In Deep learning, data augmentation techniques and transforms are essential to improve the quality and quantity of data used to train models. In the case of the CIFAR10 dataset, which consists of 60,000 color images of 32x32 pixels, these techniques are particularly important.

To augment the data, we use two techniques - Random Crop and Random Horizontal Flip. Random Crop selects a random subset of the original image, while Random Horizontal Flip flips an image horizontally with a certain probability. Both of these techniques help to introduce variations in the dataset, making the model more capable of recognizing similar images with different compositions.

After applying the data augmentation techniques, we use the To Tensor transform, which converts the images into PyTorch tensors and scales them by 255. This transformation is essential because PyTorch works with tensors, and scaling the images helps to normalize the pixel values.

Lastly, we apply the Normalize transform to adjust the mean and standard deviation of the image pixels, making the images more standardized. The values of the pixels become 0.0 and 1.0, respectively.

To ensure consistency and reproducibility, we download the CIFAR10 dataset in the root directory ./data and set PyTorch's random number generator to a seed value of 17. By doing this, we get the same validation set each time, which helps us to evaluate the model's performance accurately.

Overall, applying data augmentation techniques and transforms to the CIFAR10 dataset helps to improve the quality of the data and enhance the model's performance. These techniques can also be applied to other datasets, making it an essential part of machine learning workflows.

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

```
Mounted at /content/gdrive
```

```
import multiprocessing
import torchvision
import torchvision.transforms as transforms
import numpy as np
from torch.utils.data import DataLoader
import torch
torch.manual_seed(17)

from torchsummary import summary
from tqdm import tqdm
import matplotlib.pyplot as plt

class FetchDataset:
```

```
    def __init__(self, dataset="CIFAR10", batch_size=64):
        print("Initializing fetching %s dataset using torchvision"%
(dataset))
        # check if the dataset exists in torchvision
        self.datasetObject =
torchvision.datasets.__dict__.get(dataset, None)
        if self.datasetObject == None:
            raise Exception("Dataset %s not available in
torchvision."%(dataset))
        self.batch_size = batch_size
        self.transformers_training = []
        self.transformers_testing = []
        # set number of workers available for multiprocessing
        self.workersAvailable = min(multiprocessing.cpu_count(), 14)

    def dataAugmentation(self, size=32, padding=3):
        # add data augmentation transforms to the training set

self.transformers_training.append(transforms.RandomHorizontalFlip())

self.transformers_training.append(transforms.RandomCrop(size=size,
padding=padding))

self.transformers_training.append(transforms.functional.equalize)

self.transformers_testing.append(transforms.functional.equalize)

    def __addToTensor(self):
        # add ToTensor transform to the training and testing sets
        self.transformers_training.append(transforms.ToTensor())
        self.transformers_testing.append(transforms.ToTensor())

    def addNormalizer(self):
        self.__addToTensor()
        # load training set to compute mean and standard deviation
        dataset_training = self.datasetObject(root="./data",
train=True, download=True)
        data_train = dataset_training.data/255.0
        mean = data_train.mean(axis=(0, 1, 2))
        std = data_train.std(axis=(0, 1, 2))
        # add Normalize transform to the training and testing sets

self.transformers_training.append(transforms.Normalize(mean=mean,
std=std))

self.transformers_testing.append(transforms.Normalize(mean=mean,
std=std))


    def getLoaders(self):
```

```
        if len(self.transformers_training) == 0:
            self.__addToTensor()
        # create data loaders with the defined batch size,
transformers and number of workers
        dataset_training = self.datasetObject(root="./data",
train=True, download=True,
transform=transforms.Compose(self.transformers_training))
        dataset_testing = self.datasetObject(root="./data",
train=False, download=True,
transform=transforms.Compose(self.transformers_testing))
        load_train = DataLoader(dataset_training,
batch_size=self.batch_size, shuffle=True,
num_workers=self.workersAvailable)
        load_test = DataLoader(dataset_testing,
batch_size=self.batch_size, shuffle=False,
num_workers=self.workersAvailable)
        # return the training and testing data loaders
        return load_train, load_test


# create a new instance of FetchDataset for the CIFAR10 dataset with
batch size of 128
df = FetchDataset(dataset="CIFAR10", batch_size=128)
# add data augmentation transforms to the training set with size 32
and padding 4
df.dataAugmentation(size=32, padding=4)
# add normalizing transforms to the training and testing sets
df.addNormalizer()
# get the training and testing data loaders
trainLoader, testLoader = df.getLoaders()
```

```
Initializing fetching CIFAR10 dataset using torchvision
Downloading https://www.cs.toronto.edu/~kriz/cifar-10-python.tar.gz to
./data/cifar-10-python.tar.gz

100%|██████████| 170498071/170498071 [00:02<00:00, 84303642.89it/s]

Extracting ./data/cifar-10-python.tar.gz to ./data
Files already downloaded and verified
Files already downloaded and verified
```

Modified the basic resnet model from
https://github.com/kuangliu/pytorch-cifar/blob/master/models/resnet.py

• Ci, the number of channels in the ith layer. • Fi, the filter size in the ith layer • Ki, the kernel size in the ith skip connection • P, the pool size in the average pool layer

Using the following values for the Hyperparameters (design variables) in our architectures :

```
C=[64,128,128,256]
F=[3,3,3,3]
K=[1,1,1,1]
P=4

# Import necessary PyTorch modules
import torch.nn as nn
import torch.nn.functional as F

# Define the BasicBlock class, which is used to construct the layers
in the ResNet architecture
class BasicBlock(nn.Module):

    # Initialize the BasicBlock class
    def __init__(self, in_planes, planes, kernel_size, skip_kernel,
stride=1):
        super(BasicBlock, self).__init__()

        # Define the first convolutional layer
        self.conv1 = nn.Conv2d(in_planes, planes,
kernel_size=kernel_size, stride=stride, padding=1, bias=False)
        self.bn1 = nn.BatchNorm2d(planes)

        # Define the second convolutional layer
        self.conv2 = nn.Conv2d(planes, planes,
kernel_size=kernel_size, stride=1, padding=1, bias=False)
        self.bn2 = nn.BatchNorm2d(planes)

        # Define the shortcut connection, which is used to add the
output of the convolutional layers to the input
        self.shortcut = nn.Sequential()

        # If the stride is not 1 or the number of input planes is not
equal to the number of output planes,
        # define a convolutional layer and a batch normalization layer
for the shortcut connection
        if stride != 1 or in_planes != planes:
            self.shortcut = nn.Sequential(
                nn.Conv2d(in_planes, planes, kernel_size=skip_kernel,
stride=stride, bias=False),
                nn.BatchNorm2d(planes)
            )

    # Define the forward pass for the BasicBlock class
    def forward(self, x):
        # Apply the first convolutional layer, batch normalization,
and ReLU activation
        out = F.relu(self.bn1(self.conv1(x)))

        # Apply the second convolutional layer and batch normalization
```

```
        out = self.bn2(self.conv2(out))

        # Add the shortcut connection to the output of the
convolutional layers
        out += self.shortcut(x)

        # Apply the ReLU activation
        out = F.relu(out)

        return out

# Define the ResNet class, which is used to construct the ResNet
architecture
class ResNet(nn.Module):

    # Initialize the ResNet class
    def __init__(self,N:int, B:list, C:list, F:list, K:list, P:int,
num_classes=10):
        super(ResNet, self).__init__()

        # Initialize the number of input planes
        self.in_planes = C[0]

        # Set the block to the BasicBlock class
        self.block = BasicBlock

        # Store the values of N, B, C, F, K, and P
        self.N, self.B, self.C, self.F, self.K, self.P= N, B, C, F, K,
P

        # Initialize a container for the layers
        self.layers = []

        # Set the stride for each layer
        self.S = [2] * N
        self.S[0] = 1

        # Calculate the input dimension for the output linear layer
        self.outLayerInSize = C[N-1]*(32//(P*2**(N-1)))*(32//(P*2**(N-
1)))

        # Print Model Config
        print("\n\nModel Config: "
            "\n-------------------------------------"
            "\nN (# Layers)\t:",self.N,
            "\nB (# Blocks)\t:",self.B,
            "\nC (# Channels)\t:",C,
            "\nF (Conv Kernel)\t:",F,
            "\nK (Skip Kernel)\t:",K,
```

```
            "\nP (Pool Kernel)\t:",P,)

        # Define the first convolution layer with 3 input channels,
C[0] output channels, F[0] kernel size,
        # stride of 1, padding of 1, and no bias
        self.conv1 = nn.Conv2d(3, C[0], kernel_size=F[0], stride=1,
padding=1, bias=False)
        # Define a batch normalization layer with C[0] channels
        self.bn1 = nn.BatchNorm2d(C[0])

        # Define N residual blocks
        for i in range(N):
          # Dynamically create variable names for each residual block
using the exec() function
            exec("self.layer{} = self._make_layer(self.block,
self.C[{}], self.B[{}], self.F[{}], self.K[{}], self.S[{}])"\
                .format(i+1,i,i,i,i,i))
            # Append the residual block to the layers ModuleList
            exec("self.layers.append(self.layer{})".format(i+1))
            # Define the final linear layer with input size of
outLayerInSize and output size of num_classes
        self.linear = nn.Linear(self.outLayerInSize, num_classes)


    def _make_layer(self, block, planes, num_blocks, kernel_size,
skip_kernel, stride):
      # Set stride for each block in the layer
        strides = [stride] + [1]*(num_blocks-1)
        layers = []
        for stride in strides:
            layers.append(block(self.in_planes, planes, kernel_size,
skip_kernel, stride)) # Append each block to the layer with given
arguments
            self.in_planes = planes  # Update the number of input
planes for the next block
        return nn.Sequential(*layers)  # Return a sequential module
containing all the blocks in the layer

    def forward(self, x):
        # Apply the first convolutional layer followed by batch
normalization and ReLU activation
        out = F.relu(self.bn1(self.conv1(x)))
        # Apply all the blocks in the layer
        for layer in self.layers:
            out = layer(out)
        out = F.avg_pool2d(out, self.P) # Apply average pooling with
kernel size self.P
        out = out.view(out.size(0), -1)  # Flatten the output tensor
        out = self.linear(out)  # Apply the fully connected linear
layer
```

```python
        return out # Return the final output

def resnet_model():
# Define the parameters for the ResNet architecture
    B=[3,3,2,3]  # number of blocks in each layer
    C=[64,128,128,256]  # number of output channels in each layer
    F=[3,3,3,3]  # kernel size for each layer
    K=[1,1,1,1] # skip kernel size for each layer
    P=4       # average pooling kernel size
    N=len(B)  # number of layers in the network
# Return a new ResNet model with the defined parameters
    return ResNet(N, B, C, F, K, P)


device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
print(device)
```

```
cuda
```

```python
model = resnet_model()
model = model.to(device)
```

```
Model Config:
-------------------------------------
N (# Layers)     : 4
B (# Blocks)     : [3, 3, 2, 3]
C (# Channels)   : [64, 128, 128, 256]
F (Conv Kernel)  : [3, 3, 3, 3]
K (Skip Kernel)  : [1, 1, 1, 1]
P (Pool Kernel)  : 4
```

We run our model for 300 epochs, to find out the best possible accuracy. The accuracy becomes near about constant after it. We define our:

learning rate, weightDecay, type of optimizer to be used (we tried with Adam, Adagrad, AdaDelta), with Adadelta giving out the best accuracy.

The scheduler set the learning rate of each parameter group using a cosine annealing schedule

###**ADAM Optimizer**

```python
EPOCHS=300
globalBestAccuracy = 0.0
train_loss = []
test_loss = []
train_accuracy = []
test_accuracy = []
```

```
loss_function = torch.nn.CrossEntropyLoss(reduction='sum')
learningRate = 0.01
weightDecay = 0.0001
optimizer = torch.optim.Adam(model.parameters(), lr=learningRate,
weight_decay=weightDecay)
scheduler = torch.optim.lr_scheduler.CosineAnnealingLR(optimizer,
EPOCHS, eta_min=learningRate/10.0)
print(model.eval())
trainable_parameters = sum(p.numel() for p in model.parameters() if
p.requires_grad)
print("Total Trainable Parameters : %s"%(trainable_parameters))
if trainable_parameters > 5*(10**6):
    raise Exception("Model not under budget!")
```

```
ResNet(
  (conv1): Conv2d(3, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
  (bn1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
  (layer1): Sequential(
    (0): BasicBlock(
      (conv1): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
    )
    (1): BasicBlock(
      (conv1): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
    )
    (2): BasicBlock(
      (conv1): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True,
```

```
track_running_stats=True)
      (shortcut): Sequential()
    )
  )
  (layer2): Sequential(
    (0): BasicBlock(
      (conv1): Conv2d(64, 128, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential(
        (0): Conv2d(64, 128, kernel_size=(1, 1), stride=(2, 2),
bias=False)
        (1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (1): BasicBlock(
      (conv1): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
    )
    (2): BasicBlock(
      (conv1): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
    )
  )
  (layer3): Sequential(
    (0): BasicBlock(
      (conv1): Conv2d(128, 128, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
```

```
      (conv2): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential(
        (0): Conv2d(128, 128, kernel_size=(1, 1), stride=(2, 2),
bias=False)
        (1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (1): BasicBlock(
      (conv1): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
    )
  )
  (layer4): Sequential(
    (0): BasicBlock(
      (conv1): Conv2d(128, 256, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential(
        (0): Conv2d(128, 256, kernel_size=(1, 1), stride=(2, 2),
bias=False)
        (1): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      )
    )
    (1): BasicBlock(
      (conv1): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
```

```
    )
    (2): BasicBlock(
      (conv1): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn1): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (conv2): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1), bias=False)
      (bn2): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True,
track_running_stats=True)
      (shortcut): Sequential()
    )
  )
  (linear): Linear(in_features=256, out_features=10, bias=True)
)
Total Trainable Parameters : 4935242
```

Model Training and Testing. Here we are training our model over 300 epochs and trying to find out the best accuracy our model provides for the CIFAR dataset.

```
def train(model,loader, optimizer): # Define the function to train the
model and return the updated model and optimizer
    model.train()                   # Set the model to train mode
    optimizer.zero_grad()            # Clear the gradients of the
optimizer
    return model, optimizer         # Return the updated model and
optimizer

def test(model,loader):          # Define the function to evaluate the
model on the test set
    return model.eval()          # Set the model to evaluation mode

def getLoss(loader,model,optimizer):        # Define the function to
calculate the loss and accuracy for a given loader and model
    running_loss = 0.0                      # Initialize the running
loss and correct count
    running_correct = 0
    for images, labels in loader:            # Iterate through the
loader
        images = images.to(device)           # Move the images and
labels to the device
        labels = labels.to(device)
        output = model(images)               # Forward pass
        loss = loss_function(output, labels) # Calculate the loss
        predicted_labels = torch.argmax(output, dim=1)  # Calculate
the predicted labels
        running_loss += loss.item()     # Update the running loss and
correct count
        running_correct += torch.sum(predicted_labels ==
labels).float().item()
```

```
        if phase == "train":           # If the phase is "train",
backpropagate the loss and update the optimizer
            loss.backward()
            optimizer.step()
    return running_loss,running_correct

for i in tqdm(range(EPOCHS)):        # Iterate through the epochs
    for phase in ['train', 'test']:   # Iterate through the phases
(train and test)
        if phase == "train":          # If the phase is "train", set
the loader and call the train function
            loader = trainLoader
            model,optimzier= train(model,loader,optimizer)
        else:                      # If the phase is "test", set the
loader and call the test function
            loader = testLoader
            model=test(model,loader)
        running_loss,running_correct = getLoss(loader,model,optimizer)
        epoch_loss = running_loss/len(loader.dataset)      # Calculate
the epoch loss and accuracy
        epoch_acc = running_correct/len(loader.dataset)
        if phase == "train":          # If the phase is "train",
update the scheduler and append the results to the train lists
            scheduler.step()
            train_loss.append(epoch_loss)
            train_accuracy.append(epoch_acc)
        else:                         # If the phase is "test", append
the results to the test lists and update the global best accuracy
            test_loss.append(epoch_loss)
            test_accuracy.append(epoch_acc)
            globalBestAccuracy = max(globalBestAccuracy, epoch_acc)

        torch.save({
                    'epoch': i,
                    'model_state_dict': model.state_dict(),
                    'optimizer_state_dict': optimizer.state_dict(),
                    'train_accuracy': train_accuracy,
                    'test_accuracy': test_accuracy,
                    }, '/content/gdrive/MyDrive/model2.pt')

    print("Training Loss : %s, Testing Loss : %s, Training Accuracy :
%s, Testing Accuracy : %s"\             # Print the results for the
current epoch
          %(train_loss[-1], test_loss[-1], train_accuracy[-1],
test_accuracy[-1]))
```

```
  0%|          | 1/300 [00:53<4:24:38, 53.11s/it]

Training Loss : 2.5115449896240234, Testing Loss : 2.7181516757965087,
Training Accuracy : 0.10006, Testing Accuracy : 0.1
```

```
  1%|          | 2/300 [01:46<4:25:03, 53.37s/it]

Training Loss : 2.574282617492676, Testing Loss : 2.5344732425689696,
Training Accuracy : 0.10004, Testing Accuracy : 0.1

  1%|          | 3/300 [02:37<4:19:24, 52.40s/it]

Training Loss : 2.496542536315918, Testing Loss : 2.584727862548828,
Training Accuracy : 0.09922, Testing Accuracy : 0.1

  1%|▏         | 4/300 [03:31<4:20:27, 52.79s/it]

Training Loss : 2.5271830899047854, Testing Loss : 2.5338068775177,
Training Accuracy : 0.0983, Testing Accuracy : 0.0997

  2%|▏         | 5/300 [04:23<4:18:05, 52.49s/it]

Training Loss : 2.4802432315063476, Testing Loss : 2.4508478267669678,
Training Accuracy : 0.10316, Testing Accuracy : 0.0997

  2%|▏         | 6/300 [05:16<4:17:41, 52.59s/it]

Training Loss : 2.437269440307617, Testing Loss : 2.4632112449645995,
Training Accuracy : 0.09748, Testing Accuracy : 0.1

  2%|▏         | 7/300 [06:09<4:18:30, 52.94s/it]

Training Loss : 2.4234398226928713, Testing Loss : 2.4179781257629394,
Training Accuracy : 0.10134, Testing Accuracy : 0.1

  3%|▎         | 8/300 [07:00<4:14:57, 52.39s/it]

Training Loss : 2.416207106323242, Testing Loss : 2.428897608566284,
Training Accuracy : 0.10094, Testing Accuracy : 0.1

  3%|▎         | 9/300 [07:54<4:15:44, 52.73s/it]

Training Loss : 2.4103893798828127, Testing Loss : 2.4908620750427244,
Training Accuracy : 0.09994, Testing Accuracy : 0.0996

  3%|▎         | 10/300 [08:46<4:14:12, 52.60s/it]

Training Loss : 2.467157725830078, Testing Loss : 2.5852174240112307,
Training Accuracy : 0.09962, Testing Accuracy : 0.0997

  4%|▎         | 11/300 [09:39<4:12:58, 52.52s/it]

Training Loss : 2.5276749725341796, Testing Loss : 2.4344369106292723,
Training Accuracy : 0.09926, Testing Accuracy : 0.1

  4%|▍         | 12/300 [10:32<4:14:00, 52.92s/it]

Training Loss : 2.426012887573242, Testing Loss : 2.395417000198364,
Training Accuracy : 0.09908, Testing Accuracy : 0.1
```

```
  4%|▍         | 13/300 [11:24<4:11:37, 52.60s/it]

Training Loss : 2.3835993762207033, Testing Loss : 2.4034313106536866,
Training Accuracy : 0.09962, Testing Accuracy : 0.1004

  5%|▍         | 14/300 [12:18<4:13:07, 53.10s/it]

Training Loss : 2.391955552368164, Testing Loss : 2.773055665588379,
Training Accuracy : 0.1001, Testing Accuracy : 0.0983

  5%|▌         | 15/300 [13:12<4:13:21, 53.34s/it]

Training Loss : 2.401213876953125, Testing Loss : 4.407480944061279,
Training Accuracy : 0.09992, Testing Accuracy : 0.124

  5%|▌         | 16/300 [14:04<4:10:18, 52.88s/it]

Training Loss : 2.4815620385742188, Testing Loss : 2.6158848541259765,
Training Accuracy : 0.10016, Testing Accuracy : 0.1082

  6%|▌         | 17/300 [14:58<4:10:14, 53.05s/it]

Training Loss : 2.495260171508789, Testing Loss : 2.776174662399292,
Training Accuracy : 0.10358, Testing Accuracy : 0.1196

  6%|▌         | 18/300 [15:50<4:08:12, 52.81s/it]

Training Loss : 2.512600622558594, Testing Loss : 2.5927466426849364,
Training Accuracy : 0.09986, Testing Accuracy : 0.1

  6%|▋         | 19/300 [16:42<4:06:58, 52.73s/it]

Training Loss : 2.5199392248535157, Testing Loss : 2.4116333641052248,
Training Accuracy : 0.09938, Testing Accuracy : 0.1

  7%|▋         | 20/300 [17:36<4:06:39, 52.86s/it]

Training Loss : 2.4153979922485354, Testing Loss : 2.4259653896331788,
Training Accuracy : 0.1002, Testing Accuracy : 0.1

  7%|▋         | 21/300 [18:27<4:03:48, 52.43s/it]

Training Loss : 2.4123485415649415, Testing Loss : 2.4690521076202394,
Training Accuracy : 0.10008, Testing Accuracy : 0.1

  7%|▋         | 22/300 [19:20<4:03:48, 52.62s/it]

Training Loss : 2.4331410330200196, Testing Loss : 2.451615244293213,
Training Accuracy : 0.10072, Testing Accuracy : 0.1

  8%|▊         | 23/300 [20:12<4:02:08, 52.45s/it]

Training Loss : 2.4389807064819338, Testing Loss : 2.5032477474212644,
Training Accuracy : 0.0987, Testing Accuracy : 0.1
```

```
  8%|█         | 24/300 [21:04<4:00:40, 52.32s/it]

Training Loss : 2.4523380505371093, Testing Loss : 2.537466466140747,
Training Accuracy : 0.10076, Testing Accuracy : 0.1

  8%|█         | 25/300 [21:58<4:01:29, 52.69s/it]

Training Loss : 2.4933965032958985, Testing Loss : 2.5013695251464845,
Training Accuracy : 0.10058, Testing Accuracy : 0.1

  9%|█         | 26/300 [22:49<3:58:40, 52.27s/it]

Training Loss : 2.4555527749633788, Testing Loss : 4.62404630241394,
Training Accuracy : 0.09784, Testing Accuracy : 0.0891

  9%|█         | 27/300 [23:42<3:58:25, 52.40s/it]

Training Loss : 2.5039449996948244, Testing Loss : 2.5164929187774656,
Training Accuracy : 0.1016, Testing Accuracy : 0.1

  9%|█         | 28/300 [24:35<3:58:34, 52.63s/it]

Training Loss : 2.486978818664551, Testing Loss : 2.5562563613891602,
Training Accuracy : 0.10014, Testing Accuracy : 0.1

 10%|█         | 29/300 [25:27<3:56:24, 52.34s/it]

Training Loss : 2.4923680657958984, Testing Loss : 2.4418339614868163,
Training Accuracy : 0.0996, Testing Accuracy : 0.1

 10%|█         | 30/300 [26:20<3:57:17, 52.73s/it]

Training Loss : 2.421377738647461, Testing Loss : 2.4043018962860105,
Training Accuracy : 0.10108, Testing Accuracy : 0.1

 10%|█         | 31/300 [27:12<3:54:56, 52.41s/it]

Training Loss : 2.3733505087280276, Testing Loss : 8.938605102539062,
Training Accuracy : 0.09874, Testing Accuracy : 0.1016

 11%|█         | 32/300 [28:05<3:54:38, 52.53s/it]

Training Loss : 2.418440899658203, Testing Loss : 2.4358123878479003,
Training Accuracy : 0.09964, Testing Accuracy : 0.1

 11%|█         | 33/300 [28:57<3:53:40, 52.51s/it]

Training Loss : 2.3963614178466797, Testing Loss : 2.4238613414764405,
Training Accuracy : 0.10086, Testing Accuracy : 0.1

 11%|█         | 34/300 [29:49<3:51:53, 52.31s/it]

Training Loss : 2.418448133239746, Testing Loss : 2.4874233612060546,
Training Accuracy : 0.10016, Testing Accuracy : 0.1
```

```
 12%|█         | 35/300 [30:42<3:52:25, 52.62s/it]

Training Loss : 2.4557222631835938, Testing Loss : 2.4880004600524903,
Training Accuracy : 0.1012, Testing Accuracy : 0.1

 12%|█         | 36/300 [31:34<3:50:10, 52.31s/it]

Training Loss : 2.44314602142334, Testing Loss : 2.584379322814941,
Training Accuracy : 0.09876, Testing Accuracy : 0.1

 12%|█         | 37/300 [32:27<3:50:57, 52.69s/it]

Training Loss : 2.4535588537597657, Testing Loss : 2.614582341384888,
Training Accuracy : 0.1007, Testing Accuracy : 0.1

 13%|█▎        | 38/300 [33:19<3:48:59, 52.44s/it]

Training Loss : 2.4390418243408205, Testing Loss : 2.5224050338745116,
Training Accuracy : 0.09692, Testing Accuracy : 0.1

 13%|█▎        | 39/300 [34:11<3:46:45, 52.13s/it]

Training Loss : 2.4626368200683593, Testing Loss : 2.5577548633575438,
Training Accuracy : 0.0992, Testing Accuracy : 0.1

 13%|█▎        | 40/300 [35:04<3:47:10, 52.43s/it]

Training Loss : 2.4803876013183594, Testing Loss : 2.4553739486694335,
Training Accuracy : 0.09994, Testing Accuracy : 0.1

 14%|█▍        | 41/300 [35:55<3:45:11, 52.17s/it]

Training Loss : 2.4406739950561525, Testing Loss : 2.4890185565948486,
Training Accuracy : 0.1015, Testing Accuracy : 0.1153

 14%|█▍        | 42/300 [36:49<3:45:40, 52.48s/it]

Training Loss : 2.4514818991088867, Testing Loss : 2.5792465423583986,
Training Accuracy : 0.10024, Testing Accuracy : 0.1

 14%|█▍        | 43/300 [37:41<3:44:26, 52.40s/it]

Training Loss : 2.5202700131225586, Testing Loss : 2.5566980110168456,
Training Accuracy : 0.10092, Testing Accuracy : 0.1

 15%|█▌        | 44/300 [38:33<3:43:17, 52.33s/it]

Training Loss : 2.4646627478027345, Testing Loss : 2.6484891998291014,
Training Accuracy : 0.09998, Testing Accuracy : 0.1

 15%|█▌        | 45/300 [39:26<3:43:44, 52.65s/it]

Training Loss : 2.53202716369628, Testing Loss : 2.4443966625213625,
Training Accuracy : 0.10192, Testing Accuracy : 0.1
```

```
 15%|█▌        | 46/300 [40:18<3:42:02, 52.45s/it]

Training Loss : 2.4464820373535154, Testing Loss : 2.46876011428833,
Training Accuracy : 0.10002, Testing Accuracy : 0.1

 16%|█▌        | 47/300 [41:11<3:41:42, 52.58s/it]

Training Loss : 2.4261504486083982, Testing Loss : 2.5633094806671144,
Training Accuracy : 0.0988, Testing Accuracy : 0.0883

 16%|█▌        | 48/300 [42:04<3:41:02, 52.63s/it]

Training Loss : 2.4086627923583985, Testing Loss : 3.826700525665283,
Training Accuracy : 0.10354, Testing Accuracy : 0.1

 16%|█▋        | 49/300 [42:57<3:40:18, 52.66s/it]

Training Loss : 3.0585814086914063, Testing Loss : 3.9224335144042968,
Training Accuracy : 0.10064, Testing Accuracy : 0.1

 17%|█▋        | 50/300 [43:51<3:40:49, 53.00s/it]

Training Loss : 2.9318542388916016, Testing Loss : 2.538388332748413,
Training Accuracy : 0.10006, Testing Accuracy : 0.1

 17%|█▋        | 51/300 [44:43<3:38:55, 52.75s/it]

Training Loss : 2.601323240966797, Testing Loss : 12.037515063476562,
Training Accuracy : 0.09834, Testing Accuracy : 0.1

 17%|█▋        | 52/300 [45:36<3:38:32, 52.87s/it]

Training Loss : 3.4634024307250977, Testing Loss : 2.866824580383301,
Training Accuracy : 0.10102, Testing Accuracy : 0.1

 18%|█▊        | 53/300 [46:30<3:39:00, 53.20s/it]

Training Loss : 2.797570200805664, Testing Loss : 3.390602599334717,
Training Accuracy : 0.09996, Testing Accuracy : 0.1

 18%|█▊        | 54/300 [47:22<3:36:48, 52.88s/it]

Training Loss : 2.5428135009765627, Testing Loss : 2.668299655532837,
Training Accuracy : 0.10168, Testing Accuracy : 0.1

 18%|█▊        | 55/300 [48:15<3:35:49, 52.86s/it]

Training Loss : 2.471526468811035, Testing Loss : 2.4145833255767823,
Training Accuracy : 0.1039, Testing Accuracy : 0.1

 19%|█▊        | 56/300 [49:09<3:36:08, 53.15s/it]

Training Loss : 2.941873931274414, Testing Loss : 3.166718679046631,
Training Accuracy : 0.09912, Testing Accuracy : 0.1
```

```
 19%|██        | 57/300 [50:00<3:33:37, 52.75s/it]
Training Loss : 2.7139820022583008, Testing Loss : 3.402030937957764,
Training Accuracy : 0.10112, Testing Accuracy : 0.1
 19%|██        | 58/300 [50:54<3:33:35, 52.96s/it]
Training Loss : 2.534146623535156, Testing Loss : 2.4577402130126953,
Training Accuracy : 0.10012, Testing Accuracy : 0.1
 20%|██        | 59/300 [51:48<3:33:50, 53.24s/it]
Training Loss : 2.412534053955078, Testing Loss : 2.703105657196045,
Training Accuracy : 0.09672, Testing Accuracy : 0.1
 20%|██        | 60/300 [52:40<3:31:27, 52.86s/it]
Training Loss : 2.393736779785156, Testing Loss : 2.418498965835571,
Training Accuracy : 0.09788, Testing Accuracy : 0.1
 20%|██        | 61/300 [53:33<3:31:06, 53.00s/it]
Training Loss : 2.4168347338867187, Testing Loss : 2.7194945026397703,
Training Accuracy : 0.09952, Testing Accuracy : 0.1002
 21%|██        | 62/300 [54:26<3:29:53, 52.92s/it]
Training Loss : 2.6533205233764647, Testing Loss : 2.6422097717285156,
Training Accuracy : 0.09898, Testing Accuracy : 0.1
 21%|██        | 63/300 [55:19<3:29:11, 52.96s/it]
Training Loss : 2.5853466647338865, Testing Loss : 2.509756428527832,
Training Accuracy : 0.1015, Testing Accuracy : 0.1
 21%|██        | 64/300 [56:13<3:29:34, 53.28s/it]
Training Loss : 2.4907671810913086, Testing Loss : 2.645417866897583,
Training Accuracy : 0.0995, Testing Accuracy : 0.1
 22%|██        | 65/300 [57:04<3:26:21, 52.69s/it]
Training Loss : 2.535134960632324, Testing Loss : 2.572698163986206,
Training Accuracy : 0.09888, Testing Accuracy : 0.1
 22%|██        | 66/300 [57:57<3:25:58, 52.82s/it]
Training Loss : 2.475155044555664, Testing Loss : 2.601090798187256,
Training Accuracy : 0.09982, Testing Accuracy : 0.1
 22%|██        | 67/300 [58:52<3:27:00, 53.31s/it]
Training Loss : 2.4658202795410156, Testing Loss : 233.64074501953124,
Training Accuracy : 0.1011, Testing Accuracy : 0.1
```

```
 23%|██        | 68/300 [59:44<3:24:25, 52.87s/it]

Training Loss : 2.3866404373168946, Testing Loss : 2.39444072303772,
Training Accuracy : 0.10026, Testing Accuracy : 0.1041

 23%|██        | 69/300 [1:00:38<3:24:54, 53.22s/it]

Training Loss : 2.352609626159668, Testing Loss : 2.304650984954834,
Training Accuracy : 0.10048, Testing Accuracy : 0.1207

 23%|██        | 70/300 [1:01:31<3:24:24, 53.32s/it]

Training Loss : 2.3225936138916015, Testing Loss : 2.3315374431610105,
Training Accuracy : 0.10428, Testing Accuracy : 0.1

 24%|██        | 71/300 [1:02:23<3:22:11, 52.98s/it]

Training Loss : 2.337401962890625, Testing Loss : 2.352132459640503,
Training Accuracy : 0.09988, Testing Accuracy : 0.1

 24%|██        | 72/300 [1:03:18<3:22:52, 53.39s/it]

Training Loss : 2.374796971435547, Testing Loss : 3.283861869049072,
Training Accuracy : 0.09832, Testing Accuracy : 0.1

 24%|██        | 73/300 [1:04:09<3:19:51, 52.82s/it]

Training Loss : 2.394511413574219, Testing Loss : 2.470474102783203,
Training Accuracy : 0.09952, Testing Accuracy : 0.1

 25%|██        | 74/300 [1:05:02<3:19:15, 52.90s/it]

Training Loss : 2.4431714935302735, Testing Loss : 2.618236846923828,
Training Accuracy : 0.10038, Testing Accuracy : 0.1

 25%|██        | 75/300 [1:05:56<3:19:42, 53.26s/it]

Training Loss : 2.5083107858276366, Testing Loss : 2.8793356655120848,
Training Accuracy : 0.09994, Testing Accuracy : 0.1

 25%|██        | 76/300 [1:06:48<3:17:26, 52.89s/it]

Training Loss : 2.3973416897583006, Testing Loss : 2.518698384857178,
Training Accuracy : 0.0989, Testing Accuracy : 0.0918

 26%|██        | 77/300 [1:07:42<3:17:16, 53.08s/it]

Training Loss : 2.424843219909668, Testing Loss : 2.4492478458404543,
Training Accuracy : 0.0992, Testing Accuracy : 0.101

 26%|██        | 78/300 [1:08:36<3:17:06, 53.27s/it]

Training Loss : 2.399642203979492, Testing Loss : 2.467860721206665,
Training Accuracy : 0.102, Testing Accuracy : 0.1
```

```
 26%|███       | 79/300 [1:09:28<3:14:57, 52.93s/it]

Training Loss : 2.412879982910156, Testing Loss : 14.958598138427734,
Training Accuracy : 0.10046, Testing Accuracy : 0.1

 27%|███       | 80/300 [1:10:22<3:15:09, 53.23s/it]

Training Loss : 2.4609917764282225, Testing Loss : 2.4251259674072267,
Training Accuracy : 0.10074, Testing Accuracy : 0.1

 27%|███       | 81/300 [1:11:14<3:13:26, 53.00s/it]

Training Loss : 2.4074148751831053, Testing Loss : 2.418015592956543,
Training Accuracy : 0.1006, Testing Accuracy : 0.1

 27%|███       | 82/300 [1:12:07<3:12:02, 52.86s/it]

Training Loss : 2.3918399368286134, Testing Loss : 24.449442727661133,
Training Accuracy : 0.10146, Testing Accuracy : 0.1

 28%|███       | 83/300 [1:13:01<3:12:23, 53.20s/it]

Training Loss : 2.4250632525634765, Testing Loss : 2.4437657638549806,
Training Accuracy : 0.09914, Testing Accuracy : 0.1

 28%|███       | 84/300 [1:13:52<3:09:52, 52.75s/it]

Training Loss : 2.405951680603027, Testing Loss : 2.5159466217041015,
Training Accuracy : 0.09776, Testing Accuracy : 0.1

 28%|███       | 85/300 [1:14:46<3:09:45, 52.95s/it]

Training Loss : 2.4775459353637697, Testing Loss : 3.0403247943878173,
Training Accuracy : 0.09978, Testing Accuracy : 0.1136

 29%|███       | 86/300 [1:15:40<3:09:47, 53.21s/it]

Training Loss : 2.5711541708374024, Testing Loss : 5.3789356941223145,
Training Accuracy : 0.09984, Testing Accuracy : 0.1

 29%|███       | 87/300 [1:16:32<3:07:51, 52.92s/it]

Training Loss : 2.698598035583496, Testing Loss : 2.633738883590698,
Training Accuracy : 0.1001, Testing Accuracy : 0.1

 29%|███       | 88/300 [1:17:26<3:07:46, 53.14s/it]

Training Loss : 2.6604317669677733, Testing Loss : 2.675916171646118,
Training Accuracy : 0.1009, Testing Accuracy : 0.1

 30%|███       | 89/300 [1:18:20<3:07:48, 53.41s/it]

Training Loss : 2.4972077587890626, Testing Loss : 2.4189207302093507,
Training Accuracy : 0.10258, Testing Accuracy : 0.1
```

```
 30%|███       | 90/300 [1:19:11<3:05:21, 52.96s/it]
Training Loss : 2.3779715124511718, Testing Loss : 2.4133324962615967,
Training Accuracy : 0.10144, Testing Accuracy : 0.1

 30%|███       | 91/300 [1:20:05<3:05:24, 53.23s/it]
Training Loss : 2.392040937805176, Testing Loss : 2.366600522994995,
Training Accuracy : 0.09962, Testing Accuracy : 0.1

 31%|███       | 92/300 [1:20:58<3:03:43, 53.00s/it]
Training Loss : 2.3470897009277345, Testing Loss : 2.379064978790283,
Training Accuracy : 0.09898, Testing Accuracy : 0.1

 31%|███       | 93/300 [1:21:50<3:02:25, 52.87s/it]
Training Loss : 2.365845278015137, Testing Loss : 2.4215122104644777,
Training Accuracy : 0.10122, Testing Accuracy : 0.1

 31%|███       | 94/300 [1:22:44<3:02:14, 53.08s/it]
Training Loss : 2.3779531176757813, Testing Loss : 2.4444335666656496,
Training Accuracy : 0.1012, Testing Accuracy : 0.1

 32%|███       | 95/300 [1:23:36<3:00:11, 52.74s/it]
Training Loss : 2.411189477233887, Testing Loss : 3.519577864456177,
Training Accuracy : 0.09994, Testing Accuracy : 0.1147

 32%|███       | 96/300 [1:24:29<2:59:44, 52.86s/it]
Training Loss : 2.4308928796386717, Testing Loss : 2.5017570560455322,
Training Accuracy : 0.09818, Testing Accuracy : 0.1

 32%|███       | 97/300 [1:25:22<2:59:07, 52.94s/it]
Training Loss : 2.4337406884765627, Testing Loss : 3.957923553085327,
Training Accuracy : 0.1016, Testing Accuracy : 0.1

 33%|███       | 98/300 [1:26:14<2:57:16, 52.66s/it]
Training Loss : 2.376677502746582, Testing Loss : 11892.8358671875,
Training Accuracy : 0.09942, Testing Accuracy : 0.1

 33%|███       | 99/300 [1:27:08<2:57:37, 53.02s/it]
Training Loss : 2.3703003942871095, Testing Loss : 2.356941077423096,
Training Accuracy : 0.09954, Testing Accuracy : 0.0975

 33%|███       | 100/300 [1:28:00<2:55:38, 52.69s/it]
Training Loss : 2.331232639465332, Testing Loss : 2.3535767890930175,
Training Accuracy : 0.10104, Testing Accuracy : 0.1
```

```
 34%|███▍      | 101/300 [1:28:52<2:54:26, 52.59s/it]
Training Loss : 2.351628502197266, Testing Loss : 132.9661901123047,
Training Accuracy : 0.0995, Testing Accuracy : 0.1
 34%|███▍      | 102/300 [1:29:46<2:54:46, 52.96s/it]
Training Loss : 2.367627735900879, Testing Loss : 5885.05275078125,
Training Accuracy : 0.09996, Testing Accuracy : 0.1
 34%|███▍      | 103/300 [1:30:38<2:52:51, 52.65s/it]
Training Loss : 2.4461371295166017, Testing Loss : 2.8123597946166994,
Training Accuracy : 0.10008, Testing Accuracy : 0.1033
 35%|███▍      | 104/300 [1:31:31<2:52:35, 52.84s/it]
Training Loss : 2.41666699798584, Testing Loss : 2.4406885486602783,
Training Accuracy : 0.10038, Testing Accuracy : 0.1
 35%|███▌      | 105/300 [1:32:24<2:51:37, 52.81s/it]
Training Loss : 2.397435969543457, Testing Loss : 2.4699720066070556,
Training Accuracy : 0.10148, Testing Accuracy : 0.1
 35%|███▌      | 106/300 [1:33:16<2:50:20, 52.68s/it]
Training Loss : 2.425652016296387, Testing Loss : 2.580156976318359,
Training Accuracy : 0.09876, Testing Accuracy : 0.1
 36%|███▌      | 107/300 [1:34:11<2:51:03, 53.18s/it]
Training Loss : 2.3471031744384767, Testing Loss : 2.35615125541687,
Training Accuracy : 0.09924, Testing Accuracy : 0.1
 36%|███▌      | 108/300 [1:35:03<2:49:07, 52.85s/it]
Training Loss : 2.322478641052246, Testing Loss : 2.3228411350250244,
Training Accuracy : 0.1008, Testing Accuracy : 0.1
 36%|███▋      | 109/300 [1:35:55<2:47:40, 52.68s/it]
Training Loss : 2.3230813928222656, Testing Loss : 2.338385977554321,
Training Accuracy : 0.09922, Testing Accuracy : 0.1
 37%|███▋      | 110/300 [1:36:49<2:48:06, 53.09s/it]
Training Loss : 2.335468029174805, Testing Loss : 2.341616895675659,
Training Accuracy : 0.09802, Testing Accuracy : 0.1
 37%|███▋      | 111/300 [1:37:41<2:46:08, 52.74s/it]
Training Loss : 2.364204750671387, Testing Loss : 2.403465275192260 7,
Training Accuracy : 0.09926, Testing Accuracy : 0.1
```

```
 37%|████      | 112/300 [1:38:34<2:45:21, 52.78s/it]

Training Loss : 2.3875223733520508, Testing Loss : 2.403711038208008,
Training Accuracy : 0.0998, Testing Accuracy : 0.1

 38%|████      | 113/300 [1:39:28<2:45:21, 53.06s/it]

Training Loss : 2.4119923736572266, Testing Loss : 2.350449239730835,
Training Accuracy : 0.0996, Testing Accuracy : 0.1

 38%|████      | 114/300 [1:40:20<2:43:29, 52.74s/it]

Training Loss : 2.3442783615112304, Testing Loss : 2.324639318847656,
Training Accuracy : 0.10062, Testing Accuracy : 0.1

 38%|████      | 115/300 [1:41:14<2:43:56, 53.17s/it]

Training Loss : 2.324689014892578, Testing Loss : 284.86442451171877,
Training Accuracy : 0.1051, Testing Accuracy : 0.101

 39%|████      | 116/300 [1:42:08<2:43:32, 53.33s/it]

Training Loss : 2.3240545123291017, Testing Loss : 2.6654057037353516,
Training Accuracy : 0.13086, Testing Accuracy : 0.1494

 39%|████      | 117/300 [1:43:00<2:42:16, 53.20s/it]

Training Loss : 2.34308642578125, Testing Loss : 2.6847760540008543,
Training Accuracy : 0.13926, Testing Accuracy : 0.1451

 39%|████      | 118/300 [1:43:55<2:42:38, 53.62s/it]

Training Loss : 2.371742309875488, Testing Loss : 2.415783583831787,
Training Accuracy : 0.13864, Testing Accuracy : 0.142

 40%|████      | 119/300 [1:44:50<2:42:34, 53.89s/it]

Training Loss : 2.330822897338867, Testing Loss : 2.5095852920532224,
Training Accuracy : 0.15056, Testing Accuracy : 0.1305

 40%|████      | 120/300 [1:45:42<2:40:26, 53.48s/it]

Training Loss : 2.318798815612793, Testing Loss : 2.2121334720611574,
Training Accuracy : 0.1358, Testing Accuracy : 0.1728

 40%|████      | 121/300 [1:46:36<2:39:44, 53.54s/it]

Training Loss : 2.1713834365844726, Testing Loss : 2.1047658332824706,
Training Accuracy : 0.17238, Testing Accuracy : 0.1763

 41%|████      | 122/300 [1:47:30<2:39:17, 53.69s/it]

Training Loss : 2.10720159576416, Testing Loss : 2.2108245906829835,
Training Accuracy : 0.18036, Testing Accuracy : 0.1683
```

```
 41%|████      | 123/300 [1:48:22<2:37:26, 53.37s/it]

Training Loss : 2.1758946801757815, Testing Loss : 2.9983952293395997,
Training Accuracy : 0.1761, Testing Accuracy : 0.1585

 41%|████      | 124/300 [1:49:17<2:37:09, 53.58s/it]

Training Loss : 2.4502170782470705, Testing Loss : 2.59602222633618,
Training Accuracy : 0.15332, Testing Accuracy : 0.0992

 42%|████      | 125/300 [1:50:10<2:36:16, 53.58s/it]

Training Loss : 2.4023988446044924, Testing Loss : 2.4957943264007567,
Training Accuracy : 0.11608, Testing Accuracy : 0.1592

 42%|████      | 126/300 [1:51:02<2:34:09, 53.16s/it]

Training Loss : 2.2245573986816405, Testing Loss : 2.4763975994110106,
Training Accuracy : 0.15636, Testing Accuracy : 0.1594

 42%|████      | 127/300 [1:51:56<2:34:03, 53.43s/it]

Training Loss : 2.1511633096313476, Testing Loss : 2.170814978790283,
Training Accuracy : 0.17506, Testing Accuracy : 0.1649

 43%|████      | 128/300 [1:52:49<2:32:43, 53.27s/it]

Training Loss : 2.013557343444824, Testing Loss : 2.1073438388824464,
Training Accuracy : 0.18294, Testing Accuracy : 0.1761

 43%|████      | 129/300 [1:53:42<2:31:39, 53.21s/it]

Training Loss : 2.0005340072631834, Testing Loss : 2.314467876434326,
Training Accuracy : 0.18836, Testing Accuracy : 0.1642

 43%|████      | 130/300 [1:54:37<2:31:40, 53.53s/it]

Training Loss : 2.1371821701049805, Testing Loss : 2.0807184745788576,
Training Accuracy : 0.18586, Testing Accuracy : 0.1755

 44%|████      | 131/300 [1:55:29<2:29:49, 53.19s/it]

Training Loss : 2.042939606628418, Testing Loss : 2.221289700317383,
Training Accuracy : 0.1863, Testing Accuracy : 0.1504

 44%|████      | 132/300 [1:56:22<2:28:53, 53.18s/it]

Training Loss : 2.1536877072143557, Testing Loss : 2.593900450897217,
Training Accuracy : 0.17294, Testing Accuracy : 0.1567

 44%|████      | 133/300 [1:57:16<2:28:52, 53.49s/it]

Training Loss : 2.11001259765625, Testing Loss : 2.519721260070801,
Training Accuracy : 0.1765, Testing Accuracy : 0.1793
```

```
 45%|████▌     | 134/300 [1:58:09<2:27:07, 53.18s/it]

Training Loss : 2.1331791189575195, Testing Loss : 2.6992616500854494,
Training Accuracy : 0.18122, Testing Accuracy : 0.1911

 45%|████▌     | 135/300 [1:59:02<2:26:36, 53.31s/it]

Training Loss : 2.3035162142944334, Testing Loss : 2.266026982498169,
Training Accuracy : 0.17622, Testing Accuracy : 0.1752

 45%|████▌     | 136/300 [1:59:57<2:26:33, 53.62s/it]

Training Loss : 2.144622405090332, Testing Loss : 2.283102807235718,
Training Accuracy : 0.18208, Testing Accuracy : 0.1643

 46%|████▌     | 137/300 [2:00:49<2:24:26, 53.17s/it]

Training Loss : 2.3594637048339844, Testing Loss : 2.4017691513061523,
Training Accuracy : 0.17318, Testing Accuracy : 0.1902

 46%|████▌     | 138/300 [2:01:43<2:24:01, 53.34s/it]

Training Loss : 2.235639887084961, Testing Loss : 2.2078870906829833,
Training Accuracy : 0.1816, Testing Accuracy : 0.1857

 46%|████▋     | 139/300 [2:02:37<2:24:03, 53.69s/it]

Training Loss : 2.041650511779785, Testing Loss : 1.9896759246826172,
Training Accuracy : 0.1932, Testing Accuracy : 0.1796

 47%|████▋     | 140/300 [2:03:30<2:22:13, 53.34s/it]

Training Loss : 2.0009723501586913, Testing Loss : 1.9611277145385742,
Training Accuracy : 0.1914, Testing Accuracy : 0.2046

 47%|████▋     | 141/300 [2:04:24<2:21:46, 53.50s/it]

Training Loss : 1.9684139556884765, Testing Loss : 2.1243244564056396,
Training Accuracy : 0.19824, Testing Accuracy : 0.2346

 47%|████▋     | 142/300 [2:05:18<2:21:20, 53.68s/it]

Training Loss : 1.934263358154297, Testing Loss : 24.50160559387207,
Training Accuracy : 0.2054, Testing Accuracy : 0.1248

 48%|████▊     | 143/300 [2:06:10<2:19:18, 53.24s/it]

Training Loss : 1.8680521310424805, Testing Loss : 2.015306713104248,
Training Accuracy : 0.22544, Testing Accuracy : 0.2082

 48%|████▊     | 144/300 [2:07:04<2:18:50, 53.40s/it]

Training Loss : 1.9822244503784179, Testing Loss : 1.962862722778320
4,
Training Accuracy : 0.20658, Testing Accuracy : 0.2412
```

```
 48%|█████     | 145/300 [2:07:57<2:18:12, 53.50s/it]

Training Loss : 1.9019052124023437, Testing Loss : 1.8970420021057128,
Training Accuracy : 0.21988, Testing Accuracy : 0.2158

 49%|█████     | 146/300 [2:08:50<2:16:17, 53.10s/it]

Training Loss : 1.9869638763427735, Testing Loss : 2.011595442199707,
Training Accuracy : 0.21398, Testing Accuracy : 0.2104

 49%|█████     | 147/300 [2:09:44<2:16:10, 53.40s/it]

Training Loss : 1.9365352157592775, Testing Loss : 2.0465376304626464,
Training Accuracy : 0.22178, Testing Accuracy : 0.2082

 49%|█████     | 148/300 [2:10:36<2:14:48, 53.21s/it]

Training Loss : 1.9407332290649415, Testing Loss : 1.9508960746765136,
Training Accuracy : 0.23526, Testing Accuracy : 0.2269

 50%|█████     | 149/300 [2:11:29<2:13:48, 53.17s/it]

Training Loss : 1.8733753982543946, Testing Loss : 2.0703364543914793,
Training Accuracy : 0.22986, Testing Accuracy : 0.2036

 50%|█████     | 150/300 [2:12:24<2:13:57, 53.58s/it]

Training Loss : 2.02535166595459, Testing Loss : 2.4887466957092284,
Training Accuracy : 0.21076, Testing Accuracy : 0.209

 50%|█████     | 151/300 [2:13:16<2:11:51, 53.10s/it]

Training Loss : 1.93416518951416, Testing Loss : 2.060519492340088,
Training Accuracy : 0.22856, Testing Accuracy : 0.2222

 51%|█████     | 152/300 [2:14:09<2:11:16, 53.22s/it]

Training Loss : 1.8814119393920898, Testing Loss : 1.9203910995483398,
Training Accuracy : 0.24126, Testing Accuracy : 0.246

 51%|█████     | 153/300 [2:15:04<2:11:13, 53.56s/it]

Training Loss : 1.8384727514648438, Testing Loss : 1.8570676380157471,
Training Accuracy : 0.25154, Testing Accuracy : 0.2606

 51%|█████▏    | 154/300 [2:15:56<2:09:30, 53.22s/it]

Training Loss : 1.910321382751465, Testing Loss : 2.0597970321655272,
Training Accuracy : 0.2351, Testing Accuracy : 0.2173

 52%|█████▏    | 155/300 [2:16:50<2:09:00, 53.38s/it]

Training Loss : 1.9432246450805664, Testing Loss : 2.1099834957122803,
Training Accuracy : 0.2422, Testing Accuracy : 0.2232
```

```
 52%|█████▏    | 156/300 [2:17:45<2:09:08, 53.81s/it]

Training Loss : 1.9735364462280274, Testing Loss : 333.76589633789064,
Training Accuracy : 0.2293, Testing Accuracy : 0.1

 52%|█████▏    | 157/300 [2:18:37<2:07:11, 53.37s/it]

Training Loss : 1.8636889688110352, Testing Loss : 1.9716546535491943,
Training Accuracy : 0.26582, Testing Accuracy : 0.2459

 53%|█████▎    | 158/300 [2:19:31<2:06:30, 53.45s/it]

Training Loss : 1.856327976989746, Testing Loss : 1.9558114128112793,
Training Accuracy : 0.25484, Testing Accuracy : 0.2497

 53%|█████▎    | 159/300 [2:20:25<2:06:04, 53.65s/it]

Training Loss : 1.8815780447387696, Testing Loss : 1.9623115184783935,
Training Accuracy : 0.2665, Testing Accuracy : 0.2544

 53%|█████▎    | 160/300 [2:21:17<2:04:01, 53.15s/it]

Training Loss : 1.8276135510253906, Testing Loss : 1.729697878265381,
Training Accuracy : 0.30252, Testing Accuracy : 0.3043

 54%|█████▎    | 161/300 [2:22:11<2:03:36, 53.35s/it]

Training Loss : 1.7620404684448243, Testing Loss : 1.8640585132598877,
Training Accuracy : 0.31104, Testing Accuracy : 0.2715

 54%|█████▍    | 162/300 [2:23:05<2:03:12, 53.57s/it]

Training Loss : 1.7936637405395508, Testing Loss : 1.8446157421112062,
Training Accuracy : 0.29214, Testing Accuracy : 0.2931

 54%|█████▍    | 163/300 [2:23:57<2:01:34, 53.25s/it]

Training Loss : 1.8786257095336913, Testing Loss : 1.9317966766357422,
Training Accuracy : 0.28252, Testing Accuracy : 0.2694

 55%|█████▍    | 164/300 [2:24:51<2:01:11, 53.47s/it]

Training Loss : 1.8227077224731445, Testing Loss : 1.8595436744689942,
Training Accuracy : 0.27628, Testing Accuracy : 0.2684

 55%|█████▌    | 165/300 [2:25:45<2:00:24, 53.51s/it]

Training Loss : 1.7892800979614258, Testing Loss : 1.946696367263794,
Training Accuracy : 0.28526, Testing Accuracy : 0.3225

 55%|█████▌    | 166/300 [2:26:38<1:58:54, 53.24s/it]

Training Loss : 1.7706757858276367, Testing Loss : 1.7851778350830079,
Training Accuracy : 0.30244, Testing Accuracy : 0.3184
```

```
 56%|█████▌    | 167/300 [2:27:32<1:58:38, 53.52s/it]

Training Loss : 1.677719983215332, Testing Loss : 1.6361357326507568,
Training Accuracy : 0.3271, Testing Accuracy : 0.3588

 56%|█████▌    | 168/300 [2:28:26<1:58:13, 53.74s/it]

Training Loss : 1.6682814910888673, Testing Loss : 1.6613744968414306,
Training Accuracy : 0.33566, Testing Accuracy : 0.3097

 56%|█████▋    | 169/300 [2:29:18<1:56:25, 53.32s/it]

Training Loss : 1.5903549523925782, Testing Loss : 1.6046388599395751,
Training Accuracy : 0.34864, Testing Accuracy : 0.3528

 57%|█████▋    | 170/300 [2:30:12<1:55:50, 53.46s/it]

Training Loss : 1.533691260986328, Testing Loss : 1.929138246536255,
Training Accuracy : 0.37758, Testing Accuracy : 0.2916

 57%|█████▋    | 171/300 [2:31:06<1:55:20, 53.65s/it]

Training Loss : 1.6112493194580078, Testing Loss : 1.8488135147094726,
Training Accuracy : 0.363, Testing Accuracy : 0.341

 57%|█████▋    | 172/300 [2:31:58<1:53:32, 53.22s/it]

Training Loss : 1.5974636367797852, Testing Loss : 1.6887406341552735,
Training Accuracy : 0.36378, Testing Accuracy : 0.3575

 58%|█████▊    | 173/300 [2:32:53<1:53:13, 53.49s/it]

Training Loss : 1.6086610148620606, Testing Loss : 1.6697752773284913,
Training Accuracy : 0.35808, Testing Accuracy : 0.3788

 58%|█████▊    | 174/300 [2:33:45<1:51:52, 53.28s/it]

Training Loss : 1.5802058946228028, Testing Loss : 1.6644832096099853,
Training Accuracy : 0.37684, Testing Accuracy : 0.3389

 58%|█████▊    | 175/300 [2:34:38<1:50:48, 53.19s/it]

Training Loss : 1.5851047596740722, Testing Loss : 1.8087750431060792,
Training Accuracy : 0.38232, Testing Accuracy : 0.345

 59%|█████▊    | 176/300 [2:35:32<1:50:29, 53.47s/it]

Training Loss : 1.5871438851928712, Testing Loss : 1.971824758529663,
Training Accuracy : 0.3885, Testing Accuracy : 0.3005

 59%|█████▉    | 177/300 [2:36:25<1:48:57, 53.15s/it]

Training Loss : 1.7103779217529298, Testing Loss : 1.887357265472412,
Training Accuracy : 0.36142, Testing Accuracy : 0.3254
```

```
 59%|██████    | 178/300 [2:37:18<1:48:22, 53.30s/it]

Training Loss : 1.5320531266784667, Testing Loss : 1.5639075174331665,
Training Accuracy : 0.37974, Testing Accuracy : 0.3967

 60%|██████    | 179/300 [2:38:13<1:48:12, 53.66s/it]

Training Loss : 1.4604973217773438, Testing Loss : 1.5360118259429931,
Training Accuracy : 0.41748, Testing Accuracy : 0.4289

 60%|██████    | 180/300 [2:39:06<1:46:45, 53.38s/it]

Training Loss : 1.4318225869750976, Testing Loss : 1.4346110698699952,
Training Accuracy : 0.44336, Testing Accuracy : 0.4693

 60%|██████    | 181/300 [2:39:59<1:45:55, 53.41s/it]

Training Loss : 1.473630867614746, Testing Loss : 1.608124836730957,
Training Accuracy : 0.44134, Testing Accuracy : 0.3828

 61%|██████    | 182/300 [2:40:53<1:45:33, 53.68s/it]

Training Loss : 1.520547986755371, Testing Loss : 1.736612089920044,
Training Accuracy : 0.41588, Testing Accuracy : 0.4058

 61%|██████    | 183/300 [2:41:46<1:44:13, 53.45s/it]

Training Loss : 1.5938344647216798, Testing Loss : 1.646511633682251,
Training Accuracy : 0.3915, Testing Accuracy : 0.3666

 61%|██████▏   | 184/300 [2:42:39<1:43:06, 53.33s/it]

Training Loss : 1.5334427320861816, Testing Loss : 1.5749473258972169,
Training Accuracy : 0.4104, Testing Accuracy : 0.4322

 62%|██████▏   | 185/300 [2:43:34<1:42:47, 53.63s/it]

Training Loss : 1.4352723223876953, Testing Loss : 1.4343348899841308,
Training Accuracy : 0.45404, Testing Accuracy : 0.4487

 62%|██████▏   | 186/300 [2:44:26<1:41:07, 53.23s/it]

Training Loss : 1.3922778239440918, Testing Loss : 1.4492520231246948,
Training Accuracy : 0.457, Testing Accuracy : 0.4573

 62%|██████▏   | 187/300 [2:45:20<1:40:35, 53.42s/it]

Training Loss : 1.3580113201904296, Testing Loss : 1.366596353149414,
Training Accuracy : 0.46526, Testing Accuracy : 0.4703

 63%|██████▎   | 188/300 [2:46:14<1:40:18, 53.73s/it]

Training Loss : 1.2716251477050782, Testing Loss : 2.3078973419189452,
Training Accuracy : 0.51086, Testing Accuracy : 0.3067
```

```
 63%|██████    | 189/300 [2:47:06<1:38:30, 53.25s/it]

Training Loss : 1.251318153076172, Testing Loss : 1.4114525024414062,
Training Accuracy : 0.52062, Testing Accuracy : 0.5001

 63%|██████    | 190/300 [2:48:00<1:37:47, 53.34s/it]

Training Loss : 1.31002538772583, Testing Loss : 1.8274423614501953,
Training Accuracy : 0.5086, Testing Accuracy : 0.4533

 64%|██████    | 191/300 [2:48:54<1:37:12, 53.51s/it]

Training Loss : 1.3500681967163086, Testing Loss : 1.3097073017120362,
Training Accuracy : 0.50462, Testing Accuracy : 0.5271

 64%|██████    | 192/300 [2:49:46<1:35:30, 53.06s/it]

Training Loss : 1.2548791647338866, Testing Loss : 1.5657065963745118,
Training Accuracy : 0.53524, Testing Accuracy : 0.5124

 64%|██████    | 193/300 [2:50:39<1:34:46, 53.15s/it]

Training Loss : 1.274492939300537, Testing Loss : 1.5327913383483887,
Training Accuracy : 0.53388, Testing Accuracy : 0.4742

 65%|██████    | 194/300 [2:51:32<1:33:47, 53.09s/it]

Training Loss : 1.2905178060913085, Testing Loss : 1.3162673721313476,
Training Accuracy : 0.53128, Testing Accuracy : 0.5003

 65%|██████    | 195/300 [2:52:25<1:32:30, 52.86s/it]

Training Loss : 1.443261747894287, Testing Loss : 1.6564560535430908,
Training Accuracy : 0.50752, Testing Accuracy : 0.4482

 65%|██████    | 196/300 [2:53:18<1:32:09, 53.17s/it]

Training Loss : 1.2242732138061523, Testing Loss : 1.3537490940093995,
Training Accuracy : 0.55028, Testing Accuracy : 0.5293

 66%|██████    | 197/300 [2:54:10<1:30:38, 52.80s/it]

Training Loss : 1.169268429107666, Testing Loss : 1.2085146072387696,
Training Accuracy : 0.57184, Testing Accuracy : 0.5569

 66%|██████    | 198/300 [2:55:03<1:29:48, 52.83s/it]

Training Loss : 1.164107717590332, Testing Loss : 1.3620646404266357,
Training Accuracy : 0.56922, Testing Accuracy : 0.5702

 66%|██████    | 199/300 [2:55:57<1:29:12, 52.99s/it]

Training Loss : 1.2268438439941407, Testing Loss : 1.3754757028579712,
Training Accuracy : 0.55106, Testing Accuracy : 0.535
```

```
 67%|██████▋   | 200/300 [2:56:48<1:27:36, 52.57s/it]

Training Loss : 1.1749664903259278, Testing Loss : 1.229419179534912,
Training Accuracy : 0.56788, Testing Accuracy : 0.5956

 67%|██████▋   | 201/300 [2:57:41<1:27:02, 52.75s/it]

Training Loss : 1.1217604570007325, Testing Loss : 1.2718530670166015,
Training Accuracy : 0.59076, Testing Accuracy : 0.5517

 67%|██████▋   | 202/300 [2:58:36<1:26:55, 53.21s/it]

Training Loss : 1.1127723455810548, Testing Loss : 1.2355080017089843,
Training Accuracy : 0.59168, Testing Accuracy : 0.5795

 68%|██████▊   | 203/300 [2:59:27<1:25:10, 52.69s/it]

Training Loss : 1.1242595986938477, Testing Loss : 1.3205598342895508,
Training Accuracy : 0.59042, Testing Accuracy : 0.5541

 68%|██████▊   | 204/300 [3:00:20<1:24:31, 52.83s/it]

Training Loss : 1.078144577331543, Testing Loss : 1.2889547325134276,
Training Accuracy : 0.60724, Testing Accuracy : 0.553

 68%|██████▊   | 205/300 [3:01:13<1:23:47, 52.92s/it]

Training Loss : 1.049343872833252, Testing Loss : 1.0760360044479371,
Training Accuracy : 0.62038, Testing Accuracy : 0.6225

 69%|██████▊   | 206/300 [3:02:06<1:22:31, 52.67s/it]

Training Loss : 0.9868653161621094, Testing Loss : 1.0833637489318848,
Training Accuracy : 0.63676, Testing Accuracy : 0.6155

 69%|██████▉   | 207/300 [3:03:00<1:22:13, 53.05s/it]

Training Loss : 1.0133086935424804, Testing Loss : 1.1656289377212525,
Training Accuracy : 0.63452, Testing Accuracy : 0.5914

 69%|██████▉   | 208/300 [3:03:52<1:20:56, 52.79s/it]

Training Loss : 1.0169085258483888, Testing Loss : 1.379119439315796,
Training Accuracy : 0.63538, Testing Accuracy : 0.5577

 70%|██████▉   | 209/300 [3:04:44<1:19:57, 52.72s/it]

Training Loss : 1.0066055165100098, Testing Loss : 1.1252214948654176,
Training Accuracy : 0.63776, Testing Accuracy : 0.6049

 70%|███████   | 210/300 [3:05:38<1:19:27, 52.98s/it]

Training Loss : 0.9807969750976563, Testing Loss : 1.11516609954834,
Training Accuracy : 0.64458, Testing Accuracy : 0.6118
```

70%|███████ | 211/300 [3:06:30<1:18:04, 52.63s/it]

Training Loss : 1.005835876159668, Testing Loss : 1.0947864389419555,
Training Accuracy : 0.63594, Testing Accuracy : 0.6155

71%|███████ | 212/300 [3:07:23<1:17:21, 52.75s/it]

Training Loss : 0.9848822974395752, Testing Loss : 1.0449123079299927,
Training Accuracy : 0.65068, Testing Accuracy : 0.644

71%|███████ | 213/300 [3:08:16<1:16:57, 53.07s/it]

Training Loss : 0.9184757372283936, Testing Loss : 1.0841069835662842,
Training Accuracy : 0.67394, Testing Accuracy : 0.6415

71%|███████ | 214/300 [3:09:08<1:15:29, 52.67s/it]

Training Loss : 0.921129239654541, Testing Loss : 0.9815153545379639,
Training Accuracy : 0.67254, Testing Accuracy : 0.6708

72%|███████ | 215/300 [3:10:02<1:15:03, 52.98s/it]

Training Loss : 0.918593310546875, Testing Loss : 1.0959878671646117,
Training Accuracy : 0.66976, Testing Accuracy : 0.616

72%|███████ | 216/300 [3:10:56<1:14:30, 53.22s/it]

Training Loss : 0.9614960417175293, Testing Loss : 1.0362670715332032,
Training Accuracy : 0.66224, Testing Accuracy : 0.6362

72%|███████ | 217/300 [3:11:48<1:13:10, 52.89s/it]

Training Loss : 0.8725708544921875, Testing Loss : 1.0121027819633484,
Training Accuracy : 0.68964, Testing Accuracy : 0.6538

73%|███████ | 218/300 [3:12:41<1:12:25, 52.99s/it]

Training Loss : 0.885347140045166, Testing Loss : 1.173264838027954,
Training Accuracy : 0.68676, Testing Accuracy : 0.6242

73%|███████ | 219/300 [3:13:34<1:11:37, 53.06s/it]

Training Loss : 0.8842647050476075, Testing Loss : 0.9672788162231445,
Training Accuracy : 0.69198, Testing Accuracy : 0.6799

73%|███████ | 220/300 [3:14:27<1:10:25, 52.82s/it]

Training Loss : 0.8715949736022949, Testing Loss : 0.9983500419616699,
Training Accuracy : 0.6954, Testing Accuracy : 0.6602

74%|███████ | 221/300 [3:15:20<1:09:47, 53.00s/it]

Training Loss : 0.8328098532104492, Testing Loss : 0.9254509605407715,
Training Accuracy : 0.70584, Testing Accuracy : 0.6853

```
 74%|███████   | 222/300 [3:16:11<1:08:19, 52.56s/it]

Training Loss : 0.8321045635986328, Testing Loss : 1.07338038482666,
Training Accuracy : 0.709, Testing Accuracy : 0.6501

 74%|███████   | 223/300 [3:17:04<1:07:29, 52.59s/it]

Training Loss : 0.8660191065979004, Testing Loss : 0.9171453945159912,
Training Accuracy : 0.69706, Testing Accuracy : 0.6858

 75%|███████   | 224/300 [3:17:58<1:07:06, 52.99s/it]

Training Loss : 0.7916249053955078, Testing Loss : 0.8421197521209717,
Training Accuracy : 0.7192, Testing Accuracy : 0.7149

 75%|███████   | 225/300 [3:18:50<1:05:41, 52.55s/it]

Training Loss : 0.7659873081970214, Testing Loss : 0.8594306666374206,
Training Accuracy : 0.73236, Testing Accuracy : 0.7076

 75%|███████   | 226/300 [3:19:42<1:04:55, 52.64s/it]

Training Loss : 0.7464247463226318, Testing Loss : 0.8388983050346375,
Training Accuracy : 0.73782, Testing Accuracy : 0.7125

 76%|███████   | 227/300 [3:20:36<1:04:31, 53.04s/it]

Training Loss : 0.7334220007324219, Testing Loss : 0.8623341671943665,
Training Accuracy : 0.74264, Testing Accuracy : 0.716

 76%|███████   | 228/300 [3:21:28<1:03:10, 52.65s/it]

Training Loss : 0.7445675427246093, Testing Loss : 0.9376130151748657,
Training Accuracy : 0.7374, Testing Accuracy : 0.683

 76%|███████   | 229/300 [3:22:21<1:02:24, 52.74s/it]

Training Loss : 0.7314366162872314, Testing Loss : 0.8719662584304809,
Training Accuracy : 0.74432, Testing Accuracy : 0.7144

 77%|███████   | 230/300 [3:23:14<1:01:44, 52.92s/it]

Training Loss : 0.715693731918335, Testing Loss : 0.836197480392456,
Training Accuracy : 0.7505, Testing Accuracy : 0.719

 77%|███████   | 231/300 [3:24:06<1:00:28, 52.58s/it]

Training Loss : 0.7409554978942872, Testing Loss : 0.9459552839279175,
Training Accuracy : 0.74332, Testing Accuracy : 0.6965

 77%|███████   | 232/300 [3:24:59<59:48, 52.78s/it]

Training Loss : 0.7493763338470459, Testing Loss : 0.8735316659927368,
Training Accuracy : 0.73864, Testing Accuracy : 0.7175
```

```
 78%|███████▊  | 233/300 [3:25:52<58:40, 52.55s/it]

Training Loss : 0.7003293373870849, Testing Loss : 0.8755545380592347,
Training Accuracy : 0.75824, Testing Accuracy : 0.713

 78%|███████▊  | 234/300 [3:26:44<57:50, 52.59s/it]

Training Loss : 0.6902390925598144, Testing Loss : 0.8084589288711548,
Training Accuracy : 0.76184, Testing Accuracy : 0.7333

 78%|███████▊  | 235/300 [3:27:38<57:19, 52.91s/it]

Training Loss : 0.7643621651458741, Testing Loss : 0.9444736829757691,
Training Accuracy : 0.7375, Testing Accuracy : 0.7098

 79%|███████▊  | 236/300 [3:28:30<56:04, 52.57s/it]

Training Loss : 0.7080378447723389, Testing Loss : 0.8439880698204041,
Training Accuracy : 0.7549, Testing Accuracy : 0.7354

 79%|███████▉  | 237/300 [3:29:23<55:24, 52.77s/it]

Training Loss : 0.6841421789550781, Testing Loss : 0.8418140319824219,
Training Accuracy : 0.76452, Testing Accuracy : 0.7319

 79%|███████▉  | 238/300 [3:30:16<54:47, 53.03s/it]

Training Loss : 0.7109911837768554, Testing Loss : 0.892961464881897,
Training Accuracy : 0.75684, Testing Accuracy : 0.7097

 80%|███████▉  | 239/300 [3:31:08<53:35, 52.71s/it]

Training Loss : 0.6988387621307373, Testing Loss : 0.8080921714782715,
Training Accuracy : 0.75598, Testing Accuracy : 0.7354

 80%|████████  | 240/300 [3:32:02<52:59, 52.98s/it]

Training Loss : 0.6447921217346192, Testing Loss : 0.7937430612564087,
Training Accuracy : 0.7786, Testing Accuracy : 0.7486

 80%|████████  | 241/300 [3:32:54<51:44, 52.61s/it]

Training Loss : 0.6269122533416748, Testing Loss : 0.8109488893508912,
Training Accuracy : 0.78392, Testing Accuracy : 0.7404

 81%|████████  | 242/300 [3:33:47<50:56, 52.70s/it]

Training Loss : 0.6411709482574462, Testing Loss : 0.8368711193084717,
Training Accuracy : 0.77802, Testing Accuracy : 0.7335

 81%|████████  | 243/300 [3:34:40<50:16, 52.93s/it]

Training Loss : 0.6406319763946533, Testing Loss : 0.7480574983596802,
Training Accuracy : 0.77914, Testing Accuracy : 0.7498
```

```
 81%|████████  | 244/300 [3:35:31<48:55, 52.43s/it]
Training Loss : 0.6284590649414062, Testing Loss : 1.2781966716766358,
Training Accuracy : 0.78274, Testing Accuracy : 0.6435
 82%|████████  | 245/300 [3:36:25<48:17, 52.68s/it]
Training Loss : 0.675755630645752, Testing Loss : 0.7436552267074585,
Training Accuracy : 0.7691, Testing Accuracy : 0.7563
 82%|████████  | 246/300 [3:37:17<47:22, 52.64s/it]
Training Loss : 0.6197524947357178, Testing Loss : 0.8054048567771912,
Training Accuracy : 0.78644, Testing Accuracy : 0.7505
 82%|████████  | 247/300 [3:38:09<46:19, 52.44s/it]
Training Loss : 0.6282375070953369, Testing Loss : 0.7462368461608887,
Training Accuracy : 0.78372, Testing Accuracy : 0.7561
 83%|████████▎ | 248/300 [3:39:03<45:48, 52.86s/it]
Training Loss : 0.6048194251251221, Testing Loss : 0.7072050575256348,
Training Accuracy : 0.79192, Testing Accuracy : 0.7723
 83%|████████▎ | 249/300 [3:39:55<44:42, 52.60s/it]
Training Loss : 0.5716211364746093, Testing Loss : 0.7838101425170898,
Training Accuracy : 0.8005, Testing Accuracy : 0.7475
 83%|████████▎ | 250/300 [3:40:48<43:53, 52.67s/it]
Training Loss : 0.6362503606414794, Testing Loss : 0.8130260587692261,
Training Accuracy : 0.77872, Testing Accuracy : 0.7471
 84%|████████▎ | 251/300 [3:41:42<43:17, 53.01s/it]
Training Loss : 0.6076416198730469, Testing Loss : 0.7173876196861267,
Training Accuracy : 0.79192, Testing Accuracy : 0.771
 84%|████████▍ | 252/300 [3:42:34<42:13, 52.78s/it]
Training Loss : 0.5627188925933838, Testing Loss : 0.726141916179657,
Training Accuracy : 0.80676, Testing Accuracy : 0.7674
 84%|████████▍ | 253/300 [3:43:27<41:29, 52.96s/it]
Training Loss : 0.5892228105926514, Testing Loss : 0.8112735116958618,
Training Accuracy : 0.79642, Testing Accuracy : 0.7343
 85%|████████▍ | 254/300 [3:44:22<40:59, 53.47s/it]
Training Loss : 0.6460251658630372, Testing Loss : 0.8171537851333618,
Training Accuracy : 0.7763, Testing Accuracy : 0.7427
```

85%|████████▌ | 255/300 [3:45:14<39:48, 53.07s/it]

Training Loss : 0.5880776802062988, Testing Loss : 0.8354629841804504,
Training Accuracy : 0.7998, Testing Accuracy : 0.7463

85%|████████▌ | 256/300 [3:46:07<38:55, 53.07s/it]

Training Loss : 0.5834638314819336, Testing Loss : 0.7956326522827148,
Training Accuracy : 0.80016, Testing Accuracy : 0.7514

86%|████████▌ | 257/300 [3:47:01<38:16, 53.42s/it]

Training Loss : 0.5936464789581298, Testing Loss : 0.73969689245224,
Training Accuracy : 0.79606, Testing Accuracy : 0.7604

86%|████████▌ | 258/300 [3:47:53<37:05, 52.98s/it]

Training Loss : 0.5556702813720703, Testing Loss : 0.7185726222991944,
Training Accuracy : 0.80948, Testing Accuracy : 0.7732

86%|████████▋ | 259/300 [3:48:47<36:19, 53.15s/it]

Training Loss : 0.5340542210388184, Testing Loss : 0.6999383148193359,
Training Accuracy : 0.81548, Testing Accuracy : 0.7737

87%|████████▋ | 260/300 [3:49:41<35:37, 53.44s/it]

Training Loss : 0.5395272860717774, Testing Loss : 0.7223019674301148,
Training Accuracy : 0.81438, Testing Accuracy : 0.7688

87%|████████▋ | 261/300 [3:50:33<34:27, 53.02s/it]

Training Loss : 0.5427436051940918, Testing Loss : 0.722327382850647,
Training Accuracy : 0.81328, Testing Accuracy : 0.7677

87%|████████▋ | 262/300 [3:51:27<33:42, 53.23s/it]

Training Loss : 0.5373931032562256, Testing Loss : 0.7479909496307373,
Training Accuracy : 0.81436, Testing Accuracy : 0.7656

88%|████████▊ | 263/300 [3:52:21<33:00, 53.52s/it]

Training Loss : 0.5414316741180419, Testing Loss : 0.7189451560974122,
Training Accuracy : 0.81432, Testing Accuracy : 0.7677

88%|████████▊ | 264/300 [3:53:13<31:48, 53.02s/it]

Training Loss : 0.5249148317718506, Testing Loss : 0.6911698411941528,
Training Accuracy : 0.81938, Testing Accuracy : 0.7814

88%|████████▊ | 265/300 [3:54:07<31:04, 53.27s/it]

Training Loss : 0.509096545791626, Testing Loss : 0.679082656288147,
Training Accuracy : 0.82288, Testing Accuracy : 0.7832

89%|█████████ | 266/300 [3:55:00<30:13, 53.35s/it]

Training Loss : 0.512907402420044, Testing Loss : 0.7139552173614502, Training Accuracy : 0.823, Testing Accuracy : 0.7719

89%|█████████ | 267/300 [3:55:52<29:06, 52.93s/it]

Training Loss : 0.507461595916748, Testing Loss : 0.6902331727981568, Training Accuracy : 0.82546, Testing Accuracy : 0.7762

89%|█████████ | 268/300 [3:56:46<28:24, 53.26s/it]

Training Loss : 0.4961461491394043, Testing Loss : 0.6856316641807556, Training Accuracy : 0.82766, Testing Accuracy : 0.7802

90%|█████████ | 269/300 [3:57:39<27:26, 53.11s/it]

Training Loss : 0.49276156562805173, Testing Loss : 0.7001897045135498, Training Accuracy : 0.83156, Testing Accuracy : 0.7727

90%|█████████ | 270/300 [3:58:32<26:28, 52.96s/it]

Training Loss : 0.5224834211730957, Testing Loss : 0.8142344897270203, Training Accuracy : 0.82016, Testing Accuracy : 0.7579

90%|█████████ | 271/300 [3:59:25<25:44, 53.25s/it]

Training Loss : 0.5234785762786865, Testing Loss : 0.7144458909988404, Training Accuracy : 0.81906, Testing Accuracy : 0.7777

91%|█████████ | 272/300 [4:00:18<24:41, 52.92s/it]

Training Loss : 0.4886622774887085, Testing Loss : 0.6939555732727051, Training Accuracy : 0.83104, Testing Accuracy : 0.7806

91%|█████████ | 273/300 [4:01:11<23:51, 53.00s/it]

Training Loss : 0.4881930886077881, Testing Loss : 0.717026086807251, Training Accuracy : 0.83042, Testing Accuracy : 0.7767

91%|█████████▏| 274/300 [4:02:05<23:07, 53.36s/it]

Training Loss : 0.49975499183654787, Testing Loss : 0.6910398155212403, Training Accuracy : 0.82628, Testing Accuracy : 0.7813

92%|█████████▏| 275/300 [4:02:57<22:04, 52.98s/it]

Training Loss : 0.4790651873779297, Testing Loss : 0.6842188158988952, Training Accuracy : 0.835, Testing Accuracy : 0.7855

92%|█████████▏| 276/300 [4:03:51<21:15, 53.15s/it]

Training Loss : 0.48807950759887697, Testing Loss : 0.6733012622833252, Training Accuracy : 0.8304, Testing Accuracy : 0.7822

92%|█████████▏| 277/300 [4:04:45<20:27, 53.36s/it]

Training Loss : 0.4687655955886841, Testing Loss : 0.6571073780059814, Training Accuracy : 0.83648, Testing Accuracy : 0.7913

93%|█████████▎| 278/300 [4:05:37<19:25, 52.98s/it]

Training Loss : 0.4791935718536377, Testing Loss : 0.7118313640594482, Training Accuracy : 0.83604, Testing Accuracy : 0.7735

93%|█████████▎| 279/300 [4:06:30<18:38, 53.24s/it]

Training Loss : 0.46900507614135745, Testing Loss : 0.6678565013885498, Training Accuracy : 0.8373, Testing Accuracy : 0.7891

93%|█████████▎| 280/300 [4:07:24<17:46, 53.32s/it]

Training Loss : 0.46905773818969726, Testing Loss : 0.6719943502426148, Training Accuracy : 0.83758, Testing Accuracy : 0.7859

94%|█████████▎| 281/300 [4:08:16<16:47, 53.01s/it]

Training Loss : 0.4872045645904541, Testing Loss : 0.7086956113815308, Training Accuracy : 0.83244, Testing Accuracy : 0.7828

94%|█████████▍| 282/300 [4:09:10<15:58, 53.25s/it]

Training Loss : 0.4655338469314575, Testing Loss : 0.6336996326446533, Training Accuracy : 0.84052, Testing Accuracy : 0.797

94%|█████████▍| 283/300 [4:10:02<14:58, 52.86s/it]

Training Loss : 0.4490078141403198, Testing Loss : 0.6672515773773193, Training Accuracy : 0.84478, Testing Accuracy : 0.7934

95%|█████████▍| 284/300 [4:10:55<14:08, 53.04s/it]

Training Loss : 0.4493193613433838, Testing Loss : 0.6899222204208374, Training Accuracy : 0.84346, Testing Accuracy : 0.7878

95%|█████████▌| 285/300 [4:11:50<13:20, 53.36s/it]

Training Loss : 0.4481172345733643, Testing Loss : 0.7004397100448608, Training Accuracy : 0.84466, Testing Accuracy : 0.7837

95%|█████████▌| 286/300 [4:12:42<12:25, 53.22s/it]

Training Loss : 0.4412669822692871, Testing Loss : 0.6950112329483032, Training Accuracy : 0.847, Testing Accuracy : 0.7859

96%|█████████▌| 287/300 [4:13:36<11:32, 53.28s/it]

Training Loss : 0.44182533485412595, Testing Loss : 0.6620802074432373, Training Accuracy : 0.84606, Testing Accuracy : 0.7917

96%|█████████▌| 288/300 [4:14:30<10:42, 53.57s/it]

Training Loss : 0.44302254123687745, Testing Loss : 0.6649443256378174, Training Accuracy : 0.84834, Testing Accuracy : 0.7892

96%|█████████▋| 289/300 [4:15:22<09:44, 53.16s/it]

Training Loss : 0.44709153633117676, Testing Loss : 0.6920609186172485, Training Accuracy : 0.84716, Testing Accuracy : 0.788

97%|█████████▋| 290/300 [4:16:16<08:53, 53.31s/it]

Training Loss : 0.4294123766708374, Testing Loss : 0.6793937213897705, Training Accuracy : 0.85296, Testing Accuracy : 0.788

97%|█████████▋| 291/300 [4:17:10<08:01, 53.52s/it]

Training Loss : 0.4455366027069092, Testing Loss : 0.6474038682937622, Training Accuracy : 0.84558, Testing Accuracy : 0.7964

97%|█████████▋| 292/300 [4:18:02<07:04, 53.05s/it]

Training Loss : 0.4376537713241577, Testing Loss : 0.7123472690582275, Training Accuracy : 0.84852, Testing Accuracy : 0.7858

98%|█████████▊| 293/300 [4:18:56<06:12, 53.24s/it]

Training Loss : 0.42777966842651366, Testing Loss : 0.6145997501373291, Training Accuracy : 0.85174, Testing Accuracy : 0.8046

98%|█████████▊| 294/300 [4:19:50<05:20, 53.50s/it]

Training Loss : 0.41267605731964113, Testing Loss : 0.6566328161239624, Training Accuracy : 0.85844, Testing Accuracy : 0.7964

98%|█████████▊| 295/300 [4:20:42<04:25, 53.10s/it]

Training Loss : 0.42745529987335207, Testing Loss : 0.6349260887145997, Training Accuracy : 0.85254, Testing Accuracy : 0.7962

99%|█████████▊| 296/300 [4:21:36<03:33, 53.34s/it]

```
Training Loss : 0.44039548069000245, Testing Loss :
0.6811065022468566, Training Accuracy : 0.84874, Testing Accuracy :
0.7923
```

```
 99%|██████████| 297/300 [4:22:30<02:40, 53.49s/it]
```

```
Training Loss : 0.44409001247406005, Testing Loss :
0.6868772138595581, Training Accuracy : 0.84662, Testing Accuracy :
0.784
```

```
 99%|██████████| 298/300 [4:23:22<01:46, 53.23s/it]
```

```
Training Loss : 0.4343120652008057, Testing Loss : 0.6861574124336243,
Training Accuracy : 0.84996, Testing Accuracy : 0.7888
```

```
100%|██████████| 299/300 [4:24:16<00:53, 53.45s/it]
```

```
Training Loss : 0.4389499523162842, Testing Loss : 0.7243591913223266,
Training Accuracy : 0.8491, Testing Accuracy : 0.7813
```

```
100%|██████████| 300/300 [4:25:10<00:00, 53.03s/it]
```

```
Training Loss : 0.448305532913208, Testing Loss : 0.702930590724945,
Training Accuracy : 0.84804, Testing Accuracy : 0.7902
```

```
torch.save({
            'epoch': i,
            'model_state_dict': model.state_dict(),
            'optimizer_state_dict': optimizer.state_dict(),
            'train_accuracy': train_accuracy,
            'test_accuracy': test_accuracy,
            }, '/content/gdrive/MyDrive/final_model2.pt')
```

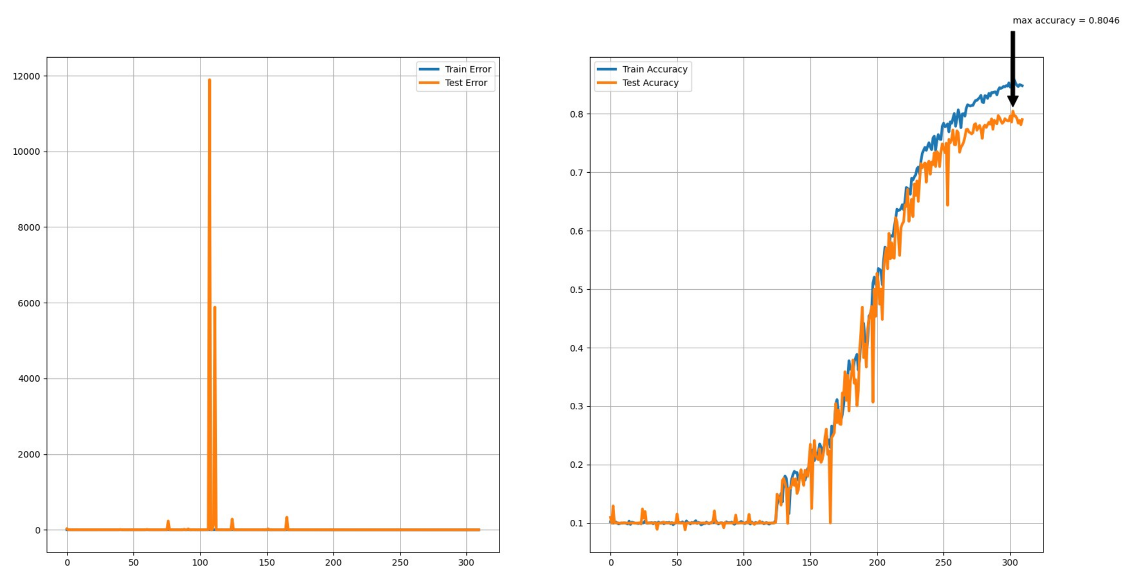
```
print("Max Testing Accuracy: %s"%(max(test_accuracy)))
xmax = np.argmax(test_accuracy)
ymax = max(test_accuracy)
```

```
Max Testing Accuracy: 0.8046
```

Plotting the graph for train loss vs test loss and also for train accuracy vs test accuracy.

```
# Create a figure object with two subplots, with a size of 20 by 10.
f, (fig1, fig2) = plt.subplots(1, 2, figsize=(20, 10))

# Set the number of data points in the training data to n.
n = len(train_loss)

# Plot the training loss and testing loss against the number of epochs
on the first subplot.
fig1.plot(range(n), train_loss, '-', linewidth='3', label='Train
Error')
```

```python
fig1.plot(range(n), test_loss, '-', linewidth='3', label='Test Error')

# Plot the training accuracy and testing accuracy against the number of epochs on the second subplot.
fig2.plot(range(n), train_accuracy, '-', linewidth='3', label='Train Accuracy')
fig2.plot(range(n), test_accuracy, '-', linewidth='3', label='Test Acuracy')

# Annotate the maximum accuracy achieved with an arrow on the second subplot.
fig2.annotate('max accuracy = %s'%(ymax), xy=(xmax, ymax), xytext=(xmax, ymax+0.15), arrowprops=dict(facecolor='black', shrink=0.05))

# Turn on the grid lines for both subplots.
fig1.grid(True)
fig2.grid(True)

# Add legends to both subplots.
fig1.legend()
fig2.legend()

# Save the figure to a file named "trainTestCurve.png".
f.savefig("./trainTestCurve.png")
```




```python
torch.save(model.state_dict(), '/content/model2.pt')
```