In [58]:
```python
import numpy as np
import pandas as pd
import math

df_train = pd.read_csv("train.csv", nrows = 1000)
df_train['intercept'] = 1
trainingData = df_train.drop("label", axis = 1).values
trainingResults = df_train["label"].values
df_test = pd.read_csv("test.csv", nrows = 500)
df_test['intercept'] = 1

stepSizes = [0.8, 0.001, 0.00001]
Cvals = [0.1, 1, 10]
EPOCHS = 10


def stochGradDesc(x, y, w, classVal, stepsize, C, passCount):
    w_t = np.copy(w)
    w_t1 = [0 for i in range(len(w))]
    for epoch in range(passCount):
        #if (epoch == passCount - 1):
        #    avgWeights = [0 for i in range(len(w))]
        for point in range(len(x)):
            # is this point in the class we are looking for?
            if y[point] == classVal:
                y_i = 1
            else:
                y_i = -1
            # update step
            partial = np.multiply(C * max(0, 1 - y_i * np.dot(x[point], w_t)), np
            partial = np.subtract(partial, np.multiply(2, w_t))
            partial = np.multiply(stepsize, partial)
            w_t1 = np.add(w_t, partial)
            #if (epoch == passCount - 1):
            #    np.add(avgWeights, w_t1)
            w_t = np.copy(w_t1)
    return w_t
```

In [60]:
```python
# Training error each class
for classVal in range(10):
    initWeights = [0 for i in range(len(trainingData[0]))]
    weights = stochGradDesc(trainingData, trainingResults, initWeights, classVal,
    misclassified = 0
    for point in range(len(trainingData)):
        pointDims = trainingData[point]
        if trainingResults[point] == classVal:
            y_i = 1
        else:
            y_i = -1
        #print(y_i, np.dot(pointDims, weights))
        if (y_i * np.dot(pointDims, weights)) >= 1:
            misclassified += 1
    print("Training error for class", classVal, ":", misclassified/len(trainingDa
```

```
Training error for class 0 : 1.0
Training error for class 1 : 0.986
Training error for class 2 : 0.982
Training error for class 3 : 0.962
Training error for class 4 : 0.987
Training error for class 5 : 0.985
Training error for class 6 : 0.97
Training error for class 7 : 0.974
Training error for class 8 : 0.97
Training error for class 9 : 0.961
```