```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import StandardScaler
from scipy.cluster.hierarchy import linkage,dendrogram
import plotly.express as px
```

```
iris = pd.read_csv('iris.csv')
```

```
iris.head().style.background_gradient(cmap =sns.cubehelix_palette(as_cmap=True))
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.100000	3.500000	1.400000	0.200000	setosa
1	4.900000	3.000000	1.400000	0.200000	setosa
2	4.700000	3.200000	1.300000	0.200000	setosa
3	4.600000	3.100000	1.500000	0.200000	setosa
4	5.000000	3.600000	1.400000	0.200000	setosa

```
iris.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   sepal_length  150 non-null    float64
 1   sepal_width   150 non-null    float64
 2   petal_length  150 non-null    float64
 3   petal_width   150 non-null    float64
 4   species       150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

```
iris.isnull().sum()
```

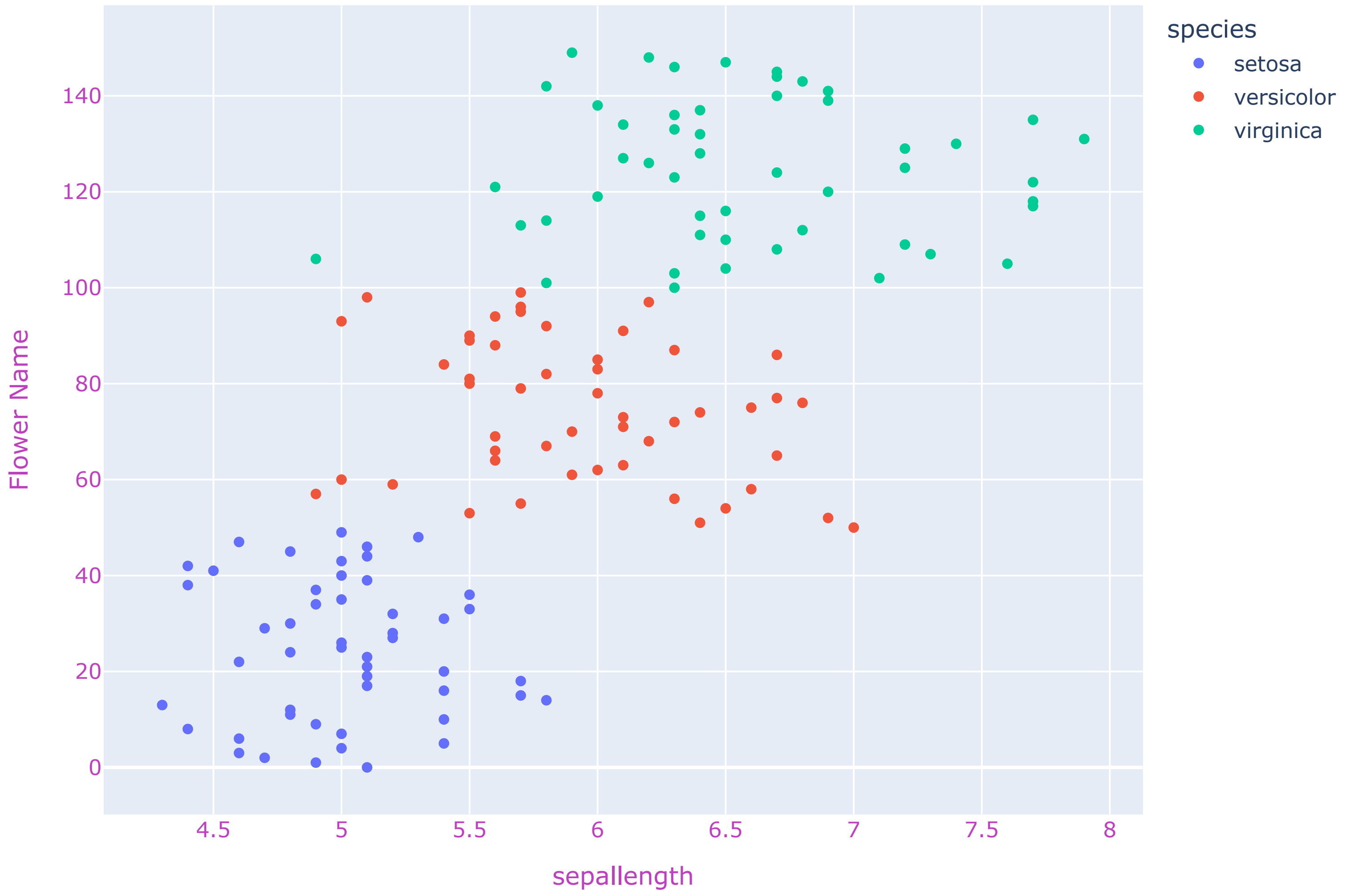
```
                0
sepal_length    0
 sepal_width    0
petal_length    0
 petal_width    0
     species    0

dtype: int64
```

```
iris.describe(include='all')
```

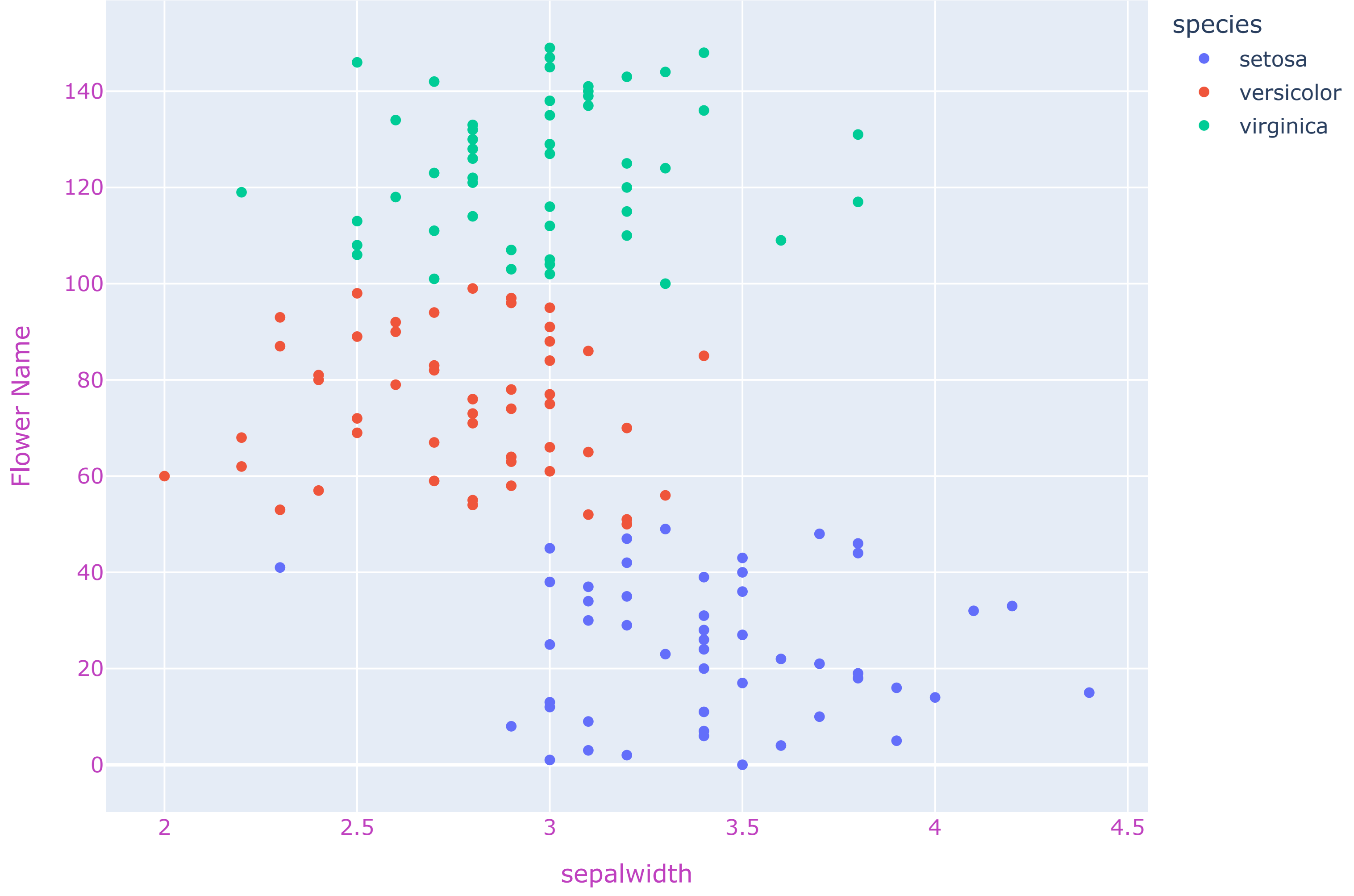
```
        sepal_length  sepal_width  petal_length  petal_width  species
count     150.000000   150.000000    150.000000   150.000000      150
unique           NaN          NaN           NaN          NaN        3
top              NaN          NaN           NaN          NaN   setosa
freq             NaN          NaN           NaN          NaN       50
mean        5.843333     3.054000      3.758667     1.198667      NaN
std         0.828066     0.433594      1.764420     0.763161      NaN
min         4.300000     2.000000      1.000000     0.100000      NaN
25%         5.100000     2.800000      1.600000     0.300000      NaN
50%         5.800000     3.000000      4.350000     1.300000      NaN
75%         6.400000     3.300000      5.100000     1.800000      NaN
max         7.900000     4.400000      6.900000     2.500000      NaN
```

```
X = iris.iloc[: , :-1].values
y = iris.iloc[: , -1].values
```

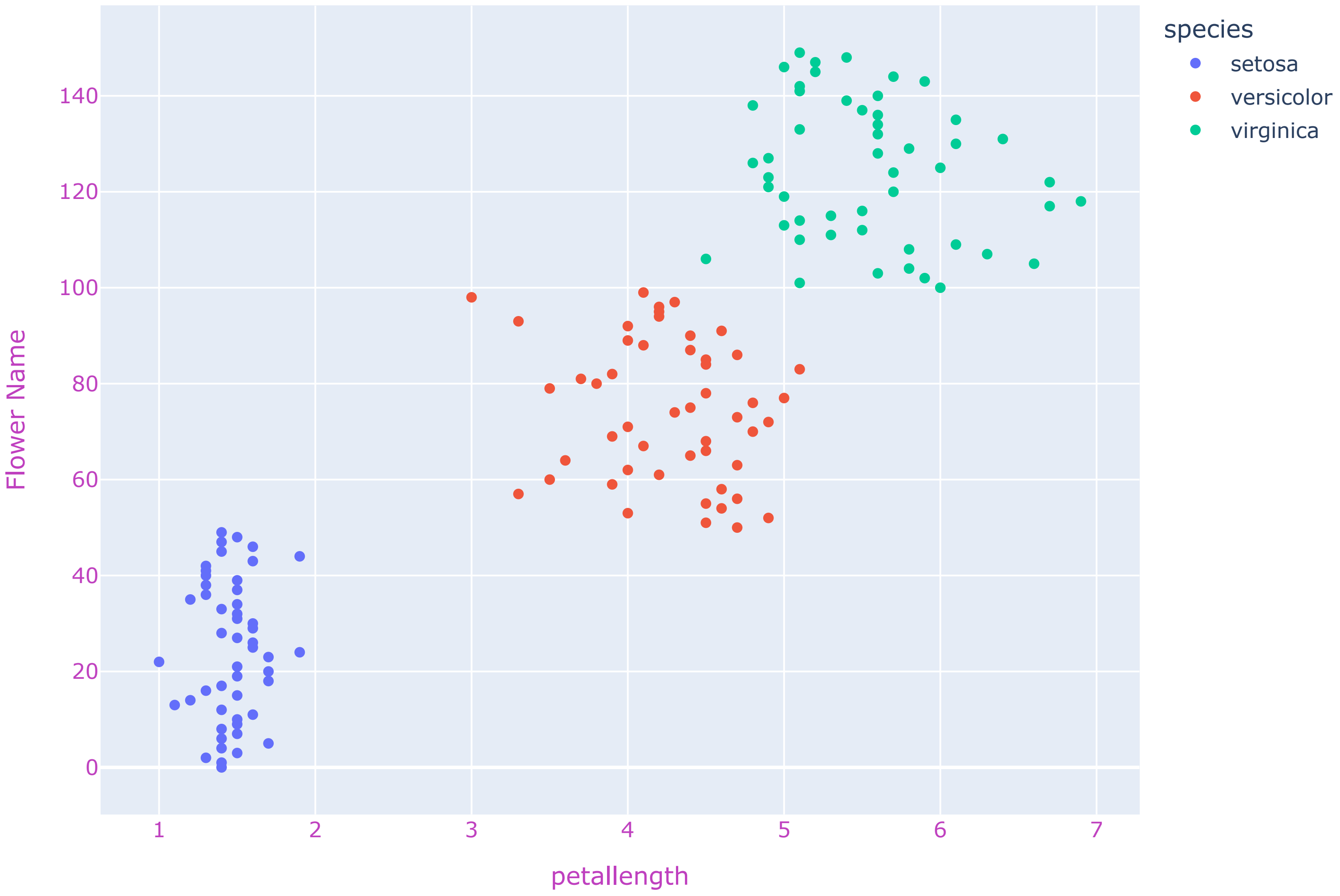
```
fig = px.scatter(data_frame=iris, x='sepal_length',color='species')
fig.update_layout(width=800, height=600,
                  xaxis=dict(title='sepallength',color="#BF40BF"),
                 yaxis=dict(title="Flower Name",color="#BF40BF"))
fig.show()
```



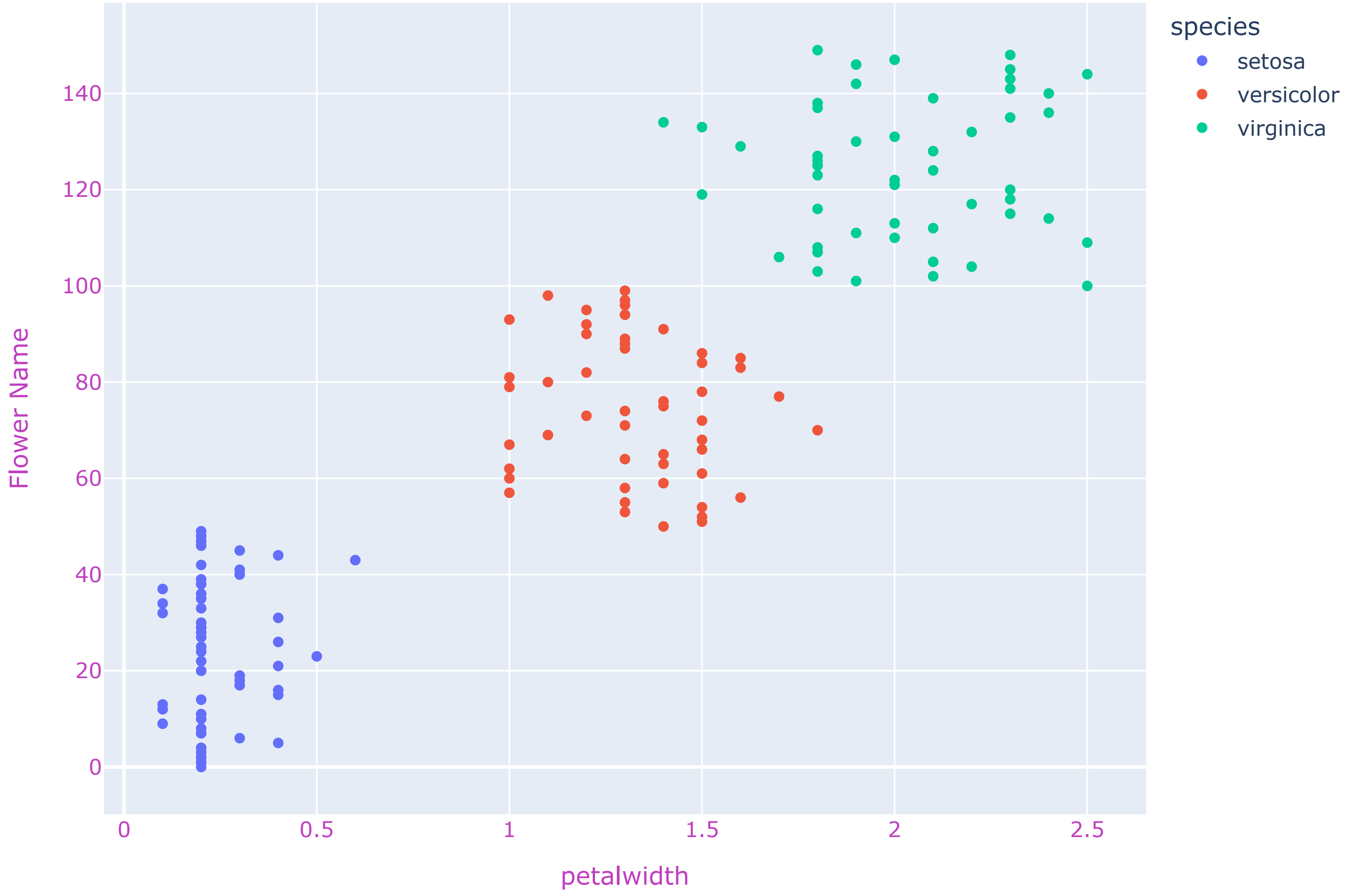
```
fig = px.scatter(data_frame=iris, x='sepal_width',color='species')
fig.update_layout(width=800, height=600,
                  xaxis=dict(title='sepalwidth',color="#BF40BF"),
                 yaxis=dict(title="Flower Name",color="#BF40BF"))
fig.show()
```



```
fig = px.scatter(data_frame=iris, x='petal_length',color='species')
fig.update_layout(width=800, height=600,
                  xaxis=dict(title='petallength',color="#BF40BF"),
                 yaxis=dict(title="Flower Name",color="#BF40BF"))
fig.show()
```



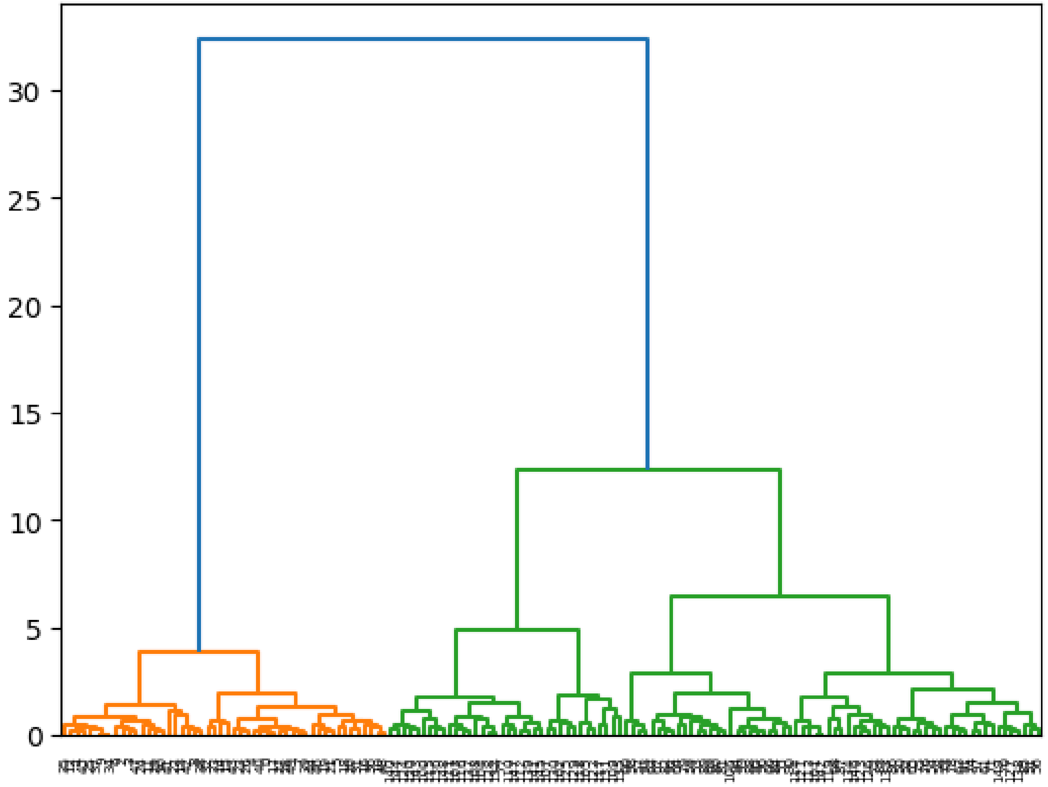
```
fig = px.scatter(data_frame=iris, x='petal_width',color='species')
fig.update_layout(width=800, height=600,
                  xaxis=dict(title='petalwidth',color="#BF40BF"),
                 yaxis=dict(title="Flower Name",color="#BF40BF"))
fig.show()
```



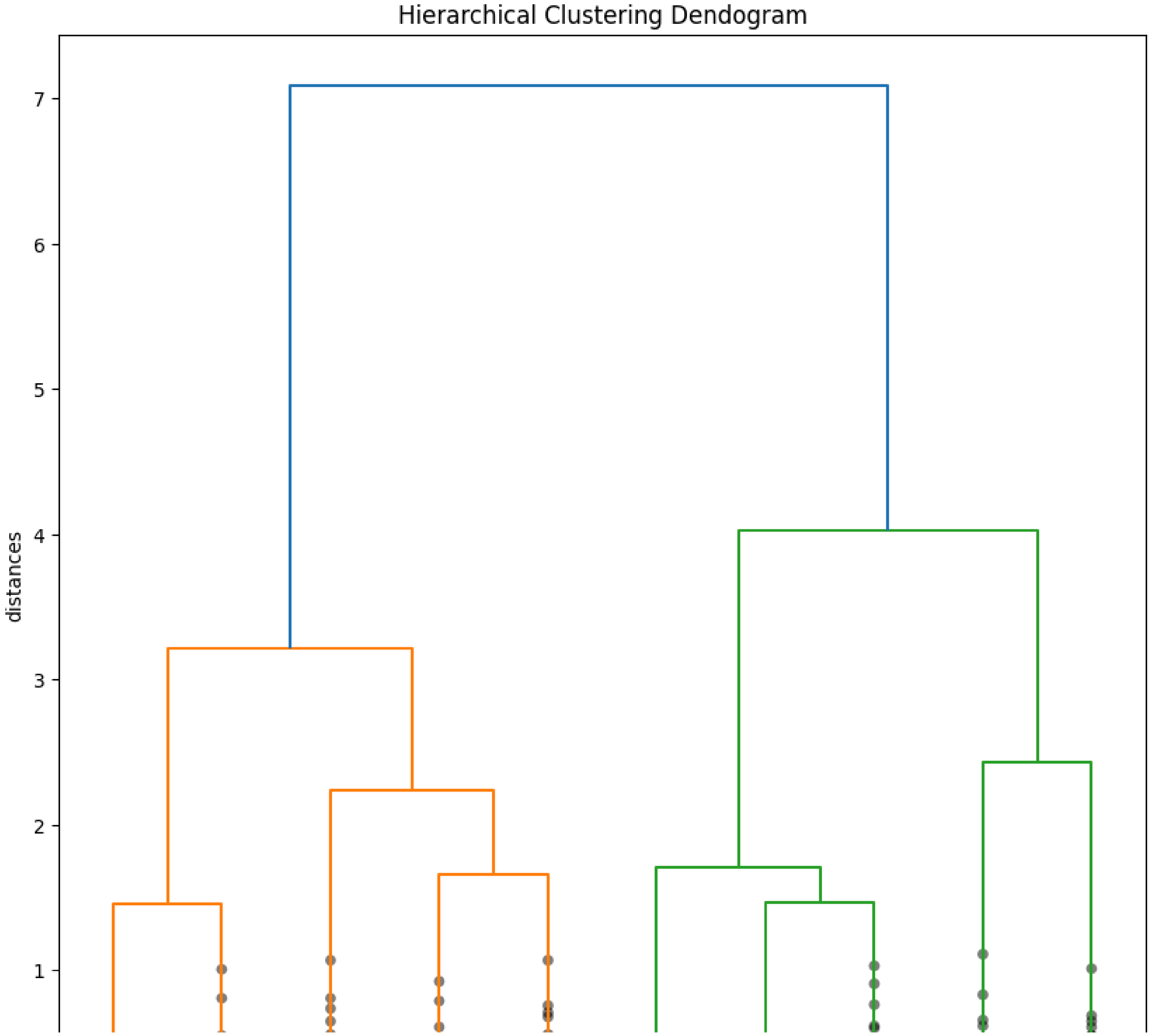
```
scaler= StandardScaler()
scaled_features= scaler.fit_transform(X)
```

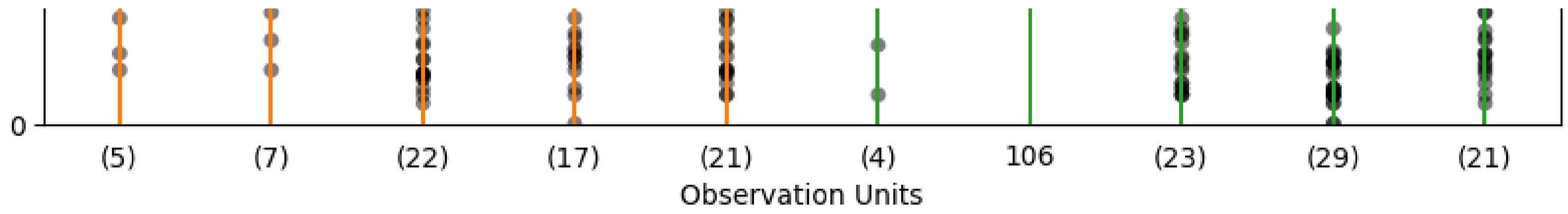
```
import scipy.cluster.hierarchy as sch
```

```
dendogram=sch.dendrogram(sch.linkage(X,method="ward"))
plt.show()
```



```
plt.figure(figsize=(10,10))
plt.title("Hierarchical Clustering Dendogram")
plt.xlabel("Observation Units")
plt.ylabel("distances")
dendrogram(linkage(X,"complete"),
          leaf_font_size=10,
          truncate_mode="lastp",
           p=10,
           show_contracted=True)
plt.show()
```

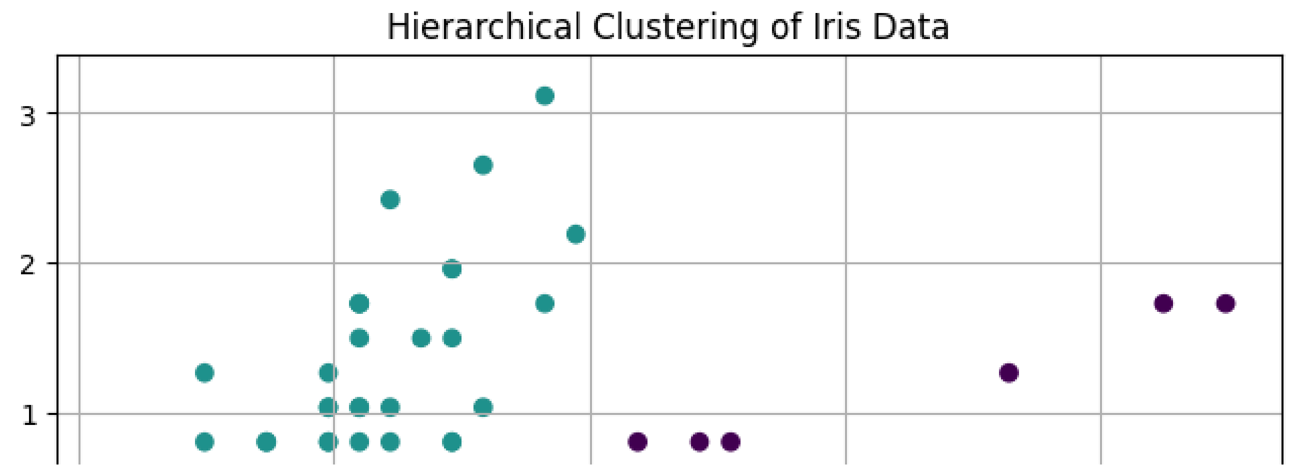

Hierarchical Clustering Dendogram
distances
7
6
5
4
3
2
1



```
from sklearn.cluster import AgglomerativeClustering
agg_model = AgglomerativeClustering(n_clusters=3, linkage='ward')
```

```
cluster_labels = agg_model.fit_predict(scaled_features)
```

```
plt.figure(figsize=(8, 6))
plt.scatter(scaled_features[:, 0], scaled_features[:, 1], c=cluster_labels, cmap='viridis', marker='o')
plt.title("Hierarchical Clustering of Iris Data")
plt.xlabel("X")
plt.ylabel("Y")
plt.grid(True)
plt.show()
```


Hierarchical Clustering of Iris Data
3
2
1