

```

from torchvision import datasets, transforms
from sklearn.model_selection import train_test_split
test_data= datasets.MNIST(
    root='/archive',
    train= True,
    download=True,
    transform=transforms.Compose([
        transforms.ToTensor(),
        transforms.Normalize((0.1307,), (0.3081,))])
)
train_data= datasets.MNIST(
    root='/archive',
    train= True,
    download=False,
    transform=transforms.Compose([
        transforms.ToTensor(),
        transforms.Normalize((0.1307,), (0.3081,))])
)
train_set, val_set = train_test_split(train_data, test_size=0.2,
    random_state=42, stratify=train_data.targets)

from torch.utils.data import DataLoader
# Create DataLoader for train data and validation data
train_loader = DataLoader(train_set, batch_size=64, shuffle=True)
val_loader = DataLoader(val_set, batch_size=64, shuffle=False)
# Create DataLoader for test data
test_loader = DataLoader(test_data, batch_size=64, shuffle=False)
import torch.nn as nn
import torch.nn.functional as F
import torch.optim as optim
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
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt

# Different batch sizes and learning rates to try
batch_sizes = [32, 64, 128, 256, 512]
learning_rates = [0.1, 0.01, 0.001, 0.0001, 0.00001]
num_epochs = 10

# Loop over learning rates
for lr in learning_rates:
    print(f'\nLearning Rate: {lr}')

    # Loop over batch sizes

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for batch_size in batch_sizes:
    print(f'\tBatch Size: {batch_size}')

    # DataLoader for efficient loading with the current batch size
    train_loader = DataLoader(train_set, batch_size=batch_size,
shuffle=True)
    val_loader = DataLoader(val_set, batch_size=batch_size,
shuffle=False)

    # Neural Network architecture with dropout and layer
normalization
    class NeuralNetwork(nn.Module):
        def forward(self, x):
            x = x.view(-1, 28 * 28)
            x = self.relu(self.fc1(x))

            x = self.dropout1(x) # Apply dropout
            x = self.relu(self.fc2(x))

            x = self.relu(self.fc3(x))
            x = self.fc4(x)
            return x

        def __init__(self):
            super(NeuralNetwork, self).__init__()
            self.fc1 = nn.Linear(28 * 28, 256)

            self.relu = nn.ReLU()
            self.dropout1 = nn.Dropout(0.2) # Dropout with a dropout
probability of 0.2
            self.fc2 = nn.Linear(256, 128)

            self.fc3 = nn.Linear(128, 64)
            self.fc4 = nn.Linear(64, 10)

    # Initialize the model with dropout and layer normalization
    model = NeuralNetwork()

    # Train the model
    optimizer = optim.SGD(model.parameters(), lr=lr)
    criterion = nn.CrossEntropyLoss()
    train_losses, val_losses, train_acc, val_acc = [], [], [], []

    for epoch in range(num_epochs):
        model.train()
        total_train_loss = 0.0
        correct_train = 0

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        for images, labels in train_loader:
            optimizer.zero_grad()
            outputs = model(images.view(images.shape[0], -1))
            loss = criterion(outputs, labels)
            loss.backward()
            optimizer.step()

            total_train_loss += loss.item()
            _, predicted = torch.max(outputs.data, 1)
            correct_train += (predicted == labels).sum().item()

    avg_train_loss = total_train_loss /
len(train_loader.dataset)
    train_accuracy = correct_train / len(train_loader.dataset)

    train_losses.append(avg_train_loss)
    train_acc.append(train_accuracy)

    # Validation
    model.eval()
    total_val_loss = 0.0
    correct_val = 0

    with torch.no_grad():
        for images, labels in val_loader:
            outputs = model(images.view(images.shape[0], -1))
            loss = criterion(outputs, labels)
            total_val_loss += loss.item()
            _, predicted = torch.max(outputs.data, 1)
            correct_val += (predicted == labels).sum().item()

    avg_val_loss = total_val_loss / len(val_loader.dataset)
    val_accuracy = correct_val / len(val_loader.dataset)

    val_losses.append(avg_val_loss)
    val_acc.append(val_accuracy)

    print(f'Epoch [{epoch + 1}/{num_epochs}], '
          f'Training Loss: {avg_train_loss:.4f}, Training
Accuracy: {train_accuracy:.4f}, '
          f'Validation Loss: {avg_val_loss:.4f}, Validation
Accuracy: {val_accuracy:.4f}')

    # Plotting
    plt.figure(figsize=(10, 5))
    plt.subplot(1, 2, 1)
    plt.plot(train_losses, label='Training Loss')
    plt.plot(val_losses, label='Validation Loss')
    plt.legend()
    plt.title(f'Training and Validation Loss (LR: {lr}, Batch

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Size: {batch_size}'))

    plt.subplot(1, 2, 2)
    plt.plot(train_acc, label='Training Accuracy')
    plt.plot(val_acc, label='Validation Accuracy')
    plt.legend()
    plt.title(f'Training and Validation Accuracy (LR: {lr}, Batch
Size: {batch_size}'))

plt.show()

# Report final accuracy
print(f'\tFinal Training Accuracy: {train_acc[-1]:.4f}')
print(f'\tFinal Validation Accuracy: {val_acc[-1]:.4f}')

# Model evaluation
model.eval()
with torch.no_grad():
    for images, labels in val_loader:
        outputs = model(images.view(images.shape[0], -1))
        _, predicted = torch.max(outputs, 1)

        # Display the images and predictions
        plt.figure(figsize=(15, 5))
        for i in range(min(5, len(images))):
            plt.subplot(1, 5, i + 1)
            plt.imshow(images[i][0], cmap='gray')
            plt.title(f'Predicted: {predicted[i]}, Actual:
{labels[i]}')
            plt.axis('off')
        plt.show()

```

Downloading <http://yann.lecun.com/exdb/mnist/train-images-idx3-ubyte.gz>

Downloading <http://yann.lecun.com/exdb/mnist/train-images-idx3-ubyte.gz> to /archive/MNIST/raw/train-images-idx3-ubyte.gz

100%|██████████| 9912422/9912422 [00:00<00:00, 113873300.13it/s]

Extracting /archive/MNIST/raw/train-images-idx3-ubyte.gz to /archive/MNIST/raw

Downloading <http://yann.lecun.com/exdb/mnist/train-labels-idx1-ubyte.gz>

Downloading <http://yann.lecun.com/exdb/mnist/train-labels-idx1-ubyte.gz> to /archive/MNIST/raw/train-labels-idx1-ubyte.gz

100%|██████████| 28881/28881 [00:00<00:00, 32668741.59it/s]

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Downloading <http://yann.lecun.com/exdb/mnist/t10k-images-idx3-ubyte.gz>
to /archive/MNIST/raw/t10k-images-idx3-ubyte.gz

100%|██████████| 1648877/1648877 [00:00<00:00, 50252438.88it/s]

Extracting /archive/MNIST/raw/t10k-images-idx3-ubyte.gz to
/archive/MNIST/raw

Downloading <http://yann.lecun.com/exdb/mnist/t10k-labels-idx1-ubyte.gz>
Downloading <http://yann.lecun.com/exdb/mnist/t10k-labels-idx1-ubyte.gz>
to /archive/MNIST/raw/t10k-labels-idx1-ubyte.gz

100%|██████████| 4542/4542 [00:00<00:00, 11795993.05it/s]

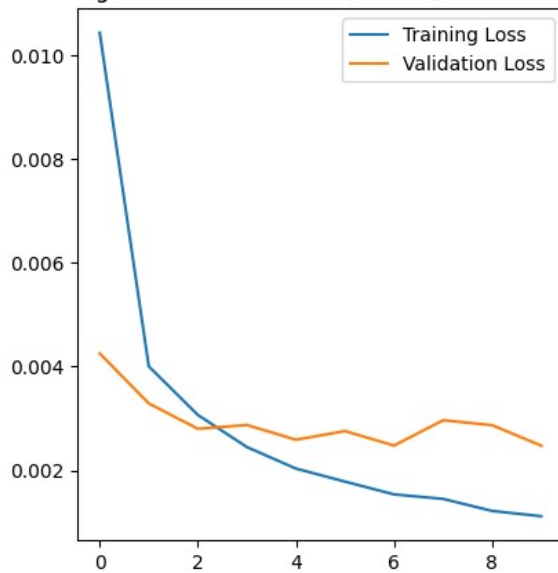
Extracting /archive/MNIST/raw/t10k-labels-idx1-ubyte.gz to
/archive/MNIST/raw

Learning Rate: 0.1

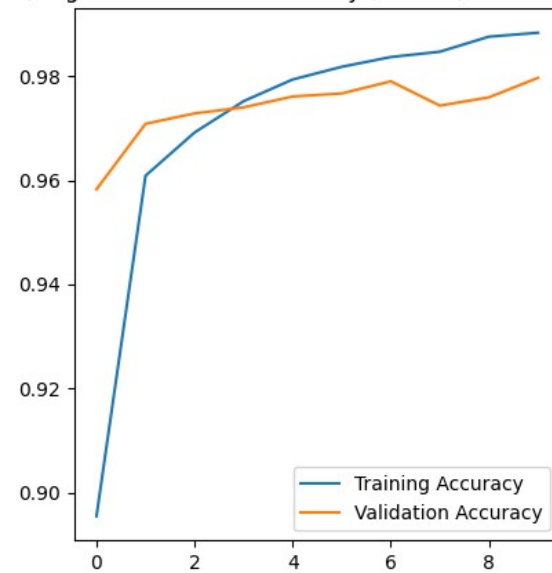
Batch Size: 32

Epoch [1/10], Training Loss: 0.0104, Training Accuracy: 0.8954,
Validation Loss: 0.0043, Validation Accuracy: 0.9583
Epoch [2/10], Training Loss: 0.0040, Training Accuracy: 0.9609,
Validation Loss: 0.0033, Validation Accuracy: 0.9708
Epoch [3/10], Training Loss: 0.0031, Training Accuracy: 0.9692,
Validation Loss: 0.0028, Validation Accuracy: 0.9728
Epoch [4/10], Training Loss: 0.0024, Training Accuracy: 0.9752,
Validation Loss: 0.0029, Validation Accuracy: 0.9740
Epoch [5/10], Training Loss: 0.0020, Training Accuracy: 0.9794,
Validation Loss: 0.0026, Validation Accuracy: 0.9761
Epoch [6/10], Training Loss: 0.0018, Training Accuracy: 0.9818,
Validation Loss: 0.0028, Validation Accuracy: 0.9767
Epoch [7/10], Training Loss: 0.0015, Training Accuracy: 0.9837,
Validation Loss: 0.0025, Validation Accuracy: 0.9790
Epoch [8/10], Training Loss: 0.0014, Training Accuracy: 0.9847,
Validation Loss: 0.0030, Validation Accuracy: 0.9743
Epoch [9/10], Training Loss: 0.0012, Training Accuracy: 0.9876,
Validation Loss: 0.0029, Validation Accuracy: 0.9759
Epoch [10/10], Training Loss: 0.0011, Training Accuracy: 0.9883,
Validation Loss: 0.0025, Validation Accuracy: 0.9797

Training and Validation Loss (LR: 0.1, Batch Size: 32)



Training and Validation Accuracy (LR: 0.1, Batch Size: 32)



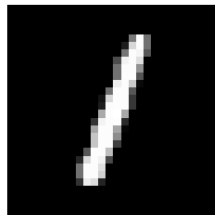
Final Training Accuracy: 0.9883

Final Validation Accuracy: 0.9797

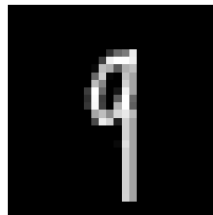
Predicted: 4, Actual: 4



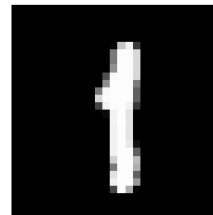
Predicted: 1, Actual: 1



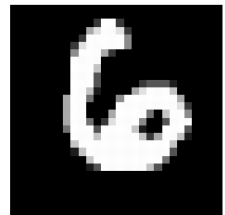
Predicted: 9, Actual: 9



Predicted: 1, Actual: 1



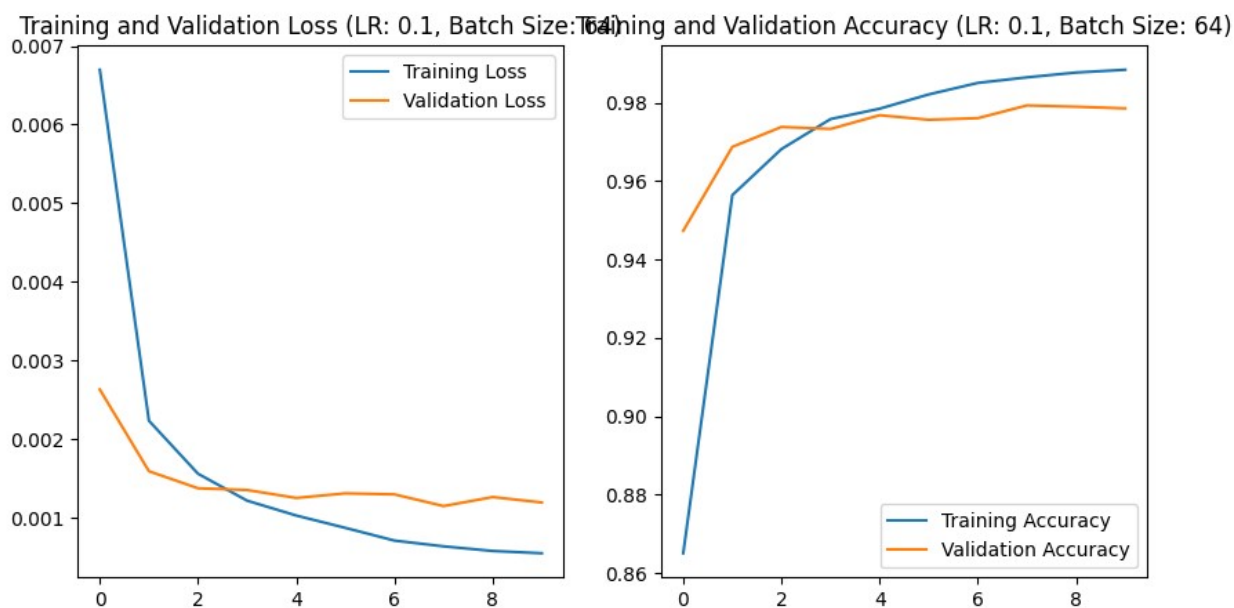
Predicted: 6, Actual: 6



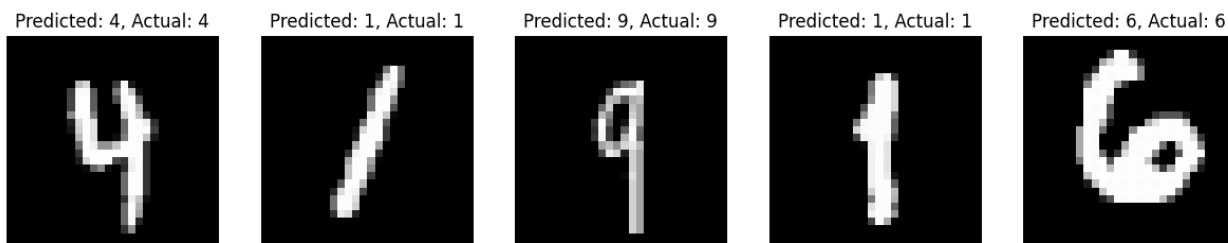
Batch Size: 64

Epoch [1/10], Training Loss: 0.0067, Training Accuracy: 0.8650, Validation Loss: 0.0026, Validation Accuracy: 0.9473
 Epoch [2/10], Training Loss: 0.0022, Training Accuracy: 0.9564, Validation Loss: 0.0016, Validation Accuracy: 0.9688
 Epoch [3/10], Training Loss: 0.0016, Training Accuracy: 0.9682, Validation Loss: 0.0014, Validation Accuracy: 0.9738
 Epoch [4/10], Training Loss: 0.0012, Training Accuracy: 0.9759, Validation Loss: 0.0014, Validation Accuracy: 0.9733
 Epoch [5/10], Training Loss: 0.0010, Training Accuracy: 0.9785, Validation Loss: 0.0013, Validation Accuracy: 0.9768
 Epoch [6/10], Training Loss: 0.0009, Training Accuracy: 0.9821, Validation Loss: 0.0013, Validation Accuracy: 0.9757
 Epoch [7/10], Training Loss: 0.0007, Training Accuracy: 0.9851, Validation Loss: 0.0013, Validation Accuracy: 0.9761
 Epoch [8/10], Training Loss: 0.0006, Training Accuracy: 0.9865, Validation Loss: 0.0012, Validation Accuracy: 0.9793
 Epoch [9/10], Training Loss: 0.0006, Training Accuracy: 0.9877, Validation Loss: 0.0013, Validation Accuracy: 0.9790

Epoch [10/10], Training Loss: 0.0006, Training Accuracy: 0.9884,
Validation Loss: 0.0012, Validation Accuracy: 0.9786



Final Training Accuracy: 0.9884
Final Validation Accuracy: 0.9786



Batch Size: 128

Epoch [1/10], Training Loss: 0.0046, Training Accuracy: 0.8179,
Validation Loss: 0.0017, Validation Accuracy: 0.9337

Epoch [2/10], Training Loss: 0.0015, Training Accuracy: 0.9425,
Validation Loss: 0.0011, Validation Accuracy: 0.9590

Epoch [3/10], Training Loss: 0.0010, Training Accuracy: 0.9604,
Validation Loss: 0.0009, Validation Accuracy: 0.9658

Epoch [4/10], Training Loss: 0.0008, Training Accuracy: 0.9689,
Validation Loss: 0.0008, Validation Accuracy: 0.9712

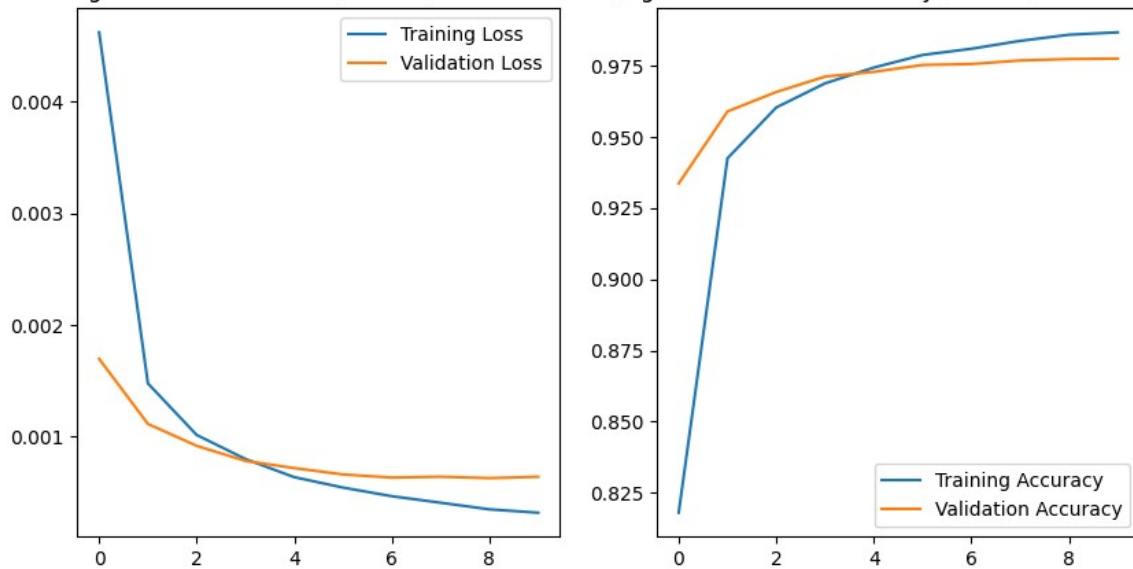
Epoch [5/10], Training Loss: 0.0006, Training Accuracy: 0.9744,
Validation Loss: 0.0007, Validation Accuracy: 0.9729

Epoch [6/10], Training Loss: 0.0005, Training Accuracy: 0.9789,
Validation Loss: 0.0007, Validation Accuracy: 0.9753

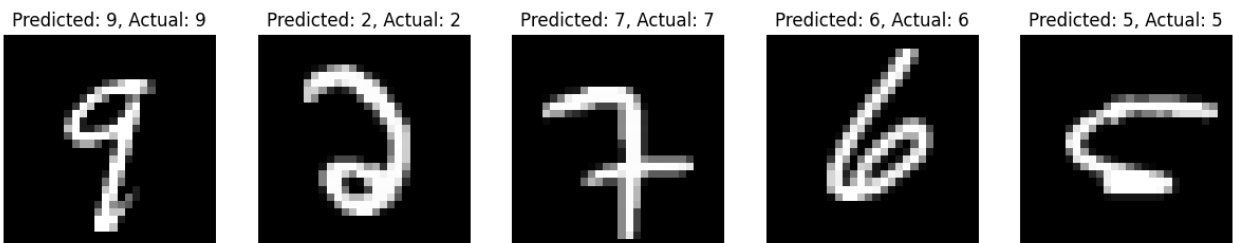
Epoch [7/10], Training Loss: 0.0005, Training Accuracy: 0.9810,
Validation Loss: 0.0006, Validation Accuracy: 0.9757

Epoch [8/10], Training Loss: 0.0004, Training Accuracy: 0.9838,
 Validation Loss: 0.0006, Validation Accuracy: 0.9769
 Epoch [9/10], Training Loss: 0.0003, Training Accuracy: 0.9860,
 Validation Loss: 0.0006, Validation Accuracy: 0.9774
 Epoch [10/10], Training Loss: 0.0003, Training Accuracy: 0.9868,
 Validation Loss: 0.0006, Validation Accuracy: 0.9776

Training and Validation Loss (LR: 0.1, Batch Size: 128) Training and Validation Accuracy (LR: 0.1, Batch Size: 128)



Final Training Accuracy: 0.9868
 Final Validation Accuracy: 0.9776

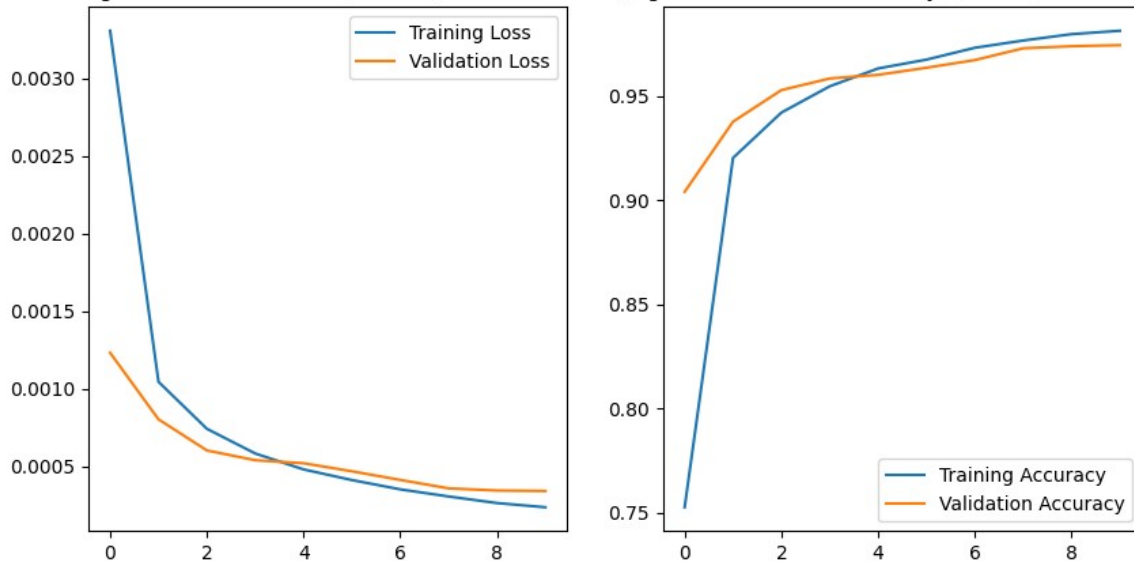


Batch Size: 256

Epoch [1/10], Training Loss: 0.0033, Training Accuracy: 0.7525,
 Validation Loss: 0.0012, Validation Accuracy: 0.9040
 Epoch [2/10], Training Loss: 0.0010, Training Accuracy: 0.9203,
 Validation Loss: 0.0008, Validation Accuracy: 0.9377
 Epoch [3/10], Training Loss: 0.0007, Training Accuracy: 0.9420,
 Validation Loss: 0.0006, Validation Accuracy: 0.9528
 Epoch [4/10], Training Loss: 0.0006, Training Accuracy: 0.9547,
 Validation Loss: 0.0005, Validation Accuracy: 0.9584
 Epoch [5/10], Training Loss: 0.0005, Training Accuracy: 0.9632,
 Validation Loss: 0.0005, Validation Accuracy: 0.9602

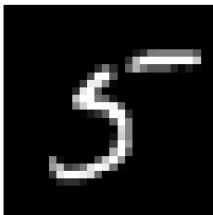
Epoch [6/10], Training Loss: 0.0004, Training Accuracy: 0.9675,
 Validation Loss: 0.0005, Validation Accuracy: 0.9636
 Epoch [7/10], Training Loss: 0.0004, Training Accuracy: 0.9732,
 Validation Loss: 0.0004, Validation Accuracy: 0.9673
 Epoch [8/10], Training Loss: 0.0003, Training Accuracy: 0.9766,
 Validation Loss: 0.0004, Validation Accuracy: 0.9729
 Epoch [9/10], Training Loss: 0.0003, Training Accuracy: 0.9797,
 Validation Loss: 0.0003, Validation Accuracy: 0.9739
 Epoch [10/10], Training Loss: 0.0002, Training Accuracy: 0.9813,
 Validation Loss: 0.0003, Validation Accuracy: 0.9744

Training and Validation Loss (LR: 0.1, Batch Size: 256) Training and Validation Accuracy (LR: 0.1, Batch Size: 256)

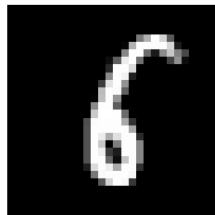


Final Training Accuracy: 0.9813
 Final Validation Accuracy: 0.9744

Predicted: 5, Actual: 5



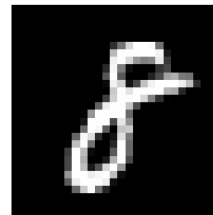
Predicted: 6, Actual: 6



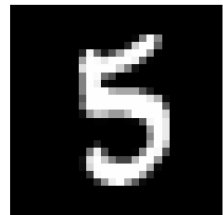
Predicted: 3, Actual: 3



Predicted: 8, Actual: 8



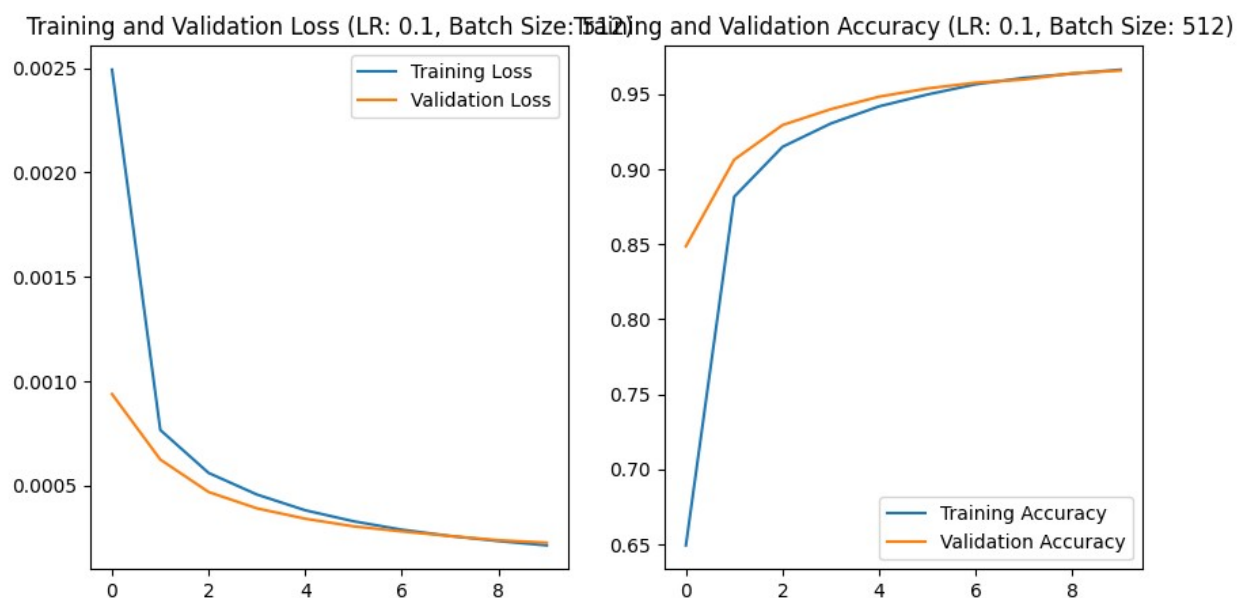
Predicted: 5, Actual: 5



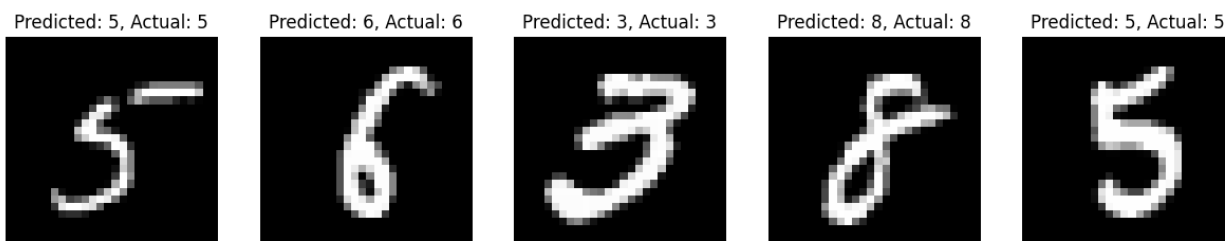
Batch Size: 512

Epoch [1/10], Training Loss: 0.0025, Training Accuracy: 0.6493,
 Validation Loss: 0.0009, Validation Accuracy: 0.8487
 Epoch [2/10], Training Loss: 0.0008, Training Accuracy: 0.8817,
 Validation Loss: 0.0006, Validation Accuracy: 0.9064
 Epoch [3/10], Training Loss: 0.0006, Training Accuracy: 0.9150,
 Validation Loss: 0.0005, Validation Accuracy: 0.9295

Epoch [4/10], Training Loss: 0.0005, Training Accuracy: 0.9305,
Validation Loss: 0.0004, Validation Accuracy: 0.9401
Epoch [5/10], Training Loss: 0.0004, Training Accuracy: 0.9420,
Validation Loss: 0.0003, Validation Accuracy: 0.9484
Epoch [6/10], Training Loss: 0.0003, Training Accuracy: 0.9499,
Validation Loss: 0.0003, Validation Accuracy: 0.9539
Epoch [7/10], Training Loss: 0.0003, Training Accuracy: 0.9567,
Validation Loss: 0.0003, Validation Accuracy: 0.9577
Epoch [8/10], Training Loss: 0.0003, Training Accuracy: 0.9610,
Validation Loss: 0.0003, Validation Accuracy: 0.9598
Epoch [9/10], Training Loss: 0.0002, Training Accuracy: 0.9637,
Validation Loss: 0.0002, Validation Accuracy: 0.9640
Epoch [10/10], Training Loss: 0.0002, Training Accuracy: 0.9664,
Validation Loss: 0.0002, Validation Accuracy: 0.9658



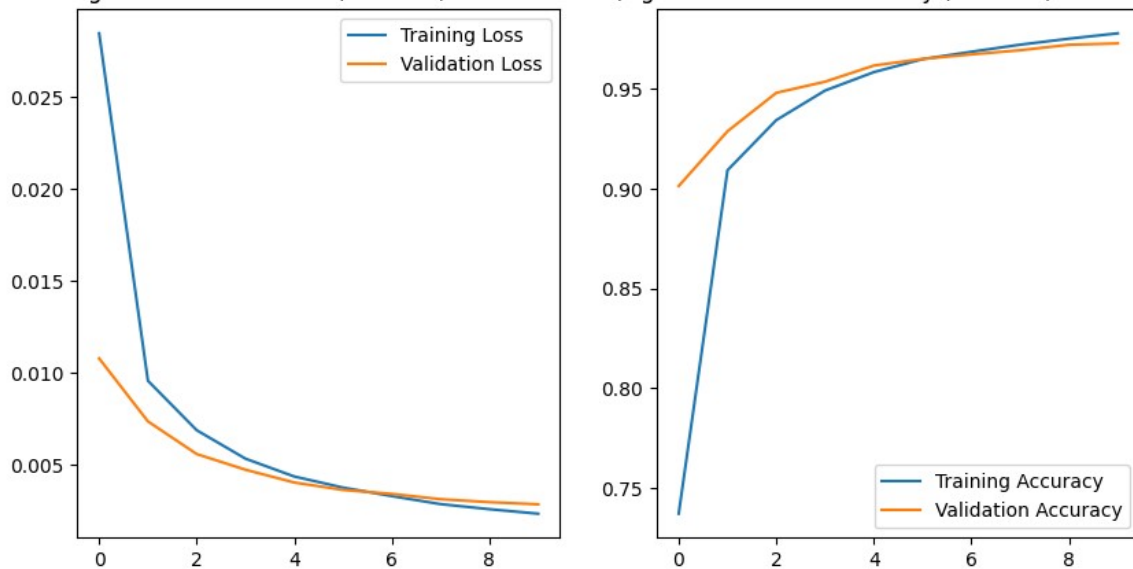
Final Training Accuracy: 0.9664
Final Validation Accuracy: 0.9658



Learning Rate: 0.01
Batch Size: 32

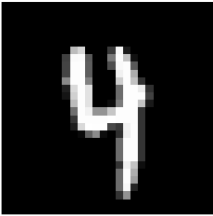
Epoch [1/10], Training Loss: 0.0284, Training Accuracy: 0.7372, Validation Loss: 0.0108, Validation Accuracy: 0.9013
 Epoch [2/10], Training Loss: 0.0096, Training Accuracy: 0.9092, Validation Loss: 0.0073, Validation Accuracy: 0.9287
 Epoch [3/10], Training Loss: 0.0069, Training Accuracy: 0.9343, Validation Loss: 0.0056, Validation Accuracy: 0.9480
 Epoch [4/10], Training Loss: 0.0053, Training Accuracy: 0.9491, Validation Loss: 0.0047, Validation Accuracy: 0.9536
 Epoch [5/10], Training Loss: 0.0044, Training Accuracy: 0.9584, Validation Loss: 0.0040, Validation Accuracy: 0.9617
 Epoch [6/10], Training Loss: 0.0037, Training Accuracy: 0.9649, Validation Loss: 0.0036, Validation Accuracy: 0.9650
 Epoch [7/10], Training Loss: 0.0033, Training Accuracy: 0.9686, Validation Loss: 0.0034, Validation Accuracy: 0.9673
 Epoch [8/10], Training Loss: 0.0029, Training Accuracy: 0.9721, Validation Loss: 0.0031, Validation Accuracy: 0.9693
 Epoch [9/10], Training Loss: 0.0026, Training Accuracy: 0.9751, Validation Loss: 0.0030, Validation Accuracy: 0.9721
 Epoch [10/10], Training Loss: 0.0023, Training Accuracy: 0.9778, Validation Loss: 0.0028, Validation Accuracy: 0.9728

Training and Validation Loss (LR: 0.01, Batch Size: 32) Training and Validation Accuracy (LR: 0.01, Batch Size: 32)

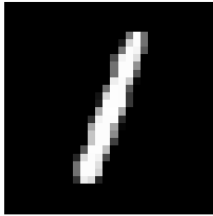


Final Training Accuracy: 0.9778
 Final Validation Accuracy: 0.9728

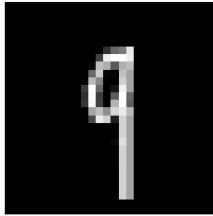
Predicted: 4, Actual: 4



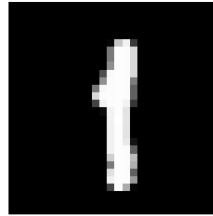
Predicted: 1, Actual: 1



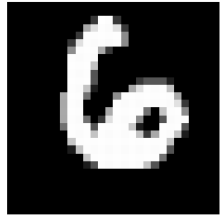
Predicted: 9, Actual: 9



Predicted: 1, Actual: 1



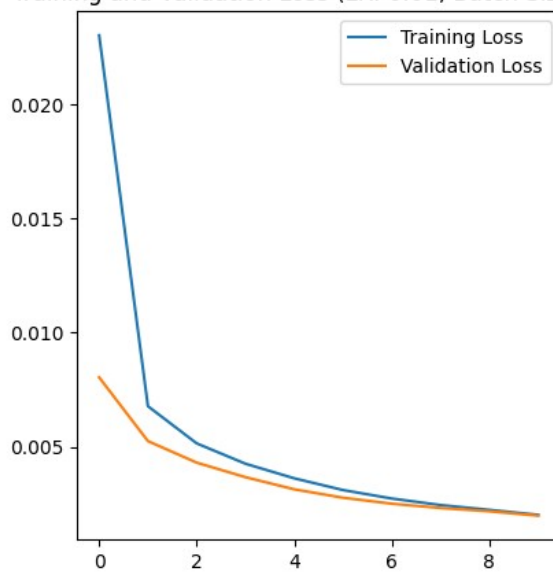
Predicted: 6, Actual: 6



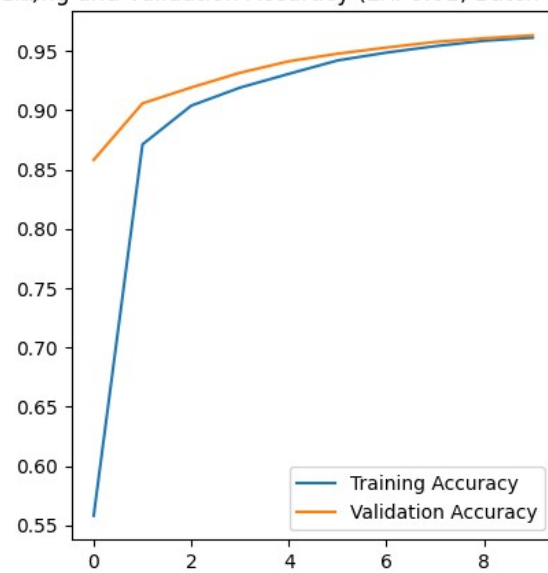
Batch Size: 64

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Epoch [1/10], Training Loss: 0.0230, Training Accuracy: 0.5580,  
Validation Loss: 0.0080, Validation Accuracy: 0.8582  
Epoch [2/10], Training Loss: 0.0068, Training Accuracy: 0.8712,  
Validation Loss: 0.0052, Validation Accuracy: 0.9058  
Epoch [3/10], Training Loss: 0.0051, Training Accuracy: 0.9039,  
Validation Loss: 0.0043, Validation Accuracy: 0.9193  
Epoch [4/10], Training Loss: 0.0043, Training Accuracy: 0.9191,  
Validation Loss: 0.0037, Validation Accuracy: 0.9317  
Epoch [5/10], Training Loss: 0.0036, Training Accuracy: 0.9307,  
Validation Loss: 0.0031, Validation Accuracy: 0.9413  
Epoch [6/10], Training Loss: 0.0031, Training Accuracy: 0.9421,  
Validation Loss: 0.0028, Validation Accuracy: 0.9477  
Epoch [7/10], Training Loss: 0.0027, Training Accuracy: 0.9487,  
Validation Loss: 0.0025, Validation Accuracy: 0.9529  
Epoch [8/10], Training Loss: 0.0024, Training Accuracy: 0.9541,  
Validation Loss: 0.0023, Validation Accuracy: 0.9577  
Epoch [9/10], Training Loss: 0.0022, Training Accuracy: 0.9586,  
Validation Loss: 0.0022, Validation Accuracy: 0.9607  
Epoch [10/10], Training Loss: 0.0020, Training Accuracy: 0.9613,  
Validation Loss: 0.0020, Validation Accuracy: 0.9633
```

Training and Validation Loss (LR: 0.01, Batch Size: 64)

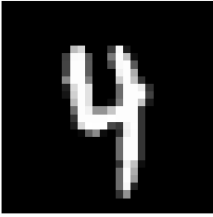


Training and Validation Accuracy (LR: 0.01, Batch Size: 64)

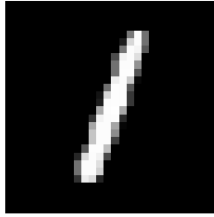


Final Training Accuracy: 0.9613
Final Validation Accuracy: 0.9633

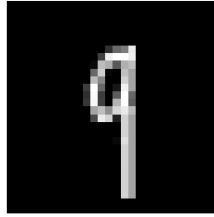
Predicted: 9, Actual: 4



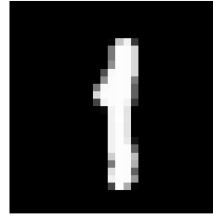
Predicted: 1, Actual: 1



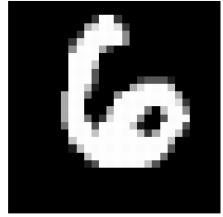
Predicted: 9, Actual: 9



Predicted: 1, Actual: 1



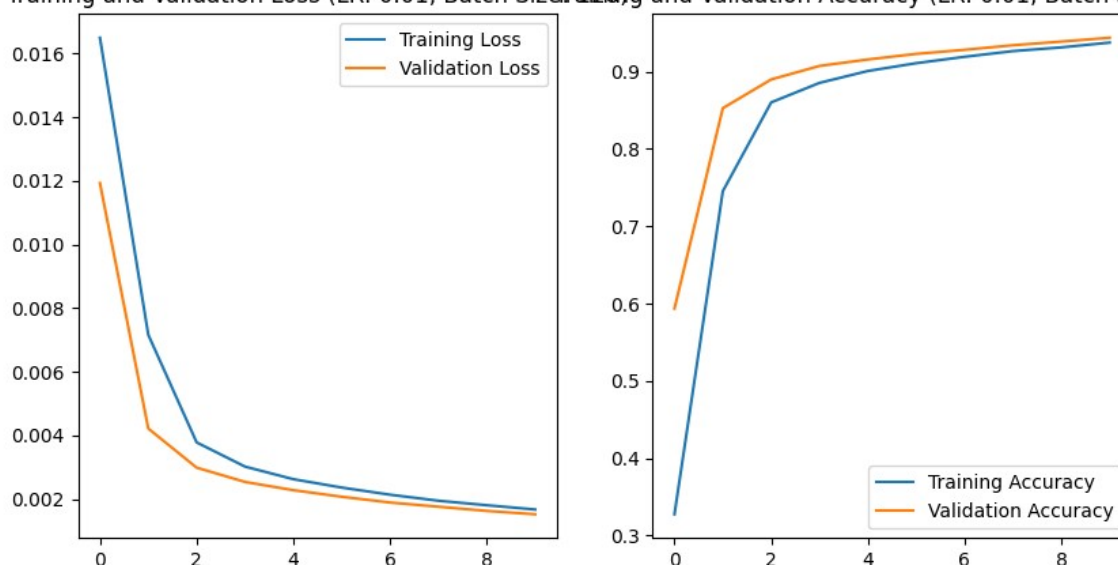
Predicted: 6, Actual: 6



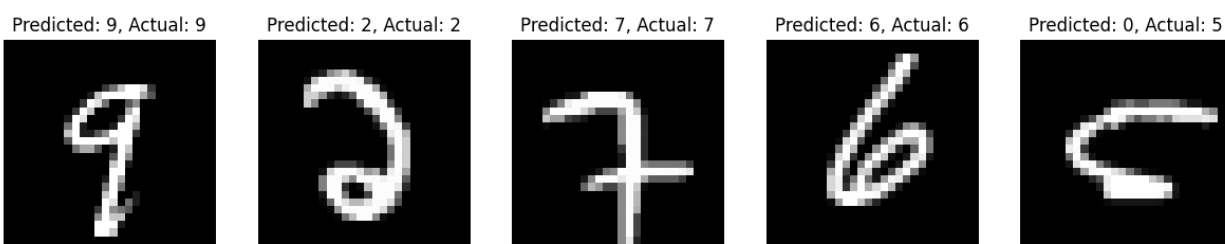
Batch Size: 128

Epoch [1/10], Training Loss: 0.0165, Training Accuracy: 0.3274,
Validation Loss: 0.0119, Validation Accuracy: 0.5935
Epoch [2/10], Training Loss: 0.0072, Training Accuracy: 0.7453,
Validation Loss: 0.0042, Validation Accuracy: 0.8527
Epoch [3/10], Training Loss: 0.0038, Training Accuracy: 0.8601,
Validation Loss: 0.0030, Validation Accuracy: 0.8898
Epoch [4/10], Training Loss: 0.0030, Training Accuracy: 0.8854,
Validation Loss: 0.0025, Validation Accuracy: 0.9073
Epoch [5/10], Training Loss: 0.0026, Training Accuracy: 0.9008,
Validation Loss: 0.0023, Validation Accuracy: 0.9157
Epoch [6/10], Training Loss: 0.0024, Training Accuracy: 0.9109,
Validation Loss: 0.0021, Validation Accuracy: 0.9229
Epoch [7/10], Training Loss: 0.0021, Training Accuracy: 0.9191,
Validation Loss: 0.0019, Validation Accuracy: 0.9282
Epoch [8/10], Training Loss: 0.0019, Training Accuracy: 0.9265,
Validation Loss: 0.0018, Validation Accuracy: 0.9341
Epoch [9/10], Training Loss: 0.0018, Training Accuracy: 0.9313,
Validation Loss: 0.0016, Validation Accuracy: 0.9388
Epoch [10/10], Training Loss: 0.0017, Training Accuracy: 0.9375,
Validation Loss: 0.0015, Validation Accuracy: 0.9437

Training and Validation Loss (LR: 0.01, Batch Size: 128) Training and Validation Accuracy (LR: 0.01, Batch Size: 128)



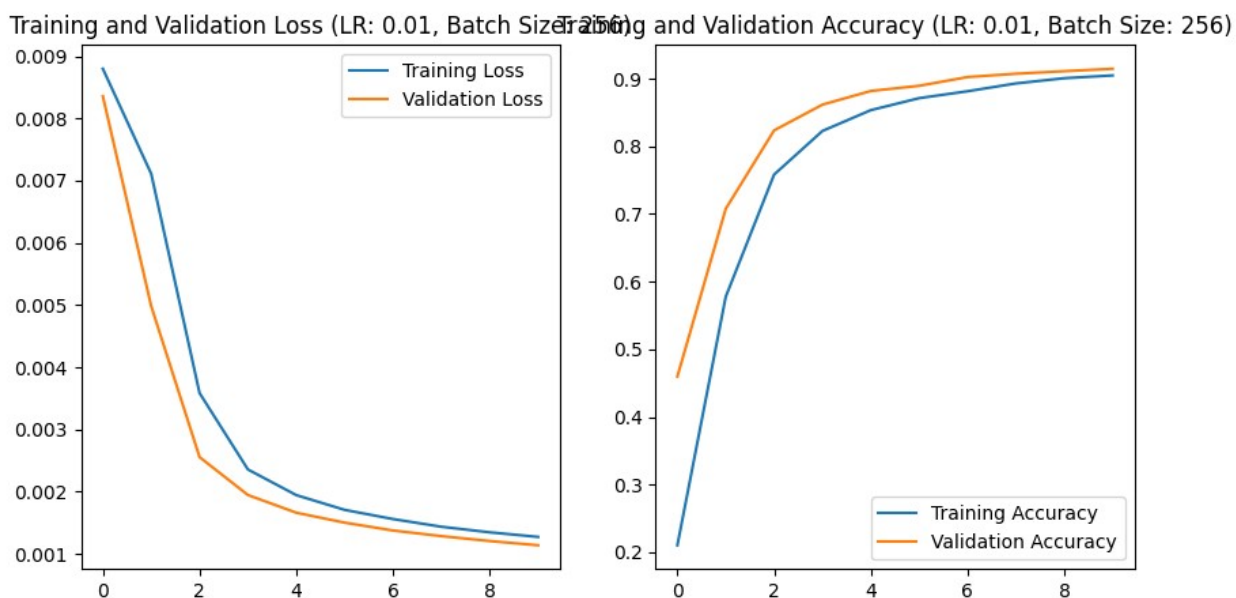
Final Training Accuracy: 0.9375
Final Validation Accuracy: 0.9437



Batch Size: 256

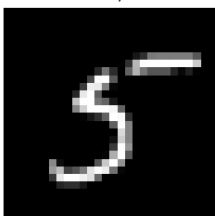
Epoch [1/10], Training Loss: 0.0088, Training Accuracy: 0.2104, Validation Loss: 0.0084, Validation Accuracy: 0.4597
Epoch [2/10], Training Loss: 0.0071, Training Accuracy: 0.5775, Validation Loss: 0.0050, Validation Accuracy: 0.7075
Epoch [3/10], Training Loss: 0.0036, Training Accuracy: 0.7581, Validation Loss: 0.0026, Validation Accuracy: 0.8233
Epoch [4/10], Training Loss: 0.0024, Training Accuracy: 0.8225, Validation Loss: 0.0019, Validation Accuracy: 0.8614
Epoch [5/10], Training Loss: 0.0019, Training Accuracy: 0.8533, Validation Loss: 0.0017, Validation Accuracy: 0.8816
Epoch [6/10], Training Loss: 0.0017, Training Accuracy: 0.8710, Validation Loss: 0.0015, Validation Accuracy: 0.8892
Epoch [7/10], Training Loss: 0.0016, Training Accuracy: 0.8812, Validation Loss: 0.0014, Validation Accuracy: 0.9022
Epoch [8/10], Training Loss: 0.0014, Training Accuracy: 0.8928, Validation Loss: 0.0013, Validation Accuracy: 0.9071
Epoch [9/10], Training Loss: 0.0013, Training Accuracy: 0.9005, Validation Loss: 0.0012, Validation Accuracy: 0.9108

Epoch [10/10], Training Loss: 0.0013, Training Accuracy: 0.9046,
Validation Loss: 0.0011, Validation Accuracy: 0.9144

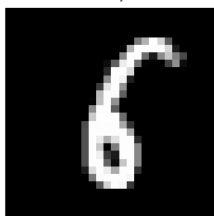


Final Training Accuracy: 0.9046
Final Validation Accuracy: 0.9144

Predicted: 5, Actual: 5



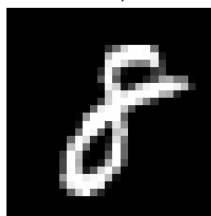
Predicted: 6, Actual: 6



Predicted: 3, Actual: 3



Predicted: 8, Actual: 8



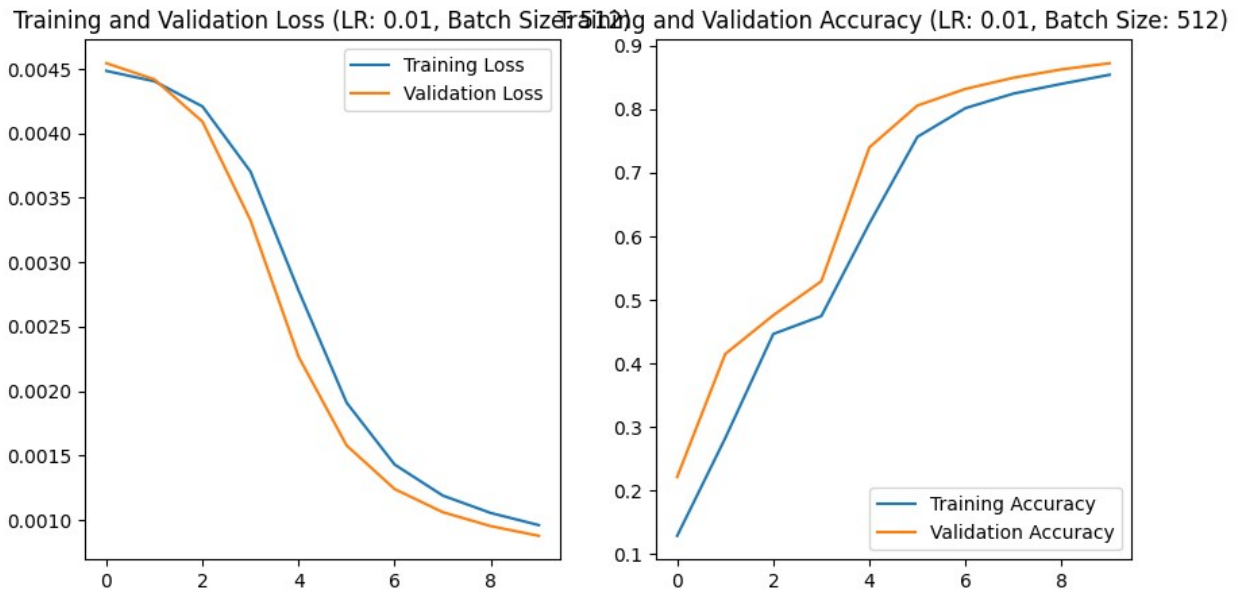
Predicted: 5, Actual: 5



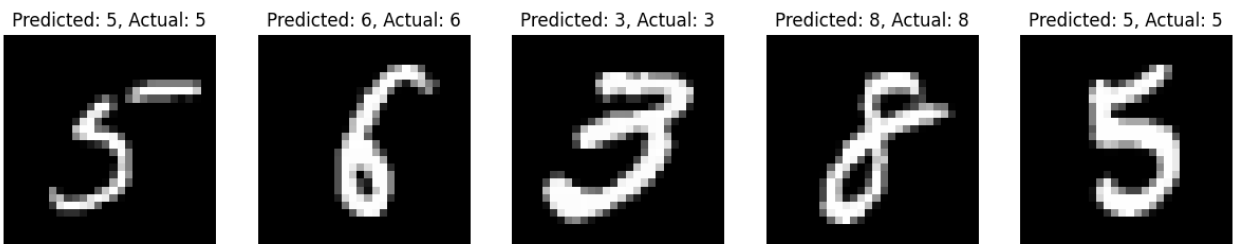
Batch Size: 512

Epoch [1/10], Training Loss: 0.0045, Training Accuracy: 0.1289,
Validation Loss: 0.0045, Validation Accuracy: 0.2215
Epoch [2/10], Training Loss: 0.0044, Training Accuracy: 0.2825,
Validation Loss: 0.0044, Validation Accuracy: 0.4149
Epoch [3/10], Training Loss: 0.0042, Training Accuracy: 0.4464,
Validation Loss: 0.0041, Validation Accuracy: 0.4758
Epoch [4/10], Training Loss: 0.0037, Training Accuracy: 0.4745,
Validation Loss: 0.0033, Validation Accuracy: 0.5293
Epoch [5/10], Training Loss: 0.0028, Training Accuracy: 0.6202,
Validation Loss: 0.0023, Validation Accuracy: 0.7398
Epoch [6/10], Training Loss: 0.0019, Training Accuracy: 0.7564,
Validation Loss: 0.0016, Validation Accuracy: 0.8057
Epoch [7/10], Training Loss: 0.0014, Training Accuracy: 0.8016,
Validation Loss: 0.0012, Validation Accuracy: 0.8318

Epoch [8/10], Training Loss: 0.0012, Training Accuracy: 0.8245,
 Validation Loss: 0.0011, Validation Accuracy: 0.8494
 Epoch [9/10], Training Loss: 0.0011, Training Accuracy: 0.8398,
 Validation Loss: 0.0010, Validation Accuracy: 0.8625
 Epoch [10/10], Training Loss: 0.0010, Training Accuracy: 0.8541,
 Validation Loss: 0.0009, Validation Accuracy: 0.8722



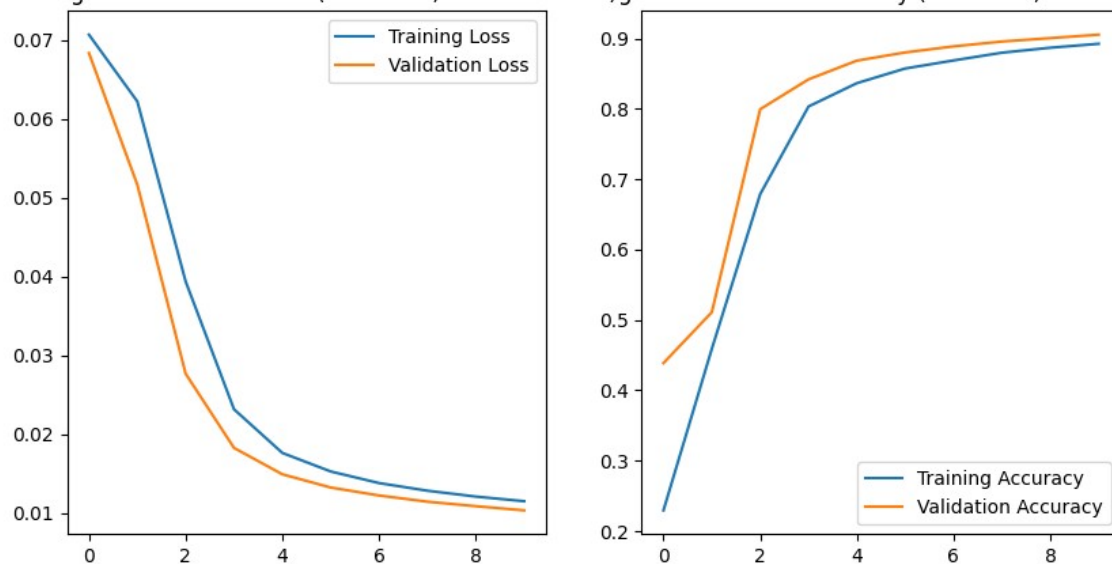
Final Training Accuracy: 0.8541
 Final Validation Accuracy: 0.8722



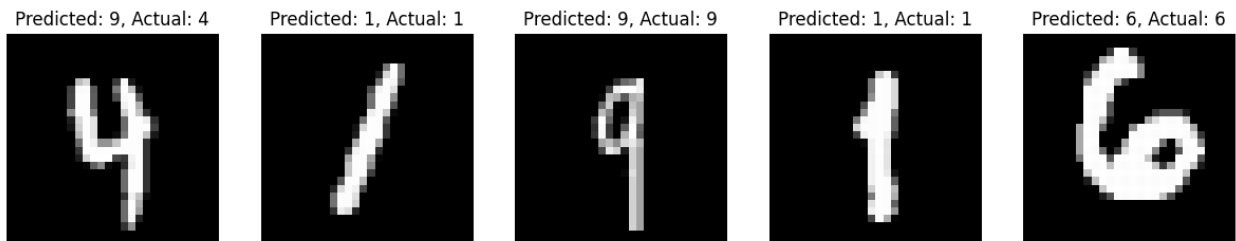
Learning Rate: 0.001
 Batch Size: 32
 Epoch [1/10], Training Loss: 0.0707, Training Accuracy: 0.2293,
 Validation Loss: 0.0684, Validation Accuracy: 0.4386
 Epoch [2/10], Training Loss: 0.0622, Training Accuracy: 0.4588,
 Validation Loss: 0.0517, Validation Accuracy: 0.5109
 Epoch [3/10], Training Loss: 0.0394, Training Accuracy: 0.6786,
 Validation Loss: 0.0277, Validation Accuracy: 0.7993
 Epoch [4/10], Training Loss: 0.0232, Training Accuracy: 0.8033,
 Validation Loss: 0.0182, Validation Accuracy: 0.8418

Epoch [5/10], Training Loss: 0.0176, Training Accuracy: 0.8364,
 Validation Loss: 0.0149, Validation Accuracy: 0.8684
 Epoch [6/10], Training Loss: 0.0153, Training Accuracy: 0.8572,
 Validation Loss: 0.0132, Validation Accuracy: 0.8801
 Epoch [7/10], Training Loss: 0.0138, Training Accuracy: 0.8687,
 Validation Loss: 0.0122, Validation Accuracy: 0.8887
 Epoch [8/10], Training Loss: 0.0128, Training Accuracy: 0.8797,
 Validation Loss: 0.0114, Validation Accuracy: 0.8956
 Epoch [9/10], Training Loss: 0.0121, Training Accuracy: 0.8868,
 Validation Loss: 0.0108, Validation Accuracy: 0.9004
 Epoch [10/10], Training Loss: 0.0115, Training Accuracy: 0.8924,
 Validation Loss: 0.0103, Validation Accuracy: 0.9053

Training and Validation Loss (LR: 0.001, Batch Size: 32) Training and Validation Accuracy (LR: 0.001, Batch Size: 32)

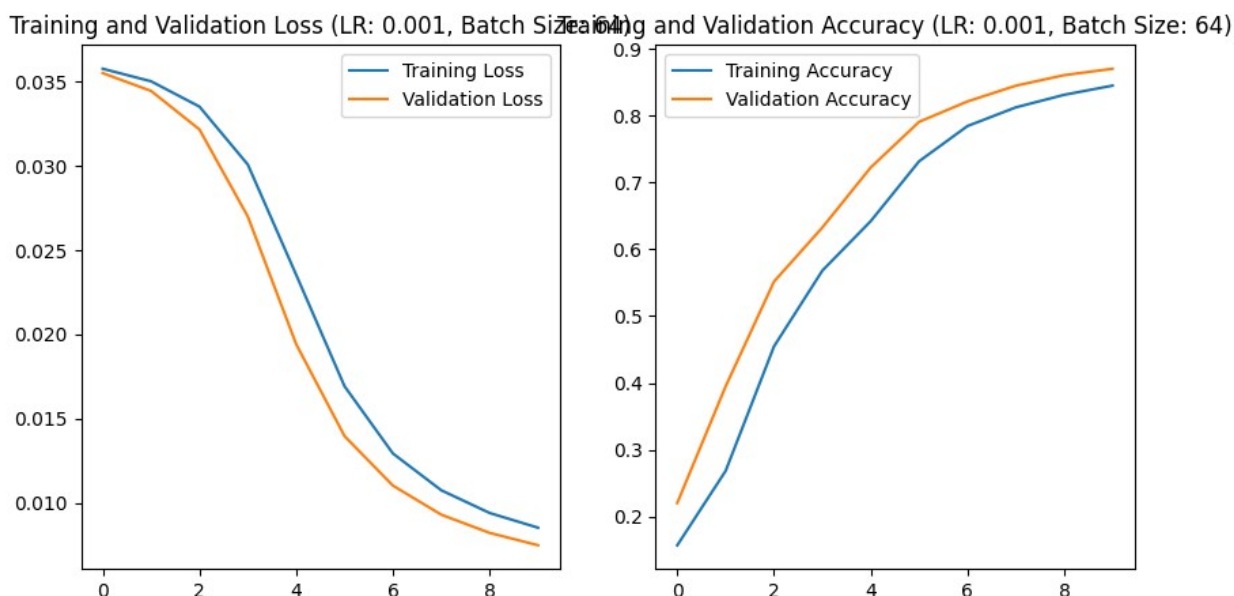


Final Training Accuracy: 0.8924
 Final Validation Accuracy: 0.9053



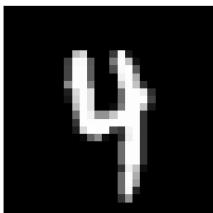
Batch Size: 64
 Epoch [1/10], Training Loss: 0.0358, Training Accuracy: 0.1573,
 Validation Loss: 0.0355, Validation Accuracy: 0.2205
 Epoch [2/10], Training Loss: 0.0350, Training Accuracy: 0.2685,
 Validation Loss: 0.0345, Validation Accuracy: 0.3949

Epoch [3/10], Training Loss: 0.0335, Training Accuracy: 0.4547,
 Validation Loss: 0.0322, Validation Accuracy: 0.5516
 Epoch [4/10], Training Loss: 0.0301, Training Accuracy: 0.5680,
 Validation Loss: 0.0270, Validation Accuracy: 0.6325
 Epoch [5/10], Training Loss: 0.0235, Training Accuracy: 0.6420,
 Validation Loss: 0.0194, Validation Accuracy: 0.7222
 Epoch [6/10], Training Loss: 0.0169, Training Accuracy: 0.7315,
 Validation Loss: 0.0140, Validation Accuracy: 0.7905
 Epoch [7/10], Training Loss: 0.0129, Training Accuracy: 0.7842,
 Validation Loss: 0.0110, Validation Accuracy: 0.8210
 Epoch [8/10], Training Loss: 0.0108, Training Accuracy: 0.8122,
 Validation Loss: 0.0093, Validation Accuracy: 0.8446
 Epoch [9/10], Training Loss: 0.0094, Training Accuracy: 0.8310,
 Validation Loss: 0.0082, Validation Accuracy: 0.8603
 Epoch [10/10], Training Loss: 0.0085, Training Accuracy: 0.8447,
 Validation Loss: 0.0075, Validation Accuracy: 0.8699

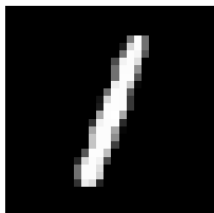


Final Training Accuracy: 0.8447
 Final Validation Accuracy: 0.8699

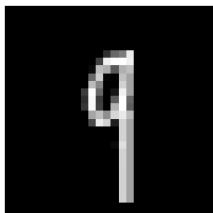
Predicted: 9, Actual: 4



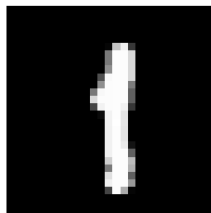
Predicted: 1, Actual: 1



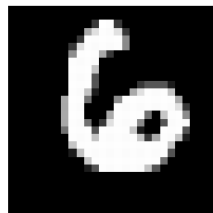
Predicted: 9, Actual: 9



Predicted: 1, Actual: 1



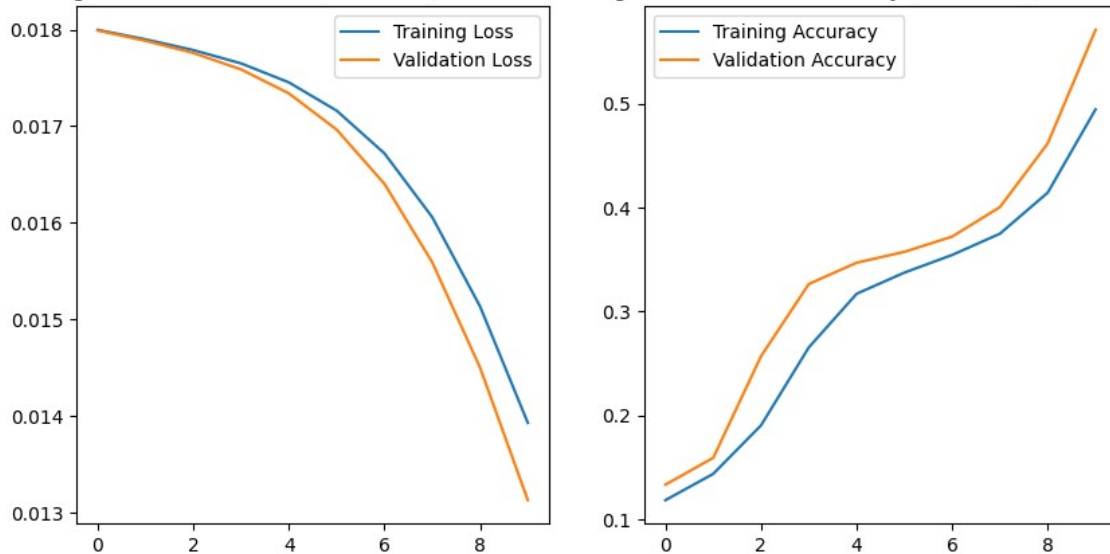
Predicted: 6, Actual: 6



Batch Size: 128

Epoch [1/10], Training Loss: 0.0180, Training Accuracy: 0.1185,
Validation Loss: 0.0180, Validation Accuracy: 0.1334
Epoch [2/10], Training Loss: 0.0179, Training Accuracy: 0.1438,
Validation Loss: 0.0179, Validation Accuracy: 0.1593
Epoch [3/10], Training Loss: 0.0178, Training Accuracy: 0.1905,
Validation Loss: 0.0178, Validation Accuracy: 0.2571
Epoch [4/10], Training Loss: 0.0176, Training Accuracy: 0.2655,
Validation Loss: 0.0176, Validation Accuracy: 0.3266
Epoch [5/10], Training Loss: 0.0175, Training Accuracy: 0.3171,
Validation Loss: 0.0173, Validation Accuracy: 0.3471
Epoch [6/10], Training Loss: 0.0172, Training Accuracy: 0.3376,
Validation Loss: 0.0170, Validation Accuracy: 0.3576
Epoch [7/10], Training Loss: 0.0167, Training Accuracy: 0.3546,
Validation Loss: 0.0164, Validation Accuracy: 0.3723
Epoch [8/10], Training Loss: 0.0161, Training Accuracy: 0.3751,
Validation Loss: 0.0156, Validation Accuracy: 0.4007
Epoch [9/10], Training Loss: 0.0151, Training Accuracy: 0.4146,
Validation Loss: 0.0145, Validation Accuracy: 0.4620
Epoch [10/10], Training Loss: 0.0139, Training Accuracy: 0.4947,
Validation Loss: 0.0131, Validation Accuracy: 0.5713

Training and Validation Loss (LR: 0.001, Batch Size: 128) and Validation Accuracy (LR: 0.001, Batch Size: 128)

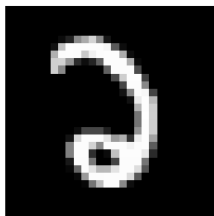


Final Training Accuracy: 0.4947
Final Validation Accuracy: 0.5713

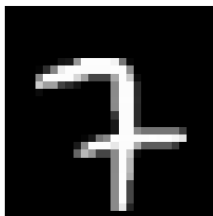
Predicted: 9, Actual: 9



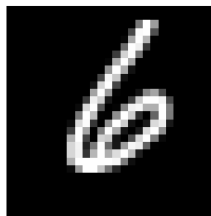
Predicted: 2, Actual: 2



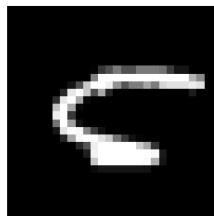
Predicted: 9, Actual: 7



Predicted: 6, Actual: 6



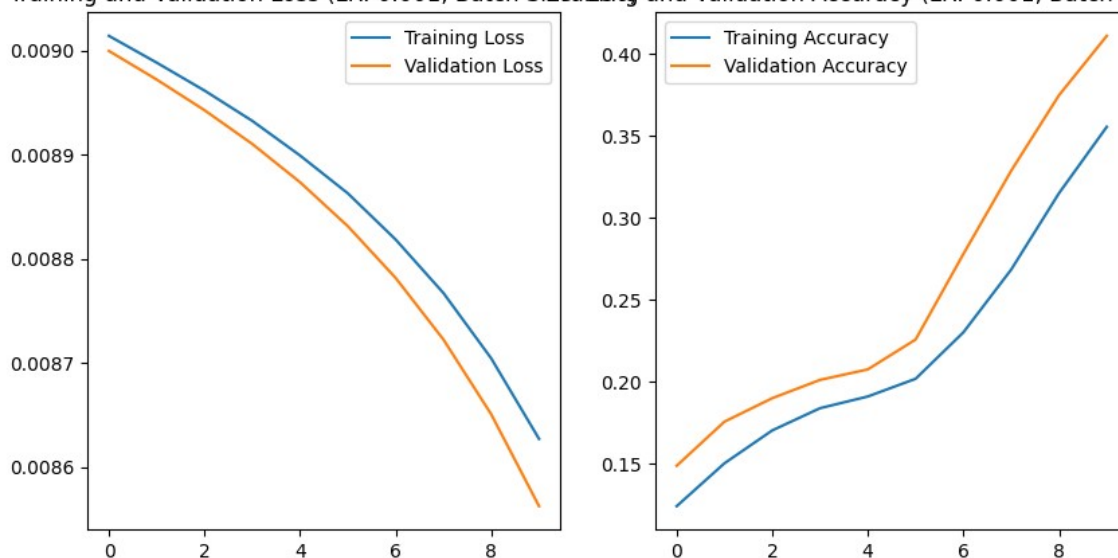
Predicted: 9, Actual: 5



Batch Size: 256

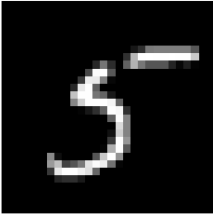
```
Epoch [1/10], Training Loss: 0.0090, Training Accuracy: 0.1239,  
Validation Loss: 0.0090, Validation Accuracy: 0.1486  
Epoch [2/10], Training Loss: 0.0090, Training Accuracy: 0.1501,  
Validation Loss: 0.0090, Validation Accuracy: 0.1755  
Epoch [3/10], Training Loss: 0.0090, Training Accuracy: 0.1702,  
Validation Loss: 0.0089, Validation Accuracy: 0.1898  
Epoch [4/10], Training Loss: 0.0089, Training Accuracy: 0.1837,  
Validation Loss: 0.0089, Validation Accuracy: 0.2010  
Epoch [5/10], Training Loss: 0.0089, Training Accuracy: 0.1909,  
Validation Loss: 0.0089, Validation Accuracy: 0.2074  
Epoch [6/10], Training Loss: 0.0089, Training Accuracy: 0.2017,  
Validation Loss: 0.0088, Validation Accuracy: 0.2257  
Epoch [7/10], Training Loss: 0.0088, Training Accuracy: 0.2301,  
Validation Loss: 0.0088, Validation Accuracy: 0.2779  
Epoch [8/10], Training Loss: 0.0088, Training Accuracy: 0.2684,  
Validation Loss: 0.0087, Validation Accuracy: 0.3287  
Epoch [9/10], Training Loss: 0.0087, Training Accuracy: 0.3150,  
Validation Loss: 0.0087, Validation Accuracy: 0.3748  
Epoch [10/10], Training Loss: 0.0086, Training Accuracy: 0.3555,  
Validation Loss: 0.0086, Validation Accuracy: 0.4111
```

Training and Validation Loss (LR: 0.001, Batch Size: 256) and Validation Accuracy (LR: 0.001, Batch Size: 256)

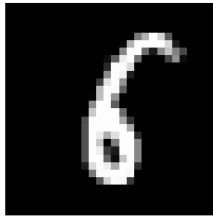


Final Training Accuracy: 0.3555
Final Validation Accuracy: 0.4111

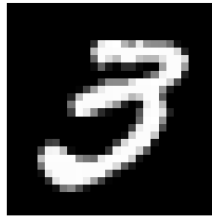
Predicted: 7, Actual: 5



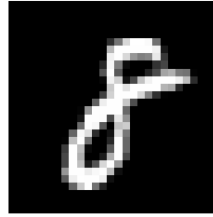
Predicted: 1, Actual: 6



Predicted: 2, Actual: 3



Predicted: 8, Actual: 8

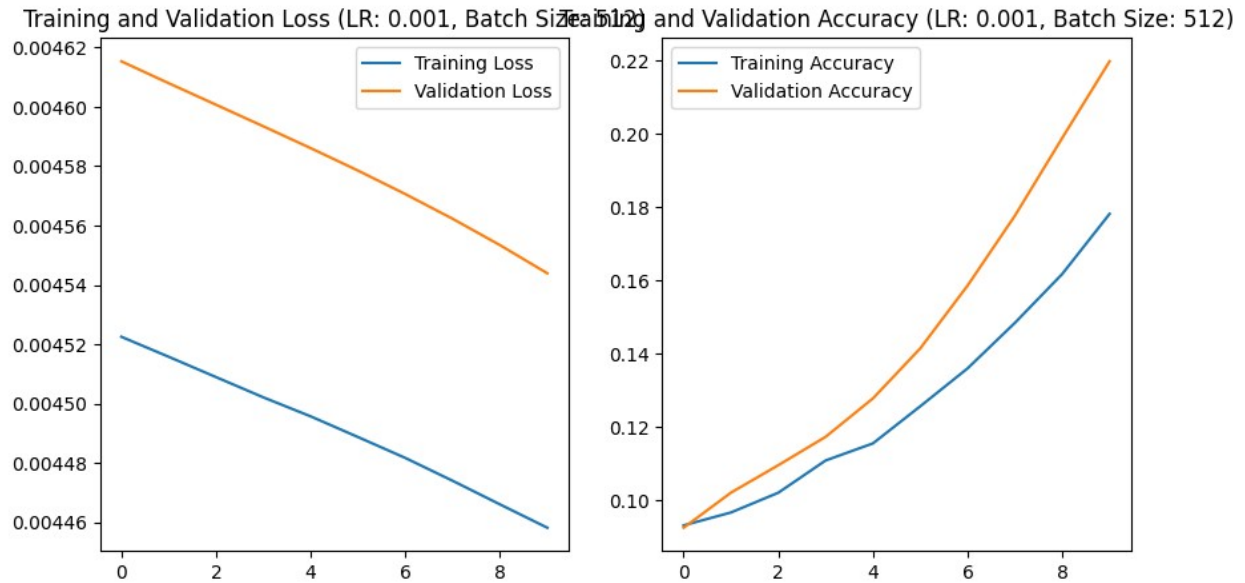


Predicted: 6, Actual: 5

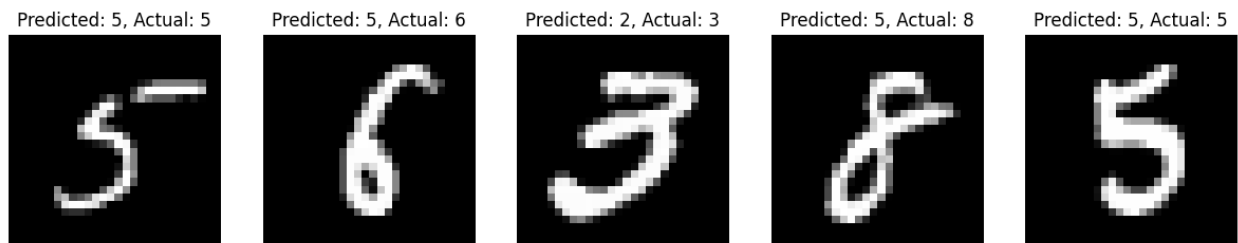


Batch Size: 512

Epoch [1/10], Training Loss: 0.0045, Training Accuracy: 0.0931,
Validation Loss: 0.0046, Validation Accuracy: 0.0924
Epoch [2/10], Training Loss: 0.0045, Training Accuracy: 0.0966,
Validation Loss: 0.0046, Validation Accuracy: 0.1020
Epoch [3/10], Training Loss: 0.0045, Training Accuracy: 0.1020,
Validation Loss: 0.0046, Validation Accuracy: 0.1095
Epoch [4/10], Training Loss: 0.0045, Training Accuracy: 0.1108,
Validation Loss: 0.0046, Validation Accuracy: 0.1172
Epoch [5/10], Training Loss: 0.0045, Training Accuracy: 0.1155,
Validation Loss: 0.0046, Validation Accuracy: 0.1278
Epoch [6/10], Training Loss: 0.0045, Training Accuracy: 0.1256,
Validation Loss: 0.0046, Validation Accuracy: 0.1414
Epoch [7/10], Training Loss: 0.0045, Training Accuracy: 0.1360,
Validation Loss: 0.0046, Validation Accuracy: 0.1586
Epoch [8/10], Training Loss: 0.0045, Training Accuracy: 0.1484,
Validation Loss: 0.0046, Validation Accuracy: 0.1777
Epoch [9/10], Training Loss: 0.0045, Training Accuracy: 0.1618,
Validation Loss: 0.0046, Validation Accuracy: 0.1989
Epoch [10/10], Training Loss: 0.0045, Training Accuracy: 0.1782,
Validation Loss: 0.0045, Validation Accuracy: 0.2198



Final Training Accuracy: 0.1782
Final Validation Accuracy: 0.2198

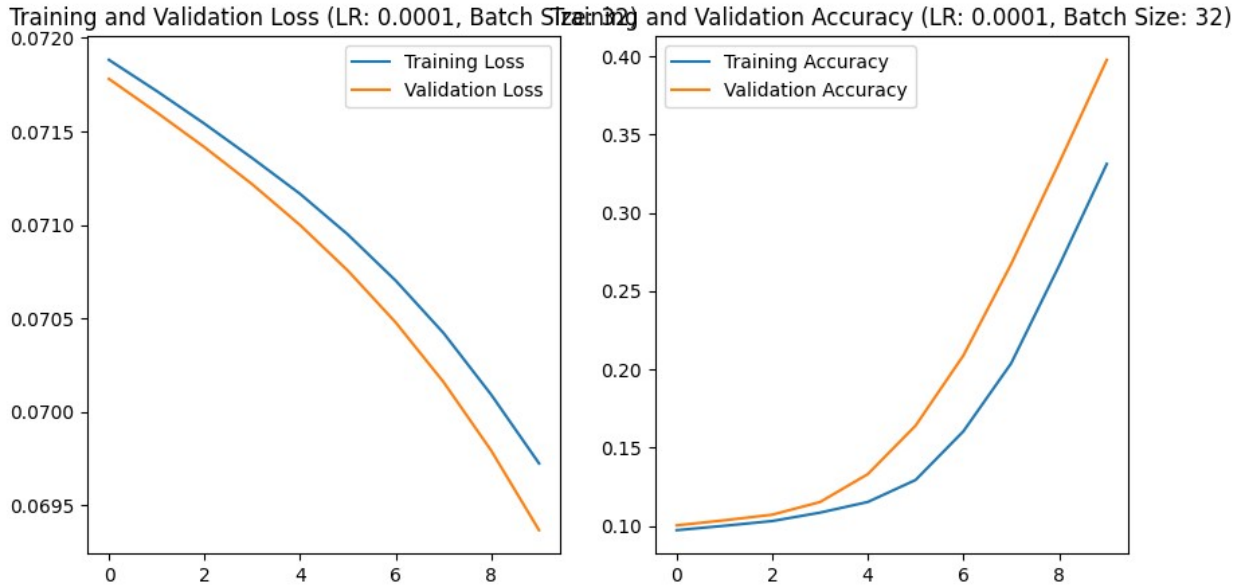


Learning Rate: 0.0001

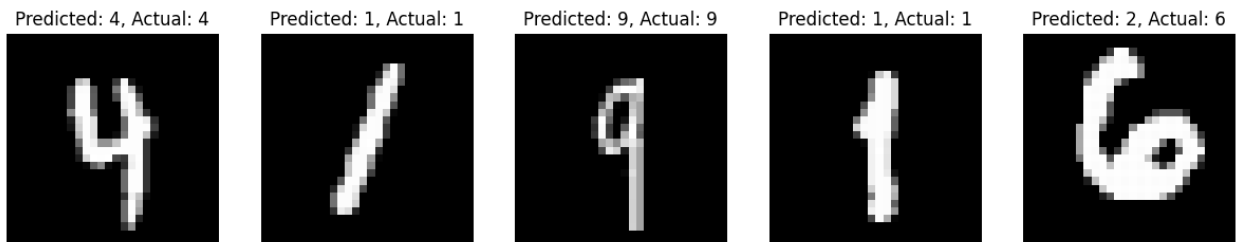
Batch Size: 32

Epoch [1/10], Training Loss: 0.0719, Training Accuracy: 0.0972, Validation Loss: 0.0718, Validation Accuracy: 0.1003
Epoch [2/10], Training Loss: 0.0717, Training Accuracy: 0.1000, Validation Loss: 0.0716, Validation Accuracy: 0.1035
Epoch [3/10], Training Loss: 0.0715, Training Accuracy: 0.1030, Validation Loss: 0.0714, Validation Accuracy: 0.1071
Epoch [4/10], Training Loss: 0.0714, Training Accuracy: 0.1084, Validation Loss: 0.0712, Validation Accuracy: 0.1152
Epoch [5/10], Training Loss: 0.0712, Training Accuracy: 0.1152, Validation Loss: 0.0710, Validation Accuracy: 0.1330
Epoch [6/10], Training Loss: 0.0709, Training Accuracy: 0.1293, Validation Loss: 0.0708, Validation Accuracy: 0.1640
Epoch [7/10], Training Loss: 0.0707, Training Accuracy: 0.1604, Validation Loss: 0.0705, Validation Accuracy: 0.2088
Epoch [8/10], Training Loss: 0.0704, Training Accuracy: 0.2038, Validation Loss: 0.0702, Validation Accuracy: 0.2672

Epoch [9/10], Training Loss: 0.0701, Training Accuracy: 0.2660,
 Validation Loss: 0.0698, Validation Accuracy: 0.3317
 Epoch [10/10], Training Loss: 0.0697, Training Accuracy: 0.3312,
 Validation Loss: 0.0694, Validation Accuracy: 0.3977



Final Training Accuracy: 0.3312
 Final Validation Accuracy: 0.3977

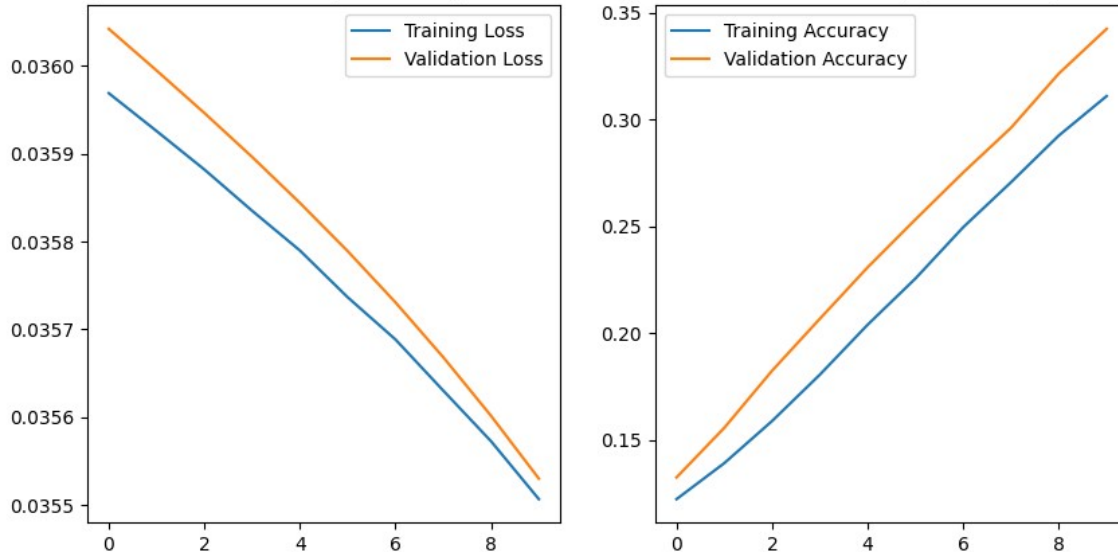


Batch Size: 64

Epoch [1/10], Training Loss: 0.0360, Training Accuracy: 0.1222,
 Validation Loss: 0.0360, Validation Accuracy: 0.1324
 Epoch [2/10], Training Loss: 0.0359, Training Accuracy: 0.1391,
 Validation Loss: 0.0360, Validation Accuracy: 0.1557
 Epoch [3/10], Training Loss: 0.0359, Training Accuracy: 0.1589,
 Validation Loss: 0.0359, Validation Accuracy: 0.1824
 Epoch [4/10], Training Loss: 0.0358, Training Accuracy: 0.1806,
 Validation Loss: 0.0359, Validation Accuracy: 0.2067
 Epoch [5/10], Training Loss: 0.0358, Training Accuracy: 0.2040,
 Validation Loss: 0.0358, Validation Accuracy: 0.2308
 Epoch [6/10], Training Loss: 0.0357, Training Accuracy: 0.2256,
 Validation Loss: 0.0358, Validation Accuracy: 0.2532

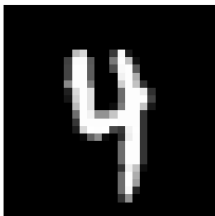
Epoch [7/10], Training Loss: 0.0357, Training Accuracy: 0.2496,
 Validation Loss: 0.0357, Validation Accuracy: 0.2752
 Epoch [8/10], Training Loss: 0.0356, Training Accuracy: 0.2707,
 Validation Loss: 0.0357, Validation Accuracy: 0.2962
 Epoch [9/10], Training Loss: 0.0356, Training Accuracy: 0.2925,
 Validation Loss: 0.0356, Validation Accuracy: 0.3216
 Epoch [10/10], Training Loss: 0.0355, Training Accuracy: 0.3110,
 Validation Loss: 0.0355, Validation Accuracy: 0.3425

Training and Validation Loss (LR: 0.0001, Batch Size: 64) Training and Validation Accuracy (LR: 0.0001, Batch Size: 64)

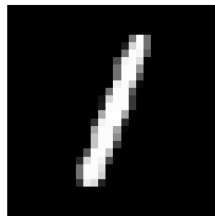


Final Training Accuracy: 0.3110
 Final Validation Accuracy: 0.3425

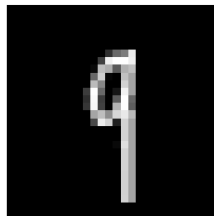
Predicted: 7, Actual: 4



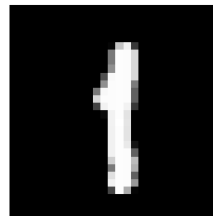
Predicted: 1, Actual: 1



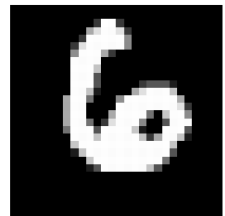
Predicted: 7, Actual: 9



Predicted: 3, Actual: 1



Predicted: 7, Actual: 6

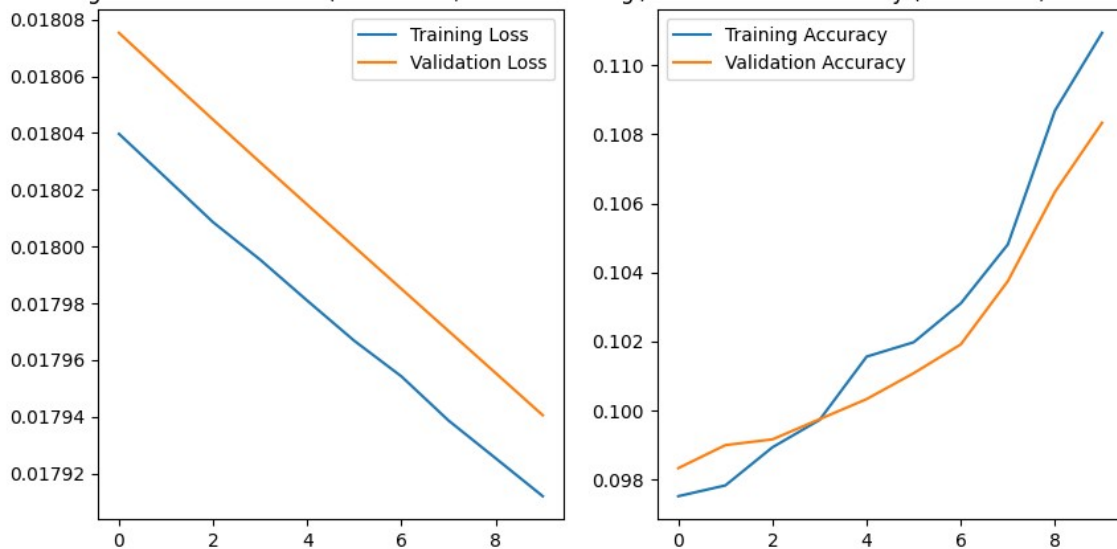


Batch Size: 128

Epoch [1/10], Training Loss: 0.0180, Training Accuracy: 0.0975,
 Validation Loss: 0.0181, Validation Accuracy: 0.0983
 Epoch [2/10], Training Loss: 0.0180, Training Accuracy: 0.0978,
 Validation Loss: 0.0181, Validation Accuracy: 0.0990
 Epoch [3/10], Training Loss: 0.0180, Training Accuracy: 0.0989,
 Validation Loss: 0.0180, Validation Accuracy: 0.0992
 Epoch [4/10], Training Loss: 0.0180, Training Accuracy: 0.0997,
 Validation Loss: 0.0180, Validation Accuracy: 0.0998

Epoch [5/10], Training Loss: 0.0180, Training Accuracy: 0.1016,
 Validation Loss: 0.0180, Validation Accuracy: 0.1003
 Epoch [6/10], Training Loss: 0.0180, Training Accuracy: 0.1020,
 Validation Loss: 0.0180, Validation Accuracy: 0.1011
 Epoch [7/10], Training Loss: 0.0180, Training Accuracy: 0.1031,
 Validation Loss: 0.0180, Validation Accuracy: 0.1019
 Epoch [8/10], Training Loss: 0.0179, Training Accuracy: 0.1048,
 Validation Loss: 0.0180, Validation Accuracy: 0.1037
 Epoch [9/10], Training Loss: 0.0179, Training Accuracy: 0.1087,
 Validation Loss: 0.0180, Validation Accuracy: 0.1063
 Epoch [10/10], Training Loss: 0.0179, Training Accuracy: 0.1109,
 Validation Loss: 0.0179, Validation Accuracy: 0.1083

Training and Validation Loss (LR: 0.0001, Batch Size: 128) and Validation Accuracy (LR: 0.0001, Batch Size: 128)

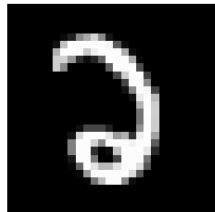


Final Training Accuracy: 0.1109
 Final Validation Accuracy: 0.1083

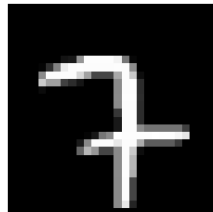
Predicted: 4, Actual: 9



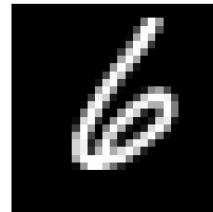
Predicted: 4, Actual: 2



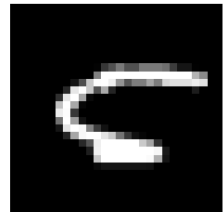
Predicted: 4, Actual: 7



Predicted: 4, Actual: 6



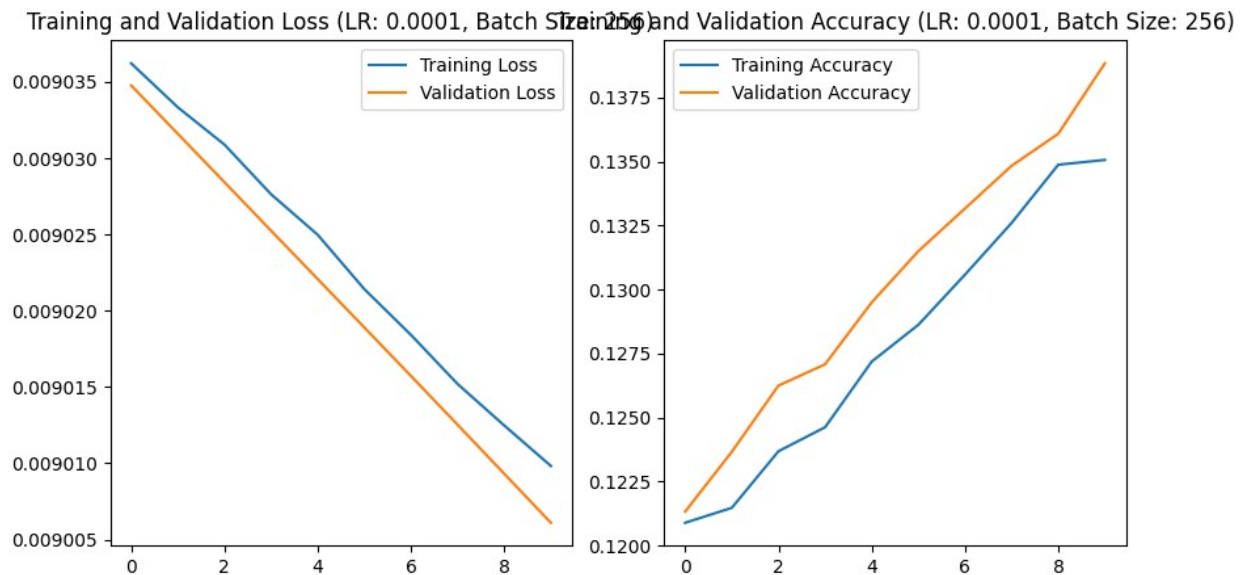
Predicted: 4, Actual: 5



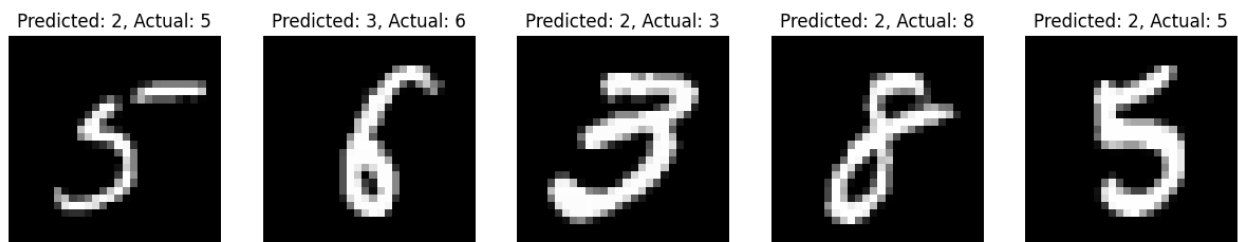
Batch Size: 256

Epoch [1/10], Training Loss: 0.0090, Training Accuracy: 0.1209,
 Validation Loss: 0.0090, Validation Accuracy: 0.1213
 Epoch [2/10], Training Loss: 0.0090, Training Accuracy: 0.1215,
 Validation Loss: 0.0090, Validation Accuracy: 0.1237
 Epoch [3/10], Training Loss: 0.0090, Training Accuracy: 0.1237,

Validation Loss: 0.0090, Validation Accuracy: 0.1263
 Epoch [4/10], Training Loss: 0.0090, Training Accuracy: 0.1246,
 Validation Loss: 0.0090, Validation Accuracy: 0.1271
 Epoch [5/10], Training Loss: 0.0090, Training Accuracy: 0.1272,
 Validation Loss: 0.0090, Validation Accuracy: 0.1295
 Epoch [6/10], Training Loss: 0.0090, Training Accuracy: 0.1286,
 Validation Loss: 0.0090, Validation Accuracy: 0.1315
 Epoch [7/10], Training Loss: 0.0090, Training Accuracy: 0.1306,
 Validation Loss: 0.0090, Validation Accuracy: 0.1332
 Epoch [8/10], Training Loss: 0.0090, Training Accuracy: 0.1326,
 Validation Loss: 0.0090, Validation Accuracy: 0.1348
 Epoch [9/10], Training Loss: 0.0090, Training Accuracy: 0.1349,
 Validation Loss: 0.0090, Validation Accuracy: 0.1361
 Epoch [10/10], Training Loss: 0.0090, Training Accuracy: 0.1351,
 Validation Loss: 0.0090, Validation Accuracy: 0.1388



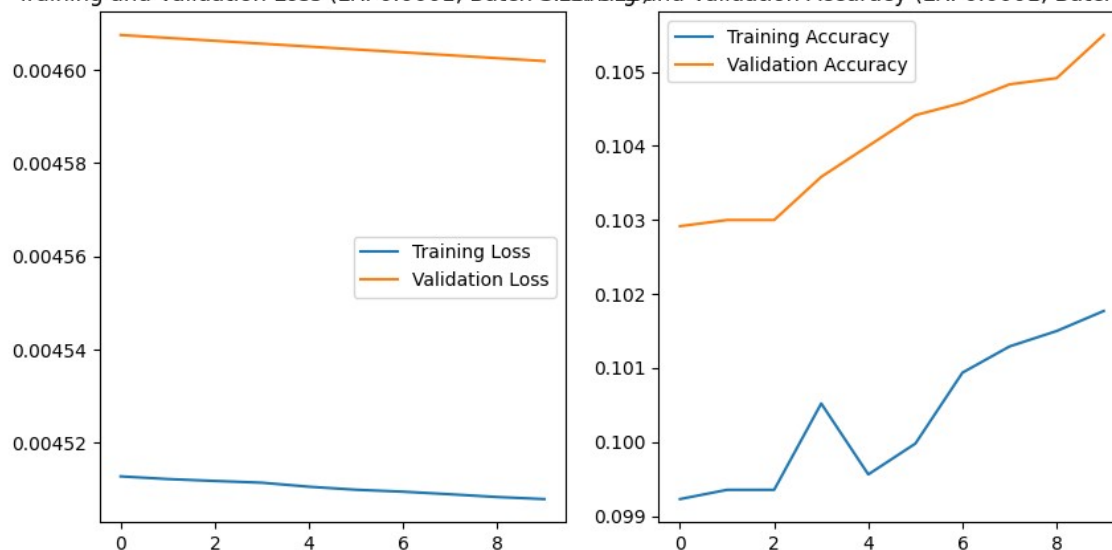
Final Training Accuracy: 0.1351
 Final Validation Accuracy: 0.1388



Batch Size: 512
 Epoch [1/10], Training Loss: 0.0045, Training Accuracy: 0.0992,
 Validation Loss: 0.0046, Validation Accuracy: 0.1029

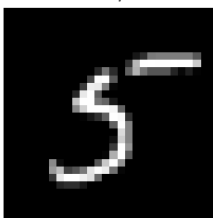
Epoch [2/10], Training Loss: 0.0045, Training Accuracy: 0.0994,
 Validation Loss: 0.0046, Validation Accuracy: 0.1030
 Epoch [3/10], Training Loss: 0.0045, Training Accuracy: 0.0994,
 Validation Loss: 0.0046, Validation Accuracy: 0.1030
 Epoch [4/10], Training Loss: 0.0045, Training Accuracy: 0.1005,
 Validation Loss: 0.0046, Validation Accuracy: 0.1036
 Epoch [5/10], Training Loss: 0.0045, Training Accuracy: 0.0996,
 Validation Loss: 0.0046, Validation Accuracy: 0.1040
 Epoch [6/10], Training Loss: 0.0045, Training Accuracy: 0.1000,
 Validation Loss: 0.0046, Validation Accuracy: 0.1044
 Epoch [7/10], Training Loss: 0.0045, Training Accuracy: 0.1009,
 Validation Loss: 0.0046, Validation Accuracy: 0.1046
 Epoch [8/10], Training Loss: 0.0045, Training Accuracy: 0.1013,
 Validation Loss: 0.0046, Validation Accuracy: 0.1048
 Epoch [9/10], Training Loss: 0.0045, Training Accuracy: 0.1015,
 Validation Loss: 0.0046, Validation Accuracy: 0.1049
 Epoch [10/10], Training Loss: 0.0045, Training Accuracy: 0.1018,
 Validation Loss: 0.0046, Validation Accuracy: 0.1055

Training and Validation Loss (LR: 0.0001, Batch Size: 512) and Validation Accuracy (LR: 0.0001, Batch Size: 512)

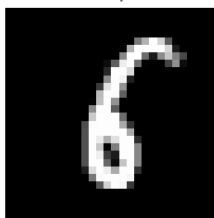


Final Training Accuracy: 0.1018
 Final Validation Accuracy: 0.1055

Predicted: 3, Actual: 5



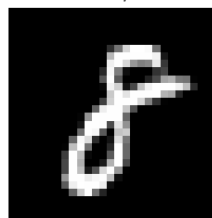
Predicted: 3, Actual: 6



Predicted: 3, Actual: 3



Predicted: 3, Actual: 8



Predicted: 3, Actual: 5

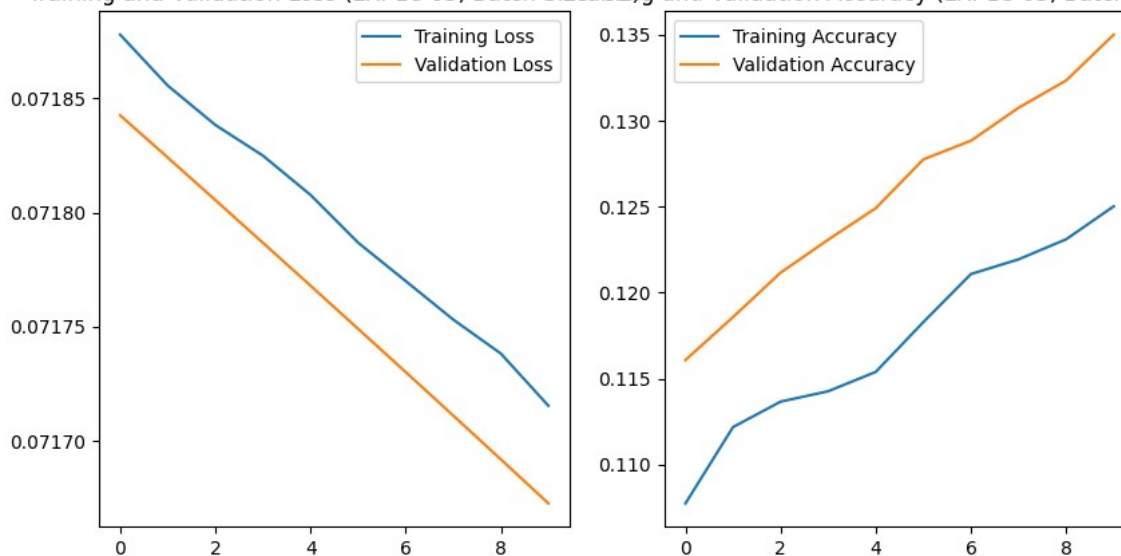


Learning Rate: 1e-05

Batch Size: 32

Epoch [1/10], Training Loss: 0.0719, Training Accuracy: 0.1077,
Validation Loss: 0.0718, Validation Accuracy: 0.1161
Epoch [2/10], Training Loss: 0.0719, Training Accuracy: 0.1122,
Validation Loss: 0.0718, Validation Accuracy: 0.1186
Epoch [3/10], Training Loss: 0.0718, Training Accuracy: 0.1137,
Validation Loss: 0.0718, Validation Accuracy: 0.1212
Epoch [4/10], Training Loss: 0.0718, Training Accuracy: 0.1143,
Validation Loss: 0.0718, Validation Accuracy: 0.1231
Epoch [5/10], Training Loss: 0.0718, Training Accuracy: 0.1154,
Validation Loss: 0.0718, Validation Accuracy: 0.1249
Epoch [6/10], Training Loss: 0.0718, Training Accuracy: 0.1183,
Validation Loss: 0.0717, Validation Accuracy: 0.1278
Epoch [7/10], Training Loss: 0.0718, Training Accuracy: 0.1211,
Validation Loss: 0.0717, Validation Accuracy: 0.1288
Epoch [8/10], Training Loss: 0.0718, Training Accuracy: 0.1219,
Validation Loss: 0.0717, Validation Accuracy: 0.1308
Epoch [9/10], Training Loss: 0.0717, Training Accuracy: 0.1231,
Validation Loss: 0.0717, Validation Accuracy: 0.1323
Epoch [10/10], Training Loss: 0.0717, Training Accuracy: 0.1250,
Validation Loss: 0.0717, Validation Accuracy: 0.1350

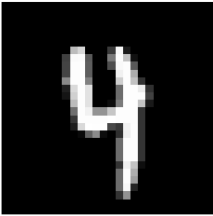
Training and Validation Loss (LR: 1e-05, Batch Size: 32) Training and Validation Accuracy (LR: 1e-05, Batch Size: 32)



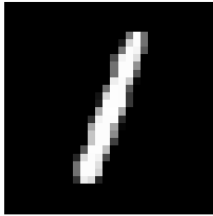
Final Training Accuracy: 0.1250

Final Validation Accuracy: 0.1350

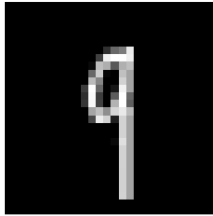
Predicted: 7, Actual: 4



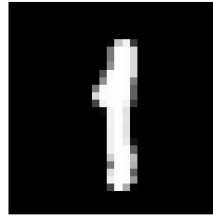
Predicted: 7, Actual: 1



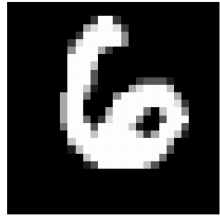
Predicted: 7, Actual: 9



Predicted: 7, Actual: 1

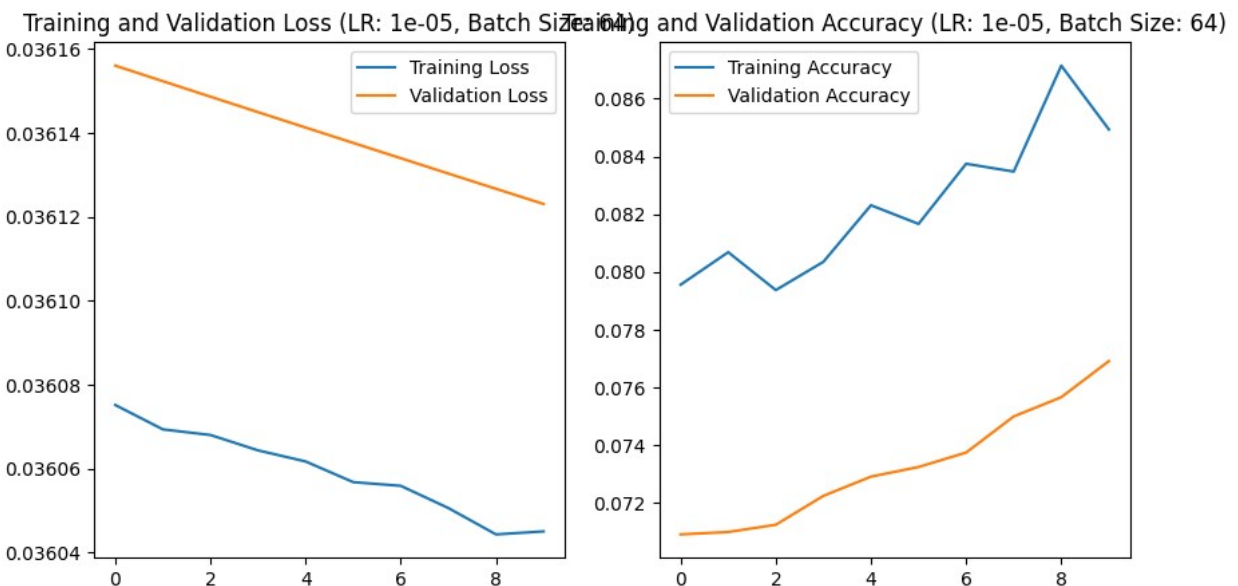


Predicted: 7, Actual: 6



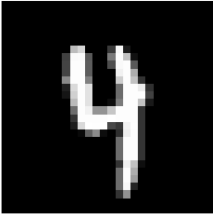
Batch Size: 64

Epoch [1/10], Training Loss: 0.0361, Training Accuracy: 0.0796,
Validation Loss: 0.0362, Validation Accuracy: 0.0709
Epoch [2/10], Training Loss: 0.0361, Training Accuracy: 0.0807,
Validation Loss: 0.0362, Validation Accuracy: 0.0710
Epoch [3/10], Training Loss: 0.0361, Training Accuracy: 0.0794,
Validation Loss: 0.0361, Validation Accuracy: 0.0712
Epoch [4/10], Training Loss: 0.0361, Training Accuracy: 0.0804,
Validation Loss: 0.0361, Validation Accuracy: 0.0722
Epoch [5/10], Training Loss: 0.0361, Training Accuracy: 0.0823,
Validation Loss: 0.0361, Validation Accuracy: 0.0729
Epoch [6/10], Training Loss: 0.0361, Training Accuracy: 0.0817,
Validation Loss: 0.0361, Validation Accuracy: 0.0732
Epoch [7/10], Training Loss: 0.0361, Training Accuracy: 0.0838,
Validation Loss: 0.0361, Validation Accuracy: 0.0737
Epoch [8/10], Training Loss: 0.0361, Training Accuracy: 0.0835,
Validation Loss: 0.0361, Validation Accuracy: 0.0750
Epoch [9/10], Training Loss: 0.0360, Training Accuracy: 0.0871,
Validation Loss: 0.0361, Validation Accuracy: 0.0757
Epoch [10/10], Training Loss: 0.0360, Training Accuracy: 0.0849,
Validation Loss: 0.0361, Validation Accuracy: 0.0769

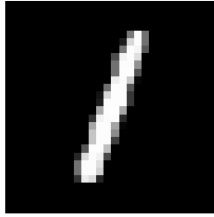


Final Training Accuracy: 0.0849
Final Validation Accuracy: 0.0769

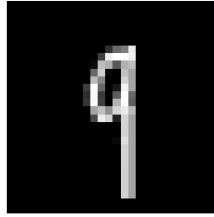
Predicted: 6, Actual: 4



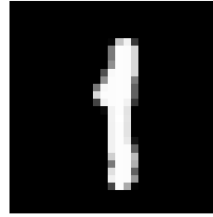
Predicted: 6, Actual: 1



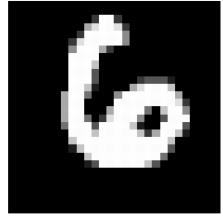
Predicted: 6, Actual: 9



Predicted: 6, Actual: 1



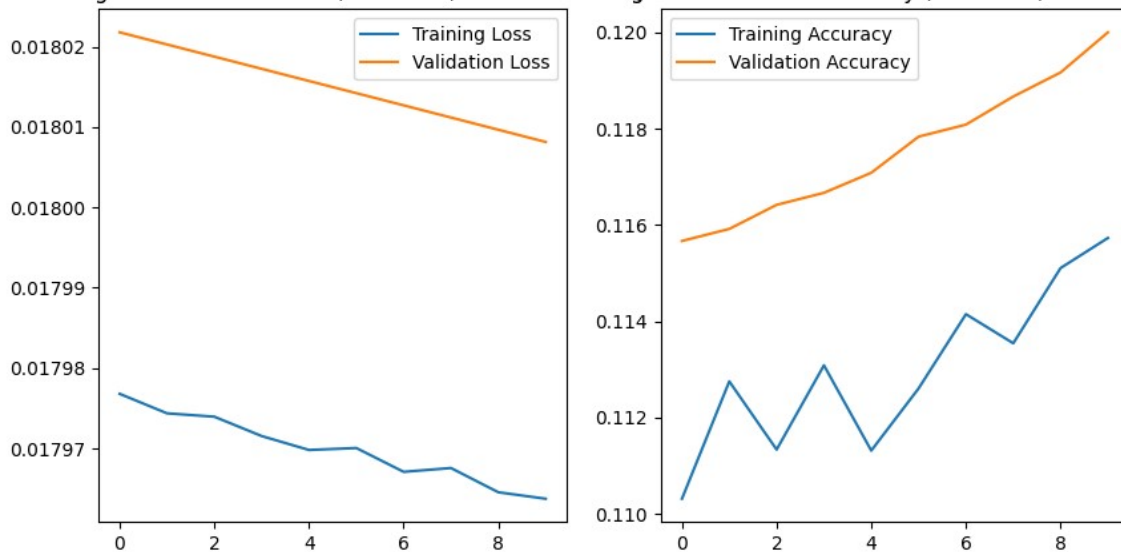
Predicted: 8, Actual: 6



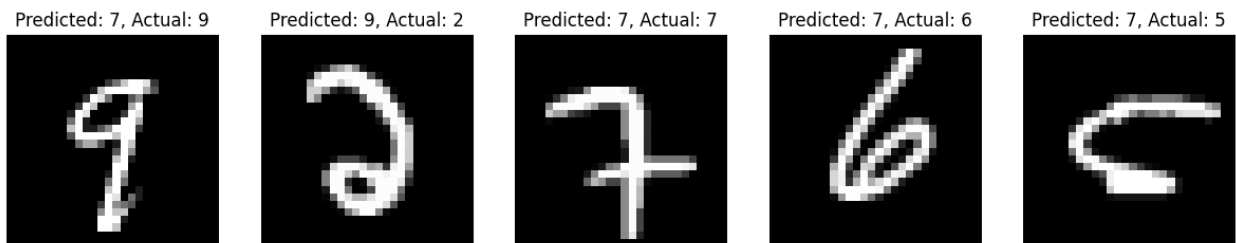
Batch Size: 128

Epoch [1/10], Training Loss: 0.0180, Training Accuracy: 0.1103,
Validation Loss: 0.0180, Validation Accuracy: 0.1157
Epoch [2/10], Training Loss: 0.0180, Training Accuracy: 0.1128,
Validation Loss: 0.0180, Validation Accuracy: 0.1159
Epoch [3/10], Training Loss: 0.0180, Training Accuracy: 0.1113,
Validation Loss: 0.0180, Validation Accuracy: 0.1164
Epoch [4/10], Training Loss: 0.0180, Training Accuracy: 0.1131,
Validation Loss: 0.0180, Validation Accuracy: 0.1167
Epoch [5/10], Training Loss: 0.0180, Training Accuracy: 0.1113,
Validation Loss: 0.0180, Validation Accuracy: 0.1171
Epoch [6/10], Training Loss: 0.0180, Training Accuracy: 0.1126,
Validation Loss: 0.0180, Validation Accuracy: 0.1178
Epoch [7/10], Training Loss: 0.0180, Training Accuracy: 0.1141,
Validation Loss: 0.0180, Validation Accuracy: 0.1181
Epoch [8/10], Training Loss: 0.0180, Training Accuracy: 0.1135,
Validation Loss: 0.0180, Validation Accuracy: 0.1187
Epoch [9/10], Training Loss: 0.0180, Training Accuracy: 0.1151,
Validation Loss: 0.0180, Validation Accuracy: 0.1192
Epoch [10/10], Training Loss: 0.0180, Training Accuracy: 0.1157,
Validation Loss: 0.0180, Validation Accuracy: 0.1200

Training and Validation Loss (LR: 1e-05, Batch Size: 128) and Validation Accuracy (LR: 1e-05, Batch Size: 128)



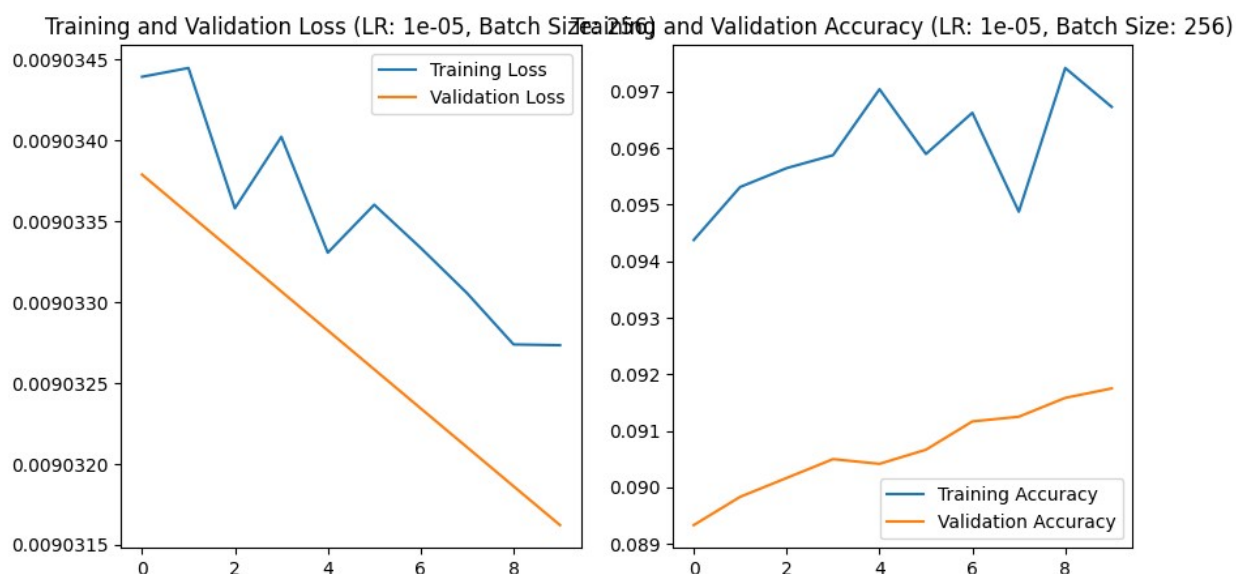
Final Training Accuracy: 0.1157
Final Validation Accuracy: 0.1200



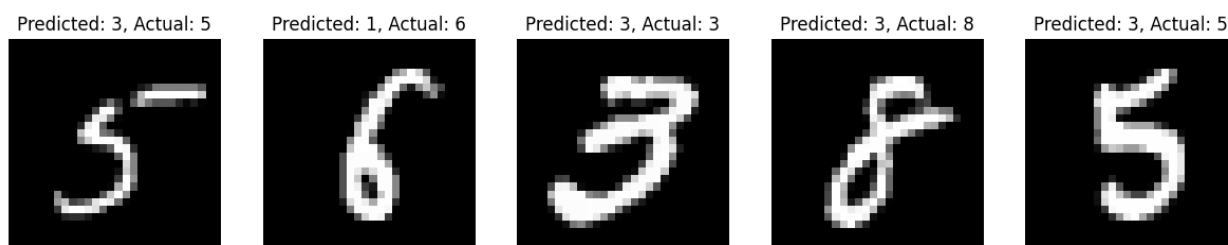
Batch Size: 256

Epoch [1/10], Training Loss: 0.0090, Training Accuracy: 0.0944, Validation Loss: 0.0090, Validation Accuracy: 0.0893
Epoch [2/10], Training Loss: 0.0090, Training Accuracy: 0.0953, Validation Loss: 0.0090, Validation Accuracy: 0.0898
Epoch [3/10], Training Loss: 0.0090, Training Accuracy: 0.0956, Validation Loss: 0.0090, Validation Accuracy: 0.0902
Epoch [4/10], Training Loss: 0.0090, Training Accuracy: 0.0959, Validation Loss: 0.0090, Validation Accuracy: 0.0905
Epoch [5/10], Training Loss: 0.0090, Training Accuracy: 0.0970, Validation Loss: 0.0090, Validation Accuracy: 0.0904
Epoch [6/10], Training Loss: 0.0090, Training Accuracy: 0.0959, Validation Loss: 0.0090, Validation Accuracy: 0.0907
Epoch [7/10], Training Loss: 0.0090, Training Accuracy: 0.0966, Validation Loss: 0.0090, Validation Accuracy: 0.0912
Epoch [8/10], Training Loss: 0.0090, Training Accuracy: 0.0949, Validation Loss: 0.0090, Validation Accuracy: 0.0912
Epoch [9/10], Training Loss: 0.0090, Training Accuracy: 0.0974, Validation Loss: 0.0090, Validation Accuracy: 0.0916

Epoch [10/10], Training Loss: 0.0090, Training Accuracy: 0.0967,
Validation Loss: 0.0090, Validation Accuracy: 0.0917



Final Training Accuracy: 0.0967
Final Validation Accuracy: 0.0917



Batch Size: 512

Epoch [1/10], Training Loss: 0.0045, Training Accuracy: 0.1189,
Validation Loss: 0.0046, Validation Accuracy: 0.1219

Epoch [2/10], Training Loss: 0.0045, Training Accuracy: 0.1192,
Validation Loss: 0.0046, Validation Accuracy: 0.1220

Epoch [3/10], Training Loss: 0.0045, Training Accuracy: 0.1203,
Validation Loss: 0.0046, Validation Accuracy: 0.1221

Epoch [4/10], Training Loss: 0.0045, Training Accuracy: 0.1194,
Validation Loss: 0.0046, Validation Accuracy: 0.1222

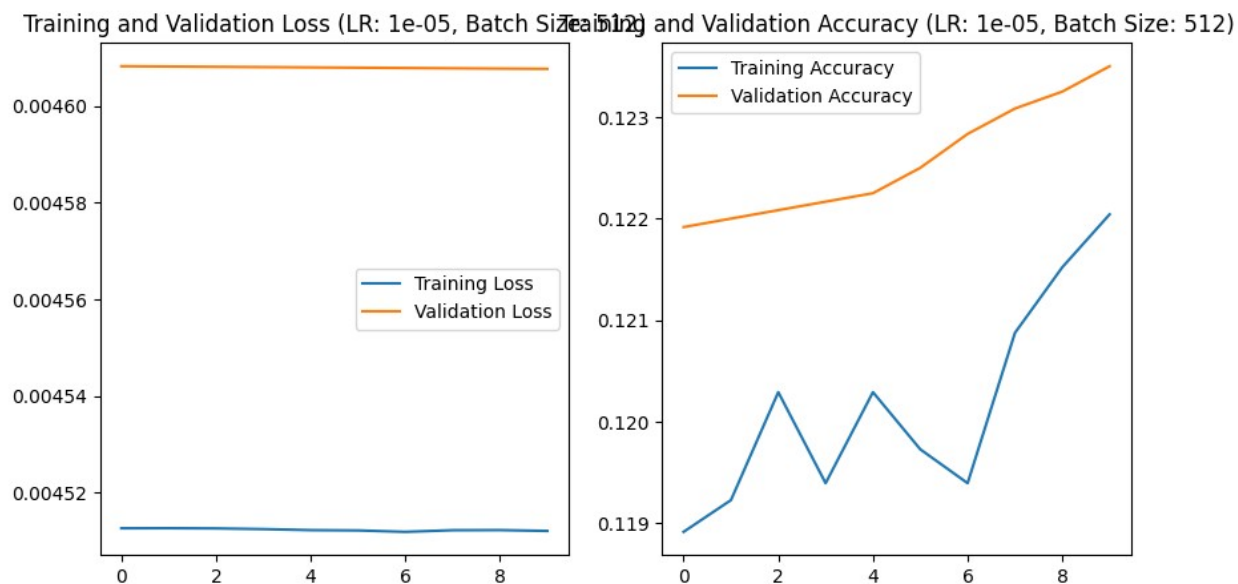
Epoch [5/10], Training Loss: 0.0045, Training Accuracy: 0.1203,
Validation Loss: 0.0046, Validation Accuracy: 0.1222

Epoch [6/10], Training Loss: 0.0045, Training Accuracy: 0.1197,
Validation Loss: 0.0046, Validation Accuracy: 0.1225

Epoch [7/10], Training Loss: 0.0045, Training Accuracy: 0.1194,
Validation Loss: 0.0046, Validation Accuracy: 0.1228

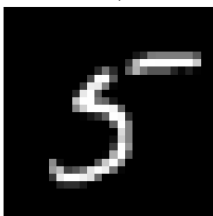
Epoch [8/10], Training Loss: 0.0045, Training Accuracy: 0.1209,

Validation Loss: 0.0046, Validation Accuracy: 0.1231
Epoch [9/10], Training Loss: 0.0045, Training Accuracy: 0.1215,
Validation Loss: 0.0046, Validation Accuracy: 0.1232
Epoch [10/10], Training Loss: 0.0045, Training Accuracy: 0.1220,
Validation Loss: 0.0046, Validation Accuracy: 0.1235

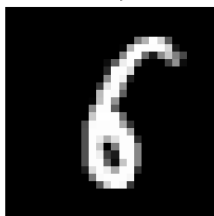


Final Training Accuracy: 0.1220
Final Validation Accuracy: 0.1235

Predicted: 9, Actual: 5



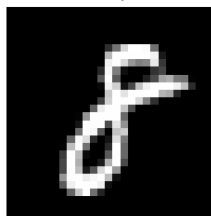
Predicted: 9, Actual: 6



Predicted: 9, Actual: 3



Predicted: 1, Actual: 8



Predicted: 9, Actual: 5

