```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
from sklearn.cluster import KMeans
from sklearn import preprocessing
import sklearn.cluster as cluster
import sklearn.metrics as metrics
from sklearn.preprocessing import MinMaxScaler


data=pd.read_csv("/content/iris.csv")


data
```

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...	...
145	146	6.7	3.0	5.2	2.3	Iris-virginica
146	147	6.3	2.5	5.0	1.9	Iris-virginica
147	148	6.5	3.0	5.2	2.0	Iris-virginica
148	149	6.2	3.4	5.4	2.3	Iris-virginica
149	150	5.9	3.0	5.1	1.8	Iris-virginica

150 rows × 6 columns


```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Id             150 non-null    int64  
 1   SepalLengthCm  150 non-null    float64
 2   SepalWidthCm   150 non-null    float64
 3   PetalLengthCm  150 non-null    float64
 4   PetalWidthCm   150 non-null    float64
 5   Species        150 non-null    object 
dtypes: float64(4), int64(1), object(1)
memory usage: 7.2+ KB
```

```
data.head(10)
```

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
5	6	5.4	3.9	1.7	0.4	Iris-setosa
6	7	4.6	3.4	1.4	0.3	Iris-setosa
7	8	5.0	3.4	1.5	0.2	Iris-setosa
8	9	4.4	2.9	1.4	0.2	Iris-setosa
9	10	4.9	3.1	1.5	0.1	Iris-setosa

```
data.describe()
```

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	75.500000	5.843333	3.054000	3.758667	1.198667
std	43.445368	0.828066	0.433594	1.764420	0.763161
min	1.000000	4.300000	2.000000	1.000000	0.100000
25%	38.250000	5.100000	2.800000	1.600000	0.300000
50%	75.500000	5.800000	3.000000	4.350000	1.300000
75%	112.750000	6.400000	3.300000	5.100000	1.800000

```
data.isnull()
```

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	False	False	False	False	False	False
1	False	False	False	False	False	False
2	False	False	False	False	False	False
3	False	False	False	False	False	False
4	False	False	False	False	False	False
...	...	...	...	...	...	...
145	False	False	False	False	False	False
146	False	False	False	False	False	False
147	False	False	False	False	False	False
148	False	False	False	False	False	False
149	False	False	False	False	False	False

150 rows × 6 columns

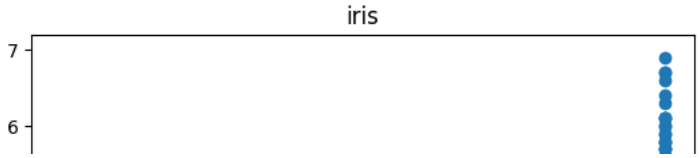

```
Id               0
SepalLengthCm    0
SepalWidthCm     0
PetalLengthCm    0
PetalWidthCm     0
Species          0
dtype: int64
```

```
data.columns
```

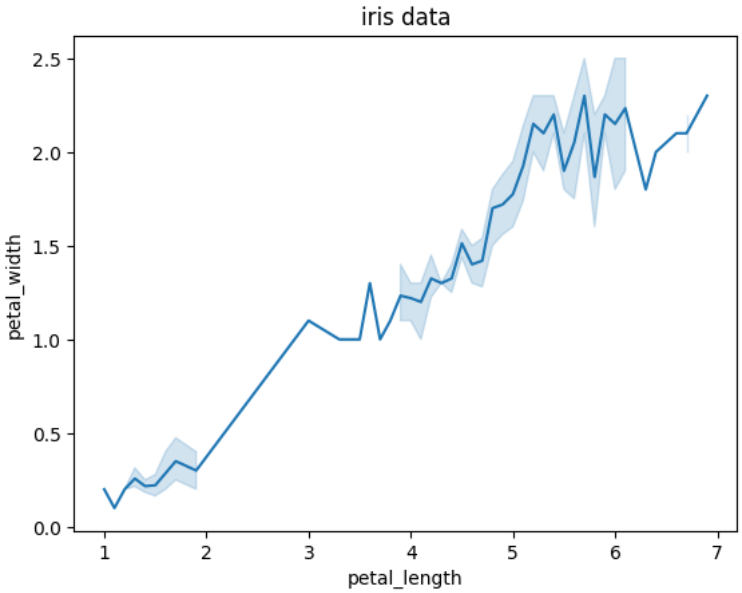
```
Index(['Id', 'SepalLengthCm', 'SepalWidthCm', 'PetalLengthCm', 'PetalWidthCm',
       'Species'],
      dtype='object')
```

```
data.rename(columns={'id':'id','SepalLengthCm':'sepal_length','SepalWidthCm':'sepal_width','PetalLengthCm':'petal_length','PetalWidthCm'
```

```
plt.scatter(data['Species'], data['petal_length'])
plt.title("iris")
plt.xlabel('Species')
plt.ylabel('petal_length')
plt.show()
```




```
sns.lineplot(x="petal_length", y="petal_width" ,data=data)
plt.title('iris data')
plt.show()
```




```
data['Species'].value_counts()
```



```
Name: Species, dtype: int64
```

```
print(data["Species"].unique())
```

```
['Iris-setosa' 'Iris-versicolor' 'Iris-virginica']
```

```
plt.figure(figsize=(12, 6))
sns.histplot(data.sepal_length)
plt.xlabel('f')
plt.ylabel('Sepal Length')
plt.title('Histogram of Sepal Length (Cm)', size=16)
```

```
Text(0.5, 1.0, 'Histogram of Sepal Length (Cm)')
```

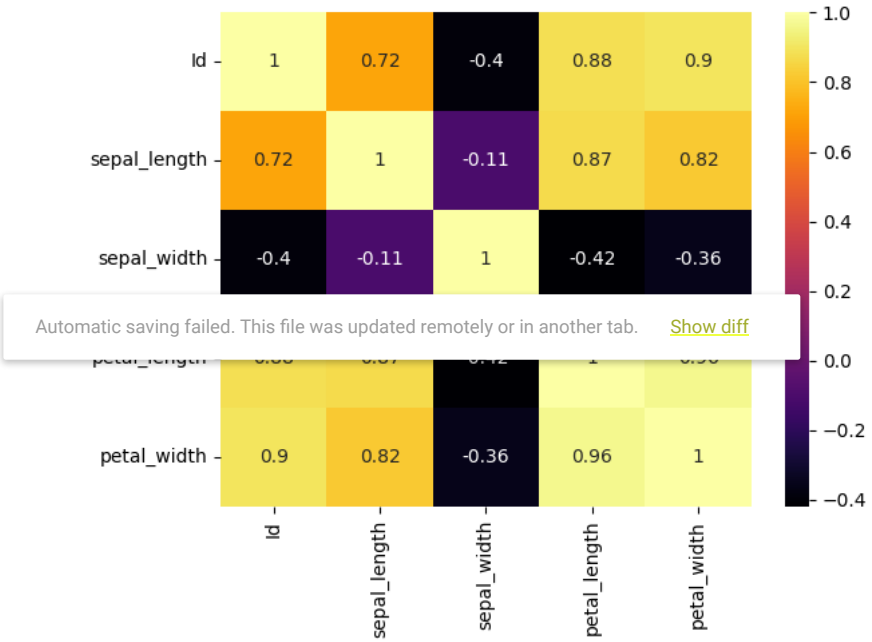

```
correlation = data.corr()
correlation
```

```
<ipython-input-54-521f87fcc686>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a f
  correlation = data.corr()
```

	Id	sepal_length	sepal_width	petal_length	petal_width
Id	1.000000	0.716676	-0.397729	0.882747	0.899759
sepal_length	0.716676	1.000000	-0.109369	0.871754	0.817954
sepal_width	-0.397729	-0.109369	1.000000	-0.420516	-0.356544
petal_length	0.882747	0.871754	-0.420516	1.000000	0.962757
petal_width	0.899759	0.817954	-0.356544	0.962757	1.000000

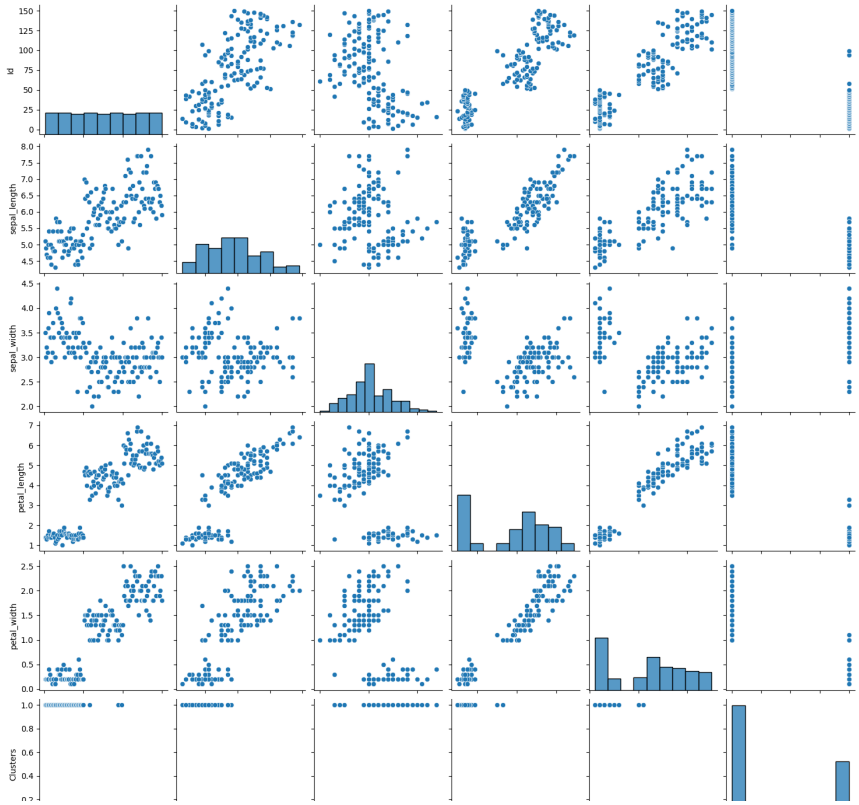
```
sns.heatmap(data.corr(),annot=True,cmap='inferno')
```

```
<ipython-input-55-c46cf576d981>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a f
  sns.heatmap(data.corr(),annot=True,cmap='inferno')
<Axes: >
```




```
sns.pairplot(data)
```

```
<seaborn.axisgrid.PairGrid at 0x7f2ea7ca2410>
```




```
scaler = MinMaxScaler()

scale = scaler.fit_transform(data[["sepal_length",  "sepal_width",  "petal_length", "petal_width"]])

data_scale = pd.DataFrame(scale, columns = ["sepal_length", "sepal_width",  "petal_length", "petal_width"]);
```


	sepal_length	sepal_width	petal_length	petal_width
0	0.222222	0.625000	0.067797	0.041667
1	0.166667	0.416667	0.067797	0.041667
2	0.111111	0.500000	0.050847	0.041667
3	0.083333	0.458333	0.084746	0.041667
4	0.194444	0.666667	0.067797	0.041667

```
print(data_scale)
```

```
     sepal_length  sepal_width  petal_length  petal_width
0        0.222222     0.625000      0.067797     0.041667
1        0.166667     0.416667      0.067797     0.041667
2        0.111111     0.500000      0.050847     0.041667
3        0.083333     0.458333      0.084746     0.041667
4        0.194444     0.666667      0.067797     0.041667
..            ...          ...           ...          ...
145      0.666667     0.416667      0.711864     0.916667
146      0.555556     0.208333      0.677966     0.750000
147      0.611111     0.416667      0.711864     0.791667
148      0.527778     0.583333      0.745763     0.916667
149      0.444444     0.416667      0.694915     0.708333

[150 rows x 4 columns]
```

```
km=KMeans(n_clusters=2)
y_predicted = km.fit_predict(data[["sepal_length",  "sepal_width",  "petal_length", "petal_width"]])
y_predicted
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change fr
  warnings.warn(
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, 0, 1, 1, 1, 1, 1, 1, 1, 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, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 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, 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], dtype=int32)
```

```
km.cluster_centers_
```

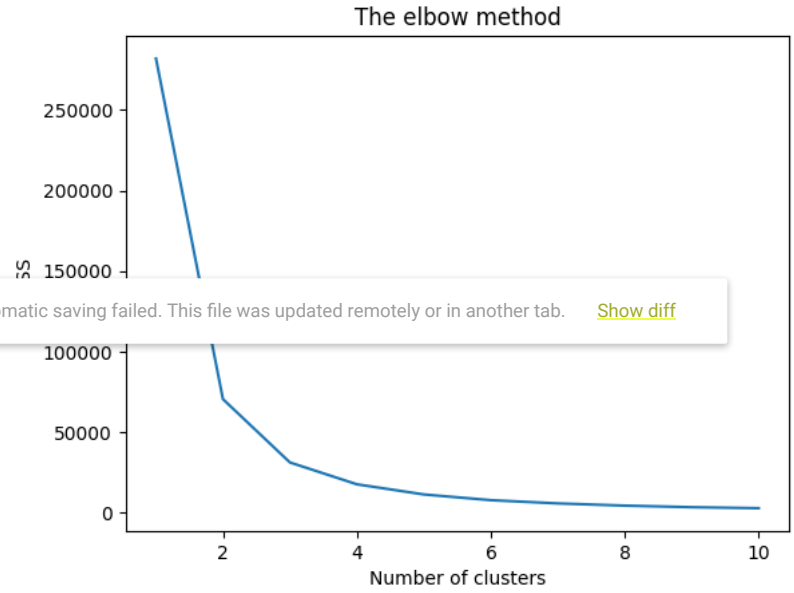
```
array([[5.00566038, 3.36037736, 1.56226415, 0.28867925],
       [6.30103093, 2.88659794, 4.95876289, 1.69587629]])
```

```
X= data.iloc[:, [0, 1, 2, 3]].values

from sklearn.cluster import KMeans
wcss = []

for i in range(1, 11):
    kmeans = KMeans(n_clusters = i, init = 'k-means++',
                    max_iter = 300, n_init = 10, random_state = 0)
    kmeans.fit(x)
    wcss.append(kmeans.inertia_)

# Plotting the results onto a line graph,
# `allowing us to observe 'The elbow'
plt.plot(range(1, 11), wcss)
plt.title('The elbow method')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS') # Within cluster sum of squares
plt.show()
```




```
kmeans = KMeans(n_clusters = 5, init = "k-means++", random_state = 42)
y_kmeans = kmeans.fit_predict(X)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change fr
  warnings.warn(
```

```
plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1], s = 60, c = 'red', label = 'Iris-setosa')
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1], s = 60, c = 'blue', label = 'Iris-versicolour')
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1], s = 60, c = 'green', label = 'Iris-virginica')
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s = 100, c = 'black', label = 'Centroids')
plt.legend()

plt.show()
```