

Name: Jaydeep Solanki

Roll: 22BEC059

Practical 7: Write a program for predicting selling price of houses in Boston dataset using KNN regressor

1. Using SkLearn Library.

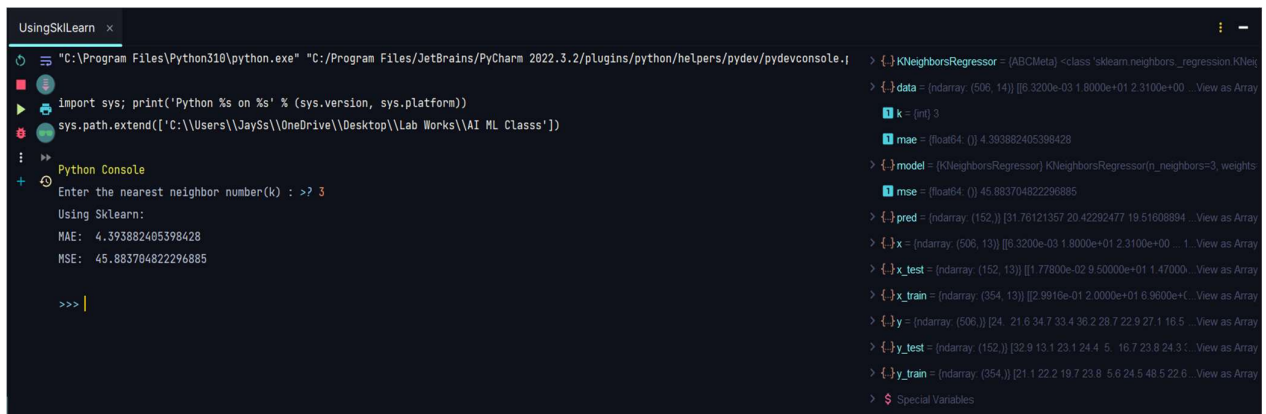
```
import pandas as pd
from sklearn.metrics import mean_absolute_error, mean_squared_error
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsRegressor

data = pd.read_csv("BostonHousing.csv", header='infer').values

x = data[:, 0:-1]
y = data[:, -1]
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3)
k = int(input("Enter the nearest neighbor number(k) : "))

model = KNeighborsRegressor(n_neighbors=k, weights='distance')
model.fit(x_train, y_train)
pred = model.predict(x_test)
mae = mean_absolute_error(y_test, pred)
mse = mean_squared_error(y_test, pred)
print("Using Sklearn: ")
print("MAE: ", mae)
print("MSE: ", mse)
```

Output:



```
UsingSkLearn x
C:\Program Files\Python310\python.exe "C:/Program Files/JetBrains/PyCharm 2022.3.2/plugins/python/helpers/pydev/pydevconsole.py"
import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['C:\\Users\\JaySs\\OneDrive\\Desktop\\Lab Works\\AI ML Classes'])
>>>
Python Console
Enter the nearest neighbor number(k) : >> 3
Using SkLearn:
MAE: 4.393882405398428
MSE: 45.883704822296885

>>> |
```

Variable Explorer:

- `KNeighborsRegressor`: (ABCMeta) <class 'sklearn.neighbors._regression.KNeighborsRegressor'
- `data`: (ndarray (506, 14)) [[6.3200e-03 1.8000e+01 2.3100e+00 ... View as Array]
- `k`: (int) 3
- `mae`: (float64 (1)) 4.393882405398428
- `model`: (KNeighborsRegressor) KNeighborsRegressor(n_neighbors=3, weights='distance')
- `mse`: (float64 (1)) 45.883704822296885
- `pred`: (ndarray (152,)) [31.76121357 20.42292477 19.51088894 ... View as Array]
- `x`: (ndarray (506, 13)) [[6.3200e-03 1.8000e+01 2.3100e+00 ... 1. View as Array]
- `x_test`: (ndarray (152, 13)) [[1.77800e-02 9.50000e+01 1.47000 ... View as Array]
- `x_train`: (ndarray (354, 13)) [[2.9910e-01 2.0000e+01 6.9000e+00 ... View as Array]
- `y`: (ndarray (506,)) [24. 21.6 34.7 33.4 36.2 28.7 22.9 27.1 16.5 ... View as Array]
- `y_test`: (ndarray (152,)) [32.9 13.1 23.1 24.4 5. 16.7 23.8 24.3 ... View as Array]
- `y_train`: (ndarray (354,)) [21.1 22.2 19.7 23.8 5.6 24.5 48.5 22.6 ... View as Array]
- Special Variables

2. Without using SkLearn Library

```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from tabulate import tabulate

def MAE(pred, y_test):
    return np.mean(abs(pred - y_test))

def MSE(pred, y_test):
    return np.mean((pred - y_test) ** 2)

def RMSE(mse):
    return np.sqrt(mse)

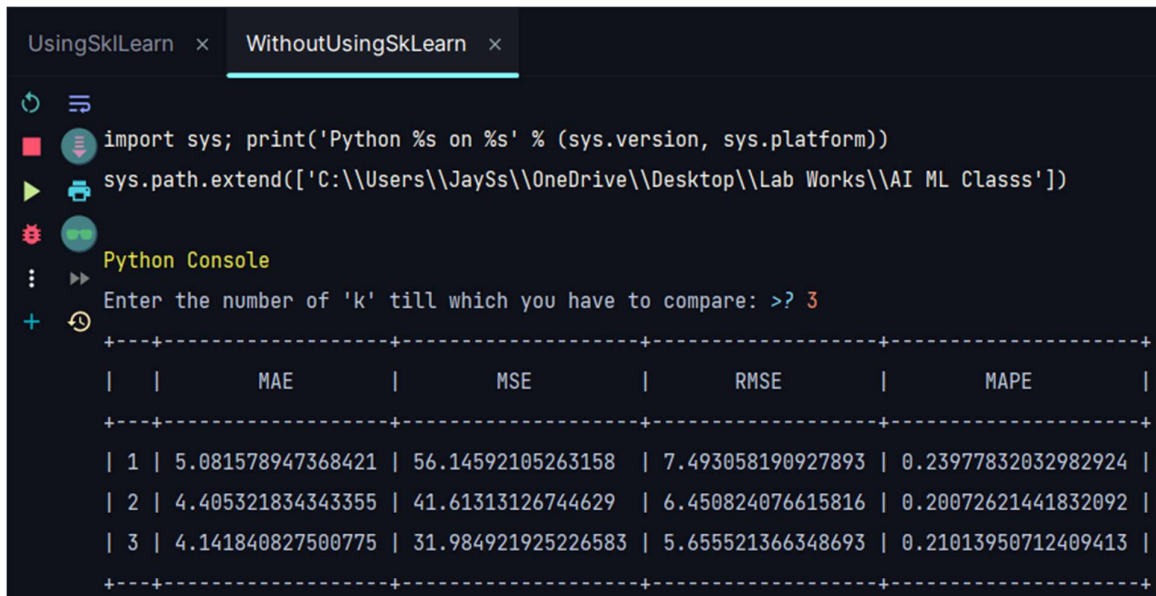
def MAPE(pred, y_test):
    return np.mean(abs(pred - y_test) / y_test)

def KNNRegressor(k):
    data = pd.read_csv("BostonHousing.csv", header='infer').values
    x = data[:, 0:-1]
    y = data[:, -1]
    x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3)
    nClasses = np.unique(y_train).shape[0]
    distance = np.zeros(shape=x_train.shape[0])
    pred = np.zeros(shape=x_test.shape[0])
    for i in range(x_test.shape[0]):
        distance = np.sqrt(np.sum((x_train - x_test[i]) ** 2, axis=1))
        kMinIndex = np.argpartition(distance, k)[0:k]
        invDist = 1 / (distance + 10e-20)
        Denom = sum(invDist[kMinIndex])
        pred[i] = np.dot(invDist[kMinIndex] / Denom, y_train[kMinIndex])
    return [MAE(pred, y_test), MSE(pred, y_test), RMSE(MSE(pred, y_test)),
    MAPE(pred, y_test)]

display = {}
n = int(input("Enter the number of 'k' till which you have to compare: "))
for i in range(1, n+1):
    ans = KNNRegressor(i)
    display[i] = ans

print(tabulate(pd.DataFrame(display).T, tablefmt="pretty", headers=["MAE", "MSE",
"RMSE", "MAPE"])))
```

Output:



```
UsingSkLearn x WithoutUsingSkLearn x
import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['C:\\Users\\JaySs\\OneDrive\\Desktop\\Lab Works\\AI ML Classs'])

Python Console
Enter the number of 'k' till which you have to compare: >? 3

+---+-----+-----+-----+-----+
| | MAE | MSE | RMSE | MAPE |
+---+-----+-----+-----+-----+
| 1 | 5.081578947368421 | 56.14592105263158 | 7.493058190927893 | 0.23977832032982924 |
| 2 | 4.405321834343355 | 41.61313126744629 | 6.450824076615816 | 0.20072621441832092 |
| 3 | 4.141840827500775 | 31.984921925226583 | 5.655521366348693 | 0.21013950712409413 |
+---+-----+-----+-----+-----+
```