Importing library

```
import pandas as pd
import numpy as np
```

Choose Dataset from directory

```
from google.colab import files
uploaded = files.upload()
```

Choose Files data.csv

- **data.csv**(text/csv) - 125141 bytes, last modified: 3/28/2023 - 100% done

```
Saving c .csv to data.csv
```

Load Dataset

```
dataset = pd.read_csv('data.csv')
dataset
```

	id	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	con
0	842302	17.99	10.38	122.80	1001.0	0.11840	
1	842517	20.57	17.77	132.90	1326.0	0.08474	
2	84300903	19.69	21.25	130.00	1203.0	0.10960	
3	84348301	11.42	20.38	77.58	386.1	0.14250	
4	84358402	20.29	14.34	135.10	1297.0	0.10030	
...	...	...	...	...	...	...	
564	926424	21.56	22.39	142.00	1479.0	0.11100	
565	926682	20.13	28.25	131.20	1261.0	0.09780	
566	926954	16.60	28.08	108.30	858.1	0.08455	
567	927241	20.60	29.33	140.10	1265.0	0.11780	
568	92751	7.76	24.54	47.92	181.0	0.05263	

569 rows × 32 columns

Summarize Dataset

```
print(dataset.shape)
print(dataset.head(5))
```

```
(569, 32)
         id  radius_mean  texture_mean  perimeter_mean  area_mean  \
0    842302        17.99         10.38          122.80     1001.0   
1    842517        20.57         17.77          132.90     1326.0   
2  84300903        19.69         21.25          130.00     1203.0   
3  84348301        11.42         20.38           77.58      386.1   
4  84358402        20.29         14.34          135.10     1297.0   

   smoothness_mean  compactness_mean  concavity_mean  concave points_mean  \
0          0.11840           0.27760          0.3001              0.14710   
1          0.08474           0.07864          0.0869              0.07017   
2          0.10960           0.15990          0.1974              0.12790   
3          0.14250           0.28390          0.2414              0.10520   
4          0.10030           0.13280          0.1980              0.10430   

   symmetry_mean  ...  texture_worst  perimeter_worst  area_worst  \
0         0.2419  ...          17.33           184.60      2019.0   
1         0.1812  ...          23.41           158.80      1956.0   
2         0.2069  ...          25.53           152.50      1709.0   
3         0.2597  ...          26.50            98.87       567.7   
4         0.1809  ...          16.67           152.20      1575.0   
```

```
   smoothness_worst  compactness_worst  concavity_worst  concave points_worst  \
0            0.1622             0.6656           0.7119                0.2654   
1            0.1238             0.1866           0.2416                0.1860   
2            0.1444             0.4245           0.4504                0.2430   
3            0.2098             0.8663           0.6869                0.2575   
4            0.1374             0.2050           0.4000                0.1625   

   symmetry_worst  fractal_dimension_worst  diagnosis  
0          0.4601                  0.11890          M  
1          0.2750                  0.08902          M  
2          0.3613                  0.08758          M  
3          0.6638                  0.17300          M  
4          0.2364                  0.07678          M  

[5 rows x 32 columns]
```

Mapping Salary Data to Binary Value

```
diagnosis_set = set(dataset['diagnosis'])
dataset['diagnosis'] = dataset['diagnosis'].map({'M':0, 'B':1}).astype(int)
print(dataset.head(5))
```

```
         id  radius_mean  texture_mean  perimeter_mean  area_mean  \
0    842302        17.99         10.38          122.80     1001.0   
1    842517        20.57         17.77          132.90     1326.0   
2  84300903        19.69         21.25          130.00     1203.0   
3  84348301        11.42         20.38           77.58      386.1   
4  84358402        20.29         14.34          135.10     1297.0   

   smoothness_mean  compactness_mean  concavity_mean  concave points_mean  \
0          0.11840           0.27760          0.3001              0.14710   
1          0.08474           0.07864          0.0869              0.07017   
2          0.10960           0.15990          0.1974              0.12790   
3          0.14250           0.28390          0.2414              0.10520   
4          0.10030           0.13280          0.1980              0.10430   

   symmetry_mean  ...  texture_worst  perimeter_worst  area_worst  \
0         0.2419  ...          17.33           184.60      2019.0   
1         0.1812  ...          23.41           158.80      1956.0   
2         0.2069  ...          25.53           152.50      1709.0   
3         0.2597  ...          26.50            98.87       567.7   
4         0.1809  ...          16.67           152.20      1575.0   

   smoothness_worst  compactness_worst  concavity_worst  concave points_worst  \
0            0.1622             0.6656           0.7119                0.2654   
1            0.1238             0.1866           0.2416                0.1860   
2            0.1444             0.4245           0.4504                0.2430   
3            0.2098             0.8663           0.6869                0.2575   
4            0.1374             0.2050           0.4000                0.1625   

   symmetry_worst  fractal_dimension_worst  diagnosis  
0          0.4601                  0.11890          0  
1          0.2750                  0.08902          0  
2          0.3613                  0.08758          0  
3          0.6638                  0.17300          0  
4          0.2364                  0.07678          0  

[5 rows x 32 columns]
```

Segregate Dataset into X & Y

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

```
array([[8.4230200e+05, 1.7990000e+01, 1.0380000e+01, ..., 2.6540000e-01,
        4.6010000e-01, 1.1890000e-01],
       [8.4251700e+05, 2.0570000e+01, 1.7770000e+01, ..., 1.8600000e-01,
        2.7500000e-01, 8.9020000e-02],
       [8.4300903e+07, 1.9690000e+01, 2.1250000e+01, ..., 2.4300000e-01,
        3.6130000e-01, 8.7580000e-02],
       ...,
       [9.2695400e+05, 1.6600000e+01, 2.8080000e+01, ..., 1.4180000e-01,
        2.2180000e-01, 7.8200000e-02],
       [9.2724100e+05, 2.0600000e+01, 2.9330000e+01, ..., 2.6500000e-01,
        4.0870000e-01, 1.2400000e-01],
       [9.2751000e+04, 7.7600000e+00, 2.4540000e+01, ..., 0.0000000e+00,
        2.8710000e-01, 7.0390000e-02]])
```

```
Y = dataset.iloc[:, -1].values
Y
```

```
    array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1,
           0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,
           0, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0,
           1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0,
           1, 1, 1, 0, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1,
           1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0,
           0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1,
           1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1,
           1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 0,
           0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0,
           1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 0, 1, 1,
           1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
           0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1,
           1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1,
           1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0,
           0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0,
           0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0,
           1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 1,
           1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 0,
           1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 1,
           1, 0, 1, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0,
           1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1,
           1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1,
           1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1,
           1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
           1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1])
```

Splitting Dataset into Train & Test

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.25, random_state = 0)
```

Feature Scaling

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
X_train
```

```
    array([[-0.23086619, -0.65079907, -0.43057322, ..., -0.36433881,
              0.32349851, -0.7578486 ],
           [-0.23082222, -0.82835341,  0.15226547, ..., -1.45036679,
              0.62563098, -1.03071387],
           [-0.23058288,  1.68277234,  2.18977235, ...,  0.72504581,
             -0.51329768, -0.96601386],
           ...,
           [ 7.05970021, -1.33114223, -0.22172269, ..., -0.98806491,
             -0.69995543, -0.12266325],
           [-0.23100067, -1.25110186, -0.24600763, ..., -1.75887319,
             -1.56206114, -1.00989735],
           [-0.23059415, -0.74662205,  1.14066273, ..., -0.2860679 ,
             -1.24094654,  0.2126516 ]])
```

Finding the Best K-Value

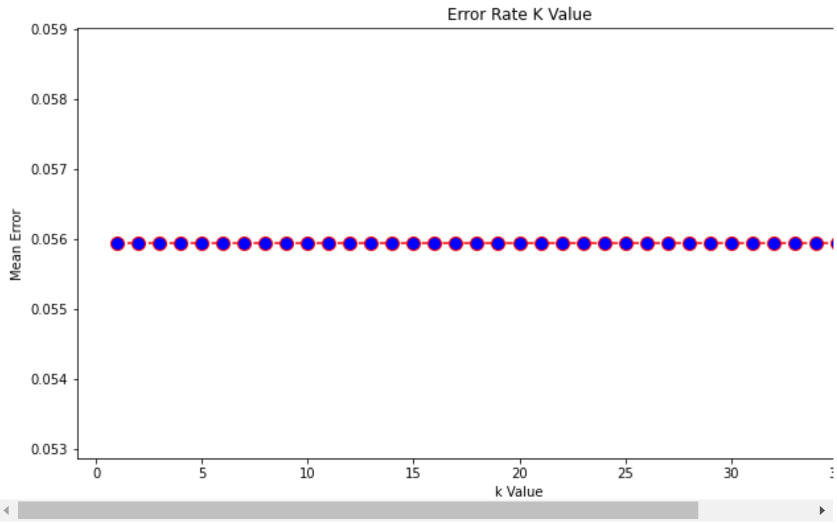
```
error = []
from sklearn.neighbors import KNeighborsClassifier #alg.
import matplotlib.pyplot as plt #Data Visualisation

#Calculating error for K values between 1 and 40

for i in range(1, 40):
  model = KNeighborsClassifier(n_neighbors=1)
  model.fit(X_train, y_train)
  pred_i = model.predict(X_test)
  error.append(np.mean(pred_i != y_test))

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')
```

```
Text(0, 0.5, 'Mean Error')
```



Training

```
from sklearn.neighbors import KNeighborsClassifier
model = KNeighborsClassifier(n_neighbors = 5, metric = 'minkowski', p = 2)
model.fit(X_train, y_train)
```

```
▸ KNeighborsClassifier
```

Predicting for all Test Data

```
y_pred = model.predict(X_test)
```

Evaluating Model - CONFUSION MATRIX

```
from sklearn.metrics import confusion_matrix, accuracy_score
cm = confusion_matrix(y_test, y_pred)

print("Confusion Matrix: ")
print(cm)

print("Accuracy of the Model: {0}%".format(accuracy_score(y_test, y_pred)*100))
```

```
Confusion Matrix:
[[47  6]
 [ 1 89]]
Accuracy of the Model: 95.1048951048951%
```

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