

```
1 import torch
2 !pip install d2l==1.0.0a0
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```
1 !pip install matplotlib
2 %matplotlib inline
3 !pip install matplotlib-inline
4 import sys
5 !{sys.executable} -m pip install matplotlib
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Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: matplotlib in /usr/local/lib/python3.8/dist-packages (3.2.2)
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Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.8/dist-packages (from python-dateutil>=2.1->matplotlib) (1.15.0)

```

1 import time
2 import numpy as np
3 import torch
4 import torchvision
5 from torchvision import transforms
6 from torch import nn
7 from d2l import torch as d2l
8 from torch.optim import lr_scheduler

1 def LeNet(num_classes=10):
2     net = nn.Sequential(nn.LazyConv2d(6, kernel_size=5, padding=2),
3         nn.Sigmoid(),
4         nn.AvgPool2d(kernel_size=2, stride=2),
5         nn.LazyConv2d(16, kernel_size=5),
6         nn.Sigmoid(),
7         nn.AvgPool2d(kernel_size=2, stride=2),
8         nn.Flatten(),
9         nn.Linear(400, 120),
10        nn.Sigmoid(),
11        nn.Linear(120, 84),
12        nn.Sigmoid(),
13        nn.Linear(84, num_classes))
14    return net

1 def train(model, train_loader, test_loader, num_epochs, loss_fn, trainer):
2
3     animator = d2l.Animator(xlabel='epoch', xlim=[0, num_epochs], legend=['train loss', 'train accuracy', 'test accuracy'])
4     for epoch in range(num_epochs):
5         metric = d2l.Accumulator(3)
6         for i, (X, y) in enumerate(train_loader):
7             net.train()
8             trainer.zero_grad()
9             y_hat = net(X)
10            l = loss_fn(y_hat, y)
11            l.backward()
12            trainer.step()
13            with torch.no_grad():
14                metric.add(1 * X.shape[0], d2l.accuracy(y_hat, y), X.shape[0])
15            train_loss = metric[0] / metric[2]
16            train_acc = metric[1] / metric[2]
17            if (i + 1) % 50 == 0:
18                animator.add(epoch + i / len(train_loader),
19                    (train_loss, train_acc, None))
20
21        test_acc = d2l.evaluate_accuracy_gpu(model, test_loader)
22        animator.add(epoch+1, (None, None, test_acc))
23
24    print(f'train loss {train_loss:.3f}, train accuracy {train_acc:.3f}, 'f'test accuracy {test_acc:.3f}')

1 loss = nn.CrossEntropyLoss()
2 batch_size = 256
3 num_epochs = 10
4 lr=0.01

1 train_loader, test_loader = d2l.load_data_fashion_mnist(batch_size=batch_size)
2 net= LeNet(num_classes=10)
3 trainer = torch.optim.Adam(net.parameters(), lr=lr)

```

/usr/local/lib/python3.8/dist-packages/torch/nn/modules/lazy.py:180: UserWarning: Lazy modules are a new feature under heavy development

warnings.warn('Lazy modules are a new feature under heavy development ')

```

1 train(net, train_loader, test_loader, num_epochs, loss, trainer)

```

train loss 0.330, train accuracy 0.877, test accuracy 0.861

