105,	loss: 0.001
i: 51,	target: -0.078,	output: -0.105,	loss: 0.001
i: 52,	target: -0.095,	output: -0.105,	loss: 0.000
i: 53,	target: -0.027,	output: 0.077,	loss: 0.011
i: 54,	target: -0.091,	output: -0.105,	loss: 0.000

i: 55,	target: -0.177,	output: -0.105,	loss: 0.005
i: 56,	target: -0.086,	output: -0.105,	loss: 0.000
i: 57,	target: -0.076,	output: -0.105,	loss: 0.001
i: 58,	target: -0.106,	output: -0.081,	loss: 0.001
i: 59,	target: -0.198,	output: -0.105,	loss: 0.009
i: 60,	target: -0.265,	output: -0.105,	loss: 0.025
i: 61,	target: -0.200,	output: -0.105,	loss: 0.009
i: 62,	target: -0.050,	output: -0.105,	loss: 0.003
i: 63,	target: -0.128,	output: -0.105,	loss: 0.000
i: 64,	target: -0.173,	output: -0.105,	loss: 0.005
i: 65,	target: -0.041,	output: -0.105,	loss: 0.004
i: 66,	target: -0.103,	output: -0.105,	loss: 0.000
i: 67,	target: -0.230,	output: -0.105,	loss: 0.016
i: 68,	target: -0.078,	output: -0.095,	loss: 0.000
i: 69,	target: -0.090,	output: -0.086,	loss: 0.000
i: 70,	target: -0.190,	output: -0.105,	loss: 0.007
i: 71,	target: -0.088,	output: -0.077,	loss: 0.000
i: 72,	target: -0.085,	output: -0.105,	loss: 0.000
i: 73,	target: -0.036,	output: -0.013,	loss: 0.000
i: 74,	target: -0.084,	output: -0.095,	loss: 0.000
i: 75,	target: -0.118,	output: -0.105,	loss: 0.000
i: 76,	target: -0.148,	output: -0.105,	loss: 0.002
i: 77,	target: -0.010,	output: 0.033,	loss: 0.002
i: 78,	target: -0.058,	output: -0.054,	loss: 0.000
i: 79,	target: -0.108,	output: -0.096,	loss: 0.000
i: 80,	target: -0.111,	output: -0.060,	loss: 0.003
i: 81,	target: -0.121,	output: -0.105,	loss: 0.000
i: 82,	target: -0.199,	output: -0.105,	loss: 0.009
i: 83,	target: -0.292,	output: -0.105,	loss: 0.035
i: 84,	target: -0.137,	output: -0.073,	loss: 0.004
i: 85,	target: -0.148,	output: -0.068,	loss: 0.007
i: 86,	target: -0.163,	output: -0.105,	loss: 0.003
i: 87,	target: -0.115,	output: -0.105,	loss: 0.000
i: 88,	target: -0.138,	output: -0.105,	loss: 0.001
i: 89,	target: -0.067,	output: -0.097,	loss: 0.001
i: 90,	target: -0.137,	output: -0.105,	loss: 0.001
i: 91,	target: 0.962,	output: 0.927,	loss: 0.001
i: 92,	target: -0.049,	output: -0.009,	loss: 0.002
i: 93,	target: -0.140,	output: -0.105,	loss: 0.001
i: 94,	target: -0.095,	output: -0.105,	loss: 0.000
i: 95,	target: 0.893,	output: 0.902,	loss: 0.000
i: 96,	target: -0.064,	output: -0.077,	loss: 0.000
i: 97,	target: -0.143,	output: -0.080,	loss: 0.004
i: 98,	target: -0.054,	output: -0.105,	loss: 0.003
i: 99,	target: -0.045,	output: -0.039,	loss: 0.000
i: 100,	target: -0.140,	output: -0.105,	loss: 0.001
i: 101,	target: 0.008,	output: 0.096,	loss: 0.008
i: 102,	target: -0.147,	output: -0.105,	loss: 0.002

i: 103,	target: -0.136,	output: -0.105,	loss: 0.001
i: 104,	target: -0.044,	output: -0.049,	loss: 0.000
i: 105,	target: 0.949,	output: 0.935,	loss: 0.000
i: 106,	target: -0.230,	output: -0.105,	loss: 0.015
i: 107,	target: -0.123,	output: -0.105,	loss: 0.000
i: 108,	target: -0.103,	output: -0.089,	loss: 0.000
i: 109,	target: -0.072,	output: -0.026,	loss: 0.002
i: 110,	target: -0.111,	output: -0.105,	loss: 0.000
i: 111,	target: -0.142,	output: -0.083,	loss: 0.003
i: 112,	target: -0.125,	output: -0.105,	loss: 0.000
i: 113,	target: 0.025,	output: -0.046,	loss: 0.005
i: 114,	target: -0.151,	output: -0.105,	loss: 0.002
i: 115,	target: -0.162,	output: -0.105,	loss: 0.003
i: 116,	target: -0.078,	output: -0.105,	loss: 0.001
i: 117,	target: -0.080,	output: -0.105,	loss: 0.001
i: 118,	target: -0.213,	output: -0.105,	loss: 0.012
i: 119,	target: 0.095,	output: 0.185,	loss: 0.008
i: 120,	target: -0.135,	output: -0.105,	loss: 0.001
i: 121,	target: 0.885,	output: 0.912,	loss: 0.001
i: 122,	target: 0.898,	output: 0.942,	loss: 0.002
i: 123,	target: 0.959,	output: 0.943,	loss: 0.000
i: 124,	target: -0.176,	output: -0.105,	loss: 0.005
i: 125,	target: -0.077,	output: -0.086,	loss: 0.000
i: 126,	target: -0.146,	output: -0.105,	loss: 0.002
i: 127,	target: -0.135,	output: -0.105,	loss: 0.001
i: 128,	target: -0.029,	output: -0.105,	loss: 0.006
i: 129,	target: -0.051,	output: -0.064,	loss: 0.000
i: 130,	target: -0.080,	output: -0.067,	loss: 0.000
i: 131,	target: -0.177,	output: -0.105,	loss: 0.005
i: 132,	target: -0.230,	output: -0.105,	loss: 0.016
i: 133,	target: -0.016,	output: -0.012,	loss: 0.000
i: 134,	target: -0.133,	output: -0.105,	loss: 0.001
i: 135,	target: -0.060,	output: 0.067,	loss: 0.016
i: 136,	target: -0.102,	output: -0.105,	loss: 0.000
i: 137,	target: -0.079,	output: -0.105,	loss: 0.001
i: 138,	target: -0.148,	output: -0.105,	loss: 0.002
i: 139,	target: -0.118,	output: -0.043,	loss: 0.006
i: 140,	target: -0.055,	output: -0.063,	loss: 0.000
i: 141,	target: -0.049,	output: -0.058,	loss: 0.000
i: 142,	target: -0.103,	output: -0.105,	loss: 0.000
i: 143,	target: -0.046,	output: -0.104,	loss: 0.003
i: 144,	target: -0.152,	output: -0.105,	loss: 0.002
i: 145,	target: -0.098,	output: -0.105,	loss: 0.000
i: 146,	target: -0.081,	output: -0.061,	loss: 0.000
i: 147,	target: -0.120,	output: -0.105,	loss: 0.000
i: 148,	target: 0.009,	output: 0.037,	loss: 0.001
i: 149,	target: -0.075,	output: 0.011,	loss: 0.007
i: 150,	target: -0.100,	output: -0.105,	loss: 0.000

i: 151,	target: -0.037,	output: 0.032,	loss: 0.005
i: 152,	target: -0.088,	output: 0.017,	loss: 0.011
i: 153,	target: -0.020,	output: -0.045,	loss: 0.001
i: 154,	target: -0.135,	output: -0.105,	loss: 0.001
i: 155,	target: -0.143,	output: -0.105,	loss: 0.001
i: 156,	target: -0.049,	output: -0.105,	loss: 0.003
i: 157,	target: -0.058,	output: -0.089,	loss: 0.001
i: 158,	target: -0.057,	output: -0.105,	loss: 0.002
i: 159,	target: -0.097,	output: -0.100,	loss: 0.000
i: 160,	target: 0.915,	output: 0.930,	loss: 0.000
i: 161,	target: -0.077,	output: -0.105,	loss: 0.001
i: 162,	target: -0.172,	output: -0.105,	loss: 0.004
i: 163,	target: -0.103,	output: -0.105,	loss: 0.000
i: 164,	target: -0.109,	output: -0.105,	loss: 0.000
i: 165,	target: -0.074,	output: -0.105,	loss: 0.001
i: 166,	target: -0.084,	output: -0.105,	loss: 0.000
i: 167,	target: -0.137,	output: -0.105,	loss: 0.001
i: 168,	target: -0.038,	output: -0.105,	loss: 0.005
i: 169,	target: 0.935,	output: 0.929,	loss: 0.000
i: 170,	target: -0.121,	output: -0.105,	loss: 0.000
i: 171,	target: -0.066,	output: -0.028,	loss: 0.001
i: 172,	target: -0.070,	output: -0.089,	loss: 0.000
i: 173,	target: -0.097,	output: -0.105,	loss: 0.000
i: 174,	target: -0.054,	output: -0.031,	loss: 0.000
i: 175,	target: -0.125,	output: -0.105,	loss: 0.000
i: 176,	target: -0.081,	output: 0.056,	loss: 0.019
i: 177,	target: -0.122,	output: -0.105,	loss: 0.000
i: 178,	target: 0.923,	output: 0.947,	loss: 0.001
i: 179,	target: -0.134,	output: -0.060,	loss: 0.005
i: 180,	target: -0.159,	output: -0.105,	loss: 0.003
i: 181,	target: -0.138,	output: -0.105,	loss: 0.001
i: 182,	target: -0.061,	output: 0.037,	loss: 0.010
i: 183,	target: -0.159,	output: -0.105,	loss: 0.003
i: 184,	target: -0.084,	output: -0.105,	loss: 0.000
i: 185,	target: -0.222,	output: -0.105,	loss: 0.014
i: 186,	target: -0.141,	output: -0.082,	loss: 0.003
i: 187,	target: -0.091,	output: -0.097,	loss: 0.000
i: 188,	target: -0.047,	output: 0.023,	loss: 0.005
i: 189,	target: -0.053,	output: 0.013,	loss: 0.004
i: 190,	target: -0.206,	output: -0.105,	loss: 0.010
i: 191,	target: -0.085,	output: -0.088,	loss: 0.000
i: 192,	target: -0.173,	output: -0.105,	loss: 0.005
i: 193,	target: -0.055,	output: -0.105,	loss: 0.003
i: 194,	target: 0.029,	output: 0.066,	loss: 0.001
i: 195,	target: -0.058,	output: -0.044,	loss: 0.000
i: 196,	target: -0.065,	output: -0.046,	loss: 0.000
i: 197,	target: -0.049,	output: -0.105,	loss: 0.003
i: 198,	target: -0.054,	output: 0.027,	loss: 0.007

i: 199,	target: -0.203,	output: -0.105,	loss: 0.010
i: 200,	target: -0.037,	output: 0.002,	loss: 0.001
i: 201,	target: -0.146,	output: -0.105,	loss: 0.002
i: 202,	target: -0.066,	output: -0.054,	loss: 0.000
i: 203,	target: -0.056,	output: -0.032,	loss: 0.001
i: 204,	target: -0.081,	output: -0.061,	loss: 0.000
i: 205,	target: -0.092,	output: -0.059,	loss: 0.001
i: 206,	target: -0.094,	output: -0.068,	loss: 0.001
i: 207,	target: -0.027,	output: -0.008,	loss: 0.000
i: 208,	target: -0.093,	output: -0.105,	loss: 0.000
i: 209,	target: -0.072,	output: -0.105,	loss: 0.001
i: 210,	target: -0.150,	output: -0.105,	loss: 0.002
i: 211,	target: -0.065,	output: -0.105,	loss: 0.002
i: 212,	target: -0.120,	output: -0.105,	loss: 0.000
i: 213,	target: 0.952,	output: 0.934,	loss: 0.000
i: 214,	target: -0.075,	output: -0.105,	loss: 0.001
i: 215,	target: -0.144,	output: -0.105,	loss: 0.001
i: 216,	target: -0.045,	output: -0.030,	loss: 0.000
i: 217,	target: -0.062,	output: -0.047,	loss: 0.000
i: 218,	target: -0.055,	output: -0.090,	loss: 0.001
i: 219,	target: -0.161,	output: -0.073,	loss: 0.008
i: 220,	target: -0.020,	output: 0.028,	loss: 0.002
i: 221,	target: -0.048,	output: -0.104,	loss: 0.003
i: 222,	target: -0.120,	output: -0.105,	loss: 0.000
i: 223,	target: -0.171,	output: -0.105,	loss: 0.004
i: 224,	target: -0.125,	output: -0.105,	loss: 0.000
i: 225,	target: 0.055,	output: 0.131,	loss: 0.006
i: 226,	target: -0.075,	output: -0.105,	loss: 0.001
i: 227,	target: -0.147,	output: -0.105,	loss: 0.002
i: 228,	target: 0.954,	output: 0.926,	loss: 0.001
i: 229,	target: -0.115,	output: -0.105,	loss: 0.000
i: 230,	target: -0.070,	output: -0.071,	loss: 0.000
i: 231,	target: -0.223,	output: -0.105,	loss: 0.014
i: 232,	target: -0.126,	output: -0.021,	loss: 0.011
i: 233,	target: -0.160,	output: -0.105,	loss: 0.003
i: 234,	target: -0.074,	output: -0.076,	loss: 0.000
i: 235,	target: -0.086,	output: -0.051,	loss: 0.001
i: 236,	target: -0.237,	output: -0.105,	loss: 0.017
i: 237,	target: -0.130,	output: -0.105,	loss: 0.001
i: 238,	target: -0.110,	output: -0.105,	loss: 0.000
i: 239,	target: -0.045,	output: -0.105,	loss: 0.004
i: 240,	target: -0.126,	output: -0.105,	loss: 0.000
i: 241,	target: -0.198,	output: -0.105,	loss: 0.009
i: 242,	target: -0.197,	output: -0.105,	loss: 0.008
i: 243,	target: 0.949,	output: 0.945,	loss: 0.000
i: 244,	target: -0.113,	output: -0.105,	loss: 0.000
i: 245,	target: -0.199,	output: -0.105,	loss: 0.009
i: 246,	target: -0.142,	output: -0.105,	loss: 0.001

i: 247,	target: 0.883,	output: 0.903,	loss: 0.000
i: 248,	target: -0.150,	output: -0.105,	loss: 0.002
i: 249,	target: -0.206,	output: -0.105,	loss: 0.010
i: 250,	target: -0.088,	output: -0.105,	loss: 0.000
i: 251,	target: -0.118,	output: -0.105,	loss: 0.000
i: 252,	target: -0.197,	output: -0.105,	loss: 0.008
i: 253,	target: -0.175,	output: -0.105,	loss: 0.005
i: 254,	target: -0.094,	output: -0.105,	loss: 0.000
i: 255,	target: -0.148,	output: -0.105,	loss: 0.002
i: 256,	target: -0.081,	output: -0.105,	loss: 0.001
i: 257,	target: -0.133,	output: -0.105,	loss: 0.001
i: 258,	target: -0.128,	output: -0.105,	loss: 0.000
i: 259,	target: 0.955,	output: 0.938,	loss: 0.000
i: 260,	target: -0.177,	output: -0.105,	loss: 0.005
i: 261,	target: -0.146,	output: -0.105,	loss: 0.002
i: 262,	target: -0.040,	output: -0.051,	loss: 0.000
i: 263,	target: -0.173,	output: -0.105,	loss: 0.005
i: 264,	target: -0.164,	output: -0.053,	loss: 0.012
i: 265,	target: -0.062,	output: -0.098,	loss: 0.001
i: 266,	target: -0.169,	output: -0.105,	loss: 0.004
i: 267,	target: -0.080,	output: -0.094,	loss: 0.000
i: 268,	target: -0.146,	output: -0.105,	loss: 0.002
i: 269,	target: 0.817,	output: 0.820,	loss: 0.000
i: 270,	target: -0.117,	output: -0.105,	loss: 0.000
i: 271,	target: -0.079,	output: -0.075,	loss: 0.000
i: 272,	target: -0.031,	output: -0.039,	loss: 0.000
i: 273,	target: -0.119,	output: -0.105,	loss: 0.000
i: 274,	target: -0.107,	output: -0.105,	loss: 0.000
i: 275,	target: -0.189,	output: -0.105,	loss: 0.007
i: 276,	target: -0.092,	output: -0.105,	loss: 0.000
i: 277,	target: -0.013,	output: -0.024,	loss: 0.000
i: 278,	target: -0.059,	output: -0.054,	loss: 0.000
i: 279,	target: -0.127,	output: -0.105,	loss: 0.000
i: 280,	target: 0.952,	output: 0.946,	loss: 0.000
i: 281,	target: -0.184,	output: -0.105,	loss: 0.006
i: 282,	target: -0.110,	output: -0.105,	loss: 0.000
i: 283,	target: -0.223,	output: -0.105,	loss: 0.014
i: 284,	target: -0.151,	output: -0.105,	loss: 0.002
i: 285,	target: -0.140,	output: -0.089,	loss: 0.003
i: 286,	target: -0.066,	output: -0.027,	loss: 0.001
i: 287,	target: -0.129,	output: -0.105,	loss: 0.001
i: 288,	target: -0.065,	output: -0.039,	loss: 0.001
i: 289,	target: -0.179,	output: -0.105,	loss: 0.005
i: 290,	target: -0.094,	output: -0.105,	loss: 0.000
i: 291,	target: 0.965,	output: 0.952,	loss: 0.000
i: 292,	target: -0.066,	output: -0.062,	loss: 0.000
i: 293,	target: -0.145,	output: -0.105,	loss: 0.002
i: 294,	target: -0.120,	output: -0.105,	loss: 0.000

i: 295,	target: -0.045,	output: -0.081,	loss: 0.001
i: 296,	target: -0.068,	output: -0.043,	loss: 0.001
i: 297,	target: -0.153,	output: -0.105,	loss: 0.002
i: 298,	target: 0.908,	output: 0.893,	loss: 0.000
i: 299,	target: -0.253,	output: -0.105,	loss: 0.022
i: 300,	target: -0.065,	output: -0.036,	loss: 0.001
i: 301,	target: -0.055,	output: 0.024,	loss: 0.006
i: 302,	target: -0.046,	output: 0.035,	loss: 0.007
i: 303,	target: -0.128,	output: -0.105,	loss: 0.001
i: 304,	target: -0.066,	output: -0.047,	loss: 0.000
i: 305,	target: -0.142,	output: -0.105,	loss: 0.001
i: 306,	target: -0.103,	output: -0.105,	loss: 0.000
i: 307,	target: -0.050,	output: -0.068,	loss: 0.000
i: 308,	target: -0.190,	output: -0.105,	loss: 0.007
i: 309,	target: -0.120,	output: -0.105,	loss: 0.000
i: 310,	target: -0.129,	output: -0.105,	loss: 0.001
i: 311,	target: -0.064,	output: -0.017,	loss: 0.002
i: 312,	target: -0.162,	output: -0.105,	loss: 0.003
i: 313,	target: -0.153,	output: -0.105,	loss: 0.002
i: 314,	target: -0.068,	output: -0.036,	loss: 0.001
i: 315,	target: 0.006,	output: 0.009,	loss: 0.000
i: 316,	target: -0.011,	output: 0.019,	loss: 0.001
i: 317,	target: -0.084,	output: -0.105,	loss: 0.000
i: 318,	target: -0.060,	output: -0.077,	loss: 0.000
i: 319,	target: 0.034,	output: 0.066,	loss: 0.001
i: 320,	target: -0.132,	output: -0.105,	loss: 0.001
i: 321,	target: -0.104,	output: -0.105,	loss: 0.000
i: 322,	target: -0.096,	output: -0.105,	loss: 0.000
i: 323,	target: 0.066,	output: 0.189,	loss: 0.015
i: 324,	target: -0.115,	output: -0.101,	loss: 0.000
i: 325,	target: -0.052,	output: 0.046,	loss: 0.010
i: 326,	target: 0.021,	output: 0.046,	loss: 0.001
i: 327,	target: -0.099,	output: -0.043,	loss: 0.003
i: 328,	target: -0.133,	output: -0.105,	loss: 0.001
i: 329,	target: -0.081,	output: -0.105,	loss: 0.001
i: 330,	target: -0.137,	output: -0.105,	loss: 0.001
i: 331,	target: 0.054,	output: 0.197,	loss: 0.021
i: 332,	target: -0.097,	output: -0.105,	loss: 0.000
i: 333,	target: -0.060,	output: -0.105,	loss: 0.002
i: 334,	target: -0.164,	output: -0.105,	loss: 0.003
i: 335,	target: -0.010,	output: 0.071,	loss: 0.007
i: 336,	target: 0.957,	output: 0.952,	loss: 0.000
i: 337,	target: -0.114,	output: -0.105,	loss: 0.000
i: 338,	target: -0.059,	output: -0.047,	loss: 0.000
i: 339,	target: -0.193,	output: -0.105,	loss: 0.008
i: 340,	target: 0.049,	output: 0.136,	loss: 0.008
i: 341,	target: -0.100,	output: -0.105,	loss: 0.000
i: 342,	target: -0.143,	output: -0.103,	loss: 0.002

i: 343,	target: -0.128,	output: -0.105,	loss: 0.001
i: 344,	target: -0.201,	output: -0.105,	loss: 0.009
i: 345,	target: -0.115,	output: -0.105,	loss: 0.000
i: 346,	target: -0.085,	output: -0.105,	loss: 0.000
i: 347,	target: -0.161,	output: -0.105,	loss: 0.003
i: 348,	target: -0.061,	output: -0.020,	loss: 0.002
i: 349,	target: -0.111,	output: -0.094,	loss: 0.000
i: 350,	target: -0.151,	output: -0.105,	loss: 0.002
i: 351,	target: 0.941,	output: 0.930,	loss: 0.000
i: 352,	target: 0.010,	output: -0.025,	loss: 0.001
i: 353,	target: -0.078,	output: -0.105,	loss: 0.001
i: 354,	target: -0.030,	output: -0.031,	loss: 0.000
i: 355,	target: -0.078,	output: -0.055,	loss: 0.000
i: 356,	target: -0.131,	output: -0.083,	loss: 0.002
i: 357,	target: -0.170,	output: -0.105,	loss: 0.004
i: 358,	target: -0.060,	output: -0.086,	loss: 0.001
i: 359,	target: -0.124,	output: -0.105,	loss: 0.000
i: 360,	target: -0.137,	output: -0.105,	loss: 0.001
i: 361,	target: -0.147,	output: -0.105,	loss: 0.002
i: 362,	target: -0.142,	output: -0.105,	loss: 0.001
i: 363,	target: -0.086,	output: -0.062,	loss: 0.001
i: 364,	target: -0.136,	output: -0.105,	loss: 0.001
i: 365,	target: 0.960,	output: 0.958,	loss: 0.000
i: 366,	target: -0.081,	output: -0.105,	loss: 0.001
i: 367,	target: -0.154,	output: -0.105,	loss: 0.002
i: 368,	target: -0.178,	output: -0.105,	loss: 0.005
i: 369,	target: -0.064,	output: -0.099,	loss: 0.001
i: 370,	target: -0.042,	output: -0.036,	loss: 0.000
i: 371,	target: -0.079,	output: -0.105,	loss: 0.001
i: 372,	target: -0.058,	output: -0.095,	loss: 0.001
i: 373,	target: 0.038,	output: 0.002,	loss: 0.001
i: 374,	target: 0.925,	output: 0.934,	loss: 0.000
i: 375,	target: -0.131,	output: -0.103,	loss: 0.001
i: 376,	target: -0.111,	output: -0.062,	loss: 0.002
i: 377,	target: -0.066,	output: -0.105,	loss: 0.002
i: 378,	target: -0.088,	output: -0.105,	loss: 0.000
i: 379,	target: -0.036,	output: -0.012,	loss: 0.001
i: 380,	target: -0.151,	output: -0.105,	loss: 0.002
i: 381,	target: -0.185,	output: -0.105,	loss: 0.006
i: 382,	target: -0.062,	output: -0.105,	loss: 0.002
i: 383,	target: -0.074,	output: -0.105,	loss: 0.001
i: 384,	target: -0.068,	output: -0.052,	loss: 0.000
i: 385,	target: -0.033,	output: 0.062,	loss: 0.009
i: 386,	target: -0.062,	output: -0.105,	loss: 0.002
i: 387,	target: -0.065,	output: 0.043,	loss: 0.012
i: 388,	target: -0.112,	output: -0.102,	loss: 0.000
i: 389,	target: -0.255,	output: -0.105,	loss: 0.022
i: 390,	target: -0.089,	output: -0.018,	loss: 0.005



i: 391,	target: -0.094,	output: -0.105,	loss: 0.000
i: 392,	target: -0.151,	output: -0.105,	loss: 0.002
i: 393,	target: -0.114,	output: -0.105,	loss: 0.000
i: 394,	target: -0.061,	output: -0.099,	loss: 0.001
i: 395,	target: -0.161,	output: -0.105,	loss: 0.003
i: 396,	target: -0.118,	output: -0.070,	loss: 0.002
i: 397,	target: -0.097,	output: -0.105,	loss: 0.000
i: 398,	target: -0.091,	output: -0.105,	loss: 0.000
i: 399,	target: 0.063,	output: 0.132,	loss: 0.005
i: 400,	target: -0.075,	output: -0.072,	loss: 0.000
i: 401,	target: -0.052,	output: -0.016,	loss: 0.001
i: 402,	target: -0.046,	output: -0.053,	loss: 0.000
i: 403,	target: -0.077,	output: -0.105,	loss: 0.001
i: 404,	target: -0.008,	output: -0.026,	loss: 0.000
i: 405,	target: -0.047,	output: -0.050,	loss: 0.000
i: 406,	target: 0.045,	output: 0.069,	loss: 0.001
i: 407,	target: -0.055,	output: -0.040,	loss: 0.000
i: 408,	target: -0.198,	output: -0.105,	loss: 0.009
i: 409,	target: -0.068,	output: -0.104,	loss: 0.001
i: 410,	target: -0.067,	output: -0.085,	loss: 0.000
i: 411,	target: -0.171,	output: -0.105,	loss: 0.004
i: 412,	target: -0.079,	output: -0.105,	loss: 0.001
i: 413,	target: -0.115,	output: -0.096,	loss: 0.000
i: 414,	target: -0.058,	output: -0.076,	loss: 0.000
i: 415,	target: -0.140,	output: -0.105,	loss: 0.001
i: 416,	target: -0.071,	output: -0.055,	loss: 0.000
i: 417,	target: -0.209,	output: -0.105,	loss: 0.011
i: 418,	target: -0.048,	output: -0.105,	loss: 0.003
i: 419,	target: -0.043,	output: -0.105,	loss: 0.004
i: 420,	target: -0.086,	output: -0.102,	loss: 0.000
i: 421,	target: -0.039,	output: -0.073,	loss: 0.001
i: 422,	target: -0.089,	output: -0.090,	loss: 0.000
i: 423,	target: 0.956,	output: 0.954,	loss: 0.000
i: 424,	target: -0.143,	output: -0.105,	loss: 0.001
i: 425,	target: -0.084,	output: -0.105,	loss: 0.000
i: 426,	target: 0.970,	output: 0.953,	loss: 0.000
i: 427,	target: -0.133,	output: -0.105,	loss: 0.001
i: 428,	target: -0.153,	output: -0.105,	loss: 0.002
i: 429,	target: -0.068,	output: -0.096,	loss: 0.001
i: 430,	target: -0.090,	output: -0.101,	loss: 0.000
i: 431,	target: -0.057,	output: -0.105,	loss: 0.002
i: 432,	target: -0.182,	output: -0.105,	loss: 0.006
i: 433,	target: -0.114,	output: -0.105,	loss: 0.000
i: 434,	target: -0.191,	output: -0.105,	loss: 0.007
i: 435,	target: -0.079,	output: -0.105,	loss: 0.001
i: 436,	target: -0.137,	output: -0.105,	loss: 0.001
i: 437,	target: -0.145,	output: -0.105,	loss: 0.002
i: 438,	target: 0.064,	output: 0.025,	loss: 0.002

i: 439,	target: -0.081,	output: -0.105,	loss: 0.001
i: 440,	target: -0.185,	output: -0.105,	loss: 0.006
i: 441,	target: -0.043,	output: 0.068,	loss: 0.012
i: 442,	target: -0.131,	output: -0.105,	loss: 0.001
i: 443,	target: -0.161,	output: -0.105,	loss: 0.003
i: 444,	target: -0.054,	output: -0.105,	loss: 0.003
i: 445,	target: -0.061,	output: -0.105,	loss: 0.002
i: 446,	target: -0.058,	output: -0.004,	loss: 0.003
i: 447,	target: -0.075,	output: -0.058,	loss: 0.000
i: 448,	target: -0.130,	output: -0.105,	loss: 0.001
i: 449,	target: -0.092,	output: -0.105,	loss: 0.000
i: 450,	target: -0.043,	output: -0.008,	loss: 0.001
i: 451,	target: 0.999,	output: 0.952,	loss: 0.002
i: 452,	target: -0.061,	output: -0.057,	loss: 0.000
i: 453,	target: -0.204,	output: -0.105,	loss: 0.010
i: 454,	target: 0.041,	output: -0.027,	loss: 0.005
i: 455,	target: -0.039,	output: 0.023,	loss: 0.004
i: 456,	target: -0.077,	output: 0.007,	loss: 0.007
i: 457,	target: -0.134,	output: -0.084,	loss: 0.003
i: 458,	target: -0.120,	output: -0.105,	loss: 0.000
i: 459,	target: -0.108,	output: -0.089,	loss: 0.000
i: 460,	target: -0.110,	output: -0.105,	loss: 0.000
i: 461,	target: -0.063,	output: -0.105,	loss: 0.002
i: 462,	target: -0.012,	output: 0.010,	loss: 0.000
i: 463,	target: -0.097,	output: -0.105,	loss: 0.000
i: 464,	target: 0.064,	output: 0.059,	loss: 0.000
i: 465,	target: -0.025,	output: -0.073,	loss: 0.002
i: 466,	target: -0.086,	output: -0.090,	loss: 0.000
i: 467,	target: -0.112,	output: -0.105,	loss: 0.000
i: 468,	target: -0.061,	output: -0.105,	loss: 0.002
i: 469,	target: -0.191,	output: -0.105,	loss: 0.007
i: 470,	target: -0.036,	output: -0.006,	loss: 0.001
i: 471,	target: -0.042,	output: -0.053,	loss: 0.000
i: 472,	target: -0.172,	output: -0.105,	loss: 0.004
i: 473,	target: -0.190,	output: -0.105,	loss: 0.007
i: 474,	target: -0.187,	output: -0.105,	loss: 0.007
i: 475,	target: -0.090,	output: -0.056,	loss: 0.001
i: 476,	target: 0.070,	output: 0.103,	loss: 0.001
i: 477,	target: -0.111,	output: -0.105,	loss: 0.000
i: 478,	target: -0.073,	output: -0.078,	loss: 0.000
i: 479,	target: -0.115,	output: -0.080,	loss: 0.001
i: 480,	target: 0.053,	output: 0.027,	loss: 0.001
i: 481,	target: -0.109,	output: -0.100,	loss: 0.000
i: 482,	target: 0.911,	output: 0.875,	loss: 0.001
i: 483,	target: -0.049,	output: -0.046,	loss: 0.000
i: 484,	target: -0.181,	output: -0.105,	loss: 0.006
i: 485,	target: -0.065,	output: -0.031,	loss: 0.001
i: 486,	target: -0.144,	output: -0.105,	loss: 0.001

i: 487,	target: -0.166,	output: -0.105,	loss: 0.004
i: 488,	target: -0.044,	output: -0.012,	loss: 0.001
i: 489,	target: -0.075,	output: -0.105,	loss: 0.001
i: 490,	target: -0.109,	output: -0.105,	loss: 0.000
i: 491,	target: -0.057,	output: -0.105,	loss: 0.002
i: 492,	target: -0.118,	output: -0.105,	loss: 0.000
i: 493,	target: -0.032,	output: 0.015,	loss: 0.002
i: 494,	target: -0.029,	output: -0.040,	loss: 0.000
i: 495,	target: -0.204,	output: -0.105,	loss: 0.010
i: 496,	target: -0.139,	output: -0.082,	loss: 0.003
i: 497,	target: -0.030,	output: -0.019,	loss: 0.000
i: 498,	target: -0.178,	output: -0.105,	loss: 0.005
i: 499,	target: -0.052,	output: -0.085,	loss: 0.001
i: 500,	target: -0.144,	output: -0.104,	loss: 0.002
i: 501,	target: -0.064,	output: -0.105,	loss: 0.002
i: 502,	target: -0.070,	output: -0.054,	loss: 0.000
i: 503,	target: 0.971,	output: 0.956,	loss: 0.000
i: 504,	target: -0.023,	output: -0.030,	loss: 0.000
i: 505,	target: -0.043,	output: 0.024,	loss: 0.004
i: 506,	target: -0.089,	output: -0.105,	loss: 0.000
i: 507,	target: -0.288,	output: -0.105,	loss: 0.033
i: 508,	target: -0.190,	output: -0.105,	loss: 0.007
i: 509,	target: -0.061,	output: -0.105,	loss: 0.002
i: 510,	target: -0.223,	output: -0.105,	loss: 0.014
i: 511,	target: -0.109,	output: -0.105,	loss: 0.000
i: 512,	target: -0.052,	output: -0.054,	loss: 0.000
i: 513,	target: 0.047,	output: 0.012,	loss: 0.001
i: 514,	target: -0.011,	output: 0.037,	loss: 0.002
i: 515,	target: -0.068,	output: -0.078,	loss: 0.000
i: 516,	target: -0.052,	output: -0.010,	loss: 0.002
i: 517,	target: 0.035,	output: 0.058,	loss: 0.001
i: 518,	target: -0.043,	output: -0.105,	loss: 0.004
i: 519,	target: -0.142,	output: -0.105,	loss: 0.001
i: 520,	target: -0.042,	output: -0.026,	loss: 0.000
i: 521,	target: -0.220,	output: -0.105,	loss: 0.013
i: 522,	target: -0.126,	output: -0.105,	loss: 0.000
i: 523,	target: -0.069,	output: -0.051,	loss: 0.000
i: 524,	target: -0.100,	output: -0.070,	loss: 0.001
i: 525,	target: -0.045,	output: 0.026,	loss: 0.005
i: 526,	target: -0.018,	output: -0.011,	loss: 0.000
i: 527,	target: -0.187,	output: -0.105,	loss: 0.007
i: 528,	target: -0.092,	output: -0.105,	loss: 0.000
i: 529,	target: -0.103,	output: -0.086,	loss: 0.000
i: 530,	target: -0.071,	output: -0.021,	loss: 0.003
i: 531,	target: -0.048,	output: 0.036,	loss: 0.007
i: 532,	target: -0.226,	output: -0.105,	loss: 0.015
i: 533,	target: -0.079,	output: -0.105,	loss: 0.001
i: 534,	target: -0.211,	output: -0.105,	loss: 0.011

i: 535,	target: -0.141,	output: -0.105,	loss: 0.001
i: 536,	target: -0.041,	output: 0.102,	loss: 0.020
i: 537,	target: -0.047,	output: 0.013,	loss: 0.004
i: 538,	target: -0.197,	output: -0.105,	loss: 0.008
i: 539,	target: -0.151,	output: -0.105,	loss: 0.002
i: 540,	target: -0.142,	output: -0.105,	loss: 0.001
i: 541,	target: -0.064,	output: -0.105,	loss: 0.002
i: 542,	target: -0.003,	output: 0.079,	loss: 0.007
i: 543,	target: -0.084,	output: -0.062,	loss: 0.000
i: 544,	target: -0.017,	output: -0.086,	loss: 0.005
i: 545,	target: -0.101,	output: -0.069,	loss: 0.001
i: 546,	target: -0.091,	output: -0.028,	loss: 0.004
i: 547,	target: -0.111,	output: -0.059,	loss: 0.003
i: 548,	target: -0.076,	output: -0.059,	loss: 0.000
i: 549,	target: -0.058,	output: -0.008,	loss: 0.003
i: 550,	target: -0.118,	output: -0.105,	loss: 0.000
i: 551,	target: -0.131,	output: -0.090,	loss: 0.002
i: 552,	target: -0.107,	output: -0.055,	loss: 0.003
i: 553,	target: -0.194,	output: -0.105,	loss: 0.008
i: 554,	target: -0.123,	output: -0.094,	loss: 0.001
i: 555,	target: 0.897,	output: 0.884,	loss: 0.000
i: 556,	target: -0.106,	output: -0.105,	loss: 0.000
i: 557,	target: -0.189,	output: -0.105,	loss: 0.007
i: 558,	target: -0.092,	output: -0.105,	loss: 0.000
i: 559,	target: -0.010,	output: 0.057,	loss: 0.005
i: 560,	target: -0.077,	output: -0.015,	loss: 0.004
i: 561,	target: -0.091,	output: -0.105,	loss: 0.000
i: 562,	target: -0.073,	output: -0.007,	loss: 0.004
i: 563,	target: -0.139,	output: -0.105,	loss: 0.001
i: 564,	target: -0.045,	output: 0.038,	loss: 0.007
i: 565,	target: -0.092,	output: -0.057,	loss: 0.001
i: 566,	target: -0.057,	output: -0.105,	loss: 0.002
i: 567,	target: -0.150,	output: -0.105,	loss: 0.002
i: 568,	target: -0.143,	output: -0.102,	loss: 0.002
i: 569,	target: -0.125,	output: -0.105,	loss: 0.000
i: 570,	target: -0.054,	output: -0.021,	loss: 0.001
i: 571,	target: 0.004,	output: 0.043,	loss: 0.001
i: 572,	target: -0.079,	output: -0.021,	loss: 0.003
i: 573,	target: -0.135,	output: -0.105,	loss: 0.001
i: 574,	target: -0.054,	output: -0.103,	loss: 0.002
i: 575,	target: -0.082,	output: -0.086,	loss: 0.000
i: 576,	target: -0.072,	output: -0.105,	loss: 0.001
i: 577,	target: -0.060,	output: -0.103,	loss: 0.002
i: 578,	target: -0.066,	output: -0.105,	loss: 0.002
i: 579,	target: -0.041,	output: -0.083,	loss: 0.002
i: 580,	target: -0.152,	output: -0.105,	loss: 0.002
i: 581,	target: -0.070,	output: -0.003,	loss: 0.004
i: 582,	target: -0.063,	output: 0.031,	loss: 0.009

i: 583,	target: -0.156,	output: -0.105,	loss: 0.003
i: 584,	target: -0.074,	output: -0.105,	loss: 0.001
i: 585,	target: -0.042,	output: -0.051,	loss: 0.000
i: 586,	target: -0.150,	output: -0.105,	loss: 0.002
i: 587,	target: -0.078,	output: -0.105,	loss: 0.001
i: 588,	target: -0.060,	output: -0.105,	loss: 0.002
i: 589,	target: 0.933,	output: 0.930,	loss: 0.000
i: 590,	target: -0.039,	output: -0.045,	loss: 0.000
i: 591,	target: 0.006,	output: 0.101,	loss: 0.009
i: 592,	target: -0.154,	output: -0.105,	loss: 0.002
i: 593,	target: -0.054,	output: -0.016,	loss: 0.001
i: 594,	target: -0.107,	output: -0.086,	loss: 0.000
i: 595,	target: -0.087,	output: -0.100,	loss: 0.000
i: 596,	target: -0.106,	output: -0.105,	loss: 0.000
i: 597,	target: -0.111,	output: -0.105,	loss: 0.000
i: 598,	target: -0.035,	output: -0.092,	loss: 0.003
i: 599,	target: -0.156,	output: -0.105,	loss: 0.003
i: 600,	target: -0.041,	output: -0.027,	loss: 0.000
i: 601,	target: -0.053,	output: -0.103,	loss: 0.002
i: 602,	target: -0.132,	output: -0.105,	loss: 0.001
i: 603,	target: -0.102,	output: -0.105,	loss: 0.000
i: 604,	target: -0.009,	output: -0.022,	loss: 0.000
i: 605,	target: -0.125,	output: -0.105,	loss: 0.000
i: 606,	target: -0.050,	output: -0.032,	loss: 0.000
i: 607,	target: -0.097,	output: -0.038,	loss: 0.003
i: 608,	target: -0.203,	output: -0.105,	loss: 0.009
i: 609,	target: -0.226,	output: -0.105,	loss: 0.015
i: 610,	target: -0.093,	output: -0.105,	loss: 0.000
i: 611,	target: 0.976,	output: 0.938,	loss: 0.001
i: 612,	target: -0.121,	output: -0.105,	loss: 0.000
i: 613,	target: -0.086,	output: -0.016,	loss: 0.005
i: 614,	target: -0.072,	output: -0.105,	loss: 0.001
i: 615,	target: -0.099,	output: -0.105,	loss: 0.000
i: 616,	target: -0.047,	output: 0.003,	loss: 0.002
i: 617,	target: -0.048,	output: 0.042,	loss: 0.008
i: 618,	target: -0.124,	output: -0.105,	loss: 0.000
i: 619,	target: -0.120,	output: -0.105,	loss: 0.000
i: 620,	target: -0.140,	output: -0.105,	loss: 0.001
i: 621,	target: -0.162,	output: -0.105,	loss: 0.003
i: 622,	target: -0.067,	output: -0.105,	loss: 0.001
i: 623,	target: -0.106,	output: -0.095,	loss: 0.000
i: 624,	target: -0.101,	output: -0.105,	loss: 0.000
i: 625,	target: -0.045,	output: -0.014,	loss: 0.001
i: 626,	target: -0.121,	output: -0.105,	loss: 0.000
i: 627,	target: -0.106,	output: -0.061,	loss: 0.002
i: 628,	target: -0.076,	output: -0.019,	loss: 0.003
i: 629,	target: -0.095,	output: -0.065,	loss: 0.001
i: 630,	target: -0.037,	output: -0.077,	loss: 0.002

i: 631,	target: -0.129,	output: -0.105,	loss: 0.001
i: 632,	target: -0.124,	output: -0.105,	loss: 0.000
i: 633,	target: -0.055,	output: -0.086,	loss: 0.001
i: 634,	target: -0.104,	output: -0.105,	loss: 0.000
i: 635,	target: -0.112,	output: -0.105,	loss: 0.000
i: 636,	target: -0.125,	output: -0.105,	loss: 0.000
i: 637,	target: -0.144,	output: -0.105,	loss: 0.002
i: 638,	target: -0.154,	output: -0.105,	loss: 0.002
i: 639,	target: -0.130,	output: -0.056,	loss: 0.005
i: 640,	target: 0.055,	output: 0.064,	loss: 0.000
i: 641,	target: -0.059,	output: -0.013,	loss: 0.002
i: 642,	target: -0.154,	output: -0.105,	loss: 0.002
i: 643,	target: -0.073,	output: -0.105,	loss: 0.001
i: 644,	target: -0.138,	output: -0.105,	loss: 0.001
i: 645,	target: -0.025,	output: 0.071,	loss: 0.009
i: 646,	target: -0.059,	output: -0.105,	loss: 0.002
i: 647,	target: -0.124,	output: -0.105,	loss: 0.000
i: 648,	target: -0.165,	output: -0.105,	loss: 0.004
i: 649,	target: -0.108,	output: -0.100,	loss: 0.000
i: 650,	target: -0.048,	output: -0.050,	loss: 0.000
i: 651,	target: -0.097,	output: -0.105,	loss: 0.000
i: 652,	target: -0.098,	output: -0.105,	loss: 0.000
i: 653,	target: -0.110,	output: -0.105,	loss: 0.000
i: 654,	target: -0.143,	output: -0.105,	loss: 0.001
i: 655,	target: -0.066,	output: -0.105,	loss: 0.002
i: 656,	target: -0.090,	output: 0.033,	loss: 0.015
i: 657,	target: -0.029,	output: 0.017,	loss: 0.002
i: 658,	target: -0.184,	output: -0.105,	loss: 0.006
i: 659,	target: -0.063,	output: -0.105,	loss: 0.002
i: 660,	target: -0.064,	output: -0.045,	loss: 0.000
i: 661,	target: -0.137,	output: -0.105,	loss: 0.001
i: 662,	target: -0.114,	output: -0.105,	loss: 0.000
i: 663,	target: -0.043,	output: -0.105,	loss: 0.004
i: 664,	target: -0.047,	output: -0.031,	loss: 0.000
i: 665,	target: -0.083,	output: -0.105,	loss: 0.001
i: 666,	target: -0.125,	output: -0.102,	loss: 0.001
i: 667,	target: -0.043,	output: 0.010,	loss: 0.003
i: 668,	target: -0.117,	output: -0.105,	loss: 0.000
i: 669,	target: -0.071,	output: -0.070,	loss: 0.000
i: 670,	target: -0.191,	output: -0.105,	loss: 0.007
i: 671,	target: -0.104,	output: -0.105,	loss: 0.000
i: 672,	target: -0.064,	output: 0.017,	loss: 0.007
i: 673,	target: -0.038,	output: -0.045,	loss: 0.000
i: 674,	target: -0.122,	output: -0.105,	loss: 0.000
i: 675,	target: -0.055,	output: -0.038,	loss: 0.000
i: 676,	target: -0.073,	output: -0.105,	loss: 0.001
i: 677,	target: -0.136,	output: -0.105,	loss: 0.001
i: 678,	target: 0.844,	output: 0.860,	loss: 0.000

i: 679,	target: -0.105,	output: -0.103,	loss: 0.000
i: 680,	target: -0.056,	output: -0.105,	loss: 0.002
i: 681,	target: -0.064,	output: -0.105,	loss: 0.002
i: 682,	target: -0.086,	output: -0.105,	loss: 0.000
i: 683,	target: -0.086,	output: -0.045,	loss: 0.002
i: 684,	target: -0.184,	output: -0.105,	loss: 0.006
i: 685,	target: -0.079,	output: -0.105,	loss: 0.001
i: 686,	target: -0.093,	output: -0.076,	loss: 0.000
i: 687,	target: -0.117,	output: -0.105,	loss: 0.000
i: 688,	target: -0.134,	output: -0.105,	loss: 0.001
i: 689,	target: 0.885,	output: 0.896,	loss: 0.000
i: 690,	target: -0.159,	output: -0.105,	loss: 0.003
i: 691,	target: -0.055,	output: 0.029,	loss: 0.007
i: 692,	target: -0.148,	output: -0.105,	loss: 0.002
i: 693,	target: -0.211,	output: -0.105,	loss: 0.011
i: 694,	target: -0.087,	output: -0.105,	loss: 0.000
i: 695,	target: -0.045,	output: -0.078,	loss: 0.001
i: 696,	target: -0.208,	output: -0.105,	loss: 0.011
i: 697,	target: -0.085,	output: -0.105,	loss: 0.000
i: 698,	target: -0.114,	output: -0.105,	loss: 0.000
i: 699,	target: -0.068,	output: -0.076,	loss: 0.000
i: 700,	target: -0.045,	output: -0.084,	loss: 0.001
i: 701,	target: 0.921,	output: 0.934,	loss: 0.000
i: 702,	target: -0.154,	output: -0.105,	loss: 0.002
i: 703,	target: -0.121,	output: -0.105,	loss: 0.000
i: 704,	target: -0.043,	output: -0.105,	loss: 0.004
i: 705,	target: -0.009,	output: -0.025,	loss: 0.000
i: 706,	target: -0.068,	output: -0.059,	loss: 0.000
i: 707,	target: -0.014,	output: 0.070,	loss: 0.007
i: 708,	target: -0.105,	output: -0.105,	loss: 0.000
i: 709,	target: -0.129,	output: -0.102,	loss: 0.001
i: 710,	target: -0.133,	output: -0.105,	loss: 0.001
i: 711,	target: 0.014,	output: 0.025,	loss: 0.000
i: 712,	target: -0.130,	output: -0.105,	loss: 0.001
i: 713,	target: -0.106,	output: -0.105,	loss: 0.000
i: 714,	target: -0.092,	output: -0.105,	loss: 0.000
i: 715,	target: -0.068,	output: -0.039,	loss: 0.001
i: 716,	target: -0.174,	output: -0.105,	loss: 0.005
i: 717,	target: -0.204,	output: -0.105,	loss: 0.010
i: 718,	target: -0.087,	output: 0.000,	loss: 0.008
i: 719,	target: -0.119,	output: -0.105,	loss: 0.000
i: 720,	target: -0.064,	output: -0.105,	loss: 0.002
i: 721,	target: -0.196,	output: -0.105,	loss: 0.008
i: 722,	target: -0.134,	output: -0.105,	loss: 0.001
i: 723,	target: -0.064,	output: -0.076,	loss: 0.000
i: 724,	target: -0.136,	output: -0.105,	loss: 0.001
i: 725,	target: -0.064,	output: -0.048,	loss: 0.000
i: 726,	target: 0.953,	output: 0.898,	loss: 0.003

i: 727,	target: -0.068,	output: -0.105,	loss: 0.001
i: 728,	target: -0.015,	output: 0.059,	loss: 0.005
i: 729,	target: -0.121,	output: -0.071,	loss: 0.002
i: 730,	target: -0.170,	output: -0.105,	loss: 0.004
i: 731,	target: -0.033,	output: -0.105,	loss: 0.005
i: 732,	target: -0.113,	output: -0.105,	loss: 0.000
i: 733,	target: -0.038,	output: 0.086,	loss: 0.015
i: 734,	target: -0.080,	output: -0.070,	loss: 0.000
i: 735,	target: 0.009,	output: 0.075,	loss: 0.004
i: 736,	target: -0.211,	output: -0.105,	loss: 0.011
i: 737,	target: -0.091,	output: -0.105,	loss: 0.000
i: 738,	target: -0.077,	output: -0.105,	loss: 0.001
i: 739,	target: -0.067,	output: -0.054,	loss: 0.000
i: 740,	target: -0.033,	output: -0.027,	loss: 0.000
i: 741,	target: -0.027,	output: -0.063,	loss: 0.001
i: 742,	target: -0.184,	output: -0.105,	loss: 0.006
i: 743,	target: -0.061,	output: -0.105,	loss: 0.002
i: 744,	target: 0.005,	output: 0.108,	loss: 0.011
i: 745,	target: -0.079,	output: -0.105,	loss: 0.001
i: 746,	target: -0.064,	output: -0.047,	loss: 0.000
i: 747,	target: 0.017,	output: 0.068,	loss: 0.003
i: 748,	target: -0.029,	output: -0.058,	loss: 0.001
i: 749,	target: -0.061,	output: -0.024,	loss: 0.001
i: 750,	target: -0.078,	output: -0.096,	loss: 0.000
i: 751,	target: -0.067,	output: -0.024,	loss: 0.002
i: 752,	target: -0.069,	output: -0.105,	loss: 0.001
i: 753,	target: -0.158,	output: -0.105,	loss: 0.003
i: 754,	target: -0.115,	output: -0.105,	loss: 0.000
i: 755,	target: -0.034,	output: 0.026,	loss: 0.004
i: 756,	target: -0.080,	output: -0.105,	loss: 0.001
i: 757,	target: -0.072,	output: -0.101,	loss: 0.001
i: 758,	target: 0.947,	output: 0.953,	loss: 0.000
i: 759,	target: -0.089,	output: -0.105,	loss: 0.000
i: 760,	target: 0.133,	output: -0.057,	loss: 0.036
i: 761,	target: -0.116,	output: -0.105,	loss: 0.000
i: 762,	target: -0.124,	output: -0.105,	loss: 0.000
i: 763,	target: -0.189,	output: -0.105,	loss: 0.007
i: 764,	target: -0.178,	output: -0.104,	loss: 0.005
i: 765,	target: -0.099,	output: -0.001,	loss: 0.010
i: 766,	target: -0.024,	output: -0.030,	loss: 0.000
i: 767,	target: -0.043,	output: 0.007,	loss: 0.003
i: 768,	target: -0.058,	output: -0.105,	loss: 0.002
i: 769,	target: -0.074,	output: -0.105,	loss: 0.001
i: 770,	target: -0.126,	output: -0.105,	loss: 0.000
i: 771,	target: -0.046,	output: -0.105,	loss: 0.004
i: 772,	target: 0.900,	output: 0.936,	loss: 0.001
i: 773,	target: -0.076,	output: -0.105,	loss: 0.001
i: 774,	target: 0.007,	output: -0.011,	loss: 0.000



i: 775,	target: -0.136,	output: -0.105,	loss: 0.001
i: 776,	target: -0.027,	output: -0.036,	loss: 0.000
i: 777,	target: 0.010,	output: 0.012,	loss: 0.000
i: 778,	target: 0.949,	output: 0.945,	loss: 0.000
i: 779,	target: -0.041,	output: -0.039,	loss: 0.000
i: 780,	target: -0.051,	output: -0.060,	loss: 0.000
i: 781,	target: 0.069,	output: 0.101,	loss: 0.001
i: 782,	target: -0.044,	output: -0.105,	loss: 0.004
i: 783,	target: -0.054,	output: -0.057,	loss: 0.000
i: 784,	target: -0.045,	output: -0.036,	loss: 0.000
i: 785,	target: -0.056,	output: -0.081,	loss: 0.001
i: 786,	target: -0.071,	output: -0.105,	loss: 0.001
i: 787,	target: -0.106,	output: -0.105,	loss: 0.000
i: 788,	target: -0.066,	output: -0.105,	loss: 0.002
i: 789,	target: -0.057,	output: -0.105,	loss: 0.002
i: 790,	target: -0.056,	output: 0.006,	loss: 0.004
i: 791,	target: -0.086,	output: -0.105,	loss: 0.000
i: 792,	target: -0.078,	output: -0.073,	loss: 0.000
i: 793,	target: -0.120,	output: -0.105,	loss: 0.000
i: 794,	target: -0.108,	output: -0.105,	loss: 0.000
i: 795,	target: -0.053,	output: -0.003,	loss: 0.003
i: 796,	target: -0.215,	output: -0.105,	loss: 0.012
i: 797,	target: -0.062,	output: -0.105,	loss: 0.002
i: 798,	target: -0.141,	output: -0.105,	loss: 0.001
i: 799,	target: -0.048,	output: -0.046,	loss: 0.000
i: 800,	target: 0.002,	output: -0.002,	loss: 0.000
i: 801,	target: -0.172,	output: -0.105,	loss: 0.004
i: 802,	target: -0.025,	output: 0.018,	loss: 0.002
i: 803,	target: -0.072,	output: -0.105,	loss: 0.001
i: 804,	target: -0.060,	output: -0.056,	loss: 0.000
i: 805,	target: -0.112,	output: -0.103,	loss: 0.000
i: 806,	target: 0.932,	output: 0.912,	loss: 0.000
i: 807,	target: -0.054,	output: -0.105,	loss: 0.003
i: 808,	target: -0.094,	output: -0.029,	loss: 0.004
i: 809,	target: -0.047,	output: -0.026,	loss: 0.000
i: 810,	target: -0.164,	output: -0.105,	loss: 0.003
i: 811,	target: -0.106,	output: -0.105,	loss: 0.000
i: 812,	target: -0.195,	output: -0.105,	loss: 0.008
i: 813,	target: -0.119,	output: -0.105,	loss: 0.000
i: 814,	target: -0.070,	output: -0.105,	loss: 0.001
i: 815,	target: -0.050,	output: -0.089,	loss: 0.002
i: 816,	target: -0.181,	output: -0.105,	loss: 0.006
i: 817,	target: -0.134,	output: -0.105,	loss: 0.001
i: 818,	target: -0.068,	output: -0.057,	loss: 0.000
i: 819,	target: -0.217,	output: -0.105,	loss: 0.012
i: 820,	target: -0.124,	output: -0.105,	loss: 0.000
i: 821,	target: -0.118,	output: -0.105,	loss: 0.000
i: 822,	target: -0.081,	output: -0.105,	loss: 0.001

i: 823,	target: -0.078,	output: -0.075,	loss: 0.000
i: 824,	target: -0.116,	output: -0.105,	loss: 0.000
i: 825,	target: -0.161,	output: -0.105,	loss: 0.003
i: 826,	target: -0.069,	output: -0.105,	loss: 0.001
i: 827,	target: -0.067,	output: -0.072,	loss: 0.000
i: 828,	target: -0.075,	output: -0.105,	loss: 0.001
i: 829,	target: -0.086,	output: -0.105,	loss: 0.000
i: 830,	target: -0.106,	output: -0.082,	loss: 0.001
i: 831,	target: -0.048,	output: 0.084,	loss: 0.017
i: 832,	target: -0.210,	output: -0.105,	loss: 0.011
i: 833,	target: -0.150,	output: -0.105,	loss: 0.002
i: 834,	target: -0.084,	output: -0.059,	loss: 0.001
i: 835,	target: -0.036,	output: 0.005,	loss: 0.002
i: 836,	target: -0.081,	output: -0.039,	loss: 0.002
i: 837,	target: -0.014,	output: 0.064,	loss: 0.006
i: 838,	target: -0.123,	output: -0.105,	loss: 0.000
i: 839,	target: -0.061,	output: -0.100,	loss: 0.002
i: 840,	target: -0.199,	output: -0.105,	loss: 0.009
i: 841,	target: -0.061,	output: -0.102,	loss: 0.002
i: 842,	target: -0.076,	output: -0.082,	loss: 0.000
i: 843,	target: -0.108,	output: -0.105,	loss: 0.000
i: 844,	target: 0.052,	output: 0.069,	loss: 0.000
i: 845,	target: -0.131,	output: -0.105,	loss: 0.001
i: 846,	target: -0.037,	output: -0.048,	loss: 0.000
i: 847,	target: -0.076,	output: -0.105,	loss: 0.001
i: 848,	target: -0.085,	output: -0.105,	loss: 0.000
i: 849,	target: -0.132,	output: -0.105,	loss: 0.001
i: 850,	target: -0.230,	output: -0.105,	loss: 0.015
i: 851,	target: -0.072,	output: -0.105,	loss: 0.001
i: 852,	target: -0.071,	output: -0.054,	loss: 0.000
i: 853,	target: -0.101,	output: -0.105,	loss: 0.000
i: 854,	target: -0.111,	output: -0.105,	loss: 0.000
i: 855,	target: -0.036,	output: -0.016,	loss: 0.000
i: 856,	target: -0.068,	output: -0.105,	loss: 0.001
i: 857,	target: 0.050,	output: 0.112,	loss: 0.004
i: 858,	target: -0.027,	output: -0.044,	loss: 0.000
i: 859,	target: -0.160,	output: -0.105,	loss: 0.003
i: 860,	target: -0.125,	output: -0.105,	loss: 0.000
i: 861,	target: -0.124,	output: -0.105,	loss: 0.000
i: 862,	target: -0.072,	output: -0.105,	loss: 0.001
i: 863,	target: -0.047,	output: -0.057,	loss: 0.000
i: 864,	target: -0.192,	output: -0.105,	loss: 0.008
i: 865,	target: -0.143,	output: -0.105,	loss: 0.001
i: 866,	target: -0.154,	output: -0.105,	loss: 0.002
i: 867,	target: -0.000,	output: 0.074,	loss: 0.006
i: 868,	target: -0.057,	output: -0.030,	loss: 0.001
i: 869,	target: -0.099,	output: -0.105,	loss: 0.000
i: 870,	target: -0.101,	output: -0.105,	loss: 0.000

i: 871,	target: -0.170,	output: -0.105,	loss: 0.004
i: 872,	target: -0.060,	output: -0.105,	loss: 0.002
i: 873,	target: -0.168,	output: -0.105,	loss: 0.004
i: 874,	target: -0.047,	output: -0.089,	loss: 0.002
i: 875,	target: -0.120,	output: -0.105,	loss: 0.000
i: 876,	target: -0.098,	output: -0.105,	loss: 0.000
i: 877,	target: -0.063,	output: 0.029,	loss: 0.009
i: 878,	target: -0.017,	output: -0.019,	loss: 0.000
i: 879,	target: -0.119,	output: -0.105,	loss: 0.000
i: 880,	target: -0.044,	output: -0.045,	loss: 0.000
i: 881,	target: -0.119,	output: -0.073,	loss: 0.002
i: 882,	target: -0.104,	output: -0.092,	loss: 0.000
i: 883,	target: -0.179,	output: -0.105,	loss: 0.005
i: 884,	target: 0.893,	output: 0.882,	loss: 0.000
i: 885,	target: -0.293,	output: -0.105,	loss: 0.035
i: 886,	target: -0.055,	output: -0.105,	loss: 0.003
i: 887,	target: 0.948,	output: 0.926,	loss: 0.000
i: 888,	target: -0.033,	output: -0.072,	loss: 0.002
i: 889,	target: -0.154,	output: -0.105,	loss: 0.002
i: 890,	target: -0.069,	output: -0.105,	loss: 0.001
i: 891,	target: -0.051,	output: -0.069,	loss: 0.000
i: 892,	target: -0.159,	output: -0.053,	loss: 0.011
i: 893,	target: -0.034,	output: -0.086,	loss: 0.003
i: 894,	target: -0.080,	output: -0.105,	loss: 0.001
i: 895,	target: -0.079,	output: -0.037,	loss: 0.002
i: 896,	target: -0.064,	output: -0.105,	loss: 0.002
i: 897,	target: -0.215,	output: -0.105,	loss: 0.012
i: 898,	target: -0.078,	output: -0.105,	loss: 0.001
i: 899,	target: -0.001,	output: 0.041,	loss: 0.002
i: 900,	target: -0.158,	output: -0.094,	loss: 0.004
i: 901,	target: -0.118,	output: -0.105,	loss: 0.000
i: 902,	target: -0.101,	output: -0.105,	loss: 0.000
i: 903,	target: -0.095,	output: -0.103,	loss: 0.000
i: 904,	target: -0.160,	output: -0.105,	loss: 0.003
i: 905,	target: -0.029,	output: -0.050,	loss: 0.000
i: 906,	target: -0.058,	output: -0.048,	loss: 0.000
i: 907,	target: -0.102,	output: -0.105,	loss: 0.000
i: 908,	target: 0.888,	output: 0.910,	loss: 0.001
i: 909,	target: -0.124,	output: -0.105,	loss: 0.000
i: 910,	target: -0.102,	output: -0.074,	loss: 0.001
i: 911,	target: -0.157,	output: -0.105,	loss: 0.003
i: 912,	target: -0.197,	output: -0.105,	loss: 0.008
i: 913,	target: -0.189,	output: -0.105,	loss: 0.007
i: 914,	target: -0.054,	output: -0.021,	loss: 0.001
i: 915,	target: -0.122,	output: -0.099,	loss: 0.001
i: 916,	target: -0.128,	output: -0.105,	loss: 0.000
i: 917,	target: -0.060,	output: -0.105,	loss: 0.002
i: 918,	target: -0.259,	output: -0.105,	loss: 0.024

i: 919,	target: -0.215,	output: -0.105,	loss: 0.012
i: 920,	target: -0.081,	output: -0.083,	loss: 0.000
i: 921,	target: -0.083,	output: -0.077,	loss: 0.000
i: 922,	target: -0.080,	output: 0.010,	loss: 0.008
i: 923,	target: -0.143,	output: -0.105,	loss: 0.001
i: 924,	target: -0.074,	output: -0.105,	loss: 0.001
i: 925,	target: -0.046,	output: -0.015,	loss: 0.001
i: 926,	target: -0.143,	output: -0.105,	loss: 0.001
i: 927,	target: -0.073,	output: -0.105,	loss: 0.001
i: 928,	target: -0.069,	output: -0.105,	loss: 0.001
i: 929,	target: -0.063,	output: -0.105,	loss: 0.002
i: 930,	target: -0.149,	output: -0.105,	loss: 0.002
i: 931,	target: -0.181,	output: -0.105,	loss: 0.006
i: 932,	target: -0.040,	output: -0.019,	loss: 0.000
i: 933,	target: -0.106,	output: -0.105,	loss: 0.000
i: 934,	target: -0.094,	output: -0.043,	loss: 0.003
i: 935,	target: -0.018,	output: -0.010,	loss: 0.000
i: 936,	target: -0.037,	output: 0.022,	loss: 0.003
i: 937,	target: -0.106,	output: -0.102,	loss: 0.000
i: 938,	target: 0.044,	output: 0.131,	loss: 0.008
i: 939,	target: -0.207,	output: -0.105,	loss: 0.010
i: 940,	target: 0.904,	output: 0.885,	loss: 0.000
i: 941,	target: -0.113,	output: -0.105,	loss: 0.000
i: 942,	target: -0.207,	output: -0.105,	loss: 0.010
i: 943,	target: -0.099,	output: -0.105,	loss: 0.000
i: 944,	target: 0.895,	output: 0.921,	loss: 0.001
i: 945,	target: -0.086,	output: -0.095,	loss: 0.000
i: 946,	target: -0.051,	output: -0.099,	loss: 0.002
i: 947,	target: -0.134,	output: -0.105,	loss: 0.001
i: 948,	target: -0.081,	output: -0.105,	loss: 0.001
i: 949,	target: -0.206,	output: -0.105,	loss: 0.010
i: 950,	target: -0.159,	output: -0.105,	loss: 0.003
i: 951,	target: -0.059,	output: -0.105,	loss: 0.002
i: 952,	target: -0.132,	output: -0.105,	loss: 0.001
i: 953,	target: 0.889,	output: 0.937,	loss: 0.002
i: 954,	target: -0.044,	output: -0.098,	loss: 0.003
i: 955,	target: -0.054,	output: -0.105,	loss: 0.003
i: 956,	target: -0.072,	output: -0.080,	loss: 0.000
i: 957,	target: -0.075,	output: -0.076,	loss: 0.000
i: 958,	target: -0.061,	output: -0.056,	loss: 0.000
i: 959,	target: -0.138,	output: -0.105,	loss: 0.001
i: 960,	target: -0.098,	output: -0.074,	loss: 0.001
i: 961,	target: -0.038,	output: -0.006,	loss: 0.001
i: 962,	target: -0.129,	output: -0.105,	loss: 0.001
i: 963,	target: -0.092,	output: -0.059,	loss: 0.001
i: 964,	target: -0.086,	output: -0.105,	loss: 0.000
i: 965,	target: -0.139,	output: -0.105,	loss: 0.001
i: 966,	target: 0.014,	output: 0.073,	loss: 0.004

i: 967,	target: -0.060,	output: 0.005,	loss: 0.004
i: 968,	target: -0.053,	output: -0.074,	loss: 0.000
i: 969,	target: -0.041,	output: -0.027,	loss: 0.000
i: 970,	target: -0.039,	output: -0.004,	loss: 0.001
i: 971,	target: 0.881,	output: 0.932,	loss: 0.003
i: 972,	target: -0.093,	output: -0.105,	loss: 0.000
i: 973,	target: -0.042,	output: -0.092,	loss: 0.003
i: 974,	target: 0.048,	output: 0.126,	loss: 0.006
i: 975,	target: -0.132,	output: -0.102,	loss: 0.001
i: 976,	target: -0.209,	output: -0.105,	loss: 0.011
i: 977,	target: -0.010,	output: 0.083,	loss: 0.009
i: 978,	target: -0.129,	output: -0.068,	loss: 0.004
i: 979,	target: -0.038,	output: 0.030,	loss: 0.005
i: 980,	target: -0.046,	output: -0.053,	loss: 0.000
i: 981,	target: -0.194,	output: -0.105,	loss: 0.008
i: 982,	target: -0.090,	output: -0.065,	loss: 0.001
i: 983,	target: -0.087,	output: -0.095,	loss: 0.000
i: 984,	target: -0.050,	output: 0.027,	loss: 0.006
i: 985,	target: -0.070,	output: -0.028,	loss: 0.002
i: 986,	target: -0.071,	output: -0.080,	loss: 0.000
i: 987,	target: -0.071,	output: -0.045,	loss: 0.001
i: 988,	target: -0.050,	output: -0.105,	loss: 0.003
i: 989,	target: -0.070,	output: -0.041,	loss: 0.001
i: 990,	target: -0.160,	output: -0.105,	loss: 0.003
i: 991,	target: -0.019,	output: 0.088,	loss: 0.011
i: 992,	target: -0.115,	output: -0.105,	loss: 0.000
i: 993,	target: -0.218,	output: -0.105,	loss: 0.013
i: 994,	target: -0.140,	output: -0.089,	loss: 0.003
i: 995,	target: 0.044,	output: 0.027,	loss: 0.000
i: 996,	target: -0.167,	output: -0.105,	loss: 0.004
i: 997,	target: -0.038,	output: -0.056,	loss: 0.000
i: 998,	target: -0.074,	output: -0.105,	loss: 0.001
i: 999,	target: -0.076,	output: -0.038,	loss: 0.001

Average loss: 0.003

## 4 Save the Notebook as a PDF

```
[27]: import subprocess
import os

name_notebook = "0726-small_hybrid_model_1q_measurement.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/0726/0726-small\_hybrid\_model\_1q\_measurement\_0.pdf already exists

Trying to save the file as

results/0726/0726-small\_hybrid\_model\_1q\_measurement\_1.pdf

```

[27]: CompletedProcess(args=['jupyter', 'nbconvert', '--to', 'pdf', '--output',
'results/0726/0726-small_hybrid_model_1q_measurement_1.pdf',
'0726-small_hybrid_model_1q_measurement.ipynb'], returncode=0)

```