

```

import torch
import torch.nn.functional as F
import torch.nn as nn
import torch.optim as optim
from torch.utils.data import DataLoader
from torch.utils.data import sampler
import torchvision.datasets as dset
import torchvision.transforms as T
import numpy as np

from google.colab import drive
drive.mount('/content/gdrive/', force_remount=True)

import sys
sys.path.insert(0, '/content/gdrive/My Drive/Colab Notebooks')

## Loss function and efficiency metrics are already provided to you.
from project_utilities import Loss
from project_utilities import efficiency
from project_utilities import ValueSet

Mounted at /content/gdrive/

DEVICE = torch.device('cuda:0' if torch.cuda.is_available() else
'cpu')

from sklearn.model_selection import train_test_split
train_set_idx, val_set_idx = train_test_split(list(range(1,3)),
test_size=1)

print(train_set_idx)
print(val_set_idx)

[1]
[2]

%cd /content/gdrive/MyDrive/Project/data

/content/gdrive/MyDrive/Project/data

%ls

bi_rnn.pt          Set_1.npz    Set_36.npz    Set_52.npz
Set_69.npz
linear.pt          Set_20.npz   Set_37.npz    Set_53.npz    Set_6.npz
RCNN_h64_l3_loss0351.pt Set_21.npz   Set_38.npz    Set_54.npz
Set_70.npz
RCNN_h64_l3_loss0356.pt Set_22.npz   Set_39.npz    Set_55.npz
Set_71.npz
RCNN_h64_l3.pt     Set_23.npz   Set_3.npz     Set_56.npz
Set_72.npz
RCNN.pt            Set_24.npz   Set_40.npz    Set_57.npz

```

Set_73.npz				
res_cnn.pt	Set_25.npz	Set_41.npz	Set_58.npz	
Set_74.npz				
RNN.pt	Set_26.npz	Set_42.npz	Set_59.npz	
Set_75.npz				
Set_10.npz	Set_27.npz	Set_43.npz	Set_5.npz	
Set_76.npz				
Set_11.npz	Set_28.npz	Set_44.npz	Set_60.npz	
Set_77.npz				
Set_12.npz	Set_29.npz	Set_45.npz	Set_61.npz	
Set_78.npz				
Set_13.npz	Set_2.npz	Set_46.npz	Set_62.npz	
Set_79.npz				
Set_14.npz	Set_30.npz	Set_47.npz	Set_63.npz	Set_7.npz
Set_15.npz	Set_31.npz	Set_48.npz	Set_64.npz	
Set_80.npz				
Set_16.npz	Set_32.npz	Set_49.npz	Set_65.npz	Set_8.npz
Set_17.npz	Set_33.npz	Set_4.npz	Set_66.npz	Set_9.npz
Set_18.npz	Set_34.npz	Set_50.npz	Set_67.npz	
Set_19.npz	Set_35.npz	Set_51.npz	Set_68.npz	

```

class MyDataset(torch.utils.data.Dataset):
    def __init__(self, setID):
        'Initialization'
        npz_files_content = np.load("./Set_"+str(setID)+".npz")
        self.X_set = torch.tensor(npz_files_content['X'])
        self.y_set = torch.tensor(npz_files_content['y'])

        # sets all nans to 0.0
        self.y_set[self.y_set != self.y_set] = 0.0
        self.X_set[self.X_set != self.X_set] = 0.0
    def __len__(self):
        'Denotes the total number of samples'
        return len(self.y_set)
    def __getitem__(self, index):
        'Generates one sample of data'
        # Select sample
        X = self.X_set[index]
        y = self.y_set[index]
        return X, y

# Train loader
for setID in train_set_idx:
    train_set = MyDataset(setID)
    train_loader = torch.utils.data.DataLoader(train_set,
                                                batch_size=128,
                                                shuffle=True)

    print(setID)
    for X_train, y_train in train_loader:
        print(X_train.shape)

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    print(y_train.shape)
    #print(X_train.sum())
    #print(set(y_train.reshape(-1).numpy()))
    break

# Validation loader
for setID in val_set_idx:
    val_set = MyDataset(setID)
    val_loader = torch.utils.data.DataLoader(val_set,
                                              batch_size=128,
                                              shuffle=True)

    print(setID)
    for X_val, y_val in val_loader:
        print(X_val.shape)
        print(y_val.shape)
        break

2
torch.Size([128, 4, 4000])
torch.Size([128, 4000])
1
torch.Size([128, 4, 4000])
torch.Size([128, 4000])
3
torch.Size([128, 4, 4000])
torch.Size([128, 4000])

loss_model = Loss(0.00001)

# Once created this class object can be used in training and
validation.
computed_loss = loss_model.forward(X_train[1][1].squeeze(),
y_train[1])
print(computed_loss)

tensor(3.4393)

computed_loss = loss_model.forward(y_train[1], y_train[1])
print(computed_loss)

tensor(0.)

# Bidirectional recurrent neural network (many-to-many)
class BiRNN_2(nn.Module):
    def __init__(self, input_size, hidden_size, num_layers):
        super(BiRNN_2, self).__init__()
        self.hidden_size = hidden_size
        self.num_layers = num_layers
        self.lstm_1 = nn.LSTM(input_size, hidden_size, num_layers,
batch_first=True, bidirectional=True)
        self.lstm_2 = nn.LSTM(2*hidden_size, 1, 1, batch_first=True,

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bidirectional=True)

    def forward(self, x):
        x = torch.transpose(x, 2, 1)
        # x dim: [batch size, sentence length, feature dim]

        out, _ = self.lstm_1(x) # out: tensor of shape (batch_size,
seq_length, hidden_size*2)
        # output dim: [batch size, sentence length, hidden dim*2]
        # hidden dim: [2, batch size, hidden dim]

        out, _ = self.lstm_2(out)

        # average pooling
        out = (out[:, :, 0] + out[:, :, 1])/2

        return out.squeeze()

print(train_set_idx)
print(val_set_idx)

[2]
[1]

#####
##### Training and evaluation wrappers
#####

def train(model, num_epochs, learning_rate=0.01, seed=123,
batch_size=128):
    cost = []
    val_cost = []
    torch.manual_seed(seed)
    optimizer = torch.optim.Adam(model.parameters(), lr=learning_rate)

    for e in range(1,num_epochs):
        batch_num = 0

        for setID in train_set_idx:
            train_set = MyDataset(setID+1)
            train_generator = torch.utils.data.DataLoader(train_set,

batch_size=batch_size,

shuffle=True,
num_workers=4)

            print(setID)
            for X_train, y_train in train_generator:
                batch_num = batch_num + 1

                # move to DEVICE

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X_train = X_train.to(DEVICE)
y_train = y_train.to(DEVICE)

#### Compute outputs ####
yhat = model(X_train)
loss = loss_model.forward(yhat, y_train)
#### Reset gradients from previous iteration ####
optimizer.zero_grad()
#### Compute gradients ####
loss.backward()
#### Update weights ####
optimizer.step()
#### Logging ####
with torch.no_grad():
    if batch_num%20 == 0:
        yhat = model(X_train)
        curr_loss = loss_model.forward(yhat, y_train)
        print('Epoch ID: %d ' % e, end="")
        print(' Set ID: %d' % setID, end="")
        print(' Batch ID: %d' % batch_num, end="")
        print(' | Loss: %.5f' % curr_loss)
        cost.append(curr_loss)
        #loss_val, eff_rate, fp_rate = validate(model)
        #val_cost.append(loss_val)
    model.train()
return cost, val_cost

def validate(model):
    loss_val = []
    eff = ValueSet(0, 0, 0, 0)
    # switch to evaluate mode
    #model.to("cpu")
    model.eval()
    with torch.no_grad():
        for setID in val_set_idx:
            #val_set = MyDataset(setID+1)
            val_set = MyDataset(11)
            val_generator = torch.utils.data.DataLoader(val_set,
                                                         batch_size=64,
                                                         shuffle=True)

            #print(setID)
            for X_val, y_val in val_generator:
                # Forward pass
                X_val = X_val.to(DEVICE)
                y_val = y_val.to(DEVICE)
                val_outputs = model(X_val)
                loss_output = loss_model.forward(val_outputs, y_val)
                loss_val.append(loss_output)
                for label, output in zip(y_val.cpu().numpy(),
val_outputs.cpu().numpy()):

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        eff += efficiency(label, output, difference = 5.0,
                           threshold = 1e-2, integral_threshold
= 0.2,
                           min_width = 3)
    return sum(loss_val)/len(loss_val), eff.eff_rate, eff.fp_rate

lr=0.001, hidden_size=64, num_layers=2
model = BiRNN_2(input_size=4, hidden_size=64, num_layers=2)

model = model.to(DEVICE)

cost, val_cost = train(model,
                        num_epochs=50,
                        learning_rate=0.001,
                        seed=123, batch_size=64)

```

2

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/usr/local/lib/python3.7/dist-packages/torch/utils/data/
dataloader.py:566: UserWarning: This DataLoader will create 4 worker
processes in total. Our suggested max number of worker in current
system is 2, which is smaller than what this DataLoader is going to
create. Please be aware that excessive worker creation might get
DataLoader running slow or even freeze, lower the worker number to
avoid potential slowness/freeze if necessary.
  cpuset_checked))

```

```

Epoch ID: 1   Set ID: 2   Batch ID: 20 | Loss: 7.31354
Epoch ID: 1   Set ID: 2   Batch ID: 40 | Loss: 6.25006
Epoch ID: 1   Set ID: 2   Batch ID: 60 | Loss: 5.50404
2
Epoch ID: 2   Set ID: 2   Batch ID: 20 | Loss: 4.80804
Epoch ID: 2   Set ID: 2   Batch ID: 40 | Loss: 3.91202
Epoch ID: 2   Set ID: 2   Batch ID: 60 | Loss: 5.69607
2
Epoch ID: 3   Set ID: 2   Batch ID: 20 | Loss: 2.78602
Epoch ID: 3   Set ID: 2   Batch ID: 40 | Loss: 5.51241
Epoch ID: 3   Set ID: 2   Batch ID: 60 | Loss: 5.51254
2
Epoch ID: 4   Set ID: 2   Batch ID: 20 | Loss: 6.07438
Epoch ID: 4   Set ID: 2   Batch ID: 40 | Loss: 6.15560
Epoch ID: 4   Set ID: 2   Batch ID: 60 | Loss: 5.88686
2
Epoch ID: 5   Set ID: 2   Batch ID: 20 | Loss: 4.94265
Epoch ID: 5   Set ID: 2   Batch ID: 40 | Loss: 4.55936
Epoch ID: 5   Set ID: 2   Batch ID: 60 | Loss: 4.90506
2
Epoch ID: 6   Set ID: 2   Batch ID: 20 | Loss: 5.38878
Epoch ID: 6   Set ID: 2   Batch ID: 40 | Loss: 4.69331
Epoch ID: 6   Set ID: 2   Batch ID: 60 | Loss: 5.55689

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2

Epoch ID: 7 Set ID: 2 Batch ID: 20 | Loss: 5.33061

Epoch ID: 7 Set ID: 2 Batch ID: 40 | Loss: 4.47063

Epoch ID: 7 Set ID: 2 Batch ID: 60 | Loss: 5.47607

2

Epoch ID: 8 Set ID: 2 Batch ID: 20 | Loss: 5.12718

Epoch ID: 8 Set ID: 2 Batch ID: 40 | Loss: 4.65535

Epoch ID: 8 Set ID: 2 Batch ID: 60 | Loss: 5.13098

2

Epoch ID: 9 Set ID: 2 Batch ID: 20 | Loss: 4.93847

Epoch ID: 9 Set ID: 2 Batch ID: 40 | Loss: 4.37798

Epoch ID: 9 Set ID: 2 Batch ID: 60 | Loss: 5.17070

2

Epoch ID: 10 Set ID: 2 Batch ID: 20 | Loss: 4.59987

Epoch ID: 10 Set ID: 2 Batch ID: 40 | Loss: 4.10304

Epoch ID: 10 Set ID: 2 Batch ID: 60 | Loss: 5.15919

2

Epoch ID: 11 Set ID: 2 Batch ID: 20 | Loss: 4.41800

Epoch ID: 11 Set ID: 2 Batch ID: 40 | Loss: 3.98330

Epoch ID: 11 Set ID: 2 Batch ID: 60 | Loss: 5.01270

2

Epoch ID: 12 Set ID: 2 Batch ID: 20 | Loss: 4.27360

Epoch ID: 12 Set ID: 2 Batch ID: 40 | Loss: 3.89987

Epoch ID: 12 Set ID: 2 Batch ID: 60 | Loss: 4.82768

2

Epoch ID: 13 Set ID: 2 Batch ID: 20 | Loss: 4.17944

Epoch ID: 13 Set ID: 2 Batch ID: 40 | Loss: 3.82332

Epoch ID: 13 Set ID: 2 Batch ID: 60 | Loss: 4.58922

2

Epoch ID: 14 Set ID: 2 Batch ID: 20 | Loss: 3.96630

Epoch ID: 14 Set ID: 2 Batch ID: 40 | Loss: 3.89899

Epoch ID: 14 Set ID: 2 Batch ID: 60 | Loss: 4.34176

2

Epoch ID: 15 Set ID: 2 Batch ID: 20 | Loss: 3.92207

Epoch ID: 15 Set ID: 2 Batch ID: 40 | Loss: 3.66620

Epoch ID: 15 Set ID: 2 Batch ID: 60 | Loss: 4.24550

2

Epoch ID: 16 Set ID: 2 Batch ID: 20 | Loss: 2.64132

Epoch ID: 16 Set ID: 2 Batch ID: 40 | Loss: 2.51833

Epoch ID: 16 Set ID: 2 Batch ID: 60 | Loss: 3.91258

2

Epoch ID: 17 Set ID: 2 Batch ID: 20 | Loss: 1.56904

Epoch ID: 17 Set ID: 2 Batch ID: 40 | Loss: 2.71014

Epoch ID: 17 Set ID: 2 Batch ID: 60 | Loss: 2.49093

2

Epoch ID: 18 Set ID: 2 Batch ID: 20 | Loss: 2.85708

Epoch ID: 18 Set ID: 2 Batch ID: 40 | Loss: 0.97562

Epoch ID: 18 Set ID: 2 Batch ID: 60 | Loss: 2.82609

2

Epoch ID: 19 Set ID: 2 Batch ID: 20 | Loss: 0.58717

Epoch ID: 19	Set ID: 2	Batch ID: 40		Loss: 2.26066
Epoch ID: 19	Set ID: 2	Batch ID: 60		Loss: 1.40918
2				
Epoch ID: 20	Set ID: 2	Batch ID: 20		Loss: 1.62604
Epoch ID: 20	Set ID: 2	Batch ID: 40		Loss: 1.54839
Epoch ID: 20	Set ID: 2	Batch ID: 60		Loss: 2.08657
2				
Epoch ID: 21	Set ID: 2	Batch ID: 20		Loss: 0.73581
Epoch ID: 21	Set ID: 2	Batch ID: 40		Loss: 1.72859
Epoch ID: 21	Set ID: 2	Batch ID: 60		Loss: 1.34311
2				
Epoch ID: 22	Set ID: 2	Batch ID: 20		Loss: 0.69242
Epoch ID: 22	Set ID: 2	Batch ID: 40		Loss: 0.41384
Epoch ID: 22	Set ID: 2	Batch ID: 60		Loss: 0.53769
2				
Epoch ID: 23	Set ID: 2	Batch ID: 20		Loss: 0.66948
Epoch ID: 23	Set ID: 2	Batch ID: 40		Loss: 0.66905
Epoch ID: 23	Set ID: 2	Batch ID: 60		Loss: 0.43445
2				
Epoch ID: 24	Set ID: 2	Batch ID: 20		Loss: 1.17535
Epoch ID: 24	Set ID: 2	Batch ID: 40		Loss: 0.64785
Epoch ID: 24	Set ID: 2	Batch ID: 60		Loss: 0.35210
2				
Epoch ID: 25	Set ID: 2	Batch ID: 20		Loss: 0.43395
Epoch ID: 25	Set ID: 2	Batch ID: 40		Loss: 0.31616
Epoch ID: 25	Set ID: 2	Batch ID: 60		Loss: 1.40711
2				
Epoch ID: 26	Set ID: 2	Batch ID: 20		Loss: 0.62028
Epoch ID: 26	Set ID: 2	Batch ID: 40		Loss: 0.33947
Epoch ID: 26	Set ID: 2	Batch ID: 60		Loss: 0.36092
2				
Epoch ID: 27	Set ID: 2	Batch ID: 20		Loss: 0.46474
Epoch ID: 27	Set ID: 2	Batch ID: 40		Loss: 0.48800
Epoch ID: 27	Set ID: 2	Batch ID: 60		Loss: 0.54724
2				
Epoch ID: 28	Set ID: 2	Batch ID: 20		Loss: 0.25870
Epoch ID: 28	Set ID: 2	Batch ID: 40		Loss: 0.47138
Epoch ID: 28	Set ID: 2	Batch ID: 60		Loss: 0.38333
2				
Epoch ID: 29	Set ID: 2	Batch ID: 20		Loss: 0.24658
Epoch ID: 29	Set ID: 2	Batch ID: 40		Loss: 0.41864
Epoch ID: 29	Set ID: 2	Batch ID: 60		Loss: 0.43399
2				
Epoch ID: 30	Set ID: 2	Batch ID: 20		Loss: 0.25203
Epoch ID: 30	Set ID: 2	Batch ID: 40		Loss: 1.09367
Epoch ID: 30	Set ID: 2	Batch ID: 60		Loss: 0.71541
2				
Epoch ID: 31	Set ID: 2	Batch ID: 20		Loss: 1.02376
Epoch ID: 31	Set ID: 2	Batch ID: 40		Loss: 0.21930
Epoch ID: 31	Set ID: 2	Batch ID: 60		Loss: 0.21237

2

Epoch ID: 32	Set ID: 2	Batch ID: 20		Loss: 0.89806
Epoch ID: 32	Set ID: 2	Batch ID: 40		Loss: 0.19218
Epoch ID: 32	Set ID: 2	Batch ID: 60		Loss: 0.18586

2

Epoch ID: 33	Set ID: 2	Batch ID: 20		Loss: 0.20444
Epoch ID: 33	Set ID: 2	Batch ID: 40		Loss: 0.27004
Epoch ID: 33	Set ID: 2	Batch ID: 60		Loss: 0.74130

2

Epoch ID: 34	Set ID: 2	Batch ID: 20		Loss: 0.20127
Epoch ID: 34	Set ID: 2	Batch ID: 40		Loss: 0.26967
Epoch ID: 34	Set ID: 2	Batch ID: 60		Loss: 0.35967

2

Epoch ID: 35	Set ID: 2	Batch ID: 20		Loss: 0.35321
Epoch ID: 35	Set ID: 2	Batch ID: 40		Loss: 0.23958
Epoch ID: 35	Set ID: 2	Batch ID: 60		Loss: 0.35351

2

Epoch ID: 36	Set ID: 2	Batch ID: 20		Loss: 0.18924
Epoch ID: 36	Set ID: 2	Batch ID: 40		Loss: 0.17646
Epoch ID: 36	Set ID: 2	Batch ID: 60		Loss: 0.34248

2

Epoch ID: 37	Set ID: 2	Batch ID: 20		Loss: 0.25933
Epoch ID: 37	Set ID: 2	Batch ID: 40		Loss: 0.25947
Epoch ID: 37	Set ID: 2	Batch ID: 60		Loss: 0.22785

2

Epoch ID: 38	Set ID: 2	Batch ID: 20		Loss: 0.39014
Epoch ID: 38	Set ID: 2	Batch ID: 40		Loss: 0.18246
Epoch ID: 38	Set ID: 2	Batch ID: 60		Loss: 0.17014

2

Epoch ID: 39	Set ID: 2	Batch ID: 20		Loss: 0.21091
Epoch ID: 39	Set ID: 2	Batch ID: 40		Loss: 0.19175
Epoch ID: 39	Set ID: 2	Batch ID: 60		Loss: 0.20587

2

Epoch ID: 40	Set ID: 2	Batch ID: 20		Loss: 0.20024
Epoch ID: 40	Set ID: 2	Batch ID: 40		Loss: 0.25554
Epoch ID: 40	Set ID: 2	Batch ID: 60		Loss: 0.19754

2

Epoch ID: 41	Set ID: 2	Batch ID: 20		Loss: 0.17097
Epoch ID: 41	Set ID: 2	Batch ID: 40		Loss: 0.19763
Epoch ID: 41	Set ID: 2	Batch ID: 60		Loss: 0.17181

2

Epoch ID: 42	Set ID: 2	Batch ID: 20		Loss: 0.21076
Epoch ID: 42	Set ID: 2	Batch ID: 40		Loss: 0.15684
Epoch ID: 42	Set ID: 2	Batch ID: 60		Loss: 0.18923

2

Epoch ID: 43	Set ID: 2	Batch ID: 20		Loss: 0.15056
Epoch ID: 43	Set ID: 2	Batch ID: 40		Loss: 0.16595
Epoch ID: 43	Set ID: 2	Batch ID: 60		Loss: 0.14935

2

Epoch ID: 44	Set ID: 2	Batch ID: 20		Loss: 0.15444
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Epoch ID: 44    Set ID: 2  Batch ID: 40 | Loss: 0.16670
Epoch ID: 44    Set ID: 2  Batch ID: 60 | Loss: 0.55602
2
Epoch ID: 45    Set ID: 2  Batch ID: 20 | Loss: 0.16344
Epoch ID: 45    Set ID: 2  Batch ID: 40 | Loss: 0.16398
Epoch ID: 45    Set ID: 2  Batch ID: 60 | Loss: 0.15226
2
Epoch ID: 46    Set ID: 2  Batch ID: 20 | Loss: 0.17017
Epoch ID: 46    Set ID: 2  Batch ID: 40 | Loss: 0.18170
Epoch ID: 46    Set ID: 2  Batch ID: 60 | Loss: 0.13894
2
Epoch ID: 47    Set ID: 2  Batch ID: 20 | Loss: 0.19372
Epoch ID: 47    Set ID: 2  Batch ID: 40 | Loss: 0.17934
Epoch ID: 47    Set ID: 2  Batch ID: 60 | Loss: 0.31962
2
Epoch ID: 48    Set ID: 2  Batch ID: 20 | Loss: 0.19214
Epoch ID: 48    Set ID: 2  Batch ID: 40 | Loss: 0.21557
Epoch ID: 48    Set ID: 2  Batch ID: 60 | Loss: 0.29247
2
Epoch ID: 49    Set ID: 2  Batch ID: 20 | Loss: 0.17677
Epoch ID: 49    Set ID: 2  Batch ID: 40 | Loss: 0.12104
Epoch ID: 49    Set ID: 2  Batch ID: 60 | Loss: 0.13670

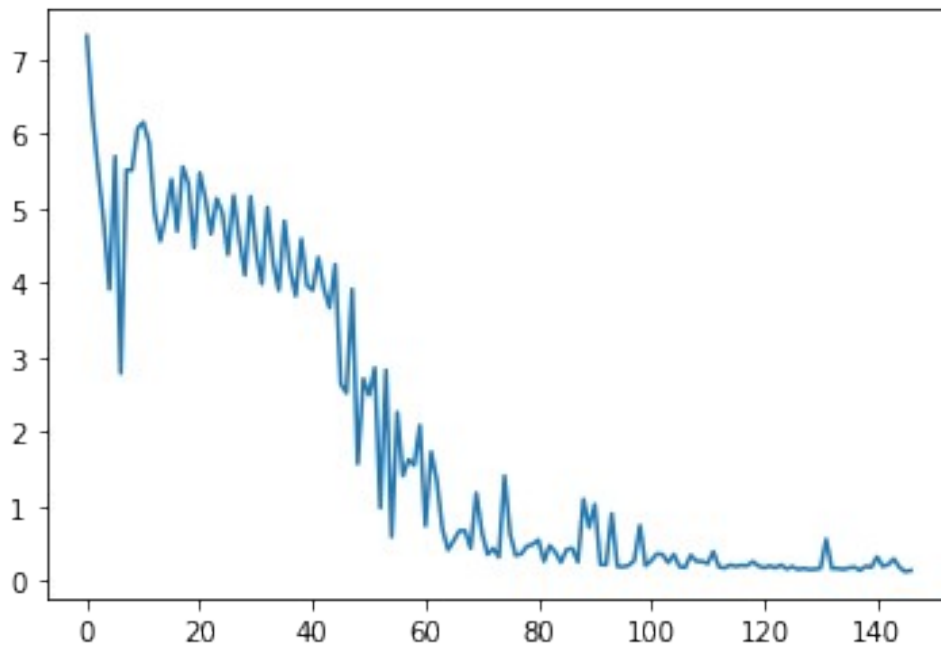
```

```

import matplotlib.pyplot as plt

cost = [c.to('cpu') for c in cost]
val_cost = [c.to('cpu') for c in val_cost]
plt.plot(cost)
#plt.plot(val_cost)
plt.show()

```



```

loss_val, eff_rate, fp_rate = validate(model)

print(f"Loss: {loss_val}")
print(f"Eff: {eff_rate}")
print(f"FP: {fp_rate}")

Loss: 0.14711976051330566
Eff: 0.6983705669837057
FP: 0.10237952409518096

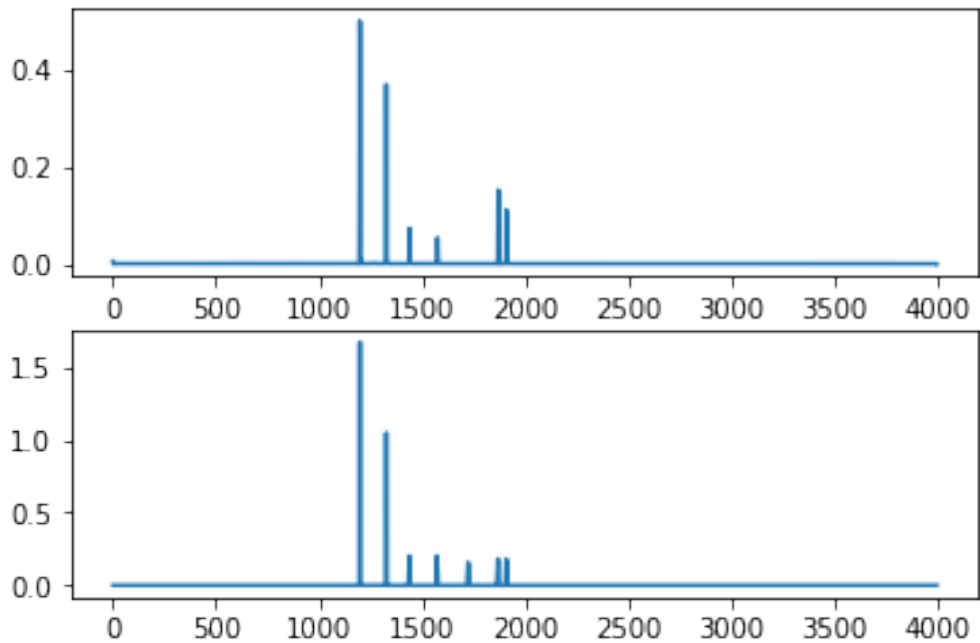
import matplotlib.pyplot as plt

model.to("cpu")
model.eval()
with torch.no_grad():
    for setID in val_set_idx:
        val_set = MyDataset(setID+1)
        val_generator = torch.utils.data.DataLoader(val_set,
                                                    batch_size=64,
                                                    shuffle=True)

        print(setID)
        for X_val, y_val in val_generator:
            # Forward pass
            val_outputs = model(X_val)
            fig, axs = plt.subplots(2)
            fig.suptitle('Vertically stacked subplots')
            axs[0].plot(val_outputs[0])
            axs[1].plot(y_val[0])
            plt.show()
            break

```

Vertically stacked subplots



```
lr=0.005,hidden_size=64,num_layers=2
```

```
model = BiRNN_2(input_size=4, hidden_size=64, num_layers=2)
```

```
model = model.to(DEVICE)
```

```
cost, val_cost = train(model,  
                        num_epochs=50,  
                        learning_rate=0.005,  
                        seed=123, batch_size=64)
```

2

```
/usr/local/lib/python3.7/dist-packages/torch/utils/data/  
dataloader.py:566: UserWarning: This DataLoader will create 4 worker  
processes in total. Our suggested max number of worker in current  
system is 2, which is smaller than what this DataLoader is going to  
create. Please be aware that excessive worker creation might get  
DataLoader running slow or even freeze, lower the worker number to  
avoid potential slowness/freeze if necessary.  
  cpuset_checked))
```

```
Epoch ID: 1   Set ID: 2   Batch ID: 20 | Loss: 0.08715
```

```
Epoch ID: 1   Set ID: 2   Batch ID: 40 | Loss: 0.09262
```

```
Epoch ID: 1   Set ID: 2   Batch ID: 60 | Loss: 0.09904
```

2

```
Epoch ID: 2   Set ID: 2   Batch ID: 20 | Loss: 0.09102
```

```
Epoch ID: 2   Set ID: 2   Batch ID: 40 | Loss: 0.09621
```

Epoch ID: 2	Set ID: 2	Batch ID: 60		Loss: 0.09957
2				
Epoch ID: 3	Set ID: 2	Batch ID: 20		Loss: 0.09547
Epoch ID: 3	Set ID: 2	Batch ID: 40		Loss: 0.09605
Epoch ID: 3	Set ID: 2	Batch ID: 60		Loss: 0.09195
2				
Epoch ID: 4	Set ID: 2	Batch ID: 20		Loss: 0.10037
Epoch ID: 4	Set ID: 2	Batch ID: 40		Loss: 0.09651
Epoch ID: 4	Set ID: 2	Batch ID: 60		Loss: 0.09779
2				
Epoch ID: 5	Set ID: 2	Batch ID: 20		Loss: 0.09287
Epoch ID: 5	Set ID: 2	Batch ID: 40		Loss: 0.10040
Epoch ID: 5	Set ID: 2	Batch ID: 60		Loss: 0.09468
2				
Epoch ID: 6	Set ID: 2	Batch ID: 20		Loss: 0.09006
Epoch ID: 6	Set ID: 2	Batch ID: 40		Loss: 0.09316
Epoch ID: 6	Set ID: 2	Batch ID: 60		Loss: 0.08885
2				
Epoch ID: 7	Set ID: 2	Batch ID: 20		Loss: 0.08920
Epoch ID: 7	Set ID: 2	Batch ID: 40		Loss: 0.08639
Epoch ID: 7	Set ID: 2	Batch ID: 60		Loss: 0.09424
2				
Epoch ID: 8	Set ID: 2	Batch ID: 20		Loss: 0.09290
Epoch ID: 8	Set ID: 2	Batch ID: 40		Loss: 0.10680
Epoch ID: 8	Set ID: 2	Batch ID: 60		Loss: 0.09557
2				
Epoch ID: 9	Set ID: 2	Batch ID: 20		Loss: 0.10311
Epoch ID: 9	Set ID: 2	Batch ID: 40		Loss: 0.09011
Epoch ID: 9	Set ID: 2	Batch ID: 60		Loss: 0.09585
2				
Epoch ID: 10	Set ID: 2	Batch ID: 20		Loss: 0.09700
Epoch ID: 10	Set ID: 2	Batch ID: 40		Loss: 0.09729
Epoch ID: 10	Set ID: 2	Batch ID: 60		Loss: 0.09257
2				
Epoch ID: 11	Set ID: 2	Batch ID: 20		Loss: 0.09375
Epoch ID: 11	Set ID: 2	Batch ID: 40		Loss: 0.09119
Epoch ID: 11	Set ID: 2	Batch ID: 60		Loss: 0.08612
2				
Epoch ID: 12	Set ID: 2	Batch ID: 20		Loss: 0.09481
Epoch ID: 12	Set ID: 2	Batch ID: 40		Loss: 0.09925
Epoch ID: 12	Set ID: 2	Batch ID: 60		Loss: 0.09541
2				
Epoch ID: 13	Set ID: 2	Batch ID: 20		Loss: 0.09811
Epoch ID: 13	Set ID: 2	Batch ID: 40		Loss: 0.10339
Epoch ID: 13	Set ID: 2	Batch ID: 60		Loss: 0.09017
2				
Epoch ID: 14	Set ID: 2	Batch ID: 20		Loss: 0.09230
Epoch ID: 14	Set ID: 2	Batch ID: 40		Loss: 0.09256
Epoch ID: 14	Set ID: 2	Batch ID: 60		Loss: 0.09142
2				

Epoch ID: 15	Set ID: 2	Batch ID: 20		Loss: 0.08987
Epoch ID: 15	Set ID: 2	Batch ID: 40		Loss: 0.09908
Epoch ID: 15	Set ID: 2	Batch ID: 60		Loss: 0.09183
2				
Epoch ID: 16	Set ID: 2	Batch ID: 20		Loss: 0.09045
Epoch ID: 16	Set ID: 2	Batch ID: 40		Loss: 0.07903
Epoch ID: 16	Set ID: 2	Batch ID: 60		Loss: 0.09285
2				
Epoch ID: 17	Set ID: 2	Batch ID: 20		Loss: 0.09250
Epoch ID: 17	Set ID: 2	Batch ID: 40		Loss: 0.09462
Epoch ID: 17	Set ID: 2	Batch ID: 60		Loss: 0.09328
2				
Epoch ID: 18	Set ID: 2	Batch ID: 20		Loss: 0.09272
Epoch ID: 18	Set ID: 2	Batch ID: 40		Loss: 0.09695
Epoch ID: 18	Set ID: 2	Batch ID: 60		Loss: 0.09583
2				
Epoch ID: 19	Set ID: 2	Batch ID: 20		Loss: 0.10573
Epoch ID: 19	Set ID: 2	Batch ID: 40		Loss: 0.09930
Epoch ID: 19	Set ID: 2	Batch ID: 60		Loss: 0.09498
2				
Epoch ID: 20	Set ID: 2	Batch ID: 20		Loss: 0.09060
Epoch ID: 20	Set ID: 2	Batch ID: 40		Loss: 0.09860
Epoch ID: 20	Set ID: 2	Batch ID: 60		Loss: 0.08521
2				
Epoch ID: 21	Set ID: 2	Batch ID: 20		Loss: 0.09789
Epoch ID: 21	Set ID: 2	Batch ID: 40		Loss: 0.09808
Epoch ID: 21	Set ID: 2	Batch ID: 60		Loss: 0.09230
2				
Epoch ID: 22	Set ID: 2	Batch ID: 20		Loss: 0.09968
Epoch ID: 22	Set ID: 2	Batch ID: 40		Loss: 0.10099
Epoch ID: 22	Set ID: 2	Batch ID: 60		Loss: 0.10059
2				
Epoch ID: 23	Set ID: 2	Batch ID: 20		Loss: 0.09249
Epoch ID: 23	Set ID: 2	Batch ID: 40		Loss: 0.09131
Epoch ID: 23	Set ID: 2	Batch ID: 60		Loss: 0.09015
2				
Epoch ID: 24	Set ID: 2	Batch ID: 20		Loss: 0.09879
Epoch ID: 24	Set ID: 2	Batch ID: 40		Loss: 0.10169
Epoch ID: 24	Set ID: 2	Batch ID: 60		Loss: 0.08496
2				
Epoch ID: 25	Set ID: 2	Batch ID: 20		Loss: 0.08825
Epoch ID: 25	Set ID: 2	Batch ID: 40		Loss: 0.09498
Epoch ID: 25	Set ID: 2	Batch ID: 60		Loss: 0.09278
2				
Epoch ID: 26	Set ID: 2	Batch ID: 20		Loss: 0.09643
Epoch ID: 26	Set ID: 2	Batch ID: 40		Loss: 0.09421
Epoch ID: 26	Set ID: 2	Batch ID: 60		Loss: 0.09342
2				
Epoch ID: 27	Set ID: 2	Batch ID: 20		Loss: 0.09236
Epoch ID: 27	Set ID: 2	Batch ID: 40		Loss: 0.09853

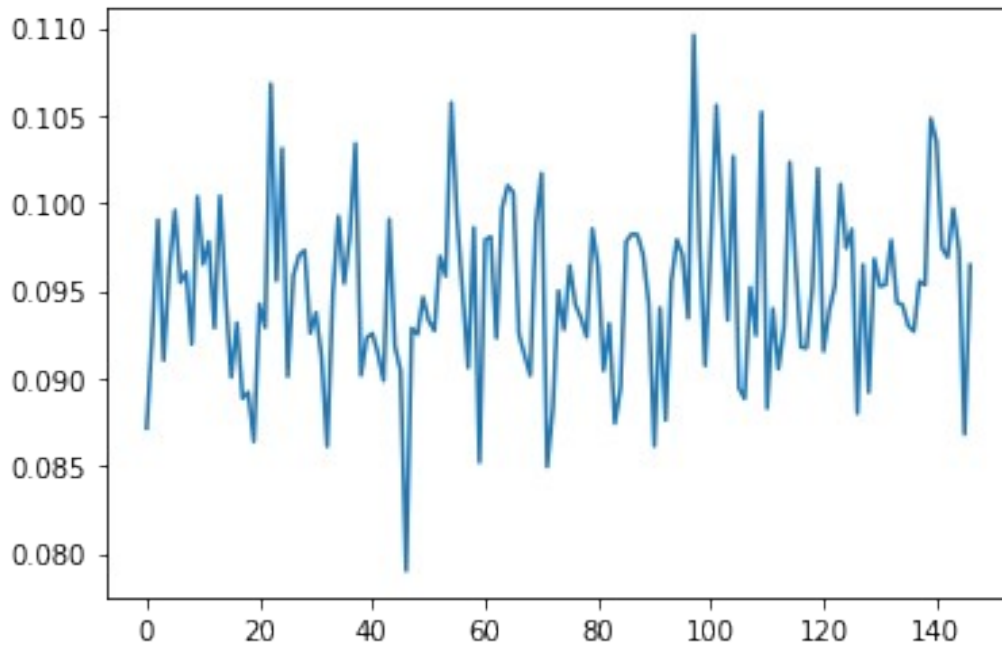
Epoch ID: 27	Set ID: 2	Batch ID: 60	Loss: 0.09643
2			
Epoch ID: 28	Set ID: 2	Batch ID: 20	Loss: 0.09044
Epoch ID: 28	Set ID: 2	Batch ID: 40	Loss: 0.09312
Epoch ID: 28	Set ID: 2	Batch ID: 60	Loss: 0.08743
2			
Epoch ID: 29	Set ID: 2	Batch ID: 20	Loss: 0.08945
Epoch ID: 29	Set ID: 2	Batch ID: 40	Loss: 0.09779
Epoch ID: 29	Set ID: 2	Batch ID: 60	Loss: 0.09823
2			
Epoch ID: 30	Set ID: 2	Batch ID: 20	Loss: 0.09819
Epoch ID: 30	Set ID: 2	Batch ID: 40	Loss: 0.09706
Epoch ID: 30	Set ID: 2	Batch ID: 60	Loss: 0.09428
2			
Epoch ID: 31	Set ID: 2	Batch ID: 20	Loss: 0.08613
Epoch ID: 31	Set ID: 2	Batch ID: 40	Loss: 0.09401
Epoch ID: 31	Set ID: 2	Batch ID: 60	Loss: 0.08761
2			
Epoch ID: 32	Set ID: 2	Batch ID: 20	Loss: 0.09551
Epoch ID: 32	Set ID: 2	Batch ID: 40	Loss: 0.09791
Epoch ID: 32	Set ID: 2	Batch ID: 60	Loss: 0.09700
2			
Epoch ID: 33	Set ID: 2	Batch ID: 20	Loss: 0.09343
Epoch ID: 33	Set ID: 2	Batch ID: 40	Loss: 0.10958
Epoch ID: 33	Set ID: 2	Batch ID: 60	Loss: 0.09788
2			
Epoch ID: 34	Set ID: 2	Batch ID: 20	Loss: 0.09073
Epoch ID: 34	Set ID: 2	Batch ID: 40	Loss: 0.09755
Epoch ID: 34	Set ID: 2	Batch ID: 60	Loss: 0.10557
2			
Epoch ID: 35	Set ID: 2	Batch ID: 20	Loss: 0.09904
Epoch ID: 35	Set ID: 2	Batch ID: 40	Loss: 0.09332
Epoch ID: 35	Set ID: 2	Batch ID: 60	Loss: 0.10266
2			
Epoch ID: 36	Set ID: 2	Batch ID: 20	Loss: 0.08945
Epoch ID: 36	Set ID: 2	Batch ID: 40	Loss: 0.08884
Epoch ID: 36	Set ID: 2	Batch ID: 60	Loss: 0.09519
2			
Epoch ID: 37	Set ID: 2	Batch ID: 20	Loss: 0.09245
Epoch ID: 37	Set ID: 2	Batch ID: 40	Loss: 0.10517
Epoch ID: 37	Set ID: 2	Batch ID: 60	Loss: 0.08829
2			
Epoch ID: 38	Set ID: 2	Batch ID: 20	Loss: 0.09398
Epoch ID: 38	Set ID: 2	Batch ID: 40	Loss: 0.09053
Epoch ID: 38	Set ID: 2	Batch ID: 60	Loss: 0.09298
2			
Epoch ID: 39	Set ID: 2	Batch ID: 20	Loss: 0.10232
Epoch ID: 39	Set ID: 2	Batch ID: 40	Loss: 0.09678
Epoch ID: 39	Set ID: 2	Batch ID: 60	Loss: 0.09177
2			

Epoch ID: 40	Set ID: 2	Batch ID: 20	Loss: 0.09173
Epoch ID: 40	Set ID: 2	Batch ID: 40	Loss: 0.09515
Epoch ID: 40	Set ID: 2	Batch ID: 60	Loss: 0.10196
2			
Epoch ID: 41	Set ID: 2	Batch ID: 20	Loss: 0.09154
Epoch ID: 41	Set ID: 2	Batch ID: 40	Loss: 0.09387
Epoch ID: 41	Set ID: 2	Batch ID: 60	Loss: 0.09527
2			
Epoch ID: 42	Set ID: 2	Batch ID: 20	Loss: 0.10107
Epoch ID: 42	Set ID: 2	Batch ID: 40	Loss: 0.09743
Epoch ID: 42	Set ID: 2	Batch ID: 60	Loss: 0.09850
2			
Epoch ID: 43	Set ID: 2	Batch ID: 20	Loss: 0.08801
Epoch ID: 43	Set ID: 2	Batch ID: 40	Loss: 0.09647
Epoch ID: 43	Set ID: 2	Batch ID: 60	Loss: 0.08920
2			
Epoch ID: 44	Set ID: 2	Batch ID: 20	Loss: 0.09681
Epoch ID: 44	Set ID: 2	Batch ID: 40	Loss: 0.09525
Epoch ID: 44	Set ID: 2	Batch ID: 60	Loss: 0.09534
2			
Epoch ID: 45	Set ID: 2	Batch ID: 20	Loss: 0.09788
Epoch ID: 45	Set ID: 2	Batch ID: 40	Loss: 0.09432
Epoch ID: 45	Set ID: 2	Batch ID: 60	Loss: 0.09419
2			
Epoch ID: 46	Set ID: 2	Batch ID: 20	Loss: 0.09301
Epoch ID: 46	Set ID: 2	Batch ID: 40	Loss: 0.09268
Epoch ID: 46	Set ID: 2	Batch ID: 60	Loss: 0.09553
2			
Epoch ID: 47	Set ID: 2	Batch ID: 20	Loss: 0.09532
Epoch ID: 47	Set ID: 2	Batch ID: 40	Loss: 0.10482
Epoch ID: 47	Set ID: 2	Batch ID: 60	Loss: 0.10354
2			
Epoch ID: 48	Set ID: 2	Batch ID: 20	Loss: 0.09743
Epoch ID: 48	Set ID: 2	Batch ID: 40	Loss: 0.09691
Epoch ID: 48	Set ID: 2	Batch ID: 60	Loss: 0.09968
2			
Epoch ID: 49	Set ID: 2	Batch ID: 20	Loss: 0.09730
Epoch ID: 49	Set ID: 2	Batch ID: 40	Loss: 0.08681
Epoch ID: 49	Set ID: 2	Batch ID: 60	Loss: 0.09646

```

cost = [c.to('cpu') for c in cost]
val_cost = [c.to('cpu') for c in val_cost]
plt.plot(cost)
#plt.plot(val_cost)
plt.show()

```

```

loss_val, eff_rate, fp_rate = validate(model)

print(f"Loss: {loss_val}")
print(f"Eff: {eff_rate}")
print(f"FP: {fp_rate}")

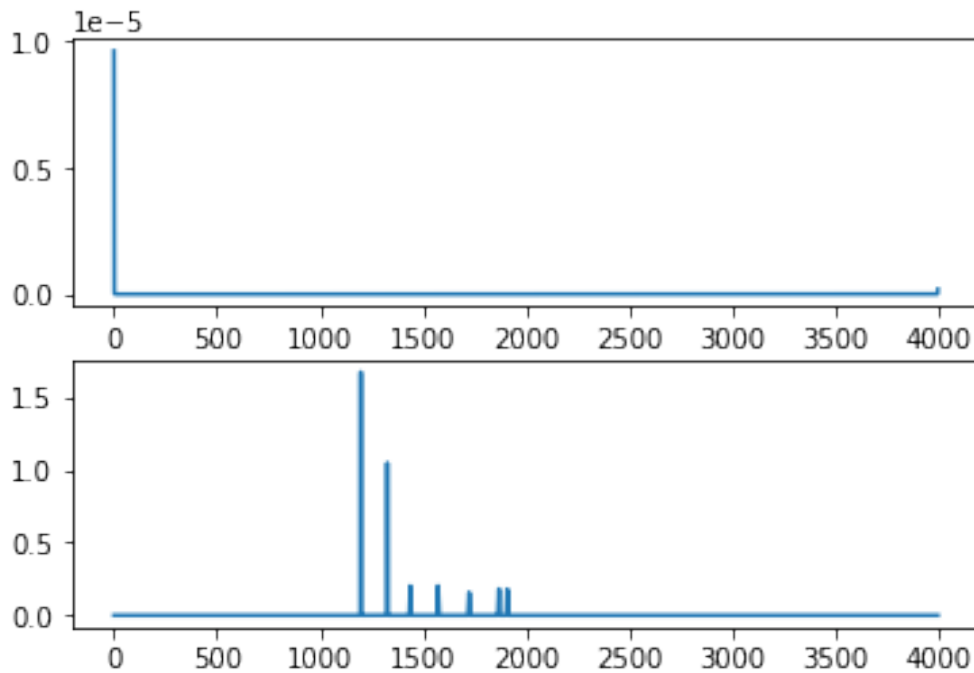
Loss: 0.09495712071657181
Eff: 0.0
FP: 0.0

model.to("cpu")
model.eval()
with torch.no_grad():
    for setID in val_set_idx:
        val_set = MyDataset(setID+1)
        val_generator = torch.utils.data.DataLoader(val_set,
                                                    batch_size=64,
                                                    shuffle=True)

        print(setID)
        for X_val, y_val in val_generator:
            # Forward pass
            val_outputs = model(X_val)
            fig, axs = plt.subplots(2)
            fig.suptitle('Vertically stacked subplots')
            axs[0].plot(val_outputs[0])
            axs[1].plot(y_val[0])
            plt.show()
            break

```

Vertically stacked subplots



lr=0.001, hidden_size=96, num_layers=2

model = BiRNN_2(input_size=4, hidden_size=96, num_layers=2)

model = model.to(DEVICE)

cost, val_cost = train(model,
 num_epochs=50,
 learning_rate=0.001,
 seed=123, batch_size=64)

2

Epoch ID: 1 Set ID: 2 Batch ID: 20 | Loss: 7.03953

Epoch ID: 1 Set ID: 2 Batch ID: 40 | Loss: 4.39459

Epoch ID: 1 Set ID: 2 Batch ID: 60 | Loss: 4.84148

2

Epoch ID: 2 Set ID: 2 Batch ID: 20 | Loss: 4.15894

Epoch ID: 2 Set ID: 2 Batch ID: 40 | Loss: 3.83936

Epoch ID: 2 Set ID: 2 Batch ID: 60 | Loss: 3.40340

2

Epoch ID: 3 Set ID: 2 Batch ID: 20 | Loss: 3.56110

Epoch ID: 3 Set ID: 2 Batch ID: 40 | Loss: 3.75310

Epoch ID: 3 Set ID: 2 Batch ID: 60 | Loss: 3.27941

2

Epoch ID: 4 Set ID: 2 Batch ID: 20 | Loss: 2.61803

Epoch ID: 4 Set ID: 2 Batch ID: 40 | Loss: 2.19934

Epoch ID: 4 Set ID: 2 Batch ID: 60 | Loss: 2.90077

2

Epoch ID: 5	Set ID: 2	Batch ID: 20		Loss: 0.67966
Epoch ID: 5	Set ID: 2	Batch ID: 40		Loss: 0.57036
Epoch ID: 5	Set ID: 2	Batch ID: 60		Loss: 2.21457
2				
Epoch ID: 6	Set ID: 2	Batch ID: 20		Loss: 0.42453
Epoch ID: 6	Set ID: 2	Batch ID: 40		Loss: 0.57453
Epoch ID: 6	Set ID: 2	Batch ID: 60		Loss: 0.78054
2				
Epoch ID: 7	Set ID: 2	Batch ID: 20		Loss: 0.80261
Epoch ID: 7	Set ID: 2	Batch ID: 40		Loss: 0.96840
Epoch ID: 7	Set ID: 2	Batch ID: 60		Loss: 0.40268
2				
Epoch ID: 8	Set ID: 2	Batch ID: 20		Loss: 0.25245
Epoch ID: 8	Set ID: 2	Batch ID: 40		Loss: 0.25730
Epoch ID: 8	Set ID: 2	Batch ID: 60		Loss: 0.19798
2				
Epoch ID: 9	Set ID: 2	Batch ID: 20		Loss: 0.17228
Epoch ID: 9	Set ID: 2	Batch ID: 40		Loss: 0.16966
Epoch ID: 9	Set ID: 2	Batch ID: 60		Loss: 0.16441
2				
Epoch ID: 10	Set ID: 2	Batch ID: 20		Loss: 0.18650
Epoch ID: 10	Set ID: 2	Batch ID: 40		Loss: 0.15111
Epoch ID: 10	Set ID: 2	Batch ID: 60		Loss: 0.17156
2				
Epoch ID: 11	Set ID: 2	Batch ID: 20		Loss: 0.16284
Epoch ID: 11	Set ID: 2	Batch ID: 40		Loss: 0.13931
Epoch ID: 11	Set ID: 2	Batch ID: 60		Loss: 0.14647
2				
Epoch ID: 12	Set ID: 2	Batch ID: 20		Loss: 0.16013
Epoch ID: 12	Set ID: 2	Batch ID: 40		Loss: 0.15142
Epoch ID: 12	Set ID: 2	Batch ID: 60		Loss: 0.13447
2				
Epoch ID: 13	Set ID: 2	Batch ID: 20		Loss: 0.14437
Epoch ID: 13	Set ID: 2	Batch ID: 40		Loss: 0.13896
Epoch ID: 13	Set ID: 2	Batch ID: 60		Loss: 0.11365
2				
Epoch ID: 14	Set ID: 2	Batch ID: 20		Loss: 0.13532
Epoch ID: 14	Set ID: 2	Batch ID: 40		Loss: 0.11545
Epoch ID: 14	Set ID: 2	Batch ID: 60		Loss: 0.12543
2				
Epoch ID: 15	Set ID: 2	Batch ID: 20		Loss: 0.10927
Epoch ID: 15	Set ID: 2	Batch ID: 40		Loss: 0.13749
Epoch ID: 15	Set ID: 2	Batch ID: 60		Loss: 0.13126
2				
Epoch ID: 16	Set ID: 2	Batch ID: 20		Loss: 0.12277
Epoch ID: 16	Set ID: 2	Batch ID: 40		Loss: 0.10041
Epoch ID: 16	Set ID: 2	Batch ID: 60		Loss: 0.10915
2				
Epoch ID: 17	Set ID: 2	Batch ID: 20		Loss: 0.11663
Epoch ID: 17	Set ID: 2	Batch ID: 40		Loss: 0.11229

Epoch ID: 17	Set ID: 2	Batch ID: 60	Loss: 0.11896
2			
Epoch ID: 18	Set ID: 2	Batch ID: 20	Loss: 0.11770
Epoch ID: 18	Set ID: 2	Batch ID: 40	Loss: 0.11550
Epoch ID: 18	Set ID: 2	Batch ID: 60	Loss: 0.10275
2			
Epoch ID: 19	Set ID: 2	Batch ID: 20	Loss: 0.11693
Epoch ID: 19	Set ID: 2	Batch ID: 40	Loss: 0.12077
Epoch ID: 19	Set ID: 2	Batch ID: 60	Loss: 0.11054
2			
Epoch ID: 20	Set ID: 2	Batch ID: 20	Loss: 0.10505
Epoch ID: 20	Set ID: 2	Batch ID: 40	Loss: 0.09531
Epoch ID: 20	Set ID: 2	Batch ID: 60	Loss: 0.09447
2			
Epoch ID: 21	Set ID: 2	Batch ID: 20	Loss: 0.11350
Epoch ID: 21	Set ID: 2	Batch ID: 40	Loss: 0.10871
Epoch ID: 21	Set ID: 2	Batch ID: 60	Loss: 0.09778
2			
Epoch ID: 22	Set ID: 2	Batch ID: 20	Loss: 0.10807
Epoch ID: 22	Set ID: 2	Batch ID: 40	Loss: 0.09731
Epoch ID: 22	Set ID: 2	Batch ID: 60	Loss: 0.11520
2			
Epoch ID: 23	Set ID: 2	Batch ID: 20	Loss: 0.09437
Epoch ID: 23	Set ID: 2	Batch ID: 40	Loss: 0.10156
Epoch ID: 23	Set ID: 2	Batch ID: 60	Loss: 0.09040
2			
Epoch ID: 24	Set ID: 2	Batch ID: 20	Loss: 0.11624
Epoch ID: 24	Set ID: 2	Batch ID: 40	Loss: 0.09133
Epoch ID: 24	Set ID: 2	Batch ID: 60	Loss: 0.10226
2			
Epoch ID: 25	Set ID: 2	Batch ID: 20	Loss: 0.09867
Epoch ID: 25	Set ID: 2	Batch ID: 40	Loss: 0.10444
Epoch ID: 25	Set ID: 2	Batch ID: 60	Loss: 0.08377
2			
Epoch ID: 26	Set ID: 2	Batch ID: 20	Loss: 0.09566
Epoch ID: 26	Set ID: 2	Batch ID: 40	Loss: 0.10563
Epoch ID: 26	Set ID: 2	Batch ID: 60	Loss: 0.09328
2			
Epoch ID: 27	Set ID: 2	Batch ID: 20	Loss: 0.09963
Epoch ID: 27	Set ID: 2	Batch ID: 40	Loss: 0.11011
Epoch ID: 27	Set ID: 2	Batch ID: 60	Loss: 0.10401
2			
Epoch ID: 28	Set ID: 2	Batch ID: 20	Loss: 0.10170
Epoch ID: 28	Set ID: 2	Batch ID: 40	Loss: 0.09664
Epoch ID: 28	Set ID: 2	Batch ID: 60	Loss: 0.08533
2			
Epoch ID: 29	Set ID: 2	Batch ID: 20	Loss: 0.09650
Epoch ID: 29	Set ID: 2	Batch ID: 40	Loss: 0.09083
Epoch ID: 29	Set ID: 2	Batch ID: 60	Loss: 0.09904
2			

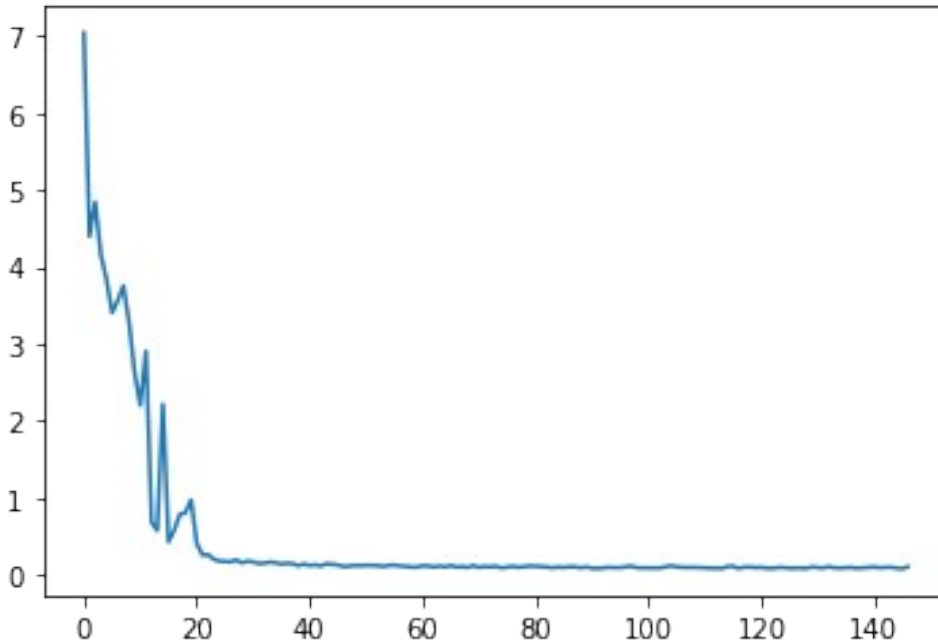
Epoch ID: 30	Set ID: 2	Batch ID: 20	Loss: 0.09849
Epoch ID: 30	Set ID: 2	Batch ID: 40	Loss: 0.08609
Epoch ID: 30	Set ID: 2	Batch ID: 60	Loss: 0.09683
2			
Epoch ID: 31	Set ID: 2	Batch ID: 20	Loss: 0.08137
Epoch ID: 31	Set ID: 2	Batch ID: 40	Loss: 0.07676
Epoch ID: 31	Set ID: 2	Batch ID: 60	Loss: 0.08644
2			
Epoch ID: 32	Set ID: 2	Batch ID: 20	Loss: 0.09239
Epoch ID: 32	Set ID: 2	Batch ID: 40	Loss: 0.08789
Epoch ID: 32	Set ID: 2	Batch ID: 60	Loss: 0.08764
2			
Epoch ID: 33	Set ID: 2	Batch ID: 20	Loss: 0.09817
Epoch ID: 33	Set ID: 2	Batch ID: 40	Loss: 0.10826
Epoch ID: 33	Set ID: 2	Batch ID: 60	Loss: 0.08569
2			
Epoch ID: 34	Set ID: 2	Batch ID: 20	Loss: 0.08410
Epoch ID: 34	Set ID: 2	Batch ID: 40	Loss: 0.08571
Epoch ID: 34	Set ID: 2	Batch ID: 60	Loss: 0.08021
2			
Epoch ID: 35	Set ID: 2	Batch ID: 20	Loss: 0.08282
Epoch ID: 35	Set ID: 2	Batch ID: 40	Loss: 0.09777
Epoch ID: 35	Set ID: 2	Batch ID: 60	Loss: 0.11213
2			
Epoch ID: 36	Set ID: 2	Batch ID: 20	Loss: 0.09777
Epoch ID: 36	Set ID: 2	Batch ID: 40	Loss: 0.09161
Epoch ID: 36	Set ID: 2	Batch ID: 60	Loss: 0.08889
2			
Epoch ID: 37	Set ID: 2	Batch ID: 20	Loss: 0.09243
Epoch ID: 37	Set ID: 2	Batch ID: 40	Loss: 0.09072
Epoch ID: 37	Set ID: 2	Batch ID: 60	Loss: 0.08551
2			
Epoch ID: 38	Set ID: 2	Batch ID: 20	Loss: 0.08019
Epoch ID: 38	Set ID: 2	Batch ID: 40	Loss: 0.08262
Epoch ID: 38	Set ID: 2	Batch ID: 60	Loss: 0.07655
2			
Epoch ID: 39	Set ID: 2	Batch ID: 20	Loss: 0.10030
Epoch ID: 39	Set ID: 2	Batch ID: 40	Loss: 0.10730
Epoch ID: 39	Set ID: 2	Batch ID: 60	Loss: 0.07712
2			
Epoch ID: 40	Set ID: 2	Batch ID: 20	Loss: 0.09501
Epoch ID: 40	Set ID: 2	Batch ID: 40	Loss: 0.09552
Epoch ID: 40	Set ID: 2	Batch ID: 60	Loss: 0.08891
2			
Epoch ID: 41	Set ID: 2	Batch ID: 20	Loss: 0.09082
Epoch ID: 41	Set ID: 2	Batch ID: 40	Loss: 0.08253
Epoch ID: 41	Set ID: 2	Batch ID: 60	Loss: 0.07851
2			
Epoch ID: 42	Set ID: 2	Batch ID: 20	Loss: 0.08993
Epoch ID: 42	Set ID: 2	Batch ID: 40	Loss: 0.09005

Epoch ID: 42	Set ID: 2	Batch ID: 60	Loss: 0.07950
2			
Epoch ID: 43	Set ID: 2	Batch ID: 20	Loss: 0.08280
Epoch ID: 43	Set ID: 2	Batch ID: 40	Loss: 0.08254
Epoch ID: 43	Set ID: 2	Batch ID: 60	Loss: 0.07919
2			
Epoch ID: 44	Set ID: 2	Batch ID: 20	Loss: 0.09608
Epoch ID: 44	Set ID: 2	Batch ID: 40	Loss: 0.09031
Epoch ID: 44	Set ID: 2	Batch ID: 60	Loss: 0.08394
2			
Epoch ID: 45	Set ID: 2	Batch ID: 20	Loss: 0.09981
Epoch ID: 45	Set ID: 2	Batch ID: 40	Loss: 0.08508
Epoch ID: 45	Set ID: 2	Batch ID: 60	Loss: 0.08321
2			
Epoch ID: 46	Set ID: 2	Batch ID: 20	Loss: 0.08539
Epoch ID: 46	Set ID: 2	Batch ID: 40	Loss: 0.09032
Epoch ID: 46	Set ID: 2	Batch ID: 60	Loss: 0.07881
2			
Epoch ID: 47	Set ID: 2	Batch ID: 20	Loss: 0.08664
Epoch ID: 47	Set ID: 2	Batch ID: 40	Loss: 0.09125
Epoch ID: 47	Set ID: 2	Batch ID: 60	Loss: 0.09616
2			
Epoch ID: 48	Set ID: 2	Batch ID: 20	Loss: 0.08766
Epoch ID: 48	Set ID: 2	Batch ID: 40	Loss: 0.09187
Epoch ID: 48	Set ID: 2	Batch ID: 60	Loss: 0.09372
2			
Epoch ID: 49	Set ID: 2	Batch ID: 20	Loss: 0.08065
Epoch ID: 49	Set ID: 2	Batch ID: 40	Loss: 0.07509
Epoch ID: 49	Set ID: 2	Batch ID: 60	Loss: 0.09818

```

cost = [c.to('cpu') for c in cost]
val_cost = [c.to('cpu') for c in val_cost]
plt.plot(cost)
#plt.plot(val_cost)
plt.show()

```



```

loss_val, eff_rate, fp_rate = validate(model)

print(f"Loss: {loss_val}")
print(f"Eff: {eff_rate}")
print(f"FP: {fp_rate}")

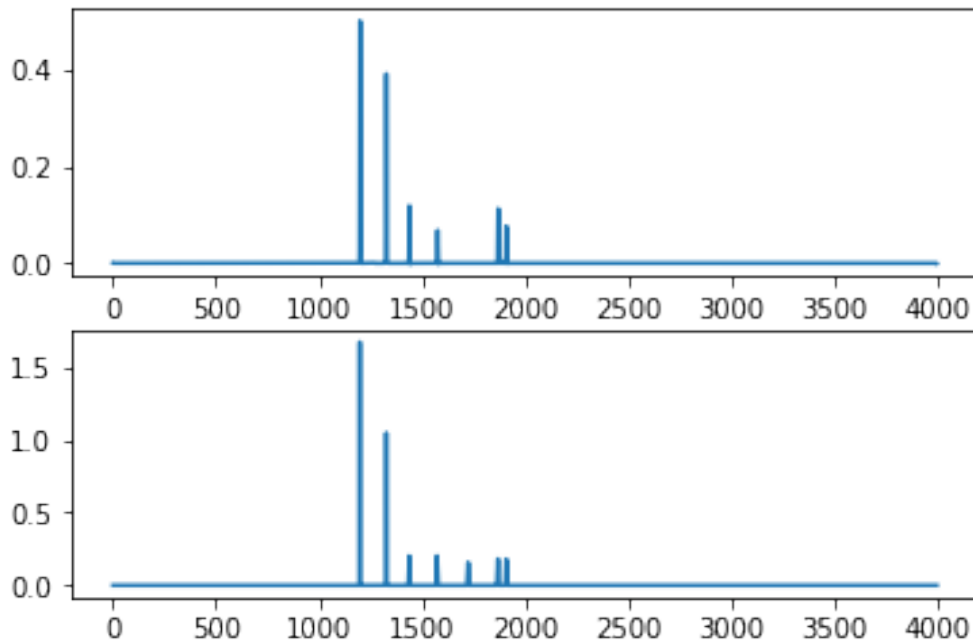
Loss: 0.09109372645616531
Eff: 0.769114502691145
FP: 0.16176764647070585

model.to("cpu")
model.eval()
with torch.no_grad():
    for setID in val_set_idx:
        val_set = MyDataset(setID+1)
        val_generator = torch.utils.data.DataLoader(val_set,
                                                    batch_size=64,
                                                    shuffle=True)

        print(setID)
        for X_val, y_val in val_generator:
            # Forward pass
            val_outputs = model(X_val)
            fig, axs = plt.subplots(2)
            fig.suptitle('Vertically stacked subplots')
            axs[0].plot(val_outputs[0])
            axs[1].plot(y_val[0])
            plt.show()
            break

```

Vertically stacked subplots



lr=0.0005, hidden_size=96, num_layers=2

model = BiRNN_2(input_size=4, hidden_size=96, num_layers=2)

model = model.to(DEVICE)

cost, val_cost = train(model,
 num_epochs=50,
 learning_rate=0.0005,
 seed=123, batch_size=64)

2

Epoch ID: 1 Set ID: 2 Batch ID: 20 | Loss: 3.81765

Epoch ID: 1 Set ID: 2 Batch ID: 40 | Loss: 2.88913

Epoch ID: 1 Set ID: 2 Batch ID: 60 | Loss: 3.56866

2

Epoch ID: 2 Set ID: 2 Batch ID: 20 | Loss: 3.76302

Epoch ID: 2 Set ID: 2 Batch ID: 40 | Loss: 3.09726

Epoch ID: 2 Set ID: 2 Batch ID: 60 | Loss: 2.84000

2

Epoch ID: 3 Set ID: 2 Batch ID: 20 | Loss: 2.39829

Epoch ID: 3 Set ID: 2 Batch ID: 40 | Loss: 1.87228

Epoch ID: 3 Set ID: 2 Batch ID: 60 | Loss: 1.03798

2

Epoch ID: 4 Set ID: 2 Batch ID: 20 | Loss: 2.90129

Epoch ID: 4 Set ID: 2 Batch ID: 40 | Loss: 2.27654

Epoch ID: 4 Set ID: 2 Batch ID: 60 | Loss: 1.92765

2

Epoch ID: 5	Set ID: 2	Batch ID: 20		Loss: 2.30203
Epoch ID: 5	Set ID: 2	Batch ID: 40		Loss: 2.00007
Epoch ID: 5	Set ID: 2	Batch ID: 60		Loss: 1.74371
2				
Epoch ID: 6	Set ID: 2	Batch ID: 20		Loss: 0.53227
Epoch ID: 6	Set ID: 2	Batch ID: 40		Loss: 0.81484
Epoch ID: 6	Set ID: 2	Batch ID: 60		Loss: 0.53849
2				
Epoch ID: 7	Set ID: 2	Batch ID: 20		Loss: 0.51422
Epoch ID: 7	Set ID: 2	Batch ID: 40		Loss: 0.62814
Epoch ID: 7	Set ID: 2	Batch ID: 60		Loss: 0.36428
2				
Epoch ID: 8	Set ID: 2	Batch ID: 20		Loss: 0.32193
Epoch ID: 8	Set ID: 2	Batch ID: 40		Loss: 0.54105
Epoch ID: 8	Set ID: 2	Batch ID: 60		Loss: 0.30979
2				
Epoch ID: 9	Set ID: 2	Batch ID: 20		Loss: 0.28436
Epoch ID: 9	Set ID: 2	Batch ID: 40		Loss: 0.30107
Epoch ID: 9	Set ID: 2	Batch ID: 60		Loss: 0.32824
2				
Epoch ID: 10	Set ID: 2	Batch ID: 20		Loss: 0.26572
Epoch ID: 10	Set ID: 2	Batch ID: 40		Loss: 0.29834
Epoch ID: 10	Set ID: 2	Batch ID: 60		Loss: 0.23879
2				
Epoch ID: 11	Set ID: 2	Batch ID: 20		Loss: 0.24865
Epoch ID: 11	Set ID: 2	Batch ID: 40		Loss: 0.30288
Epoch ID: 11	Set ID: 2	Batch ID: 60		Loss: 0.23337
2				
Epoch ID: 12	Set ID: 2	Batch ID: 20		Loss: 0.22058
Epoch ID: 12	Set ID: 2	Batch ID: 40		Loss: 0.26445
Epoch ID: 12	Set ID: 2	Batch ID: 60		Loss: 0.20661
2				
Epoch ID: 13	Set ID: 2	Batch ID: 20		Loss: 0.22867
Epoch ID: 13	Set ID: 2	Batch ID: 40		Loss: 0.22331
Epoch ID: 13	Set ID: 2	Batch ID: 60		Loss: 0.19733
2				
Epoch ID: 14	Set ID: 2	Batch ID: 20		Loss: 0.20923
Epoch ID: 14	Set ID: 2	Batch ID: 40		Loss: 0.18449
Epoch ID: 14	Set ID: 2	Batch ID: 60		Loss: 0.18252
2				
Epoch ID: 15	Set ID: 2	Batch ID: 20		Loss: 0.20919
Epoch ID: 15	Set ID: 2	Batch ID: 40		Loss: 0.18998
Epoch ID: 15	Set ID: 2	Batch ID: 60		Loss: 0.14196
2				
Epoch ID: 16	Set ID: 2	Batch ID: 20		Loss: 0.15349
Epoch ID: 16	Set ID: 2	Batch ID: 40		Loss: 0.16011
Epoch ID: 16	Set ID: 2	Batch ID: 60		Loss: 0.18821
2				
Epoch ID: 17	Set ID: 2	Batch ID: 20		Loss: 0.16541
Epoch ID: 17	Set ID: 2	Batch ID: 40		Loss: 0.12361

Epoch ID: 17	Set ID: 2	Batch ID: 60		Loss: 0.13357
2				
Epoch ID: 18	Set ID: 2	Batch ID: 20		Loss: 0.11899
Epoch ID: 18	Set ID: 2	Batch ID: 40		Loss: 0.13510
Epoch ID: 18	Set ID: 2	Batch ID: 60		Loss: 0.15184
2				
Epoch ID: 19	Set ID: 2	Batch ID: 20		Loss: 0.14303
Epoch ID: 19	Set ID: 2	Batch ID: 40		Loss: 0.18036
Epoch ID: 19	Set ID: 2	Batch ID: 60		Loss: 0.12293
2				
Epoch ID: 20	Set ID: 2	Batch ID: 20		Loss: 0.11757
Epoch ID: 20	Set ID: 2	Batch ID: 40		Loss: 0.11796
Epoch ID: 20	Set ID: 2	Batch ID: 60		Loss: 0.11148
2				
Epoch ID: 21	Set ID: 2	Batch ID: 20		Loss: 0.16095
Epoch ID: 21	Set ID: 2	Batch ID: 40		Loss: 0.15797
Epoch ID: 21	Set ID: 2	Batch ID: 60		Loss: 0.11316
2				
Epoch ID: 22	Set ID: 2	Batch ID: 20		Loss: 0.09573
Epoch ID: 22	Set ID: 2	Batch ID: 40		Loss: 0.14192
Epoch ID: 22	Set ID: 2	Batch ID: 60		Loss: 0.12145
2				
Epoch ID: 23	Set ID: 2	Batch ID: 20		Loss: 0.13261
Epoch ID: 23	Set ID: 2	Batch ID: 40		Loss: 0.11940
Epoch ID: 23	Set ID: 2	Batch ID: 60		Loss: 0.11431
2				
Epoch ID: 24	Set ID: 2	Batch ID: 20		Loss: 0.12634
Epoch ID: 24	Set ID: 2	Batch ID: 40		Loss: 0.12787
Epoch ID: 24	Set ID: 2	Batch ID: 60		Loss: 0.10310
2				
Epoch ID: 25	Set ID: 2	Batch ID: 20		Loss: 0.10400
Epoch ID: 25	Set ID: 2	Batch ID: 40		Loss: 0.12330
Epoch ID: 25	Set ID: 2	Batch ID: 60		Loss: 0.10237
2				
Epoch ID: 26	Set ID: 2	Batch ID: 20		Loss: 0.08521
Epoch ID: 26	Set ID: 2	Batch ID: 40		Loss: 0.10498
Epoch ID: 26	Set ID: 2	Batch ID: 60		Loss: 0.11072
2				
Epoch ID: 27	Set ID: 2	Batch ID: 20		Loss: 0.09100
Epoch ID: 27	Set ID: 2	Batch ID: 40		Loss: 0.10996
Epoch ID: 27	Set ID: 2	Batch ID: 60		Loss: 0.11555
2				
Epoch ID: 28	Set ID: 2	Batch ID: 20		Loss: 0.10881
Epoch ID: 28	Set ID: 2	Batch ID: 40		Loss: 0.11094
Epoch ID: 28	Set ID: 2	Batch ID: 60		Loss: 0.08128
2				
Epoch ID: 29	Set ID: 2	Batch ID: 20		Loss: 0.08882
Epoch ID: 29	Set ID: 2	Batch ID: 40		Loss: 0.09619
Epoch ID: 29	Set ID: 2	Batch ID: 60		Loss: 0.10701
2				

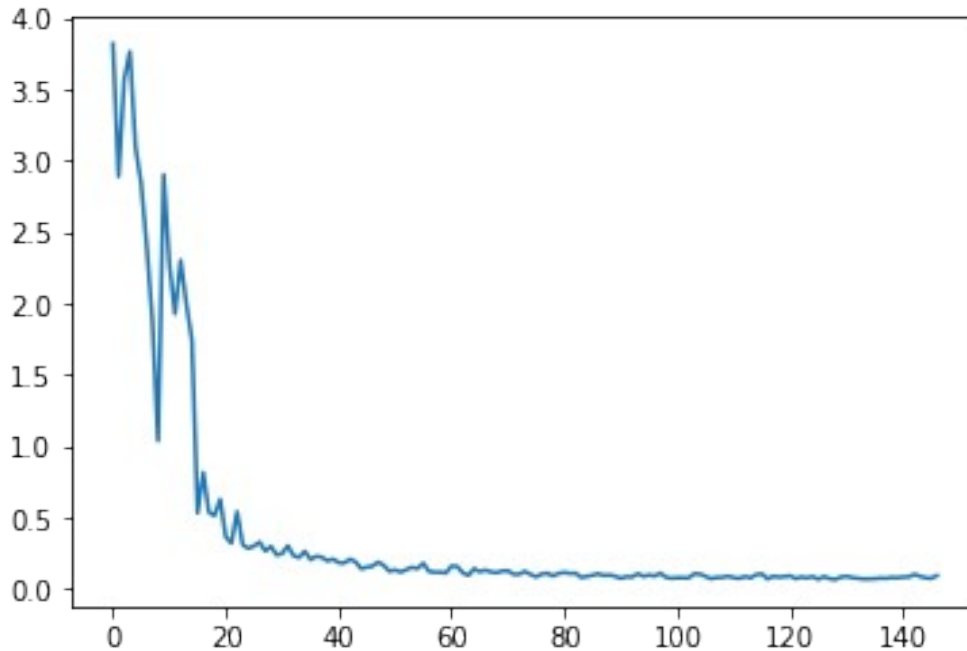
Epoch ID: 30	Set ID: 2	Batch ID: 20	Loss: 0.09433
Epoch ID: 30	Set ID: 2	Batch ID: 40	Loss: 0.09836
Epoch ID: 30	Set ID: 2	Batch ID: 60	Loss: 0.08915
2			
Epoch ID: 31	Set ID: 2	Batch ID: 20	Loss: 0.07524
Epoch ID: 31	Set ID: 2	Batch ID: 40	Loss: 0.08609
Epoch ID: 31	Set ID: 2	Batch ID: 60	Loss: 0.08408
2			
Epoch ID: 32	Set ID: 2	Batch ID: 20	Loss: 0.10728
Epoch ID: 32	Set ID: 2	Batch ID: 40	Loss: 0.08894
Epoch ID: 32	Set ID: 2	Batch ID: 60	Loss: 0.09814
2			
Epoch ID: 33	Set ID: 2	Batch ID: 20	Loss: 0.09111
Epoch ID: 33	Set ID: 2	Batch ID: 40	Loss: 0.11073
Epoch ID: 33	Set ID: 2	Batch ID: 60	Loss: 0.08200
2			
Epoch ID: 34	Set ID: 2	Batch ID: 20	Loss: 0.07545
Epoch ID: 34	Set ID: 2	Batch ID: 40	Loss: 0.07911
Epoch ID: 34	Set ID: 2	Batch ID: 60	Loss: 0.07900
2			
Epoch ID: 35	Set ID: 2	Batch ID: 20	Loss: 0.07665
Epoch ID: 35	Set ID: 2	Batch ID: 40	Loss: 0.10663
Epoch ID: 35	Set ID: 2	Batch ID: 60	Loss: 0.10483
2			
Epoch ID: 36	Set ID: 2	Batch ID: 20	Loss: 0.08946
Epoch ID: 36	Set ID: 2	Batch ID: 40	Loss: 0.07237
Epoch ID: 36	Set ID: 2	Batch ID: 60	Loss: 0.08103
2			
Epoch ID: 37	Set ID: 2	Batch ID: 20	Loss: 0.08092
Epoch ID: 37	Set ID: 2	Batch ID: 40	Loss: 0.09004
Epoch ID: 37	Set ID: 2	Batch ID: 60	Loss: 0.07903
2			
Epoch ID: 38	Set ID: 2	Batch ID: 20	Loss: 0.07450
Epoch ID: 38	Set ID: 2	Batch ID: 40	Loss: 0.08758
Epoch ID: 38	Set ID: 2	Batch ID: 60	Loss: 0.07814
2			
Epoch ID: 39	Set ID: 2	Batch ID: 20	Loss: 0.10021
Epoch ID: 39	Set ID: 2	Batch ID: 40	Loss: 0.10633
Epoch ID: 39	Set ID: 2	Batch ID: 60	Loss: 0.07060
2			
Epoch ID: 40	Set ID: 2	Batch ID: 20	Loss: 0.08968
Epoch ID: 40	Set ID: 2	Batch ID: 40	Loss: 0.08366
Epoch ID: 40	Set ID: 2	Batch ID: 60	Loss: 0.08662
2			
Epoch ID: 41	Set ID: 2	Batch ID: 20	Loss: 0.09249
Epoch ID: 41	Set ID: 2	Batch ID: 40	Loss: 0.07268
Epoch ID: 41	Set ID: 2	Batch ID: 60	Loss: 0.08442
2			
Epoch ID: 42	Set ID: 2	Batch ID: 20	Loss: 0.07757
Epoch ID: 42	Set ID: 2	Batch ID: 40	Loss: 0.08748

Epoch ID: 42	Set ID: 2	Batch ID: 60	Loss: 0.06795
2			
Epoch ID: 43	Set ID: 2	Batch ID: 20	Loss: 0.08744
Epoch ID: 43	Set ID: 2	Batch ID: 40	Loss: 0.07276
Epoch ID: 43	Set ID: 2	Batch ID: 60	Loss: 0.06589
2			
Epoch ID: 44	Set ID: 2	Batch ID: 20	Loss: 0.08423
Epoch ID: 44	Set ID: 2	Batch ID: 40	Loss: 0.08859
Epoch ID: 44	Set ID: 2	Batch ID: 60	Loss: 0.07963
2			
Epoch ID: 45	Set ID: 2	Batch ID: 20	Loss: 0.07389
Epoch ID: 45	Set ID: 2	Batch ID: 40	Loss: 0.07017
Epoch ID: 45	Set ID: 2	Batch ID: 60	Loss: 0.07127
2			
Epoch ID: 46	Set ID: 2	Batch ID: 20	Loss: 0.07213
Epoch ID: 46	Set ID: 2	Batch ID: 40	Loss: 0.07711
Epoch ID: 46	Set ID: 2	Batch ID: 60	Loss: 0.07459
2			
Epoch ID: 47	Set ID: 2	Batch ID: 20	Loss: 0.08091
Epoch ID: 47	Set ID: 2	Batch ID: 40	Loss: 0.07865
Epoch ID: 47	Set ID: 2	Batch ID: 60	Loss: 0.08353
2			
Epoch ID: 48	Set ID: 2	Batch ID: 20	Loss: 0.08405
Epoch ID: 48	Set ID: 2	Batch ID: 40	Loss: 0.10274
Epoch ID: 48	Set ID: 2	Batch ID: 60	Loss: 0.08924
2			
Epoch ID: 49	Set ID: 2	Batch ID: 20	Loss: 0.07857
Epoch ID: 49	Set ID: 2	Batch ID: 40	Loss: 0.07435
Epoch ID: 49	Set ID: 2	Batch ID: 60	Loss: 0.09408

```

cost = [c.to('cpu') for c in cost]
val_cost = [c.to('cpu') for c in val_cost]
plt.plot(cost)
#plt.plot(val_cost)
plt.show()

```



```
loss_val, eff_rate, fp_rate = validate(model)
```

```
print(f"Loss: {loss_val}")
```

```
print(f"Eff: {eff_rate}")
```

```
print(f"FP: {fp_rate}")
```

```
Loss: 0.08754191547632217
```

```
Eff: 0.7617046376170463
```

```
FP: 0.16056788642271547
```

```
model.to("cpu")
```

```
model.eval()
```

```
with torch.no_grad():
```

```
    for setID in val_set_idx:
```

```
        val_set = MyDataset(setID+1)
```

```
        val_generator = torch.utils.data.DataLoader(val_set,
                                                    batch_size=64,
                                                    shuffle=True)
```

```
        print(setID)
```

```
        for X_val, y_val in val_generator:
```

```
            # Forward pass
```

```
            val_outputs = model(X_val)
```

```
            fig, axs = plt.subplots(2)
```

```
            fig.suptitle('Vertically stacked subplots')
```

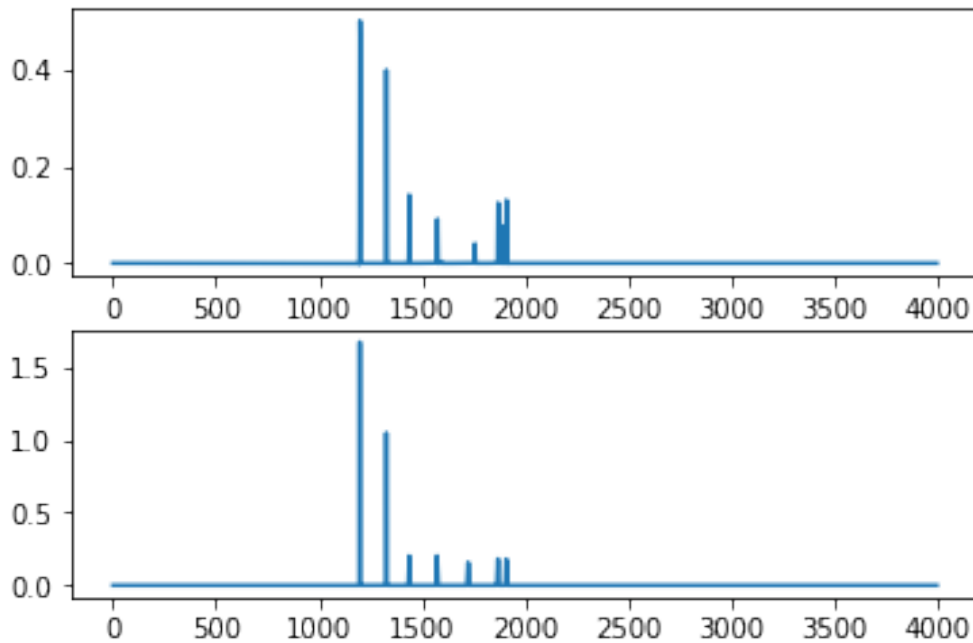
```
            axs[0].plot(val_outputs[0])
```

```
            axs[1].plot(y_val[0])
```

```
            plt.show()
```

```
            break
```

Vertically stacked subplots



Larger sample size 10,000

```
train_set_idx, val_set_idx = train_test_split(list(range(1,4)),
test_size=1)
print(train_set_idx)
print(val_set_idx)
```

```
[1, 2]
[3]
```

```
model = BiRNN_2(input_size=4, hidden_size=96, num_layers=2)
```

```
model = model.to(DEVICE)
```

```
cost, val_cost = train(model,
                        num_epochs=50,
                        learning_rate=0.0005,
                        seed=123, batch_size=64)
```

1

```
Epoch ID: 1   Set ID: 1   Batch ID: 20 | Loss: 6.23193
Epoch ID: 1   Set ID: 1   Batch ID: 40 | Loss: 6.02308
Epoch ID: 1   Set ID: 1   Batch ID: 60 | Loss: 6.13180
```

2

```
Epoch ID: 1   Set ID: 2   Batch ID: 80 | Loss: 4.86710
Epoch ID: 1   Set ID: 2   Batch ID: 100 | Loss: 5.17678
Epoch ID: 1   Set ID: 2   Batch ID: 120 | Loss: 3.45116
Epoch ID: 1   Set ID: 2   Batch ID: 140 | Loss: 5.61135
```

```

1
Epoch ID: 2   Set ID: 1   Batch ID: 20 | Loss: 5.95167
Epoch ID: 2   Set ID: 1   Batch ID: 40 | Loss: 6.01338
Epoch ID: 2   Set ID: 1   Batch ID: 60 | Loss: 5.64921
2
Epoch ID: 2   Set ID: 2   Batch ID: 80 | Loss: 4.98391
Epoch ID: 2   Set ID: 2   Batch ID: 100 | Loss: 4.58587
Epoch ID: 2   Set ID: 2   Batch ID: 120 | Loss: 4.78780
Epoch ID: 2   Set ID: 2   Batch ID: 140 | Loss: 4.53941
1
Epoch ID: 3   Set ID: 1   Batch ID: 20 | Loss: 2.97612
Epoch ID: 3   Set ID: 1   Batch ID: 40 | Loss: 4.87644
Epoch ID: 3   Set ID: 1   Batch ID: 60 | Loss: 1.09970
2
Epoch ID: 3   Set ID: 2   Batch ID: 80 | Loss: 4.24516
Epoch ID: 3   Set ID: 2   Batch ID: 100 | Loss: 1.65141
Epoch ID: 3   Set ID: 2   Batch ID: 120 | Loss: 2.20126
Epoch ID: 3   Set ID: 2   Batch ID: 140 | Loss: 1.72152
1
Epoch ID: 4   Set ID: 1   Batch ID: 20 | Loss: 2.31239
Epoch ID: 4   Set ID: 1   Batch ID: 40 | Loss: 1.84582
Epoch ID: 4   Set ID: 1   Batch ID: 60 | Loss: 2.38384
2
Epoch ID: 4   Set ID: 2   Batch ID: 80 | Loss: 1.79189
Epoch ID: 4   Set ID: 2   Batch ID: 100 | Loss: 1.51629
Epoch ID: 4   Set ID: 2   Batch ID: 120 | Loss: 1.59401
Epoch ID: 4   Set ID: 2   Batch ID: 140 | Loss: 1.22043
1
Epoch ID: 5   Set ID: 1   Batch ID: 20 | Loss: 0.42654
Epoch ID: 5   Set ID: 1   Batch ID: 40 | Loss: 0.49351
Epoch ID: 5   Set ID: 1   Batch ID: 60 | Loss: 0.71992
2
Epoch ID: 5   Set ID: 2   Batch ID: 80 | Loss: 0.47476
Epoch ID: 5   Set ID: 2   Batch ID: 100 | Loss: 1.66480
Epoch ID: 5   Set ID: 2   Batch ID: 120 | Loss: 0.35941
Epoch ID: 5   Set ID: 2   Batch ID: 140 | Loss: 0.66565
1
Epoch ID: 6   Set ID: 1   Batch ID: 20 | Loss: 0.33486
Epoch ID: 6   Set ID: 1   Batch ID: 40 | Loss: 0.33070
Epoch ID: 6   Set ID: 1   Batch ID: 60 | Loss: 0.28266
2
Epoch ID: 6   Set ID: 2   Batch ID: 80 | Loss: 0.84965
Epoch ID: 6   Set ID: 2   Batch ID: 100 | Loss: 0.42349
Epoch ID: 6   Set ID: 2   Batch ID: 120 | Loss: 0.35656
Epoch ID: 6   Set ID: 2   Batch ID: 140 | Loss: 0.29555
1
Epoch ID: 7   Set ID: 1   Batch ID: 20 | Loss: 0.33904
Epoch ID: 7   Set ID: 1   Batch ID: 40 | Loss: 0.60889
Epoch ID: 7   Set ID: 1   Batch ID: 60 | Loss: 0.27866
2

```

Epoch ID: 7	Set ID: 2	Batch ID: 80		Loss: 0.24959
Epoch ID: 7	Set ID: 2	Batch ID: 100		Loss: 0.23591
Epoch ID: 7	Set ID: 2	Batch ID: 120		Loss: 0.25580
Epoch ID: 7	Set ID: 2	Batch ID: 140		Loss: 0.20411
1				
Epoch ID: 8	Set ID: 1	Batch ID: 20		Loss: 0.23903
Epoch ID: 8	Set ID: 1	Batch ID: 40		Loss: 0.22871
Epoch ID: 8	Set ID: 1	Batch ID: 60		Loss: 0.21034
2				
Epoch ID: 8	Set ID: 2	Batch ID: 80		Loss: 0.22206
Epoch ID: 8	Set ID: 2	Batch ID: 100		Loss: 0.18433
Epoch ID: 8	Set ID: 2	Batch ID: 120		Loss: 0.20491
Epoch ID: 8	Set ID: 2	Batch ID: 140		Loss: 0.23314
1				
Epoch ID: 9	Set ID: 1	Batch ID: 20		Loss: 0.18484
Epoch ID: 9	Set ID: 1	Batch ID: 40		Loss: 0.19235
Epoch ID: 9	Set ID: 1	Batch ID: 60		Loss: 0.24427
2				
Epoch ID: 9	Set ID: 2	Batch ID: 80		Loss: 0.16987
Epoch ID: 9	Set ID: 2	Batch ID: 100		Loss: 0.18724
Epoch ID: 9	Set ID: 2	Batch ID: 120		Loss: 0.15571
Epoch ID: 9	Set ID: 2	Batch ID: 140		Loss: 0.17505
1				
Epoch ID: 10	Set ID: 1	Batch ID: 20		Loss: 0.14557
Epoch ID: 10	Set ID: 1	Batch ID: 40		Loss: 0.15223
Epoch ID: 10	Set ID: 1	Batch ID: 60		Loss: 0.14156
2				
Epoch ID: 10	Set ID: 2	Batch ID: 80		Loss: 0.19953
Epoch ID: 10	Set ID: 2	Batch ID: 100		Loss: 0.16240
Epoch ID: 10	Set ID: 2	Batch ID: 120		Loss: 0.16066
Epoch ID: 10	Set ID: 2	Batch ID: 140		Loss: 0.13266
1				
Epoch ID: 11	Set ID: 1	Batch ID: 20		Loss: 0.13945
Epoch ID: 11	Set ID: 1	Batch ID: 40		Loss: 0.13373
Epoch ID: 11	Set ID: 1	Batch ID: 60		Loss: 0.11476
2				
Epoch ID: 11	Set ID: 2	Batch ID: 80		Loss: 0.15287
Epoch ID: 11	Set ID: 2	Batch ID: 100		Loss: 0.14295
Epoch ID: 11	Set ID: 2	Batch ID: 120		Loss: 0.11841
Epoch ID: 11	Set ID: 2	Batch ID: 140		Loss: 0.12181
1				
Epoch ID: 12	Set ID: 1	Batch ID: 20		Loss: 0.11333
Epoch ID: 12	Set ID: 1	Batch ID: 40		Loss: 0.11481
Epoch ID: 12	Set ID: 1	Batch ID: 60		Loss: 0.11902
2				
Epoch ID: 12	Set ID: 2	Batch ID: 80		Loss: 0.13181
Epoch ID: 12	Set ID: 2	Batch ID: 100		Loss: 0.09837
Epoch ID: 12	Set ID: 2	Batch ID: 120		Loss: 0.10590
Epoch ID: 12	Set ID: 2	Batch ID: 140		Loss: 0.11795
1				

Epoch ID: 13	Set ID: 1	Batch ID: 20		Loss: 0.12929
Epoch ID: 13	Set ID: 1	Batch ID: 40		Loss: 0.09949
Epoch ID: 13	Set ID: 1	Batch ID: 60		Loss: 0.10780
2				
Epoch ID: 13	Set ID: 2	Batch ID: 80		Loss: 0.10042
Epoch ID: 13	Set ID: 2	Batch ID: 100		Loss: 0.10412
Epoch ID: 13	Set ID: 2	Batch ID: 120		Loss: 0.10442
Epoch ID: 13	Set ID: 2	Batch ID: 140		Loss: 0.10481
1				
Epoch ID: 14	Set ID: 1	Batch ID: 20		Loss: 0.11396
Epoch ID: 14	Set ID: 1	Batch ID: 40		Loss: 0.10170
Epoch ID: 14	Set ID: 1	Batch ID: 60		Loss: 0.09147
2				
Epoch ID: 14	Set ID: 2	Batch ID: 80		Loss: 0.09665
Epoch ID: 14	Set ID: 2	Batch ID: 100		Loss: 0.09869
Epoch ID: 14	Set ID: 2	Batch ID: 120		Loss: 0.08684
Epoch ID: 14	Set ID: 2	Batch ID: 140		Loss: 0.08318
1				
Epoch ID: 15	Set ID: 1	Batch ID: 20		Loss: 0.09671
Epoch ID: 15	Set ID: 1	Batch ID: 40		Loss: 0.08697
Epoch ID: 15	Set ID: 1	Batch ID: 60		Loss: 0.09001
2				
Epoch ID: 15	Set ID: 2	Batch ID: 80		Loss: 0.09955
Epoch ID: 15	Set ID: 2	Batch ID: 100		Loss: 0.08568
Epoch ID: 15	Set ID: 2	Batch ID: 120		Loss: 0.08699
Epoch ID: 15	Set ID: 2	Batch ID: 140		Loss: 0.08172
1				
Epoch ID: 16	Set ID: 1	Batch ID: 20		Loss: 0.08472
Epoch ID: 16	Set ID: 1	Batch ID: 40		Loss: 0.07900
Epoch ID: 16	Set ID: 1	Batch ID: 60		Loss: 0.07820
2				
Epoch ID: 16	Set ID: 2	Batch ID: 80		Loss: 0.08778
Epoch ID: 16	Set ID: 2	Batch ID: 100		Loss: 0.08526
Epoch ID: 16	Set ID: 2	Batch ID: 120		Loss: 0.08961
Epoch ID: 16	Set ID: 2	Batch ID: 140		Loss: 0.08835
1				
Epoch ID: 17	Set ID: 1	Batch ID: 20		Loss: 0.09304
Epoch ID: 17	Set ID: 1	Batch ID: 40		Loss: 0.08242
Epoch ID: 17	Set ID: 1	Batch ID: 60		Loss: 0.07900
2				
Epoch ID: 17	Set ID: 2	Batch ID: 80		Loss: 0.09806
Epoch ID: 17	Set ID: 2	Batch ID: 100		Loss: 0.08663
Epoch ID: 17	Set ID: 2	Batch ID: 120		Loss: 0.07230
Epoch ID: 17	Set ID: 2	Batch ID: 140		Loss: 0.08454
1				
Epoch ID: 18	Set ID: 1	Batch ID: 20		Loss: 0.08427
Epoch ID: 18	Set ID: 1	Batch ID: 40		Loss: 0.08737
Epoch ID: 18	Set ID: 1	Batch ID: 60		Loss: 0.08330
2				
Epoch ID: 18	Set ID: 2	Batch ID: 80		Loss: 0.08487

Epoch ID: 18	Set ID: 2	Batch ID: 100	Loss: 0.08863
Epoch ID: 18	Set ID: 2	Batch ID: 120	Loss: 0.08671
Epoch ID: 18	Set ID: 2	Batch ID: 140	Loss: 0.08138
1			
Epoch ID: 19	Set ID: 1	Batch ID: 20	Loss: 0.08213
Epoch ID: 19	Set ID: 1	Batch ID: 40	Loss: 0.07149
Epoch ID: 19	Set ID: 1	Batch ID: 60	Loss: 0.07431
2			
Epoch ID: 19	Set ID: 2	Batch ID: 80	Loss: 0.07919
Epoch ID: 19	Set ID: 2	Batch ID: 100	Loss: 0.07621
Epoch ID: 19	Set ID: 2	Batch ID: 120	Loss: 0.08212
Epoch ID: 19	Set ID: 2	Batch ID: 140	Loss: 0.07418
1			
Epoch ID: 20	Set ID: 1	Batch ID: 20	Loss: 0.06592
Epoch ID: 20	Set ID: 1	Batch ID: 40	Loss: 0.07484
Epoch ID: 20	Set ID: 1	Batch ID: 60	Loss: 0.07068
2			
Epoch ID: 20	Set ID: 2	Batch ID: 80	Loss: 0.07403
Epoch ID: 20	Set ID: 2	Batch ID: 100	Loss: 0.08353
Epoch ID: 20	Set ID: 2	Batch ID: 120	Loss: 0.06905
Epoch ID: 20	Set ID: 2	Batch ID: 140	Loss: 0.07497
1			
Epoch ID: 21	Set ID: 1	Batch ID: 20	Loss: 0.08304
Epoch ID: 21	Set ID: 1	Batch ID: 40	Loss: 0.07733
Epoch ID: 21	Set ID: 1	Batch ID: 60	Loss: 0.07521
2			
Epoch ID: 21	Set ID: 2	Batch ID: 80	Loss: 0.07803
Epoch ID: 21	Set ID: 2	Batch ID: 100	Loss: 0.07523
Epoch ID: 21	Set ID: 2	Batch ID: 120	Loss: 0.08640
Epoch ID: 21	Set ID: 2	Batch ID: 140	Loss: 0.07492
1			
Epoch ID: 22	Set ID: 1	Batch ID: 20	Loss: 0.07467
Epoch ID: 22	Set ID: 1	Batch ID: 40	Loss: 0.06432
Epoch ID: 22	Set ID: 1	Batch ID: 60	Loss: 0.08034
2			
Epoch ID: 22	Set ID: 2	Batch ID: 80	Loss: 0.07633
Epoch ID: 22	Set ID: 2	Batch ID: 100	Loss: 0.08189
Epoch ID: 22	Set ID: 2	Batch ID: 120	Loss: 0.07302
Epoch ID: 22	Set ID: 2	Batch ID: 140	Loss: 0.06890
1			
Epoch ID: 23	Set ID: 1	Batch ID: 20	Loss: 0.08912
Epoch ID: 23	Set ID: 1	Batch ID: 40	Loss: 0.08750
Epoch ID: 23	Set ID: 1	Batch ID: 60	Loss: 0.06326
2			
Epoch ID: 23	Set ID: 2	Batch ID: 80	Loss: 0.07282
Epoch ID: 23	Set ID: 2	Batch ID: 100	Loss: 0.05943
Epoch ID: 23	Set ID: 2	Batch ID: 120	Loss: 0.06700
Epoch ID: 23	Set ID: 2	Batch ID: 140	Loss: 0.07139
1			
Epoch ID: 24	Set ID: 1	Batch ID: 20	Loss: 0.07056

Epoch ID: 24	Set ID: 1	Batch ID: 40		Loss: 0.06897
Epoch ID: 24	Set ID: 1	Batch ID: 60		Loss: 0.07183
2				
Epoch ID: 24	Set ID: 2	Batch ID: 80		Loss: 0.08325
Epoch ID: 24	Set ID: 2	Batch ID: 100		Loss: 0.07143
Epoch ID: 24	Set ID: 2	Batch ID: 120		Loss: 0.06654
Epoch ID: 24	Set ID: 2	Batch ID: 140		Loss: 0.07248
1				
Epoch ID: 25	Set ID: 1	Batch ID: 20		Loss: 0.07370
Epoch ID: 25	Set ID: 1	Batch ID: 40		Loss: 0.07383
Epoch ID: 25	Set ID: 1	Batch ID: 60		Loss: 0.06882
2				
Epoch ID: 25	Set ID: 2	Batch ID: 80		Loss: 0.07371
Epoch ID: 25	Set ID: 2	Batch ID: 100		Loss: 0.08031
Epoch ID: 25	Set ID: 2	Batch ID: 120		Loss: 0.07264
Epoch ID: 25	Set ID: 2	Batch ID: 140		Loss: 0.06508
1				
Epoch ID: 26	Set ID: 1	Batch ID: 20		Loss: 0.07573
Epoch ID: 26	Set ID: 1	Batch ID: 40		Loss: 0.08081
Epoch ID: 26	Set ID: 1	Batch ID: 60		Loss: 0.07518
2				
Epoch ID: 26	Set ID: 2	Batch ID: 80		Loss: 0.08460
Epoch ID: 26	Set ID: 2	Batch ID: 100		Loss: 0.06514
Epoch ID: 26	Set ID: 2	Batch ID: 120		Loss: 0.07211
Epoch ID: 26	Set ID: 2	Batch ID: 140		Loss: 0.07148
1				
Epoch ID: 27	Set ID: 1	Batch ID: 20		Loss: 0.07647
Epoch ID: 27	Set ID: 1	Batch ID: 40		Loss: 0.07103
Epoch ID: 27	Set ID: 1	Batch ID: 60		Loss: 0.07056
2				
Epoch ID: 27	Set ID: 2	Batch ID: 80		Loss: 0.07819
Epoch ID: 27	Set ID: 2	Batch ID: 100		Loss: 0.06928
Epoch ID: 27	Set ID: 2	Batch ID: 120		Loss: 0.07425
Epoch ID: 27	Set ID: 2	Batch ID: 140		Loss: 0.07863
1				
Epoch ID: 28	Set ID: 1	Batch ID: 20		Loss: 0.07470
Epoch ID: 28	Set ID: 1	Batch ID: 40		Loss: 0.07023
Epoch ID: 28	Set ID: 1	Batch ID: 60		Loss: 0.07477
2				
Epoch ID: 28	Set ID: 2	Batch ID: 80		Loss: 0.08641
Epoch ID: 28	Set ID: 2	Batch ID: 100		Loss: 0.07387
Epoch ID: 28	Set ID: 2	Batch ID: 120		Loss: 0.07211
Epoch ID: 28	Set ID: 2	Batch ID: 140		Loss: 0.07680
1				
Epoch ID: 29	Set ID: 1	Batch ID: 20		Loss: 0.08675
Epoch ID: 29	Set ID: 1	Batch ID: 40		Loss: 0.08505
Epoch ID: 29	Set ID: 1	Batch ID: 60		Loss: 0.08399
2				
Epoch ID: 29	Set ID: 2	Batch ID: 80		Loss: 0.08746
Epoch ID: 29	Set ID: 2	Batch ID: 100		Loss: 0.08259

Epoch ID: 29	Set ID: 2	Batch ID: 120	Loss: 0.09242
Epoch ID: 29	Set ID: 2	Batch ID: 140	Loss: 0.09250
1			
Epoch ID: 30	Set ID: 1	Batch ID: 20	Loss: 0.08672
Epoch ID: 30	Set ID: 1	Batch ID: 40	Loss: 0.08575
Epoch ID: 30	Set ID: 1	Batch ID: 60	Loss: 0.09603
2			
Epoch ID: 30	Set ID: 2	Batch ID: 80	Loss: 0.10602
Epoch ID: 30	Set ID: 2	Batch ID: 100	Loss: 0.08567
Epoch ID: 30	Set ID: 2	Batch ID: 120	Loss: 0.08165
Epoch ID: 30	Set ID: 2	Batch ID: 140	Loss: 0.09786
1			
Epoch ID: 31	Set ID: 1	Batch ID: 20	Loss: 0.09516
Epoch ID: 31	Set ID: 1	Batch ID: 40	Loss: 0.09775
Epoch ID: 31	Set ID: 1	Batch ID: 60	Loss: 0.07205
2			
Epoch ID: 31	Set ID: 2	Batch ID: 80	Loss: 0.09888
Epoch ID: 31	Set ID: 2	Batch ID: 100	Loss: 0.09747
Epoch ID: 31	Set ID: 2	Batch ID: 120	Loss: 0.11199
Epoch ID: 31	Set ID: 2	Batch ID: 140	Loss: 0.07951
1			
Epoch ID: 32	Set ID: 1	Batch ID: 20	Loss: 0.10534
Epoch ID: 32	Set ID: 1	Batch ID: 40	Loss: 0.08469
Epoch ID: 32	Set ID: 1	Batch ID: 60	Loss: 0.09428
2			
Epoch ID: 32	Set ID: 2	Batch ID: 80	Loss: 0.08332
Epoch ID: 32	Set ID: 2	Batch ID: 100	Loss: 0.08224
Epoch ID: 32	Set ID: 2	Batch ID: 120	Loss: 0.08511
Epoch ID: 32	Set ID: 2	Batch ID: 140	Loss: 0.09343
1			
Epoch ID: 33	Set ID: 1	Batch ID: 20	Loss: 0.10791
Epoch ID: 33	Set ID: 1	Batch ID: 40	Loss: 0.09424
Epoch ID: 33	Set ID: 1	Batch ID: 60	Loss: 0.08424
2			
Epoch ID: 33	Set ID: 2	Batch ID: 80	Loss: 0.09453
Epoch ID: 33	Set ID: 2	Batch ID: 100	Loss: 0.08981
Epoch ID: 33	Set ID: 2	Batch ID: 120	Loss: 0.07181
Epoch ID: 33	Set ID: 2	Batch ID: 140	Loss: 0.08550
1			
Epoch ID: 34	Set ID: 1	Batch ID: 20	Loss: 0.09730
Epoch ID: 34	Set ID: 1	Batch ID: 40	Loss: 0.07275
Epoch ID: 34	Set ID: 1	Batch ID: 60	Loss: 0.07980
2			
Epoch ID: 34	Set ID: 2	Batch ID: 80	Loss: 0.08514
Epoch ID: 34	Set ID: 2	Batch ID: 100	Loss: 0.07520
Epoch ID: 34	Set ID: 2	Batch ID: 120	Loss: 0.07407
Epoch ID: 34	Set ID: 2	Batch ID: 140	Loss: 0.07550
1			
Epoch ID: 35	Set ID: 1	Batch ID: 20	Loss: 0.07045
Epoch ID: 35	Set ID: 1	Batch ID: 40	Loss: 0.07623

Epoch ID: 35	Set ID: 1	Batch ID: 60		Loss: 0.07858
2				
Epoch ID: 35	Set ID: 2	Batch ID: 80		Loss: 0.08478
Epoch ID: 35	Set ID: 2	Batch ID: 100		Loss: 0.08054
Epoch ID: 35	Set ID: 2	Batch ID: 120		Loss: 0.08067
Epoch ID: 35	Set ID: 2	Batch ID: 140		Loss: 0.07428
1				
Epoch ID: 36	Set ID: 1	Batch ID: 20		Loss: 0.07714
Epoch ID: 36	Set ID: 1	Batch ID: 40		Loss: 0.07561
Epoch ID: 36	Set ID: 1	Batch ID: 60		Loss: 0.07878
2				
Epoch ID: 36	Set ID: 2	Batch ID: 80		Loss: 0.08993
Epoch ID: 36	Set ID: 2	Batch ID: 100		Loss: 0.07811
Epoch ID: 36	Set ID: 2	Batch ID: 120		Loss: 0.06762
Epoch ID: 36	Set ID: 2	Batch ID: 140		Loss: 0.06652
1				
Epoch ID: 37	Set ID: 1	Batch ID: 20		Loss: 0.06203
Epoch ID: 37	Set ID: 1	Batch ID: 40		Loss: 0.07527
Epoch ID: 37	Set ID: 1	Batch ID: 60		Loss: 0.06554
2				
Epoch ID: 37	Set ID: 2	Batch ID: 80		Loss: 0.06813
Epoch ID: 37	Set ID: 2	Batch ID: 100		Loss: 0.07498
Epoch ID: 37	Set ID: 2	Batch ID: 120		Loss: 0.06251
Epoch ID: 37	Set ID: 2	Batch ID: 140		Loss: 0.06144
1				
Epoch ID: 38	Set ID: 1	Batch ID: 20		Loss: 0.06929
Epoch ID: 38	Set ID: 1	Batch ID: 40		Loss: 0.06702
Epoch ID: 38	Set ID: 1	Batch ID: 60		Loss: 0.06439
2				
Epoch ID: 38	Set ID: 2	Batch ID: 80		Loss: 0.08010
Epoch ID: 38	Set ID: 2	Batch ID: 100		Loss: 0.06319
Epoch ID: 38	Set ID: 2	Batch ID: 120		Loss: 0.05453
Epoch ID: 38	Set ID: 2	Batch ID: 140		Loss: 0.06897
1				
Epoch ID: 39	Set ID: 1	Batch ID: 20		Loss: 0.06858
Epoch ID: 39	Set ID: 1	Batch ID: 40		Loss: 0.07091
Epoch ID: 39	Set ID: 1	Batch ID: 60		Loss: 0.06206
2				
Epoch ID: 39	Set ID: 2	Batch ID: 80		Loss: 0.08164
Epoch ID: 39	Set ID: 2	Batch ID: 100		Loss: 0.05811
Epoch ID: 39	Set ID: 2	Batch ID: 120		Loss: 0.06886
Epoch ID: 39	Set ID: 2	Batch ID: 140		Loss: 0.06266
1				
Epoch ID: 40	Set ID: 1	Batch ID: 20		Loss: 0.06293
Epoch ID: 40	Set ID: 1	Batch ID: 40		Loss: 0.06749
Epoch ID: 40	Set ID: 1	Batch ID: 60		Loss: 0.05630
2				
Epoch ID: 40	Set ID: 2	Batch ID: 80		Loss: 0.07424
Epoch ID: 40	Set ID: 2	Batch ID: 100		Loss: 0.06334
Epoch ID: 40	Set ID: 2	Batch ID: 120		Loss: 0.06503

Epoch ID: 40	Set ID: 2	Batch ID: 140		Loss: 0.06066
1				
Epoch ID: 41	Set ID: 1	Batch ID: 20		Loss: 0.05885
Epoch ID: 41	Set ID: 1	Batch ID: 40		Loss: 0.06240
Epoch ID: 41	Set ID: 1	Batch ID: 60		Loss: 0.06659
2				
Epoch ID: 41	Set ID: 2	Batch ID: 80		Loss: 0.07321
Epoch ID: 41	Set ID: 2	Batch ID: 100		Loss: 0.05815
Epoch ID: 41	Set ID: 2	Batch ID: 120		Loss: 0.05233
Epoch ID: 41	Set ID: 2	Batch ID: 140		Loss: 0.05719
1				
Epoch ID: 42	Set ID: 1	Batch ID: 20		Loss: 0.05691
Epoch ID: 42	Set ID: 1	Batch ID: 40		Loss: 0.05921
Epoch ID: 42	Set ID: 1	Batch ID: 60		Loss: 0.06460
2				
Epoch ID: 42	Set ID: 2	Batch ID: 80		Loss: 0.06166
Epoch ID: 42	Set ID: 2	Batch ID: 100		Loss: 0.05895
Epoch ID: 42	Set ID: 2	Batch ID: 120		Loss: 0.06369
Epoch ID: 42	Set ID: 2	Batch ID: 140		Loss: 0.05856
1				
Epoch ID: 43	Set ID: 1	Batch ID: 20		Loss: 0.05446
Epoch ID: 43	Set ID: 1	Batch ID: 40		Loss: 0.05087
Epoch ID: 43	Set ID: 1	Batch ID: 60		Loss: 0.06022
2				
Epoch ID: 43	Set ID: 2	Batch ID: 80		Loss: 0.06312
Epoch ID: 43	Set ID: 2	Batch ID: 100		Loss: 0.05445
Epoch ID: 43	Set ID: 2	Batch ID: 120		Loss: 0.06247
Epoch ID: 43	Set ID: 2	Batch ID: 140		Loss: 0.05082
1				
Epoch ID: 44	Set ID: 1	Batch ID: 20		Loss: 0.05311
Epoch ID: 44	Set ID: 1	Batch ID: 40		Loss: 0.06218
Epoch ID: 44	Set ID: 1	Batch ID: 60		Loss: 0.07336
2				
Epoch ID: 44	Set ID: 2	Batch ID: 80		Loss: 0.06610
Epoch ID: 44	Set ID: 2	Batch ID: 100		Loss: 0.05539
Epoch ID: 44	Set ID: 2	Batch ID: 120		Loss: 0.06257
Epoch ID: 44	Set ID: 2	Batch ID: 140		Loss: 0.05818
1				
Epoch ID: 45	Set ID: 1	Batch ID: 20		Loss: 0.06023
Epoch ID: 45	Set ID: 1	Batch ID: 40		Loss: 0.06258
Epoch ID: 45	Set ID: 1	Batch ID: 60		Loss: 0.05575
2				
Epoch ID: 45	Set ID: 2	Batch ID: 80		Loss: 0.06121
Epoch ID: 45	Set ID: 2	Batch ID: 100		Loss: 0.05815
Epoch ID: 45	Set ID: 2	Batch ID: 120		Loss: 0.05702
Epoch ID: 45	Set ID: 2	Batch ID: 140		Loss: 0.05602
1				
Epoch ID: 46	Set ID: 1	Batch ID: 20		Loss: 0.05606
Epoch ID: 46	Set ID: 1	Batch ID: 40		Loss: 0.06355
Epoch ID: 46	Set ID: 1	Batch ID: 60		Loss: 0.05827

```

2
Epoch ID: 46    Set ID: 2    Batch ID: 80 | Loss: 0.06930
Epoch ID: 46    Set ID: 2    Batch ID: 100 | Loss: 0.06173
Epoch ID: 46    Set ID: 2    Batch ID: 120 | Loss: 0.05581
Epoch ID: 46    Set ID: 2    Batch ID: 140 | Loss: 0.05799
1
Epoch ID: 47    Set ID: 1    Batch ID: 20 | Loss: 0.06772
Epoch ID: 47    Set ID: 1    Batch ID: 40 | Loss: 0.05689
Epoch ID: 47    Set ID: 1    Batch ID: 60 | Loss: 0.06010
2
Epoch ID: 47    Set ID: 2    Batch ID: 80 | Loss: 0.06465
Epoch ID: 47    Set ID: 2    Batch ID: 100 | Loss: 0.05629
Epoch ID: 47    Set ID: 2    Batch ID: 120 | Loss: 0.05869
Epoch ID: 47    Set ID: 2    Batch ID: 140 | Loss: 0.05315
1
Epoch ID: 48    Set ID: 1    Batch ID: 20 | Loss: 0.06765
Epoch ID: 48    Set ID: 1    Batch ID: 40 | Loss: 0.05315
Epoch ID: 48    Set ID: 1    Batch ID: 60 | Loss: 0.06417
2
Epoch ID: 48    Set ID: 2    Batch ID: 80 | Loss: 0.06216
Epoch ID: 48    Set ID: 2    Batch ID: 100 | Loss: 0.05708
Epoch ID: 48    Set ID: 2    Batch ID: 120 | Loss: 0.05298
Epoch ID: 48    Set ID: 2    Batch ID: 140 | Loss: 0.05566
1
Epoch ID: 49    Set ID: 1    Batch ID: 20 | Loss: 0.05605
Epoch ID: 49    Set ID: 1    Batch ID: 40 | Loss: 0.06138
Epoch ID: 49    Set ID: 1    Batch ID: 60 | Loss: 0.05680
2
Epoch ID: 49    Set ID: 2    Batch ID: 80 | Loss: 0.06162
Epoch ID: 49    Set ID: 2    Batch ID: 100 | Loss: 0.05406
Epoch ID: 49    Set ID: 2    Batch ID: 120 | Loss: 0.06435
Epoch ID: 49    Set ID: 2    Batch ID: 140 | Loss: 0.05201

```

```
loss_val, eff_rate, fp_rate = validate(model)
```

```

print(f"Loss: {loss_val}")
print(f"Eff: {eff_rate}")
print(f"FP: {fp_rate}")

```

```

Loss: 0.05557173117995262
Eff: 0.784597802845978
FP: 0.14037192561487702

```

Larger Sample Size 15,000

```

train_set_idx, val_set_idx = train_test_split(list(range(1,5)),
test_size=1)
print(train_set_idx)
print(val_set_idx)

```

```
[1, 4, 2]  
[3]
```

```
model = BiRNN_2(input_size=4, hidden_size=96, num_layers=2)
```

```
model = model.to(DEVICE)
```

```
cost, val_cost = train(model,  
                        num_epochs=50,  
                        learning_rate=0.0005,  
                        seed=123, batch_size=64)
```

```
1
```

```
Epoch ID: 1   Set ID: 1   Batch ID: 20 | Loss: 5.19526  
Epoch ID: 1   Set ID: 1   Batch ID: 40 | Loss: 4.55949  
Epoch ID: 1   Set ID: 1   Batch ID: 60 | Loss: 2.52273
```

```
4
```

```
Epoch ID: 1   Set ID: 4   Batch ID: 80 | Loss: 3.13117  
Epoch ID: 1   Set ID: 4   Batch ID: 100 | Loss: 2.70643  
Epoch ID: 1   Set ID: 4   Batch ID: 120 | Loss: 2.63259  
Epoch ID: 1   Set ID: 4   Batch ID: 140 | Loss: 1.93767
```

```
2
```

```
Epoch ID: 1   Set ID: 2   Batch ID: 160 | Loss: 2.39024  
Epoch ID: 1   Set ID: 2   Batch ID: 180 | Loss: 2.28861  
Epoch ID: 1   Set ID: 2   Batch ID: 200 | Loss: 2.58105  
Epoch ID: 1   Set ID: 2   Batch ID: 220 | Loss: 3.15524
```

```
1
```

```
Epoch ID: 2   Set ID: 1   Batch ID: 20 | Loss: 1.83045  
Epoch ID: 2   Set ID: 1   Batch ID: 40 | Loss: 1.78442  
Epoch ID: 2   Set ID: 1   Batch ID: 60 | Loss: 1.35095
```

```
4
```

```
Epoch ID: 2   Set ID: 4   Batch ID: 80 | Loss: 2.68353  
Epoch ID: 2   Set ID: 4   Batch ID: 100 | Loss: 2.57162  
Epoch ID: 2   Set ID: 4   Batch ID: 120 | Loss: 0.74037  
Epoch ID: 2   Set ID: 4   Batch ID: 140 | Loss: 0.56370
```

```
2
```

```
Epoch ID: 2   Set ID: 2   Batch ID: 160 | Loss: 0.44869  
Epoch ID: 2   Set ID: 2   Batch ID: 180 | Loss: 2.01523  
Epoch ID: 2   Set ID: 2   Batch ID: 200 | Loss: 3.46512  
Epoch ID: 2   Set ID: 2   Batch ID: 220 | Loss: 1.41479
```

```
1
```

```
Epoch ID: 3   Set ID: 1   Batch ID: 20 | Loss: 1.29272  
Epoch ID: 3   Set ID: 1   Batch ID: 40 | Loss: 1.22484  
Epoch ID: 3   Set ID: 1   Batch ID: 60 | Loss: 0.31252
```

```
4
```

```
Epoch ID: 3   Set ID: 4   Batch ID: 80 | Loss: 0.71198  
Epoch ID: 3   Set ID: 4   Batch ID: 100 | Loss: 0.34402  
Epoch ID: 3   Set ID: 4   Batch ID: 120 | Loss: 0.32428  
Epoch ID: 3   Set ID: 4   Batch ID: 140 | Loss: 0.27629
```

```
2
```

```
Epoch ID: 3   Set ID: 2   Batch ID: 160 | Loss: 0.28365
```


Epoch ID: 3	Set ID: 2	Batch ID: 180		Loss: 0.34440
Epoch ID: 3	Set ID: 2	Batch ID: 200		Loss: 0.50357
Epoch ID: 3	Set ID: 2	Batch ID: 220		Loss: 0.27103
1				
Epoch ID: 4	Set ID: 1	Batch ID: 20		Loss: 0.31545
Epoch ID: 4	Set ID: 1	Batch ID: 40		Loss: 0.29420
Epoch ID: 4	Set ID: 1	Batch ID: 60		Loss: 0.25357
4				
Epoch ID: 4	Set ID: 4	Batch ID: 80		Loss: 0.25958
Epoch ID: 4	Set ID: 4	Batch ID: 100		Loss: 0.31076
Epoch ID: 4	Set ID: 4	Batch ID: 120		Loss: 0.25041
Epoch ID: 4	Set ID: 4	Batch ID: 140		Loss: 0.23895
2				
Epoch ID: 4	Set ID: 2	Batch ID: 160		Loss: 0.27651
Epoch ID: 4	Set ID: 2	Batch ID: 180		Loss: 0.20904
Epoch ID: 4	Set ID: 2	Batch ID: 200		Loss: 0.26987
Epoch ID: 4	Set ID: 2	Batch ID: 220		Loss: 0.24190
1				
Epoch ID: 5	Set ID: 1	Batch ID: 20		Loss: 0.26964
Epoch ID: 5	Set ID: 1	Batch ID: 40		Loss: 0.24907
Epoch ID: 5	Set ID: 1	Batch ID: 60		Loss: 0.25247
4				
Epoch ID: 5	Set ID: 4	Batch ID: 80		Loss: 0.24841
Epoch ID: 5	Set ID: 4	Batch ID: 100		Loss: 0.27131
Epoch ID: 5	Set ID: 4	Batch ID: 120		Loss: 0.24070
Epoch ID: 5	Set ID: 4	Batch ID: 140		Loss: 0.22704
2				
Epoch ID: 5	Set ID: 2	Batch ID: 160		Loss: 0.25914
Epoch ID: 5	Set ID: 2	Batch ID: 180		Loss: 0.22830
Epoch ID: 5	Set ID: 2	Batch ID: 200		Loss: 0.20462
Epoch ID: 5	Set ID: 2	Batch ID: 220		Loss: 0.23202
1				
Epoch ID: 6	Set ID: 1	Batch ID: 20		Loss: 0.22859
Epoch ID: 6	Set ID: 1	Batch ID: 40		Loss: 0.18296
Epoch ID: 6	Set ID: 1	Batch ID: 60		Loss: 0.21006
4				
Epoch ID: 6	Set ID: 4	Batch ID: 80		Loss: 0.20070
Epoch ID: 6	Set ID: 4	Batch ID: 100		Loss: 0.20309
Epoch ID: 6	Set ID: 4	Batch ID: 120		Loss: 0.20080
Epoch ID: 6	Set ID: 4	Batch ID: 140		Loss: 0.18473
2				
Epoch ID: 6	Set ID: 2	Batch ID: 160		Loss: 0.18476
Epoch ID: 6	Set ID: 2	Batch ID: 180		Loss: 0.17363
Epoch ID: 6	Set ID: 2	Batch ID: 200		Loss: 0.16971
Epoch ID: 6	Set ID: 2	Batch ID: 220		Loss: 0.18075
1				
Epoch ID: 7	Set ID: 1	Batch ID: 20		Loss: 0.15851
Epoch ID: 7	Set ID: 1	Batch ID: 40		Loss: 0.15345
Epoch ID: 7	Set ID: 1	Batch ID: 60		Loss: 0.13799
4				

Epoch ID: 7	Set ID: 4	Batch ID: 80	Loss: 0.14288
Epoch ID: 7	Set ID: 4	Batch ID: 100	Loss: 0.15333
Epoch ID: 7	Set ID: 4	Batch ID: 120	Loss: 0.16110
Epoch ID: 7	Set ID: 4	Batch ID: 140	Loss: 0.15748
2			
Epoch ID: 7	Set ID: 2	Batch ID: 160	Loss: 0.15335
Epoch ID: 7	Set ID: 2	Batch ID: 180	Loss: 0.13239
Epoch ID: 7	Set ID: 2	Batch ID: 200	Loss: 0.15542
Epoch ID: 7	Set ID: 2	Batch ID: 220	Loss: 0.13184
1			
Epoch ID: 8	Set ID: 1	Batch ID: 20	Loss: 0.12827
Epoch ID: 8	Set ID: 1	Batch ID: 40	Loss: 0.12265
Epoch ID: 8	Set ID: 1	Batch ID: 60	Loss: 0.12408
4			
Epoch ID: 8	Set ID: 4	Batch ID: 80	Loss: 0.14785
Epoch ID: 8	Set ID: 4	Batch ID: 100	Loss: 0.13579
Epoch ID: 8	Set ID: 4	Batch ID: 120	Loss: 0.11445
Epoch ID: 8	Set ID: 4	Batch ID: 140	Loss: 0.12846
2			
Epoch ID: 8	Set ID: 2	Batch ID: 160	Loss: 0.12046
Epoch ID: 8	Set ID: 2	Batch ID: 180	Loss: 0.12455
Epoch ID: 8	Set ID: 2	Batch ID: 200	Loss: 0.10703
Epoch ID: 8	Set ID: 2	Batch ID: 220	Loss: 0.11896
1			
Epoch ID: 9	Set ID: 1	Batch ID: 20	Loss: 0.12114
Epoch ID: 9	Set ID: 1	Batch ID: 40	Loss: 0.09417
Epoch ID: 9	Set ID: 1	Batch ID: 60	Loss: 0.10949
4			
Epoch ID: 9	Set ID: 4	Batch ID: 80	Loss: 0.10016
Epoch ID: 9	Set ID: 4	Batch ID: 100	Loss: 0.11408
Epoch ID: 9	Set ID: 4	Batch ID: 120	Loss: 0.09300
Epoch ID: 9	Set ID: 4	Batch ID: 140	Loss: 0.10009
2			
Epoch ID: 9	Set ID: 2	Batch ID: 160	Loss: 0.11734
Epoch ID: 9	Set ID: 2	Batch ID: 180	Loss: 0.10014
Epoch ID: 9	Set ID: 2	Batch ID: 200	Loss: 0.11100
Epoch ID: 9	Set ID: 2	Batch ID: 220	Loss: 0.09952
1			
Epoch ID: 10	Set ID: 1	Batch ID: 20	Loss: 0.10032
Epoch ID: 10	Set ID: 1	Batch ID: 40	Loss: 0.10334
Epoch ID: 10	Set ID: 1	Batch ID: 60	Loss: 0.08526
4			
Epoch ID: 10	Set ID: 4	Batch ID: 80	Loss: 0.09237
Epoch ID: 10	Set ID: 4	Batch ID: 100	Loss: 0.08329
Epoch ID: 10	Set ID: 4	Batch ID: 120	Loss: 0.08770
Epoch ID: 10	Set ID: 4	Batch ID: 140	Loss: 0.08031
2			
Epoch ID: 10	Set ID: 2	Batch ID: 160	Loss: 0.11135
Epoch ID: 10	Set ID: 2	Batch ID: 180	Loss: 0.08019
Epoch ID: 10	Set ID: 2	Batch ID: 200	Loss: 0.09660

Epoch ID: 10	Set ID: 2	Batch ID: 220		Loss: 0.08115
1				
Epoch ID: 11	Set ID: 1	Batch ID: 20		Loss: 0.07629
Epoch ID: 11	Set ID: 1	Batch ID: 40		Loss: 0.07739
Epoch ID: 11	Set ID: 1	Batch ID: 60		Loss: 0.08741
4				
Epoch ID: 11	Set ID: 4	Batch ID: 80		Loss: 0.10979
Epoch ID: 11	Set ID: 4	Batch ID: 100		Loss: 0.09153
Epoch ID: 11	Set ID: 4	Batch ID: 120		Loss: 0.08711
Epoch ID: 11	Set ID: 4	Batch ID: 140		Loss: 0.08942
2				
Epoch ID: 11	Set ID: 2	Batch ID: 160		Loss: 0.11498
Epoch ID: 11	Set ID: 2	Batch ID: 180		Loss: 0.08676
Epoch ID: 11	Set ID: 2	Batch ID: 200		Loss: 0.08257
Epoch ID: 11	Set ID: 2	Batch ID: 220		Loss: 0.08473
1				
Epoch ID: 12	Set ID: 1	Batch ID: 20		Loss: 0.08533
Epoch ID: 12	Set ID: 1	Batch ID: 40		Loss: 0.08532
Epoch ID: 12	Set ID: 1	Batch ID: 60		Loss: 0.07975
4				
Epoch ID: 12	Set ID: 4	Batch ID: 80		Loss: 0.09333
Epoch ID: 12	Set ID: 4	Batch ID: 100		Loss: 0.07768
Epoch ID: 12	Set ID: 4	Batch ID: 120		Loss: 0.09167
Epoch ID: 12	Set ID: 4	Batch ID: 140		Loss: 0.08463
2				
Epoch ID: 12	Set ID: 2	Batch ID: 160		Loss: 0.11282
Epoch ID: 12	Set ID: 2	Batch ID: 180		Loss: 0.08466
Epoch ID: 12	Set ID: 2	Batch ID: 200		Loss: 0.08665
Epoch ID: 12	Set ID: 2	Batch ID: 220		Loss: 0.09761
1				
Epoch ID: 13	Set ID: 1	Batch ID: 20		Loss: 0.10674
Epoch ID: 13	Set ID: 1	Batch ID: 40		Loss: 0.09176
Epoch ID: 13	Set ID: 1	Batch ID: 60		Loss: 0.08721
4				
Epoch ID: 13	Set ID: 4	Batch ID: 80		Loss: 0.09484
Epoch ID: 13	Set ID: 4	Batch ID: 100		Loss: 0.09197
Epoch ID: 13	Set ID: 4	Batch ID: 120		Loss: 0.08636
Epoch ID: 13	Set ID: 4	Batch ID: 140		Loss: 0.07739
2				
Epoch ID: 13	Set ID: 2	Batch ID: 160		Loss: 0.09702
Epoch ID: 13	Set ID: 2	Batch ID: 180		Loss: 0.07939
Epoch ID: 13	Set ID: 2	Batch ID: 200		Loss: 0.09142
Epoch ID: 13	Set ID: 2	Batch ID: 220		Loss: 0.10594
1				
Epoch ID: 14	Set ID: 1	Batch ID: 20		Loss: 0.08639
Epoch ID: 14	Set ID: 1	Batch ID: 40		Loss: 0.09595
Epoch ID: 14	Set ID: 1	Batch ID: 60		Loss: 0.08555
4				
Epoch ID: 14	Set ID: 4	Batch ID: 80		Loss: 0.09780
Epoch ID: 14	Set ID: 4	Batch ID: 100		Loss: 0.10368

Epoch ID: 14	Set ID: 4	Batch ID: 120		Loss: 0.08659
Epoch ID: 14	Set ID: 4	Batch ID: 140		Loss: 0.08067
2				
Epoch ID: 14	Set ID: 2	Batch ID: 160		Loss: 0.12736
Epoch ID: 14	Set ID: 2	Batch ID: 180		Loss: 0.09597
Epoch ID: 14	Set ID: 2	Batch ID: 200		Loss: 0.08828
Epoch ID: 14	Set ID: 2	Batch ID: 220		Loss: 0.10561
1				
Epoch ID: 15	Set ID: 1	Batch ID: 20		Loss: 0.08340
Epoch ID: 15	Set ID: 1	Batch ID: 40		Loss: 0.07996
Epoch ID: 15	Set ID: 1	Batch ID: 60		Loss: 0.09086
4				
Epoch ID: 15	Set ID: 4	Batch ID: 80		Loss: 0.10038
Epoch ID: 15	Set ID: 4	Batch ID: 100		Loss: 0.09817
Epoch ID: 15	Set ID: 4	Batch ID: 120		Loss: 0.09197
Epoch ID: 15	Set ID: 4	Batch ID: 140		Loss: 0.08204
2				
Epoch ID: 15	Set ID: 2	Batch ID: 160		Loss: 0.09542
Epoch ID: 15	Set ID: 2	Batch ID: 180		Loss: 0.10147
Epoch ID: 15	Set ID: 2	Batch ID: 200		Loss: 0.09138
Epoch ID: 15	Set ID: 2	Batch ID: 220		Loss: 0.08512
1				
Epoch ID: 16	Set ID: 1	Batch ID: 20		Loss: 0.09104
Epoch ID: 16	Set ID: 1	Batch ID: 40		Loss: 0.08403
Epoch ID: 16	Set ID: 1	Batch ID: 60		Loss: 0.07661
4				
Epoch ID: 16	Set ID: 4	Batch ID: 80		Loss: 0.08318
Epoch ID: 16	Set ID: 4	Batch ID: 100		Loss: 0.08243
Epoch ID: 16	Set ID: 4	Batch ID: 120		Loss: 0.08940
Epoch ID: 16	Set ID: 4	Batch ID: 140		Loss: 0.07990
2				
Epoch ID: 16	Set ID: 2	Batch ID: 160		Loss: 0.10532
Epoch ID: 16	Set ID: 2	Batch ID: 180		Loss: 0.07635
Epoch ID: 16	Set ID: 2	Batch ID: 200		Loss: 0.07153
Epoch ID: 16	Set ID: 2	Batch ID: 220		Loss: 0.08963
1				
Epoch ID: 17	Set ID: 1	Batch ID: 20		Loss: 0.08730
Epoch ID: 17	Set ID: 1	Batch ID: 40		Loss: 0.09397
Epoch ID: 17	Set ID: 1	Batch ID: 60		Loss: 0.07878
4				
Epoch ID: 17	Set ID: 4	Batch ID: 80		Loss: 0.08632
Epoch ID: 17	Set ID: 4	Batch ID: 100		Loss: 0.08658
Epoch ID: 17	Set ID: 4	Batch ID: 120		Loss: 0.08365
Epoch ID: 17	Set ID: 4	Batch ID: 140		Loss: 0.10217
2				
Epoch ID: 17	Set ID: 2	Batch ID: 160		Loss: 0.10348
Epoch ID: 17	Set ID: 2	Batch ID: 180		Loss: 0.07613
Epoch ID: 17	Set ID: 2	Batch ID: 200		Loss: 0.08282
Epoch ID: 17	Set ID: 2	Batch ID: 220		Loss: 0.09015
1				

Epoch ID: 18	Set ID: 1	Batch ID: 20	Loss: 0.08906
Epoch ID: 18	Set ID: 1	Batch ID: 40	Loss: 0.08798
Epoch ID: 18	Set ID: 1	Batch ID: 60	Loss: 0.08903
4			
Epoch ID: 18	Set ID: 4	Batch ID: 80	Loss: 0.10466
Epoch ID: 18	Set ID: 4	Batch ID: 100	Loss: 0.07546
Epoch ID: 18	Set ID: 4	Batch ID: 120	Loss: 0.07432
Epoch ID: 18	Set ID: 4	Batch ID: 140	Loss: 0.09233
2			
Epoch ID: 18	Set ID: 2	Batch ID: 160	Loss: 0.11019
Epoch ID: 18	Set ID: 2	Batch ID: 180	Loss: 0.09206
Epoch ID: 18	Set ID: 2	Batch ID: 200	Loss: 0.08901
Epoch ID: 18	Set ID: 2	Batch ID: 220	Loss: 0.07837
1			
Epoch ID: 19	Set ID: 1	Batch ID: 20	Loss: 0.07728
Epoch ID: 19	Set ID: 1	Batch ID: 40	Loss: 0.07875
Epoch ID: 19	Set ID: 1	Batch ID: 60	Loss: 0.07042
4			
Epoch ID: 19	Set ID: 4	Batch ID: 80	Loss: 0.08383
Epoch ID: 19	Set ID: 4	Batch ID: 100	Loss: 0.07610
Epoch ID: 19	Set ID: 4	Batch ID: 120	Loss: 0.08097
Epoch ID: 19	Set ID: 4	Batch ID: 140	Loss: 0.08229
2			
Epoch ID: 19	Set ID: 2	Batch ID: 160	Loss: 0.08014
Epoch ID: 19	Set ID: 2	Batch ID: 180	Loss: 0.08065
Epoch ID: 19	Set ID: 2	Batch ID: 200	Loss: 0.07829
Epoch ID: 19	Set ID: 2	Batch ID: 220	Loss: 0.07429
1			
Epoch ID: 20	Set ID: 1	Batch ID: 20	Loss: 0.09563
Epoch ID: 20	Set ID: 1	Batch ID: 40	Loss: 0.08709
Epoch ID: 20	Set ID: 1	Batch ID: 60	Loss: 0.10859
4			
Epoch ID: 20	Set ID: 4	Batch ID: 80	Loss: 0.07146
Epoch ID: 20	Set ID: 4	Batch ID: 100	Loss: 0.07629
Epoch ID: 20	Set ID: 4	Batch ID: 120	Loss: 0.07282
Epoch ID: 20	Set ID: 4	Batch ID: 140	Loss: 0.08270
2			
Epoch ID: 20	Set ID: 2	Batch ID: 160	Loss: 0.09588
Epoch ID: 20	Set ID: 2	Batch ID: 180	Loss: 0.09045
Epoch ID: 20	Set ID: 2	Batch ID: 200	Loss: 0.08136
Epoch ID: 20	Set ID: 2	Batch ID: 220	Loss: 0.08906
1			
Epoch ID: 21	Set ID: 1	Batch ID: 20	Loss: 0.07595
Epoch ID: 21	Set ID: 1	Batch ID: 40	Loss: 0.07591
Epoch ID: 21	Set ID: 1	Batch ID: 60	Loss: 0.07030
4			
Epoch ID: 21	Set ID: 4	Batch ID: 80	Loss: 0.07849
Epoch ID: 21	Set ID: 4	Batch ID: 100	Loss: 0.07361
Epoch ID: 21	Set ID: 4	Batch ID: 120	Loss: 0.07331
Epoch ID: 21	Set ID: 4	Batch ID: 140	Loss: 0.07601

2

Epoch ID: 21	Set ID: 2	Batch ID: 160	Loss: 0.08888
Epoch ID: 21	Set ID: 2	Batch ID: 180	Loss: 0.08544
Epoch ID: 21	Set ID: 2	Batch ID: 200	Loss: 0.07663
Epoch ID: 21	Set ID: 2	Batch ID: 220	Loss: 0.07357

1

Epoch ID: 22	Set ID: 1	Batch ID: 20	Loss: 0.07417
Epoch ID: 22	Set ID: 1	Batch ID: 40	Loss: 0.06958
Epoch ID: 22	Set ID: 1	Batch ID: 60	Loss: 0.08361

4

Epoch ID: 22	Set ID: 4	Batch ID: 80	Loss: 0.08813
Epoch ID: 22	Set ID: 4	Batch ID: 100	Loss: 0.07053
Epoch ID: 22	Set ID: 4	Batch ID: 120	Loss: 0.07677
Epoch ID: 22	Set ID: 4	Batch ID: 140	Loss: 0.08039

2

Epoch ID: 22	Set ID: 2	Batch ID: 160	Loss: 0.09909
Epoch ID: 22	Set ID: 2	Batch ID: 180	Loss: 0.07517
Epoch ID: 22	Set ID: 2	Batch ID: 200	Loss: 0.07092
Epoch ID: 22	Set ID: 2	Batch ID: 220	Loss: 0.07139

1

Epoch ID: 23	Set ID: 1	Batch ID: 20	Loss: 0.06752
Epoch ID: 23	Set ID: 1	Batch ID: 40	Loss: 0.07500
Epoch ID: 23	Set ID: 1	Batch ID: 60	Loss: 0.07396

4

Epoch ID: 23	Set ID: 4	Batch ID: 80	Loss: 0.08684
Epoch ID: 23	Set ID: 4	Batch ID: 100	Loss: 0.07475
Epoch ID: 23	Set ID: 4	Batch ID: 120	Loss: 0.05933
Epoch ID: 23	Set ID: 4	Batch ID: 140	Loss: 0.06812

2

Epoch ID: 23	Set ID: 2	Batch ID: 160	Loss: 0.07463
Epoch ID: 23	Set ID: 2	Batch ID: 180	Loss: 0.07012
Epoch ID: 23	Set ID: 2	Batch ID: 200	Loss: 0.07112
Epoch ID: 23	Set ID: 2	Batch ID: 220	Loss: 0.06867

1

Epoch ID: 24	Set ID: 1	Batch ID: 20	Loss: 0.07041
Epoch ID: 24	Set ID: 1	Batch ID: 40	Loss: 0.06488
Epoch ID: 24	Set ID: 1	Batch ID: 60	Loss: 0.06710

4

Epoch ID: 24	Set ID: 4	Batch ID: 80	Loss: 0.08146
Epoch ID: 24	Set ID: 4	Batch ID: 100	Loss: 0.07128
Epoch ID: 24	Set ID: 4	Batch ID: 120	Loss: 0.06267
Epoch ID: 24	Set ID: 4	Batch ID: 140	Loss: 0.08636

2

Epoch ID: 24	Set ID: 2	Batch ID: 160	Loss: 0.07422
Epoch ID: 24	Set ID: 2	Batch ID: 180	Loss: 0.07294
Epoch ID: 24	Set ID: 2	Batch ID: 200	Loss: 0.06147
Epoch ID: 24	Set ID: 2	Batch ID: 220	Loss: 0.07205

1

Epoch ID: 25	Set ID: 1	Batch ID: 20	Loss: 0.06756
Epoch ID: 25	Set ID: 1	Batch ID: 40	Loss: 0.06850

Epoch ID: 25	Set ID: 1	Batch ID: 60		Loss: 0.07081
4				
Epoch ID: 25	Set ID: 4	Batch ID: 80		Loss: 0.07527
Epoch ID: 25	Set ID: 4	Batch ID: 100		Loss: 0.06686
Epoch ID: 25	Set ID: 4	Batch ID: 120		Loss: 0.05903
Epoch ID: 25	Set ID: 4	Batch ID: 140		Loss: 0.05992
2				
Epoch ID: 25	Set ID: 2	Batch ID: 160		Loss: 0.07165
Epoch ID: 25	Set ID: 2	Batch ID: 180		Loss: 0.06516
Epoch ID: 25	Set ID: 2	Batch ID: 200		Loss: 0.06379
Epoch ID: 25	Set ID: 2	Batch ID: 220		Loss: 0.06272
1				
Epoch ID: 26	Set ID: 1	Batch ID: 20		Loss: 0.06775
Epoch ID: 26	Set ID: 1	Batch ID: 40		Loss: 0.06266
Epoch ID: 26	Set ID: 1	Batch ID: 60		Loss: 0.07355
4				
Epoch ID: 26	Set ID: 4	Batch ID: 80		Loss: 0.07249
Epoch ID: 26	Set ID: 4	Batch ID: 100		Loss: 0.06011
Epoch ID: 26	Set ID: 4	Batch ID: 120		Loss: 0.06546
Epoch ID: 26	Set ID: 4	Batch ID: 140		Loss: 0.06359
2				
Epoch ID: 26	Set ID: 2	Batch ID: 160		Loss: 0.07824
Epoch ID: 26	Set ID: 2	Batch ID: 180		Loss: 0.06799
Epoch ID: 26	Set ID: 2	Batch ID: 200		Loss: 0.06379
Epoch ID: 26	Set ID: 2	Batch ID: 220		Loss: 0.06610
1				
Epoch ID: 27	Set ID: 1	Batch ID: 20		Loss: 0.06886
Epoch ID: 27	Set ID: 1	Batch ID: 40		Loss: 0.07469
Epoch ID: 27	Set ID: 1	Batch ID: 60		Loss: 0.06365
4				
Epoch ID: 27	Set ID: 4	Batch ID: 80		Loss: 0.06771
Epoch ID: 27	Set ID: 4	Batch ID: 100		Loss: 0.06934
Epoch ID: 27	Set ID: 4	Batch ID: 120		Loss: 0.06745
Epoch ID: 27	Set ID: 4	Batch ID: 140		Loss: 0.06593
2				
Epoch ID: 27	Set ID: 2	Batch ID: 160		Loss: 0.06945
Epoch ID: 27	Set ID: 2	Batch ID: 180		Loss: 0.06510
Epoch ID: 27	Set ID: 2	Batch ID: 200		Loss: 0.06868
Epoch ID: 27	Set ID: 2	Batch ID: 220		Loss: 0.06192
1				
Epoch ID: 28	Set ID: 1	Batch ID: 20		Loss: 0.05845
Epoch ID: 28	Set ID: 1	Batch ID: 40		Loss: 0.06289
Epoch ID: 28	Set ID: 1	Batch ID: 60		Loss: 0.06420
4				
Epoch ID: 28	Set ID: 4	Batch ID: 80		Loss: 0.05873
Epoch ID: 28	Set ID: 4	Batch ID: 100		Loss: 0.06391
Epoch ID: 28	Set ID: 4	Batch ID: 120		Loss: 0.05568
Epoch ID: 28	Set ID: 4	Batch ID: 140		Loss: 0.06954
2				
Epoch ID: 28	Set ID: 2	Batch ID: 160		Loss: 0.06557

Epoch ID: 28	Set ID: 2	Batch ID: 180		Loss: 0.05758
Epoch ID: 28	Set ID: 2	Batch ID: 200		Loss: 0.06547
Epoch ID: 28	Set ID: 2	Batch ID: 220		Loss: 0.06292
1				
Epoch ID: 29	Set ID: 1	Batch ID: 20		Loss: 0.06022
Epoch ID: 29	Set ID: 1	Batch ID: 40		Loss: 0.05077
Epoch ID: 29	Set ID: 1	Batch ID: 60		Loss: 0.06600
4				
Epoch ID: 29	Set ID: 4	Batch ID: 80		Loss: 0.06558
Epoch ID: 29	Set ID: 4	Batch ID: 100		Loss: 0.06902
Epoch ID: 29	Set ID: 4	Batch ID: 120		Loss: 0.06919
Epoch ID: 29	Set ID: 4	Batch ID: 140		Loss: 0.06665
2				
Epoch ID: 29	Set ID: 2	Batch ID: 160		Loss: 0.06953
Epoch ID: 29	Set ID: 2	Batch ID: 180		Loss: 0.05881
Epoch ID: 29	Set ID: 2	Batch ID: 200		Loss: 0.05722
Epoch ID: 29	Set ID: 2	Batch ID: 220		Loss: 0.06439
1				
Epoch ID: 30	Set ID: 1	Batch ID: 20		Loss: 0.06896
Epoch ID: 30	Set ID: 1	Batch ID: 40		Loss: 0.06405
Epoch ID: 30	Set ID: 1	Batch ID: 60		Loss: 0.06599
4				
Epoch ID: 30	Set ID: 4	Batch ID: 80		Loss: 0.06820
Epoch ID: 30	Set ID: 4	Batch ID: 100		Loss: 0.06596
Epoch ID: 30	Set ID: 4	Batch ID: 120		Loss: 0.05749
Epoch ID: 30	Set ID: 4	Batch ID: 140		Loss: 0.06095
2				
Epoch ID: 30	Set ID: 2	Batch ID: 160		Loss: 0.07677
Epoch ID: 30	Set ID: 2	Batch ID: 180		Loss: 0.06410
Epoch ID: 30	Set ID: 2	Batch ID: 200		Loss: 0.06046
Epoch ID: 30	Set ID: 2	Batch ID: 220		Loss: 0.06162
1				
Epoch ID: 31	Set ID: 1	Batch ID: 20		Loss: 0.05970
Epoch ID: 31	Set ID: 1	Batch ID: 40		Loss: 0.06669
Epoch ID: 31	Set ID: 1	Batch ID: 60		Loss: 0.06103
4				
Epoch ID: 31	Set ID: 4	Batch ID: 80		Loss: 0.06906
Epoch ID: 31	Set ID: 4	Batch ID: 100		Loss: 0.06076
Epoch ID: 31	Set ID: 4	Batch ID: 120		Loss: 0.06538
Epoch ID: 31	Set ID: 4	Batch ID: 140		Loss: 0.05962
2				
Epoch ID: 31	Set ID: 2	Batch ID: 160		Loss: 0.05445
Epoch ID: 31	Set ID: 2	Batch ID: 180		Loss: 0.06068
Epoch ID: 31	Set ID: 2	Batch ID: 200		Loss: 0.05756
Epoch ID: 31	Set ID: 2	Batch ID: 220		Loss: 0.06811
1				
Epoch ID: 32	Set ID: 1	Batch ID: 20		Loss: 0.06057
Epoch ID: 32	Set ID: 1	Batch ID: 40		Loss: 0.05774
Epoch ID: 32	Set ID: 1	Batch ID: 60		Loss: 0.05785
4				

Epoch ID: 32	Set ID: 4	Batch ID: 80		Loss: 0.07419
Epoch ID: 32	Set ID: 4	Batch ID: 100		Loss: 0.05972
Epoch ID: 32	Set ID: 4	Batch ID: 120		Loss: 0.05676
Epoch ID: 32	Set ID: 4	Batch ID: 140		Loss: 0.06893
2				
Epoch ID: 32	Set ID: 2	Batch ID: 160		Loss: 0.07062
Epoch ID: 32	Set ID: 2	Batch ID: 180		Loss: 0.06541
Epoch ID: 32	Set ID: 2	Batch ID: 200		Loss: 0.05459
Epoch ID: 32	Set ID: 2	Batch ID: 220		Loss: 0.05961
1				
Epoch ID: 33	Set ID: 1	Batch ID: 20		Loss: 0.05601
Epoch ID: 33	Set ID: 1	Batch ID: 40		Loss: 0.06930
Epoch ID: 33	Set ID: 1	Batch ID: 60		Loss: 0.06150
4				
Epoch ID: 33	Set ID: 4	Batch ID: 80		Loss: 0.06275
Epoch ID: 33	Set ID: 4	Batch ID: 100		Loss: 0.05982
Epoch ID: 33	Set ID: 4	Batch ID: 120		Loss: 0.06434
Epoch ID: 33	Set ID: 4	Batch ID: 140		Loss: 0.05821
2				
Epoch ID: 33	Set ID: 2	Batch ID: 160		Loss: 0.06439
Epoch ID: 33	Set ID: 2	Batch ID: 180		Loss: 0.06102
Epoch ID: 33	Set ID: 2	Batch ID: 200		Loss: 0.05530
Epoch ID: 33	Set ID: 2	Batch ID: 220		Loss: 0.06028
1				
Epoch ID: 34	Set ID: 1	Batch ID: 20		Loss: 0.06301
Epoch ID: 34	Set ID: 1	Batch ID: 40		Loss: 0.05992
Epoch ID: 34	Set ID: 1	Batch ID: 60		Loss: 0.06110
4				
Epoch ID: 34	Set ID: 4	Batch ID: 80		Loss: 0.07258
Epoch ID: 34	Set ID: 4	Batch ID: 100		Loss: 0.05810
Epoch ID: 34	Set ID: 4	Batch ID: 120		Loss: 0.06002
Epoch ID: 34	Set ID: 4	Batch ID: 140		Loss: 0.06444
2				
Epoch ID: 34	Set ID: 2	Batch ID: 160		Loss: 0.06202
Epoch ID: 34	Set ID: 2	Batch ID: 180		Loss: 0.06325
Epoch ID: 34	Set ID: 2	Batch ID: 200		Loss: 0.06204
Epoch ID: 34	Set ID: 2	Batch ID: 220		Loss: 0.06159
1				
Epoch ID: 35	Set ID: 1	Batch ID: 20		Loss: 0.05692
Epoch ID: 35	Set ID: 1	Batch ID: 40		Loss: 0.06638
Epoch ID: 35	Set ID: 1	Batch ID: 60		Loss: 0.06257
4				
Epoch ID: 35	Set ID: 4	Batch ID: 80		Loss: 0.08490
Epoch ID: 35	Set ID: 4	Batch ID: 100		Loss: 0.05891
Epoch ID: 35	Set ID: 4	Batch ID: 120		Loss: 0.06384
Epoch ID: 35	Set ID: 4	Batch ID: 140		Loss: 0.06052
2				
Epoch ID: 35	Set ID: 2	Batch ID: 160		Loss: 0.06515
Epoch ID: 35	Set ID: 2	Batch ID: 180		Loss: 0.07041
Epoch ID: 35	Set ID: 2	Batch ID: 200		Loss: 0.06181

Epoch ID: 35	Set ID: 2	Batch ID: 220		Loss: 0.05328
1				
Epoch ID: 36	Set ID: 1	Batch ID: 20		Loss: 0.05822
Epoch ID: 36	Set ID: 1	Batch ID: 40		Loss: 0.06328
Epoch ID: 36	Set ID: 1	Batch ID: 60		Loss: 0.06297
4				
Epoch ID: 36	Set ID: 4	Batch ID: 80		Loss: 0.06467
Epoch ID: 36	Set ID: 4	Batch ID: 100		Loss: 0.05486
Epoch ID: 36	Set ID: 4	Batch ID: 120		Loss: 0.06034
Epoch ID: 36	Set ID: 4	Batch ID: 140		Loss: 0.06397
2				
Epoch ID: 36	Set ID: 2	Batch ID: 160		Loss: 0.06254
Epoch ID: 36	Set ID: 2	Batch ID: 180		Loss: 0.05910
Epoch ID: 36	Set ID: 2	Batch ID: 200		Loss: 0.06123
Epoch ID: 36	Set ID: 2	Batch ID: 220		Loss: 0.05712
1				
Epoch ID: 37	Set ID: 1	Batch ID: 20		Loss: 0.06282
Epoch ID: 37	Set ID: 1	Batch ID: 40		Loss: 0.05140
Epoch ID: 37	Set ID: 1	Batch ID: 60		Loss: 0.06678
4				
Epoch ID: 37	Set ID: 4	Batch ID: 80		Loss: 0.06424
Epoch ID: 37	Set ID: 4	Batch ID: 100		Loss: 0.05600
Epoch ID: 37	Set ID: 4	Batch ID: 120		Loss: 0.05795
Epoch ID: 37	Set ID: 4	Batch ID: 140		Loss: 0.06031
2				
Epoch ID: 37	Set ID: 2	Batch ID: 160		Loss: 0.05883
Epoch ID: 37	Set ID: 2	Batch ID: 180		Loss: 0.05341
Epoch ID: 37	Set ID: 2	Batch ID: 200		Loss: 0.05743
Epoch ID: 37	Set ID: 2	Batch ID: 220		Loss: 0.05695
1				
Epoch ID: 38	Set ID: 1	Batch ID: 20		Loss: 0.05977
Epoch ID: 38	Set ID: 1	Batch ID: 40		Loss: 0.05707
Epoch ID: 38	Set ID: 1	Batch ID: 60		Loss: 0.06048
4				
Epoch ID: 38	Set ID: 4	Batch ID: 80		Loss: 0.06863
Epoch ID: 38	Set ID: 4	Batch ID: 100		Loss: 0.06126
Epoch ID: 38	Set ID: 4	Batch ID: 120		Loss: 0.05388
Epoch ID: 38	Set ID: 4	Batch ID: 140		Loss: 0.05961
2				
Epoch ID: 38	Set ID: 2	Batch ID: 160		Loss: 0.06478
Epoch ID: 38	Set ID: 2	Batch ID: 180		Loss: 0.06449
Epoch ID: 38	Set ID: 2	Batch ID: 200		Loss: 0.05833
Epoch ID: 38	Set ID: 2	Batch ID: 220		Loss: 0.05655
1				
Epoch ID: 39	Set ID: 1	Batch ID: 20		Loss: 0.06119
Epoch ID: 39	Set ID: 1	Batch ID: 40		Loss: 0.05525
Epoch ID: 39	Set ID: 1	Batch ID: 60		Loss: 0.06023
4				
Epoch ID: 39	Set ID: 4	Batch ID: 80		Loss: 0.06009
Epoch ID: 39	Set ID: 4	Batch ID: 100		Loss: 0.06237

Epoch ID: 39	Set ID: 4	Batch ID: 120	Loss: 0.06338
Epoch ID: 39	Set ID: 4	Batch ID: 140	Loss: 0.05743
2			
Epoch ID: 39	Set ID: 2	Batch ID: 160	Loss: 0.06507
Epoch ID: 39	Set ID: 2	Batch ID: 180	Loss: 0.06077
Epoch ID: 39	Set ID: 2	Batch ID: 200	Loss: 0.05778
Epoch ID: 39	Set ID: 2	Batch ID: 220	Loss: 0.05372
1			
Epoch ID: 40	Set ID: 1	Batch ID: 20	Loss: 0.05151
Epoch ID: 40	Set ID: 1	Batch ID: 40	Loss: 0.05877
Epoch ID: 40	Set ID: 1	Batch ID: 60	Loss: 0.05938
4			
Epoch ID: 40	Set ID: 4	Batch ID: 80	Loss: 0.07395
Epoch ID: 40	Set ID: 4	Batch ID: 100	Loss: 0.06363
Epoch ID: 40	Set ID: 4	Batch ID: 120	Loss: 0.05938
Epoch ID: 40	Set ID: 4	Batch ID: 140	Loss: 0.06356
2			
Epoch ID: 40	Set ID: 2	Batch ID: 160	Loss: 0.05636
Epoch ID: 40	Set ID: 2	Batch ID: 180	Loss: 0.06053
Epoch ID: 40	Set ID: 2	Batch ID: 200	Loss: 0.06249
Epoch ID: 40	Set ID: 2	Batch ID: 220	Loss: 0.05429
1			
Epoch ID: 41	Set ID: 1	Batch ID: 20	Loss: 0.05852
Epoch ID: 41	Set ID: 1	Batch ID: 40	Loss: 0.06372
Epoch ID: 41	Set ID: 1	Batch ID: 60	Loss: 0.05527
4			
Epoch ID: 41	Set ID: 4	Batch ID: 80	Loss: 0.06520
Epoch ID: 41	Set ID: 4	Batch ID: 100	Loss: 0.06036
Epoch ID: 41	Set ID: 4	Batch ID: 120	Loss: 0.05644
Epoch ID: 41	Set ID: 4	Batch ID: 140	Loss: 0.05762
2			
Epoch ID: 41	Set ID: 2	Batch ID: 160	Loss: 0.05328
Epoch ID: 41	Set ID: 2	Batch ID: 180	Loss: 0.05137
Epoch ID: 41	Set ID: 2	Batch ID: 200	Loss: 0.05154
Epoch ID: 41	Set ID: 2	Batch ID: 220	Loss: 0.05331
1			
Epoch ID: 42	Set ID: 1	Batch ID: 20	Loss: 0.06172
Epoch ID: 42	Set ID: 1	Batch ID: 40	Loss: 0.05871
Epoch ID: 42	Set ID: 1	Batch ID: 60	Loss: 0.05828
4			
Epoch ID: 42	Set ID: 4	Batch ID: 80	Loss: 0.06231
Epoch ID: 42	Set ID: 4	Batch ID: 100	Loss: 0.06447
Epoch ID: 42	Set ID: 4	Batch ID: 120	Loss: 0.05910
Epoch ID: 42	Set ID: 4	Batch ID: 140	Loss: 0.05813
2			
Epoch ID: 42	Set ID: 2	Batch ID: 160	Loss: 0.06077
Epoch ID: 42	Set ID: 2	Batch ID: 180	Loss: 0.05384
Epoch ID: 42	Set ID: 2	Batch ID: 200	Loss: 0.06186
Epoch ID: 42	Set ID: 2	Batch ID: 220	Loss: 0.05325
1			

Epoch ID: 43	Set ID: 1	Batch ID: 20	Loss: 0.06051
Epoch ID: 43	Set ID: 1	Batch ID: 40	Loss: 0.05866
Epoch ID: 43	Set ID: 1	Batch ID: 60	Loss: 0.06247
4			
Epoch ID: 43	Set ID: 4	Batch ID: 80	Loss: 0.06466
Epoch ID: 43	Set ID: 4	Batch ID: 100	Loss: 0.06368
Epoch ID: 43	Set ID: 4	Batch ID: 120	Loss: 0.05875
Epoch ID: 43	Set ID: 4	Batch ID: 140	Loss: 0.05474
2			
Epoch ID: 43	Set ID: 2	Batch ID: 160	Loss: 0.05362
Epoch ID: 43	Set ID: 2	Batch ID: 180	Loss: 0.05632
Epoch ID: 43	Set ID: 2	Batch ID: 200	Loss: 0.06133
Epoch ID: 43	Set ID: 2	Batch ID: 220	Loss: 0.04951
1			
Epoch ID: 44	Set ID: 1	Batch ID: 20	Loss: 0.05960
Epoch ID: 44	Set ID: 1	Batch ID: 40	Loss: 0.06775
Epoch ID: 44	Set ID: 1	Batch ID: 60	Loss: 0.05654
4			
Epoch ID: 44	Set ID: 4	Batch ID: 80	Loss: 0.05389
Epoch ID: 44	Set ID: 4	Batch ID: 100	Loss: 0.05329
Epoch ID: 44	Set ID: 4	Batch ID: 120	Loss: 0.05836
Epoch ID: 44	Set ID: 4	Batch ID: 140	Loss: 0.05714
2			
Epoch ID: 44	Set ID: 2	Batch ID: 160	Loss: 0.06571
Epoch ID: 44	Set ID: 2	Batch ID: 180	Loss: 0.06011
Epoch ID: 44	Set ID: 2	Batch ID: 200	Loss: 0.04983
Epoch ID: 44	Set ID: 2	Batch ID: 220	Loss: 0.04935
1			
Epoch ID: 45	Set ID: 1	Batch ID: 20	Loss: 0.05712
Epoch ID: 45	Set ID: 1	Batch ID: 40	Loss: 0.05907
Epoch ID: 45	Set ID: 1	Batch ID: 60	Loss: 0.05505
4			
Epoch ID: 45	Set ID: 4	Batch ID: 80	Loss: 0.06273
Epoch ID: 45	Set ID: 4	Batch ID: 100	Loss: 0.05926
Epoch ID: 45	Set ID: 4	Batch ID: 120	Loss: 0.05368
Epoch ID: 45	Set ID: 4	Batch ID: 140	Loss: 0.06177
2			
Epoch ID: 45	Set ID: 2	Batch ID: 160	Loss: 0.05068
Epoch ID: 45	Set ID: 2	Batch ID: 180	Loss: 0.06806
Epoch ID: 45	Set ID: 2	Batch ID: 200	Loss: 0.06061
Epoch ID: 45	Set ID: 2	Batch ID: 220	Loss: 0.05529
1			
Epoch ID: 46	Set ID: 1	Batch ID: 20	Loss: 0.06073
Epoch ID: 46	Set ID: 1	Batch ID: 40	Loss: 0.06194
Epoch ID: 46	Set ID: 1	Batch ID: 60	Loss: 0.05636
4			
Epoch ID: 46	Set ID: 4	Batch ID: 80	Loss: 0.06006
Epoch ID: 46	Set ID: 4	Batch ID: 100	Loss: 0.05598
Epoch ID: 46	Set ID: 4	Batch ID: 120	Loss: 0.06806
Epoch ID: 46	Set ID: 4	Batch ID: 140	Loss: 0.05800

```

2
Epoch ID: 46   Set ID: 2   Batch ID: 160 | Loss: 0.05740
Epoch ID: 46   Set ID: 2   Batch ID: 180 | Loss: 0.06052
Epoch ID: 46   Set ID: 2   Batch ID: 200 | Loss: 0.05138
Epoch ID: 46   Set ID: 2   Batch ID: 220 | Loss: 0.05294
1
Epoch ID: 47   Set ID: 1   Batch ID: 20  | Loss: 0.05390
Epoch ID: 47   Set ID: 1   Batch ID: 40  | Loss: 0.06487
Epoch ID: 47   Set ID: 1   Batch ID: 60  | Loss: 0.06338
4
Epoch ID: 47   Set ID: 4   Batch ID: 80  | Loss: 0.06064
Epoch ID: 47   Set ID: 4   Batch ID: 100 | Loss: 0.06027
Epoch ID: 47   Set ID: 4   Batch ID: 120 | Loss: 0.05354
Epoch ID: 47   Set ID: 4   Batch ID: 140 | Loss: 0.05402
2
Epoch ID: 47   Set ID: 2   Batch ID: 160 | Loss: 0.06147
Epoch ID: 47   Set ID: 2   Batch ID: 180 | Loss: 0.05971
Epoch ID: 47   Set ID: 2   Batch ID: 200 | Loss: 0.05583
Epoch ID: 47   Set ID: 2   Batch ID: 220 | Loss: 0.04821
1
Epoch ID: 48   Set ID: 1   Batch ID: 20  | Loss: 0.05239
Epoch ID: 48   Set ID: 1   Batch ID: 40  | Loss: 0.05921
Epoch ID: 48   Set ID: 1   Batch ID: 60  | Loss: 0.06062
4
Epoch ID: 48   Set ID: 4   Batch ID: 80  | Loss: 0.05841
Epoch ID: 48   Set ID: 4   Batch ID: 100 | Loss: 0.05693
Epoch ID: 48   Set ID: 4   Batch ID: 120 | Loss: 0.05337
Epoch ID: 48   Set ID: 4   Batch ID: 140 | Loss: 0.05420
2
Epoch ID: 48   Set ID: 2   Batch ID: 160 | Loss: 0.05997
Epoch ID: 48   Set ID: 2   Batch ID: 180 | Loss: 0.05795
Epoch ID: 48   Set ID: 2   Batch ID: 200 | Loss: 0.05081
Epoch ID: 48   Set ID: 2   Batch ID: 220 | Loss: 0.05325
1
Epoch ID: 49   Set ID: 1   Batch ID: 20  | Loss: 0.04725
Epoch ID: 49   Set ID: 1   Batch ID: 40  | Loss: 0.05138
Epoch ID: 49   Set ID: 1   Batch ID: 60  | Loss: 0.05819
4
Epoch ID: 49   Set ID: 4   Batch ID: 80  | Loss: 0.05542
Epoch ID: 49   Set ID: 4   Batch ID: 100 | Loss: 0.05024
Epoch ID: 49   Set ID: 4   Batch ID: 120 | Loss: 0.05560
Epoch ID: 49   Set ID: 4   Batch ID: 140 | Loss: 0.05397
2
Epoch ID: 49   Set ID: 2   Batch ID: 160 | Loss: 0.05499
Epoch ID: 49   Set ID: 2   Batch ID: 180 | Loss: 0.05582
Epoch ID: 49   Set ID: 2   Batch ID: 200 | Loss: 0.05191
Epoch ID: 49   Set ID: 2   Batch ID: 220 | Loss: 0.04853

```

```
loss_val, eff_rate, fp_rate = validate(model)
```

```
print(f"Loss: {loss_val}")  
print(f"Eff: {eff_rate}")  
print(f"FP: {fp_rate}")
```

```
Loss: 0.05449014529585838  
Eff: 0.7900169579001696  
FP: 0.15476904619076184
```