ResNet

April 6, 2025

[7]:
```
import torch.optim as optim

# Define the loss function
criterion = nn.CrossEntropyLoss()

# set the optimizer as SGD with Momentum
# Please finish this part
optimizer_SGD = optim.SGD(model_SGD.parameters(), lr=0.001, momentum=0.9)
```

[ ]:
```
# Train model_SGD by SGD with Momentum optimization algorith
# Please add code to finish this part.
train_loss_SGD, train_acc_SGD = [], []
test_loss_SGD, test_acc_SGD = [], []

for epoch in range(30):
    train_loss, train_acc = train(trainloader, model_SGD, criterion,␣
 ↪optimizer_SGD)
    train_loss_SGD.append(train_loss)
    train_acc_SGD.append(train_acc)
    test_loss, test_acc = test(testloader, model_SGD, criterion)
    test_loss_SGD.append(test_loss)
    test_acc_SGD.append(test_acc)
```

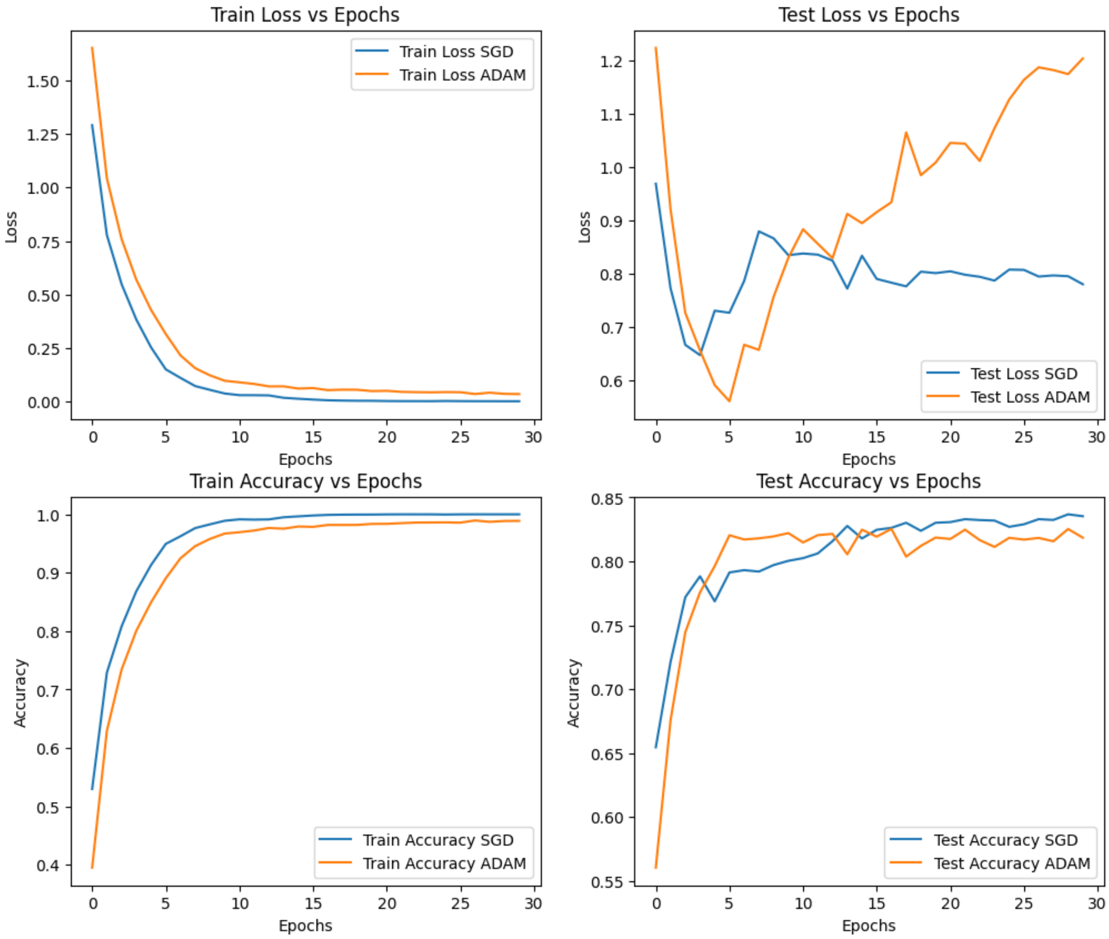
[ ]:
```
# Repeat the training and testing procedure for model_ADAM
# Visualize the results and save the images. Add the images to your assignment␣
 ↪solution.
optimizer_ADAM = optim.Adam(model_ADAM.parameters(), lr=0.01)

train_loss_ADAM, train_acc_ADAM = [], []
test_loss_ADAM, test_acc_ADAM = [], []

for epoch in range(30):
    train_loss, train_acc = train(trainloader, model_ADAM, criterion,␣
 ↪optimizer_ADAM)
    train_loss_ADAM.append(train_loss)
    train_acc_ADAM.append(train_acc)
    test_loss, test_acc = test(testloader, model_ADAM, criterion)
    test_loss_ADAM.append(test_loss)
    test_acc_ADAM.append(test_acc)
```

[12]:

```
# Visualize the results (You can refer to other tutorial notebooks)
import matplotlib.pyplot as plt

## Add codes to finish this part and save the images. Add the images to your␣
 ↪assignment solution.
plt.figure(figsize=(12, 10))
plt.subplot(2, 2, 1)
plt.plot(train_loss_SGD, label='Train Loss SGD')
plt.plot(train_loss_ADAM, label='Train Loss ADAM')
plt.xlabel('Epochs')
plt.ylabel('Loss')
plt.legend()
plt.title('Train Loss vs Epochs')

plt.subplot(2, 2, 2)
plt.plot(test_loss_SGD, label='Test Loss SGD')
plt.plot(test_loss_ADAM, label='Test Loss ADAM')
plt.xlabel('Epochs')
plt.ylabel('Loss')
plt.legend()
plt.title('Test Loss vs Epochs')

plt.subplot(2, 2, 3)
plt.plot(train_acc_SGD, label='Train Accuracy SGD')
plt.plot(train_acc_ADAM, label='Train Accuracy ADAM')
plt.xlabel('Epochs')
plt.ylabel('Accuracy')
plt.legend()
plt.title('Train Accuracy vs Epochs')

plt.subplot(2, 2, 4)
plt.plot(test_acc_SGD, label='Test Accuracy SGD')
plt.plot(test_acc_ADAM, label='Test Accuracy ADAM')
plt.xlabel('Epochs')
plt.ylabel('Accuracy')
plt.legend()
plt.title('Test Accuracy vs Epochs')
```

[12]:

```
Text(0.5, 1.0, 'Test Accuracy vs Epochs')
```


Train Loss vs Epochs
Train Loss SGD
Train Loss ADAM
Loss
0.00
0.25
0.50
0.75
1.00
1.25
1.50
Epochs
0
5
10
15
20
25
30
Test Loss vs Epochs
Test Loss SGD
Test Loss ADAM
Loss
0.6
0.7
0.8
0.9
1.0
1.1
1.2
Epochs
0
5
10
15
20
25
30
Train Accuracy vs Epochs
Train Accuracy SGD
Train Accuracy ADAM
Accuracy
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Epochs
0
5
10
15
20
25
30
Test Accuracy vs Epochs
Test Accuracy SGD
Test Accuracy ADAM
Accuracy
0.55
0.60
0.65
0.70
0.75
0.80
0.85
Epochs
0
5
10
15
20
25
30