ML_LAB_KNN_Online

June 23, 2021

0.1 23 June 2021

0.2 ML Lab 3

0.2.1 K NN

0.2.2 Dr Neeraj Gupta

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

[2]:
```
url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"

# Assign colum names to the dataset
names = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'Class']

# Read dataset to pandas dataframe
dataset = pd.read_csv(url, names=names)
```

[3]:
```
dataset.head()
```

[3]:

	sepal-length	sepal-width	petal-length	petal-width	Class
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

[4]:
```
dataset['Class'].values
```

[4]:
```
array(['Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
```

```
'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
'Iris-setosa', 'Iris-setosa', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
'Iris-virginica', 'Iris-virginica'], dtype=object)
```

[5]:
```
X = dataset.iloc[:, :-1].values
y = dataset.iloc[:, 4].values
```

[6]:
```
#Train & Test Split
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20)
```

[9]:
```
#Feature Scaling
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
scaler.fit(X_train)
X_train = scaler.transform(X_train)
X_test = scaler.transform(X_test)
```

[10]:
```
#Training and Predictions
from sklearn.neighbors import KNeighborsClassifier

classifier = KNeighborsClassifier(n_neighbors=5, metric='minkowski')␣
↪#metric='minkowski' #euclidean #minkowski

classifier.fit(X_train, y_train)
```

[10]:
```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
                     metric_params=None, n_jobs=None, n_neighbors=5, p=2,
                     weights='uniform')
```

[11]:
```
y_pred = classifier.predict(X_test)
y_pred
```

[11]:
```
array(['Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-virginica', 'Iris-virginica', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-setosa', 'Iris-versicolor',
       'Iris-virginica', 'Iris-setosa', 'Iris-setosa', 'Iris-versicolor',
       'Iris-setosa', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
       'Iris-versicolor', 'Iris-virginica', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-versicolor', 'Iris-virginica',
       'Iris-virginica', 'Iris-versicolor', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica'], dtype=object)
```

[12]:
```
y_test
```

[12]:
```
array(['Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-virginica', 'Iris-virginica', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-setosa', 'Iris-virginica',
       'Iris-virginica', 'Iris-setosa', 'Iris-setosa', 'Iris-versicolor',
       'Iris-setosa', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
       'Iris-versicolor', 'Iris-virginica', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-versicolor', 'Iris-virginica',
       'Iris-virginica', 'Iris-versicolor', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica'], dtype=object)
```

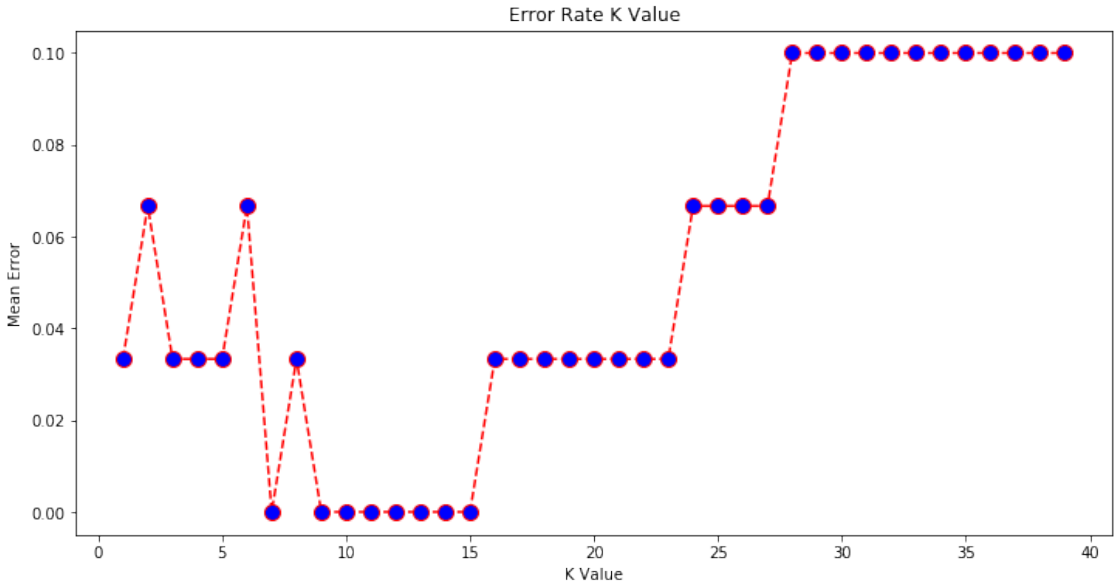
[13]:
```
from sklearn.metrics import classification_report, confusion_matrix
print(confusion_matrix(y_test, y_pred))
print(classification_report(y_test, y_pred))
```

```
[[13  0  0]
 [ 0  6  0]
 [ 0  1 10]]
                 precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00        13
Iris-versicolor       0.86      1.00      0.92         6
 Iris-virginica       1.00      0.91      0.95        11

       accuracy                           0.97        30
      macro avg       0.95      0.97      0.96        30
   weighted avg       0.97      0.97      0.97        30
```

[14]:
```
#Comparing Error Rate with the K Value
error = []
# Calculating error for K values between 1 and 40
for i in range(1, 40):
    knn = KNeighborsClassifier(n_neighbors=i)
    knn.fit(X_train, y_train)
    pred_i = knn.predict(X_test)
    error.append(np.mean(pred_i != y_test))
```

[15]:
```
plt.figure(figsize=(12, 6))
plt.plot(range(1, 40), error, color='red', linestyle='dashed', marker='o',
markerfacecolor='blue', markersize=10)
plt.title('Error Rate K Value')
plt.xlabel('K Value')
plt.ylabel('Mean Error')
```

[15]:
```
Text(0, 0.5, 'Mean Error')
```


Error Rate K Value
Mean Error
K Value
0.10
0.08
0.06
0.04
0.02
0.00
0
5
10
15
20
25
30
35
40