EX.NO:07
16.09.25

BUILD A CNN MODEL TO CLASSIFY CAT & DOG IMAGE

AIM

TO Build and train CNN model that classify images into 2 catogories : cat & dog

Objective

1) TO understand the architecture of CNN

2) TO preposess image datasets for training and testing

3) To implement a CNN model using pyTorch

4) TO evaluate the performance /model using accuracy & loss

Pseudocode

```
Begin
    1) Import necessary libraries (Torch, Torch vession, Torch.nn)
    2) Load the dataset
    3) create a class CNN with
      → convolutional-layer + Relu + maxpooling
      → Fully Connected layers
      → output layer with 2 newrons
    4) Train the data
Initialize model , loss function
```

```
For each epoch:
    For each batch in training data.
        Forward pass
        compute Loss
        Backpropagate loss
        update weights
        print training Loss.
3. Testing
    Evaluate model on Testdata
    Calculate accuracy
END
```

Observation

1. Dataset

Dataset contains image of cats and dogs

Images resized to 128 X 128 normalized before training

2. At beginning of trainning, CNN hod randomly initialized weights, which resulted in high training loss and low accuracy.

3. As multiple epochs, CNN Layer begin to extract meaningful features such as edges, Textures, shapes

4. polling layers helped reduce dimensionality while retaining most important feature

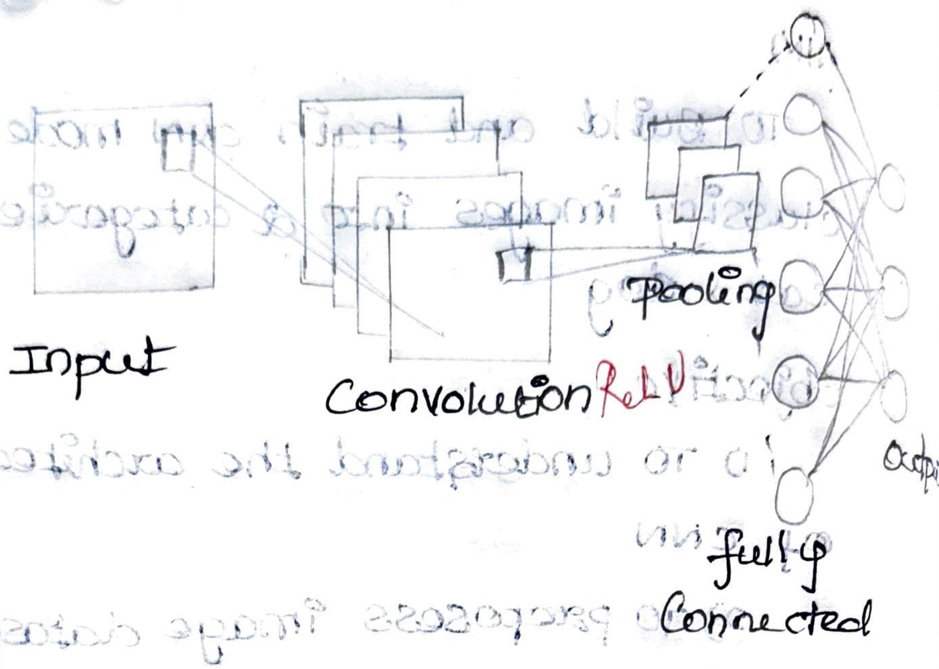
5. After several epochs, models loss decreases while accuracy improves

5/7 23/9/25

Results

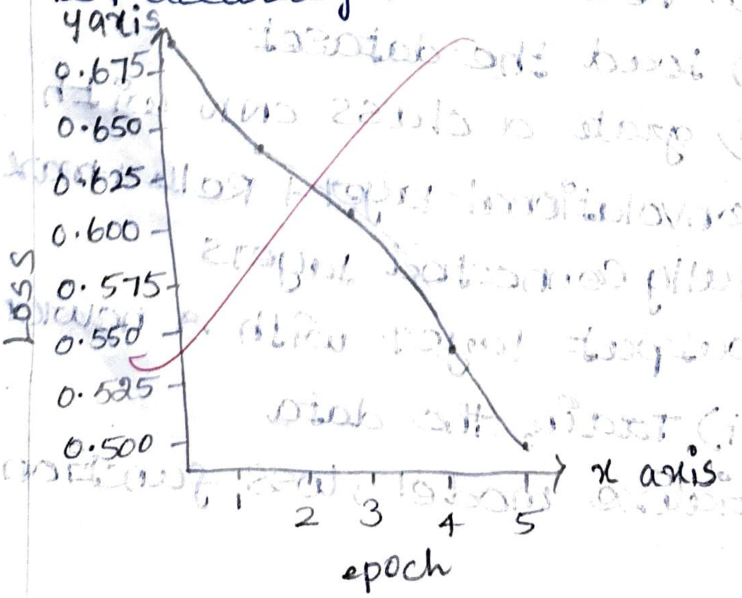
implemented - Build CNN model to classify cat & Dog image.

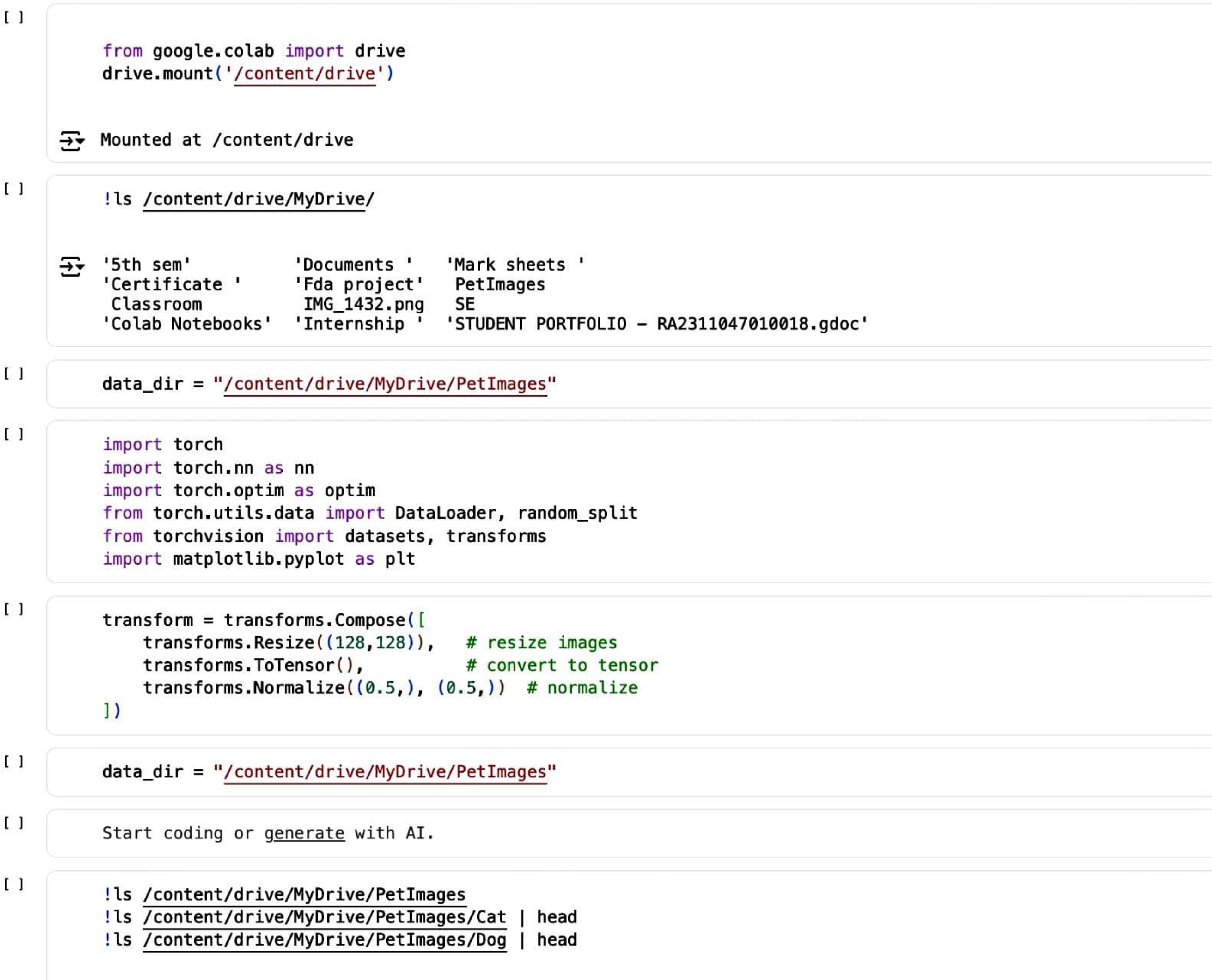
CNN Architecture



output

```
Epoch 1/5 , Loss : 0.6830
Epoch 2/5 , Loss : 0.6382
Epoch 3/5 , Loss : 0.6020
Epoch 4/5 , Loss : 0.5469
Epoch 5/5 , Loss : 0.5029

Test accuracy : 72.53%
```





```
[ ]
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
[ ]
!ls /content/drive/MyDrive/
```

```
'5th sem'           'Documents '   'Mark sheets '
'Certificate '      'Fda project'   PetImages
 Classroom           IMG_1432.png   SE
'Colab Notebooks'   'Internship '  'STUDENT PORTFOLIO - RA2311047010018.gdoc'
```

```
[ ]
data_dir = "/content/drive/MyDrive/PetImages"
```

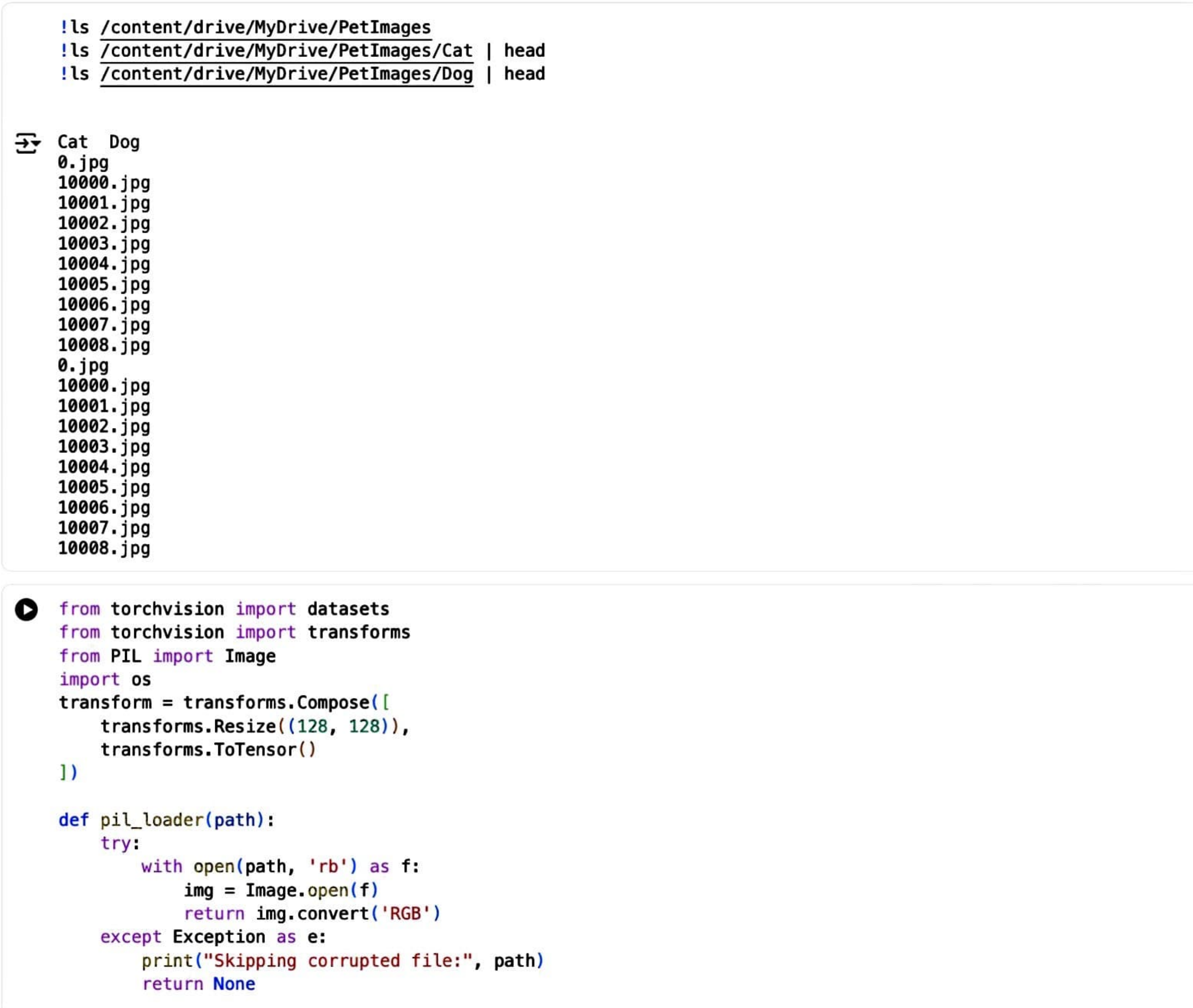
```
[ ]
import torch
import torch.nn as nn
import torch.optim as optim
from torch.utils.data import DataLoader, random_split
from torchvision import datasets, transforms
import matplotlib.pyplot as plt
```

```
[ ]
transform = transforms.Compose([
    transforms.Resize((128,128)),   # resize images
    transforms.ToTensor(),          # convert to tensor
    transforms.Normalize((0.5,), (0.5,))  # normalize
])
```

```
[ ]
data_dir = "/content/drive/MyDrive/PetImages"
```

```
[ ]
Start coding or generate with AI.
```

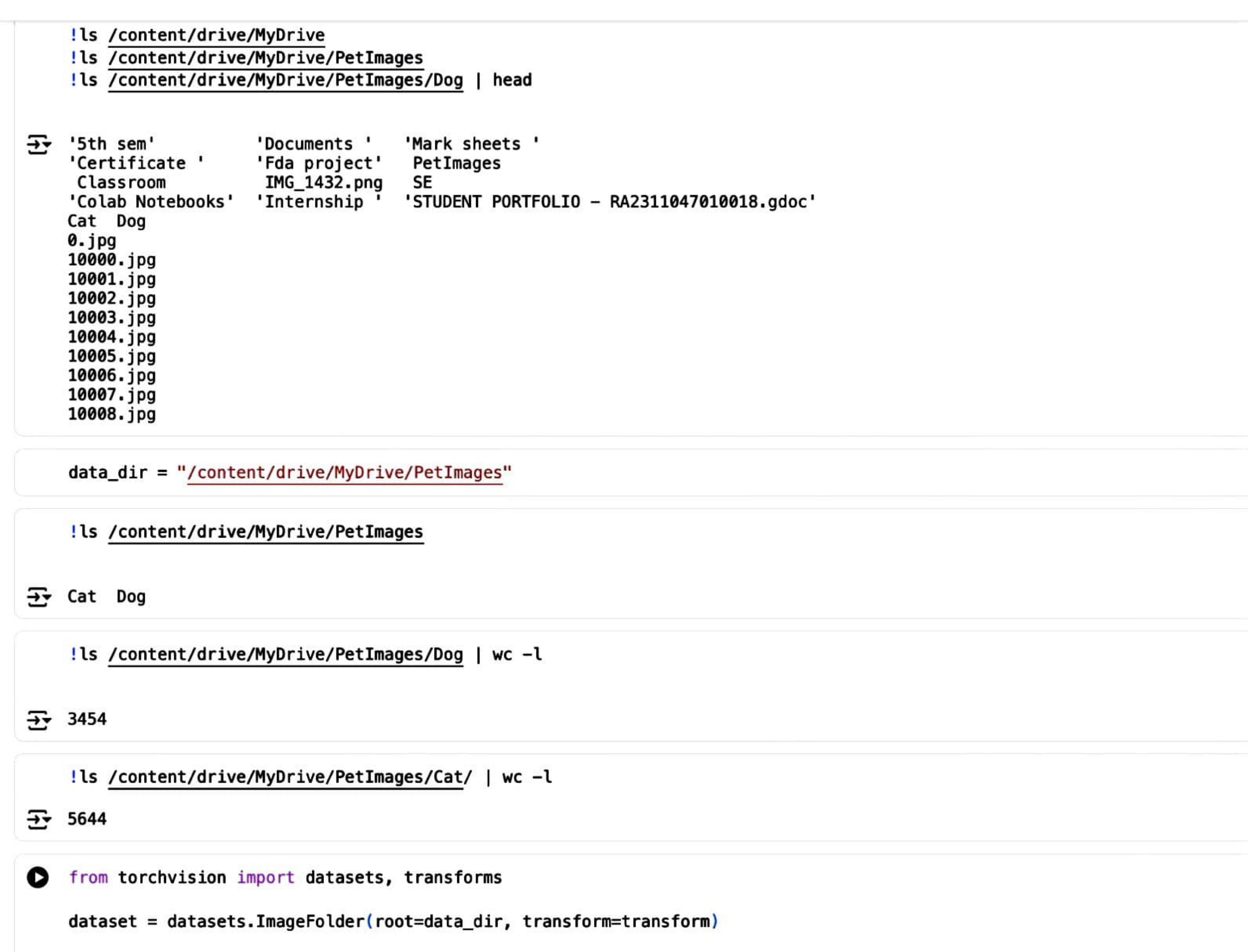
```
[ ]
!ls /content/drive/MyDrive/PetImages
!ls /content/drive/MyDrive/PetImages/Cat | head
!ls /content/drive/MyDrive/PetImages/Dog | head
```



```
!ls /content/drive/MyDrive/PetImages
!ls /content/drive/MyDrive/PetImages/Cat | head
!ls /content/drive/MyDrive/PetImages/Dog | head
```

```
Cat  Dog
0.jpg
10000.jpg
10001.jpg
10002.jpg
10003.jpg
10004.jpg
10005.jpg
10006.jpg
10007.jpg
10008.jpg
0.jpg
10000.jpg
10001.jpg
10002.jpg
10003.jpg
10004.jpg
10005.jpg
10006.jpg
10007.jpg
10008.jpg
```

```python
from torchvision import datasets
from torchvision import transforms
from PIL import Image
import os
transform = transforms.Compose([
    transforms.Resize((128, 128)),
    transforms.ToTensor()
])

def pil_loader(path):
    try:
        with open(path, 'rb') as f:
            img = Image.open(f)
            return img.convert('RGB')
    except Exception as e:
        print("Skipping corrupted file:", path)
        return None
```



```
!ls /content/drive/MyDrive
!ls /content/drive/MyDrive/PetImages
!ls /content/drive/MyDrive/PetImages/Dog | head
```

```
'5th sem'           'Documents '   'Mark sheets '
'Certificate '      'Fda project'   PetImages
 Classroom           IMG_1432.png   SE
'Colab Notebooks'   'Internship '  'STUDENT PORTFOLIO - RA2311047010018.gdoc'
Cat  Dog
0.jpg
10000.jpg
10001.jpg
10002.jpg
10003.jpg
10004.jpg
10005.jpg
10006.jpg
10007.jpg
10008.jpg
```

```
data_dir = "/content/drive/MyDrive/PetImages"
```

```
!ls /content/drive/MyDrive/PetImages
```

```
Cat  Dog
```

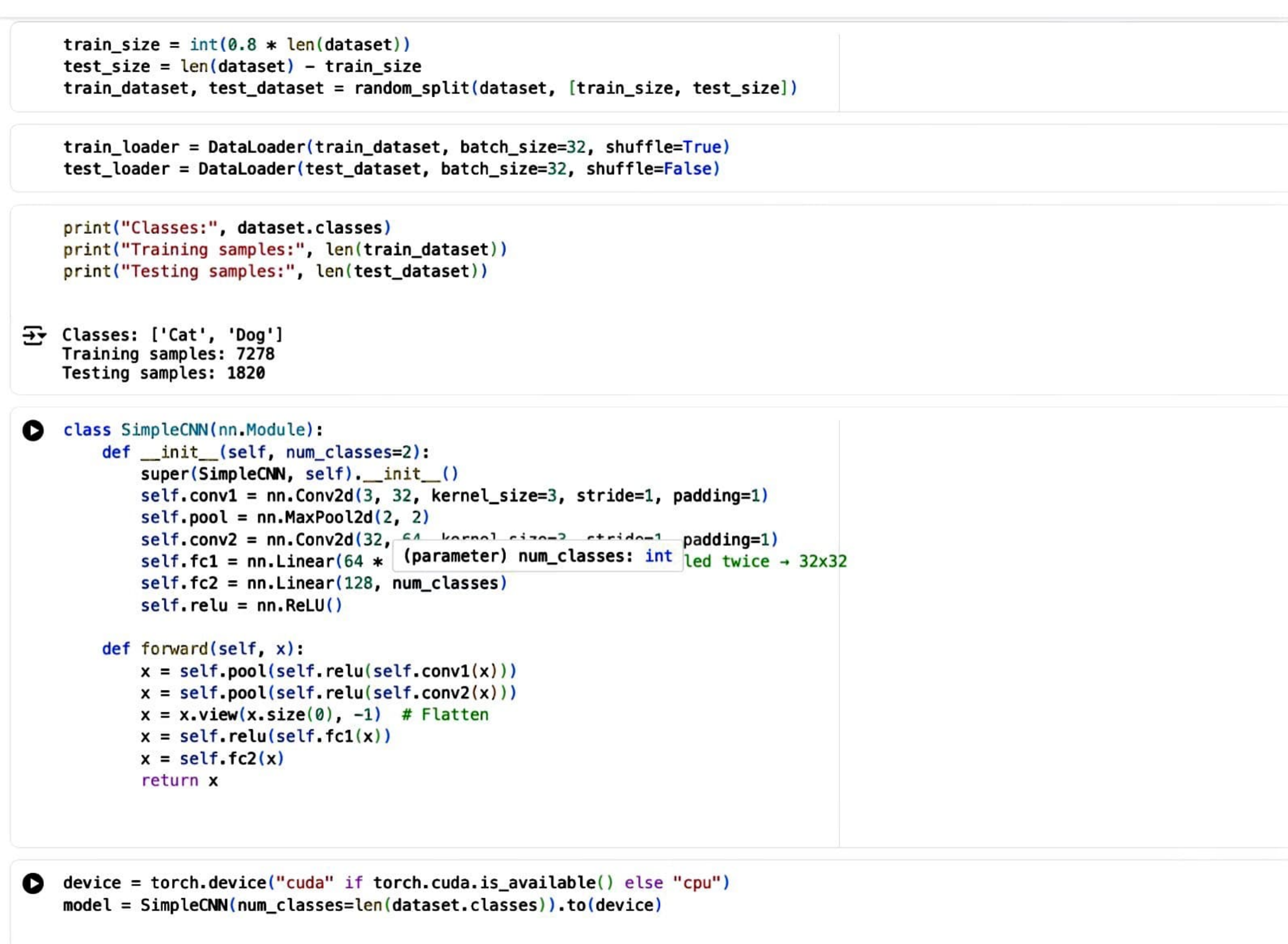
```
!ls /content/drive/MyDrive/PetImages/Dog | wc -l
```

```
3454
```

```
!ls /content/drive/MyDrive/PetImages/Cat/ | wc -l
```

```
5644
```

```
from torchvision import datasets, transforms

dataset = datasets.ImageFolder(root=data_dir, transform=transform)
```



```
train_size = int(0.8 * len(dataset))
test_size = len(dataset) - train_size
train_dataset, test_dataset = random_split(dataset, [train_size, test_size])
```

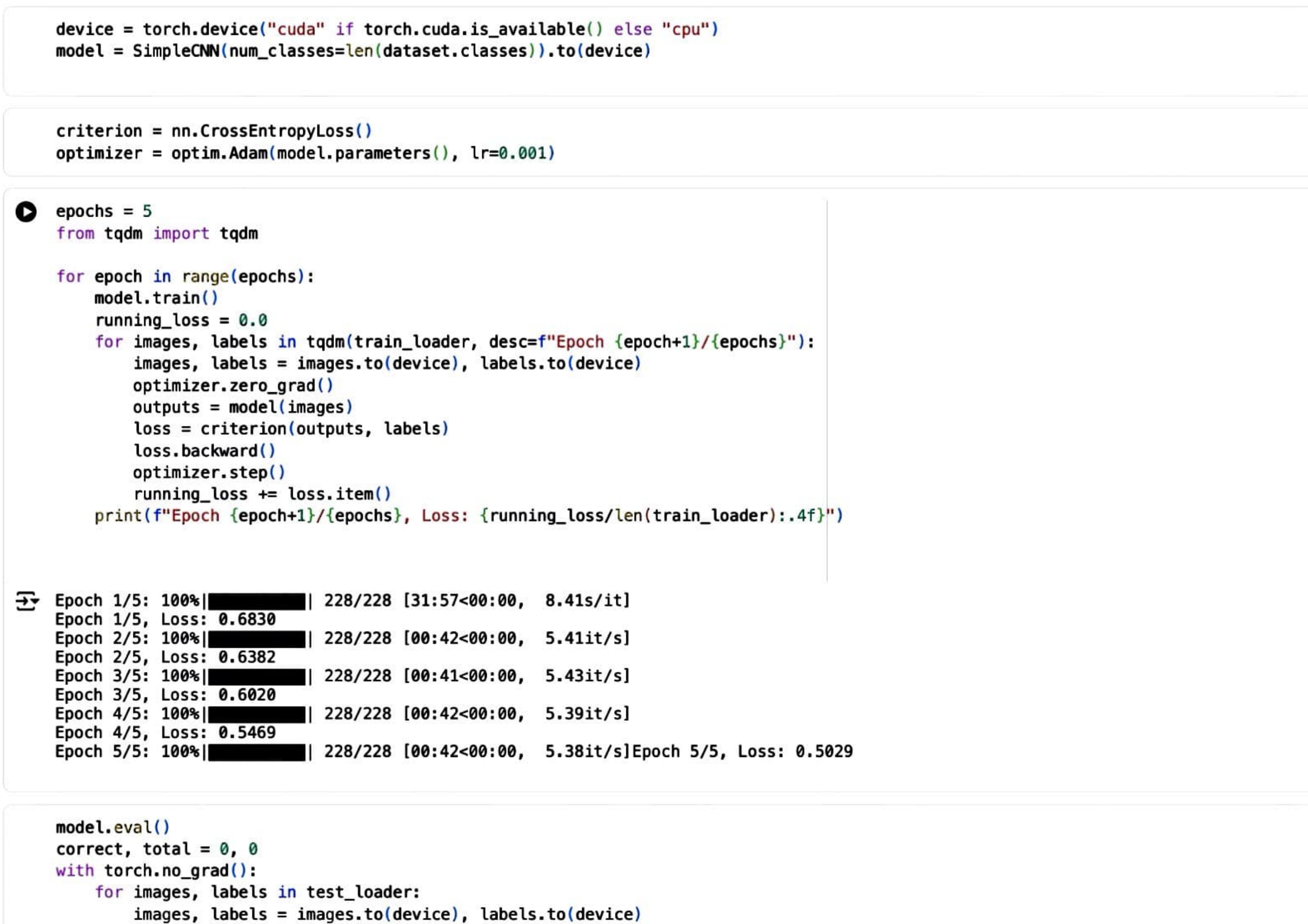
```
train_loader = DataLoader(train_dataset, batch_size=32, shuffle=True)
test_loader = DataLoader(test_dataset, batch_size=32, shuffle=False)
```

```
print("Classes:", dataset.classes)
print("Training samples:", len(train_dataset))
print("Testing samples:", len(test_dataset))
```

```
Classes: ['Cat', 'Dog']
Training samples: 7278
Testing samples: 1820
```

```
class SimpleCNN(nn.Module):
    def __init__(self, num_classes=2):
        super(SimpleCNN, self).__init__()
        self.conv1 = nn.Conv2d(3, 32, kernel_size=3, stride=1, padding=1)
        self.pool = nn.MaxPool2d(2, 2)
        self.conv2 = nn.Conv2d(32, 64, kernel_size=3, stride=1, padding=1)
        self.fc1 = nn.Linear(64 * (parameter) num_classes: int led twice → 32x32
        self.fc2 = nn.Linear(128, num_classes)
        self.relu = nn.ReLU()

    def forward(self, x):
        x = self.pool(self.relu(self.conv1(x)))
        x = self.pool(self.relu(self.conv2(x)))
        x = x.view(x.size(0), -1)  # Flatten
        x = self.relu(self.fc1(x))
        x = self.fc2(x)
        return x
```

```
device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
model = SimpleCNN(num_classes=len(dataset.classes)).to(device)
```



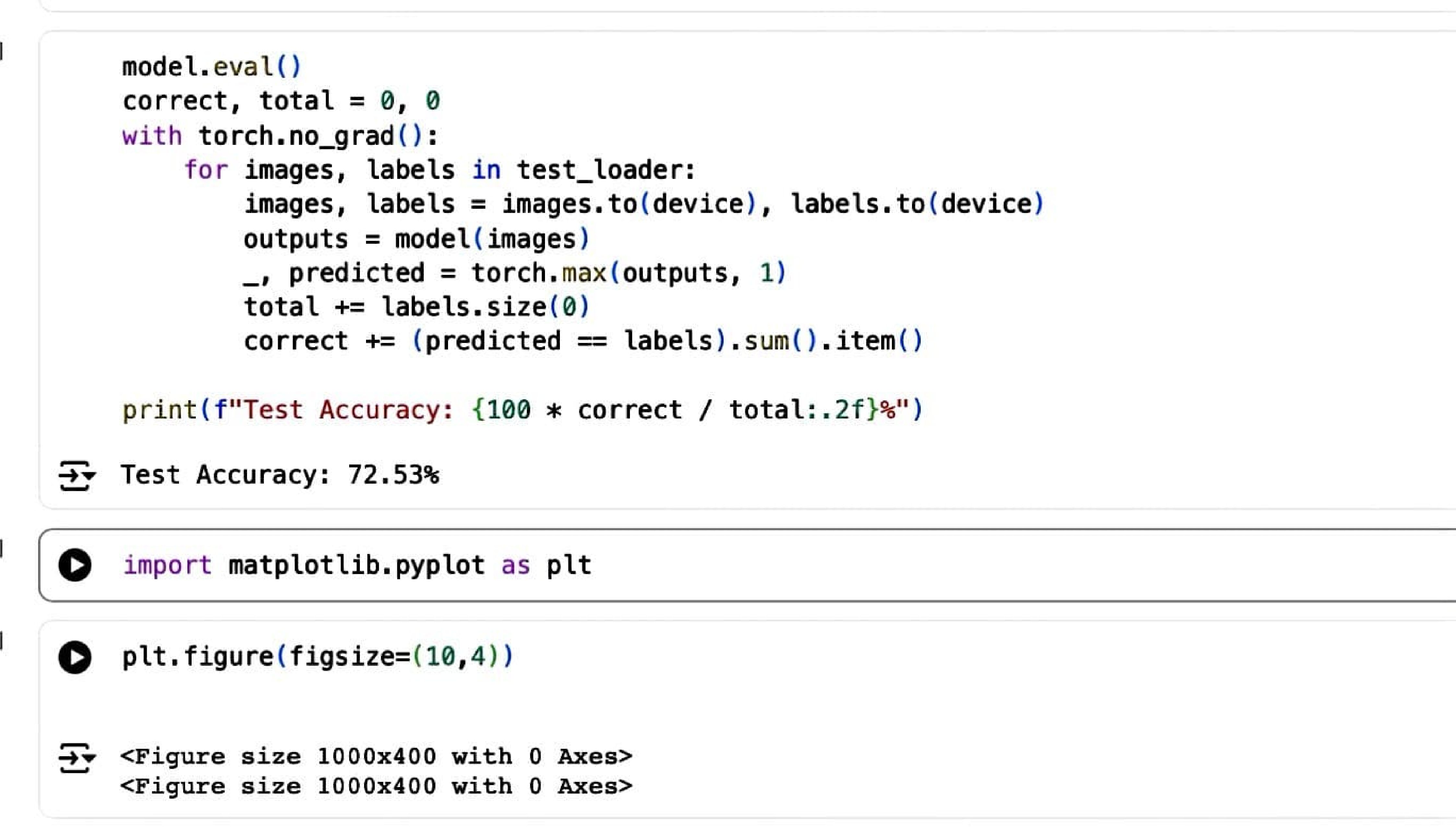
```
device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
model = SimpleCNN(num_classes=len(dataset.classes)).to(device)
```

```
criterion = nn.CrossEntropyLoss()
optimizer = optim.Adam(model.parameters(), lr=0.001)
```

```
epochs = 5
from tqdm import tqdm

for epoch in range(epochs):
    model.train()
    running_loss = 0.0
    for images, labels in tqdm(train_loader, desc=f"Epoch {epoch+1}/{epochs}"):
        images, labels = images.to(device), labels.to(device)
        optimizer.zero_grad()
        outputs = model(images)
        loss = criterion(outputs, labels)
        loss.backward()
        optimizer.step()
        running_loss += loss.item()
    print(f"Epoch {epoch+1}/{epochs}, Loss: {running_loss/len(train_loader):.4f}")
```

```
Epoch 1/5: 100%|██████████| 228/228 [31:57<00:00,  8.41s/it]
Epoch 1/5, Loss: 0.6830
Epoch 2/5: 100%|██████████| 228/228 [00:42<00:00,  5.41it/s]
Epoch 2/5, Loss: 0.6382
Epoch 3/5: 100%|██████████| 228/228 [00:41<00:00,  5.43it/s]
Epoch 3/5, Loss: 0.6020
Epoch 4/5: 100%|██████████| 228/228 [00:42<00:00,  5.39it/s]
Epoch 4/5, Loss: 0.5469
Epoch 5/5: 100%|██████████| 228/228 [00:42<00:00,  5.38it/s]Epoch 5/5, Loss: 0.5029
```

```
model.eval()
correct, total = 0, 0
with torch.no_grad():
    for images, labels in test_loader:
        images, labels = images.to(device), labels.to(device)
```



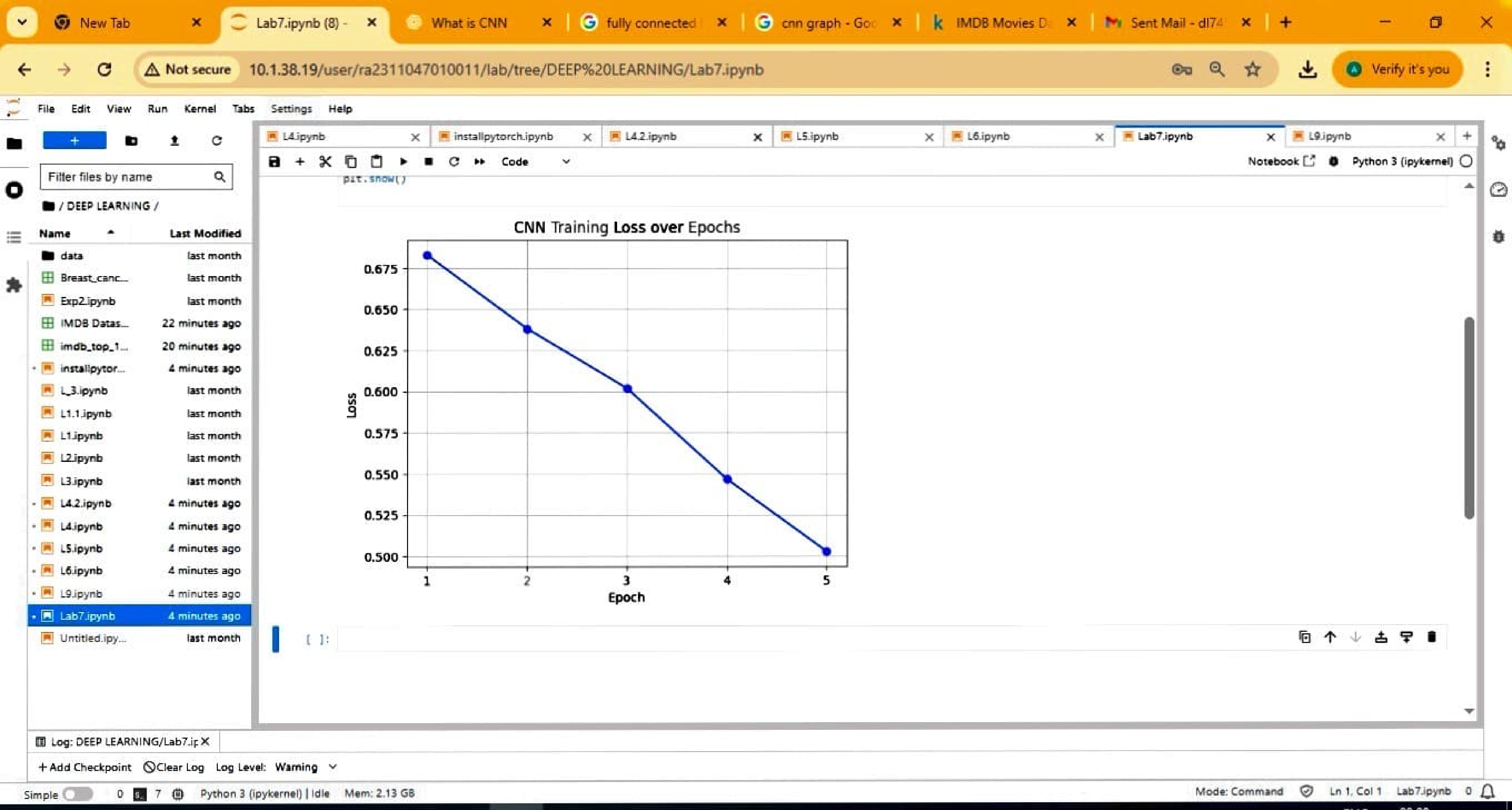
```
model.eval()
correct, total = 0, 0
with torch.no_grad():
    for images, labels in test_loader:
        images, labels = images.to(device), labels.to(device)
        outputs = model(images)
        _, predicted = torch.max(outputs, 1)
        total += labels.size(0)
        correct += (predicted == labels).sum().item()

print(f"Test Accuracy: {100 * correct / total:.2f}%")
```

```
Test Accuracy: 72.53%
```

```
import matplotlib.pyplot as plt
```

```
plt.figure(figsize=(10,4))
```

```
<Figure size 1000x400 with 0 Axes>
<Figure size 1000x400 with 0 Axes>
```



Name	Last Modified
data	last month
Breast_canc...	last month
Exp2.ipynb	last month
IMDB Datas...	22 minutes ago
imdb_top_1...	20 minutes ago
installpytor...	4 minutes ago
L_3.ipynb	last month
L1.1.ipynb	last month
L1.ipynb	last month
L2.ipynb	last month
L3.ipynb	last month
L4.2.ipynb	4 minutes ago
L4.ipynb	4 minutes ago
L5.ipynb	4 minutes ago
L6.ipynb	4 minutes ago
L9.ipynb	4 minutes ago
Lab7.ipynb	4 minutes ago
Untitled.ipy...	last month

```
plt.show()
```

```
0  7  Python 3 (ipykernel) | Idle   Mem: 2.13 GB        Mode: Command   Ln 1, Col 1   Lab7.ipynb  0
```