# 411021334

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Importing packages

[1]:
```
from sklearn.cluster import KMeans
from sklearn.datasets import make_blobs
from yellowbrick.cluster import KElbowVisualizer

import pandas as pd
import io
import matplotlib.pyplot as plt
```

reading the seeds data from txt file as pandas dataframe

[2]:
```
with open("./seeds/seeds_dataset.txt", "r") as file:
    data = file.read().replace('\t\t', '\t')

file_like_object = io.StringIO(data)

df = pd.read_csv(file_like_object, delimiter='\t', header=None)
wheat_type_mapping = {1: 'Kama', 2: 'Rosa', 3: 'Canadian'}

features = [ 'area', 'perimiter', 'compactness', 'length_of_kernel',␣
 ↪'width_of_kernel', 'asymetry_coefficient', 'length_of_kernel_groove',␣
 ↪'wheat_type']
df.columns = features
df['wheat_type'] = df['wheat_type'].replace(wheat_type_mapping)

df.info()
df[0:10]
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 210 entries, 0 to 209
Data columns (total 8 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   area                    210 non-null    float64
 1   perimiter               210 non-null    float64
 2   compactness             210 non-null    float64
 3   length_of_kernel        210 non-null    float64
 4   width_of_kernel         210 non-null    float64
```

```
 5   asymetry_coefficient     210 non-null    float64
 6   length_of_kernel_groove  210 non-null    float64
 7   wheat_type               210 non-null    object
dtypes: float64(7), object(1)
memory usage: 13.3+ KB
```

[2]:

| | area | perimiter | compactness | length_of_kernel | width_of_kernel | asymetry_coefficient | length_of_kernel_groove | wheat_type |
|---|---|---|---|---|---|---|---|---|
| 0 | 15.26 | 14.84 | 0.8710 | 5.763 | 3.312 | 2.221 | 5.220 | Kama |
| 1 | 14.88 | 14.57 | 0.8811 | 5.554 | 3.333 | 1.018 | 4.956 | Kama |
| 2 | 14.29 | 14.09 | 0.9050 | 5.291 | 3.337 | 2.699 | 4.825 | Kama |
| 3 | 13.84 | 13.94 | 0.8955 | 5.324 | 3.379 | 2.259 | 4.805 | Kama |
| 4 | 16.14 | 14.99 | 0.9034 | 5.658 | 3.562 | 1.355 | 5.175 | Kama |
| 5 | 14.38 | 14.21 | 0.8951 | 5.386 | 3.312 | 2.462 | 4.956 | Kama |
| 6 | 14.69 | 14.49 | 0.8799 | 5.563 | 3.259 | 3.586 | 5.219 | Kama |
| 7 | 14.11 | 14.10 | 0.8911 | 5.420 | 3.302 | 2.700 | 5.000 | Kama |
| 8 | 16.63 | 15.46 | 0.8747 | 6.053 | 3.465 | 2.040 | 5.877 | Kama |
| 9 | 16.44 | 15.25 | 0.8880 | 5.884 | 3.505 | 1.969 | 5.533 | Kama |

[3]:
```
wheat_instances = pd.crosstab(index=df["wheat_type"], columns="count")
wheat_instances
```

[3]:

| wheat_type | count |
|---|---|
| Canadian | 70 |
| Kama | 70 |
| Rosa | 70 |

Instantiate the clustering model and KElbowVisualizer visualizer

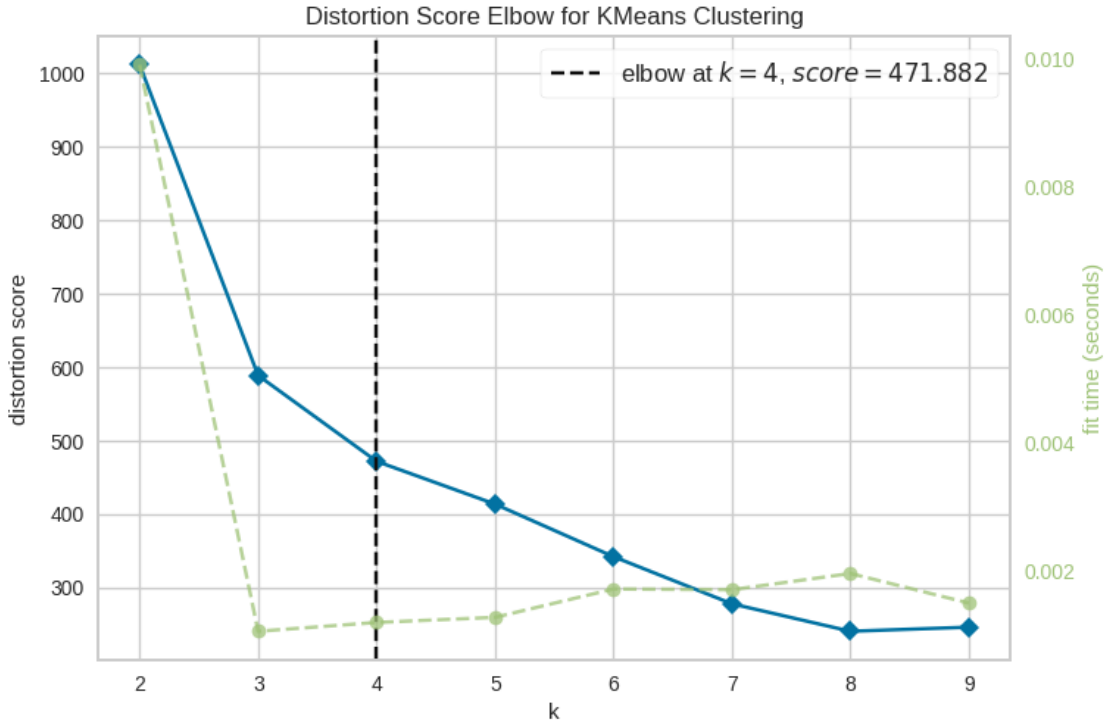
[4]:
```
X = df.iloc[:, list(range(7)),].to_numpy()

# Instantiate the clustering model and visualizer
model = KMeans()
visualizer = KElbowVisualizer(model, k=(2,10))

visualizer.fit(X)
```

```
optimal_k = visualizer.elbow_value_
print( f'Optimal K:\t{optimal_k}' )
visualizer.show()
```

```
Optimal K:      4
```




[4]:
```
<Axes: title={'center': 'Distortion Score Elbow for KMeans Clustering'},
xlabel='k', ylabel='distortion score'>
```

</5>

Initiating Kmeans model with optimal_k value from the ElbowVisualizer and fitting the data

[5]:
```
kmeans = KMeans(n_clusters = optimal_k, init = 'k-means++', max_iter = 300,␣
↪n_init = 10, random_state = 0)
y_kmeans = kmeans.fit_predict(X)
```

Visualising the clusters with a 2D diagram

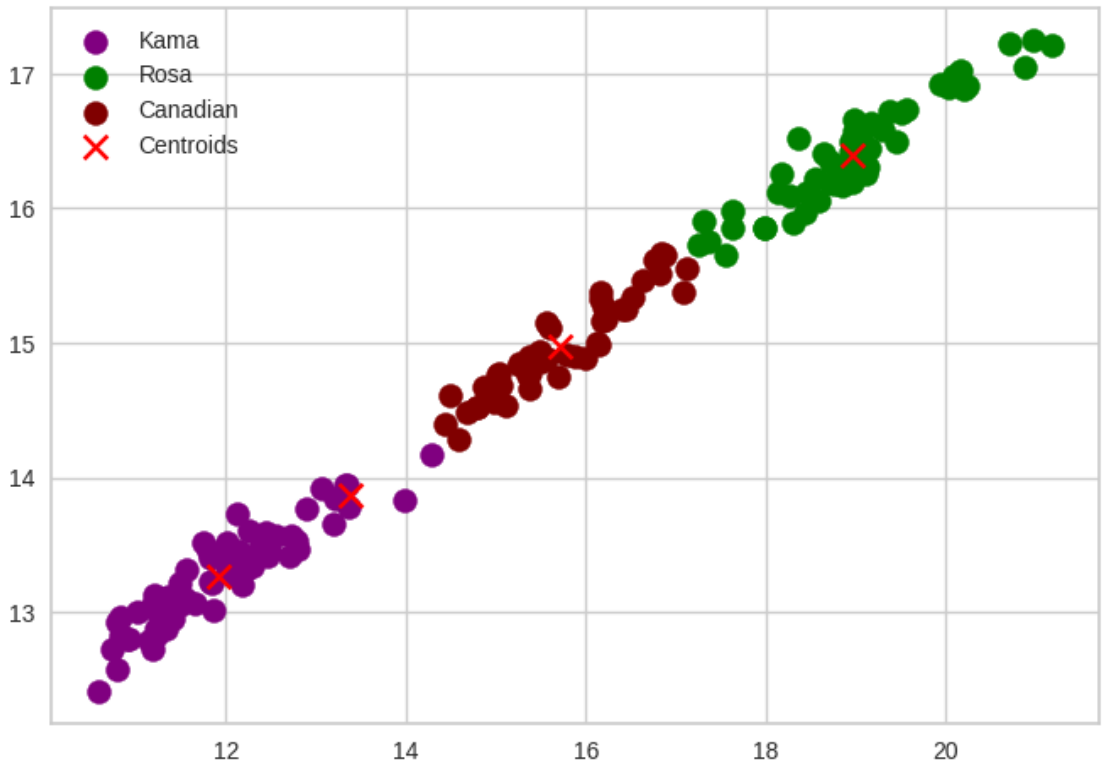
[6]:
```
plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1], s = 100, c = 'purple',␣
↪label = 'Kama')
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1], s = 100, c = 'green',␣
↪label = 'Rosa')
```

```
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1], s = 100, c = 'maroon',␣
 ↪label = 'Canadian')

# adding the centroids of the clusters
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:,1], s =␣
 ↪100, c = 'red', marker='x', label = 'Centroids')

plt.legend()
```

[6]: <matplotlib.legend.Legend at 0x71bc01781190>




Constructing a 3D scatterplot using matplotlib

[7]:
```
fig = plt.figure(figsize = (10, 10))
ax = fig.add_subplot(111, projection='3d')

plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1], s = 100, c = 'purple',␣
 ↪label = 'Kama')
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1], s = 100, c = 'green',␣
 ↪label = 'Rosa')
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1], s = 100, c = 'maroon',␣
 ↪label = 'Canadian')
```

```
# adding the centroids of the clusters
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:,1], s =␣
 ↪100, c = 'red', label = 'Centroids')
plt.legend()
plt.show()
```