Assignment-4 | Sahil Sareen RA1911003010464

18CSE398J Machine Learning - Core Concepts with Applications

Performing k-means clustering on Iris flower Dataset from Assignment-4

Data Collection

In [1]:

```
from sklearn.cluster import KMeans
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
from matplotlib import pyplot as plt
%matplotlib inline
```

In [2]:

```
iris = "iris.csv"
df = pd.read_csv(iris)
df.head()
```

Out[2]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

Data cleaning

In [3]:

```
df.drop(['sepal_length', 'sepal_width', 'species'],axis='columns',inplace=True)
```

In [4]:

```
df.head()
```

Out[4]:

	petal_length	petal_width
0	1.4	0.2
1	1.4	0.2
2	1.3	0.2
3	1.5	0.2
4	1.4	0.2

Columns that were not of much use are dropped.

We only want to do clustering of petals that's why sepal columns are dropped.

Species column was of string that's why removed.

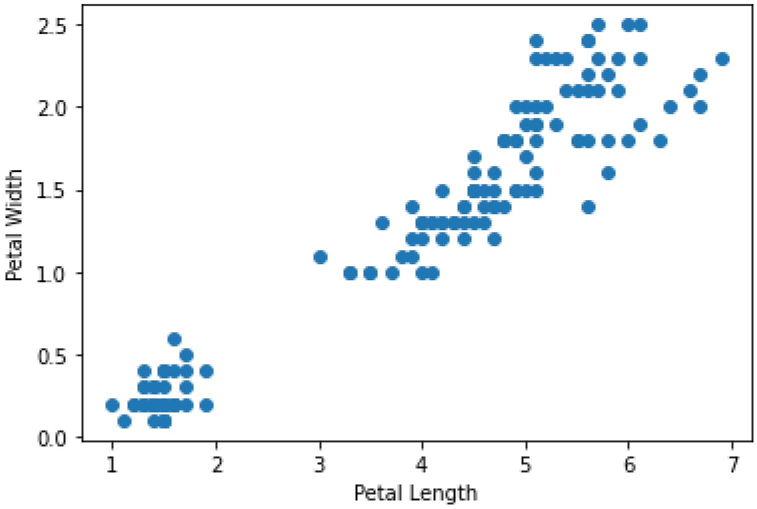
Data Visualization

In [5]:

```
plt.scatter(df.petal_length,df.petal_width)
plt.xlabel('Petal Length')
plt.ylabel('Petal Width')
```

Out[5]:

```
Text(0, 0.5, 'Petal Width')
```



K-Means

In [6]:

```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df)
y_predicted
```

Out[6]:

```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 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, 1, 2, 2, 2, 2, 2, 1, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1])
```

In [7]:

```
df['cluster'] = y_predicted
df.head(5)
```

Out[7]:

	petal_length	petal_width	cluster
0	1.4	0.2	0
1	1.4	0.2	0
2	1.3	0.2	0
3	1.5	0.2	0
4	1.4	0.2	0

In [8]:

```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
```

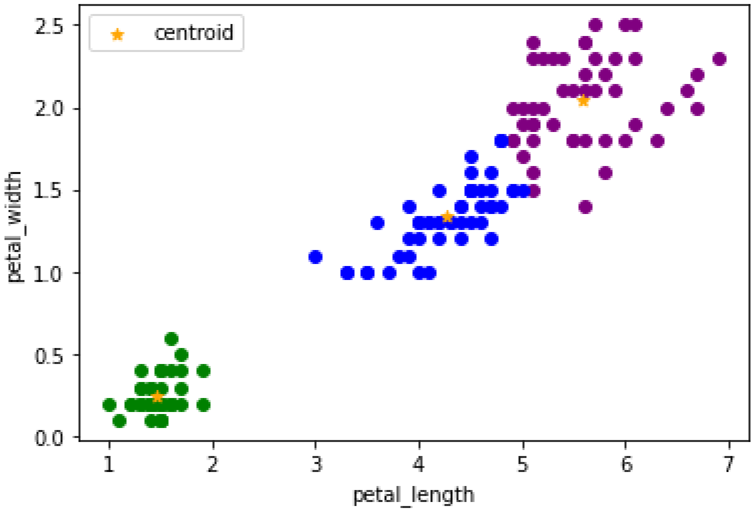
In [9]:

```
km.cluster_centers_
```

```
Out[9]: array([[1.464     , 0.244     ],
               [5.59583333, 2.0375    ],
               [4.26923077, 1.34230769]])
```

```
In [10]:
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.scatter(df1.petal_length,df1['petal_width'],color='green')
plt.scatter(df2.petal_length,df2['petal_width'],color='purple')
plt.scatter(df3.petal_length,df3['petal_width'],color='blue')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='orange',marker='*',la
plt.xlabel('petal_length')
plt.ylabel('petal_width')
plt.legend()
```

```
Out[10]: <matplotlib.legend.Legend at 0x19089ed3eb0>
```



It is observer that the data is not properly scaled so for getting better results, proper preprocessing of the dataset should be done using min max scaler.

Preprocessing using min max scaler

```
In [11]:
scaler = MinMaxScaler()

scaler.fit(df[['petal_width']])
df['petal_width'] = scaler.transform(df[['petal_width']])

scaler.fit(df[['petal_length']])
df['petal_length'] = scaler.transform(df[['petal_length']])
```

```
In [12]:
df.head()
```

Out[12]:

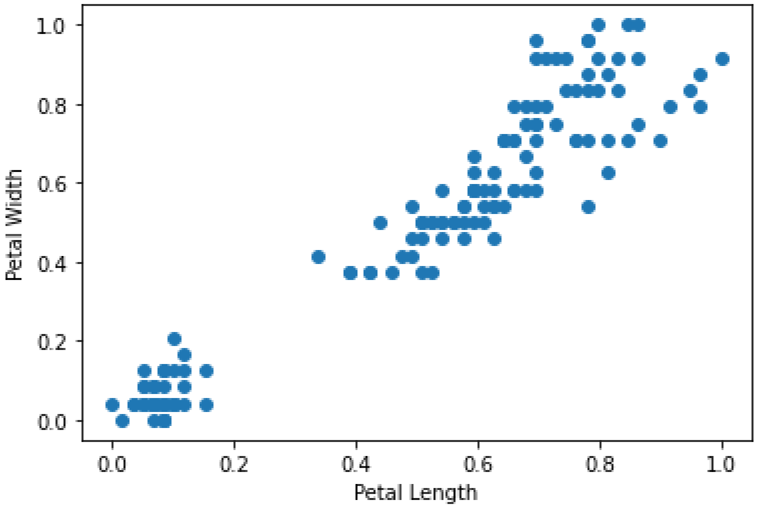
	petal_length	petal_width	cluster
0	0.067797	0.041667	0
1	0.067797	0.041667	0
2	0.050847	0.041667	0
3	0.084746	0.041667	0
4	0.067797	0.041667	0

In [13]:

```
plt.scatter(df.petal_length,df.petal_width)
plt.xlabel('Petal Length')
plt.ylabel('Petal Width')
```

Out[13]:

```
Text(0, 0.5, 'Petal Width')
```



In [14]:

```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df)
y_predicted
```

Out[14]:

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

In [15]:

```
df['cluster']=y_predicted
df.head()
```

Out[15]:

	petal_length	petal_width	cluster
0	0.067797	0.041667	2
1	0.067797	0.041667	2
2	0.050847	0.041667	2
3	0.084746	0.041667	2
4	0.067797	0.041667	2

In [16]:

```
km.cluster_centers_
```

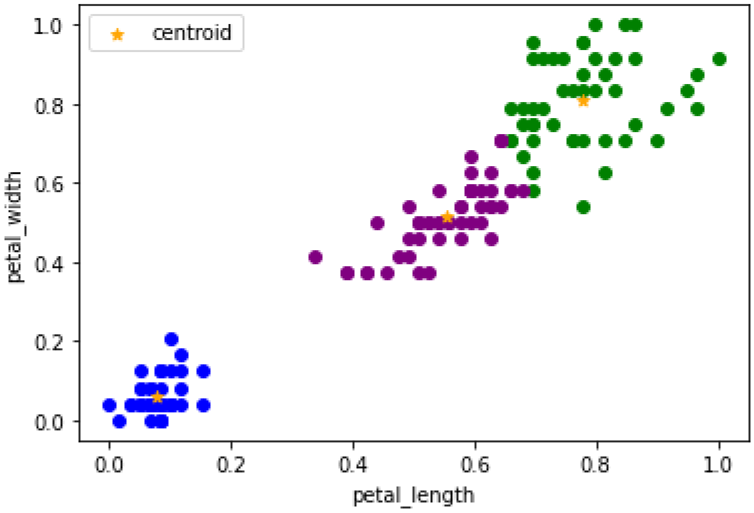
Out[16]:

```
array([[ 7.78954802e-01,  8.07291667e-01,  1.00000000e+00],
       [ 5.54106910e-01,  5.17628205e-01,  2.00000000e+00],
       [ 7.86440678e-02,  6.00000000e-02, -2.22044605e-16]])
```

In [17]:

```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.scatter(df1.petal_length,df1['petal_width'],color='green')
plt.scatter(df2.petal_length,df2['petal_width'],color='purple')
plt.scatter(df3.petal_length,df3['petal_width'],color='blue')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='orange',marker='*',la
plt.xlabel('petal_length')
plt.ylabel('petal_width')
plt.legend()
```

Out[17]:
```
<matplotlib.legend.Legend at 0x19089e869a0>
```



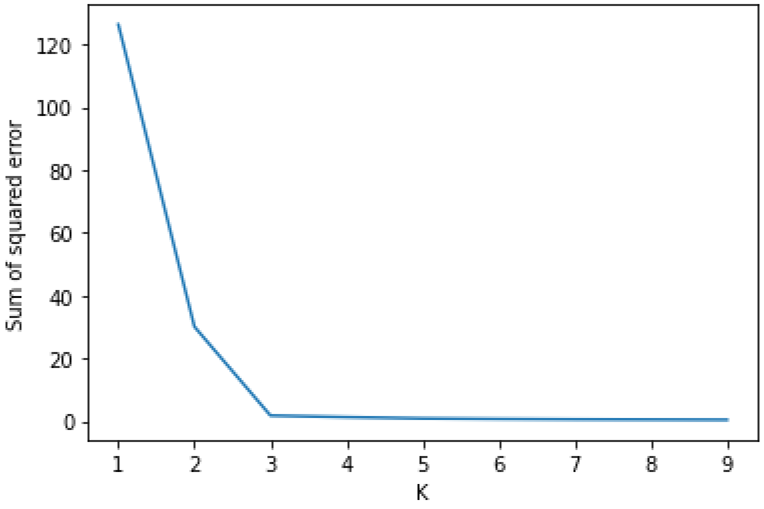
It is observed that, After proper scaling much better results are produced.

Finding optimal value of K using Elbow Method:

In [18]:
```
sse = []
k_rng = range(1,10)
for k in k_rng:
    km = KMeans(n_clusters=k)
    km.fit(df)
    sse.append(km.inertia_)
```

In [19]:
```
plt.xlabel('K')
plt.ylabel('Sum of squared error')
plt.plot(k_rng,sse)
```

Out[19]:
```
[<matplotlib.lines.Line2D at 0x1908a04bb80>]
```



As per the graph it can be observed that the optimal number of clusters i.e. value of K should be 3. Hence, the model is successfully evaluated.