In [1]:

```
import matplotlib.pyplot as plt
from sklearn import datasets
from sklearn.cluster import KMeans
import sklearn.metrics as sm
from sklearn.metrics import accuracy_score, confusion_matrix
import pandas as pd
import numpy as np
iris = datasets.load_iris()
print("Iris Data: \n", iris.data)
print("\n\nIris Features: \n", iris.feature_names)
print("\n\nIris Target: \n", iris.target)
print("\n\nIris Target Names: \n", iris.target_names)
X = pd.DataFrame(iris.data)
print(X)
```

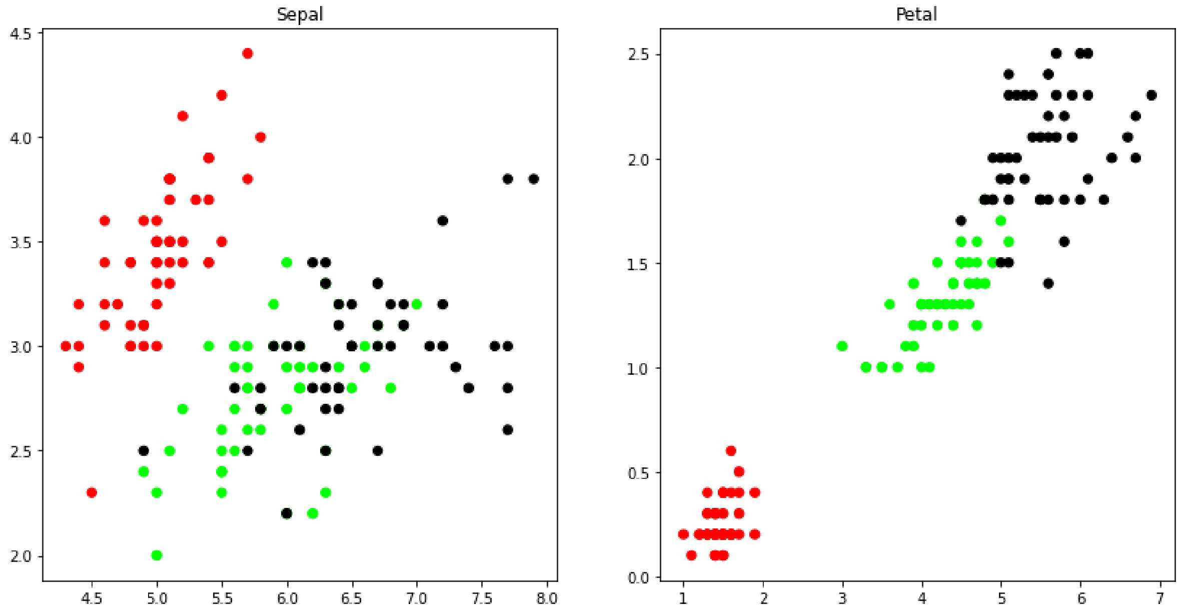
```
Iris Data:
 [[5.1 3.5 1.4 0.2]
 [4.9 3.  1.4 0.2]
 [4.7 3.2 1.3 0.2]
 [4.6 3.1 1.5 0.2]
 [5.  3.6 1.4 0.2]
 [5.4 3.9 1.7 0.4]
 [4.6 3.4 1.4 0.3]
 [5.  3.4 1.5 0.2]
 [4.4 2.9 1.4 0.2]
 [4.9 3.1 1.5 0.1]
 [5.4 3.7 1.5 0.2]
 [4.8 3.4 1.6 0.2]
 [4.8 3.  1.4 0.1]
 [4.3 3.  1.1 0.1]
 [5.8 4.  1.2 0.2]
 [5.7 4.4 1.5 0.4]
 [5.4 3.9 1.3 0.4]
 [5.1 3.5 1.4 0.3]
```

In [2]:

```
X.columns = ['Sepal_Length', 'Sepal_Width', 'Petal_Length', 'Petal_Width']
y = pd.DataFrame(iris.target)
y.columns = ['Targets']
plt.figure(figsize = (14, 7))
colormap = np.array(['red', 'lime', 'black'])
plt.subplot(1, 2, 1)
plt.scatter(X.Sepal_Length, X.Sepal_Width, c=colormap[y.Targets], s=40)
plt.title('Sepal')
plt.subplot(1, 2, 2)
plt.scatter(X.Petal_Length, X.Petal_Width, c=colormap[y.Targets], s=40)
plt.title('Petal')
```

Out[2]:

```
Text(0.5, 1.0, 'Petal')
```



In [3]:

```
model = KMeans(n_clusters=3)
model.fit(X)
```

Out[3]:

```
KMeans(n_clusters=3)
```

In [4]:

```
model.labels_
```

Out[4]:

```
array([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, 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, 2, 2, 0, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 0, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 0, 2, 0, 0, 0, 0, 2, 0, 0, 0,
       0, 0, 0, 2, 2, 0, 0, 0, 0, 2, 0, 2, 0, 2, 0, 0, 2, 2, 0, 0, 0, 0,
       0, 2, 0, 0, 0, 0, 2, 0, 0, 0, 2, 0, 0, 0, 2, 0, 0, 2])
```

In [5]:

```
sm.accuracy_score(y, model.labels_)
```

Out[5]:

```
0.09333333333333334
```

In [6]:

```
sm.confusion_matrix(y, model.labels_)
```

Out[6]:

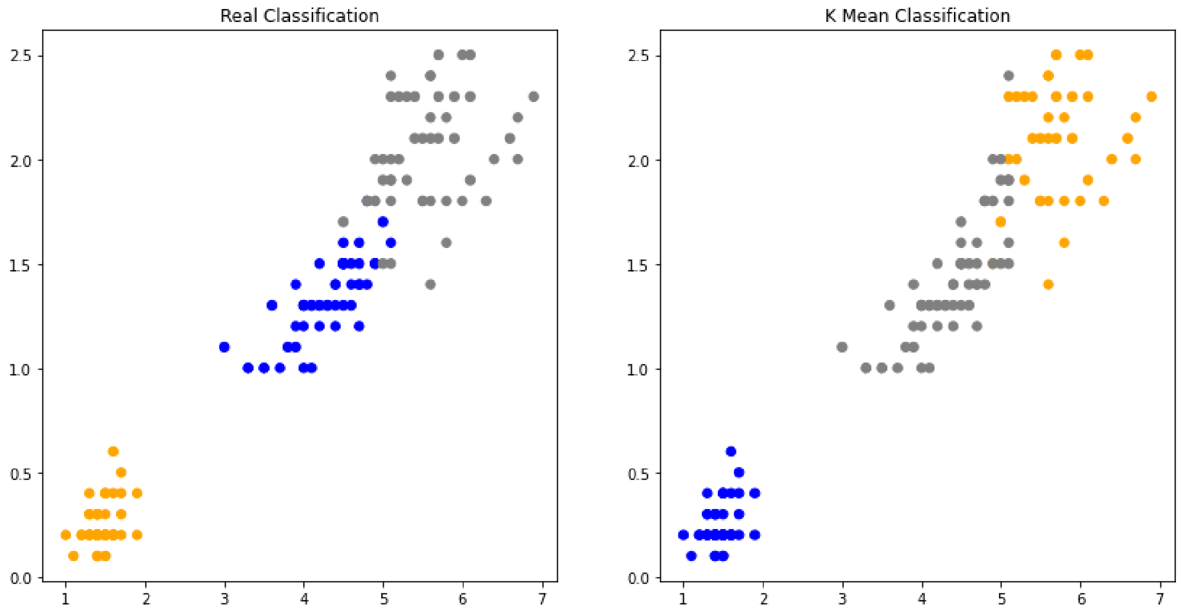
```
array([[ 0, 50,  0],
       [ 2,  0, 48],
       [36,  0, 14]], dtype=int64)
```

In [7]:

```
plt.figure(figsize=(14, 7))
colormap = np.array(['orange', 'blue', 'grey'])
plt.subplot(1, 2, 1)
plt.scatter(X.Petal_Length, X.Petal_Width, c=colormap[y.Targets], s=40)
plt.title("Real Classification")
plt.subplot(1, 2, 2)
plt.scatter(X.Petal_Length, X.Petal_Width, c=colormap[model.labels_], s=40)
plt.title("K Mean Classification")
```

Out[7]:

```
Text(0.5, 1.0, 'K Mean Classification')
```



In [8]:

```
from sklearn import preprocessing
scaler = preprocessing.StandardScaler()
scaler.fit(X)
xsa = scaler.transform(X)
xs = pd.DataFrame(xsa, columns=X.columns)
xs.sample(5)
```

Out[8]:

	Sepal_Length	Sepal_Width	Petal_Length	Petal_Width
148	0.432165	0.788808	0.933271	1.448832
94	-0.294842	-0.822570	0.251221	0.132510
55	-0.173674	-0.592373	0.421734	0.132510
102	1.522676	-0.131979	1.217458	1.185567
72	0.553333	-1.282963	0.649083	0.395774

In [9]:

```
from sklearn.mixture import GaussianMixture
gmm = GaussianMixture(n_components=3)
gmm.fit(xs)
```

Out[9]:

```
GaussianMixture(n_components=3)
```

In [10]:

```
y_cluster_gmm = gmm.predict(xs)
y_cluster_gmm
```

Out[10]:

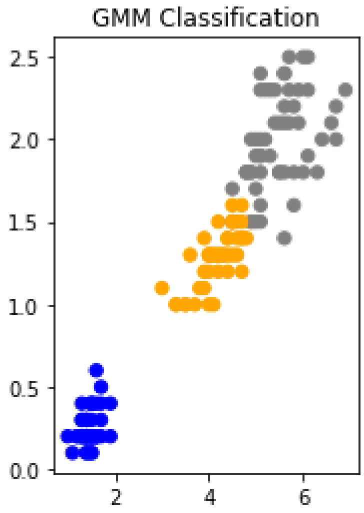
```
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 2, 0, 2, 0, 2, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2], dtype=int64)
```

In [11]:

```
plt.subplot(1, 2, 1)
plt.scatter(X.Petal_Length, X.Petal_Width, c=colormap[y_cluster_gmm], s=40)
plt.title('GMM Classification')
```

Out[11]:

```
Text(0.5, 1.0, 'GMM Classification')
```



In [12]:

```
sm.accuracy_score(y, y_cluster_gmm)
```

Out[12]:

```
0.3333333333333333
```

In [13]:

```
sm.confusion_matrix(y, y_cluster_gmm)
```

Out[13]:

```
array([[ 0, 50,  0],
       [45,  0,  5],
       [ 0,  0, 50]], dtype=int64)
```

In [ ]: