K Nearest Neighbors Project

October 26, 2016

1 K Nearest Neighbors Project

1.1 Import Libraries

Import pandas,seaborn, and the usual libraries.

```
In [6]: import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        import seaborn as sns
        %matplotlib inline
```

1.2 Get the Data

```
In [7]: df = pd.read_csv('KNN_Project_Data')
```

Check the head of the dataframe.

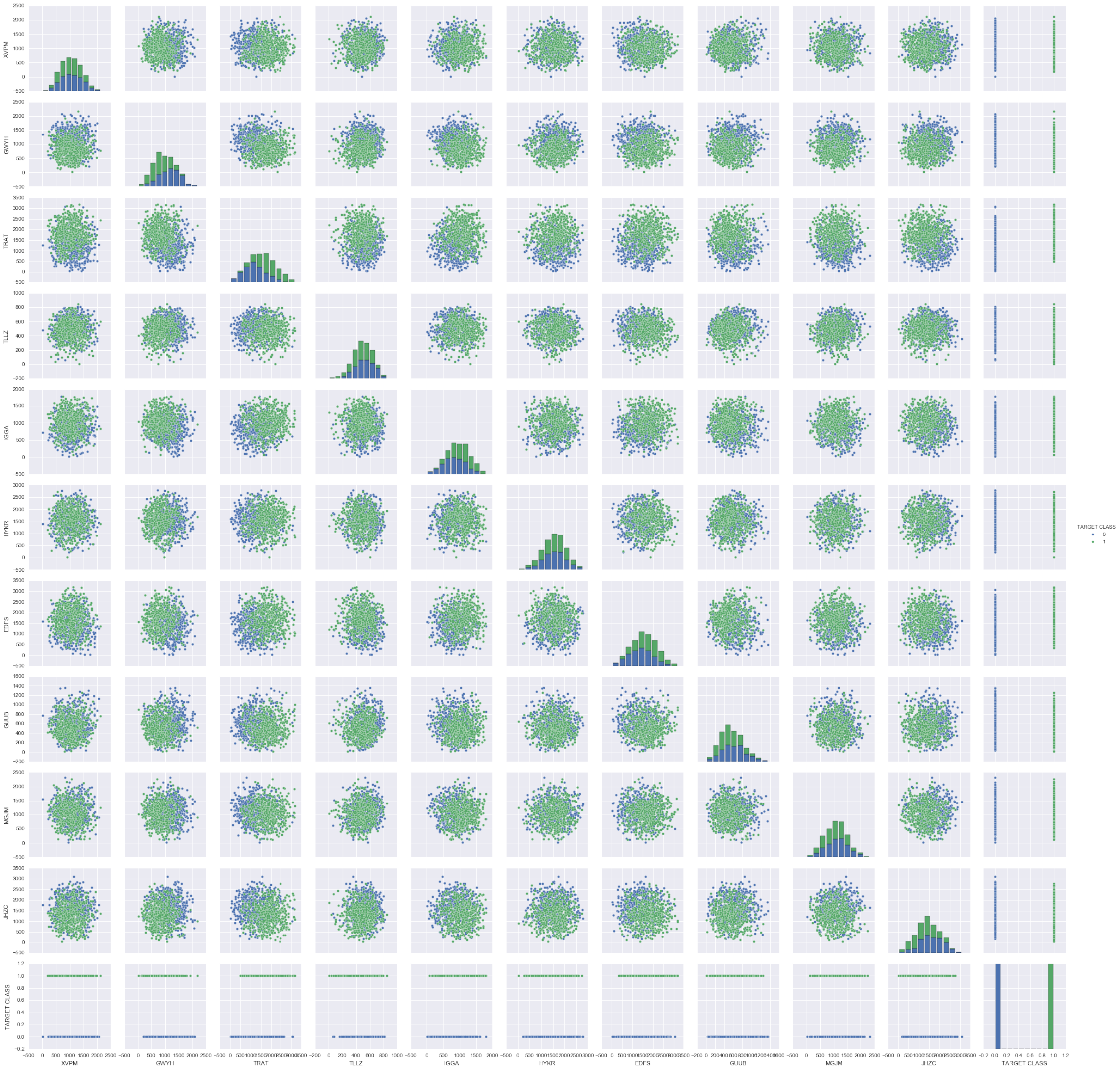
```
In [8]: df.head()
```

```
Out[8]:           XVPM         GWYH         TRAT        TLLZ         IGGA  \
        0  1636.670614   817.988525  2565.995189  358.347163   550.417491
        1  1013.402760   577.587332  2644.141273  280.428203  1161.873391
        2  1300.035501   820.518697  2025.854469  525.562292   922.206261
        3  1059.347542  1066.866418   612.000041  480.827789   419.467495
        4  1018.340526  1313.679056   950.622661  724.742174   843.065903

                  HYKR         EDFS        GUUB         MGJM         JHZC  \
        0  1618.870897  2147.641254  330.727893  1494.878631   845.136088
        1  2084.107872   853.404981  447.157619  1193.032521   861.081809
        2  2552.355407   818.676686  845.491492  1968.367513  1647.186291
        3   685.666983   852.867810  341.664784  1154.391368  1450.935357
        4  1370.554164   905.469453  658.118202   539.459350  1899.850792

           TARGET CLASS
        0             0
        1             1
        2             1
        3             0
        4             0
```

2 EDA

```
In [15]: sns.pairplot(df,hue='TARGET CLASS')
```

```
Out[15]: <seaborn.axisgrid.PairGrid at 0xced915df28>
```



3 Standardize the Variables

```
In [16]: from sklearn.preprocessing import StandardScaler
```

** Create a StandardScaler() object called scaler.**

```
In [17]: scaler = StandardScaler()
```

** Fit scaler to the features.**

```
In [18]: scaler.fit(df.drop('TARGET CLASS',axis=1))
```

```
Out[18]: StandardScaler(copy=True, with_mean=True, with_std=True)
```

Use the .transform() method to transform the features to a scaled version.

```
In [19]: scaled_features = scaler.transform(df.drop('TARGET CLASS',axis=1))
```

Convert the scaled features to a dataframe and check the head of this dataframe to make sure the scaling worked.

```
In [20]: df_feat = pd.DataFrame(scaled_features,columns=df.columns[:-1])
         df_feat.head()
```

```
Out[20]:        XVPM      GWYH      TRAT      TLLZ      IGGA      HYKR      EDFS  \
         0  1.568522 -0.443435  1.619808 -0.958255 -1.128481  0.138336  0.980493
         1 -0.112376 -1.056574  1.741918 -1.504220  0.640009  1.081552 -1.182663
         2  0.660647 -0.436981  0.775793  0.213394 -0.053171  2.030872 -1.240707
         3  0.011533  0.191324 -1.433473 -0.100053 -1.507223 -1.753632 -1.183561
         4 -0.099059  0.820815 -0.904346  1.609015 -0.282065 -0.365099 -1.095644

                GUUB      MGJM      JHZC
         0 -0.932794  1.008313 -1.069627
         1 -0.461864  0.258321 -1.041546
         2  1.149298  2.184784  0.342811
         3 -0.888557  0.162310 -0.002793
         4  0.391419 -1.365603  0.787762
```

4 Train Test Split

Use train_test_split to split your data into a training set and a testing set.

```
In [10]: from sklearn.cross_validation import train_test_split
```

```
In [11]: X_train, X_test, y_train, y_test = train_test_split(scaled_features,df['TARGET CLASS'],
                                                             test_size=0.30)
```

5 Using KNN

Import KNeighborsClassifier from scikit learn.

```
In [12]: from sklearn.neighbors import KNeighborsClassifier
```

Create a KNN model instance with n_neighbors=1

```
In [13]: knn = KNeighborsClassifier(n_neighbors=1)
```

Fit this KNN model to the training data.

```
In [14]: knn.fit(X_train,y_train)
```

```
Out[14]: KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
                    metric_params=None, n_jobs=1, n_neighbors=1, p=2,
                    weights='uniform')
```

6 Predictions and Evaluations

```
In [24]: pred = knn.predict(X_test)
```

** Create a confusion matrix and classification report.**

```
In [16]: from sklearn.metrics import classification_report,confusion_matrix
```

```
In [17]: print(confusion_matrix(y_test,pred))
```

```
[[112  40]
 [ 34 114]]
```

```
In [18]: print(classification_report(y_test,pred))
```

```
precision    recall  f1-score   support

          0       0.77      0.74      0.75       152
          1       0.74      0.77      0.75       148

avg / total       0.75      0.75      0.75       300
```

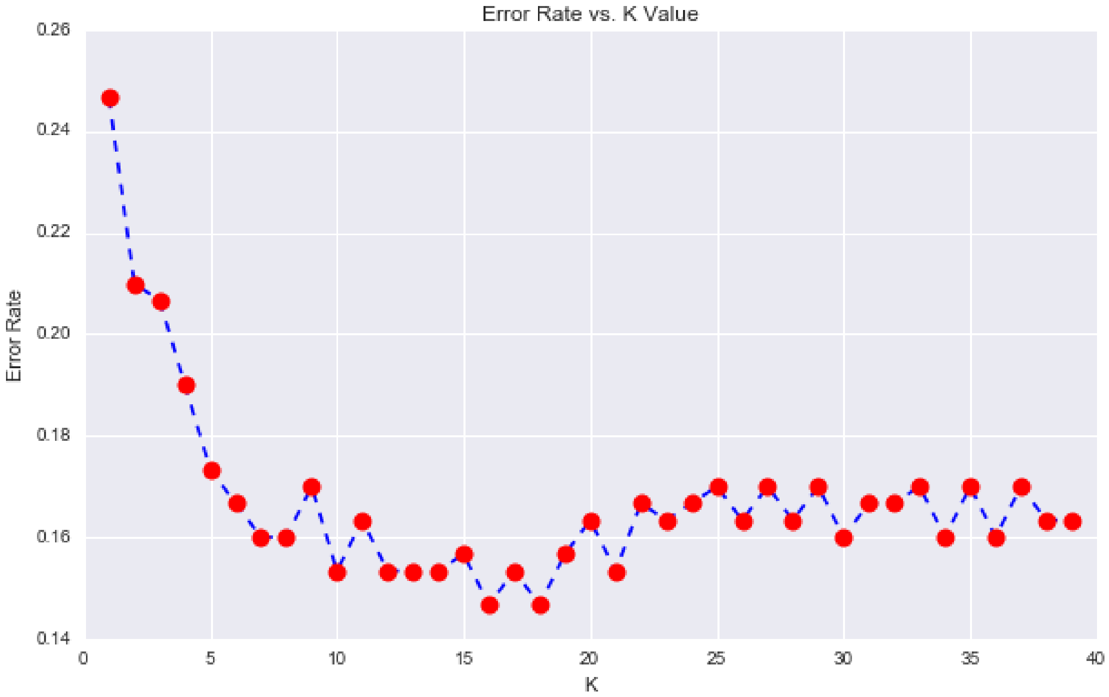
7 Choosing a K Value

```
In [25]: error_rate = []

         # Will take some time
         for i in range(1,40):

             knn = KNeighborsClassifier(n_neighbors=i)
             knn.fit(X_train,y_train)
             pred_i = knn.predict(X_test)
             error_rate.append(np.mean(pred_i != y_test))
```

Now create the following plot using the information from your for loop.

```
In [20]: plt.figure(figsize=(10,6))
         plt.plot(range(1,40),error_rate,color='blue', linestyle='dashed', marker='o',
                  markerfacecolor='red', markersize=10)
         plt.title('Error Rate vs. K Value')
         plt.xlabel('K')
         plt.ylabel('Error Rate')
```

```
Out[20]: <matplotlib.text.Text at 0x11cbdb710>
```



7.1 Retrain with new K Value

```
In [21]: # NOW WITH K=30
         knn = KNeighborsClassifier(n_neighbors=30)

         knn.fit(X_train,y_train)
         pred = knn.predict(X_test)

         print('WITH K=30')
         print('\n')
         print(confusion_matrix(y_test,pred))
         print('\n')
         print(classification_report(y_test,pred))
```

```
WITH K=30


[[127  25]
 [ 23 125]]


             precision    recall  f1-score   support

          0       0.85      0.84      0.84       152
          1       0.83      0.84      0.84       148

avg / total       0.84      0.84      0.84       300
```