Data Mining (Δ02): Exercise Set 2: 2.2 - 4Rectangles Dataset (K-Means - Silhouette)

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


#classifiers
from sklearn.cluster import KMeans
from sklearn.metrics import silhouette_score

#to ignore warnings
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
data = []
# read the file line by line
with open(r'C:\Users\Nefeli\Desktop\dm_msc\DM_Homework2_2024\clustering\4rectangles.txt'
    for line in file:
        # Strip whitespace, split (by space)
        clean_line = line.strip().split()
        data.append((float(clean_line[0]), float(clean_line[1])))

# Create DataFrame from the list
main_df = pd.DataFrame(data, columns=['x', 'y'])
```

In [3]:
```
#range of k values to test
k = range(2, 11)

silhouette_scores = []

# get silhouette for each different k
for k_i in k:
    kmeans = KMeans(n_clusters=k_i, random_state=42)
    labels = kmeans.fit_predict(main_df)
    silhouette_avg = silhouette_score(main_df, labels)
    silhouette_scores.append(silhouette_avg)
    print("k = {} ----- Silhouette Score = {}".format(k_i,silhouette_avg))

# get best k (highest silhouette score)
best_k = k[np.argmax(silhouette_scores)]
print("Optimal number of clusters: {}".format(best_k))
```

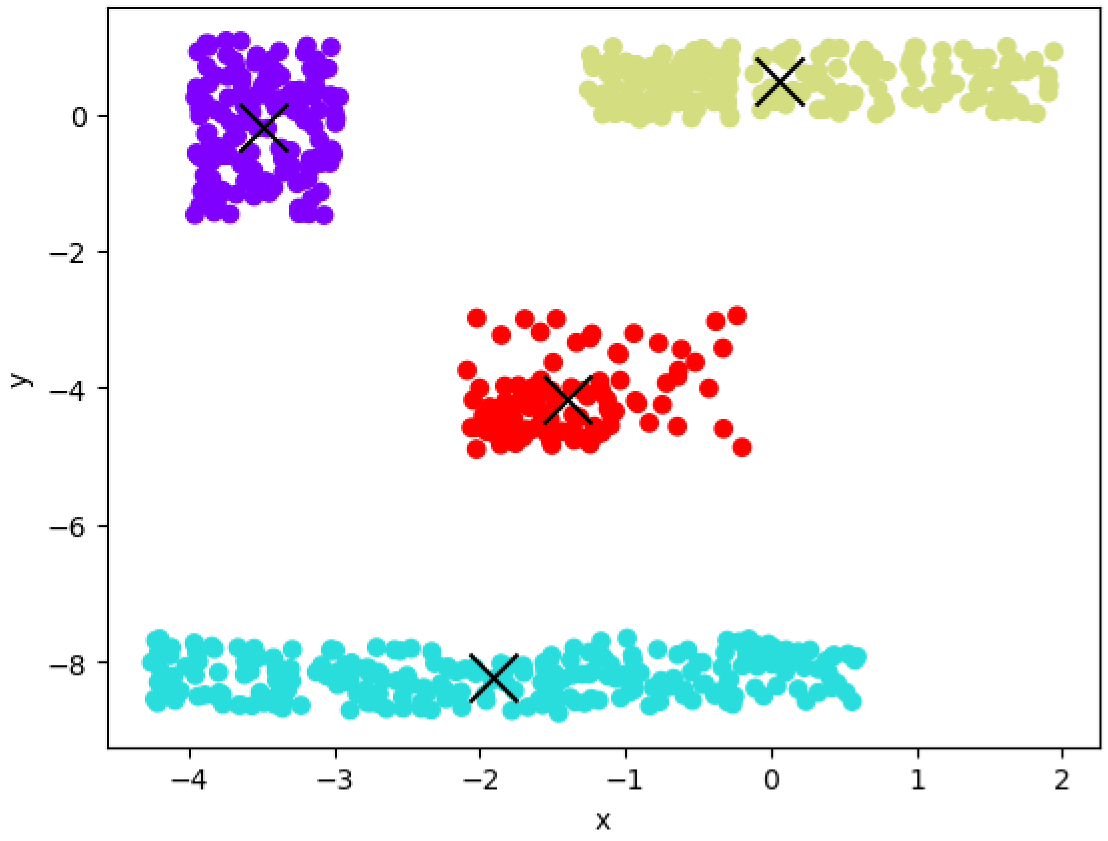
```
k = 2 ----- Silhouette Score = 0.6439303703961847
k = 3 ----- Silhouette Score = 0.6268658685616204
k = 4 ----- Silhouette Score = 0.6769687393241283
k = 5 ----- Silhouette Score = 0.6744350904741775
k = 6 ----- Silhouette Score = 0.6412276600077713
k = 7 ----- Silhouette Score = 0.6080819455834188
```

```
k = 8 ----- Silhouette Score = 0.57546859206769
k = 9 ----- Silhouette Score = 0.5654851854040588
k = 10 ----- Silhouette Score = 0.5257511284451178
Optimal number of clusters: 4
```

In [4]:
```python
#init and fit
kmeans = KMeans(n_clusters=4)
kmeans.fit(main_df)

# get centroids and labels
centroids = kmeans.cluster_centers_
labels = kmeans.labels_

plt.scatter(main_df['x'], main_df['y'], c=labels, cmap='rainbow')
plt.scatter(centroids[:, 0], centroids[:, 1], s=300, c='black', marker='x')
plt.xlabel('x')
plt.ylabel('y')
plt.show()
```



The optimal number of clusters matches the number of clusters expected from visual inspection of the data.