

CS_228_DL_HW4

May 30, 2023

0.0.1 Imports

```
[1]: # include pytorch
import torch

# load dataset
import torchvision

# plot images
import matplotlib.pyplot as plt

# tabulate results of grid run
import pandas as pd

# for random normal choice for sampling
import numpy as np

# import for looking at batch progress
from tqdm import tqdm
```

```
[2]: # Set random seed for reproducibility
torch.manual_seed(42)
np.random.seed(0)

# Set desired number of samples per class
desired_samples = 1000

# Set desired batch size
batch_size = 100

# set total number of epochs
num_epochs = 80
```

0.0.2 Get Dataset

```
[3]: # create a custom transform that takes in an image and normalizes it to have 0 mean and 1 variance
class PerImageNormalize(torchvision.transforms.ToTensor):
    def __call__(self, pic):
        tensor = super().__call__(pic)
        tensor = tensor.reshape(-1,784)
        tensor = (tensor - torch.mean(tensor, axis=1, keepdims=True)) / (torch.
        std(tensor, axis=1, keepdims=True) + 1e-8)
        return tensor
```

```
[4]: # add transforms
transforms = torchvision.transforms.Compose([
    PerImageNormalize()
])

# create dataset
train_dataset = torchvision.datasets.MNIST(root='./', train=True,
        download=True, transform=transforms)
test_dataset = torchvision.datasets.MNIST(root='./', train=False,
        download=True, transform=transforms)
```

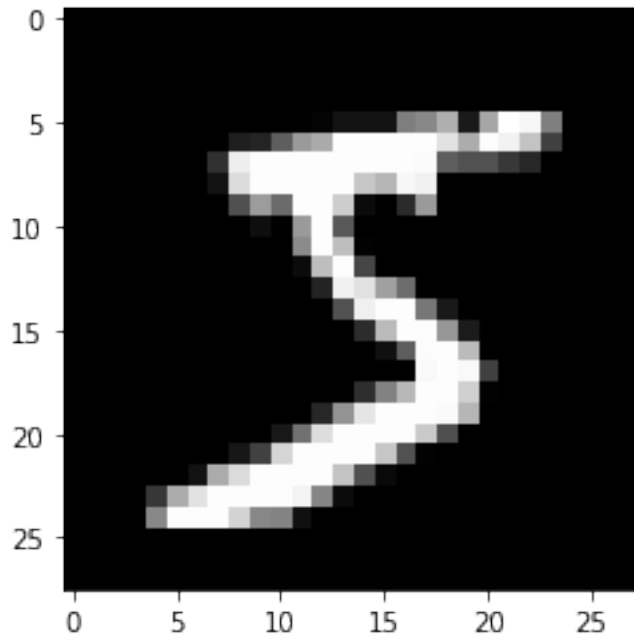
0.0.3 Visualize 1 sample

```
[5]: img, label = train_dataset[0]

print(label)
plt.imshow(img.reshape(28,28), cmap='gray')
```

5

```
[5]: <matplotlib.image.AxesImage at 0x17ef6f5b400>
```



0.0.4 Create Dataloaders with sampling

```
[6]: # Create a list to store the indices of the selected samples
selected_indices = []

# Iterate over each unique target class
for class_label in range(10):

    # Get the indices of samples belonging to the current class
    class_indices = torch.nonzero(train_dataset.targets == class_label).
    ↪squeeze()

    # Randomly select desired_samples number of samples from the class
    class_indices = torch.from_numpy(np.random.choice(class_indices,
    ↪desired_samples, replace=False))

    # Append the selected indices to the list
    selected_indices.append(class_indices)

# Concatenate the selected indices for all classes
selected_indices = torch.cat(selected_indices)

# Create a SubsetRandomSampler using the selected indices
sampler = torch.utils.data.SubsetRandomSampler(selected_indices)
```

```
[7]: # Create a DataLoader using the dataset and the sampler
# sampling is only needed for train set
train_dataloader = torch.utils.data.DataLoader(train_dataset,
    ↪batch_size=batch_size, sampler=sampler)
test_dataloader = torch.utils.data.DataLoader(train_dataset,
    ↪batch_size=batch_size)
```

0.0.5 Base Classifier

```
[8]: # Define the model architecture
# Architecture  $f(x) = \text{softmax}(V @ \text{ReLU}(W @ x))$ 

class MNISTClassifier(torch.nn.Module):
    def __init__(self, input_size, k, output_size, dropout_prob):
        super(MNISTClassifier, self).__init__()

        self.fc1 = torch.nn.Linear(input_size, k, bias=False)
        self.relu = torch.nn.ReLU()
        self.dropout = torch.nn.Dropout(dropout_prob)
        self.fc2 = torch.nn.Linear(k, output_size, bias=False)

        # Initialize weights with He initialization
        self.initialize_weights()

    def forward(self, x):
        x = self.fc1(x)
        x = self.relu(x)
        x = self.dropout(x)
        x = self.fc2(x)
        return x

    def initialize_weights(self):
        for m in self.modules():
            if isinstance(m, torch.nn.Linear):
                torch.nn.init.kaiming_normal_(m.weight, mode='fan_in',
    ↪nonlinearity='relu')
                # nn.init.constant_(m.bias, 0)

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

```
[9]: device
```

```
[9]: device(type='cuda')
```

0.0.6 Training Loop

```
[10]: # Training loop
def train_loop(train_loader, test_loader, n_epochs= 15, k=10, dropout_prob=0.1,
               lr = 0.001):

    # Initialize the model
    model = MNISTClassifier(784, k, 10, dropout_prob).to(device)

    # Define loss function and optimizer
    criterion = torch.nn.CrossEntropyLoss()
    optimizer = torch.optim.Adam(model.parameters(), lr=lr)

    train_loss_list = []
    test_loss_list = []
    train_acc_list = []
    test_acc_list = []

    # Training loop
    for epoch in range(n_epochs):

        print (f'Epoch : [{epoch}/{n_epochs}]')
        model.train()
        for batch_idx, (data, targets) in enumerate(tqdm(train_loader)):

            # Move data to device
            data = data.squeeze(1)
            data = data.to(device)
            targets = targets.to(device)

            # Forward pass
            outputs = model(data)
            loss = criterion(outputs, targets)

            # Backward and optimize
            optimizer.zero_grad()
            loss.backward()
            optimizer.step()

        if epoch == 0 or epoch+1 == n_epochs or epoch % 5 == 0:
            # Evaluation on the test set
            model.eval()
            with torch.no_grad():

                correct = 0
                total = 0
                for data, targets in test_loader:
```

```

        data = data.squeeze(1)
        data = data.to(device)
        targets = targets.to(device)

        outputs = model(data)
        loss = criterion(outputs, targets)

        _, predicted = torch.max(outputs.data, 1)
        total += targets.size(0)
        correct += (predicted == targets).sum().item()

    print(f"Accuracy on the train set: {(100 * correct / total):.
↪2f}%, Train Loss: {loss.item():.4f}")
    train_loss_list.append(loss.item())
    train_acc_list.append((100 * correct / total))

    # Evaluation on the test set
    correct = 0
    total = 0
    for data, targets in test_loader:

        data = data.squeeze(1)
        data = data.to(device)
        targets = targets.to(device)

        outputs = model(data)
        loss = criterion(outputs, targets)

        _, predicted = torch.max(outputs.data, 1)
        total += targets.size(0)
        correct += (predicted == targets).sum().item()

    print(f"Accuracy on the test set: {(100 * correct / total):.
↪2f}%, Test Loss: {loss.item():.4f}\n")
    test_loss_list.append(loss.item())
    test_acc_list.append((100 * correct / total))

    return train_loss_list, test_loss_list, train_acc_list, test_acc_list

```

```

[11]: train_loss, test_loss, train_acc, test_acc = train_loop(train_dataloader,
                                                             test_dataloader,
                                                             n_epochs=num_epochs,
                                                             k=40,
                                                             dropout_prob=0.1,
                                                             lr=0.001)

```

Epoch : [0/80]

100%|

| 100/100 [00:07<00:00, 12.51it/s]

Accuracy on the train set: 88.77%, Train Loss: 0.4470

Accuracy on the test set: 88.47%, Test Loss: 0.3581

Epoch : [1/80]

100%|

| 100/100 [00:04<00:00, 24.88it/s]

Epoch : [2/80]

100%|

| 100/100 [00:03<00:00, 26.62it/s]

Epoch : [3/80]

100%|

| 100/100 [00:03<00:00, 25.87it/s]

Epoch : [4/80]

100%|

| 100/100 [00:03<00:00, 28.72it/s]

Epoch : [5/80]

100%|

| 100/100 [00:03<00:00, 26.95it/s]

Accuracy on the train set: 96.56%, Train Loss: 0.1355

Accuracy on the test set: 94.18%, Test Loss: 0.2001

Epoch : [6/80]

100%|

| 100/100 [00:03<00:00, 25.39it/s]

Epoch : [7/80]

100%|

| 100/100 [00:03<00:00, 26.78it/s]

Epoch : [8/80]

100%|

| 100/100 [00:03<00:00, 26.12it/s]

Epoch : [9/80]

100%|

| 100/100 [00:04<00:00, 24.95it/s]

Epoch : [10/80]

100%|
| 100/100 [00:03<00:00, 25.87it/s]
Accuracy on the train set: 98.00%, Train Loss: 0.0988
Accuracy on the test set: 94.94%, Test Loss: 0.2296

Epoch : [11/80]
100%|
| 100/100 [00:03<00:00, 29.21it/s]
Epoch : [12/80]
100%|
| 100/100 [00:03<00:00, 25.32it/s]
Epoch : [13/80]
100%|
| 100/100 [00:03<00:00, 25.94it/s]
Epoch : [14/80]
100%|
| 100/100 [00:03<00:00, 30.23it/s]
Epoch : [15/80]
100%|
| 100/100 [00:03<00:00, 32.21it/s]
Accuracy on the train set: 99.03%, Train Loss: 0.0743
Accuracy on the test set: 95.54%, Test Loss: 0.2136

Epoch : [16/80]
100%|
| 100/100 [00:03<00:00, 31.33it/s]
Epoch : [17/80]
100%|
| 100/100 [00:02<00:00, 33.42it/s]
Epoch : [18/80]
100%|
| 100/100 [00:02<00:00, 34.03it/s]
Epoch : [19/80]
100%|
| 100/100 [00:03<00:00, 32.70it/s]
Epoch : [20/80]
100%|
| 100/100 [00:02<00:00, 33.58it/s]

Accuracy on the train set: 99.51%, Train Loss: 0.0244
Accuracy on the test set: 95.70%, Test Loss: 0.2416

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 34.54it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 34.44it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 33.64it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 34.07it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 34.13it/s]

Accuracy on the train set: 99.64%, Train Loss: 0.0244

Accuracy on the test set: 95.85%, Test Loss: 0.2187

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 28.78it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 29.10it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 31.03it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 29.56it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 30.26it/s]

Accuracy on the train set: 99.78%, Train Loss: 0.0120
Accuracy on the test set: 95.81%, Test Loss: 0.2406

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 30.81it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 29.53it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 31.56it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 31.46it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 30.01it/s]

Accuracy on the train set: 99.86%, Train Loss: 0.0124

Accuracy on the test set: 95.84%, Test Loss: 0.2876

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 34.81it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 35.82it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 28.10it/s]

Epoch : [39/80]

100%|

| 100/100 [00:04<00:00, 23.98it/s]

Epoch : [40/80]

100%|

| 100/100 [00:04<00:00, 21.37it/s]

Accuracy on the train set: 99.96%, Train Loss: 0.0188
Accuracy on the test set: 95.93%, Test Loss: 0.2823

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 36.04it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 34.47it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 37.30it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 35.94it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 34.21it/s]

Accuracy on the train set: 99.92%, Train Loss: 0.0121

Accuracy on the test set: 95.72%, Test Loss: 0.2761

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 36.35it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 36.26it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 36.17it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 37.70it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 31.26it/s]

Accuracy on the train set: 99.96%, Train Loss: 0.0051
Accuracy on the test set: 95.80%, Test Loss: 0.3427

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 27.47it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 28.34it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 26.52it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 26.82it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 26.89it/s]

Accuracy on the train set: 99.97%, Train Loss: 0.0048

Accuracy on the test set: 95.87%, Test Loss: 0.3299

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 31.48it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 31.54it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 31.72it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 27.68it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 29.37it/s]

Accuracy on the train set: 99.98%, Train Loss: 0.0012
Accuracy on the test set: 95.73%, Test Loss: 0.3640

Epoch : [61/80]

100%|

| 100/100 [00:04<00:00, 24.94it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 26.15it/s]

Epoch : [63/80]

100%|

| 100/100 [00:03<00:00, 27.58it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 27.85it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 26.21it/s]

Accuracy on the train set: 99.98%, Train Loss: 0.0111

Accuracy on the test set: 95.82%, Test Loss: 0.3221

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 26.43it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 26.20it/s]

Epoch : [68/80]

100%|

| 100/100 [00:04<00:00, 23.03it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 25.12it/s]

Epoch : [70/80]

100%|

| 100/100 [00:04<00:00, 24.43it/s]

Accuracy on the train set: 99.98%, Train Loss: 0.0015
Accuracy on the test set: 95.86%, Test Loss: 0.3371

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 25.63it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 25.85it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 26.14it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 25.62it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 26.02it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0016
Accuracy on the test set: 95.78%, Test Loss: 0.3842

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 25.23it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 25.70it/s]

Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 26.17it/s]

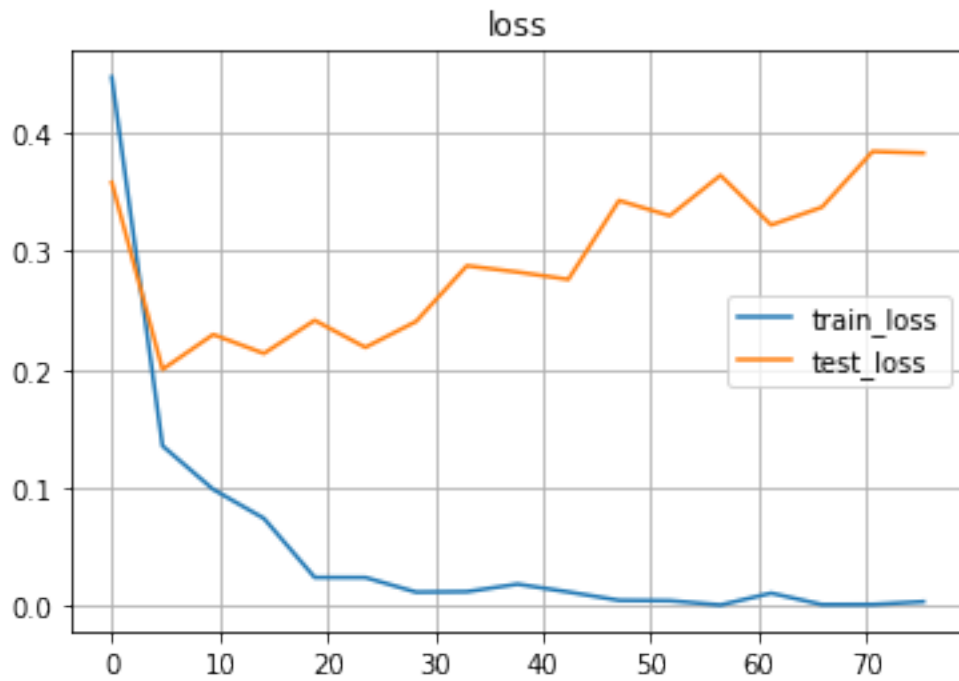
Epoch : [79/80]

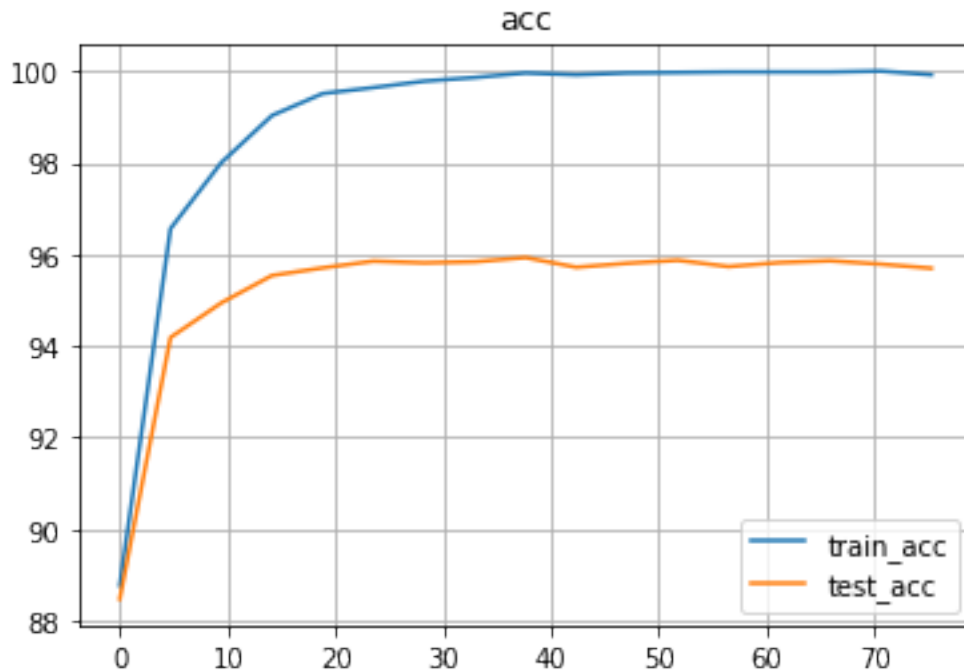
100%|
| 100/100 [00:03<00:00, 26.10it/s]

Accuracy on the train set: 99.92%, Train Loss: 0.0040
Accuracy on the test set: 95.69%, Test Loss: 0.3828

```
[12]: def plot_list(l1,l1_title, l2,l2_title, plt_title):
    plt.figure(1)
    plt.title(plt_title)
    plt.plot(torch.arange(0,num_epochs,num_epochs/len(l1)), l1, label=l1_title)
    plt.plot(torch.arange(0,num_epochs,num_epochs/len(l2)), l2, label=l2_title)
    plt.legend()
    plt.grid()
    plt.show()

plot_list(train_loss,'train_loss', test_loss,'test_loss', 'loss')
plot_list(train_acc,'train_acc', test_acc,'test_acc', 'acc')
```





0.0.7 Grid Run

```
[13]: records = []

for k in [1,5,10,20,40]:
    for dropout_prob in [0.1, 0.5, 1.0]:

        print (f'----- for k = {k} and dropout = {dropout_prob} -----')
        train_loss, test_loss, train_acc, test_acc =
        ↪train_loop(train_dataloader,                                test_dataloader,
                                                         ↪
        ↪n_epochs=num_epochs,                                    k=k,
                                                         ↪
        ↪dropout_prob=1-dropout_prob,                            lr=0.001)

        plot_list(train_loss,'train_loss', test_loss,'test_loss', f'loss for ↪
        ↪k={k} and drop={dropout_prob}')
        plot_list(train_acc,'train_acc', test_acc,'test_acc', f'acc for k={k} ↪
        ↪and drop={dropout_prob}')

        records.append({
```



```

        'k':k,
        'dropout_prob':dropout_prob,
        'train_loss':train_loss,
        'test_loss': test_loss,
        'train_acc': train_acc,
        'test_acc': test_acc
    })

```

----- for k = 1 and dropout = 0.1 -----

Epoch : [0/80]

100%|

| 100/100 [00:04<00:00, 22.85it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [1/80]

100%|

| 100/100 [00:03<00:00, 25.96it/s]

Epoch : [2/80]

100%|

| 100/100 [00:03<00:00, 25.76it/s]

Epoch : [3/80]

100%|

| 100/100 [00:03<00:00, 25.71it/s]

Epoch : [4/80]

100%|

| 100/100 [00:03<00:00, 25.61it/s]

Epoch : [5/80]

100%|

| 100/100 [00:03<00:00, 25.36it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [6/80]

100%|

| 100/100 [00:03<00:00, 25.40it/s]

Epoch : [7/80]

100%|

| 100/100 [00:03<00:00, 25.52it/s]

Epoch : [8/80]
100%|
| 100/100 [00:03<00:00, 25.86it/s]
Epoch : [9/80]
100%|
| 100/100 [00:04<00:00, 24.52it/s]
Epoch : [10/80]
100%|
| 100/100 [00:04<00:00, 24.89it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026
Epoch : [11/80]
100%|
| 100/100 [00:03<00:00, 25.65it/s]
Epoch : [12/80]
100%|
| 100/100 [00:04<00:00, 23.67it/s]
Epoch : [13/80]
100%|
| 100/100 [00:03<00:00, 25.12it/s]
Epoch : [14/80]
100%|
| 100/100 [00:03<00:00, 25.80it/s]
Epoch : [15/80]
100%|
| 100/100 [00:03<00:00, 25.44it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026
Epoch : [16/80]
100%|
| 100/100 [00:03<00:00, 25.52it/s]
Epoch : [17/80]
100%|
| 100/100 [00:03<00:00, 25.18it/s]
Epoch : [18/80]

```

100%|
  | 100/100 [00:04<00:00, 24.50it/s]
Epoch : [19/80]
100%|
  | 100/100 [00:03<00:00, 25.37it/s]
Epoch : [20/80]
100%|
  | 100/100 [00:03<00:00, 26.12it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026
Epoch : [21/80]
100%|
  | 100/100 [00:03<00:00, 28.24it/s]
Epoch : [22/80]
100%|
  | 100/100 [00:03<00:00, 27.35it/s]
Epoch : [23/80]
100%|
  | 100/100 [00:03<00:00, 26.00it/s]
Epoch : [24/80]
100%|
  | 100/100 [00:03<00:00, 25.75it/s]
Epoch : [25/80]
100%|
  | 100/100 [00:03<00:00, 25.88it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026
Epoch : [26/80]
100%|
  | 100/100 [00:03<00:00, 26.60it/s]
Epoch : [27/80]
100%|
  | 100/100 [00:03<00:00, 26.08it/s]
Epoch : [28/80]
100%|
  | 100/100 [00:03<00:00, 26.14it/s]

```

Epoch : [29/80]
100%|
| 100/100 [00:03<00:00, 26.18it/s]
Epoch : [30/80]
100%|
| 100/100 [00:03<00:00, 27.03it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026
Epoch : [31/80]
100%|
| 100/100 [00:03<00:00, 26.09it/s]
Epoch : [32/80]
100%|
| 100/100 [00:03<00:00, 25.95it/s]
Epoch : [33/80]
100%|
| 100/100 [00:04<00:00, 23.94it/s]
Epoch : [34/80]
100%|
| 100/100 [00:03<00:00, 25.83it/s]
Epoch : [35/80]
100%|
| 100/100 [00:03<00:00, 26.93it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026
Epoch : [36/80]
100%|
| 100/100 [00:03<00:00, 25.34it/s]
Epoch : [37/80]
100%|
| 100/100 [00:03<00:00, 26.55it/s]
Epoch : [38/80]
100%|
| 100/100 [00:04<00:00, 24.24it/s]
Epoch : [39/80]

```

100%|
  | 100/100 [00:03<00:00, 26.02it/s]
Epoch : [40/80]
100%|
  | 100/100 [00:03<00:00, 26.20it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [41/80]
100%|
  | 100/100 [00:04<00:00, 23.39it/s]
Epoch : [42/80]
100%|
  | 100/100 [00:04<00:00, 24.42it/s]
Epoch : [43/80]
100%|
  | 100/100 [00:04<00:00, 23.42it/s]
Epoch : [44/80]
100%|
  | 100/100 [00:04<00:00, 20.01it/s]
Epoch : [45/80]
100%|
  | 100/100 [00:04<00:00, 21.22it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [46/80]
100%|
  | 100/100 [00:03<00:00, 26.48it/s]
Epoch : [47/80]
100%|
  | 100/100 [00:03<00:00, 25.34it/s]
Epoch : [48/80]
100%|
  | 100/100 [00:04<00:00, 24.32it/s]
Epoch : [49/80]
100%|
  | 100/100 [00:03<00:00, 25.49it/s]

```

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 26.93it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 25.39it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 25.35it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 25.57it/s]

Epoch : [54/80]

100%|

| 100/100 [00:04<00:00, 23.57it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 25.26it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 26.62it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 26.15it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 25.08it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 27.63it/s]

Epoch : [60/80]

100%|
| 100/100 [00:03<00:00, 28.24it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [61/80]
100%|
| 100/100 [00:03<00:00, 26.05it/s]
Epoch : [62/80]
100%|
| 100/100 [00:03<00:00, 26.37it/s]
Epoch : [63/80]
100%|
| 100/100 [00:03<00:00, 25.69it/s]
Epoch : [64/80]
100%|
| 100/100 [00:03<00:00, 25.66it/s]
Epoch : [65/80]
100%|
| 100/100 [00:03<00:00, 27.49it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [66/80]
100%|
| 100/100 [00:03<00:00, 25.64it/s]
Epoch : [67/80]
100%|
| 100/100 [00:03<00:00, 27.60it/s]
Epoch : [68/80]
100%|
| 100/100 [00:03<00:00, 26.52it/s]
Epoch : [69/80]
100%|
| 100/100 [00:03<00:00, 28.82it/s]
Epoch : [70/80]
100%|
| 100/100 [00:03<00:00, 27.86it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 28.22it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 27.83it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 26.16it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 27.06it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 26.97it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 26.78it/s]

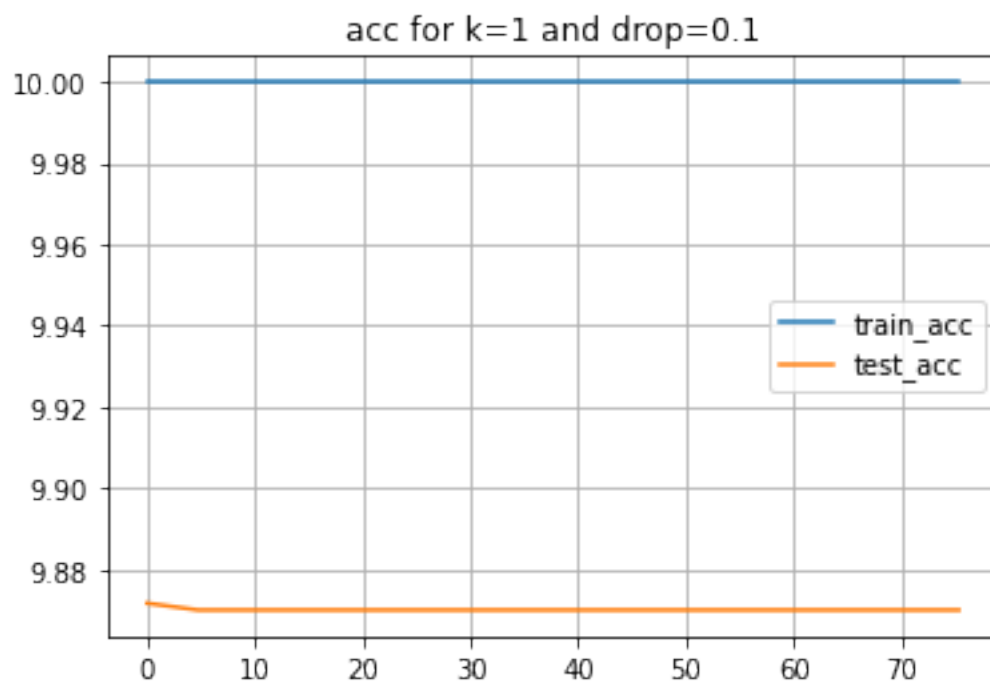
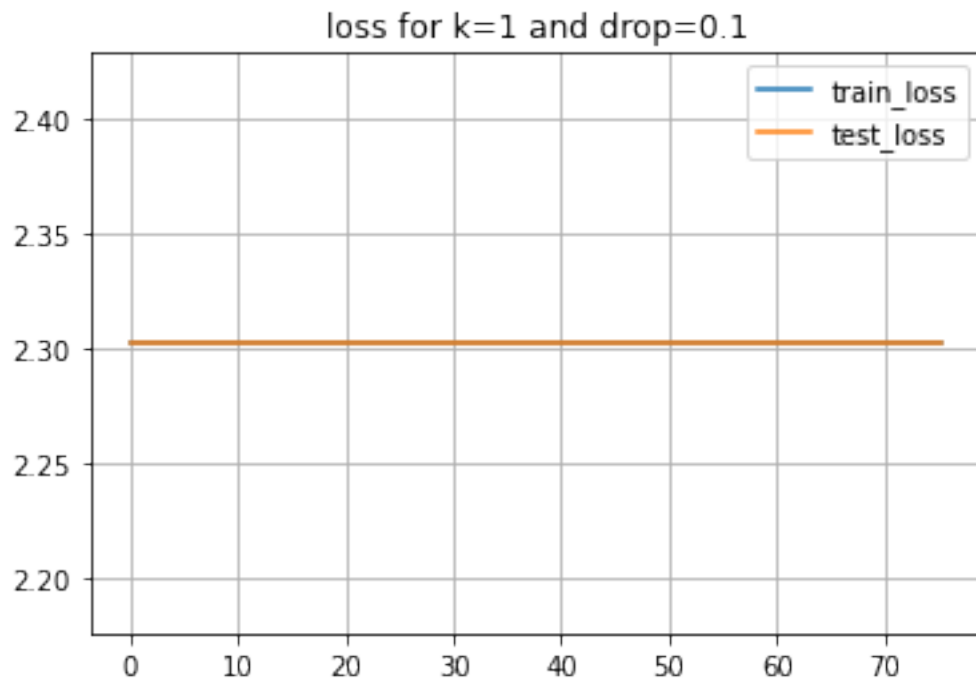
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 25.77it/s]

Epoch : [79/80]

100%|
| 100/100 [00:04<00:00, 24.99it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026



----- for k = 1 and dropout = 0.5 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 26.22it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 27.76it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 26.82it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 27.50it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 27.61it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 26.28it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 27.45it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 26.97it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 25.86it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 26.76it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:03<00:00, 25.88it/s]

```

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [11/80]

100%|
| 100/100 [00:03<00:00, 25.57it/s]

Epoch : [12/80]

100%|
| 100/100 [00:03<00:00, 27.11it/s]

Epoch : [13/80]

100%|
| 100/100 [00:03<00:00, 28.59it/s]

Epoch : [14/80]

100%|
| 100/100 [00:03<00:00, 27.68it/s]

Epoch : [15/80]

100%|
| 100/100 [00:03<00:00, 28.69it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [16/80]

100%|
| 100/100 [00:04<00:00, 24.43it/s]

Epoch : [17/80]

100%|
| 100/100 [00:04<00:00, 24.13it/s]

Epoch : [18/80]

100%|
| 100/100 [00:03<00:00, 27.07it/s]

Epoch : [19/80]

100%|
| 100/100 [00:03<00:00, 25.30it/s]

Epoch : [20/80]

100%|
| 100/100 [00:03<00:00, 25.91it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [21/80]

100%|
| 100/100 [00:03<00:00, 32.54it/s]

Epoch : [22/80]

100%|
| 100/100 [00:03<00:00, 25.33it/s]

Epoch : [23/80]

100%|
| 100/100 [00:03<00:00, 26.18it/s]

Epoch : [24/80]

100%|
| 100/100 [00:03<00:00, 27.26it/s]

Epoch : [25/80]

100%|
| 100/100 [00:03<00:00, 29.04it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [26/80]

100%|
| 100/100 [00:03<00:00, 27.37it/s]

Epoch : [27/80]

100%|
| 100/100 [00:03<00:00, 26.17it/s]

Epoch : [28/80]

100%|
| 100/100 [00:03<00:00, 26.19it/s]

Epoch : [29/80]

100%|
| 100/100 [00:03<00:00, 25.98it/s]

Epoch : [30/80]

100%|
| 100/100 [00:03<00:00, 28.01it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 26.16it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 27.32it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 25.56it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 25.60it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 26.49it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 28.11it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 27.55it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 27.43it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 26.56it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 27.83it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 28.06it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 28.78it/s]

Epoch : [43/80]

100%|

| 100/100 [00:04<00:00, 24.74it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 26.15it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 28.13it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 28.32it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 28.00it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 28.09it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 27.76it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 27.87it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 28.83it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 29.65it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 27.48it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 25.77it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 28.53it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 27.20it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 28.38it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 28.88it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 25.66it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 28.16it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [61/80]

100%|
| 100/100 [00:03<00:00, 28.48it/s]

Epoch : [62/80]

100%|
| 100/100 [00:03<00:00, 28.82it/s]

Epoch : [63/80]

100%|
| 100/100 [00:03<00:00, 27.08it/s]

Epoch : [64/80]

100%|
| 100/100 [00:03<00:00, 26.92it/s]

Epoch : [65/80]

100%|
| 100/100 [00:03<00:00, 27.57it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [66/80]

100%|
| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [67/80]

100%|
| 100/100 [00:03<00:00, 27.05it/s]

Epoch : [68/80]

100%|
| 100/100 [00:03<00:00, 27.31it/s]

Epoch : [69/80]

100%|
| 100/100 [00:03<00:00, 27.50it/s]

Epoch : [70/80]

100%|
| 100/100 [00:03<00:00, 26.07it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 27.64it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 27.87it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 25.91it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 27.35it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 27.00it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 27.82it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 29.28it/s]

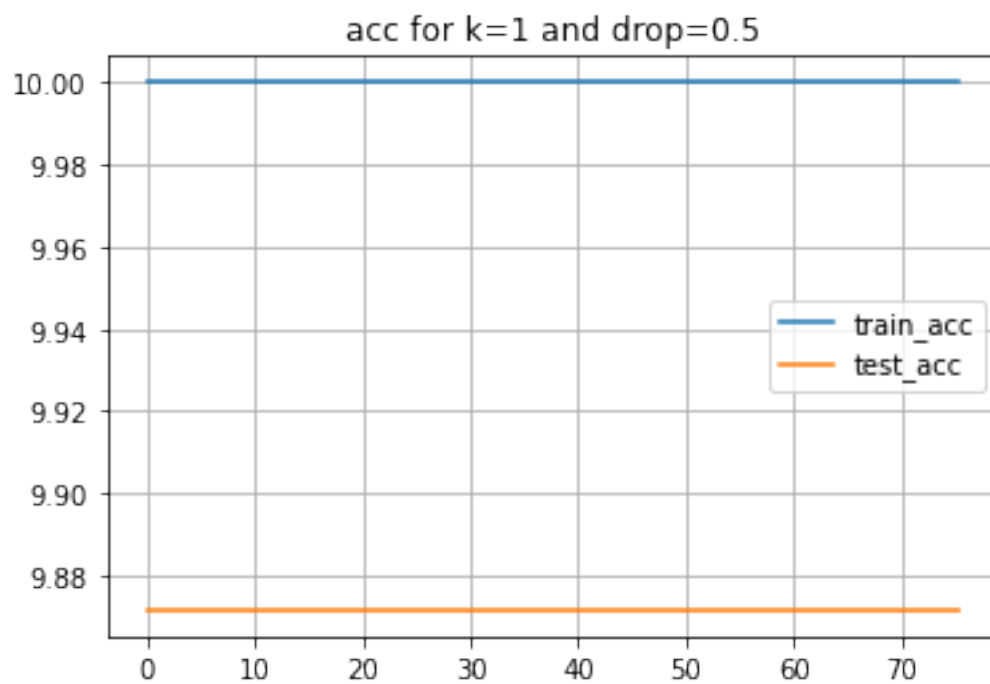
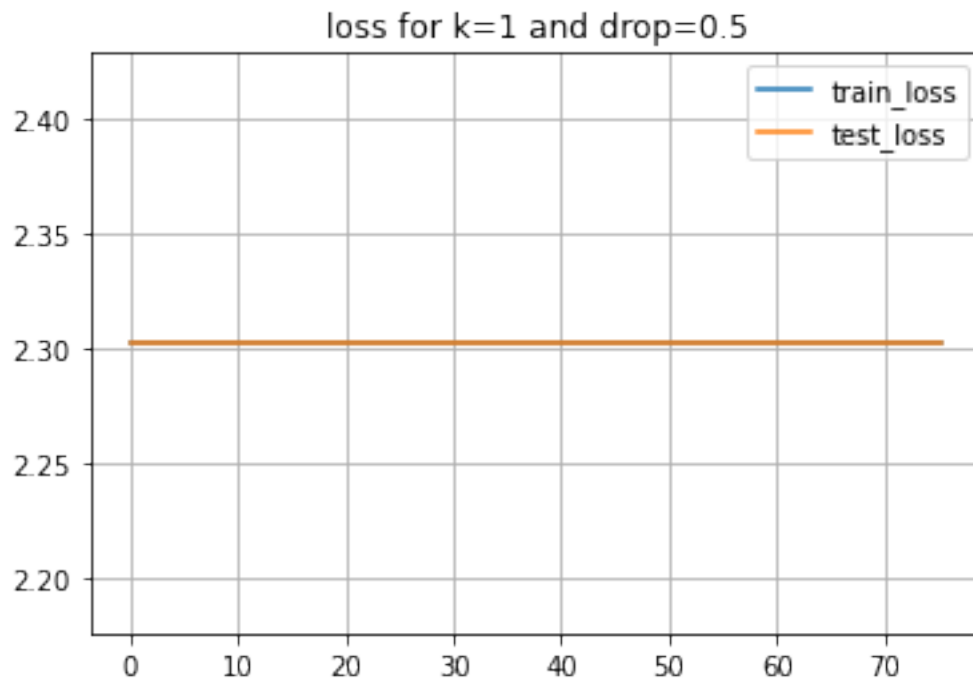
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 26.63it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 26.46it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3026



----- for k = 1 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:03<00:00, 27.96it/s]
Accuracy on the train set: 10.34%, Train Loss: 2.2761
Accuracy on the test set: 10.16%, Test Loss: 2.3041

Epoch : [1/80]
100%|
| 100/100 [00:03<00:00, 27.14it/s]
Epoch : [2/80]
100%|
| 100/100 [00:03<00:00, 26.93it/s]
Epoch : [3/80]
100%|
| 100/100 [00:03<00:00, 27.88it/s]
Epoch : [4/80]
100%|
| 100/100 [00:03<00:00, 28.54it/s]
Epoch : [5/80]
100%|
| 100/100 [00:03<00:00, 27.13it/s]
Accuracy on the train set: 19.79%, Train Loss: 2.0476
Accuracy on the test set: 20.77%, Test Loss: 2.0642

Epoch : [6/80]
100%|
| 100/100 [00:03<00:00, 26.68it/s]
Epoch : [7/80]
100%|
| 100/100 [00:03<00:00, 28.60it/s]
Epoch : [8/80]
100%|
| 100/100 [00:03<00:00, 29.15it/s]
Epoch : [9/80]
100%|
| 100/100 [00:03<00:00, 27.31it/s]
Epoch : [10/80]
100%|
| 100/100 [00:03<00:00, 28.38it/s]

Accuracy on the train set: 19.74%, Train Loss: 2.0797
Accuracy on the test set: 20.73%, Test Loss: 2.0498

Epoch : [11/80]

100%|

| 100/100 [00:04<00:00, 24.46it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 27.79it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 28.18it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 29.23it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 27.75it/s]

Accuracy on the train set: 19.80%, Train Loss: 2.0348

Accuracy on the test set: 20.83%, Test Loss: 2.0383

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 27.76it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 27.64it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 26.38it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 28.49it/s]

Accuracy on the train set: 19.79%, Train Loss: 2.0808
Accuracy on the test set: 20.75%, Test Loss: 2.0368

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 26.66it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 26.90it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 26.50it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 28.21it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 28.57it/s]

Accuracy on the train set: 19.79%, Train Loss: 2.1082

Accuracy on the test set: 20.78%, Test Loss: 2.0501

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 27.18it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 28.27it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 29.61it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 29.06it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 28.14it/s]

Accuracy on the train set: 19.81%, Train Loss: 2.0389
Accuracy on the test set: 20.80%, Test Loss: 2.0355

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 28.16it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 27.95it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 27.61it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 29.35it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 27.63it/s]

Accuracy on the train set: 19.80%, Train Loss: 2.0278

Accuracy on the test set: 20.81%, Test Loss: 2.0340

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 26.10it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 28.96it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 27.53it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 30.08it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 27.65it/s]

Accuracy on the train set: 19.82%, Train Loss: 1.9504
Accuracy on the test set: 20.82%, Test Loss: 2.0298

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 25.58it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 27.15it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 28.08it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 28.50it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 28.55it/s]

Accuracy on the train set: 19.79%, Train Loss: 2.0008

Accuracy on the test set: 20.80%, Test Loss: 2.0269

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 27.18it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 27.08it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 27.41it/s]

Accuracy on the train set: 19.78%, Train Loss: 2.0703
Accuracy on the test set: 20.81%, Test Loss: 1.9962

Epoch : [51/80]

100%|

| 100/100 [00:04<00:00, 23.09it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 27.88it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 27.72it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 26.74it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 26.76it/s]

Accuracy on the train set: 19.81%, Train Loss: 1.9074

Accuracy on the test set: 20.81%, Test Loss: 2.0044

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 26.53it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 26.59it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 25.97it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 27.39it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 25.94it/s]

Accuracy on the train set: 19.83%, Train Loss: 2.0627
Accuracy on the test set: 20.82%, Test Loss: 2.0149

Epoch : [61/80]

100%|

| 100/100 [00:03<00:00, 28.46it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 26.84it/s]

Epoch : [63/80]

100%|

| 100/100 [00:03<00:00, 28.55it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 30.02it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 29.02it/s]

Accuracy on the train set: 19.83%, Train Loss: 2.0301

Accuracy on the test set: 20.84%, Test Loss: 2.0149

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 30.81it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 29.82it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 30.42it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 30.69it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 29.86it/s]

Accuracy on the train set: 19.82%, Train Loss: 1.9791
Accuracy on the test set: 20.79%, Test Loss: 2.0125

Epoch : [71/80]

100%|

| 100/100 [00:04<00:00, 24.35it/s]

Epoch : [72/80]

100%|

| 100/100 [00:03<00:00, 26.83it/s]

Epoch : [73/80]

100%|

| 100/100 [00:03<00:00, 27.59it/s]

Epoch : [74/80]

100%|

| 100/100 [00:03<00:00, 27.86it/s]

Epoch : [75/80]

100%|

| 100/100 [00:03<00:00, 28.01it/s]

Accuracy on the train set: 19.77%, Train Loss: 1.9997

Accuracy on the test set: 20.71%, Test Loss: 2.0362

Epoch : [76/80]

100%|

| 100/100 [00:03<00:00, 26.90it/s]

Epoch : [77/80]

100%|

| 100/100 [00:03<00:00, 27.89it/s]

Epoch : [78/80]

100%|

| 100/100 [00:03<00:00, 26.49it/s]

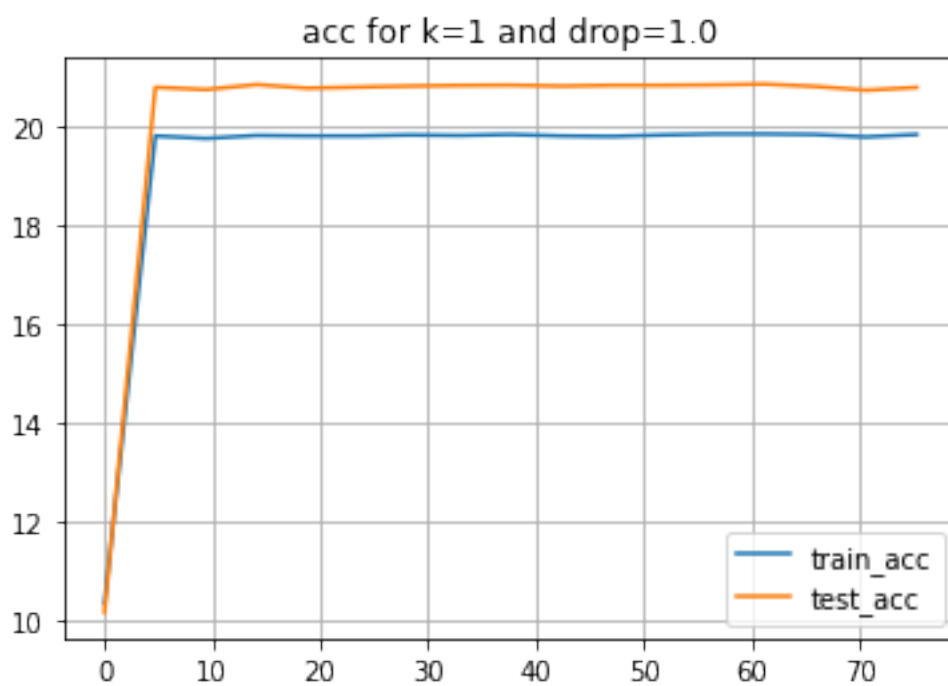
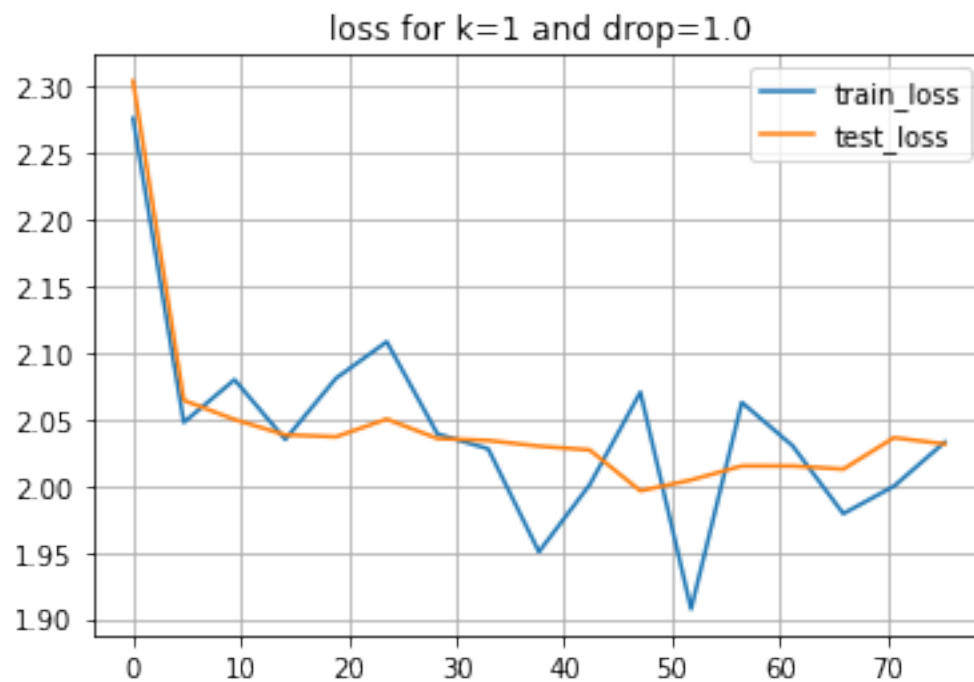
Epoch : [79/80]

100%|

| 100/100 [00:03<00:00, 26.25it/s]

Accuracy on the train set: 19.82%, Train Loss: 2.0328

Accuracy on the test set: 20.77%, Test Loss: 2.0314



----- for k = 5 and dropout = 0.1 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 26.66it/s]

Accuracy on the train set: 10.10%, Train Loss: 2.2997
Accuracy on the test set: 9.96%, Test Loss: 2.3026

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 29.30it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 30.13it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 30.90it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:04<00:00, 24.66it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 27.69it/s]

Accuracy on the train set: 10.08%, Train Loss: 2.3026
Accuracy on the test set: 9.97%, Test Loss: 2.3026

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 31.02it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 30.41it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 26.16it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:04<00:00, 23.00it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:03<00:00, 26.22it/s]

```

Accuracy on the train set: 10.06%, Train Loss: 2.3026
Accuracy on the test set: 9.94%, Test Loss: 2.3026

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 25.29it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 28.34it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 28.75it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 28.72it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 26.79it/s]

Accuracy on the train set: 10.05%, Train Loss: 2.3026

Accuracy on the test set: 9.93%, Test Loss: 2.3026

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 28.83it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 29.26it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 30.14it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 28.27it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 28.73it/s]

Accuracy on the train set: 10.58%, Train Loss: 2.2920
Accuracy on the test set: 10.44%, Test Loss: 2.2971

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 27.73it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 29.18it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 32.55it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 31.25it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 31.25it/s]

Accuracy on the train set: 10.05%, Train Loss: 2.3026

Accuracy on the test set: 9.91%, Test Loss: 2.3026

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 29.68it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 28.50it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 28.03it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 27.55it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 28.41it/s]

Accuracy on the train set: 10.27%, Train Loss: 2.3026
Accuracy on the test set: 10.10%, Test Loss: 2.2934

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 26.70it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 27.43it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 27.01it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 26.97it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 26.53it/s]

Accuracy on the train set: 11.47%, Train Loss: 2.2539

Accuracy on the test set: 11.18%, Test Loss: 2.2044

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 27.06it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 26.69it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 27.93it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 25.62it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 26.77it/s]

Accuracy on the train set: 11.89%, Train Loss: 2.2876
Accuracy on the test set: 11.61%, Test Loss: 2.1874

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 27.67it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 26.87it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 26.82it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 27.60it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 26.81it/s]

Accuracy on the train set: 12.37%, Train Loss: 2.2493

Accuracy on the test set: 12.05%, Test Loss: 2.1940

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 27.46it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 27.05it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 27.07it/s]

Epoch : [49/80]

100%|

| 100/100 [00:04<00:00, 24.54it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 27.68it/s]

Accuracy on the train set: 12.95%, Train Loss: 2.2893
Accuracy on the test set: 12.58%, Test Loss: 2.1887

Epoch : [51/80]

100%|
| 100/100 [00:03<00:00, 26.67it/s]

Epoch : [52/80]

100%|
| 100/100 [00:03<00:00, 26.59it/s]

Epoch : [53/80]

100%|
| 100/100 [00:03<00:00, 27.07it/s]

Epoch : [54/80]

100%|
| 100/100 [00:03<00:00, 26.01it/s]

Epoch : [55/80]

100%|
| 100/100 [00:03<00:00, 27.48it/s]

Accuracy on the train set: 14.93%, Train Loss: 2.2505
Accuracy on the test set: 14.26%, Test Loss: 2.1777

Epoch : [56/80]

100%|
| 100/100 [00:03<00:00, 28.28it/s]

Epoch : [57/80]

100%|
| 100/100 [00:03<00:00, 26.48it/s]

Epoch : [58/80]

100%|
| 100/100 [00:03<00:00, 26.82it/s]

Epoch : [59/80]

100%|
| 100/100 [00:03<00:00, 26.27it/s]

Epoch : [60/80]

100%|
| 100/100 [00:03<00:00, 27.90it/s]

Accuracy on the train set: 16.35%, Train Loss: 2.1587
Accuracy on the test set: 15.61%, Test Loss: 2.1451

Epoch : [61/80]

100%|

| 100/100 [00:03<00:00, 27.01it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 27.14it/s]

Epoch : [63/80]

100%|

| 100/100 [00:04<00:00, 24.56it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 27.00it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 27.80it/s]

Accuracy on the train set: 16.49%, Train Loss: 2.2049

Accuracy on the test set: 15.70%, Test Loss: 2.1654

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 26.78it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 27.35it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 26.62it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 26.62it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 26.98it/s]

Accuracy on the train set: 16.80%, Train Loss: 2.2206
Accuracy on the test set: 15.97%, Test Loss: 2.1478

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 28.65it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 26.76it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 26.91it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 26.40it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 25.76it/s]

Accuracy on the train set: 16.95%, Train Loss: 2.2044
Accuracy on the test set: 16.11%, Test Loss: 2.1737

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 25.51it/s]

Epoch : [77/80]

100%|
| 100/100 [00:04<00:00, 23.80it/s]

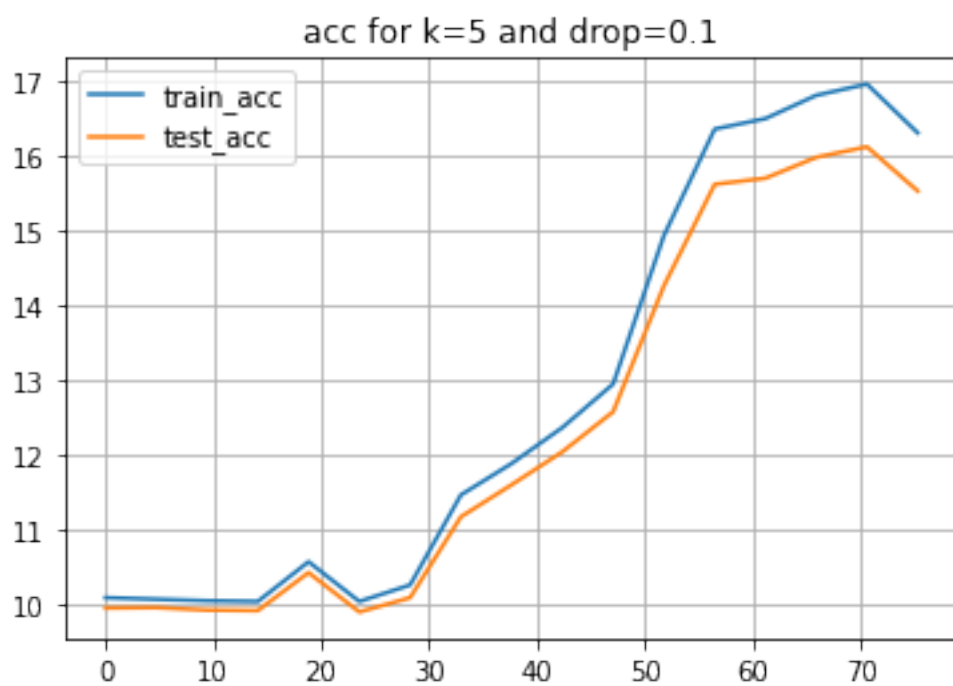
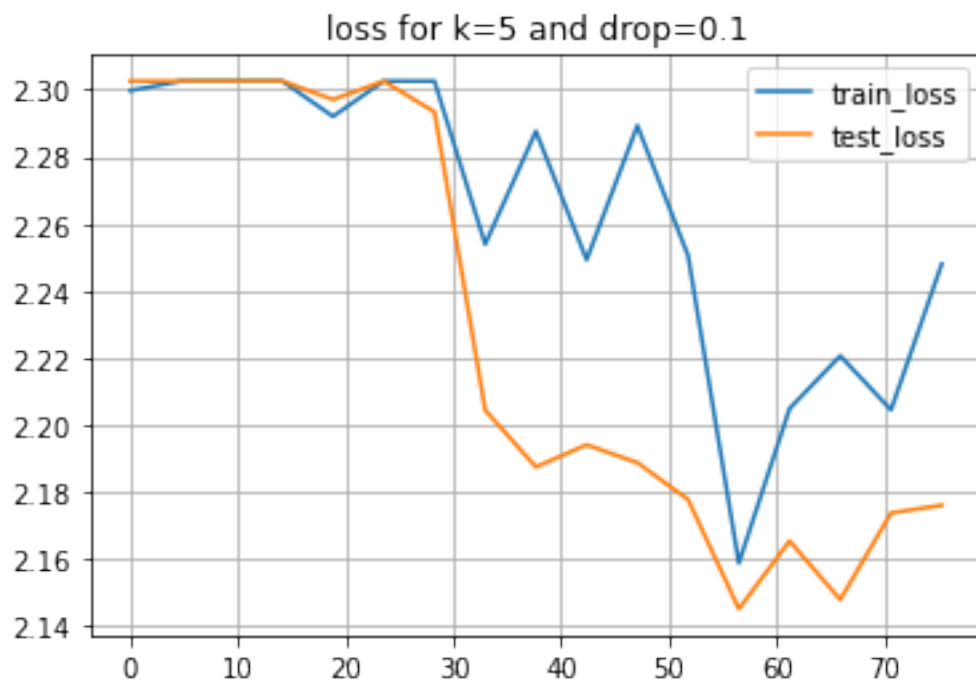
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 26.52it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 25.51it/s]

Accuracy on the train set: 16.30%, Train Loss: 2.2480
Accuracy on the test set: 15.53%, Test Loss: 2.1760



----- for k = 5 and dropout = 0.5 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 25.80it/s]

Accuracy on the train set: 28.80%, Train Loss: 2.0639
Accuracy on the test set: 28.98%, Test Loss: 2.0929

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 27.84it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 26.62it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 27.62it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 28.17it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 27.07it/s]

Accuracy on the train set: 42.68%, Train Loss: 1.6617
Accuracy on the test set: 43.53%, Test Loss: 1.5848

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 26.45it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 26.13it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 26.72it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 26.35it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:04<00:00, 23.30it/s]

```

Accuracy on the train set: 54.09%, Train Loss: 1.3429
Accuracy on the test set: 54.90%, Test Loss: 1.3412

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 28.25it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 29.16it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 29.34it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 28.82it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 29.09it/s]

Accuracy on the train set: 58.13%, Train Loss: 1.2768

Accuracy on the test set: 58.53%, Test Loss: 1.2413

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 27.74it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 28.41it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 26.88it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 26.64it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 28.40it/s]

Accuracy on the train set: 62.61%, Train Loss: 1.1074
Accuracy on the test set: 63.11%, Test Loss: 1.1475

Epoch : [21/80]

100%|
| 100/100 [00:03<00:00, 26.88it/s]

Epoch : [22/80]

100%|
| 100/100 [00:03<00:00, 26.53it/s]

Epoch : [23/80]

100%|
| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [24/80]

100%|
| 100/100 [00:04<00:00, 24.84it/s]

Epoch : [25/80]

100%|
| 100/100 [00:03<00:00, 26.85it/s]

Accuracy on the train set: 64.31%, Train Loss: 1.1550
Accuracy on the test set: 64.36%, Test Loss: 1.1830

Epoch : [26/80]

100%|
| 100/100 [00:03<00:00, 26.76it/s]

Epoch : [27/80]

100%|
| 100/100 [00:03<00:00, 26.74it/s]

Epoch : [28/80]

100%|
| 100/100 [00:03<00:00, 25.11it/s]

Epoch : [29/80]

100%|
| 100/100 [00:03<00:00, 26.50it/s]

Epoch : [30/80]

100%|
| 100/100 [00:03<00:00, 26.13it/s]

Accuracy on the train set: 64.39%, Train Loss: 1.1908
Accuracy on the test set: 64.57%, Test Loss: 1.1290

Epoch : [31/80]

100%|
| 100/100 [00:03<00:00, 27.12it/s]

Epoch : [32/80]

100%|
| 100/100 [00:03<00:00, 26.95it/s]

Epoch : [33/80]

100%|
| 100/100 [00:03<00:00, 26.91it/s]

Epoch : [34/80]

100%|
| 100/100 [00:03<00:00, 28.01it/s]

Epoch : [35/80]

100%|
| 100/100 [00:03<00:00, 26.94it/s]

Accuracy on the train set: 64.48%, Train Loss: 1.1821
Accuracy on the test set: 64.85%, Test Loss: 1.1182

Epoch : [36/80]

100%|
| 100/100 [00:03<00:00, 25.22it/s]

Epoch : [37/80]

100%|
| 100/100 [00:03<00:00, 27.04it/s]

Epoch : [38/80]

100%|
| 100/100 [00:04<00:00, 24.73it/s]

Epoch : [39/80]

100%|
| 100/100 [00:03<00:00, 26.41it/s]

Epoch : [40/80]

100%|
| 100/100 [00:03<00:00, 27.17it/s]

Accuracy on the train set: 66.01%, Train Loss: 1.1473
Accuracy on the test set: 65.60%, Test Loss: 1.1829

Epoch : [41/80]

100%|
| 100/100 [00:03<00:00, 27.37it/s]

Epoch : [42/80]

100%|
| 100/100 [00:03<00:00, 27.18it/s]

Epoch : [43/80]

100%|
| 100/100 [00:03<00:00, 27.00it/s]

Epoch : [44/80]

100%|
| 100/100 [00:03<00:00, 27.21it/s]

Epoch : [45/80]

100%|
| 100/100 [00:03<00:00, 26.79it/s]

Accuracy on the train set: 68.85%, Train Loss: 1.0921
Accuracy on the test set: 68.32%, Test Loss: 1.0891

Epoch : [46/80]

100%|
| 100/100 [00:03<00:00, 26.68it/s]

Epoch : [47/80]

100%|
| 100/100 [00:03<00:00, 27.77it/s]

Epoch : [48/80]

100%|
| 100/100 [00:03<00:00, 26.21it/s]

Epoch : [49/80]

100%|
| 100/100 [00:03<00:00, 25.86it/s]

Epoch : [50/80]

100%|
| 100/100 [00:03<00:00, 25.56it/s]

Accuracy on the train set: 70.33%, Train Loss: 1.0393
Accuracy on the test set: 69.84%, Test Loss: 1.0719

Epoch : [51/80]

100%|

| 100/100 [00:04<00:00, 24.46it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 26.10it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 26.67it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 26.21it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 25.93it/s]

Accuracy on the train set: 70.30%, Train Loss: 0.9633

Accuracy on the test set: 69.54%, Test Loss: 0.9948

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 27.01it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 26.88it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 28.72it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 27.64it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 26.70it/s]

Accuracy on the train set: 70.21%, Train Loss: 0.8414
Accuracy on the test set: 69.61%, Test Loss: 1.1023

Epoch : [61/80]

100%|
| 100/100 [00:03<00:00, 26.78it/s]

Epoch : [62/80]

100%|
| 100/100 [00:03<00:00, 27.85it/s]

Epoch : [63/80]

100%|
| 100/100 [00:03<00:00, 25.50it/s]

Epoch : [64/80]

100%|
| 100/100 [00:03<00:00, 27.05it/s]

Epoch : [65/80]

100%|
| 100/100 [00:03<00:00, 26.64it/s]

Accuracy on the train set: 69.81%, Train Loss: 1.1746
Accuracy on the test set: 68.65%, Test Loss: 1.0297

Epoch : [66/80]

100%|
| 100/100 [00:03<00:00, 25.98it/s]

Epoch : [67/80]

100%|
| 100/100 [00:03<00:00, 28.28it/s]

Epoch : [68/80]

100%|
| 100/100 [00:03<00:00, 26.83it/s]

Epoch : [69/80]

100%|
| 100/100 [00:03<00:00, 28.44it/s]

Epoch : [70/80]

100%|
| 100/100 [00:03<00:00, 27.90it/s]

Accuracy on the train set: 70.36%, Train Loss: 0.9443
Accuracy on the test set: 69.22%, Test Loss: 1.0386

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 26.20it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 26.93it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 26.74it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 26.85it/s]

Epoch : [75/80]

100%|
| 100/100 [00:04<00:00, 23.61it/s]

Accuracy on the train set: 70.57%, Train Loss: 1.0787
Accuracy on the test set: 69.43%, Test Loss: 1.0090

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 26.60it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 28.24it/s]

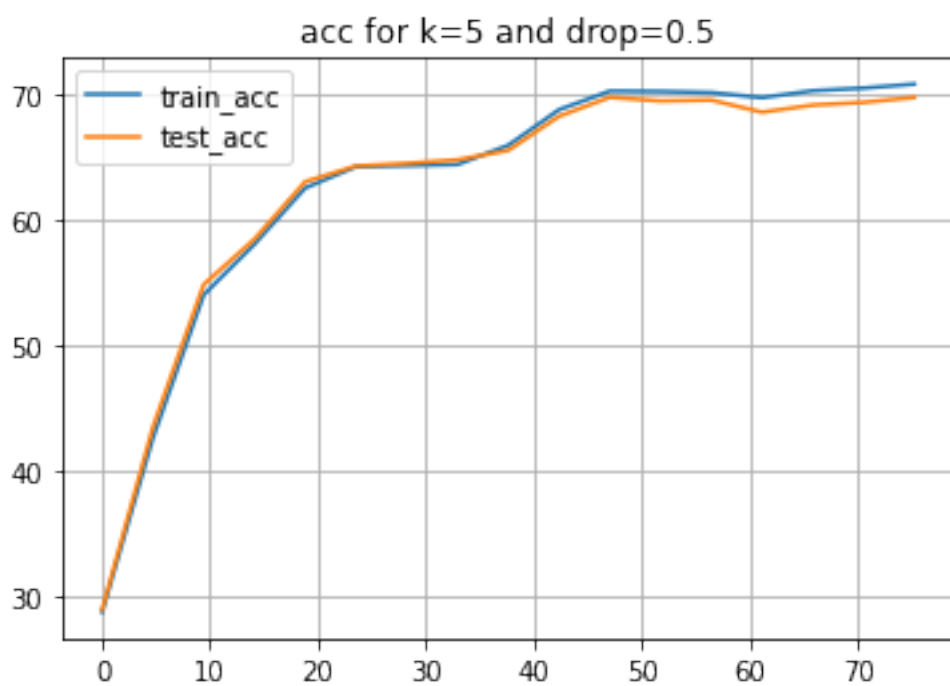
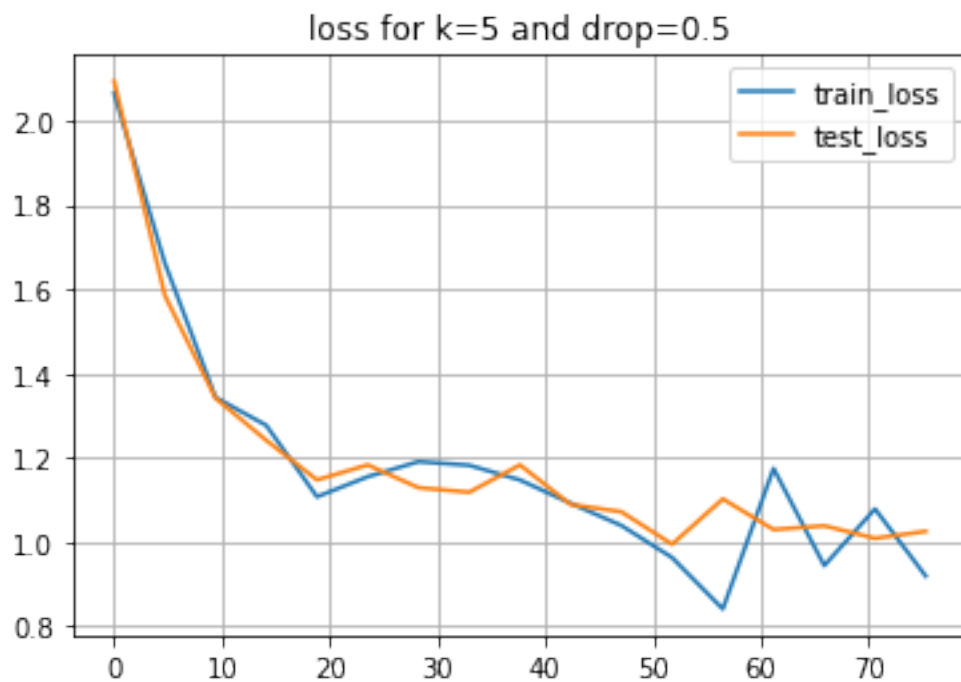
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 27.71it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 28.35it/s]

Accuracy on the train set: 70.89%, Train Loss: 0.9194
Accuracy on the test set: 69.83%, Test Loss: 1.0256



----- for k = 5 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:03<00:00, 30.15it/s]
Accuracy on the train set: 36.78%, Train Loss: 1.5996
Accuracy on the test set: 37.38%, Test Loss: 1.7256
Epoch : [1/80]
100%|
| 100/100 [00:03<00:00, 27.30it/s]
Epoch : [2/80]
100%|
| 100/100 [00:03<00:00, 27.79it/s]
Epoch : [3/80]
100%|
| 100/100 [00:03<00:00, 27.80it/s]
Epoch : [4/80]
100%|
| 100/100 [00:03<00:00, 28.48it/s]
Epoch : [5/80]
100%|
| 100/100 [00:03<00:00, 25.72it/s]
Accuracy on the train set: 69.26%, Train Loss: 1.0768
Accuracy on the test set: 69.27%, Test Loss: 0.8915
Epoch : [6/80]
100%|
| 100/100 [00:03<00:00, 27.67it/s]
Epoch : [7/80]
100%|
| 100/100 [00:03<00:00, 27.53it/s]
Epoch : [8/80]
100%|
| 100/100 [00:03<00:00, 27.96it/s]
Epoch : [9/80]
100%|
| 100/100 [00:03<00:00, 27.14it/s]
Epoch : [10/80]
100%|
| 100/100 [00:03<00:00, 27.59it/s]

Accuracy on the train set: 80.78%, Train Loss: 0.7250
Accuracy on the test set: 79.92%, Test Loss: 0.5751

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 27.16it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 26.83it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 25.31it/s]

Epoch : [14/80]

100%|

| 100/100 [00:04<00:00, 22.88it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 28.20it/s]

Accuracy on the train set: 84.99%, Train Loss: 0.3808

Accuracy on the test set: 83.47%, Test Loss: 0.4990

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 27.19it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 26.26it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 27.63it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 26.55it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 28.49it/s]

Accuracy on the train set: 86.04%, Train Loss: 0.6616
Accuracy on the test set: 84.06%, Test Loss: 0.5359

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 27.31it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 26.69it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 26.07it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 26.84it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 25.68it/s]

Accuracy on the train set: 86.54%, Train Loss: 0.4104

Accuracy on the test set: 84.38%, Test Loss: 0.5136

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 26.24it/s]

Epoch : [27/80]

100%|

| 100/100 [00:04<00:00, 24.39it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 26.53it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 27.62it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 26.47it/s]

Accuracy on the train set: 86.79%, Train Loss: 0.3154
Accuracy on the test set: 84.52%, Test Loss: 0.5060

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 27.60it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 26.97it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 26.98it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 26.26it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 27.11it/s]

Accuracy on the train set: 87.43%, Train Loss: 0.6158

Accuracy on the test set: 84.50%, Test Loss: 0.5708

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 25.12it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 26.27it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 26.06it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 28.00it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 28.95it/s]

Accuracy on the train set: 88.08%, Train Loss: 0.3921
Accuracy on the test set: 85.09%, Test Loss: 0.5351

Epoch : [41/80]

100%|

| 100/100 [00:04<00:00, 24.69it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 27.17it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 27.54it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 26.60it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 27.74it/s]

Accuracy on the train set: 88.03%, Train Loss: 0.4783

Accuracy on the test set: 85.05%, Test Loss: 0.5496

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 32.31it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 26.11it/s]

Epoch : [48/80]

100%|

| 100/100 [00:04<00:00, 23.49it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 30.53it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 25.15it/s]

Accuracy on the train set: 88.64%, Train Loss: 0.5126
Accuracy on the test set: 85.21%, Test Loss: 0.5494

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 29.44it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 26.52it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 28.84it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 28.11it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 29.93it/s]

Accuracy on the train set: 88.67%, Train Loss: 0.4725

Accuracy on the test set: 85.25%, Test Loss: 0.5583

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 26.29it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 29.62it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 30.20it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 29.56it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 27.77it/s]

Accuracy on the train set: 88.78%, Train Loss: 0.3275
Accuracy on the test set: 85.05%, Test Loss: 0.5591

Epoch : [61/80]

100%|

| 100/100 [00:03<00:00, 31.30it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 31.38it/s]

Epoch : [63/80]

100%|

| 100/100 [00:03<00:00, 28.03it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 25.50it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 28.56it/s]

Accuracy on the train set: 89.04%, Train Loss: 0.3789

Accuracy on the test set: 85.18%, Test Loss: 0.5747

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 28.73it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 27.57it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 29.54it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 29.68it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 30.43it/s]

Accuracy on the train set: 88.93%, Train Loss: 0.2835
Accuracy on the test set: 84.89%, Test Loss: 0.6081

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 26.05it/s]

Epoch : [72/80]

100%|
| 100/100 [00:04<00:00, 24.23it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 26.72it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 26.03it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 27.25it/s]

Accuracy on the train set: 89.46%, Train Loss: 0.2390
Accuracy on the test set: 85.31%, Test Loss: 0.5748

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 26.76it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 27.64it/s]

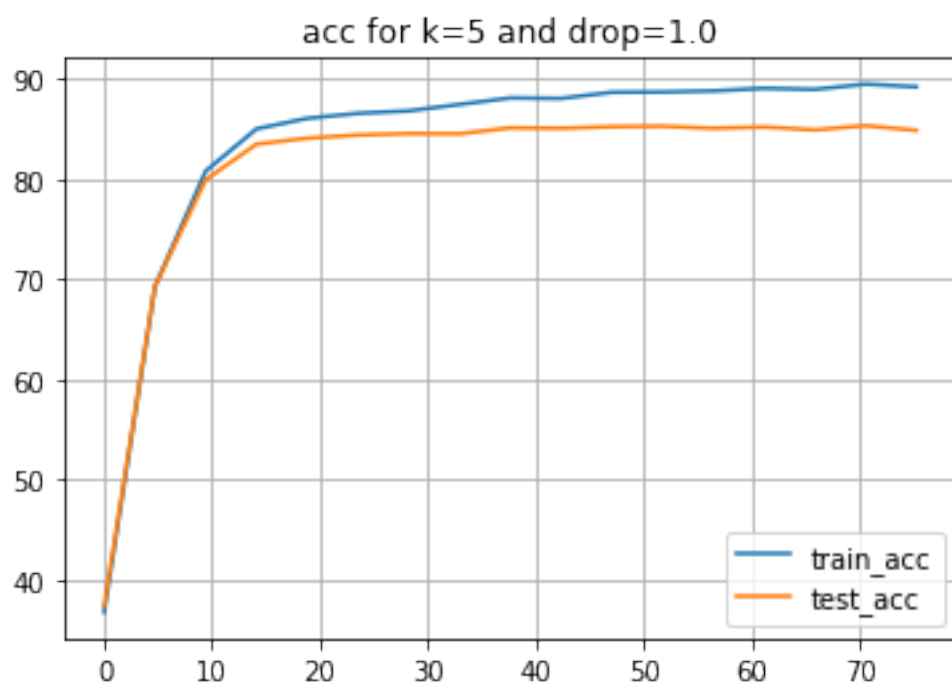
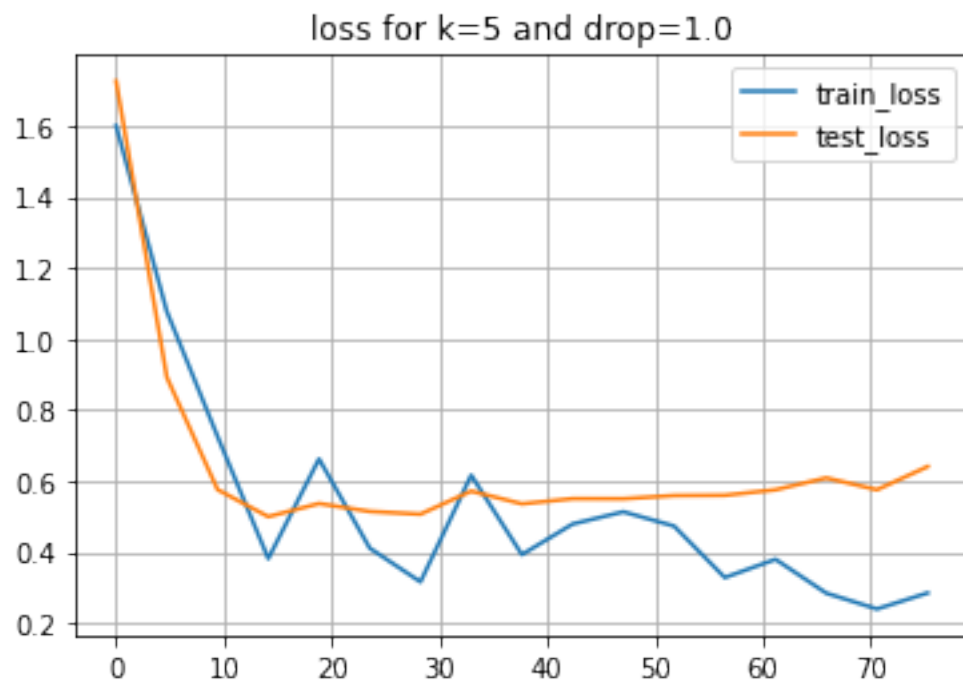
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 26.25it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 26.52it/s]

Accuracy on the train set: 89.19%, Train Loss: 0.2842
Accuracy on the test set: 84.84%, Test Loss: 0.6402



----- for k = 10 and dropout = 0.1 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 27.39it/s]

Accuracy on the train set: 19.53%, Train Loss: 2.2661
Accuracy on the test set: 20.54%, Test Loss: 2.2426

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 25.87it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 27.07it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 26.39it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 27.39it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:04<00:00, 24.74it/s]

Accuracy on the train set: 19.79%, Train Loss: 2.1557
Accuracy on the test set: 20.81%, Test Loss: 2.1690

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 26.51it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 27.35it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 27.67it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 27.13it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:03<00:00, 25.48it/s]

```

Accuracy on the train set: 19.84%, Train Loss: 2.1566
Accuracy on the test set: 20.85%, Test Loss: 2.1550

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 26.38it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 26.90it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 27.20it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 27.46it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 27.06it/s]

Accuracy on the train set: 30.00%, Train Loss: 1.8249

Accuracy on the test set: 31.32%, Test Loss: 2.0683

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 26.47it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 26.64it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 25.67it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 25.53it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 26.42it/s]

Accuracy on the train set: 33.44%, Train Loss: 1.9267
Accuracy on the test set: 34.88%, Test Loss: 1.9489

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 27.55it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 25.96it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 27.14it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 25.98it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 26.62it/s]

Accuracy on the train set: 34.38%, Train Loss: 1.8204

Accuracy on the test set: 34.95%, Test Loss: 1.8962

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 26.97it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 26.22it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 26.97it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 26.77it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 26.73it/s]

Accuracy on the train set: 36.14%, Train Loss: 1.6287
Accuracy on the test set: 37.26%, Test Loss: 1.8336

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 26.91it/s]

Epoch : [32/80]

100%|

| 100/100 [00:04<00:00, 24.39it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 26.15it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 26.33it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 27.08it/s]

Accuracy on the train set: 36.94%, Train Loss: 1.6356

Accuracy on the test set: 38.15%, Test Loss: 1.8120

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 26.74it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 25.84it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 26.54it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 28.23it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 27.24it/s]

Accuracy on the train set: 36.76%, Train Loss: 1.7446
Accuracy on the test set: 38.08%, Test Loss: 1.7749

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 26.76it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 26.94it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 27.16it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 26.39it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 26.16it/s]

Accuracy on the train set: 36.87%, Train Loss: 1.8316

Accuracy on the test set: 38.04%, Test Loss: 1.7882

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 26.80it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 27.16it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 27.14it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 27.51it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 26.70it/s]

Accuracy on the train set: 36.47%, Train Loss: 1.6414
Accuracy on the test set: 37.61%, Test Loss: 1.8123

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 27.39it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 26.40it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 27.24it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 27.64it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 25.19it/s]

Accuracy on the train set: 36.38%, Train Loss: 1.7115

Accuracy on the test set: 37.47%, Test Loss: 1.7954

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 27.54it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 25.65it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 27.57it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 27.29it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 26.03it/s]

Accuracy on the train set: 37.24%, Train Loss: 1.6042
Accuracy on the test set: 38.41%, Test Loss: 1.7456

Epoch : [61/80]

100%|

| 100/100 [00:04<00:00, 21.25it/s]

Epoch : [62/80]

100%|

| 100/100 [00:04<00:00, 21.16it/s]

Epoch : [63/80]

100%|

| 100/100 [00:04<00:00, 21.36it/s]

Epoch : [64/80]

100%|

| 100/100 [00:04<00:00, 24.41it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 26.66it/s]

Accuracy on the train set: 37.37%, Train Loss: 1.6824

Accuracy on the test set: 38.52%, Test Loss: 1.7054

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 27.32it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 25.50it/s]

Epoch : [68/80]

100%|

| 100/100 [00:04<00:00, 24.26it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 27.45it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 26.34it/s]

Accuracy on the train set: 44.17%, Train Loss: 1.8627
Accuracy on the test set: 45.34%, Test Loss: 1.7743

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 27.48it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 27.56it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 27.36it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 26.90it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 26.89it/s]

Accuracy on the train set: 49.53%, Train Loss: 1.6558
Accuracy on the test set: 50.71%, Test Loss: 1.7194

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 26.47it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 27.81it/s]

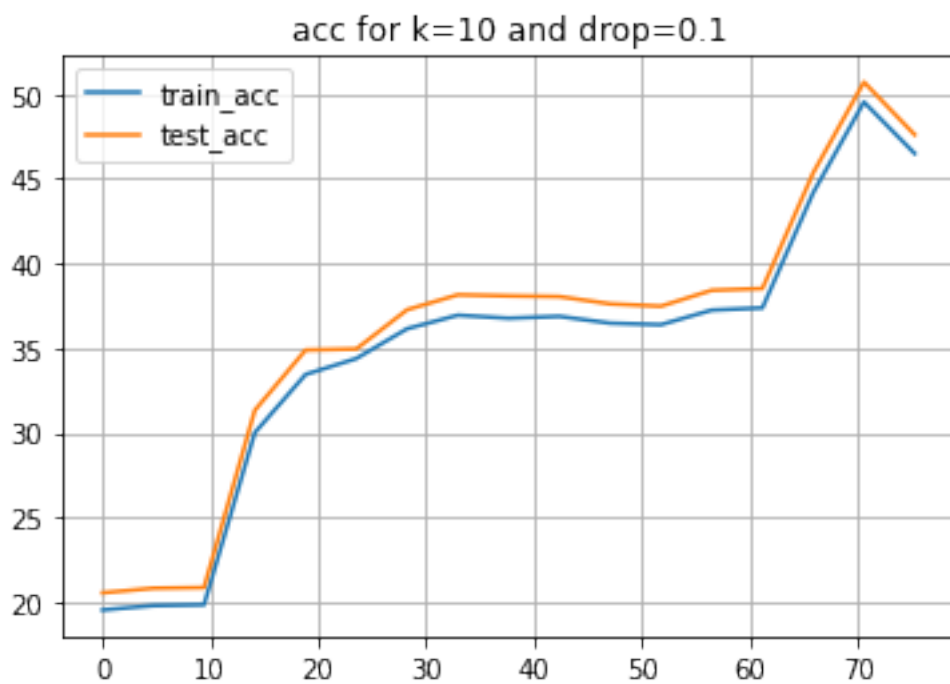
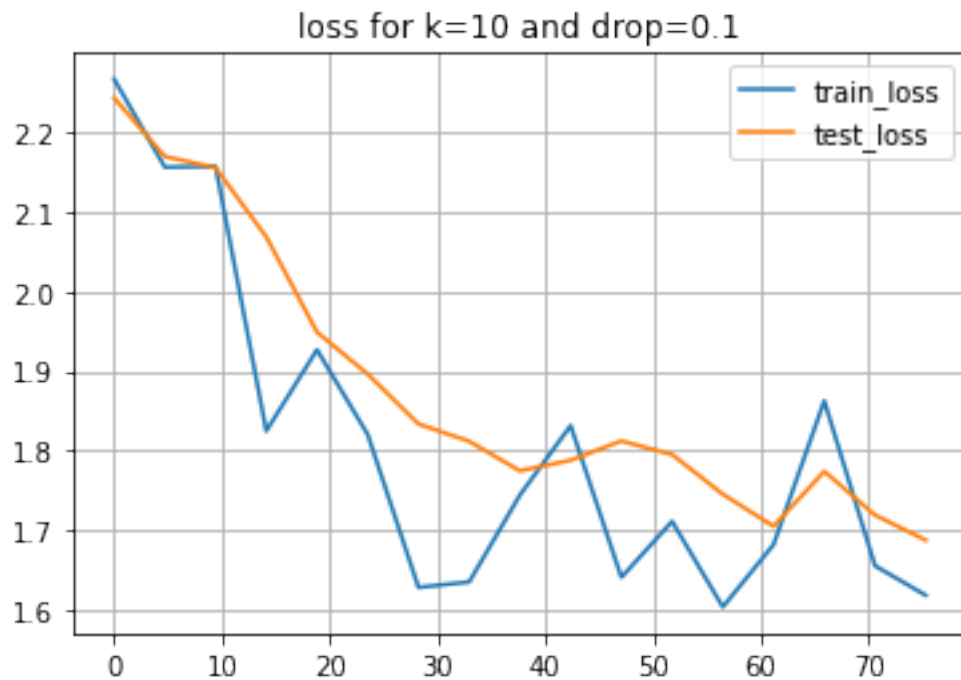
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 27.47it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 28.49it/s]

Accuracy on the train set: 46.49%, Train Loss: 1.6189
Accuracy on the test set: 47.60%, Test Loss: 1.6880



----- for k = 10 and dropout = 0.5 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 27.55it/s]

Accuracy on the train set: 49.73%, Train Loss: 1.5018
Accuracy on the test set: 48.82%, Test Loss: 1.6458

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 27.36it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 27.21it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 26.61it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 26.31it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 26.21it/s]

Accuracy on the train set: 85.13%, Train Loss: 0.7316
Accuracy on the test set: 84.22%, Test Loss: 0.6687

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 25.97it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 26.17it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 25.50it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 27.10it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:03<00:00, 27.20it/s]

```


Accuracy on the train set: 88.64%, Train Loss: 0.5322
Accuracy on the test set: 87.24%, Test Loss: 0.4520

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 28.68it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 27.49it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 27.38it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 28.08it/s]

Epoch : [15/80]

100%|

| 100/100 [00:04<00:00, 24.91it/s]

Accuracy on the train set: 89.67%, Train Loss: 0.5553

Accuracy on the test set: 88.09%, Test Loss: 0.4523

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 26.26it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 26.41it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 26.39it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 27.26it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 28.04it/s]

Accuracy on the train set: 89.76%, Train Loss: 0.6020
Accuracy on the test set: 88.15%, Test Loss: 0.4651

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 27.22it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 27.51it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 27.27it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 27.35it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 27.49it/s]

Accuracy on the train set: 90.55%, Train Loss: 0.3410

Accuracy on the test set: 88.54%, Test Loss: 0.4162

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 25.06it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 27.97it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 25.90it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 25.26it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 27.89it/s]

Accuracy on the train set: 90.72%, Train Loss: 0.4927
Accuracy on the test set: 88.52%, Test Loss: 0.4146

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 27.25it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 26.26it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 27.33it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 26.67it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 25.88it/s]

Accuracy on the train set: 91.11%, Train Loss: 0.4410

Accuracy on the test set: 88.94%, Test Loss: 0.4080

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 26.58it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 28.75it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 27.97it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 26.46it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 27.19it/s]

Accuracy on the train set: 91.13%, Train Loss: 0.3360
Accuracy on the test set: 88.56%, Test Loss: 0.3892

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 27.97it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 27.39it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 25.65it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 26.82it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 27.16it/s]

Accuracy on the train set: 91.89%, Train Loss: 0.3671

Accuracy on the test set: 89.10%, Test Loss: 0.3919

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 26.59it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 26.83it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 25.63it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 26.94it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 26.46it/s]

Accuracy on the train set: 91.93%, Train Loss: 0.3629
Accuracy on the test set: 89.01%, Test Loss: 0.3925

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 28.43it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 28.29it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 26.02it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 26.44it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 26.74it/s]

Accuracy on the train set: 91.87%, Train Loss: 0.4200

Accuracy on the test set: 88.88%, Test Loss: 0.3942

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 27.71it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 26.06it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 26.61it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 26.66it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 25.99it/s]

Accuracy on the train set: 92.00%, Train Loss: 0.3374
Accuracy on the test set: 89.10%, Test Loss: 0.4010

Epoch : [61/80]

100%|

| 100/100 [00:04<00:00, 24.66it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 26.84it/s]

Epoch : [63/80]

100%|

| 100/100 [00:03<00:00, 26.70it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 26.00it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 27.49it/s]

Accuracy on the train set: 92.67%, Train Loss: 0.3255

Accuracy on the test set: 89.35%, Test Loss: 0.4167

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 26.72it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 26.44it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 26.63it/s]

Epoch : [69/80]

100%|

| 100/100 [00:04<00:00, 24.46it/s]

Epoch : [70/80]

100%|

| 100/100 [00:04<00:00, 20.92it/s]

Accuracy on the train set: 92.57%, Train Loss: 0.4207
Accuracy on the test set: 89.40%, Test Loss: 0.4117

Epoch : [71/80]

100%|

| 100/100 [00:03<00:00, 25.29it/s]

Epoch : [72/80]

100%|

| 100/100 [00:03<00:00, 28.29it/s]

Epoch : [73/80]

100%|

| 100/100 [00:03<00:00, 27.99it/s]

Epoch : [74/80]

100%|

| 100/100 [00:03<00:00, 27.40it/s]

Epoch : [75/80]

100%|

| 100/100 [00:03<00:00, 28.02it/s]

Accuracy on the train set: 92.20%, Train Loss: 0.4391

Accuracy on the test set: 89.10%, Test Loss: 0.4047

Epoch : [76/80]

100%|

| 100/100 [00:03<00:00, 27.82it/s]

Epoch : [77/80]

100%|

| 100/100 [00:03<00:00, 27.86it/s]

Epoch : [78/80]

100%|

| 100/100 [00:04<00:00, 24.53it/s]

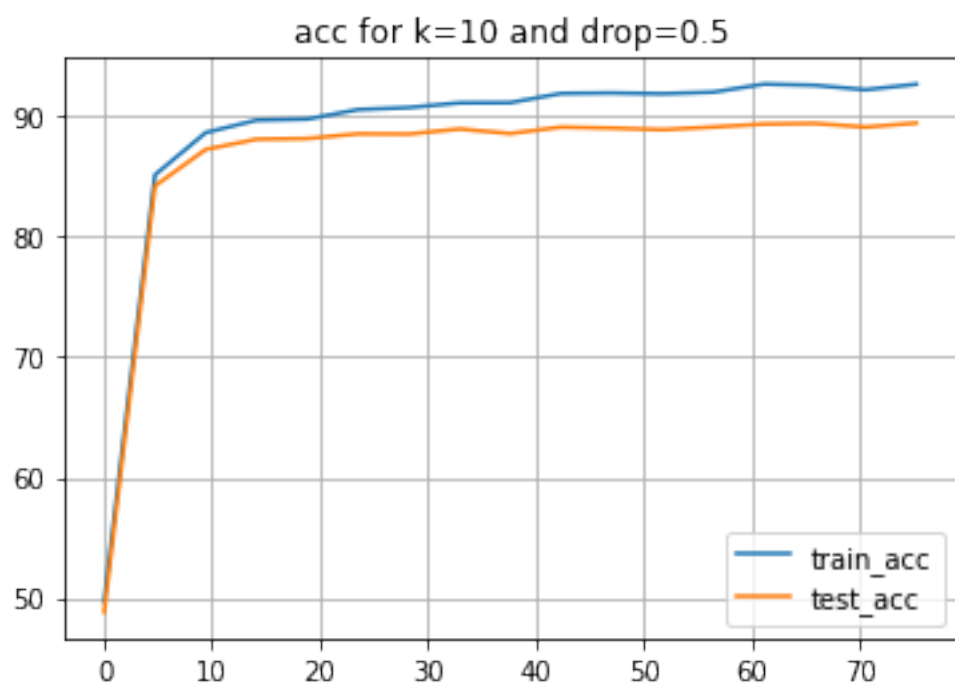
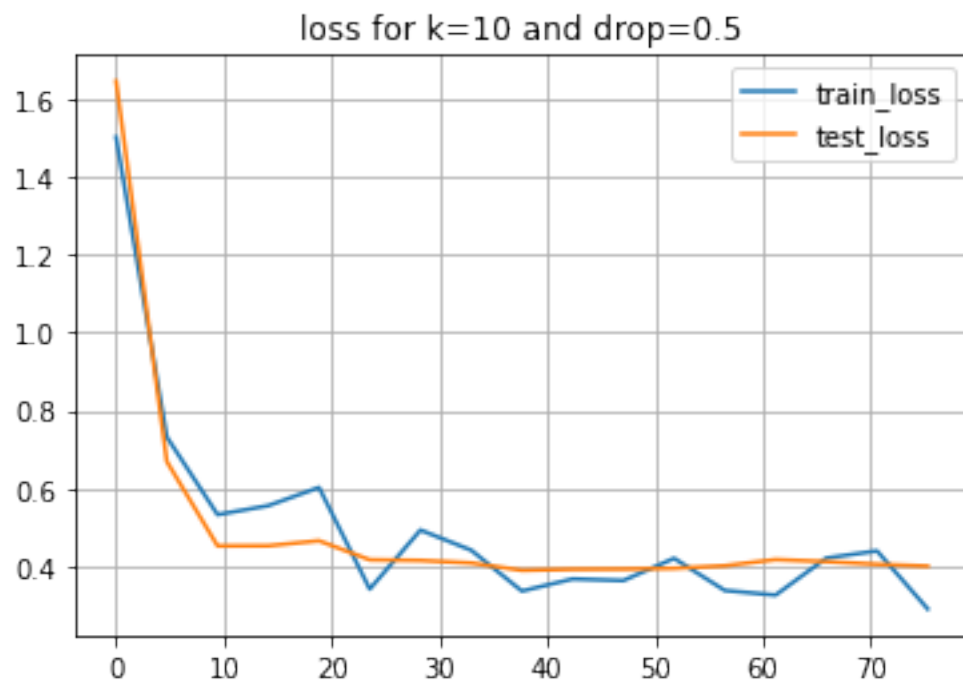
Epoch : [79/80]

100%|

| 100/100 [00:03<00:00, 26.48it/s]

Accuracy on the train set: 92.66%, Train Loss: 0.2899

Accuracy on the test set: 89.43%, Test Loss: 0.4000



----- for k = 10 and dropout = 1.0 -----
Epoch : [0/80]


```

100%|
  | 100/100 [00:03<00:00, 27.64it/s]

Accuracy on the train set: 81.28%, Train Loss: 0.6242
Accuracy on the test set: 81.70%, Test Loss: 0.6965

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 26.63it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 26.13it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 25.19it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 26.26it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 25.90it/s]

Accuracy on the train set: 91.83%, Train Loss: 0.2250
Accuracy on the test set: 90.51%, Test Loss: 0.2596

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 26.70it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 25.84it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 26.81it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 27.27it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:03<00:00, 26.30it/s]

```

Accuracy on the train set: 93.69%, Train Loss: 0.2568
Accuracy on the test set: 91.46%, Test Loss: 0.2293

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 27.57it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 27.21it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 28.37it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 26.96it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 26.65it/s]

Accuracy on the train set: 94.69%, Train Loss: 0.2027

Accuracy on the test set: 91.77%, Test Loss: 0.2358

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 36.82it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 30.74it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 36.68it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 36.17it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 34.15it/s]

Accuracy on the train set: 95.53%, Train Loss: 0.1854
Accuracy on the test set: 91.91%, Test Loss: 0.2359

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 32.96it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 29.20it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 26.57it/s]

Epoch : [24/80]

100%|

| 100/100 [00:04<00:00, 23.68it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 27.17it/s]

Accuracy on the train set: 96.09%, Train Loss: 0.2261

Accuracy on the test set: 92.21%, Test Loss: 0.2107

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 25.52it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 25.33it/s]

Epoch : [28/80]

100%|

| 100/100 [00:04<00:00, 24.93it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 25.79it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 25.88it/s]

Accuracy on the train set: 96.59%, Train Loss: 0.0801
Accuracy on the test set: 92.11%, Test Loss: 0.2168

Epoch : [31/80]

100%|

| 100/100 [00:04<00:00, 24.04it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 27.97it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 27.98it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 31.77it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 33.15it/s]

Accuracy on the train set: 96.74%, Train Loss: 0.1282

Accuracy on the test set: 92.11%, Test Loss: 0.2400

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 37.25it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 36.53it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 37.20it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 39.14it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 37.10it/s]

Accuracy on the train set: 97.33%, Train Loss: 0.1527
Accuracy on the test set: 92.15%, Test Loss: 0.1900

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 38.51it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 37.44it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 35.62it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 38.97it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 38.35it/s]

Accuracy on the train set: 97.39%, Train Loss: 0.0500

Accuracy on the test set: 91.94%, Test Loss: 0.2164

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 38.36it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 39.08it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 39.02it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 37.29it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 38.38it/s]

Accuracy on the train set: 97.72%, Train Loss: 0.0685
Accuracy on the test set: 92.11%, Test Loss: 0.2504

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 32.54it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 39.09it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 38.95it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 39.05it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 37.99it/s]

Accuracy on the train set: 98.21%, Train Loss: 0.0358

Accuracy on the test set: 92.14%, Test Loss: 0.2167

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 37.77it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 36.99it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 38.51it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 37.38it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 38.36it/s]

Accuracy on the train set: 98.04%, Train Loss: 0.0285
Accuracy on the test set: 91.84%, Test Loss: 0.2582

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 33.63it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 38.51it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 35.33it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 38.40it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 36.68it/s]

Accuracy on the train set: 98.33%, Train Loss: 0.0380

Accuracy on the test set: 91.91%, Test Loss: 0.2862

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 27.83it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 30.05it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 28.18it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 27.35it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 27.26it/s]

Accuracy on the train set: 98.52%, Train Loss: 0.0479
Accuracy on the test set: 91.73%, Test Loss: 0.2740

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 29.57it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 27.71it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 29.04it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 31.95it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 31.03it/s]

Accuracy on the train set: 98.71%, Train Loss: 0.0358
Accuracy on the test set: 91.90%, Test Loss: 0.2959

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 29.47it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 29.38it/s]

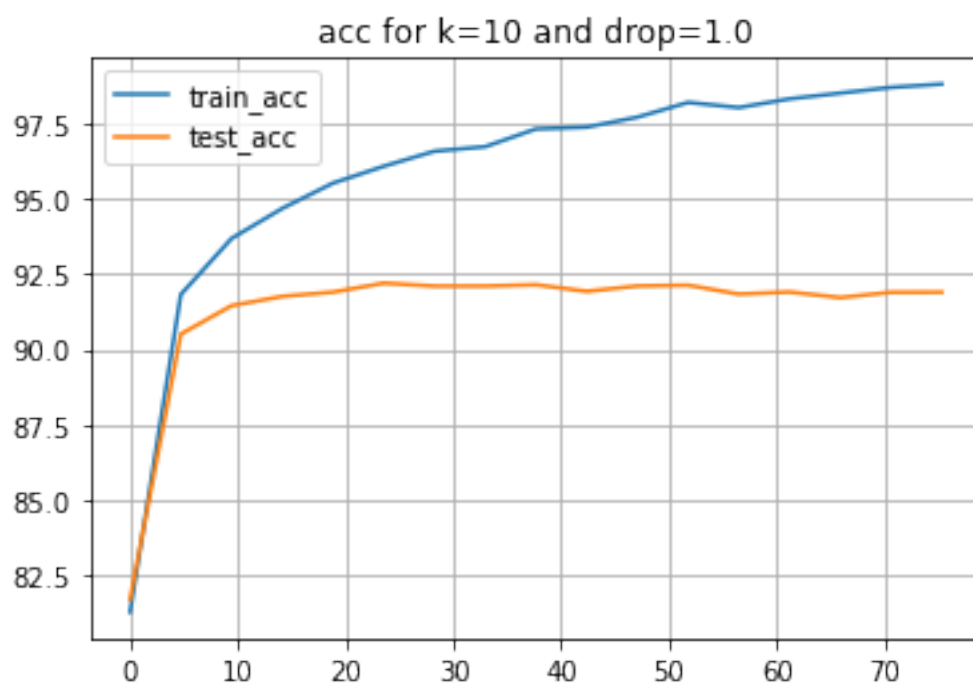
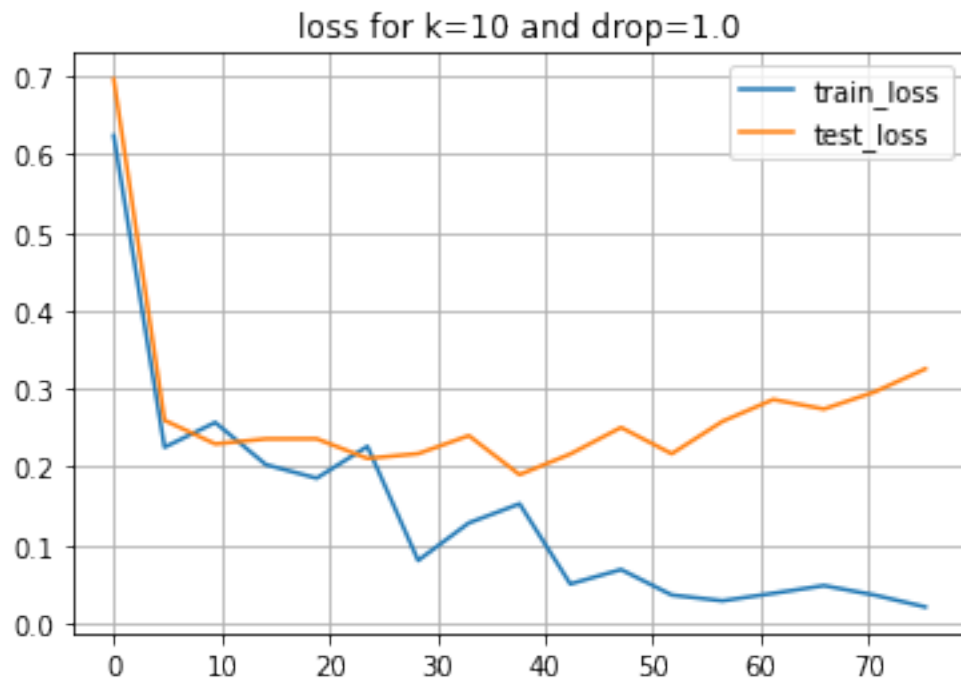
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 30.59it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 27.73it/s]

Accuracy on the train set: 98.82%, Train Loss: 0.0205
Accuracy on the test set: 91.91%, Test Loss: 0.3255



----- for k = 20 and dropout = 0.1 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 28.99it/s]

Accuracy on the train set: 16.18%, Train Loss: 2.2670
Accuracy on the test set: 17.04%, Test Loss: 2.2856

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 26.84it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 26.58it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 25.98it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 28.77it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 27.04it/s]

Accuracy on the train set: 27.78%, Train Loss: 2.0744
Accuracy on the test set: 28.75%, Test Loss: 2.1096

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 27.03it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 26.63it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 27.67it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 27.06it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:03<00:00, 26.80it/s]

```

Accuracy on the train set: 27.56%, Train Loss: 1.9316
Accuracy on the test set: 28.52%, Test Loss: 2.0309

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 28.33it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 25.73it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 26.42it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 28.17it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 26.90it/s]

Accuracy on the train set: 28.27%, Train Loss: 1.9933

Accuracy on the test set: 29.18%, Test Loss: 1.9560

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 27.52it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 25.14it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 27.27it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 27.05it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 28.20it/s]

Accuracy on the train set: 28.31%, Train Loss: 1.9688
Accuracy on the test set: 29.16%, Test Loss: 1.9211

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 26.97it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 27.33it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 28.43it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 28.75it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 28.80it/s]

Accuracy on the train set: 45.82%, Train Loss: 1.8227

Accuracy on the test set: 46.69%, Test Loss: 1.7454

Epoch : [26/80]

100%|

| 100/100 [00:04<00:00, 23.44it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 26.34it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 27.38it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 26.59it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 27.27it/s]

Accuracy on the train set: 45.96%, Train Loss: 1.6262
Accuracy on the test set: 46.83%, Test Loss: 1.7031

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 26.03it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 26.28it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 25.55it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 26.57it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 27.22it/s]

Accuracy on the train set: 54.82%, Train Loss: 1.6039

Accuracy on the test set: 55.86%, Test Loss: 1.5574

Epoch : [36/80]

100%|

| 100/100 [00:03<00:00, 27.11it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 27.11it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 27.26it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 27.43it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 27.61it/s]

Accuracy on the train set: 56.20%, Train Loss: 1.4430
Accuracy on the test set: 56.97%, Test Loss: 1.5528

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 27.98it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 27.58it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 28.05it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 29.12it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 27.42it/s]

Accuracy on the train set: 47.71%, Train Loss: 1.5133

Accuracy on the test set: 48.66%, Test Loss: 1.5288

Epoch : [46/80]

100%|

| 100/100 [00:04<00:00, 24.76it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 27.69it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 28.43it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 27.74it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 26.39it/s]

Accuracy on the train set: 47.29%, Train Loss: 1.4364
Accuracy on the test set: 48.19%, Test Loss: 1.5304

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 28.12it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 26.17it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 28.43it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 26.94it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 29.14it/s]

Accuracy on the train set: 51.27%, Train Loss: 1.5782

Accuracy on the test set: 52.26%, Test Loss: 1.4989

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 29.31it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 29.26it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 29.36it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 29.08it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 27.34it/s]

Accuracy on the train set: 62.28%, Train Loss: 1.4310
Accuracy on the test set: 63.00%, Test Loss: 1.5038

Epoch : [61/80]

100%|

| 100/100 [00:03<00:00, 26.06it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 25.70it/s]

Epoch : [63/80]

100%|

| 100/100 [00:03<00:00, 25.27it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 27.70it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 28.38it/s]

Accuracy on the train set: 49.58%, Train Loss: 1.3672

Accuracy on the test set: 50.51%, Test Loss: 1.4816

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 27.18it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 26.99it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 26.91it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 26.63it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 26.89it/s]

Accuracy on the train set: 49.42%, Train Loss: 1.5980
Accuracy on the test set: 50.18%, Test Loss: 1.4927

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 27.17it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 26.30it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 27.35it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 26.45it/s]

Epoch : [75/80]

100%|
| 100/100 [00:04<00:00, 24.48it/s]

Accuracy on the train set: 56.26%, Train Loss: 1.5587
Accuracy on the test set: 56.57%, Test Loss: 1.4830

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 28.07it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 27.53it/s]

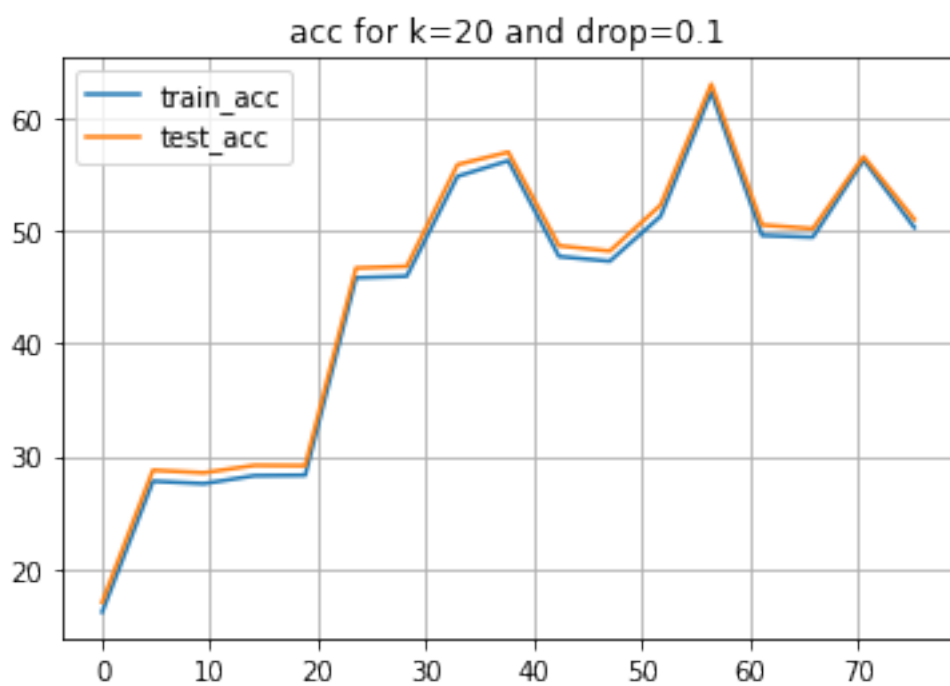
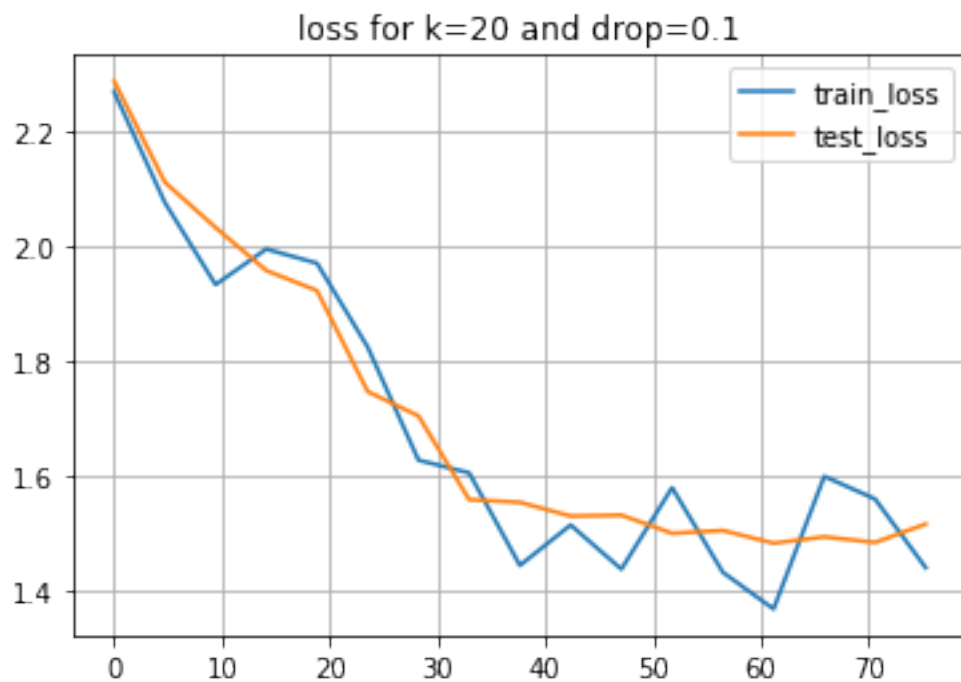
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 28.60it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 28.78it/s]

Accuracy on the train set: 50.28%, Train Loss: 1.4390
Accuracy on the test set: 51.00%, Test Loss: 1.5150



----- for k = 20 and dropout = 0.5 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:03<00:00, 27.93it/s]

Accuracy on the train set: 77.96%, Train Loss: 0.9269
Accuracy on the test set: 78.42%, Test Loss: 0.8592

Epoch : [1/80]

100%|
  | 100/100 [00:03<00:00, 27.01it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:03<00:00, 26.80it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:03<00:00, 27.30it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:03<00:00, 27.70it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:03<00:00, 26.72it/s]

Accuracy on the train set: 90.95%, Train Loss: 0.4240
Accuracy on the test set: 90.13%, Test Loss: 0.3068

Epoch : [6/80]

100%|
  | 100/100 [00:03<00:00, 28.33it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:03<00:00, 28.02it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:03<00:00, 27.94it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:03<00:00, 26.21it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:04<00:00, 21.27it/s]

```

Accuracy on the train set: 92.78%, Train Loss: 0.2658
Accuracy on the test set: 91.51%, Test Loss: 0.3044

Epoch : [11/80]

100%|

| 100/100 [00:03<00:00, 25.77it/s]

Epoch : [12/80]

100%|

| 100/100 [00:03<00:00, 27.89it/s]

Epoch : [13/80]

100%|

| 100/100 [00:03<00:00, 26.50it/s]

Epoch : [14/80]

100%|

| 100/100 [00:03<00:00, 26.34it/s]

Epoch : [15/80]

100%|

| 100/100 [00:03<00:00, 27.06it/s]

Accuracy on the train set: 93.22%, Train Loss: 0.2817

Accuracy on the test set: 91.57%, Test Loss: 0.3278

Epoch : [16/80]

100%|

| 100/100 [00:03<00:00, 27.12it/s]

Epoch : [17/80]

100%|

| 100/100 [00:03<00:00, 27.47it/s]

Epoch : [18/80]

100%|

| 100/100 [00:03<00:00, 27.65it/s]

Epoch : [19/80]

100%|

| 100/100 [00:03<00:00, 26.08it/s]

Epoch : [20/80]

100%|

| 100/100 [00:03<00:00, 26.02it/s]

Accuracy on the train set: 93.81%, Train Loss: 0.2245
Accuracy on the test set: 91.87%, Test Loss: 0.3179

Epoch : [21/80]

100%|

| 100/100 [00:03<00:00, 28.15it/s]

Epoch : [22/80]

100%|

| 100/100 [00:03<00:00, 26.92it/s]

Epoch : [23/80]

100%|

| 100/100 [00:03<00:00, 28.41it/s]

Epoch : [24/80]

100%|

| 100/100 [00:03<00:00, 27.78it/s]

Epoch : [25/80]

100%|

| 100/100 [00:03<00:00, 28.36it/s]

Accuracy on the train set: 94.14%, Train Loss: 0.2700

Accuracy on the test set: 91.90%, Test Loss: 0.3369

Epoch : [26/80]

100%|

| 100/100 [00:03<00:00, 26.43it/s]

Epoch : [27/80]

100%|

| 100/100 [00:03<00:00, 26.40it/s]

Epoch : [28/80]

100%|

| 100/100 [00:03<00:00, 26.86it/s]

Epoch : [29/80]

100%|

| 100/100 [00:03<00:00, 27.83it/s]

Epoch : [30/80]

100%|

| 100/100 [00:03<00:00, 26.13it/s]

Accuracy on the train set: 94.46%, Train Loss: 0.2770
Accuracy on the test set: 91.88%, Test Loss: 0.3223

Epoch : [31/80]

100%|

| 100/100 [00:03<00:00, 27.55it/s]

Epoch : [32/80]

100%|

| 100/100 [00:03<00:00, 27.36it/s]

Epoch : [33/80]

100%|

| 100/100 [00:03<00:00, 27.57it/s]

Epoch : [34/80]

100%|

| 100/100 [00:03<00:00, 27.98it/s]

Epoch : [35/80]

100%|

| 100/100 [00:03<00:00, 27.88it/s]

Accuracy on the train set: 94.84%, Train Loss: 0.2082

Accuracy on the test set: 92.08%, Test Loss: 0.3194

Epoch : [36/80]

100%|

| 100/100 [00:04<00:00, 23.58it/s]

Epoch : [37/80]

100%|

| 100/100 [00:03<00:00, 27.14it/s]

Epoch : [38/80]

100%|

| 100/100 [00:03<00:00, 28.24it/s]

Epoch : [39/80]

100%|

| 100/100 [00:03<00:00, 28.14it/s]

Epoch : [40/80]

100%|

| 100/100 [00:03<00:00, 26.39it/s]

Accuracy on the train set: 94.95%, Train Loss: 0.2282
Accuracy on the test set: 92.23%, Test Loss: 0.3053

Epoch : [41/80]

100%|

| 100/100 [00:03<00:00, 27.03it/s]

Epoch : [42/80]

100%|

| 100/100 [00:03<00:00, 28.13it/s]

Epoch : [43/80]

100%|

| 100/100 [00:03<00:00, 27.88it/s]

Epoch : [44/80]

100%|

| 100/100 [00:03<00:00, 27.62it/s]

Epoch : [45/80]

100%|

| 100/100 [00:03<00:00, 27.19it/s]

Accuracy on the train set: 95.12%, Train Loss: 0.1880

Accuracy on the test set: 92.23%, Test Loss: 0.2743

Epoch : [46/80]

100%|

| 100/100 [00:03<00:00, 27.31it/s]

Epoch : [47/80]

100%|

| 100/100 [00:03<00:00, 26.80it/s]

Epoch : [48/80]

100%|

| 100/100 [00:03<00:00, 29.61it/s]

Epoch : [49/80]

100%|

| 100/100 [00:03<00:00, 28.83it/s]

Epoch : [50/80]

100%|

| 100/100 [00:03<00:00, 26.98it/s]

Accuracy on the train set: 95.32%, Train Loss: 0.2089
Accuracy on the test set: 92.38%, Test Loss: 0.2575

Epoch : [51/80]

100%|

| 100/100 [00:03<00:00, 25.65it/s]

Epoch : [52/80]

100%|

| 100/100 [00:03<00:00, 29.10it/s]

Epoch : [53/80]

100%|

| 100/100 [00:03<00:00, 28.30it/s]

Epoch : [54/80]

100%|

| 100/100 [00:03<00:00, 27.12it/s]

Epoch : [55/80]

100%|

| 100/100 [00:03<00:00, 27.28it/s]

Accuracy on the train set: 95.45%, Train Loss: 0.1337

Accuracy on the test set: 92.22%, Test Loss: 0.3238

Epoch : [56/80]

100%|

| 100/100 [00:03<00:00, 27.80it/s]

Epoch : [57/80]

100%|

| 100/100 [00:03<00:00, 27.78it/s]

Epoch : [58/80]

100%|

| 100/100 [00:03<00:00, 28.35it/s]

Epoch : [59/80]

100%|

| 100/100 [00:03<00:00, 28.96it/s]

Epoch : [60/80]

100%|

| 100/100 [00:03<00:00, 27.99it/s]

Accuracy on the train set: 95.79%, Train Loss: 0.1201
Accuracy on the test set: 92.51%, Test Loss: 0.2961

Epoch : [61/80]

100%|

| 100/100 [00:03<00:00, 28.11it/s]

Epoch : [62/80]

100%|

| 100/100 [00:03<00:00, 28.92it/s]

Epoch : [63/80]

100%|

| 100/100 [00:03<00:00, 28.31it/s]

Epoch : [64/80]

100%|

| 100/100 [00:03<00:00, 27.33it/s]

Epoch : [65/80]

100%|

| 100/100 [00:03<00:00, 28.83it/s]

Accuracy on the train set: 95.86%, Train Loss: 0.0816

Accuracy on the test set: 92.42%, Test Loss: 0.3179

Epoch : [66/80]

100%|

| 100/100 [00:03<00:00, 25.66it/s]

Epoch : [67/80]

100%|

| 100/100 [00:03<00:00, 28.63it/s]

Epoch : [68/80]

100%|

| 100/100 [00:03<00:00, 29.26it/s]

Epoch : [69/80]

100%|

| 100/100 [00:03<00:00, 28.17it/s]

Epoch : [70/80]

100%|

| 100/100 [00:03<00:00, 27.70it/s]

Accuracy on the train set: 96.10%, Train Loss: 0.1796
Accuracy on the test set: 92.45%, Test Loss: 0.2927

Epoch : [71/80]

100%|
| 100/100 [00:03<00:00, 29.41it/s]

Epoch : [72/80]

100%|
| 100/100 [00:03<00:00, 28.30it/s]

Epoch : [73/80]

100%|
| 100/100 [00:03<00:00, 29.18it/s]

Epoch : [74/80]

100%|
| 100/100 [00:03<00:00, 28.25it/s]

Epoch : [75/80]

100%|
| 100/100 [00:03<00:00, 28.98it/s]

Accuracy on the train set: 96.19%, Train Loss: 0.1030
Accuracy on the test set: 92.45%, Test Loss: 0.2889

Epoch : [76/80]

100%|
| 100/100 [00:03<00:00, 27.08it/s]

Epoch : [77/80]

100%|
| 100/100 [00:03<00:00, 26.94it/s]

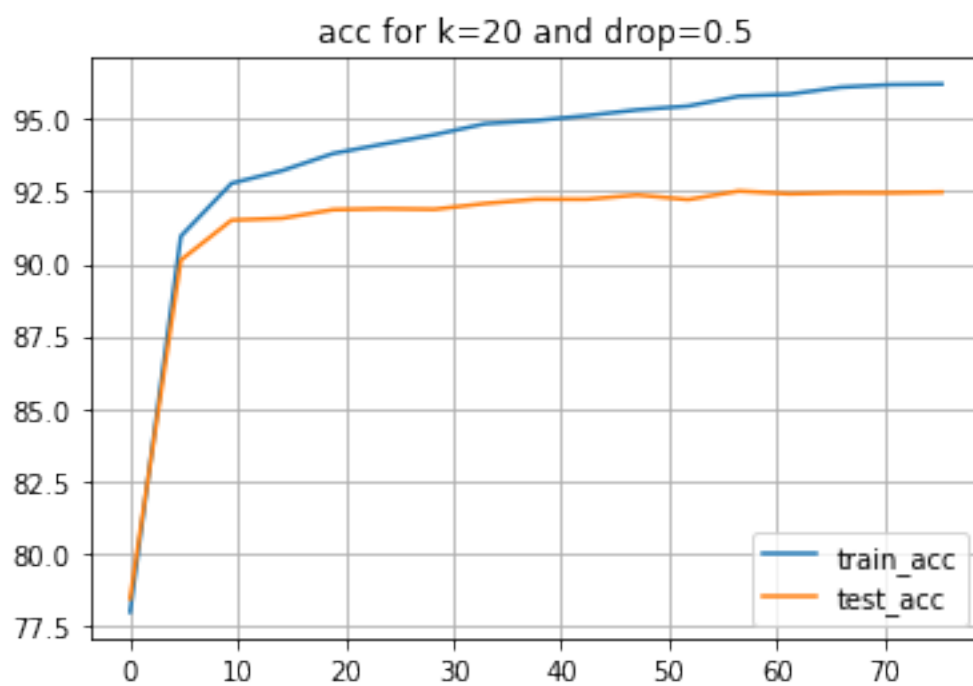
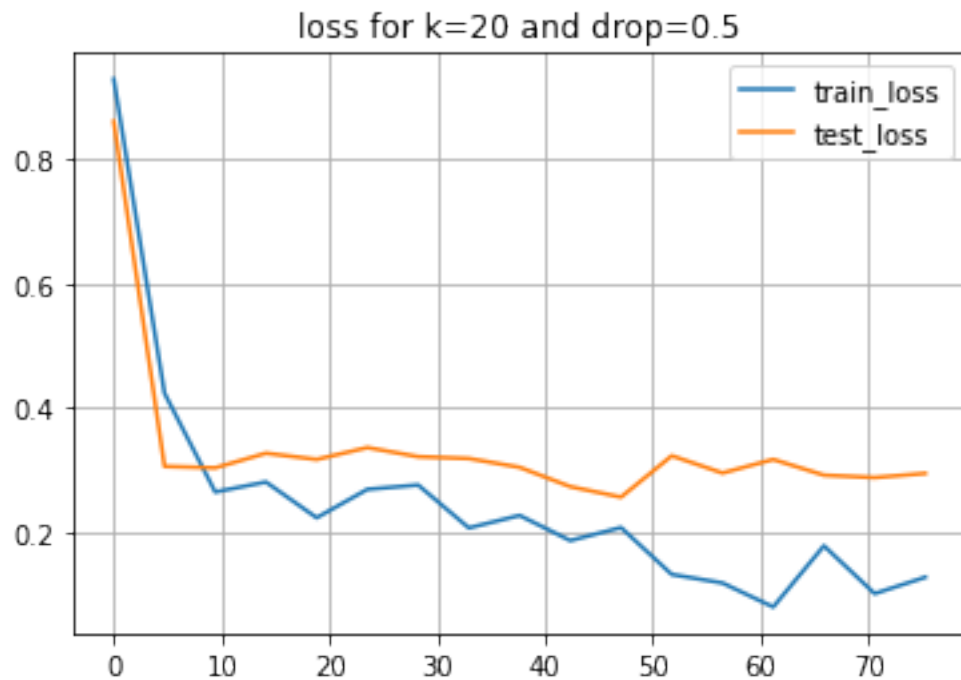
Epoch : [78/80]

100%|
| 100/100 [00:03<00:00, 27.23it/s]

Epoch : [79/80]

100%|
| 100/100 [00:03<00:00, 27.79it/s]

Accuracy on the train set: 96.21%, Train Loss: 0.1293
Accuracy on the test set: 92.48%, Test Loss: 0.2955



----- for k = 20 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:03<00:00, 26.80it/s]
Accuracy on the train set: 86.04%, Train Loss: 0.6011
Accuracy on the test set: 85.87%, Test Loss: 0.5049

Epoch : [1/80]
100%|
| 100/100 [00:03<00:00, 27.26it/s]
Epoch : [2/80]
100%|
| 100/100 [00:03<00:00, 28.38it/s]
Epoch : [3/80]
100%|
| 100/100 [00:03<00:00, 29.33it/s]
Epoch : [4/80]
100%|
| 100/100 [00:03<00:00, 29.40it/s]
Epoch : [5/80]
100%|
| 100/100 [00:03<00:00, 28.73it/s]
Accuracy on the train set: 94.66%, Train Loss: 0.2778
Accuracy on the test set: 92.40%, Test Loss: 0.2259

Epoch : [6/80]
100%|
| 100/100 [00:03<00:00, 31.38it/s]
Epoch : [7/80]
100%|
| 100/100 [00:03<00:00, 29.57it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 34.54it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 40.01it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.24it/s]

Accuracy on the train set: 96.64%, Train Loss: 0.0842
Accuracy on the test set: 93.30%, Test Loss: 0.2401

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 35.01it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.00it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 41.68it/s]

Accuracy on the train set: 97.93%, Train Loss: 0.0565

Accuracy on the test set: 93.92%, Test Loss: 0.2273

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.84it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 41.05it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Accuracy on the train set: 98.41%, Train Loss: 0.0941
Accuracy on the test set: 93.97%, Test Loss: 0.2434

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.78it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.61it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 42.90it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Accuracy on the train set: 98.93%, Train Loss: 0.0493

Accuracy on the test set: 94.17%, Test Loss: 0.2237

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.69it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.65it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.86it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.89it/s]

Accuracy on the train set: 99.37%, Train Loss: 0.0284
Accuracy on the test set: 94.18%, Test Loss: 0.2699

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.57it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 42.08it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.57it/s]

Accuracy on the train set: 99.75%, Train Loss: 0.0120

Accuracy on the test set: 94.42%, Test Loss: 0.2403

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.65it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 42.11it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.89it/s]

Accuracy on the train set: 99.91%, Train Loss: 0.0160
Accuracy on the test set: 94.44%, Test Loss: 0.2440

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.79it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 41.62it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.69it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.94it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0058

Accuracy on the test set: 94.45%, Test Loss: 0.2778

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Accuracy on the train set: 99.99%, Train Loss: 0.0091
Accuracy on the test set: 94.44%, Test Loss: 0.2732

Epoch : [51/80]

100%|
| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [52/80]

100%|
| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [53/80]

100%|
| 100/100 [00:02<00:00, 43.57it/s]

Epoch : [54/80]

100%|
| 100/100 [00:02<00:00, 42.77it/s]

Epoch : [55/80]

100%|
| 100/100 [00:02<00:00, 43.62it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0027
Accuracy on the test set: 94.38%, Test Loss: 0.2797

Epoch : [56/80]

100%|
| 100/100 [00:02<00:00, 42.38it/s]

Epoch : [57/80]

100%|
| 100/100 [00:02<00:00, 40.57it/s]

Epoch : [58/80]

100%|
| 100/100 [00:02<00:00, 42.23it/s]

Epoch : [59/80]

100%|
| 100/100 [00:02<00:00, 43.64it/s]

Epoch : [60/80]

100%|
| 100/100 [00:02<00:00, 43.45it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0056
Accuracy on the test set: 94.34%, Test Loss: 0.2886

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 42.41it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.71it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0025

Accuracy on the test set: 94.47%, Test Loss: 0.2941

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.66it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0017
Accuracy on the test set: 94.51%, Test Loss: 0.3192

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.97it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 42.39it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.60it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.64it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0013
Accuracy on the test set: 94.41%, Test Loss: 0.3096

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.84it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.33it/s]

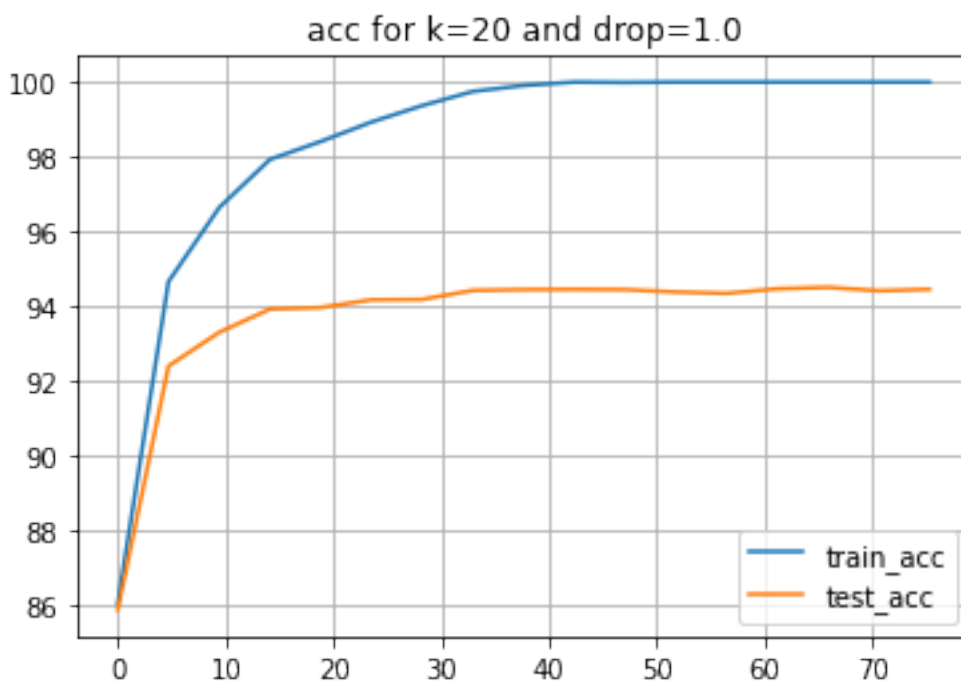
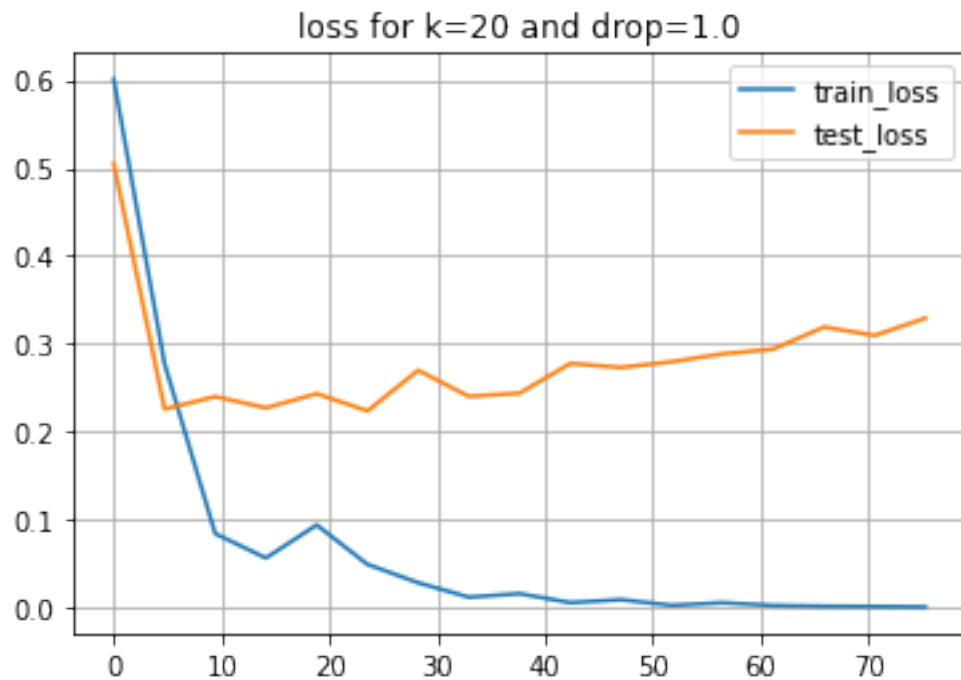
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.55it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0008
Accuracy on the test set: 94.45%, Test Loss: 0.3293



----- for k = 40 and dropout = 0.1 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 42.85it/s]
Accuracy on the train set: 33.07%, Train Loss: 2.0897
Accuracy on the test set: 34.29%, Test Loss: 2.0238

Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.46it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 43.17it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 42.97it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.09it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 43.45it/s]
Accuracy on the train set: 72.46%, Train Loss: 1.3211
Accuracy on the test set: 72.76%, Test Loss: 1.3401

Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.30it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.47it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 42.86it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.78it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 41.87it/s]

Accuracy on the train set: 76.02%, Train Loss: 1.1197
Accuracy on the test set: 75.84%, Test Loss: 1.0441

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.61it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 42.78it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.16it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.69it/s]

Accuracy on the train set: 79.51%, Train Loss: 0.9304

Accuracy on the test set: 79.34%, Test Loss: 0.9090

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 41.81it/s]

Accuracy on the train set: 81.06%, Train Loss: 1.0036
Accuracy on the test set: 80.88%, Test Loss: 0.8610

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Accuracy on the train set: 81.18%, Train Loss: 0.8714

Accuracy on the test set: 81.11%, Test Loss: 0.7997

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 42.64it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 42.49it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.78it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 42.09it/s]

Accuracy on the train set: 80.36%, Train Loss: 0.7431
Accuracy on the test set: 80.11%, Test Loss: 0.7701

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.61it/s]

Accuracy on the train set: 84.07%, Train Loss: 0.6491

Accuracy on the test set: 83.65%, Test Loss: 0.7127

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 41.87it/s]

Accuracy on the train set: 85.97%, Train Loss: 0.7990
Accuracy on the test set: 85.14%, Test Loss: 0.7538

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Accuracy on the train set: 86.05%, Train Loss: 0.7599

Accuracy on the test set: 85.32%, Test Loss: 0.6986

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 40.76it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.96it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 42.00it/s]

Accuracy on the train set: 87.56%, Train Loss: 0.7328
Accuracy on the test set: 86.66%, Test Loss: 0.6847

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Accuracy on the train set: 86.59%, Train Loss: 0.6597

Accuracy on the test set: 85.56%, Test Loss: 0.6804

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 42.13it/s]

Accuracy on the train set: 88.04%, Train Loss: 0.6251
Accuracy on the test set: 86.82%, Test Loss: 0.6676

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Accuracy on the train set: 87.74%, Train Loss: 0.7672

Accuracy on the test set: 86.45%, Test Loss: 0.6688

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.75it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 42.24it/s]

Accuracy on the train set: 88.28%, Train Loss: 0.6249
Accuracy on the test set: 86.99%, Test Loss: 0.5964

Epoch : [71/80]

100%|

| 100/100 [00:02<00:00, 42.28it/s]

Epoch : [72/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [73/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [74/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [75/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Accuracy on the train set: 87.10%, Train Loss: 0.6378

Accuracy on the test set: 86.11%, Test Loss: 0.6520

Epoch : [76/80]

100%|

| 100/100 [00:02<00:00, 43.02it/s]

Epoch : [77/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [78/80]

100%|

| 100/100 [00:02<00:00, 43.54it/s]

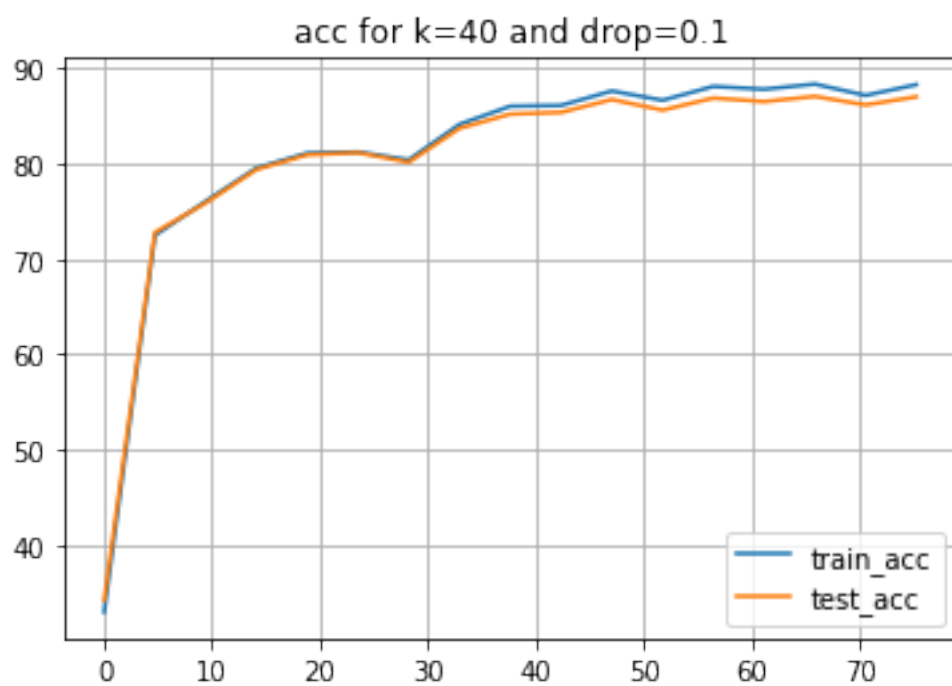
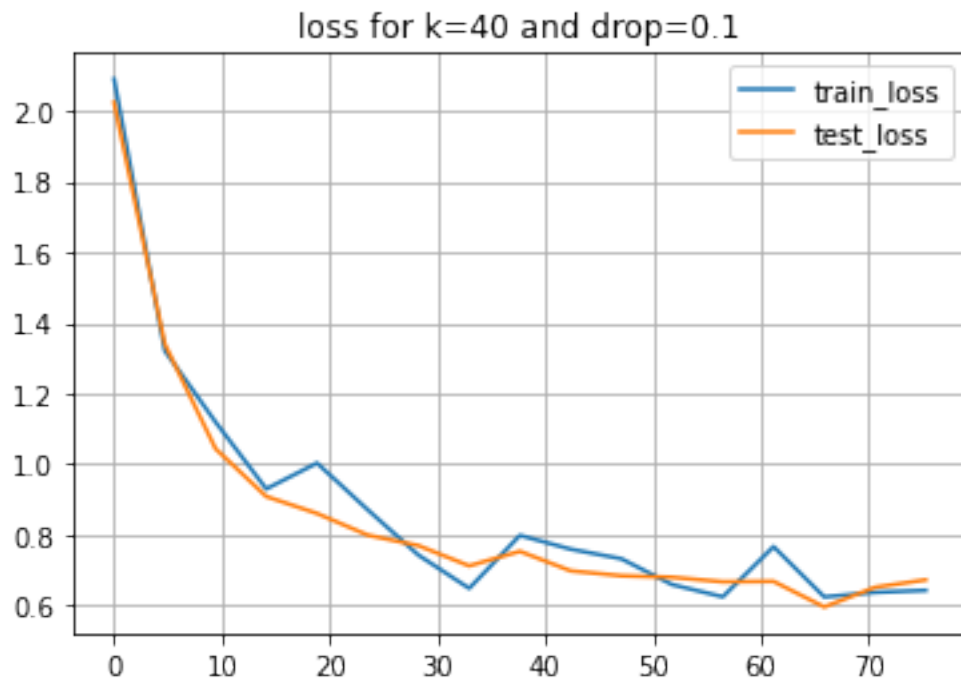
Epoch : [79/80]

100%|

| 100/100 [00:02<00:00, 43.56it/s]

Accuracy on the train set: 88.22%, Train Loss: 0.6435

Accuracy on the test set: 86.95%, Test Loss: 0.6731



----- for k = 40 and dropout = 0.5 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 44.00it/s]
Accuracy on the train set: 84.30%, Train Loss: 0.6509
Accuracy on the test set: 84.27%, Test Loss: 0.6622

Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.41it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 43.30it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 44.04it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.05it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 43.31it/s]
Accuracy on the train set: 93.50%, Train Loss: 0.1753
Accuracy on the test set: 92.09%, Test Loss: 0.2390

Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 41.66it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.40it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.34it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.04it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 42.88it/s]

Accuracy on the train set: 95.11%, Train Loss: 0.1869
Accuracy on the test set: 93.09%, Test Loss: 0.2527

Epoch : [11/80]

100%|
| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [12/80]

100%|
| 100/100 [00:02<00:00, 43.72it/s]

Epoch : [13/80]

100%|
| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [14/80]

100%|
| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [15/80]

100%|
| 100/100 [00:02<00:00, 43.12it/s]

Accuracy on the train set: 95.99%, Train Loss: 0.1096
Accuracy on the test set: 93.42%, Test Loss: 0.2371

Epoch : [16/80]

100%|
| 100/100 [00:02<00:00, 43.57it/s]

Epoch : [17/80]

100%|
| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [18/80]

100%|
| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [19/80]

100%|
| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [20/80]

100%|
| 100/100 [00:02<00:00, 43.28it/s]

Accuracy on the train set: 96.44%, Train Loss: 0.2206
Accuracy on the test set: 93.76%, Test Loss: 0.2266

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Accuracy on the train set: 97.17%, Train Loss: 0.0497

Accuracy on the test set: 94.11%, Test Loss: 0.2554

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Accuracy on the train set: 97.25%, Train Loss: 0.1152
Accuracy on the test set: 94.21%, Test Loss: 0.2543

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Accuracy on the train set: 97.47%, Train Loss: 0.0370

Accuracy on the test set: 94.10%, Test Loss: 0.2535

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Accuracy on the train set: 98.02%, Train Loss: 0.0931
Accuracy on the test set: 94.45%, Test Loss: 0.2484

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 42.66it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Accuracy on the train set: 98.20%, Train Loss: 0.0857

Accuracy on the test set: 94.58%, Test Loss: 0.2598

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 42.73it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Accuracy on the train set: 98.32%, Train Loss: 0.1138
Accuracy on the test set: 94.50%, Test Loss: 0.2985

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 42.91it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Accuracy on the train set: 98.37%, Train Loss: 0.0533

Accuracy on the test set: 94.52%, Test Loss: 0.3314

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Accuracy on the train set: 98.67%, Train Loss: 0.0278
Accuracy on the test set: 94.51%, Test Loss: 0.2893

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 42.83it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 42.90it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.51it/s]

Accuracy on the train set: 98.43%, Train Loss: 0.0726

Accuracy on the test set: 94.33%, Test Loss: 0.3623

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.57it/s]

Accuracy on the train set: 98.70%, Train Loss: 0.0372
Accuracy on the test set: 94.50%, Test Loss: 0.3673

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.60it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.81it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 42.90it/s]

Accuracy on the train set: 98.87%, Train Loss: 0.0213
Accuracy on the test set: 94.64%, Test Loss: 0.3573

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.04it/s]

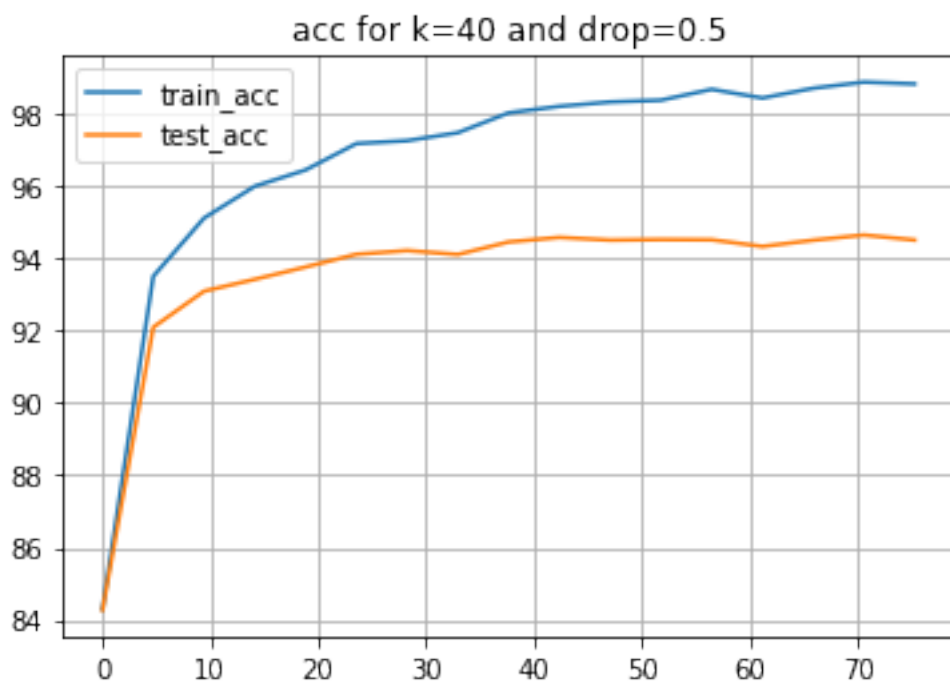
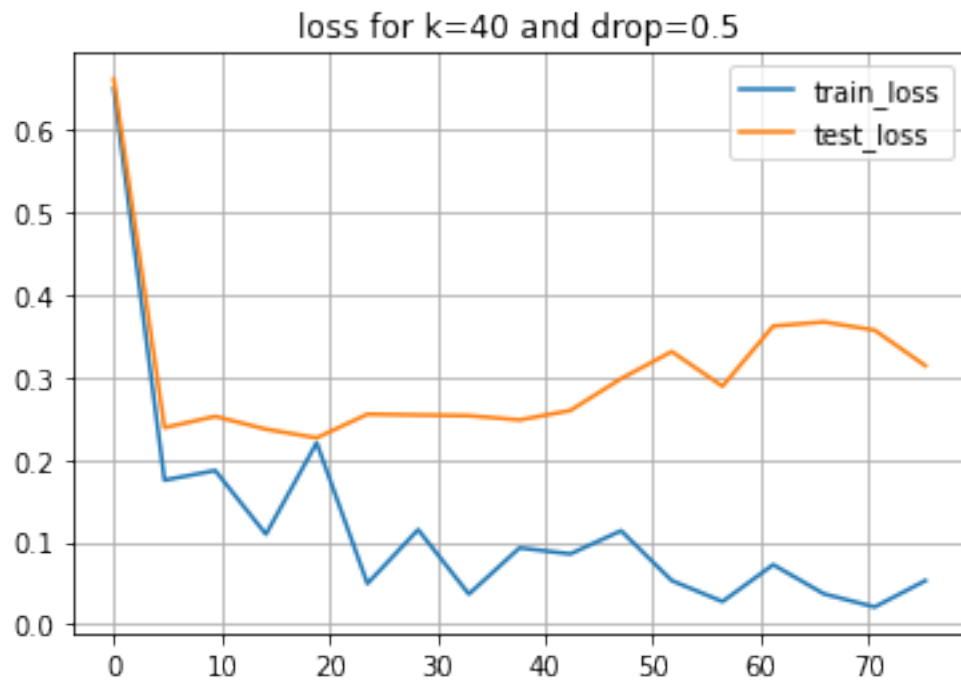
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.30it/s]

Accuracy on the train set: 98.82%, Train Loss: 0.0533
Accuracy on the test set: 94.50%, Test Loss: 0.3142



----- for k = 40 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 43.49it/s]
Accuracy on the train set: 89.69%, Train Loss: 0.4834
Accuracy on the test set: 89.16%, Test Loss: 0.3074
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.44it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 42.80it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.48it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 42.24it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 44.17it/s]
Accuracy on the train set: 97.03%, Train Loss: 0.0859
Accuracy on the test set: 94.23%, Test Loss: 0.2032
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.29it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.53it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.87it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.20it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.74it/s]

Accuracy on the train set: 98.50%, Train Loss: 0.0741
Accuracy on the test set: 94.71%, Test Loss: 0.2554

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.91it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.05it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Accuracy on the train set: 99.64%, Train Loss: 0.0135

Accuracy on the test set: 95.52%, Test Loss: 0.2492

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.83it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.73it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.52it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.60it/s]

Accuracy on the train set: 99.88%, Train Loss: 0.0124
Accuracy on the test set: 95.50%, Test Loss: 0.2719

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 41.34it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 42.22it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0083

Accuracy on the test set: 95.70%, Test Loss: 0.2997

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.51it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.95it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 42.74it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 44.26it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0075
Accuracy on the test set: 95.72%, Test Loss: 0.3294

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 41.85it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0021

Accuracy on the test set: 95.78%, Test Loss: 0.3510

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.56it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.44it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.61it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0018
Accuracy on the test set: 95.79%, Test Loss: 0.3689

Epoch : [41/80]

100%|
| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [42/80]

100%|
| 100/100 [00:02<00:00, 43.51it/s]

Epoch : [43/80]

100%|
| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [44/80]

100%|
| 100/100 [00:02<00:00, 42.18it/s]

Epoch : [45/80]

100%|
| 100/100 [00:02<00:00, 43.57it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0010
Accuracy on the test set: 95.78%, Test Loss: 0.3729

Epoch : [46/80]

100%|
| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [47/80]

100%|
| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [48/80]

100%|
| 100/100 [00:02<00:00, 43.60it/s]

Epoch : [49/80]

100%|
| 100/100 [00:02<00:00, 44.07it/s]

Epoch : [50/80]

100%|
| 100/100 [00:02<00:00, 43.24it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0016
Accuracy on the test set: 95.80%, Test Loss: 0.4085

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 41.61it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.64it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0004

Accuracy on the test set: 95.86%, Test Loss: 0.4252

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0007
Accuracy on the test set: 95.78%, Test Loss: 0.4329

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.58it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 41.53it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0002

Accuracy on the test set: 95.86%, Test Loss: 0.4684

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 44.04it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0003
Accuracy on the test set: 95.84%, Test Loss: 0.4744

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.55it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.34it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.59it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0002
Accuracy on the test set: 95.86%, Test Loss: 0.4965

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.40it/s]

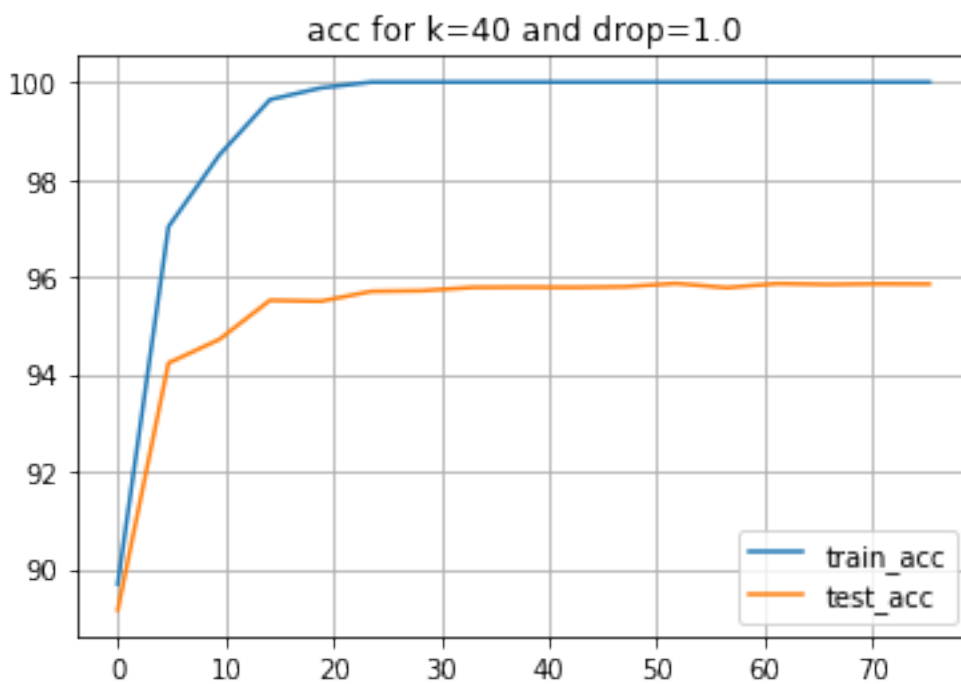
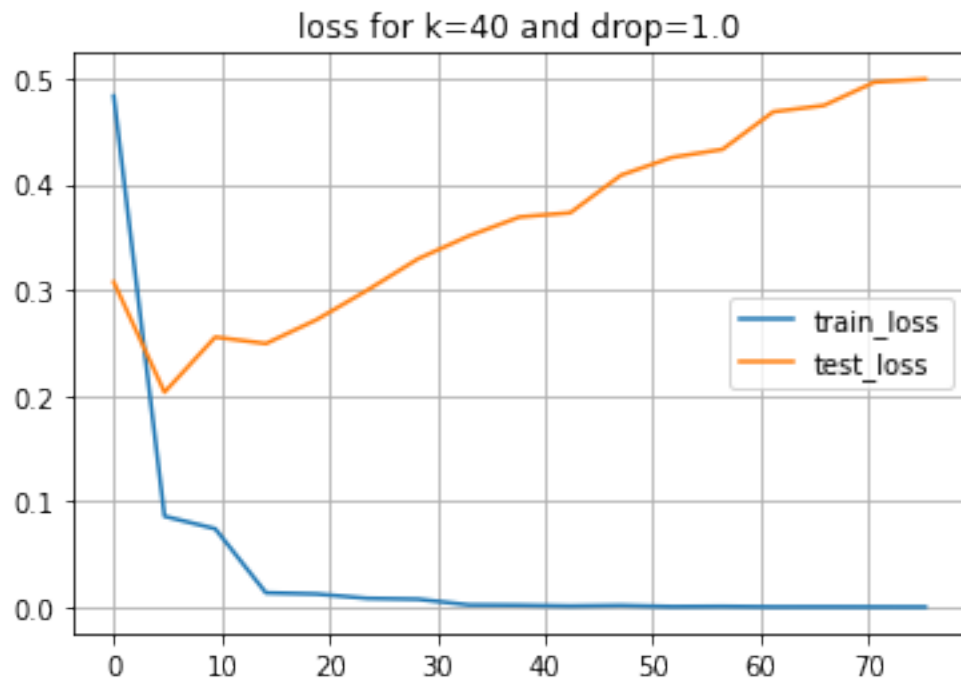
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.56it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.80it/s]

Accuracy on the train set: 100.00%, Train Loss: 0.0001
Accuracy on the test set: 95.85%, Test Loss: 0.4993



```
[14]: records_updated = []
```

```

for record in records:
    records_updated.append({
        'k':record['k'],
        'dropout_prob':record['dropout_prob'],
        'train_acc': max(record['train_acc']),
        'test_acc': max(record['test_acc']),
    })
df = pd.DataFrame.from_records(records_updated)
df

```

```

[14]:
   k  dropout_prob  train_acc  test_acc
0   1           0.1      10.00   9.871667
1   1           0.5      10.00   9.871667
2   1           1.0     19.83  20.838333
3   5           0.1     16.95  16.113333
4   5           0.5     70.89  69.838333
5   5           1.0     89.46  85.313333
6  10           0.1     49.53  50.706667
7  10           0.5     92.67  89.431667
8  10           1.0     98.82  92.206667
9  20           0.1     62.28  62.998333
10 20           0.5     96.21  92.511667
11 20           1.0    100.00  94.506667
12 40           0.1     88.28  86.990000
13 40           0.5     98.87  94.641667
14 40           1.0    100.00  95.865000

```

0.0.8 Plot Results

```

[15]: df_tensor = torch.tensor(df.values)
df_tensor

```

```

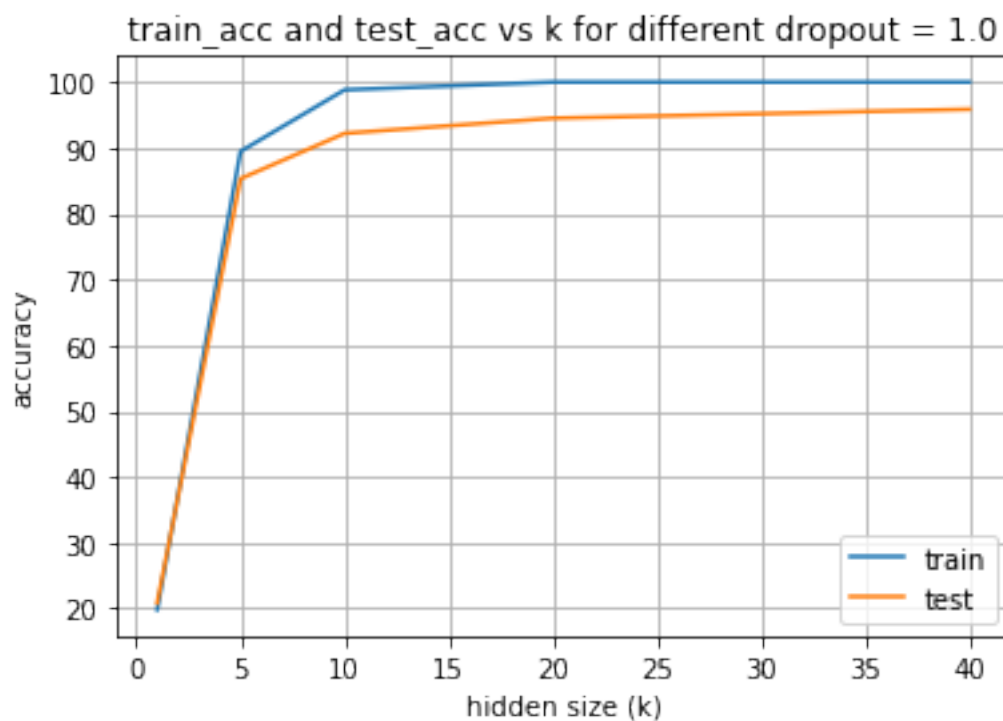
[15]: tensor([[ 1.0000,  0.1000, 10.0000,  9.8717],
              [ 1.0000,  0.5000, 10.0000,  9.8717],
              [ 1.0000,  1.0000, 19.8300, 20.8383],
              [ 5.0000,  0.1000, 16.9500, 16.1133],
              [ 5.0000,  0.5000, 70.8900, 69.8383],
              [ 5.0000,  1.0000, 89.4600, 85.3133],
              [10.0000,  0.1000, 49.5300, 50.7067],
              [10.0000,  0.5000, 92.6700, 89.4317],
              [10.0000,  1.0000, 98.8200, 92.2067],
              [20.0000,  0.1000, 62.2800, 62.9983],
              [20.0000,  0.5000, 96.2100, 92.5117],
              [20.0000,  1.0000, 100.0000, 94.5067],
              [40.0000,  0.1000, 88.2800, 86.9900],
              [40.0000,  0.5000, 98.8700, 94.6417],
              [40.0000,  1.0000, 100.0000, 95.8650]], dtype=torch.float64)

```



```
[16]: plt.figure(1)
sub_df = df_tensor[df_tensor[:,1] == 1.0]
plt.plot(sub_df[:, 0], sub_df[:,2], label='train')
plt.plot(sub_df[:, 0], sub_df[:,3], label='test')

plt.title('train_acc and test_acc vs k for different dropout = 1.0')
plt.legend()
plt.xlabel('hidden size (k)')
plt.ylabel('accuracy')
plt.grid()
plt.plot()
plt.show()
```

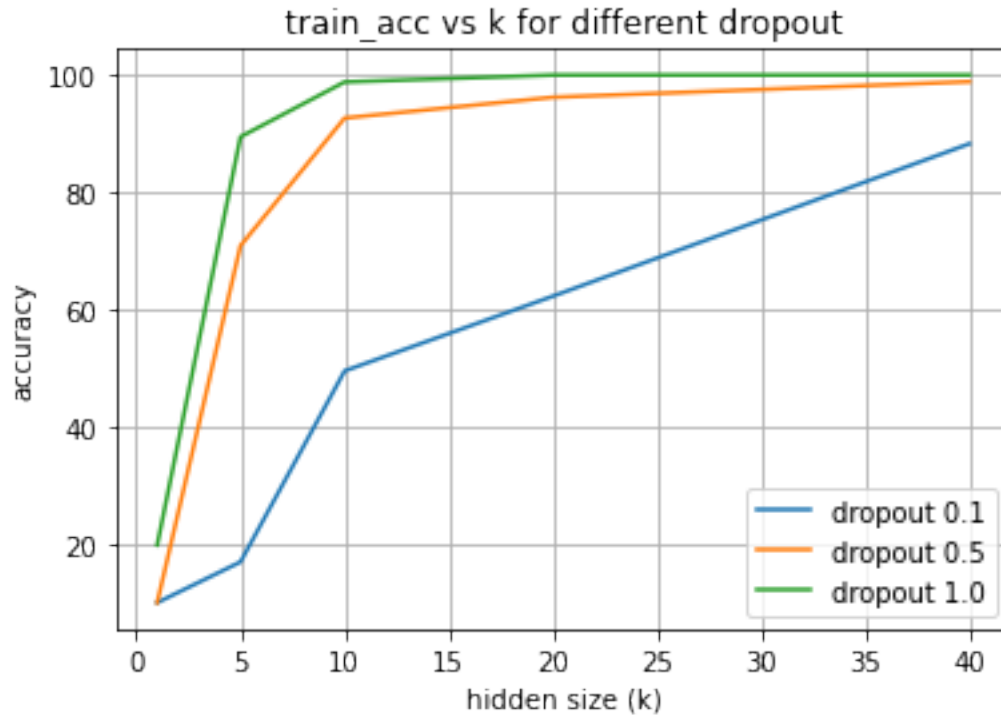


As k increases, the accuracy and performance of the model increases and improves. At at and after 20, we can see that accuracy becomes 100%

```
[17]: plt.figure(2)
for p in [0.1,0.5, 1.0]:
    sub_df = df_tensor[df_tensor[:,1] == p]
    plt.plot(sub_df[:, 0], sub_df[:,2], label=f'dropout {p}')

plt.title('train_acc vs k for different dropout')
plt.legend()
plt.xlabel('hidden size (k)')
```

```
plt.ylabel('accuracy')
plt.grid()
plt.plot()
plt.show()
```



The value of p or dropout helps the model generalize and prevents overfitting.

As we increase the value of p, we can see that the model improves and also it is easier to optimize.

At $p = 1$ we can see 100% train accuracy at $k = 20$.

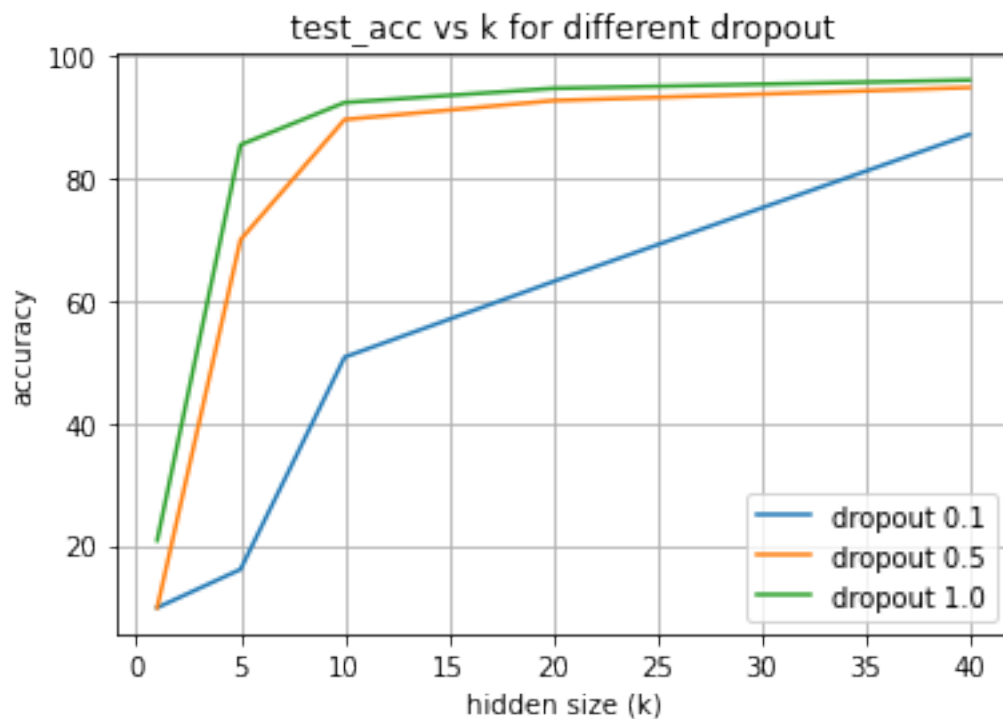
At $p = 0.5$ we can see 100% train accuracy at $k = 40$.

At $p = 0.1$ we can see 100% train accuracy at $k = 80$ if we had run our model for that many hidden units.

```
[18]: plt.figure(3)
      for p in [0.1, 0.5, 1.0]:
          sub_df = df_tensor[df_tensor[:, 1] == p]
          plt.plot(sub_df[:, 0], sub_df[:, 3], label=f'dropout {p}')

      plt.title('test_acc vs k for different dropout')
      plt.legend()
      plt.xlabel('hidden size (k)')
      plt.ylabel('accuracy')
      plt.grid()
```

```
plt.plot()
plt.show()
```



We can see a little improvement in test accuracy when we add dropout.

The model converges earlier.

For $k = 40$ and dropout = 1.0, we can get the best test accuracy

0.0.9 Create Dataset again and Add Noise

```
[19]: class PerImageNormalize(torchvision.transforms.ToTensor):
    def __call__(self, pic):
        tensor = super().__call__(pic)
        tensor = tensor.reshape(-1, 784)
        tensor = (tensor - torch.mean(tensor, axis=1, keepdims=True)) / (torch.
        ↪std(tensor, axis=1, keepdims=True) + 1e-8)
        return tensor

transforms = torchvision.transforms.Compose([
    PerImageNormalize()
])
```

```

train_dataset = torchvision.datasets.MNIST(root='./', train=True,
    ↪download=True, transform=transforms)
test_dataset = torchvision.datasets.MNIST(root='./', train=False,
    ↪download=True, transform=transforms)

```

```

[20]: def generate_random_numbers(start, end, exclude, num_samples):
    random_nums = []
    while len(random_nums) < num_samples:
        batch_size = num_samples - len(random_nums)
        random_batch = torch.randint(start, end, (batch_size,))
        valid_nums = random_batch[random_batch != exclude]
        random_nums.extend(valid_nums.tolist())
    return torch.tensor(random_nums)

```

```

[21]: noisy_labels = train_dataset.targets.clone()

# ~40% of examples per label will have their labels changed
noise_ratio = 0.4

for label in range(10):
    label_indices = torch.where(train_dataset.targets == label)[0]
    sampled_indices = np.random.choice(label_indices, label_indices.shape[0],
    ↪replace=False)
    noisy_indices = np.random.choice(sampled_indices, int(label_indices.
    ↪shape[0] * noise_ratio), replace=False)
    new_labels = generate_random_numbers(0, 10, label, (int(label_indices.
    ↪shape[0] * noise_ratio)))
    noisy_labels[noisy_indices] = new_labels

train_dataset.targets = noisy_labels

```

0.0.10 Sample Again

```

[22]: # Create a list to store the indices of the selected samples
selected_indices = []

# Iterate over each unique target class
for class_label in range(10):

    # Get the indices of samples belonging to the current class
    class_indices = torch.nonzero(train_dataset.targets == class_label).
    ↪squeeze()

    # Randomly select desired_samples number of samples from the class

```

```

class_indices = torch.from_numpy(np.random.choice(class_indices,
↳desired_samples, replace=False))

# Append the selected indices to the list
selected_indices.append(class_indices)

# Concatenate the selected indices for all classes
selected_indices = torch.cat(selected_indices)

# Create a SubsetRandomSampler using the selected indices
sampler = torch.utils.data.SubsetRandomSampler(selected_indices)

```

```

[23]: # Create a DataLoader using the dataset and the sampler
# sampling is only needed for train set
train_dataloader = torch.utils.data.DataLoader(train_dataset,
↳batch_size=batch_size, sampler=sampler)
test_dataloader = torch.utils.data.DataLoader(train_dataset,
↳batch_size=batch_size)

```

0.0.11 Run Grid Again

```

[24]: records = []

for k in [1,5,10,20,40]:
    for dropout_prob in [0.1, 0.5, 1.0]:

        print (f'----- for k = {k} and dropout = {dropout_prob} -----')
        train_loss, test_loss, train_acc, test_acc =
↳train_loop(train_dataloader,
                                                    test_dataloader,
↳n_epochs=num_epochs,
                                                    k=k,
↳dropout_prob=1-dropout_prob,
                                                    lr=0.001)

        plot_list(train_loss, 'train_loss', test_loss, 'test_loss', f'loss for
↳k={k} and drop={dropout_prob}')
        plot_list(train_acc, 'train_acc', test_acc, 'test_acc', f'acc for k={k}
↳and drop={dropout_prob}')

        records.append({
            'k':k,
            'dropout_prob':dropout_prob,
            'train_loss':train_loss,

```

```
        'test_loss': test_loss,  
        'train_acc': train_acc,  
        'test_acc': test_acc  
    })
```

----- for k = 1 and dropout = 0.1 -----

Epoch : [0/80]

100%|

| 100/100 [00:02<00:00, 42.84it/s]

Accuracy on the train set: 9.99%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [1/80]

100%|

| 100/100 [00:02<00:00, 43.02it/s]

Epoch : [2/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [3/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [4/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [5/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Accuracy on the train set: 9.99%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [6/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [7/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [8/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 42.62it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.39it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026
Epoch : [11/80]
100%|
| 100/100 [00:02<00:00, 43.58it/s]
Epoch : [12/80]
100%|
| 100/100 [00:02<00:00, 43.80it/s]
Epoch : [13/80]
100%|
| 100/100 [00:02<00:00, 43.36it/s]
Epoch : [14/80]
100%|
| 100/100 [00:02<00:00, 42.78it/s]
Epoch : [15/80]
100%|
| 100/100 [00:02<00:00, 43.20it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026
Epoch : [16/80]
100%|
| 100/100 [00:02<00:00, 42.60it/s]
Epoch : [17/80]
100%|
| 100/100 [00:02<00:00, 43.34it/s]
Epoch : [18/80]
100%|
| 100/100 [00:02<00:00, 44.05it/s]
Epoch : [19/80]

100%|
| 100/100 [00:02<00:00, 43.27it/s]
Epoch : [20/80]
100%|
| 100/100 [00:02<00:00, 43.18it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026
Epoch : [21/80]
100%|
| 100/100 [00:02<00:00, 43.05it/s]
Epoch : [22/80]
100%|
| 100/100 [00:02<00:00, 43.37it/s]
Epoch : [23/80]
100%|
| 100/100 [00:02<00:00, 43.16it/s]
Epoch : [24/80]
100%|
| 100/100 [00:02<00:00, 43.08it/s]
Epoch : [25/80]
100%|
| 100/100 [00:02<00:00, 43.37it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026
Epoch : [26/80]
100%|
| 100/100 [00:02<00:00, 43.38it/s]
Epoch : [27/80]
100%|
| 100/100 [00:02<00:00, 43.69it/s]
Epoch : [28/80]
100%|
| 100/100 [00:02<00:00, 42.92it/s]
Epoch : [29/80]
100%|
| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 42.73it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 42.69it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.72it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [40/80]

100%|
| 100/100 [00:02<00:00, 42.34it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [41/80]
100%|
| 100/100 [00:02<00:00, 43.38it/s]
Epoch : [42/80]
100%|
| 100/100 [00:02<00:00, 43.76it/s]
Epoch : [43/80]
100%|
| 100/100 [00:02<00:00, 43.30it/s]
Epoch : [44/80]
100%|
| 100/100 [00:02<00:00, 43.54it/s]
Epoch : [45/80]
100%|
| 100/100 [00:02<00:00, 43.29it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [46/80]
100%|
| 100/100 [00:02<00:00, 43.67it/s]
Epoch : [47/80]
100%|
| 100/100 [00:02<00:00, 43.26it/s]
Epoch : [48/80]
100%|
| 100/100 [00:02<00:00, 43.66it/s]
Epoch : [49/80]
100%|
| 100/100 [00:02<00:00, 42.87it/s]
Epoch : [50/80]
100%|
| 100/100 [00:02<00:00, 41.77it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.78it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.56it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 41.82it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [61/80]

100%|
| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [62/80]

100%|
| 100/100 [00:02<00:00, 43.77it/s]

Epoch : [63/80]

100%|
| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [64/80]

100%|
| 100/100 [00:02<00:00, 42.37it/s]

Epoch : [65/80]

100%|
| 100/100 [00:02<00:00, 43.21it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [66/80]

100%|
| 100/100 [00:02<00:00, 42.87it/s]

Epoch : [67/80]

100%|
| 100/100 [00:02<00:00, 43.44it/s]

Epoch : [68/80]

100%|
| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [69/80]

100%|
| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [70/80]

100%|
| 100/100 [00:02<00:00, 43.58it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 42.90it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.69it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.45it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 42.11it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 42.38it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.21it/s]

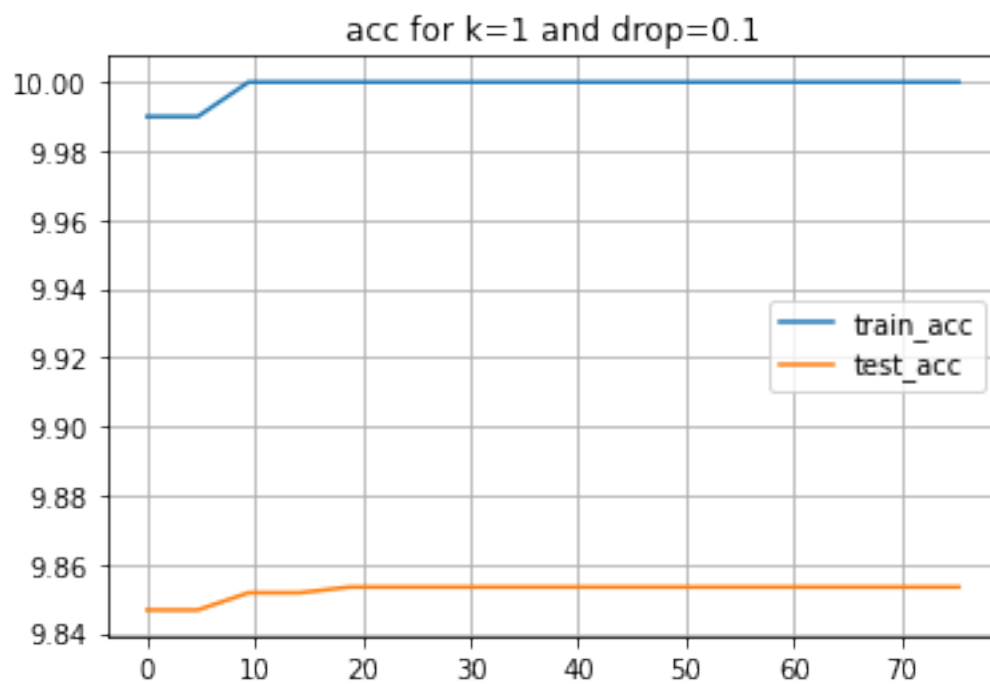
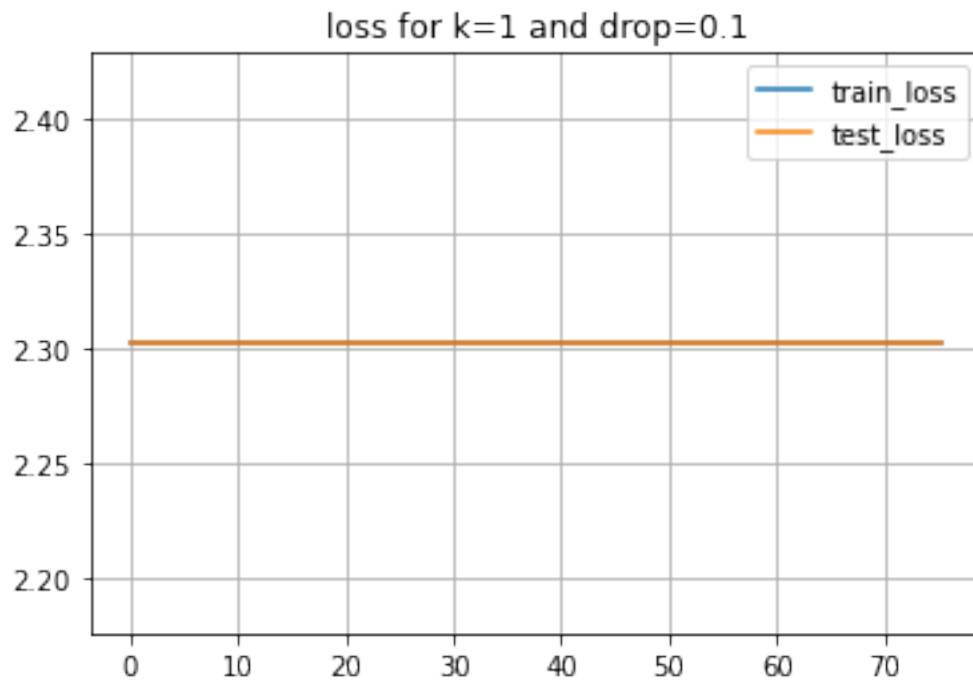
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.07it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026



----- for k = 1 and dropout = 0.5 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 43.49it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 44.14it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 42.11it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.07it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.30it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 42.44it/s]
Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.64it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 42.87it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.05it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.17it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 42.85it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 41.43it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.61it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.65it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 42.03it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 42.14it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 41.93it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.74it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 42.40it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 42.15it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.62it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 42.28it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 42.82it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 42.77it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [51/80]

100%|
| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [52/80]

100%|
| 100/100 [00:02<00:00, 41.37it/s]

Epoch : [53/80]

100%|
| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [54/80]

100%|
| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [55/80]

100%|
| 100/100 [00:02<00:00, 43.46it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [56/80]

100%|
| 100/100 [00:02<00:00, 42.66it/s]

Epoch : [57/80]

100%|
| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [58/80]

100%|
| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [59/80]

100%|
| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [60/80]

100%|
| 100/100 [00:02<00:00, 43.19it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [61/80]

100%|
| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [62/80]

100%|
| 100/100 [00:02<00:00, 42.19it/s]

Epoch : [63/80]

100%|
| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [64/80]

100%|
| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [65/80]

100%|
| 100/100 [00:02<00:00, 42.44it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [66/80]

100%|
| 100/100 [00:02<00:00, 42.56it/s]

Epoch : [67/80]

100%|
| 100/100 [00:02<00:00, 43.27it/s]

Epoch : [68/80]

100%|
| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [69/80]

100%|
| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [70/80]

100%|
| 100/100 [00:02<00:00, 43.08it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 42.14it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 42.62it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.59it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.26it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.16it/s]

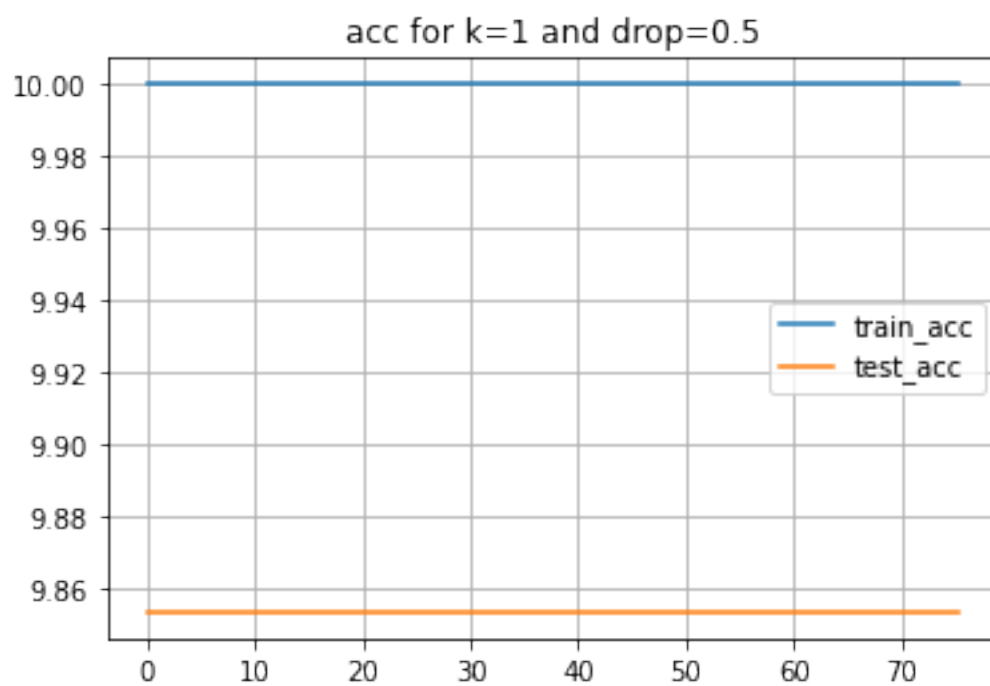
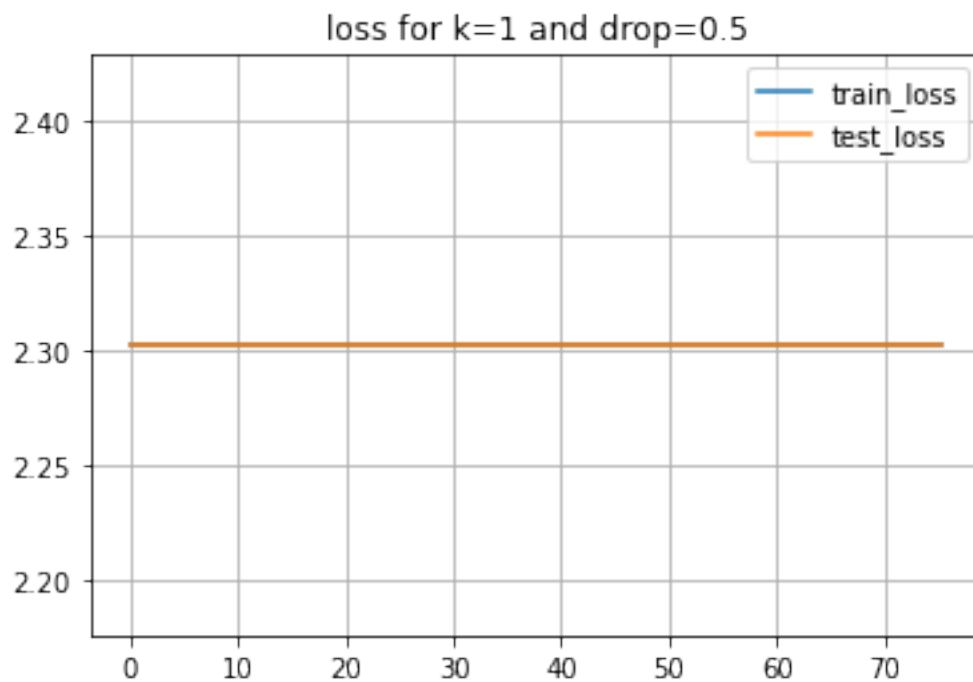
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.18it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026



----- for k = 1 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 41.59it/s]
Accuracy on the train set: 10.04%, Train Loss: 2.3026
Accuracy on the test set: 9.88%, Test Loss: 2.3026
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 40.23it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 43.21it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.18it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.76it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 42.90it/s]
Accuracy on the train set: 10.24%, Train Loss: 2.3026
Accuracy on the test set: 10.05%, Test Loss: 2.3026
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.47it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.11it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.67it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.63it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 42.34it/s]

Accuracy on the train set: 13.66%, Train Loss: 2.2558
Accuracy on the test set: 13.41%, Test Loss: 2.2616

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Accuracy on the train set: 13.87%, Train Loss: 2.2743

Accuracy on the test set: 13.30%, Test Loss: 2.2546

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.66it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 41.69it/s]

Accuracy on the train set: 14.67%, Train Loss: 2.1761
Accuracy on the test set: 14.41%, Test Loss: 2.2655

Epoch : [21/80]

100%|
| 100/100 [00:02<00:00, 42.20it/s]

Epoch : [22/80]

100%|
| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [23/80]

100%|
| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [24/80]

100%|
| 100/100 [00:02<00:00, 43.65it/s]

Epoch : [25/80]

100%|
| 100/100 [00:02<00:00, 43.15it/s]

Accuracy on the train set: 14.71%, Train Loss: 2.2217
Accuracy on the test set: 14.27%, Test Loss: 2.2632

Epoch : [26/80]

100%|
| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [27/80]

100%|
| 100/100 [00:02<00:00, 43.77it/s]

Epoch : [28/80]

100%|
| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [29/80]

100%|
| 100/100 [00:02<00:00, 43.08it/s]

Epoch : [30/80]

100%|
| 100/100 [00:02<00:00, 41.02it/s]

Accuracy on the train set: 15.09%, Train Loss: 2.2871
Accuracy on the test set: 14.79%, Test Loss: 2.2537

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.75it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Accuracy on the train set: 14.84%, Train Loss: 2.2351

Accuracy on the test set: 14.36%, Test Loss: 2.2791

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 42.50it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 44.05it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.58it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 42.60it/s]

Accuracy on the train set: 15.05%, Train Loss: 2.1964
Accuracy on the test set: 14.58%, Test Loss: 2.2731

Epoch : [41/80]

100%|
| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [42/80]

100%|
| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [43/80]

100%|
| 100/100 [00:02<00:00, 43.57it/s]

Epoch : [44/80]

100%|
| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [45/80]

100%|
| 100/100 [00:02<00:00, 43.60it/s]

Accuracy on the train set: 15.07%, Train Loss: 2.1987
Accuracy on the test set: 14.77%, Test Loss: 2.2482

Epoch : [46/80]

100%|
| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [47/80]

100%|
| 100/100 [00:02<00:00, 43.76it/s]

Epoch : [48/80]

100%|
| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [49/80]

100%|
| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [50/80]

100%|
| 100/100 [00:02<00:00, 41.79it/s]

Accuracy on the train set: 14.91%, Train Loss: 2.1897
Accuracy on the test set: 14.29%, Test Loss: 2.2630

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.66it/s]

Accuracy on the train set: 15.16%, Train Loss: 2.1667

Accuracy on the test set: 14.52%, Test Loss: 2.2570

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.79it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 41.74it/s]

Accuracy on the train set: 15.06%, Train Loss: 2.1917
Accuracy on the test set: 14.69%, Test Loss: 2.2536

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 42.71it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.54it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 42.31it/s]

Accuracy on the train set: 15.15%, Train Loss: 2.2204

Accuracy on the test set: 14.63%, Test Loss: 2.2558

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.02it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 41.64it/s]

Accuracy on the train set: 15.13%, Train Loss: 2.2442
Accuracy on the test set: 14.46%, Test Loss: 2.2605

Epoch : [71/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [72/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [73/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [74/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [75/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Accuracy on the train set: 15.11%, Train Loss: 2.2181

Accuracy on the test set: 14.36%, Test Loss: 2.2648

Epoch : [76/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [77/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [78/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

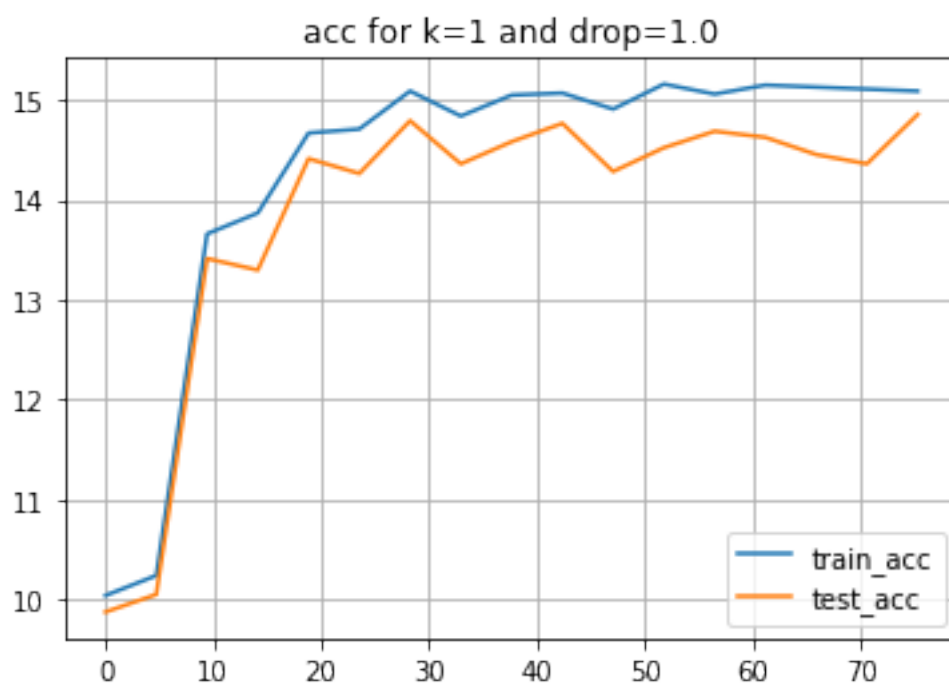
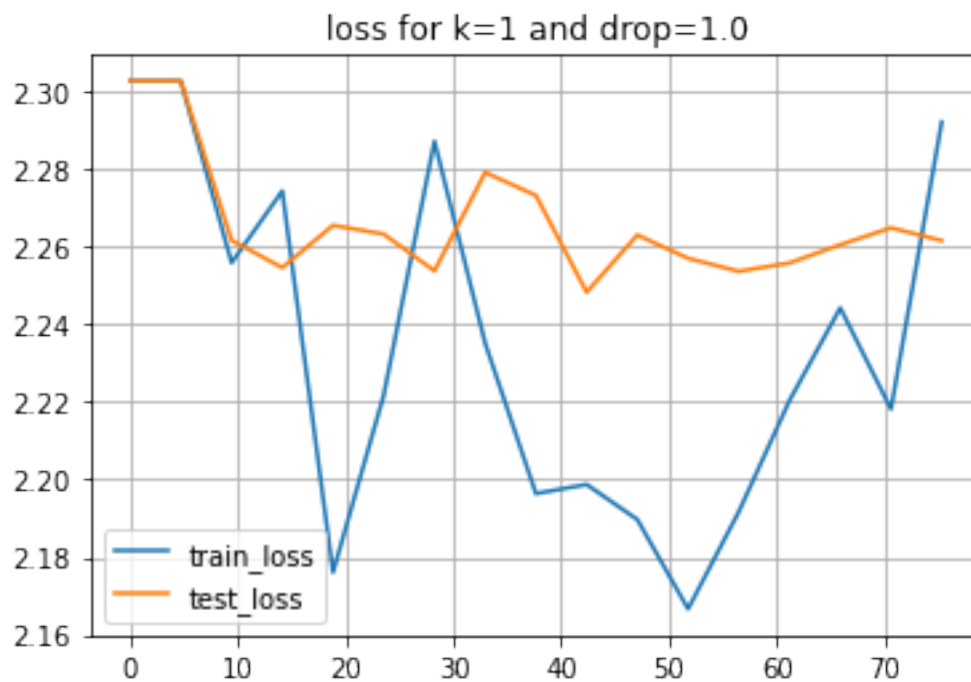
Epoch : [79/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Accuracy on the train set: 15.09%, Train Loss: 2.2921

Accuracy on the test set: 14.86%, Test Loss: 2.2615



----- for k = 5 and dropout = 0.1 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 42.89it/s]
Accuracy on the train set: 9.99%, Train Loss: 2.3023
Accuracy on the test set: 9.89%, Test Loss: 2.3109
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 41.46it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 42.90it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.24it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.13it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 42.97it/s]
Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.87%, Test Loss: 2.3024
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.23it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 41.55it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.19it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 42.68it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.28it/s]

Accuracy on the train set: 10.05%, Train Loss: 2.2995
Accuracy on the test set: 9.90%, Test Loss: 2.3024

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Accuracy on the train set: 9.99%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3017

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 42.07it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Accuracy on the train set: 9.99%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 42.69it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 42.22it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 42.27it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 42.63it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 41.78it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026

Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 41.94it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [41/80]

100%|
| 100/100 [00:02<00:00, 43.82it/s]

Epoch : [42/80]

100%|
| 100/100 [00:02<00:00, 41.71it/s]

Epoch : [43/80]

100%|
| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [44/80]

100%|
| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [45/80]

100%|
| 100/100 [00:02<00:00, 43.14it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3026

Epoch : [46/80]

100%|
| 100/100 [00:02<00:00, 42.81it/s]

Epoch : [47/80]

100%|
| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [48/80]

100%|
| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [49/80]

100%|
| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [50/80]

100%|
| 100/100 [00:02<00:00, 43.15it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 41.81it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026

Accuracy on the test set: 9.86%, Test Loss: 2.3025

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 42.27it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3024

Epoch : [61/80]

100%|
| 100/100 [00:02<00:00, 41.63it/s]

Epoch : [62/80]

100%|
| 100/100 [00:02<00:00, 42.11it/s]

Epoch : [63/80]

100%|
| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [64/80]

100%|
| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [65/80]

100%|
| 100/100 [00:02<00:00, 43.02it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3023

Epoch : [66/80]

100%|
| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [67/80]

100%|
| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [68/80]

100%|
| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [69/80]

100%|
| 100/100 [00:02<00:00, 41.86it/s]

Epoch : [70/80]

100%|
| 100/100 [00:02<00:00, 42.81it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3022

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 42.74it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.52it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.08it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 42.93it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3022

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.65it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 41.75it/s]

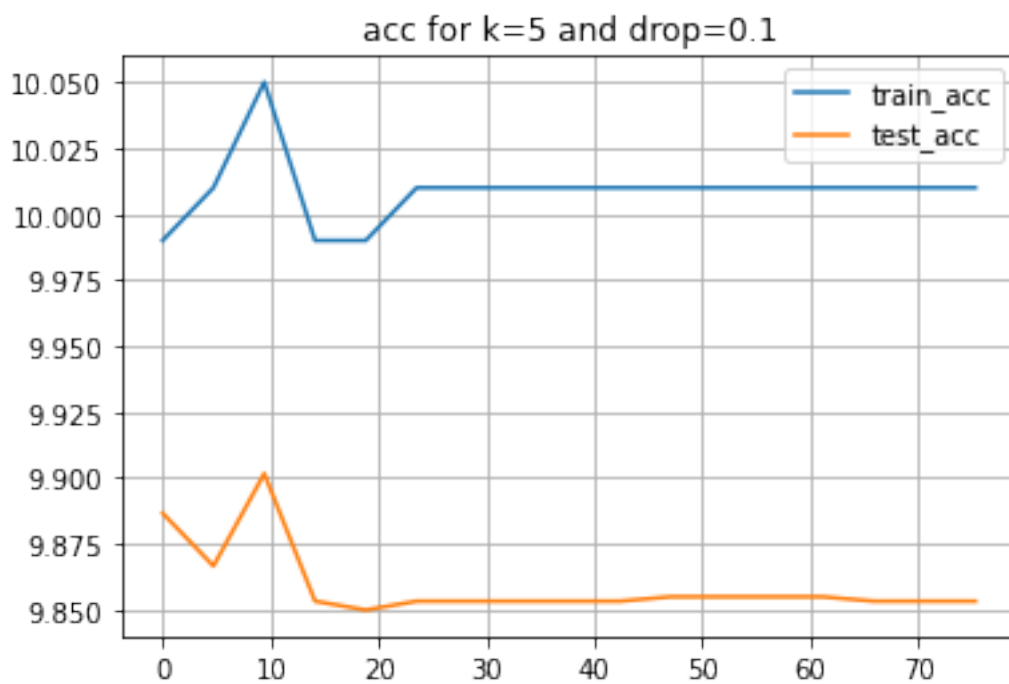
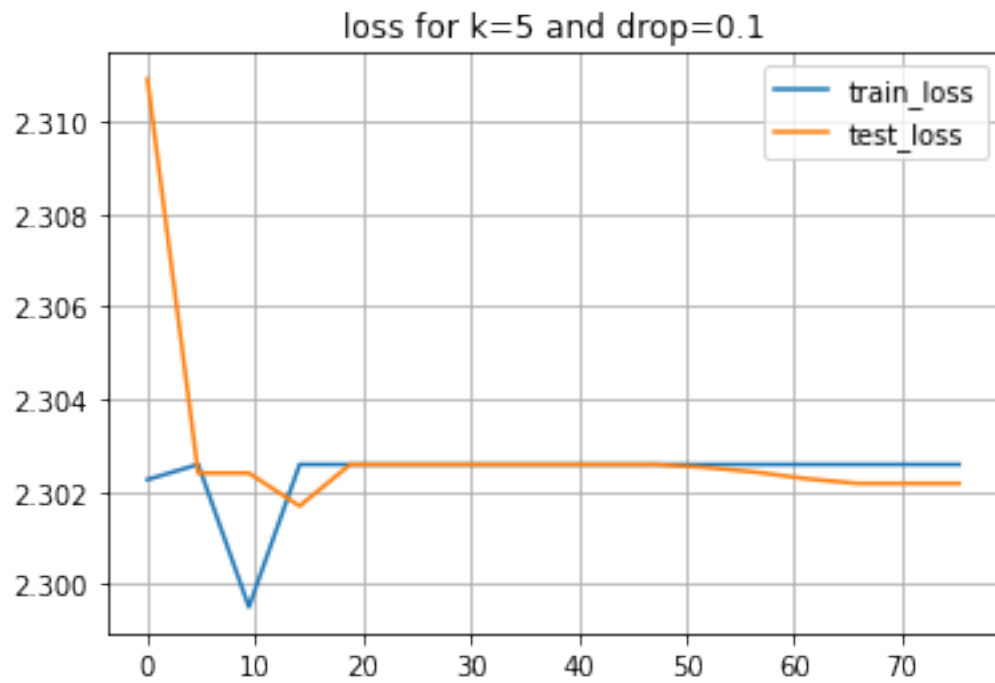
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.25it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3026
Accuracy on the test set: 9.85%, Test Loss: 2.3022



----- for k = 5 and dropout = 0.5 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:02<00:00, 43.14it/s]

Accuracy on the train set: 10.01%, Train Loss: 2.3067
Accuracy on the test set: 9.86%, Test Loss: 2.3002

Epoch : [1/80]

100%|
  | 100/100 [00:02<00:00, 43.14it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:02<00:00, 42.82it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:02<00:00, 43.57it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:02<00:00, 42.70it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:02<00:00, 43.58it/s]

Accuracy on the train set: 13.71%, Train Loss: 2.3096
Accuracy on the test set: 13.31%, Test Loss: 2.2666

Epoch : [6/80]

100%|
  | 100/100 [00:02<00:00, 43.05it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:02<00:00, 43.34it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:02<00:00, 43.66it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:02<00:00, 43.77it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:02<00:00, 43.17it/s]

```

Accuracy on the train set: 14.16%, Train Loss: 2.2462
Accuracy on the test set: 13.59%, Test Loss: 2.2731

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 41.96it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.13it/s]

Accuracy on the train set: 15.37%, Train Loss: 2.2558

Accuracy on the test set: 14.88%, Test Loss: 2.2651

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Accuracy on the train set: 15.48%, Train Loss: 2.3122
Accuracy on the test set: 14.97%, Test Loss: 2.2586

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 41.68it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 42.71it/s]

Accuracy on the train set: 18.01%, Train Loss: 2.2303

Accuracy on the test set: 17.77%, Test Loss: 2.2494

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 42.90it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.60it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Accuracy on the train set: 19.23%, Train Loss: 2.1974
Accuracy on the test set: 19.13%, Test Loss: 2.2494

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 42.14it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 42.69it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 42.61it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.66it/s]

Accuracy on the train set: 19.90%, Train Loss: 2.1855

Accuracy on the test set: 19.90%, Test Loss: 2.2218

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 42.17it/s]

Accuracy on the train set: 20.18%, Train Loss: 2.1630
Accuracy on the test set: 20.25%, Test Loss: 2.2133

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 41.12it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 40.94it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 40.79it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 36.64it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 40.32it/s]

Accuracy on the train set: 20.38%, Train Loss: 2.1758

Accuracy on the test set: 20.44%, Test Loss: 2.2206

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.44it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 41.89it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 40.45it/s]

Accuracy on the train set: 20.46%, Train Loss: 2.2350
Accuracy on the test set: 20.49%, Test Loss: 2.2230

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Accuracy on the train set: 20.41%, Train Loss: 2.1690

Accuracy on the test set: 20.24%, Test Loss: 2.2207

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 42.91it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 42.05it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Accuracy on the train set: 20.32%, Train Loss: 2.2194
Accuracy on the test set: 20.32%, Test Loss: 2.2098

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 42.87it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Accuracy on the train set: 20.51%, Train Loss: 2.2158

Accuracy on the test set: 20.36%, Test Loss: 2.2251

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 41.58it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 42.83it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Accuracy on the train set: 19.75%, Train Loss: 2.2178
Accuracy on the test set: 19.38%, Test Loss: 2.2152

Epoch : [71/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [72/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [73/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [74/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [75/80]

100%|

| 100/100 [00:02<00:00, 41.77it/s]

Accuracy on the train set: 20.29%, Train Loss: 2.1698

Accuracy on the test set: 20.28%, Test Loss: 2.1923

Epoch : [76/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [77/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [78/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

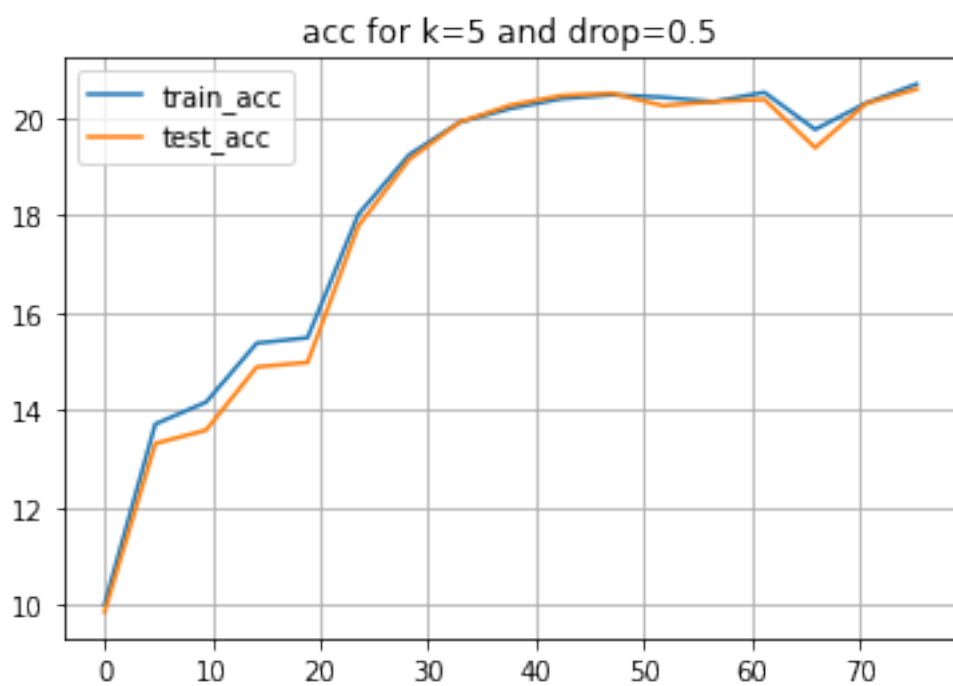
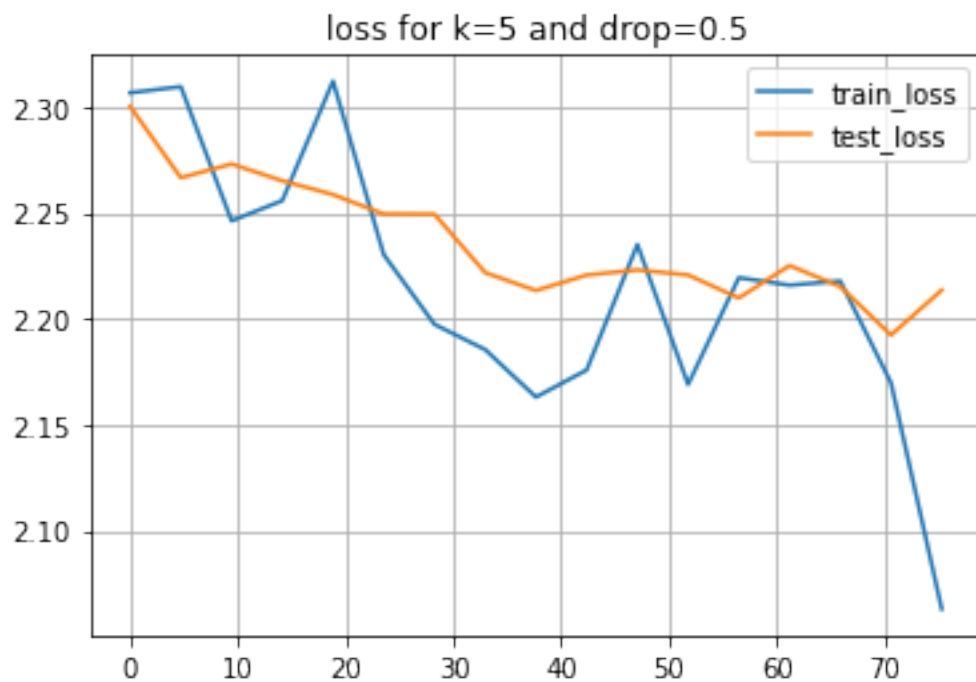
Epoch : [79/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Accuracy on the train set: 20.68%, Train Loss: 2.0630

Accuracy on the test set: 20.58%, Test Loss: 2.2136



----- for k = 5 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 43.34it/s]
Accuracy on the train set: 13.01%, Train Loss: 2.2920
Accuracy on the test set: 13.06%, Test Loss: 2.2009
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.53it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 42.36it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.46it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.64it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 43.11it/s]
Accuracy on the train set: 31.83%, Train Loss: 1.8638
Accuracy on the test set: 30.71%, Test Loss: 1.9747
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.49it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.78it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.34it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.29it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.44it/s]

Accuracy on the train set: 40.99%, Train Loss: 1.7695
Accuracy on the test set: 39.37%, Test Loss: 1.9196

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 42.05it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.08it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 43.77it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.91it/s]

Accuracy on the train set: 42.54%, Train Loss: 1.8483

Accuracy on the test set: 40.18%, Test Loss: 1.9096

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Accuracy on the train set: 45.44%, Train Loss: 1.8542
Accuracy on the test set: 43.22%, Test Loss: 1.8995

Epoch : [21/80]

100%|
| 100/100 [00:02<00:00, 41.99it/s]

Epoch : [22/80]

100%|
| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [23/80]

100%|
| 100/100 [00:02<00:00, 43.02it/s]

Epoch : [24/80]

100%|
| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [25/80]

100%|
| 100/100 [00:02<00:00, 43.20it/s]

Accuracy on the train set: 47.77%, Train Loss: 1.6897
Accuracy on the test set: 45.13%, Test Loss: 1.9013

Epoch : [26/80]

100%|
| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [27/80]

100%|
| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [28/80]

100%|
| 100/100 [00:02<00:00, 43.92it/s]

Epoch : [29/80]

100%|
| 100/100 [00:02<00:00, 41.76it/s]

Epoch : [30/80]

100%|
| 100/100 [00:02<00:00, 43.64it/s]

Accuracy on the train set: 47.28%, Train Loss: 1.8496
Accuracy on the test set: 44.73%, Test Loss: 1.9310

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.94it/s]

Accuracy on the train set: 48.00%, Train Loss: 1.8516

Accuracy on the test set: 44.96%, Test Loss: 1.9135

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.78it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 41.79it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Accuracy on the train set: 47.75%, Train Loss: 2.0003
Accuracy on the test set: 44.77%, Test Loss: 1.8995

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.51it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Accuracy on the train set: 48.31%, Train Loss: 1.6267

Accuracy on the test set: 45.35%, Test Loss: 1.9174

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 42.15it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.66it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Accuracy on the train set: 48.30%, Train Loss: 1.9319
Accuracy on the test set: 45.19%, Test Loss: 1.9247

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Accuracy on the train set: 48.46%, Train Loss: 1.7940

Accuracy on the test set: 44.88%, Test Loss: 1.9199

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 41.61it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.55it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Accuracy on the train set: 47.85%, Train Loss: 1.7663
Accuracy on the test set: 44.57%, Test Loss: 1.9063

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 41.62it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.60it/s]

Accuracy on the train set: 48.42%, Train Loss: 1.9428

Accuracy on the test set: 44.94%, Test Loss: 1.9170

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.55it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 42.66it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Accuracy on the train set: 47.89%, Train Loss: 1.9449
Accuracy on the test set: 44.50%, Test Loss: 1.9697

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.72it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 41.84it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.08it/s]

Accuracy on the train set: 48.12%, Train Loss: 1.7284
Accuracy on the test set: 44.56%, Test Loss: 1.9893

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.44it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 42.96it/s]

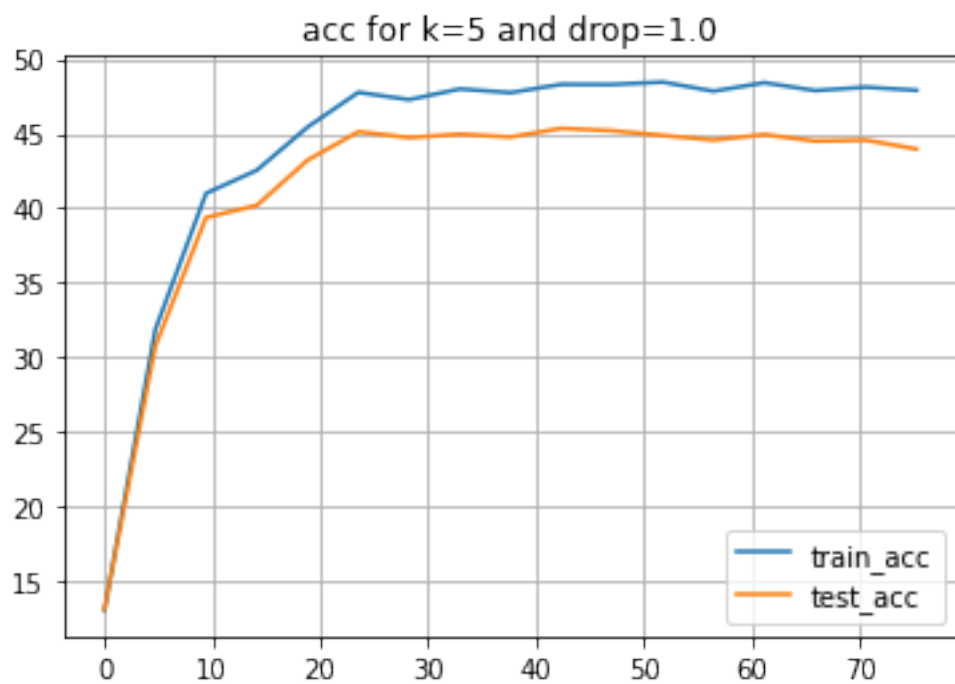
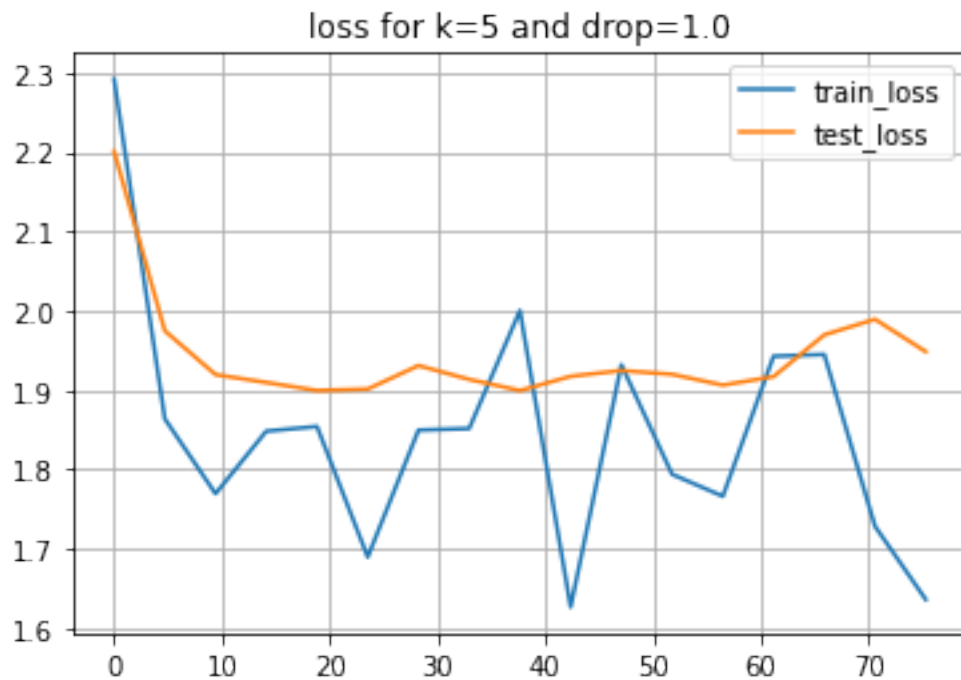
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.55it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.30it/s]

Accuracy on the train set: 47.91%, Train Loss: 1.6362
Accuracy on the test set: 43.96%, Test Loss: 1.9485



----- for k = 10 and dropout = 0.1 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:02<00:00, 41.50it/s]

Accuracy on the train set: 10.04%, Train Loss: 2.3027
Accuracy on the test set: 9.88%, Test Loss: 2.3023

Epoch : [1/80]

100%|
  | 100/100 [00:02<00:00, 42.75it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:02<00:00, 43.01it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:02<00:00, 43.12it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:02<00:00, 43.14it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:02<00:00, 42.82it/s]

Accuracy on the train set: 10.04%, Train Loss: 2.3026
Accuracy on the test set: 9.88%, Test Loss: 2.3026

Epoch : [6/80]

100%|
  | 100/100 [00:02<00:00, 43.00it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:02<00:00, 43.37it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:02<00:00, 42.78it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:02<00:00, 42.65it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:02<00:00, 41.62it/s]

```

Accuracy on the train set: 10.06%, Train Loss: 2.3026
Accuracy on the test set: 9.88%, Test Loss: 2.3026

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Accuracy on the train set: 10.07%, Train Loss: 2.3026

Accuracy on the test set: 9.88%, Test Loss: 2.3026

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 42.84it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 42.82it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 41.03it/s]

Accuracy on the train set: 10.12%, Train Loss: 2.3026
Accuracy on the test set: 9.94%, Test Loss: 2.3026

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 42.55it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.02it/s]

Accuracy on the train set: 10.07%, Train Loss: 2.3026

Accuracy on the test set: 9.89%, Test Loss: 2.3026

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 42.60it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 42.88it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 40.94it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 41.54it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 42.87it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 41.79it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [51/80]

100%|
| 100/100 [00:02<00:00, 42.08it/s]

Epoch : [52/80]

100%|
| 100/100 [00:02<00:00, 42.51it/s]

Epoch : [53/80]

100%|
| 100/100 [00:02<00:00, 43.44it/s]

Epoch : [54/80]

100%|
| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [55/80]

100%|
| 100/100 [00:02<00:00, 43.42it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [56/80]

100%|
| 100/100 [00:02<00:00, 42.84it/s]

Epoch : [57/80]

100%|
| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [58/80]

100%|
| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [59/80]

100%|
| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [60/80]

100%|
| 100/100 [00:02<00:00, 41.65it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026

Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.56it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 42.68it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 42.16it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.02it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 42.88it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.81it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.05it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.56it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.02it/s]

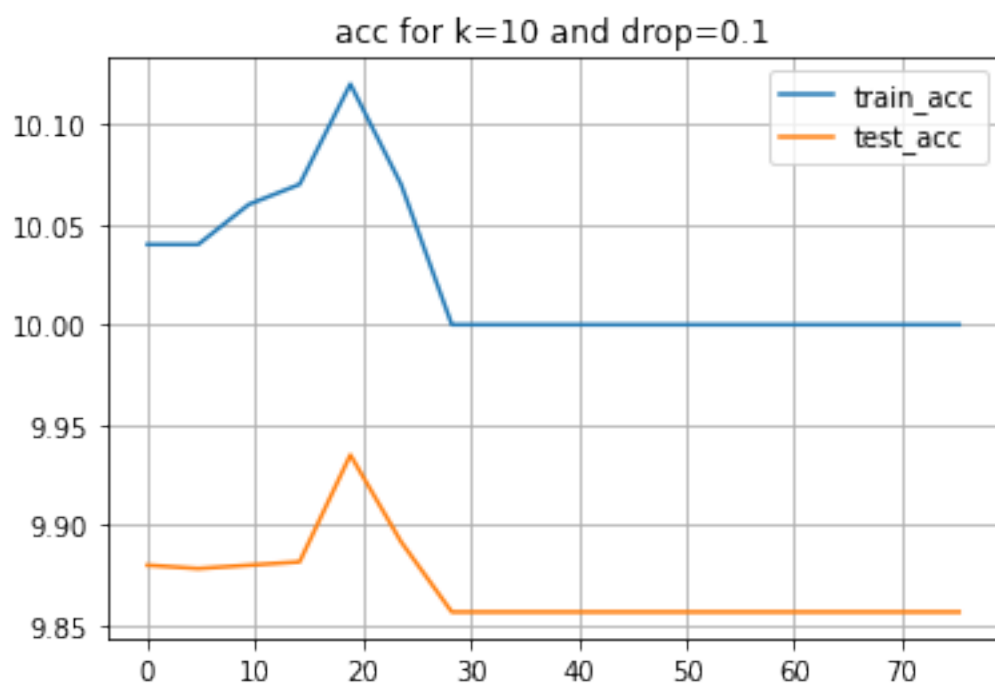
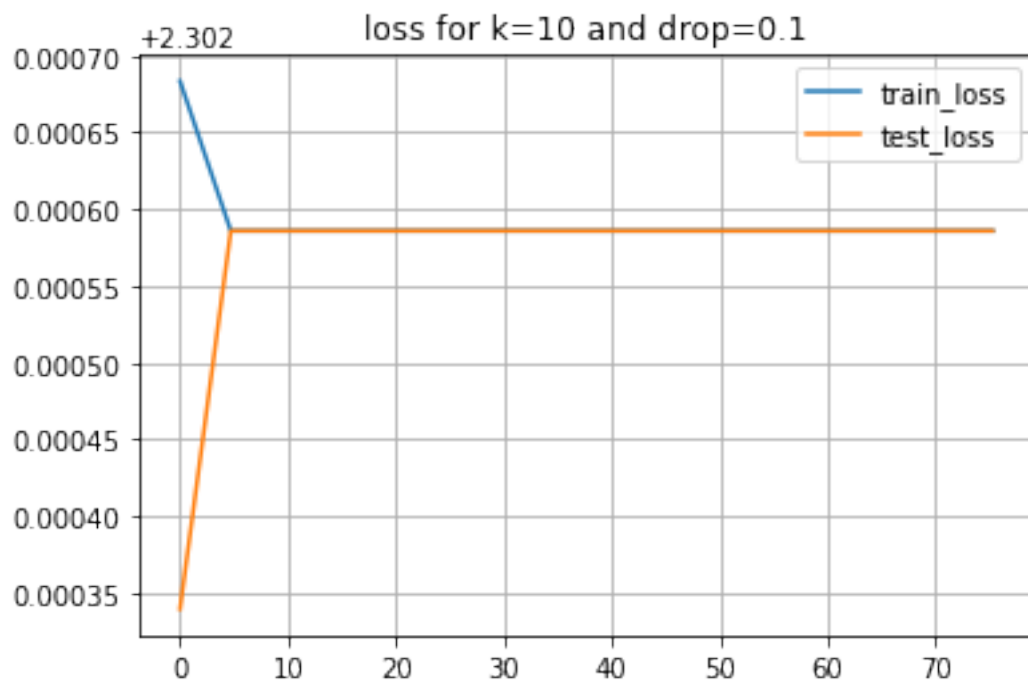
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 42.91it/s]

Accuracy on the train set: 10.00%, Train Loss: 2.3026
Accuracy on the test set: 9.86%, Test Loss: 2.3026



----- for k = 10 and dropout = 0.5 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 40.13it/s]
Accuracy on the train set: 14.53%, Train Loss: 2.2536
Accuracy on the test set: 14.41%, Test Loss: 2.2723
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.40it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 43.16it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.17it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 42.99it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 43.13it/s]
Accuracy on the train set: 20.52%, Train Loss: 2.1064
Accuracy on the test set: 20.83%, Test Loss: 2.1703
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 42.07it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.30it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 42.96it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.42it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.17it/s]

Accuracy on the train set: 25.02%, Train Loss: 2.0692
Accuracy on the test set: 25.10%, Test Loss: 2.1129

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 42.71it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.48it/s]

Accuracy on the train set: 34.70%, Train Loss: 2.0045

Accuracy on the test set: 34.24%, Test Loss: 2.0549

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 41.62it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 41.01it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 42.51it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Accuracy on the train set: 37.62%, Train Loss: 1.8871
Accuracy on the test set: 37.24%, Test Loss: 2.0098

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 42.83it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Accuracy on the train set: 39.82%, Train Loss: 1.9716

Accuracy on the test set: 39.02%, Test Loss: 2.0478

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.80it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Accuracy on the train set: 40.77%, Train Loss: 1.8833
Accuracy on the test set: 39.71%, Test Loss: 2.0029

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 42.58it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 41.47it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Accuracy on the train set: 41.94%, Train Loss: 1.9181

Accuracy on the test set: 40.65%, Test Loss: 1.9870

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 42.30it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 41.78it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Accuracy on the train set: 42.16%, Train Loss: 1.9794
Accuracy on the test set: 40.57%, Test Loss: 2.0221

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.81it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 41.72it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Accuracy on the train set: 40.32%, Train Loss: 2.0010

Accuracy on the test set: 37.90%, Test Loss: 2.0295

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 42.62it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Accuracy on the train set: 42.23%, Train Loss: 1.9210
Accuracy on the test set: 40.65%, Test Loss: 1.9823

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 42.56it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 41.47it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 41.98it/s]

Accuracy on the train set: 43.51%, Train Loss: 1.8343

Accuracy on the test set: 41.27%, Test Loss: 1.9730

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.87it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.62it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 42.78it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Accuracy on the train set: 43.65%, Train Loss: 1.6607
Accuracy on the test set: 41.43%, Test Loss: 1.9757

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 42.87it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 41.86it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.64it/s]

Accuracy on the train set: 44.09%, Train Loss: 1.8111

Accuracy on the test set: 41.80%, Test Loss: 1.9697

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Accuracy on the train set: 43.84%, Train Loss: 1.8812
Accuracy on the test set: 41.13%, Test Loss: 1.9925

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 42.46it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 41.92it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.41it/s]

Accuracy on the train set: 45.61%, Train Loss: 1.7984
Accuracy on the test set: 42.52%, Test Loss: 1.9790

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 42.04it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 42.96it/s]

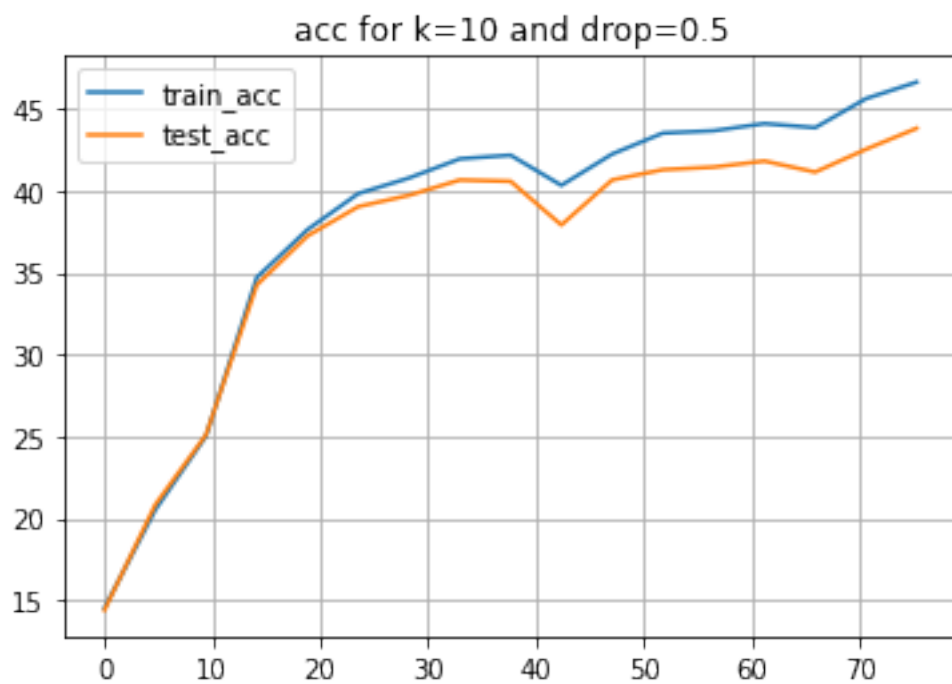
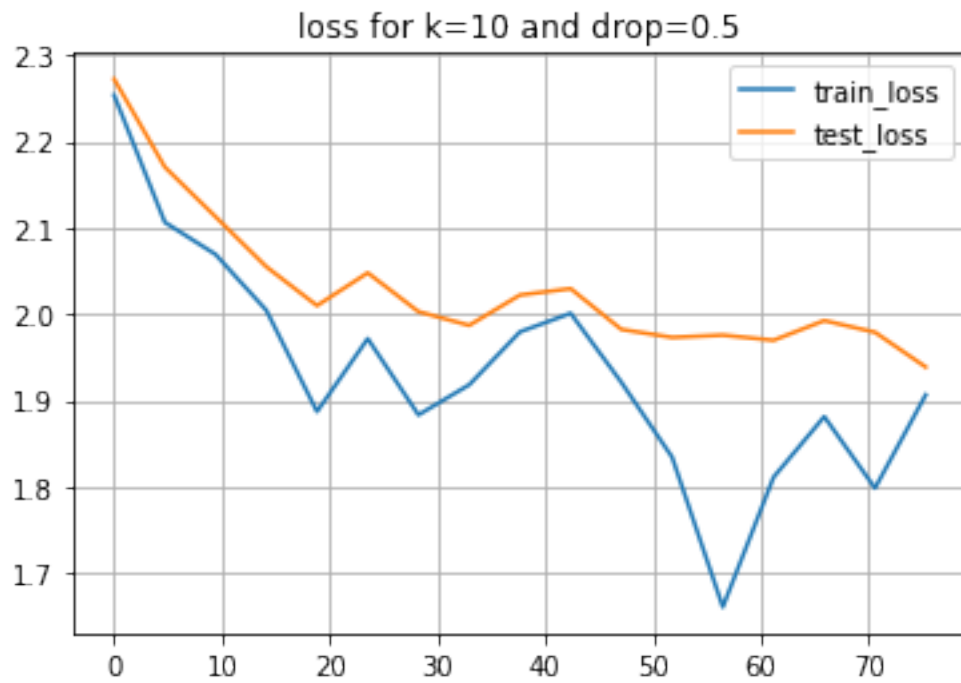
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.30it/s]

Accuracy on the train set: 46.62%, Train Loss: 1.9065
Accuracy on the test set: 43.80%, Test Loss: 1.9387



----- for k = 10 and dropout = 1.0 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:02<00:00, 43.03it/s]

Accuracy on the train set: 19.31%, Train Loss: 2.1358
Accuracy on the test set: 18.76%, Test Loss: 2.1366

Epoch : [1/80]

100%|
  | 100/100 [00:02<00:00, 42.24it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:02<00:00, 43.19it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:02<00:00, 42.01it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:02<00:00, 43.18it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:02<00:00, 43.59it/s]

Accuracy on the train set: 48.62%, Train Loss: 1.7136
Accuracy on the test set: 47.10%, Test Loss: 1.8260

Epoch : [6/80]

100%|
  | 100/100 [00:02<00:00, 43.78it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:02<00:00, 43.51it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:02<00:00, 43.77it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:02<00:00, 43.28it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:02<00:00, 43.45it/s]

```

Accuracy on the train set: 52.62%, Train Loss: 1.6599
Accuracy on the test set: 50.18%, Test Loss: 1.7389

Epoch : [11/80]

100%|
| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [12/80]

100%|
| 100/100 [00:02<00:00, 42.36it/s]

Epoch : [13/80]

100%|
| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [14/80]

100%|
| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [15/80]

100%|
| 100/100 [00:02<00:00, 43.21it/s]

Accuracy on the train set: 54.00%, Train Loss: 1.7538
Accuracy on the test set: 51.02%, Test Loss: 1.6989

Epoch : [16/80]

100%|
| 100/100 [00:02<00:00, 43.76it/s]

Epoch : [17/80]

100%|
| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [18/80]

100%|
| 100/100 [00:02<00:00, 43.98it/s]

Epoch : [19/80]

100%|
| 100/100 [00:02<00:00, 41.65it/s]

Epoch : [20/80]

100%|
| 100/100 [00:02<00:00, 43.54it/s]

Accuracy on the train set: 54.97%, Train Loss: 1.6399
Accuracy on the test set: 51.74%, Test Loss: 1.7210

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Accuracy on the train set: 55.70%, Train Loss: 1.6010

Accuracy on the test set: 52.01%, Test Loss: 1.7485

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.49it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 42.45it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 41.54it/s]

Accuracy on the train set: 56.03%, Train Loss: 1.4547
Accuracy on the test set: 51.76%, Test Loss: 1.7546

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 41.80it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Accuracy on the train set: 55.99%, Train Loss: 1.2668

Accuracy on the test set: 51.34%, Test Loss: 1.7704

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.60it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 42.91it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 42.09it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Accuracy on the train set: 56.54%, Train Loss: 1.6693
Accuracy on the test set: 51.64%, Test Loss: 1.7498

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 38.88it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 42.54it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.73it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Accuracy on the train set: 56.82%, Train Loss: 1.3013

Accuracy on the test set: 51.51%, Test Loss: 1.7679

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 42.60it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Accuracy on the train set: 56.73%, Train Loss: 1.6044
Accuracy on the test set: 50.99%, Test Loss: 1.7739

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.63it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 42.13it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Accuracy on the train set: 56.81%, Train Loss: 1.4568

Accuracy on the test set: 51.02%, Test Loss: 1.8209

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.73it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Accuracy on the train set: 57.31%, Train Loss: 1.3621
Accuracy on the test set: 51.17%, Test Loss: 1.7898

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.51it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 41.66it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Accuracy on the train set: 57.07%, Train Loss: 1.4987

Accuracy on the test set: 50.41%, Test Loss: 1.8060

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.76it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.57it/s]

Accuracy on the train set: 57.82%, Train Loss: 1.4503
Accuracy on the test set: 50.83%, Test Loss: 1.8467

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.67it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 41.71it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.43it/s]

Accuracy on the train set: 57.17%, Train Loss: 1.3936
Accuracy on the test set: 50.41%, Test Loss: 1.8439

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.36it/s]

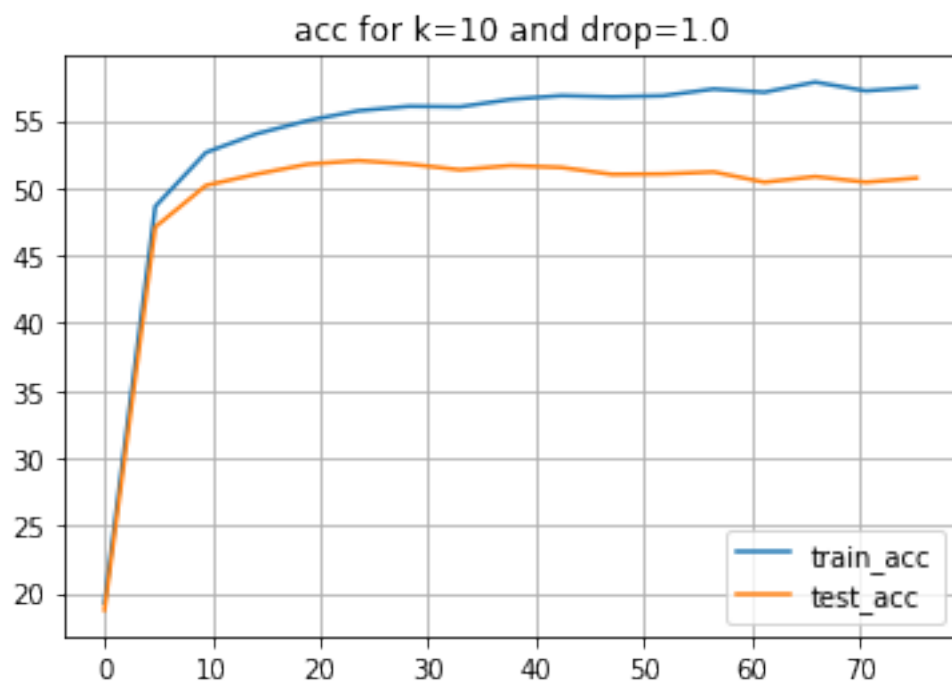
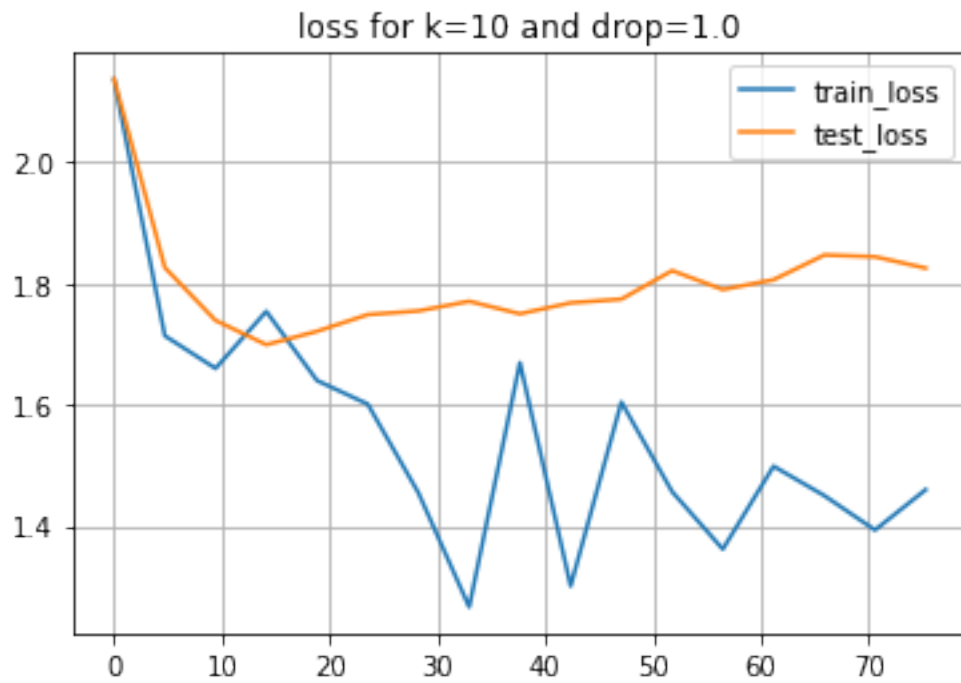
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.20it/s]

Accuracy on the train set: 57.44%, Train Loss: 1.4601
Accuracy on the test set: 50.72%, Test Loss: 1.8251



----- for k = 20 and dropout = 0.1 -----
Epoch : [0/80]

```

100%|
  | 100/100 [00:02<00:00, 42.89it/s]

Accuracy on the train set: 10.08%, Train Loss: 2.3026
Accuracy on the test set: 9.91%, Test Loss: 2.3057

Epoch : [1/80]

100%|
  | 100/100 [00:02<00:00, 43.21it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:02<00:00, 43.15it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:02<00:00, 42.77it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:02<00:00, 43.21it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:02<00:00, 41.50it/s]

Accuracy on the train set: 10.87%, Train Loss: 2.2982
Accuracy on the test set: 10.60%, Test Loss: 2.3064

Epoch : [6/80]

100%|
  | 100/100 [00:02<00:00, 41.59it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:02<00:00, 42.85it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:02<00:00, 43.32it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:02<00:00, 42.87it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:02<00:00, 43.23it/s]

```

Accuracy on the train set: 10.09%, Train Loss: 2.2978
Accuracy on the test set: 9.87%, Test Loss: 2.3031

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Accuracy on the train set: 10.09%, Train Loss: 2.3024

Accuracy on the test set: 9.88%, Test Loss: 2.3031

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.69it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.90it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 10.16%, Train Loss: 2.3026
Accuracy on the test set: 9.93%, Test Loss: 2.3040

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 42.88it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 42.91it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Accuracy on the train set: 10.14%, Train Loss: 2.3029

Accuracy on the test set: 9.89%, Test Loss: 2.3032

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Accuracy on the train set: 10.13%, Train Loss: 2.3026
Accuracy on the test set: 9.92%, Test Loss: 2.3026

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 41.59it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 42.59it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Accuracy on the train set: 10.11%, Train Loss: 2.3026

Accuracy on the test set: 9.90%, Test Loss: 2.3026

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.62it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.08it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Accuracy on the train set: 10.14%, Train Loss: 2.3026
Accuracy on the test set: 9.93%, Test Loss: 2.3026

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 41.76it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Accuracy on the train set: 10.15%, Train Loss: 2.3026

Accuracy on the test set: 9.93%, Test Loss: 2.3026

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Accuracy on the train set: 10.14%, Train Loss: 2.3026
Accuracy on the test set: 9.94%, Test Loss: 2.3026

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.58it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 10.02%, Train Loss: 2.3026

Accuracy on the test set: 9.87%, Test Loss: 2.3026

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 41.83it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 42.74it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Accuracy on the train set: 10.03%, Train Loss: 2.3026
Accuracy on the test set: 9.88%, Test Loss: 2.3026

Epoch : [61/80]

100%|
| 100/100 [00:02<00:00, 42.50it/s]

Epoch : [62/80]

100%|
| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [63/80]

100%|
| 100/100 [00:02<00:00, 42.78it/s]

Epoch : [64/80]

100%|
| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [65/80]

100%|
| 100/100 [00:02<00:00, 42.34it/s]

Accuracy on the train set: 10.13%, Train Loss: 2.3026
Accuracy on the test set: 9.90%, Test Loss: 2.3026

Epoch : [66/80]

100%|
| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [67/80]

100%|
| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [68/80]

100%|
| 100/100 [00:02<00:00, 41.24it/s]

Epoch : [69/80]

100%|
| 100/100 [00:02<00:00, 43.52it/s]

Epoch : [70/80]

100%|
| 100/100 [00:02<00:00, 43.35it/s]

Accuracy on the train set: 10.13%, Train Loss: 2.3026
Accuracy on the test set: 9.93%, Test Loss: 2.3026

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 42.81it/s]

Accuracy on the train set: 10.13%, Train Loss: 2.3010
Accuracy on the test set: 9.92%, Test Loss: 2.3026

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 41.99it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 42.89it/s]

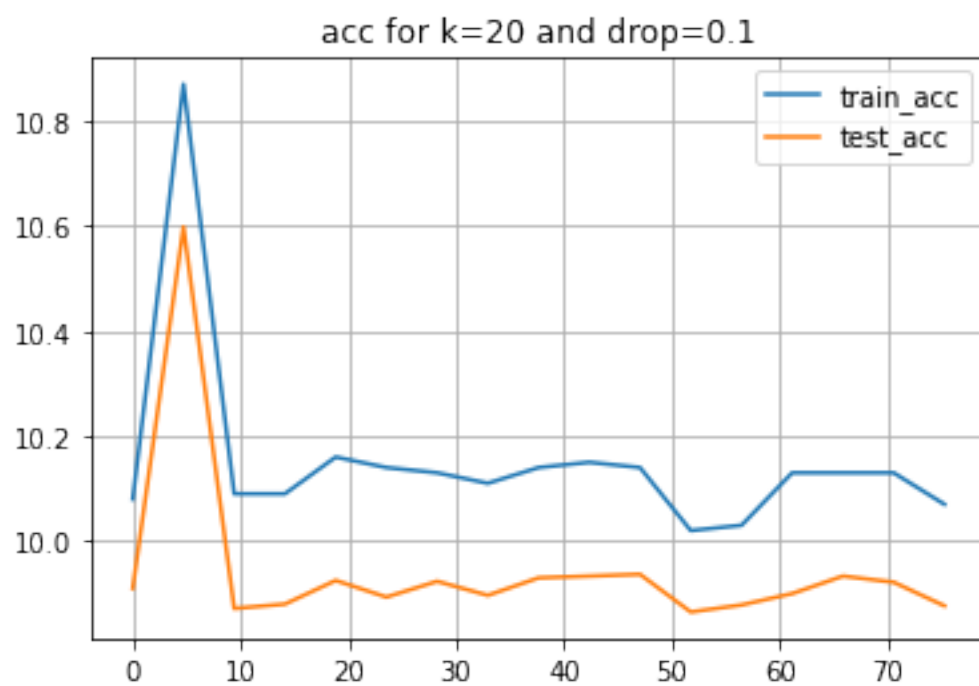
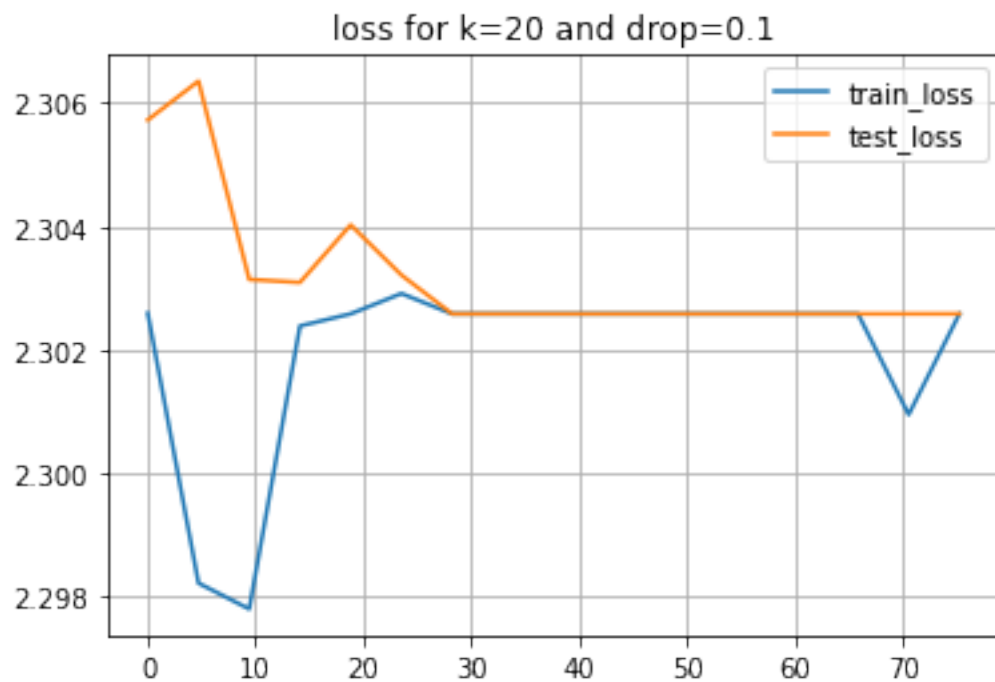
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.29it/s]

Accuracy on the train set: 10.07%, Train Loss: 2.3026
Accuracy on the test set: 9.88%, Test Loss: 2.3026



----- for k = 20 and dropout = 0.5 -----
Epoch : [0/80]

```
100%|
  | 100/100 [00:02<00:00, 43.34it/s]

Accuracy on the train set: 28.76%, Train Loss: 2.1915
Accuracy on the test set: 28.81%, Test Loss: 2.1376

Epoch : [1/80]

100%|
  | 100/100 [00:02<00:00, 43.14it/s]

Epoch : [2/80]

100%|
  | 100/100 [00:02<00:00, 42.80it/s]

Epoch : [3/80]

100%|
  | 100/100 [00:02<00:00, 42.79it/s]

Epoch : [4/80]

100%|
  | 100/100 [00:02<00:00, 41.81it/s]

Epoch : [5/80]

100%|
  | 100/100 [00:02<00:00, 43.21it/s]

Accuracy on the train set: 45.68%, Train Loss: 1.9285
Accuracy on the test set: 44.78%, Test Loss: 1.9656

Epoch : [6/80]

100%|
  | 100/100 [00:02<00:00, 43.15it/s]

Epoch : [7/80]

100%|
  | 100/100 [00:02<00:00, 42.97it/s]

Epoch : [8/80]

100%|
  | 100/100 [00:02<00:00, 43.06it/s]

Epoch : [9/80]

100%|
  | 100/100 [00:02<00:00, 42.85it/s]

Epoch : [10/80]

100%|
  | 100/100 [00:02<00:00, 43.09it/s]
```


Accuracy on the train set: 52.69%, Train Loss: 1.8032
Accuracy on the test set: 50.65%, Test Loss: 1.8710

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 41.33it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Accuracy on the train set: 54.49%, Train Loss: 1.7769

Accuracy on the test set: 52.26%, Test Loss: 1.8233

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.08it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 42.56it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Accuracy on the train set: 55.74%, Train Loss: 1.5803
Accuracy on the test set: 53.43%, Test Loss: 1.7728

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.75it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 41.91it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Accuracy on the train set: 56.12%, Train Loss: 1.6074

Accuracy on the test set: 53.44%, Test Loss: 1.7660

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Accuracy on the train set: 56.17%, Train Loss: 1.6813
Accuracy on the test set: 53.11%, Test Loss: 1.8309

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 41.61it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.51it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.83it/s]

Accuracy on the train set: 56.32%, Train Loss: 1.8321

Accuracy on the test set: 53.16%, Test Loss: 1.7999

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 42.73it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 42.06it/s]

Accuracy on the train set: 56.64%, Train Loss: 1.7148
Accuracy on the test set: 53.22%, Test Loss: 1.7799

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Accuracy on the train set: 56.33%, Train Loss: 1.6960

Accuracy on the test set: 52.70%, Test Loss: 1.7744

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 41.26it/s]

Accuracy on the train set: 56.73%, Train Loss: 1.6024
Accuracy on the test set: 52.92%, Test Loss: 1.7690

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 41.97it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 56.86%, Train Loss: 1.4929

Accuracy on the test set: 53.04%, Test Loss: 1.7550

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.66it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 41.85it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 42.49it/s]

Accuracy on the train set: 57.01%, Train Loss: 1.5312
Accuracy on the test set: 52.75%, Test Loss: 1.7889

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Accuracy on the train set: 56.93%, Train Loss: 1.5330

Accuracy on the test set: 52.23%, Test Loss: 1.7905

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 42.91it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 41.68it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Accuracy on the train set: 56.71%, Train Loss: 1.6814
Accuracy on the test set: 52.37%, Test Loss: 1.8116

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.56it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.40it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 42.91it/s]

Accuracy on the train set: 57.24%, Train Loss: 1.7106
Accuracy on the test set: 52.46%, Test Loss: 1.8112

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 41.65it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.10it/s]

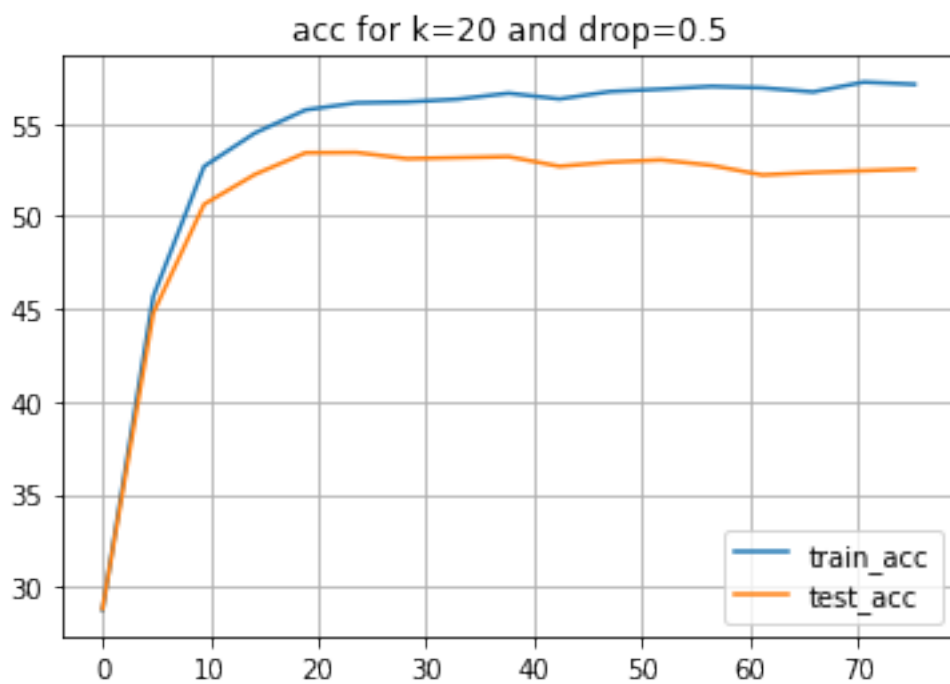
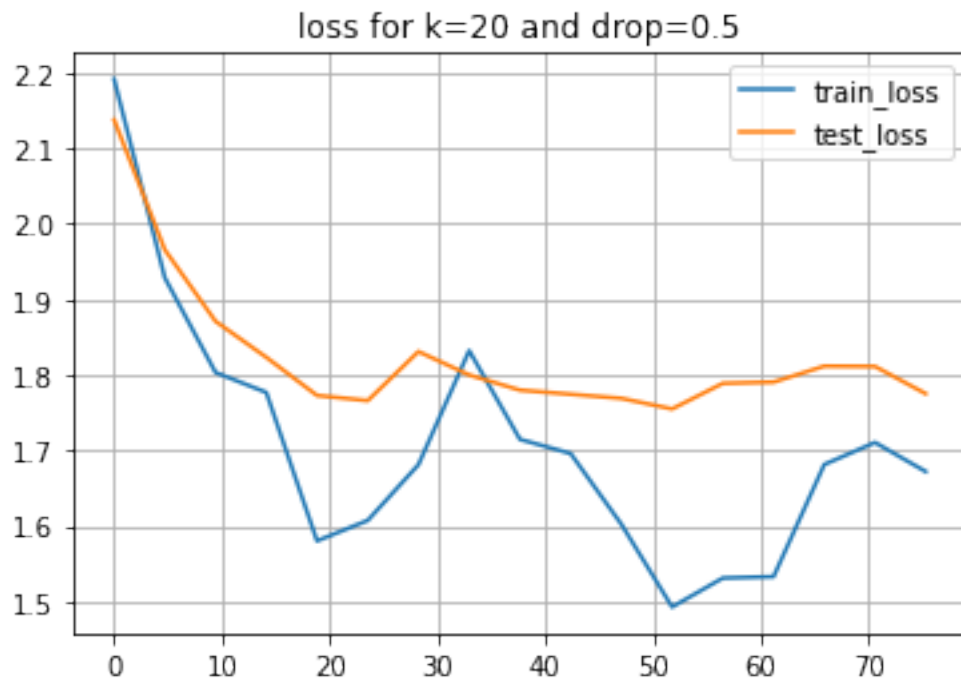
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 42.68it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.12it/s]

Accuracy on the train set: 57.12%, Train Loss: 1.6721
Accuracy on the test set: 52.55%, Test Loss: 1.7751



----- for k = 20 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 43.35it/s]
Accuracy on the train set: 41.47%, Train Loss: 1.8702
Accuracy on the test set: 41.53%, Test Loss: 1.9550

Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.85it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 43.34it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 42.09it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.79it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 43.37it/s]
Accuracy on the train set: 54.00%, Train Loss: 1.6636
Accuracy on the test set: 51.95%, Test Loss: 1.8096

Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.33it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.44it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 41.92it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.11it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 42.85it/s]

Accuracy on the train set: 55.46%, Train Loss: 1.7022
Accuracy on the test set: 52.91%, Test Loss: 1.7949

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 42.65it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 40.70it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Accuracy on the train set: 56.72%, Train Loss: 1.4575

Accuracy on the test set: 53.15%, Test Loss: 1.7691

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.09it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.40it/s]

Accuracy on the train set: 57.03%, Train Loss: 1.5220
Accuracy on the test set: 52.18%, Test Loss: 1.7317

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.61it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 41.87it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Accuracy on the train set: 57.87%, Train Loss: 1.5915

Accuracy on the test set: 52.55%, Test Loss: 1.7870

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.64it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.46it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.44it/s]

Accuracy on the train set: 58.69%, Train Loss: 1.3091
Accuracy on the test set: 52.20%, Test Loss: 1.8211

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 42.08it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 39.78it/s]

Accuracy on the train set: 59.08%, Train Loss: 1.3326

Accuracy on the test set: 51.67%, Test Loss: 1.8358

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Accuracy on the train set: 59.49%, Train Loss: 1.4184
Accuracy on the test set: 51.15%, Test Loss: 1.8483

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 41.51it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.55it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 42.46it/s]

Accuracy on the train set: 59.73%, Train Loss: 1.5312

Accuracy on the test set: 51.10%, Test Loss: 1.8634

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Accuracy on the train set: 60.26%, Train Loss: 1.6038
Accuracy on the test set: 50.39%, Test Loss: 1.8918

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 42.70it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 41.84it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 41.85it/s]

Accuracy on the train set: 60.54%, Train Loss: 1.2438

Accuracy on the test set: 50.19%, Test Loss: 1.9194

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 42.84it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 43.58it/s]

Accuracy on the train set: 60.73%, Train Loss: 1.3906
Accuracy on the test set: 49.88%, Test Loss: 2.0446

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 41.99it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Accuracy on the train set: 61.82%, Train Loss: 1.4225

Accuracy on the test set: 49.81%, Test Loss: 2.0404

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.55it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 42.25it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Accuracy on the train set: 62.17%, Train Loss: 1.4083
Accuracy on the test set: 49.66%, Test Loss: 2.0836

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.42it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 41.90it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.21it/s]

Accuracy on the train set: 61.84%, Train Loss: 1.2055
Accuracy on the test set: 49.13%, Test Loss: 2.0995

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 41.90it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.50it/s]

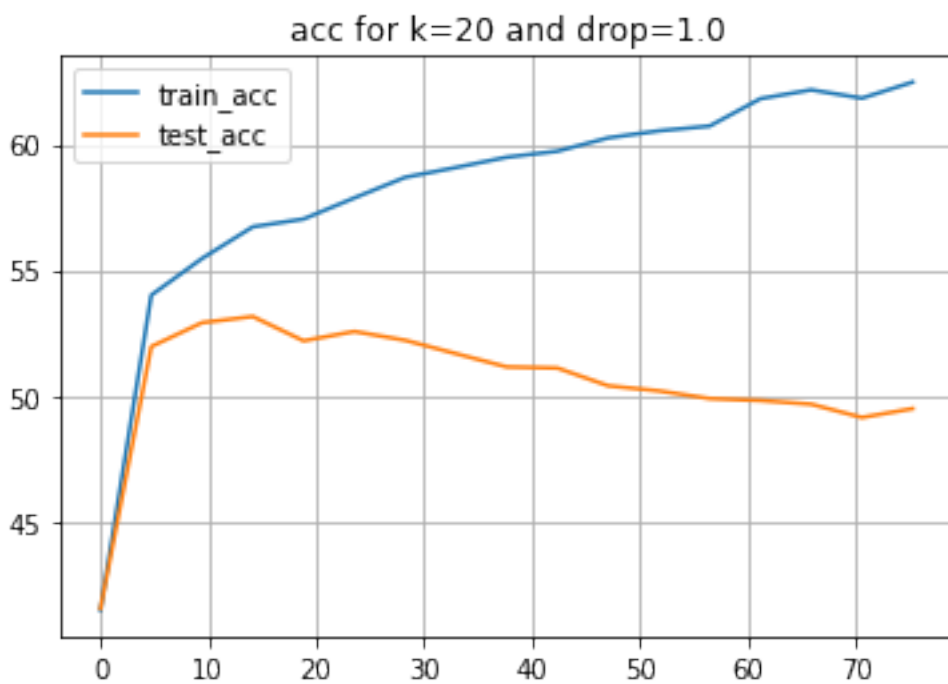
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.49it/s]

Accuracy on the train set: 62.48%, Train Loss: 1.2163
Accuracy on the test set: 49.48%, Test Loss: 2.1652



----- for k = 40 and dropout = 0.1 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 43.30it/s]
Accuracy on the train set: 8.90%, Train Loss: 2.2916
Accuracy on the test set: 8.86%, Test Loss: 2.3080
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.04it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 41.65it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.10it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 43.08it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 42.68it/s]
Accuracy on the train set: 14.01%, Train Loss: 2.2900
Accuracy on the test set: 13.89%, Test Loss: 2.2758
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.38it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 42.82it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 42.91it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 42.87it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 42.76it/s]

Accuracy on the train set: 13.81%, Train Loss: 2.2916
Accuracy on the test set: 13.66%, Test Loss: 2.2961

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 41.45it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 42.84it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Accuracy on the train set: 14.80%, Train Loss: 2.2898

Accuracy on the test set: 14.86%, Test Loss: 2.2911

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 41.65it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 42.73it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 43.38it/s]

Accuracy on the train set: 15.95%, Train Loss: 2.2804
Accuracy on the test set: 15.81%, Test Loss: 2.2824

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 42.67it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Accuracy on the train set: 16.41%, Train Loss: 2.2868

Accuracy on the test set: 16.17%, Test Loss: 2.2842

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.16it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Accuracy on the train set: 15.90%, Train Loss: 2.2903
Accuracy on the test set: 15.54%, Test Loss: 2.2822

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.43it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.94it/s]

Accuracy on the train set: 17.58%, Train Loss: 2.2792

Accuracy on the test set: 17.17%, Test Loss: 2.2848

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 42.50it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 42.70it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.53it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 42.74it/s]

Accuracy on the train set: 19.54%, Train Loss: 2.2736
Accuracy on the test set: 19.01%, Test Loss: 2.2774

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.58it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 42.87it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Accuracy on the train set: 19.96%, Train Loss: 2.2676

Accuracy on the test set: 19.43%, Test Loss: 2.2727

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 42.76it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 42.77it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Accuracy on the train set: 20.22%, Train Loss: 2.2810
Accuracy on the test set: 19.70%, Test Loss: 2.2825

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.15it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 42.80it/s]

Accuracy on the train set: 20.63%, Train Loss: 2.2737

Accuracy on the test set: 20.04%, Test Loss: 2.2713

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 43.17it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.08it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 41.45it/s]

Accuracy on the train set: 20.85%, Train Loss: 2.2653
Accuracy on the test set: 20.50%, Test Loss: 2.2649

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 41.74it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.41it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 41.77it/s]

Accuracy on the train set: 20.28%, Train Loss: 2.2796

Accuracy on the test set: 19.82%, Test Loss: 2.2775

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 41.76it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.22it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 41.94it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Accuracy on the train set: 20.63%, Train Loss: 2.2735
Accuracy on the test set: 20.35%, Test Loss: 2.2675

Epoch : [71/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [72/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [73/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [74/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [75/80]

100%|

| 100/100 [00:02<00:00, 42.35it/s]

Accuracy on the train set: 20.44%, Train Loss: 2.2798

Accuracy on the test set: 19.93%, Test Loss: 2.2700

Epoch : [76/80]

100%|

| 100/100 [00:02<00:00, 42.59it/s]

Epoch : [77/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [78/80]

100%|

| 100/100 [00:02<00:00, 42.71it/s]

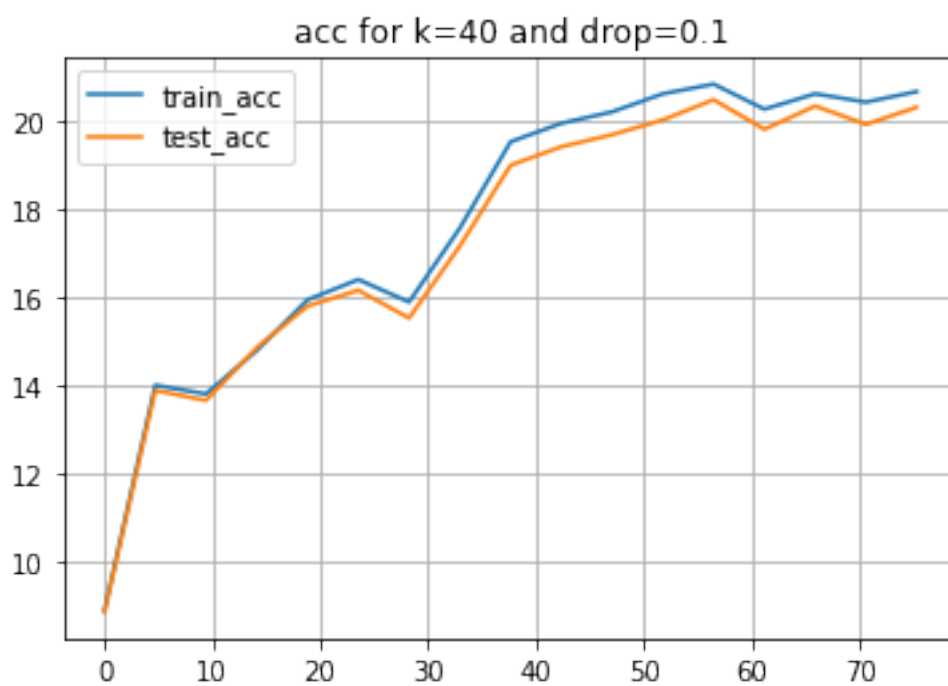
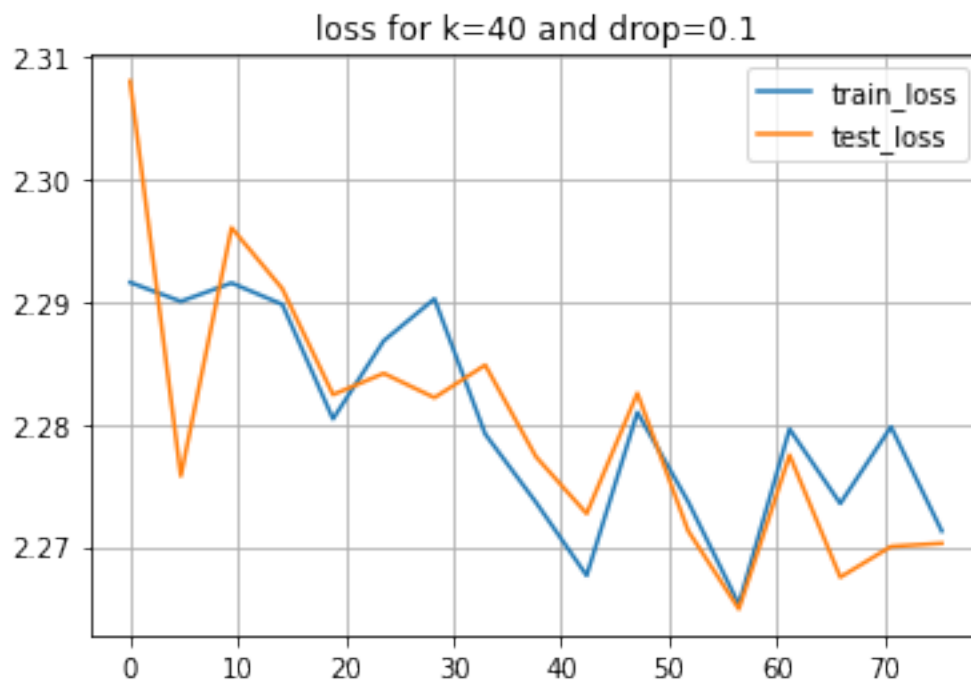
Epoch : [79/80]

100%|

| 100/100 [00:02<00:00, 41.79it/s]

Accuracy on the train set: 20.68%, Train Loss: 2.2713

Accuracy on the test set: 20.32%, Test Loss: 2.2703



----- for k = 40 and dropout = 0.5 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 42.32it/s]
Accuracy on the train set: 33.91%, Train Loss: 2.1042
Accuracy on the test set: 34.23%, Test Loss: 2.1087
Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 42.40it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 42.74it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.54it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 42.95it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 41.68it/s]
Accuracy on the train set: 53.33%, Train Loss: 1.6872
Accuracy on the test set: 51.98%, Test Loss: 1.8302
Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 41.87it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.43it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.09it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 43.22it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 43.48it/s]

Accuracy on the train set: 55.45%, Train Loss: 1.6708
Accuracy on the test set: 53.61%, Test Loss: 1.7787

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 43.45it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 43.68it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 41.73it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Accuracy on the train set: 55.96%, Train Loss: 1.6778

Accuracy on the test set: 53.59%, Test Loss: 1.7885

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.19it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 42.69it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.06it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 42.93it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 42.28it/s]

Accuracy on the train set: 56.61%, Train Loss: 1.5907
Accuracy on the test set: 53.97%, Test Loss: 1.7888

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 41.59it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.23it/s]

Accuracy on the train set: 57.60%, Train Loss: 1.5132

Accuracy on the test set: 54.38%, Test Loss: 1.7838

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 41.87it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.01it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Accuracy on the train set: 57.41%, Train Loss: 1.3665
Accuracy on the test set: 54.00%, Test Loss: 1.8208

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 41.60it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 43.07it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 42.26it/s]

Accuracy on the train set: 58.23%, Train Loss: 1.5873

Accuracy on the test set: 54.30%, Test Loss: 1.7265

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 42.55it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.29it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 42.99it/s]

Accuracy on the train set: 58.48%, Train Loss: 1.4704
Accuracy on the test set: 54.27%, Test Loss: 1.7358

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 40.00it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 42.90it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.37it/s]

Accuracy on the train set: 58.87%, Train Loss: 1.5002

Accuracy on the test set: 54.34%, Test Loss: 1.7401

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 41.30it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 42.95it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 42.75it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 41.83it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.74it/s]

Accuracy on the train set: 59.11%, Train Loss: 1.3305
Accuracy on the test set: 54.22%, Test Loss: 1.7483

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.26it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 42.83it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 42.91it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 42.82it/s]

Accuracy on the train set: 59.27%, Train Loss: 1.5555

Accuracy on the test set: 53.95%, Test Loss: 1.7786

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 42.87it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 41.70it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.03it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 42.67it/s]

Accuracy on the train set: 59.48%, Train Loss: 1.6298
Accuracy on the test set: 53.80%, Test Loss: 1.7841

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 43.04it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 43.13it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 42.46it/s]

Accuracy on the train set: 59.98%, Train Loss: 1.3618

Accuracy on the test set: 54.13%, Test Loss: 1.7982

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 41.57it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.05it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 42.62it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 42.88it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Accuracy on the train set: 59.85%, Train Loss: 1.3775
Accuracy on the test set: 53.71%, Test Loss: 1.7982

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 42.86it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 43.34it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 42.12it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.83it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 42.87it/s]

Accuracy on the train set: 60.15%, Train Loss: 1.4562
Accuracy on the test set: 53.79%, Test Loss: 1.7933

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 39.75it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 42.38it/s]

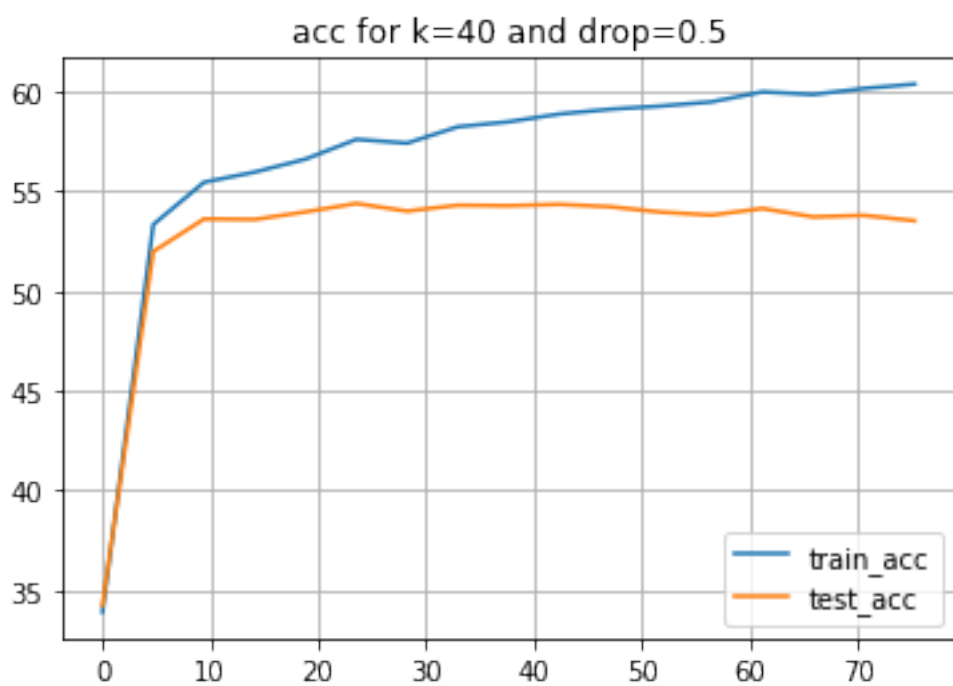
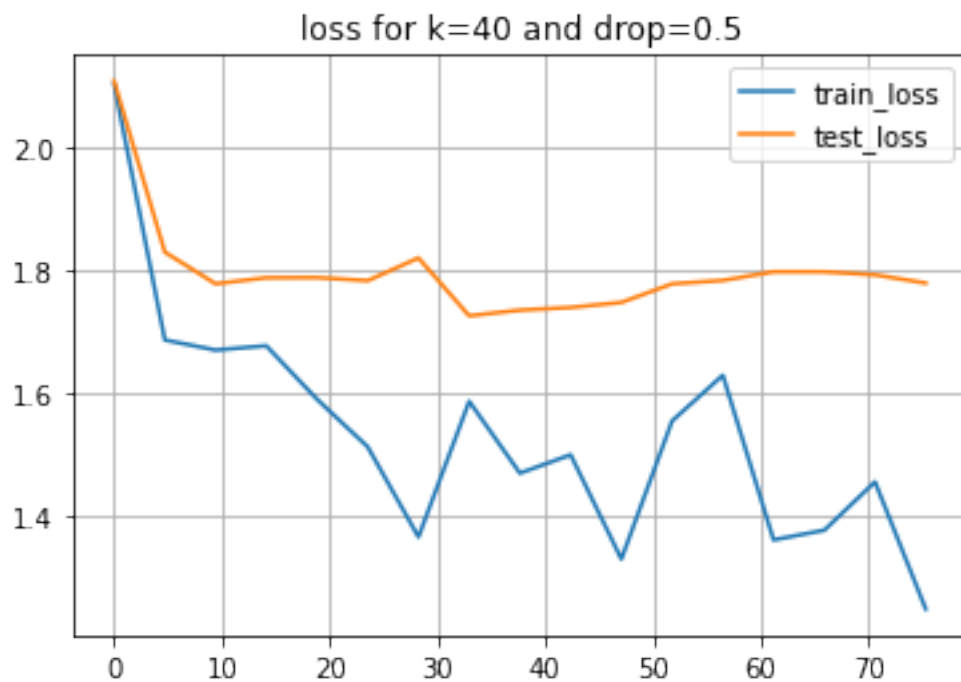
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 42.89it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.40it/s]

Accuracy on the train set: 60.37%, Train Loss: 1.2493
Accuracy on the test set: 53.52%, Test Loss: 1.7798



----- for k = 40 and dropout = 1.0 -----
Epoch : [0/80]

100%|
| 100/100 [00:02<00:00, 43.59it/s]
Accuracy on the train set: 50.02%, Train Loss: 1.8161
Accuracy on the test set: 48.82%, Test Loss: 1.8098

Epoch : [1/80]
100%|
| 100/100 [00:02<00:00, 43.49it/s]
Epoch : [2/80]
100%|
| 100/100 [00:02<00:00, 43.55it/s]
Epoch : [3/80]
100%|
| 100/100 [00:02<00:00, 43.21it/s]
Epoch : [4/80]
100%|
| 100/100 [00:02<00:00, 41.93it/s]
Epoch : [5/80]
100%|
| 100/100 [00:02<00:00, 43.21it/s]
Accuracy on the train set: 55.62%, Train Loss: 1.7816
Accuracy on the test set: 52.83%, Test Loss: 1.7369

Epoch : [6/80]
100%|
| 100/100 [00:02<00:00, 43.73it/s]
Epoch : [7/80]
100%|
| 100/100 [00:02<00:00, 43.15it/s]
Epoch : [8/80]
100%|
| 100/100 [00:02<00:00, 43.06it/s]
Epoch : [9/80]
100%|
| 100/100 [00:02<00:00, 42.98it/s]
Epoch : [10/80]
100%|
| 100/100 [00:02<00:00, 42.99it/s]

Accuracy on the train set: 58.16%, Train Loss: 1.3021
Accuracy on the test set: 53.74%, Test Loss: 1.6949

Epoch : [11/80]

100%|

| 100/100 [00:02<00:00, 41.73it/s]

Epoch : [12/80]

100%|

| 100/100 [00:02<00:00, 42.96it/s]

Epoch : [13/80]

100%|

| 100/100 [00:02<00:00, 42.98it/s]

Epoch : [14/80]

100%|

| 100/100 [00:02<00:00, 42.27it/s]

Epoch : [15/80]

100%|

| 100/100 [00:02<00:00, 42.89it/s]

Accuracy on the train set: 59.77%, Train Loss: 1.2353

Accuracy on the test set: 53.47%, Test Loss: 1.6891

Epoch : [16/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Epoch : [17/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [18/80]

100%|

| 100/100 [00:02<00:00, 43.35it/s]

Epoch : [19/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [20/80]

100%|

| 100/100 [00:02<00:00, 41.38it/s]

Accuracy on the train set: 61.48%, Train Loss: 1.2637
Accuracy on the test set: 52.99%, Test Loss: 1.7388

Epoch : [21/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [22/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Epoch : [23/80]

100%|

| 100/100 [00:02<00:00, 42.79it/s]

Epoch : [24/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Epoch : [25/80]

100%|

| 100/100 [00:02<00:00, 43.11it/s]

Accuracy on the train set: 62.64%, Train Loss: 0.9543

Accuracy on the test set: 51.96%, Test Loss: 1.8168

Epoch : [26/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [27/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [28/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [29/80]

100%|

| 100/100 [00:02<00:00, 41.79it/s]

Epoch : [30/80]

100%|

| 100/100 [00:02<00:00, 44.07it/s]

Accuracy on the train set: 63.88%, Train Loss: 0.9462
Accuracy on the test set: 51.15%, Test Loss: 1.7529

Epoch : [31/80]

100%|

| 100/100 [00:02<00:00, 43.47it/s]

Epoch : [32/80]

100%|

| 100/100 [00:02<00:00, 43.48it/s]

Epoch : [33/80]

100%|

| 100/100 [00:02<00:00, 41.50it/s]

Epoch : [34/80]

100%|

| 100/100 [00:02<00:00, 41.67it/s]

Epoch : [35/80]

100%|

| 100/100 [00:02<00:00, 43.65it/s]

Accuracy on the train set: 65.15%, Train Loss: 1.1545

Accuracy on the test set: 50.81%, Test Loss: 1.8016

Epoch : [36/80]

100%|

| 100/100 [00:02<00:00, 43.30it/s]

Epoch : [37/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [38/80]

100%|

| 100/100 [00:02<00:00, 42.97it/s]

Epoch : [39/80]

100%|

| 100/100 [00:02<00:00, 42.38it/s]

Epoch : [40/80]

100%|

| 100/100 [00:02<00:00, 43.28it/s]

Accuracy on the train set: 66.34%, Train Loss: 1.0769
Accuracy on the test set: 49.47%, Test Loss: 1.8907

Epoch : [41/80]

100%|

| 100/100 [00:02<00:00, 43.95it/s]

Epoch : [42/80]

100%|

| 100/100 [00:02<00:00, 43.59it/s]

Epoch : [43/80]

100%|

| 100/100 [00:02<00:00, 43.70it/s]

Epoch : [44/80]

100%|

| 100/100 [00:02<00:00, 43.33it/s]

Epoch : [45/80]

100%|

| 100/100 [00:02<00:00, 43.67it/s]

Accuracy on the train set: 67.43%, Train Loss: 0.9948

Accuracy on the test set: 49.49%, Test Loss: 1.9611

Epoch : [46/80]

100%|

| 100/100 [00:02<00:00, 41.81it/s]

Epoch : [47/80]

100%|

| 100/100 [00:02<00:00, 43.10it/s]

Epoch : [48/80]

100%|

| 100/100 [00:02<00:00, 43.18it/s]

Epoch : [49/80]

100%|

| 100/100 [00:02<00:00, 42.27it/s]

Epoch : [50/80]

100%|

| 100/100 [00:02<00:00, 43.27it/s]

Accuracy on the train set: 68.56%, Train Loss: 0.9545
Accuracy on the test set: 49.46%, Test Loss: 2.0171

Epoch : [51/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [52/80]

100%|

| 100/100 [00:02<00:00, 42.92it/s]

Epoch : [53/80]

100%|

| 100/100 [00:02<00:00, 43.12it/s]

Epoch : [54/80]

100%|

| 100/100 [00:02<00:00, 43.25it/s]

Epoch : [55/80]

100%|

| 100/100 [00:02<00:00, 41.78it/s]

Accuracy on the train set: 69.97%, Train Loss: 0.9022

Accuracy on the test set: 49.08%, Test Loss: 2.1026

Epoch : [56/80]

100%|

| 100/100 [00:02<00:00, 43.31it/s]

Epoch : [57/80]

100%|

| 100/100 [00:02<00:00, 42.73it/s]

Epoch : [58/80]

100%|

| 100/100 [00:02<00:00, 43.20it/s]

Epoch : [59/80]

100%|

| 100/100 [00:02<00:00, 43.00it/s]

Epoch : [60/80]

100%|

| 100/100 [00:02<00:00, 42.77it/s]

Accuracy on the train set: 70.80%, Train Loss: 0.9321
Accuracy on the test set: 48.81%, Test Loss: 2.1433

Epoch : [61/80]

100%|

| 100/100 [00:02<00:00, 43.36it/s]

Epoch : [62/80]

100%|

| 100/100 [00:02<00:00, 42.88it/s]

Epoch : [63/80]

100%|

| 100/100 [00:02<00:00, 43.21it/s]

Epoch : [64/80]

100%|

| 100/100 [00:02<00:00, 41.72it/s]

Epoch : [65/80]

100%|

| 100/100 [00:02<00:00, 43.50it/s]

Accuracy on the train set: 72.56%, Train Loss: 0.8630

Accuracy on the test set: 47.98%, Test Loss: 2.2423

Epoch : [66/80]

100%|

| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [67/80]

100%|

| 100/100 [00:02<00:00, 43.39it/s]

Epoch : [68/80]

100%|

| 100/100 [00:02<00:00, 43.32it/s]

Epoch : [69/80]

100%|

| 100/100 [00:02<00:00, 43.14it/s]

Epoch : [70/80]

100%|

| 100/100 [00:02<00:00, 43.51it/s]

Accuracy on the train set: 73.16%, Train Loss: 0.9269
Accuracy on the test set: 47.96%, Test Loss: 2.3300

Epoch : [71/80]

100%|
| 100/100 [00:02<00:00, 43.24it/s]

Epoch : [72/80]

100%|
| 100/100 [00:02<00:00, 42.85it/s]

Epoch : [73/80]

100%|
| 100/100 [00:02<00:00, 43.65it/s]

Epoch : [74/80]

100%|
| 100/100 [00:02<00:00, 42.53it/s]

Epoch : [75/80]

100%|
| 100/100 [00:02<00:00, 43.10it/s]

Accuracy on the train set: 74.38%, Train Loss: 0.9201
Accuracy on the test set: 47.73%, Test Loss: 2.3852

Epoch : [76/80]

100%|
| 100/100 [00:02<00:00, 43.38it/s]

Epoch : [77/80]

100%|
| 100/100 [00:02<00:00, 43.38it/s]

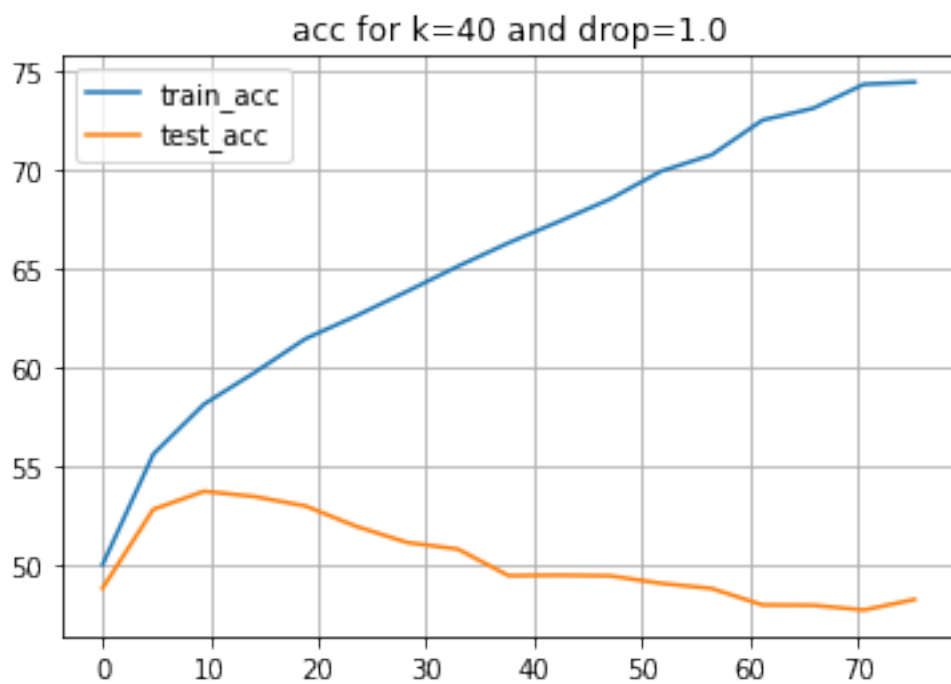
Epoch : [78/80]

100%|
| 100/100 [00:02<00:00, 43.69it/s]

Epoch : [79/80]

100%|
| 100/100 [00:02<00:00, 43.74it/s]

Accuracy on the train set: 74.49%, Train Loss: 0.7271
Accuracy on the test set: 48.26%, Test Loss: 2.4511



```
[25]: records_updated = []
```

```

for record in records:
    records_updated.append({
        'k':record['k'],
        'dropout_prob':record['dropout_prob'],
        'train_acc': max(record['train_acc']),
        'test_acc': max(record['test_acc']),
    })
df = pd.DataFrame.from_records(records_updated)

print (df)
df_tensor = torch.tensor(df.values)

```

	k	dropout_prob	train_acc	test_acc
0	1	0.1	10.00	9.853333
1	1	0.5	10.00	9.853333
2	1	1.0	15.16	14.856667
3	5	0.1	10.05	9.901667
4	5	0.5	20.68	20.578333
5	5	1.0	48.46	45.355000
6	10	0.1	10.12	9.935000
7	10	0.5	46.62	43.801667
8	10	1.0	57.82	52.011667
9	20	0.1	10.87	10.598333
10	20	0.5	57.24	53.443333
11	20	1.0	62.48	53.150000
12	40	0.1	20.85	20.495000
13	40	0.5	60.37	54.385000
14	40	1.0	74.49	53.743333

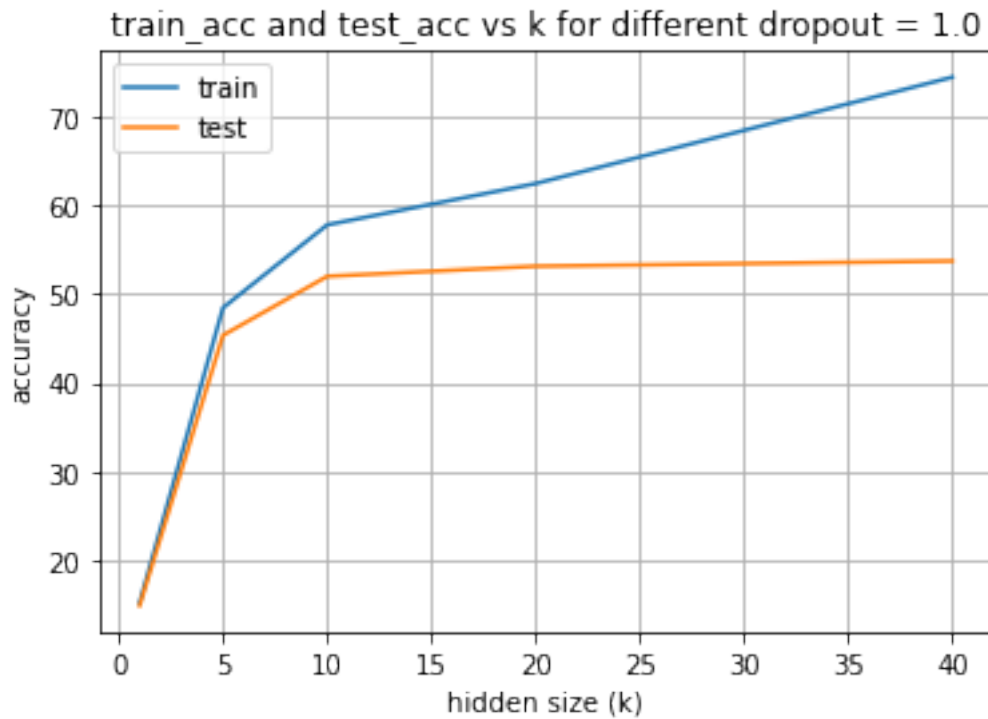
```

[26]: plt.figure(1)
sub_df = df_tensor[df_tensor[:,1] == 1.0]
plt.plot(sub_df[:, 0], sub_df[:,2], label='train')
plt.plot(sub_df[:, 0], sub_df[:,3], label='test')

plt.title('train_acc and test_acc vs k for different dropout = 1.0')
plt.legend()
plt.xlabel('hidden size (k)')
plt.ylabel('accuracy')
plt.grid()
plt.plot()

```

[26]: []

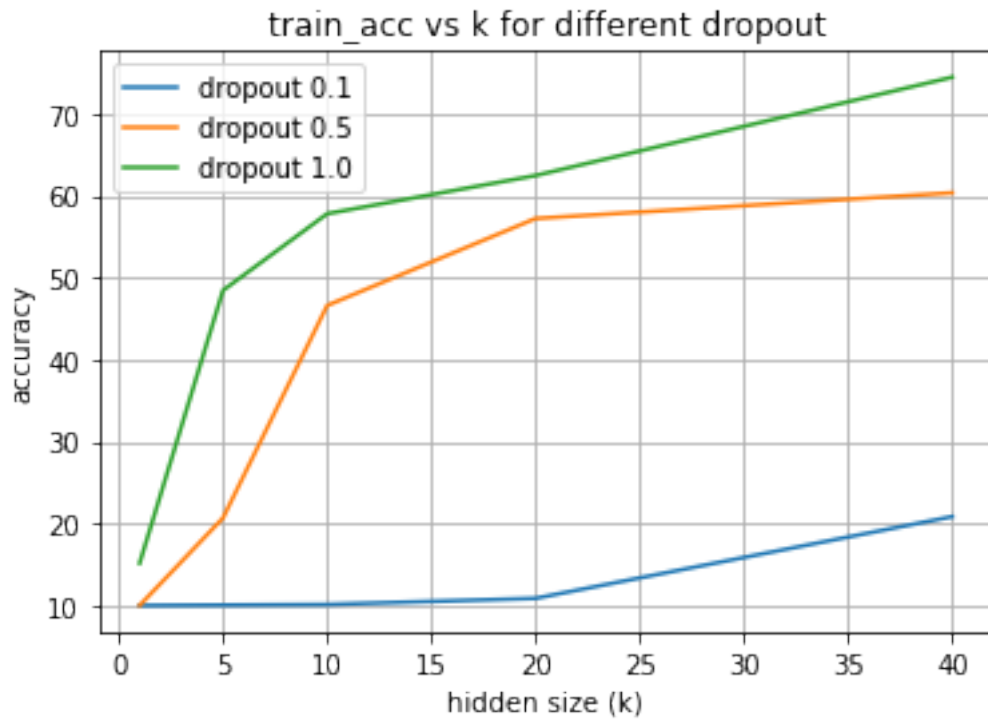


As k increases, the accuracy and performance of the model increases and improves. As we have noisy data, we can not have 100% accuracy. However, as 60% of the data is true, so we should have around 60% accuracy and we can get that $k = 20$

```
[27]: plt.figure(2)
      for p in [0.1, 0.5, 1.0]:
          sub_df = df_tensor[df_tensor[:, 1] == p]
          plt.plot(sub_df[:, 0], sub_df[:, 2], label=f'dropout {p}')

      plt.title('train_acc vs k for different dropout')
      plt.legend()
      plt.xlabel('hidden size (k)')
      plt.ylabel('accuracy')
      plt.grid()
      plt.plot()
```

[27]: []



The value of p or dropout helps the model generalize and prevents overfitting.

As we increase the value of p , we can see that the model improves and also it is easier to optimize.

At $p = 1$ we can see 60% train accuracy at $k = 20$.

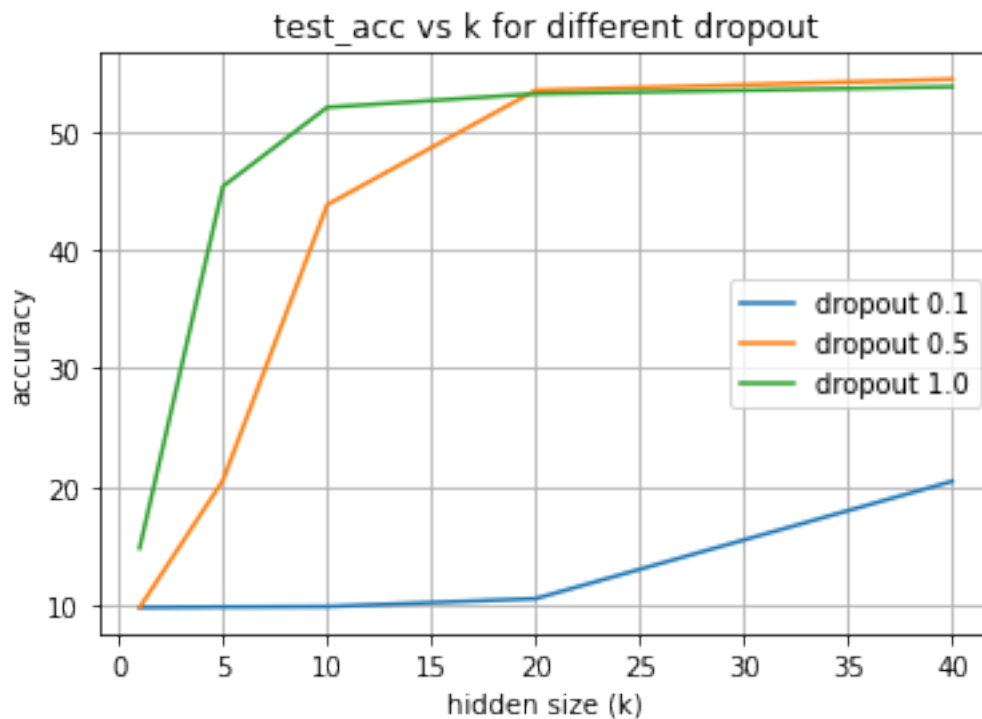
At $p = 0.5$ we can see 60% train accuracy at $k = 40$.

At $p = 0.1$ we can see 60% train accuracy at $k = 80$ if we had run our model for that many hidden units.

```
[28]: plt.figure(2)
      for p in [0.1, 0.5, 1.0]:
          sub_df = df_tensor[df_tensor[:, 1] == p]
          plt.plot(sub_df[:, 0], sub_df[:, 3], label=f'dropout {p}')

      plt.title('test_acc vs k for different dropout')
      plt.legend()
      plt.xlabel('hidden size (k)')
      plt.ylabel('accuracy')
      plt.grid()
      plt.plot()
```

[28]: []



We can see a little improvement in test accuracy when we add dropout.

The model converges earlier.

For $k = 40$ and dropout = 1.0, we can get the best test accuracy

Noise adds random datapoints with incorrect labels and thus makes it hard for the model to learn the correct representation of the dataset.

Here we can see that adding 40% noise lowers the accuracy drastically and the best accuracy we can achieve is 63%.

However, we can see that dropout is more helpful in the noisy scenario as the model converges earlier.