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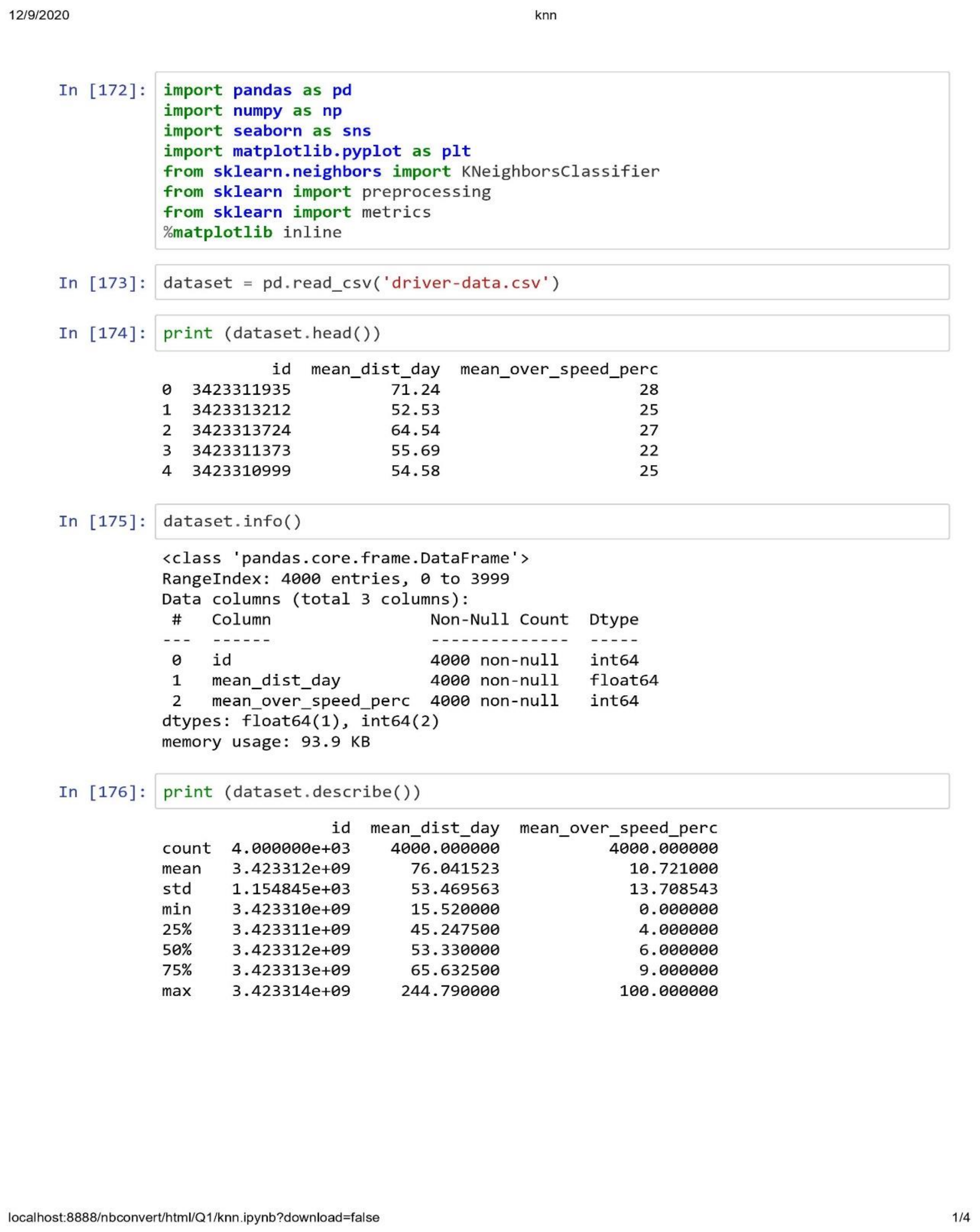
COE15

Q1 KNN



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In [172]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.neighbors import KNeighborsClassifier
from sklearn import preprocessing
from sklearn import metrics
%matplotlib inline
```

In [173]:
```
dataset = pd.read_csv('driver-data.csv')
```

In [174]:
```
print (dataset.head())
```

```
           id  mean_dist_day  mean_over_speed_perc
0  3423311935          71.24                    28
1  3423313212          52.53                    25
2  3423313724          64.54                    27
3  3423311373          55.69                    22
4  3423310999          54.58                    25
```

In [175]:
```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4000 entries, 0 to 3999
Data columns (total 3 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   id                    4000 non-null   int64  
 1   mean_dist_day         4000 non-null   float64
 2   mean_over_speed_perc  4000 non-null   int64  
dtypes: float64(1), int64(2)
memory usage: 93.9 KB
```

In [176]:
```
print (dataset.describe())
```

```
                 id  mean_dist_day  mean_over_speed_perc
count  4.000000e+03    4000.000000           4000.000000
mean   3.423312e+09      76.041523             10.721000
std    1.154845e+03      53.469563             13.708543
min    3.423310e+09      15.520000              0.000000
25%    3.423311e+09      45.247500              4.000000
50%    3.423312e+09      53.330000              6.000000
75%    3.423313e+09      65.632500              9.000000
max    3.423314e+09     244.790000            100.000000
```

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In [177]:

```
labels=list()
for index, row in dataset.iterrows():
    # dist big,speed big
    if row['mean_dist_day']>=50 and row['mean_over_speed_perc']>=20:
        labels.append(1)
    # dist low,speed big
    elif row['mean_dist_day']<=50 and row['mean_over_speed_perc']>=20:
        labels.append(2)
    # dist high,speed low
    elif row['mean_dist_day']>=50 and row['mean_over_speed_perc']<=20:
        labels.append(3)
    # dist low,speed low
    else:
        labels.append(4)
```

In [178]:

```
len(labels)
```

Out[178]:

```
4000
```

In [179]:

```
x = dataset.iloc[:,[1,2]].values
```

In [180]:

```
x
```

Out[180]:

```
array([[ 71.24,  28.  ],
       [ 52.53,  25.  ],
       [ 64.54,  27.  ],
       ...,
       [170.91,  12.  ],
       [176.14,   5.  ],
       [168.03,   9.  ]])
```

In [181]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x, labels, test_size=0.20,
random_state=0)
```

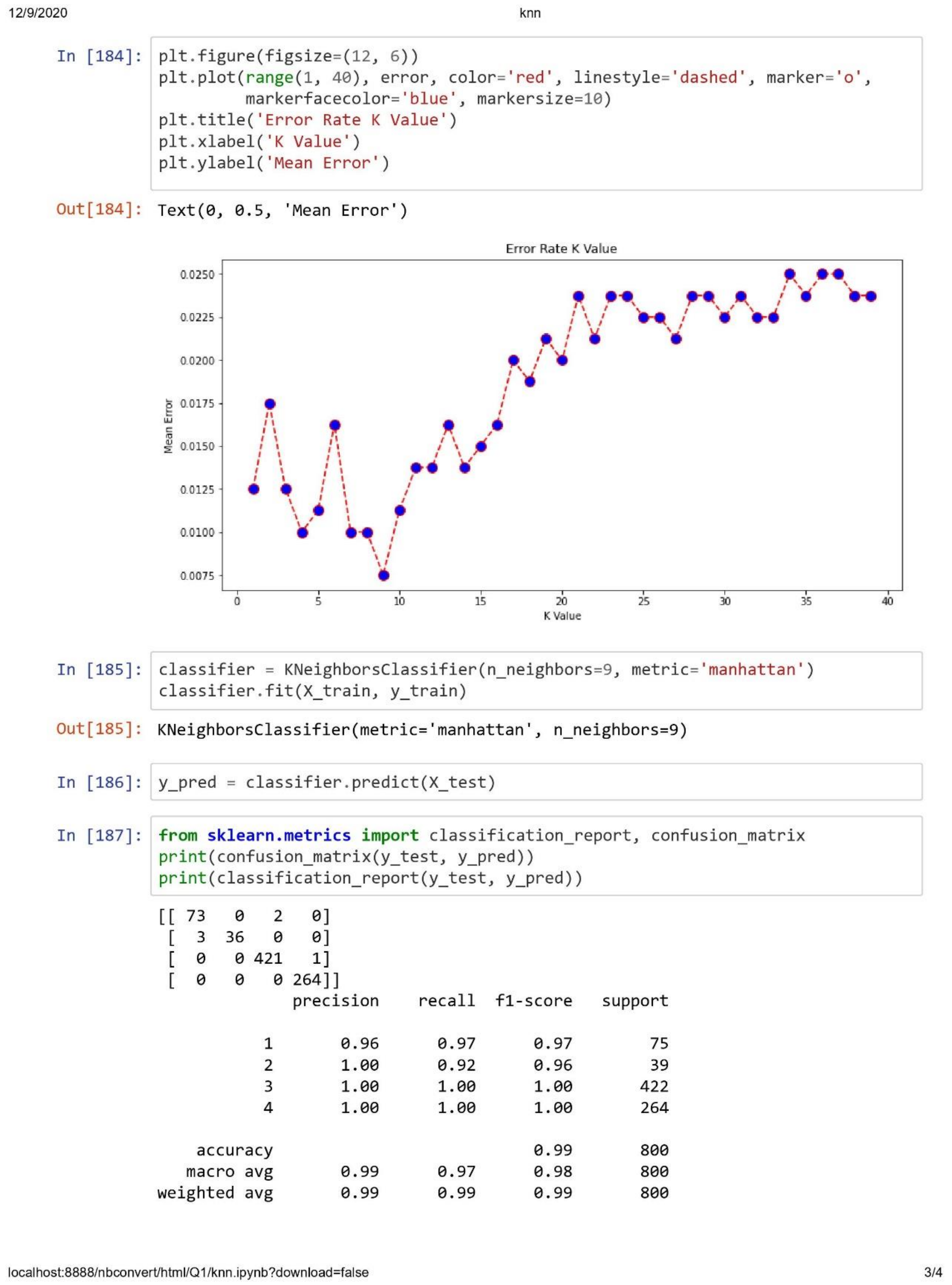
In [182]:

```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
scaler.fit(X_train)

X_train = scaler.transform(X_train)
X_test = scaler.transform(X_test)
```

In [183]:

```
from sklearn.neighbors import KNeighborsClassifier
error = []
# Calculating error for K values between 1 and 40
for i in range(1, 40):
    knn = KNeighborsClassifier(n_neighbors=i,metric='manhattan')
    knn.fit(X_train, y_train)
    pred_i = knn.predict(X_test)
    error.append(np.mean(pred_i != y_test))
```



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In [184]:
```
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')
```

Out[184]:
```
Text(0, 0.5, 'Mean Error')
```

In [185]:
```
classifier = KNeighborsClassifier(n_neighbors=9, metric='manhattan')
classifier.fit(X_train, y_train)
```

Out[185]:
```
KNeighborsClassifier(metric='manhattan', n_neighbors=9)
```

In [186]:
```
y_pred = classifier.predict(X_test)
```

In [187]:
```
from sklearn.metrics import classification_report, confusion_matrix
print(confusion_matrix(y_test, y_pred))
print(classification_report(y_test, y_pred))
```

```
[[ 73   0   2   0]
 [  3  36   0   0]
 [  0   0 421   1]
 [  0   0   0 264]]
              precision    recall  f1-score   support

           1       0.96      0.97      0.97        75
           2       1.00      0.92      0.96        39
           3       1.00      1.00      1.00       422
           4       1.00      1.00      1.00       264

    accuracy                           0.99       800
   macro avg       0.99      0.97      0.98       800
weighted avg       0.99      0.99      0.99       800
```

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Q2 PROLOG

/*Medical Expert System*/

go:-

hypothesis(Disease),

```
write('I believe that the patient have : '),

write(Disease),

nl,

write('TAKE CARE!!! '),

undo.


/*Hypothesis that should be tested*/

hypothesis(cold) :- cold, !.

hypothesis(flu) :- flu, !.

hypothesis(covid_19) :- covid_19, !.

hypothesis(typhoid) :- typhoid, !.

hypothesis(measles) :- measles, !.

hypothesis(dengue) :- dengue, !.

hypothesis(unknown). /* no diagnosis*/


/*Hypothesis Identification Rules*/

cold :-

verify(headache),

verify(runny_nose),

verify(sneezing),

verify(sore_throat),

write('Advices and Suggestions:'),

nl,

write('1: Tylenol '),

nl,

write('2: Panadol '),

nl,

write('3: Nasal spray '),

nl,

write('Please wear warm cloths because : '),

nl.
```

```
flu :-
verify(fever),
verify(headache),
verify(chills),
verify(body_ache),
write('Advices and Suggestions:'),
nl,
write('1: Tamiflu '),
nl,
write('2: Panadol '),
nl,
write('3: Zanamivir '),
nl,
write('Please take a warm bath and do salt gargling because : '),
nl.

covid_19 :-
verify(fever),
verify(headache),
verify(chills),
verify(sore_throat),
verify(body_ache),
verify(breathlessness),
write('Advices and Suggestions:'),
nl,
write('No direct vaccine or medication for now :- under investigation. '),
nl,
write('To reduce fever and body pain take Acetaminophen.'),
nl,
write('Please take plenty of rest, stay well hydrated because : '),
nl.

typhoid :-
verify(headache),
verify(abdominal_pain),
verify(poor_appetite),
verify(fever),
write('Advices and Suggestions:'),
nl,
write('1: Chloramphenicol '),
nl,
write('2: Amoxicillin '),
nl,
write('3: Ciprofloxacin '),
nl,
write('4: Azithromycin '),
nl,
write('Please do complete bed rest and take soft diet because : '),
nl.

measles :-
verify(fever),
verify(runny_nose),
verify(rash),
verify(conjunctivitis),
write('Advices and Suggestions: '),
nl,
write('1: Tylenol '),
nl,
write('2: Aleve '),
nl,
write('3: Advil '),
nl,
write('4: Vitamin A '),
nl,
write('Please get some rest and drink more fluids because : '),
nl.

dengue :-
verify(fever),
verify(sweating),
verify(headache),
verify(nausea),
verify(vomiting),
verify(joint_pain),
write('Advices and Suggestions:'),
nl,
write('Acetaminophen to reduce fever and joint_pain. '),
nl,
write('Please do not sleep in open air, cover your full skin and drink plenty of fluids to be hydrated because : '),
nl.

/* How to ask questions */
ask(Question) :-
write('Does the patient has following symptom: '),
write(Question),
write('? '),
read(Response),
nl,
( (Response == yes ; Response == y)
->
assert(yes(Question)) ;

assert(no(Question)), fail).


:- dynamic yes/1,no/1.


/*How to verify something */

verify(S) :-

(yes(S)

->

true ;

(no(S)

->

fail ;

ask(S))).

/* undo all yes/no assertions*/

undo :- retract(yes(_)),fail.

undo :- retract(no(_)),fail.

undo.
```