

Q3 part 2

In [1]:

```
import numpy as np
import idx2numpy
import random
from matplotlib import pyplot as plt
import cv2
import numpy as np
from sklearn.multiclass import OneVsOneClassifier
from sklearn.svm import SVC
from sklearn.metrics import precision_recall_fscore_support
from sklearn.metrics import accuracy_score
import pandas as pd
from sklearn.linear_model import LogisticRegression
```

In [2]:

```
train_images = idx2numpy.convert_from_file('train-images.idx3-ubyte')
train_labels = idx2numpy.convert_from_file('train-labels.idx1-ubyte')
test_images = idx2numpy.convert_from_file('t10k-images.idx3-ubyte')
test_labels = idx2numpy.convert_from_file('t10k-labels.idx1-ubyte')
train_new=[]
test_new=[]
for i in train_images:
    i=np.array(i)
    train_new.append(i.flatten())
for i in test_images:
    i=np.array(i)
    test_new.append(i.flatten())
train_images=train_new
test_images=test_new
```

In [3]:

```
clf = OneVsOneClassifier(LogisticRegression(random_state=0,max_iter=1000)).fit(train_images, train_labels)
# clf = OneVsRestClassifier(SVC()).fit(train_images, train_labels)
```

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In [6]:

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ac=accuracy_score(clf.predict(test_images),test_labels)
print("Accuracy=",ac)
fscore=precision_recall_fscore_support(clf.predict(test_images), test_labels, average='micro')
print("Precision=",fscore[0])
print("Recall=",fscore[1])
print("F1-Score=",fscore[2])
```

```
Accuracy= 0.9249
Precision= 0.9249
Recall= 0.9249
F1-Score= 0.9249
```