In [35]:
```
import pandas as pd
import numpy as np
```

In [36]:
```
df=pd.read_csv('Iris.csv')
df
```

Out[36]:

	SL	SW	PL	PW	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
...	...	...	...	...	...
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 × 5 columns

In [37]:
```
X=df.drop(columns='Species',axis=1 )
```

In [38]:
```
X
```

Out[38]:

	SL	SW	PL	PW
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2
...	...	...	...	...
145	6.7	3.0	5.2	2.3
146	6.3	2.5	5.0	1.9
147	6.5	3.0	5.2	2.0
148	6.2	3.4	5.4	2.3
149	5.9	3.0	5.1	1.8

150 rows × 4 columns

In [39]:
```
from sklearn.cluster import KMeans
km = KMeans(n_clusters=3,random_state=1)
km.fit(X)
```

```
C:\Users\Personal\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default
value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress
the warning
  warnings.warn(
C:\Users\Personal\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is kno
wn to have a memory leak on Windows with MKL, when there are less chunks than available threads. You can
avoid it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

Out[39]:

KMeans

```
KMeans(n_clusters=3, random_state=1)
```

In [40]:
```
km.labels_
```

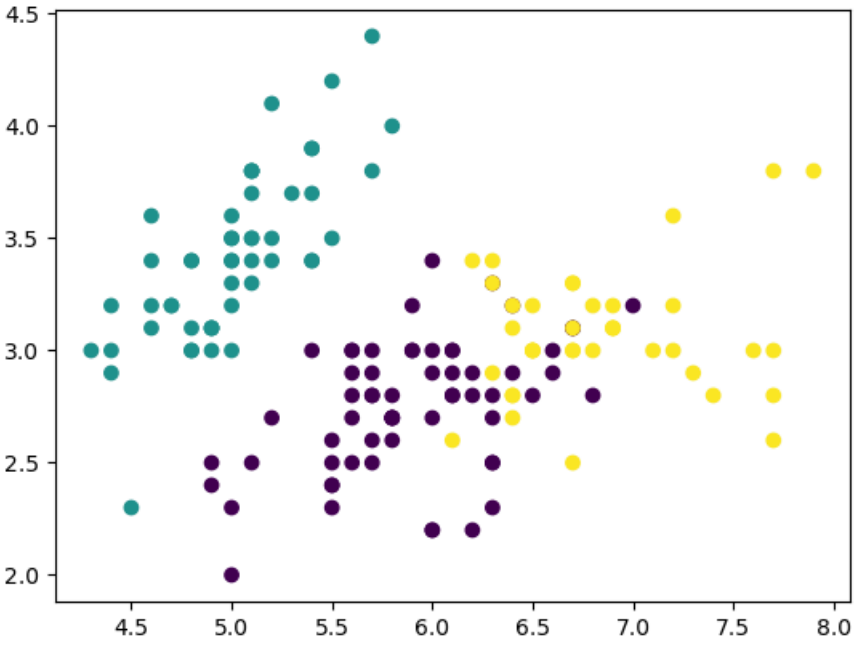
Out[40]:
```
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 2, 2, 2, 2, 0, 2, 2, 2,
       2, 2, 2, 0, 0, 2, 2, 2, 2, 0, 2, 0, 2, 0, 2, 2, 0, 0, 2, 2, 2, 2,
       2, 0, 2, 2, 2, 2, 0, 2, 2, 2, 0, 2, 2, 2, 0, 2, 2, 0])
```

In [41]:
```
km.cluster_centers_
```

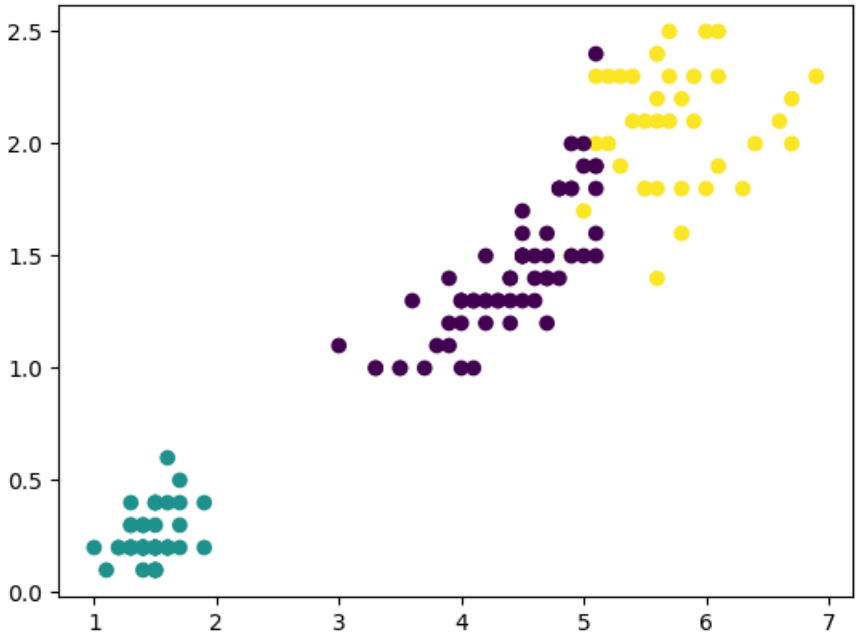
Out[41]:
```
array([[5.9016129 , 2.7483871 , 4.39354839, 1.43387097],
       [5.006     , 3.418     , 1.464     , 0.244     ],
       [6.85      , 3.07368421, 5.74210526, 2.07105263]])
```

In [42]:
```
import matplotlib.pyplot as plt
```

In [43]:
```
plt.scatter(X['SL'],X['SW'],c=km.labels_)
plt.show()
```



In [44]:
```
plt.scatter(X['PL'],X['PW'],c=km.labels_)
plt.show()
```



In [59]:
```
inertia_scores=[]
for i in range(1,150):
    k=KMeans(n_clusters=i)
    k.fit(X)
    inertia_scores.append(k.inertia_)
```

```
C:\Users\Personal\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default
value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress
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C:\Users\Personal\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default
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avoid it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
C:\Users\Personal\AppData\Local\Temp\ipykernel_12284\3453700103.py:4: ConvergenceWarning: Number of disti
nct clusters (147) found smaller than n_clusters (148). Possibly due to duplicate points in X.
  k.fit(X)
C:\Users\Personal\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:870: FutureWarning: The default
value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress
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  warnings.warn(
C:\Users\Personal\AppData\Local\Temp\ipykernel_12284\3453700103.py:4: ConvergenceWarning: Number of disti
nct clusters (147) found smaller than n_clusters (149). Possibly due to duplicate points in X.
  k.fit(X)
```

In [60]:

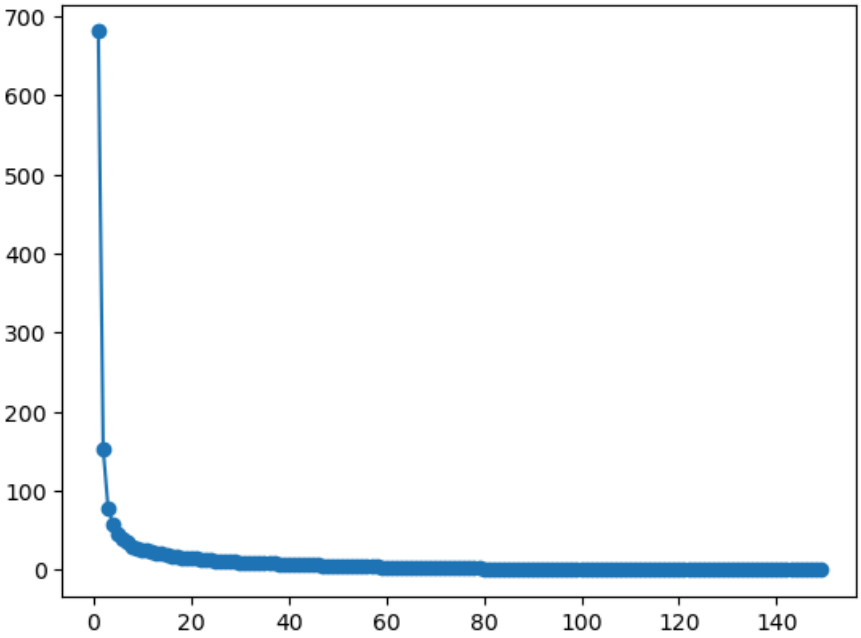
```
inertia_scores
```

Out[60]: [680.8244,
152.36870647733906,
78.94084142614602,
57.31787321428571,
46.535582051282056,
38.930963049671746,
34.42194766505636,
30.02341635819897,
27.91432359307359,
26.124019708361818,
24.815894671504964,
23.518838499167785,
21.221680708180706,
20.727974535268658,
19.575248376623378,
18.13585960852873,
17.182036435786436,
16.051823593073596,
15.75249042950514,
14.930148926237164,
14.45311904761905,
14.067059523809524,
13.266902930402937,
12.72933424908425,
11.681765873015873,
11.70160515873016,
11.125469336219336,
10.96146031746032,
10.68225793650794,
9.857737012987016,
9.700779761904766,
9.729704906204907,
9.282284632034631,
8.774728243978245,
8.707641025641028,
8.167935425685426,
8.24925,
7.920209595959598,
7.76610606060606,
7.444739177489177,
7.276106060606061,
7.172785714285714,
6.543611111111112,
6.6309047619047625,
6.151555555555555,
6.222492063492065,
5.863329365079364,
5.813207875457875,
5.485880952380951,
5.36652380952381,
5.218972222222222,
4.981333333333334,
4.651333333333335,
4.7605,
4.5535,
4.5120000000000005,
4.270500000000001,
4.025833333333334,
3.9778333333333347,
3.9178055555555567,
3.790107142857144,
3.611583333333334,
3.5395198412698416,
3.4107539682539683,
3.109833333333334,
3.1980833333333347,
2.919555555555556,
3.021000000000001,
2.9349603174603183,
2.8663095238095244,
2.665500000000001,
2.6083333333333334,
2.5683888888888893,
2.4549166666666675,
2.3624642857142866,

2.338500000000001,
2.1975000000000002,
2.1265833333333335,
2.072809523809525,
1.930055555555556,
1.8935000000000004,
1.837142857142858,
1.7641428571428577,
1.769083333333334,
1.6612500000000008,
1.6371428571428581,
1.538392857142858,
1.4679761904761912,
1.4153333333333338,
1.3641666666666674,
1.3323333333333336,
1.2837500000000006,
1.2365000000000004,
1.200166666666668,
1.1279166666666673,
1.0929166666666672,
1.0495000000000005,
1.0386666666666675,
0.9886666666666671,
0.9495000000000006,
0.8720000000000002,
0.8633333333333343,
0.8286666666666679,
0.824583333333334,
0.750333333333334,
0.7441666666666672,
0.6733333333333339,
0.6433333333333341,
0.6200000000000006,
0.5904166666666673,
0.5570000000000007,
0.5200000000000008,
0.49083333333333395,
0.47333333333333394,
0.4336666666666672,
0.41200000000000075,
0.38333333333333375,
0.3608333333333338,
0.3408333333333341,
0.3250000000000004,
0.3033333333333336,
0.28500000000000053,
0.2725000000000004,
0.23666666666666694,
0.23000000000000023,
0.22000000000000022,
0.19500000000000015,
0.19166666666666693,
0.17000000000000007,
0.1550000000000002,
0.1500000000000001,
0.13500000000000015,
0.1300000000000001,
0.11000000000000015,
0.10500000000000001,
0.095,
0.0850000000000001,
0.07000000000000015,
0.06000000000000004,
0.050000000000000065,
0.04000000000000007,
0.03000000000000005,
0.020000000000000035,
0.015000000000000027,
0.010000000000000018,
0.005000000000000009,
1.4791141972893971e-31,
1.4791141972893971e-31,
5.9164567891575885e-31]

Till Above

In [65]:
```
x_labels=range(1,150)
plt.plot(x_labels,inertia_scores,marker='o')
#plt.xlim(0,20)
plt.show()
```



In [48]:
```
from sklearn.cluster import AgglomerativeClustering
```

In [49]:
```
cluster=AgglomerativeClustering(n_clusters=3).fit(X)
```

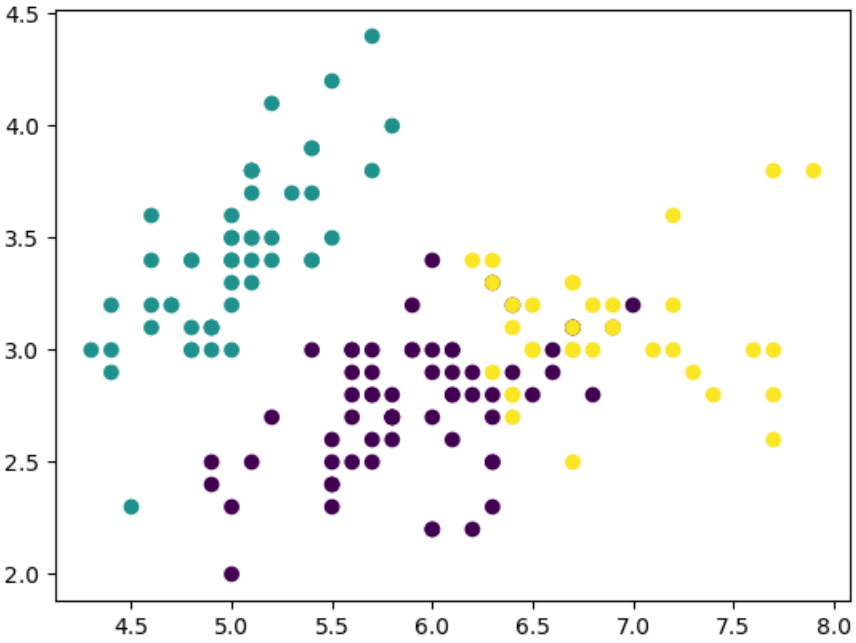
In [50]:
```
cluster
```

Out[50]:
```
AgglomerativeClustering(n_clusters=3)
```

In [51]:
```
cluster.labels_
```

Out[51]:
```
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, 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, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 2, 2, 2, 2, 0, 2,
       2, 2, 2, 0, 0, 2, 2, 2, 2, 0, 2, 0, 2, 0, 2, 2, 0, 0, 2, 2, 2,
       2, 2, 0, 0, 2, 2, 2, 0, 2, 2, 2, 0, 2, 2, 2, 0, 2, 2, 0], dtype=int64)
```

In [52]:
```
plt.scatter(X['SL'],X['SW'],c=cluster.labels_)
plt.show()
```



In [53]:
```
from sklearn.metrics import confusion_matrix
```

In [54]:
```
confusion_matrix(km.labels_,cluster.labels_)
```

Out[54]:
```
array([[62,  0,  0],
       [ 0, 50,  0],
       [ 2,  0, 36]], dtype=int64)
```

In [55]:
```
df=pd.DataFrame({'km':km.labels_,'ac':cluster.labels_})
```

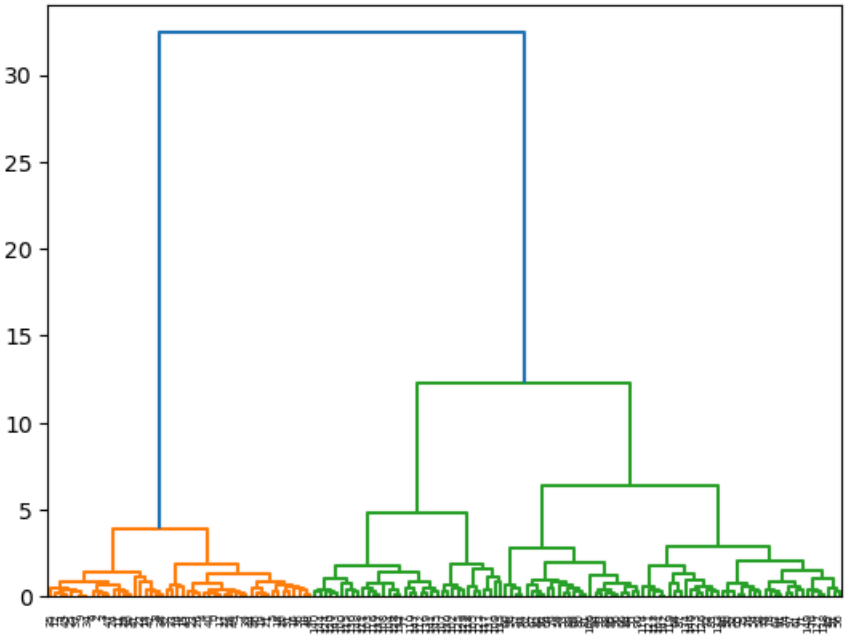
In [56]:
```
df
```

Out[56]:

	km	ac
0	1	1
1	1	1
2	1	1
3	1	1
4	1	1
...	...	...
145	2	2
146	0	0
147	2	2
148	2	2
149	0	0

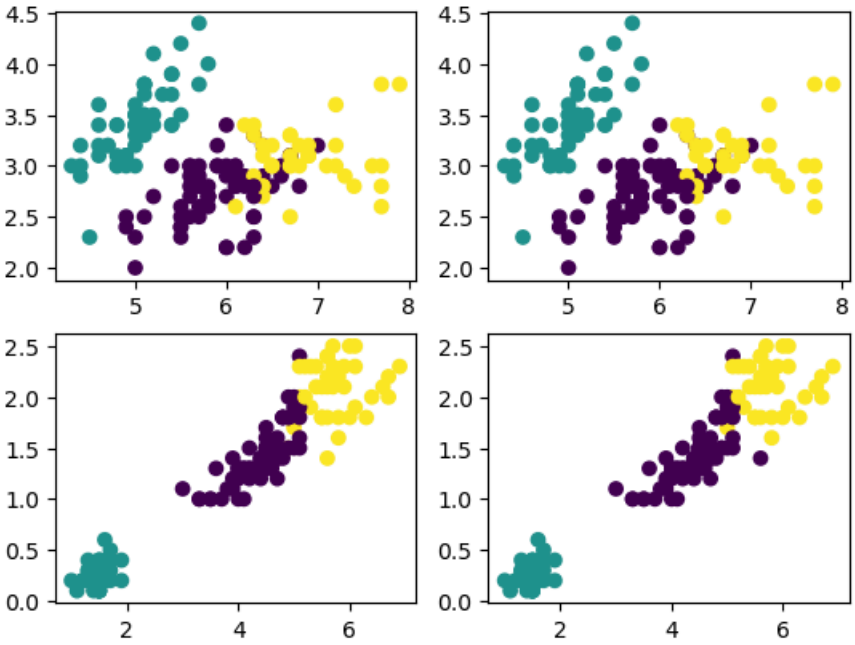
150 rows × 2 columns

In [57]:
```
import scipy.cluster.hierarchy as sch
dendogram=sch.dendrogram(sch.linkage(X,method='ward'))
```



In [58]:
```
plt.subplot(2,2,1)
plt.scatter(X['SL'],X['SW'],c=km.labels_)
plt.subplot(2,2,2)
plt.scatter(X['SL'],X['SW'],c=cluster.labels_)
plt.subplot(2,2,3)
plt.scatter(X['PL'],X['PW'],c=km.labels_)
plt.subplot(2,2,4)
plt.scatter(X['PL'],X['PW'],c=cluster.labels_)
```

Out[58]: <matplotlib.collections.PathCollection at 0x21887cd9910>



In [ ]: