In [1]:

```
import numpy as np
import pandas as pd
import matplotlib as plt
from sklearn import tree
from sklearn.cluster import KMeans
from sklearn.model_selection import train_test_split
from sklearn import metrics
```

In [2]:

```
header=["sepal length","sepal width","petal length","petal width","class"]
data=pd.read_csv("http://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data",header= None,names = h
print(data)
```

```
     sepal length  sepal width  petal length  petal width           class
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
..            ...          ...           ...          ...             ...
145           6.7          3.0           5.2          2.3  Iris-virginica
146           6.3          2.5           5.0          1.9  Iris-virginica
147           6.5          3.0           5.2          2.0  Iris-virginica
148           6.2          3.4           5.4          2.3  Iris-virginica
149           5.9          3.0           5.1          1.8  Iris-virginica

[150 rows x 5 columns]
```

In [3]:

```
data.index
```

Out[3]:

```
RangeIndex(start=0, stop=150, step=1)
```

In [4]:

```
data.columns
```

Out[4]:

```
Index(['sepal length', 'sepal width', 'petal length', 'petal width', 'class'], dtype='object')
```

In [5]:

```
data.size
```

Out[5]:

```
750
```

In [6]:

```
data.shape
```

Out[6]:

```
(150, 5)
```

In [7]:

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

Out[7]:

	sepal length	sepal width	petal length	petal width	class
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
5	5.4	3.9	1.7	0.4	Iris-setosa
6	4.6	3.4	1.4	0.3	Iris-setosa
7	5.0	3.4	1.5	0.2	Iris-setosa
8	4.4	2.9	1.4	0.2	Iris-setosa
9	4.9	3.1	1.5	0.1	Iris-setosa

In [8]:

In [8]:

```
data.tail(10)
```

Out[8]:

	sepal length	sepal width	petal length	petal width	class
140	6.7	3.1	5.6	2.4	Iris-virginica
141	6.9	3.1	5.1	2.3	Iris-virginica
142	5.8	2.7	5.1	1.9	Iris-virginica
143	6.8	3.2	5.9	2.3	Iris-virginica
144	6.7	3.3	5.7	2.5	Iris-virginica
145	6.7	3.0	5.2	2.3	Iris-virginica
146	6.3	2.5	5.0	1.9	Iris-virginica
147	6.5	3.0	5.2	2.0	Iris-virginica
148	6.2	3.4	5.4	2.3	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica

In [9]:

```
data.describe()
```

Out[9]:

	sepal length	sepal width	petal length	petal width
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.054000	3.758667	1.198667
std	0.828066	0.433594	1.764420	0.763161
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

In [10]:

```
data.info
```

Out[10]:

```
<bound method DataFrame.info of      sepal length  sepal width  petal length  petal width           class
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
..            ...          ...           ...          ...             ...
145           6.7          3.0           5.2          2.3  Iris-virginica
146           6.3          2.5           5.0          1.9  Iris-virginica
147           6.5          3.0           5.2          2.0  Iris-virginica
148           6.2          3.4           5.4          2.3  Iris-virginica
149           5.9          3.0           5.1          1.8  Iris-virginica

[150 rows x 5 columns]>
```

In [11]:

```
data.isnull().sum()
```

Out[11]:

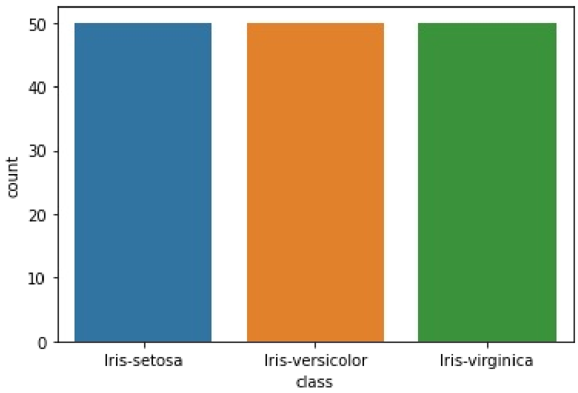
```
sepal length    0
sepal width     0
petal length    0
petal width     0
class           0
dtype: int64
```

In [12]:

```
import matplotlib.pyplot as plt
import seaborn as sns
sns.countplot(data['class'],label="Size")
plt.show()
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable a
s a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretation.
```

```
  warnings.warn(
```

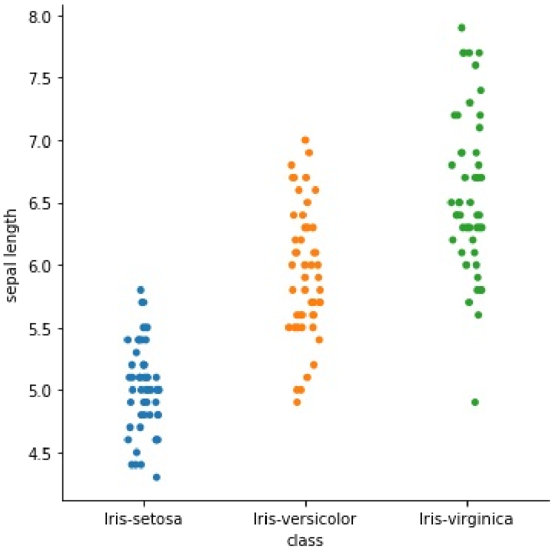


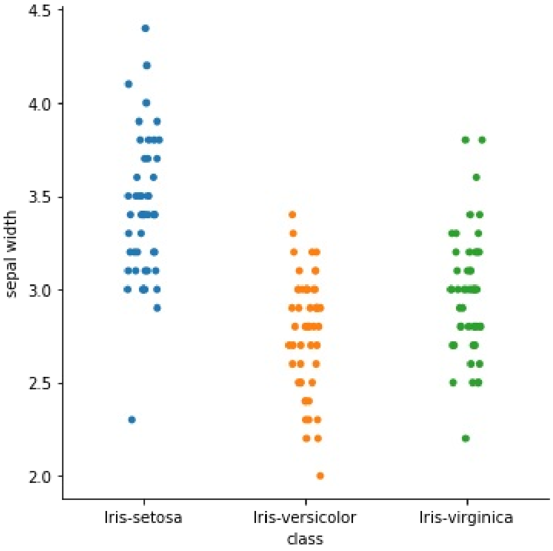
In [13]:

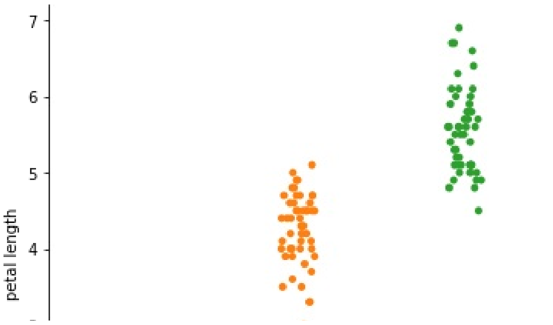
```
sns.catplot(x='class',y='sepal length',data=data)
sns.catplot(x='class',y='sepal width',data=data)
sns.catplot(x='class',y='petal length',data=data)
sns.catplot(x='class',y='petal length',data=data)
```

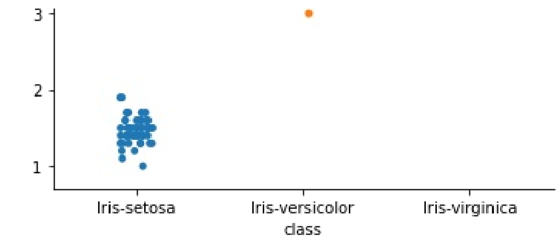
Out[13]:

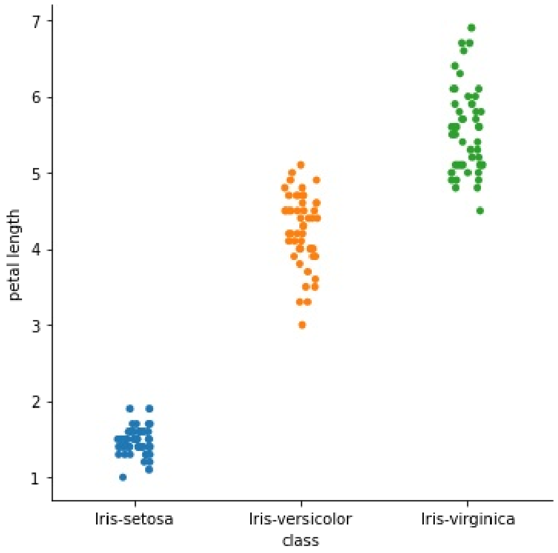
```
<seaborn.axisgrid.FacetGrid at 0x9ba1a18>
```











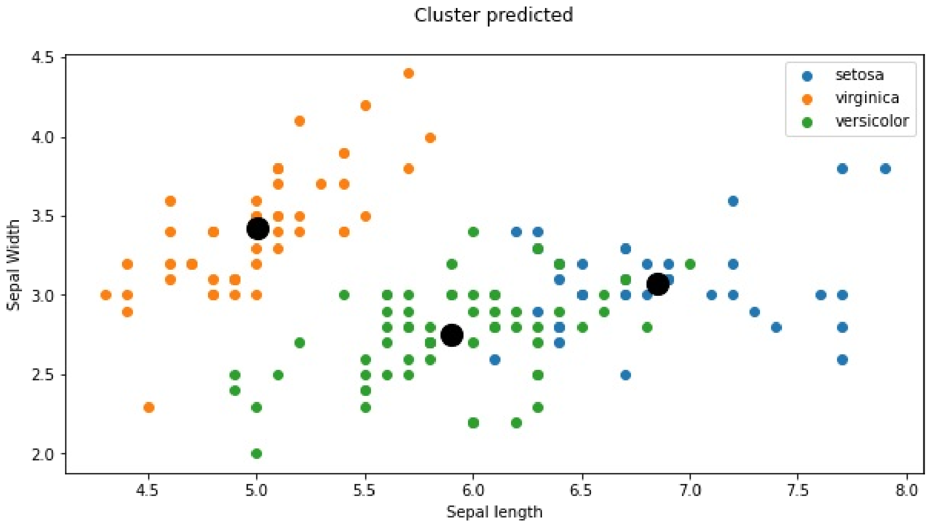
In [14]:

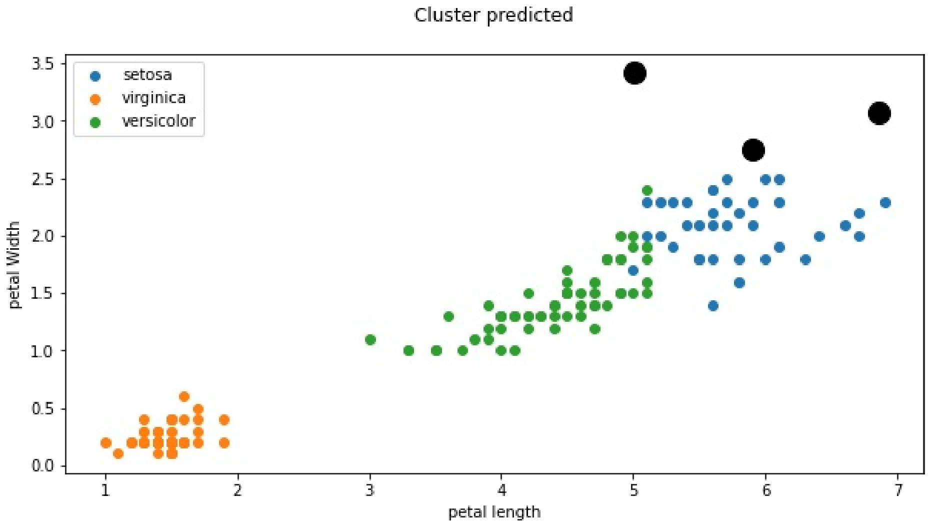
```
from sklearn.cluster import KMeans
ic=[]
for i in range(1,10):
    kmeans =KMeans(n_jobs=-1,n_clusters = i,init = 'k-means++')
    kmeans.fit(data.iloc[:,[0,1,2,3]])
    ic.append(kmeans.inertia_)
```

```
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
C:\Users\User\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:973: FutureWarning: 'n_jobs' was deprecated
in version 0.23 and will be removed in 0.25.
  warnings.warn("'n_jobs' was deprecated in version 0.23 and will be"
```

In [15]:

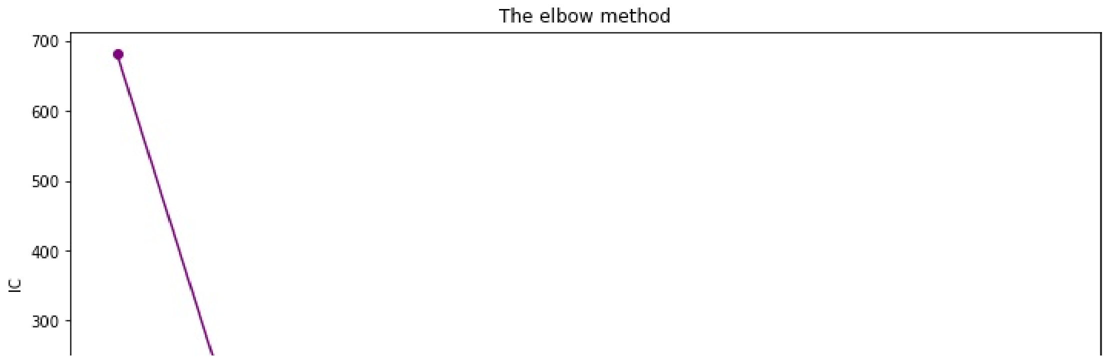
```
kmeans=KMeans(n_clusters=3, init='k-means++')
y_kmeans=kmeans.fit_predict(data.iloc[:,[0,1,2,3]].values)

x= data.iloc[:,[0,1,2,3]].values
plt.figure(figsize=(10,5))
plt.scatter(x[y_kmeans==0,0],x[y_kmeans==0,1],label='setosa')
plt.scatter(x[y_kmeans==1,0],x[y_kmeans==1,1],label='virginica')
plt.scatter(x[y_kmeans==2,0],x[y_kmeans==2,1],label='versicolor')
plt.legend()
plt.title('Cluster predicted\n')
plt.xlabel('Sepal length')
plt.ylabel('Sepal Width')
plt.scatter(kmeans.cluster_centers_[:,0],kmeans.cluster_centers_[:,1],s=200,c='black',label='Centroids')
plt.show()

plt.figure(figsize=(10,5))
plt.scatter(x[y_kmeans==0,2],x[y_kmeans==0,3],label='setosa')
plt.scatter(x[y_kmeans==1,2],x[y_kmeans==1,3],label='virginica')
plt.scatter(x[y_kmeans==2,2],x[y_kmeans==2,3],label='versicolor')
plt.legend()
plt.title('Cluster predicted\n')
plt.xlabel('petal length')
plt.ylabel('petal Width')
plt.scatter(kmeans.cluster_centers_[:,0],kmeans.cluster_centers_[:,1],s=200,c='black',label='Centroids')
plt.show()
```

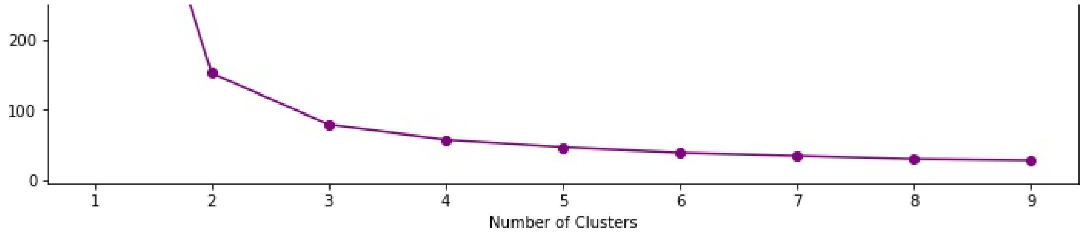




In [16]:

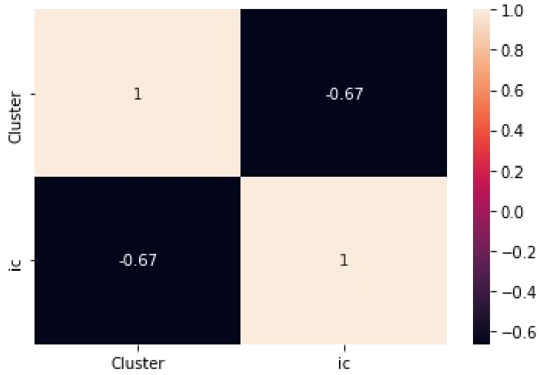
```
df=pd.DataFrame({'Cluster':range(1,10),'ic':ic})
plt.figure(figsize=(12,6))
plt.plot(df['Cluster'],df['ic'],marker='o',color='purple')
plt.xlabel('Number of Clusters')
plt.ylabel('IC')
plt.title('The elbow method')
plt.show()
```





In [17]:

```
sns.heatmap(df.corr(),annot= True)
plt.show()
```



In [18]:

```
x_data=data.reindex(columns=["sepal length","sepal width","petal length","petal width"])
x_train,x_test,y_train,y_test=train_test_split(x_data, data["class"],test_size=0.3,random_state=42)
from sklearn.naive_bayes import GaussianNB
gnb = GaussianNB()
gnb.fit(x_train, y_train)
print('Accuracy of Gaussians naive bayes classifiers on training set: {:.2f}'.format(gnb.score(x_train,y_train)))
print('Accuracy of Gaussians naive bayes classifiers on test set: {:.2f}'.format(gnb.score(x_test,y_test)))
```

```
Accuracy of Gaussians naive bayes classifiers on training set: 0.94
Accuracy of Gaussians naive bayes classifiers on test set: 0.98
```

In [ ]:

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