

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_iris
from sklearn.cluster import AgglomerativeClustering
from scipy.cluster.hierarchy import dendrogram, linkage
```

```
In [2]: iris = load_iris()
data = pd.DataFrame(data=iris.data, columns=iris.feature_names)
```

```
In [3]: data.head()
```

```
Out[3]:
```

| | sepal length (cm) | sepal width (cm) | petal length (cm) | petal width (cm) |
|---|-------------------|------------------|-------------------|------------------|
| 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 |

```
In [9]: data.columns
```

```
Out[9]: Index(['sepal length (cm)', 'sepal width (cm)', 'petal length (cm)',
              'petal width (cm)'],
              dtype='object')
```

```
In [10]: data.dtypes
```

```
Out[10]: sepal length (cm)    float64
sepal width (cm)             float64
petal length (cm)            float64
petal width (cm)             float64
dtype: object
```

```
In [5]: X = data.iloc[:, :2]
```

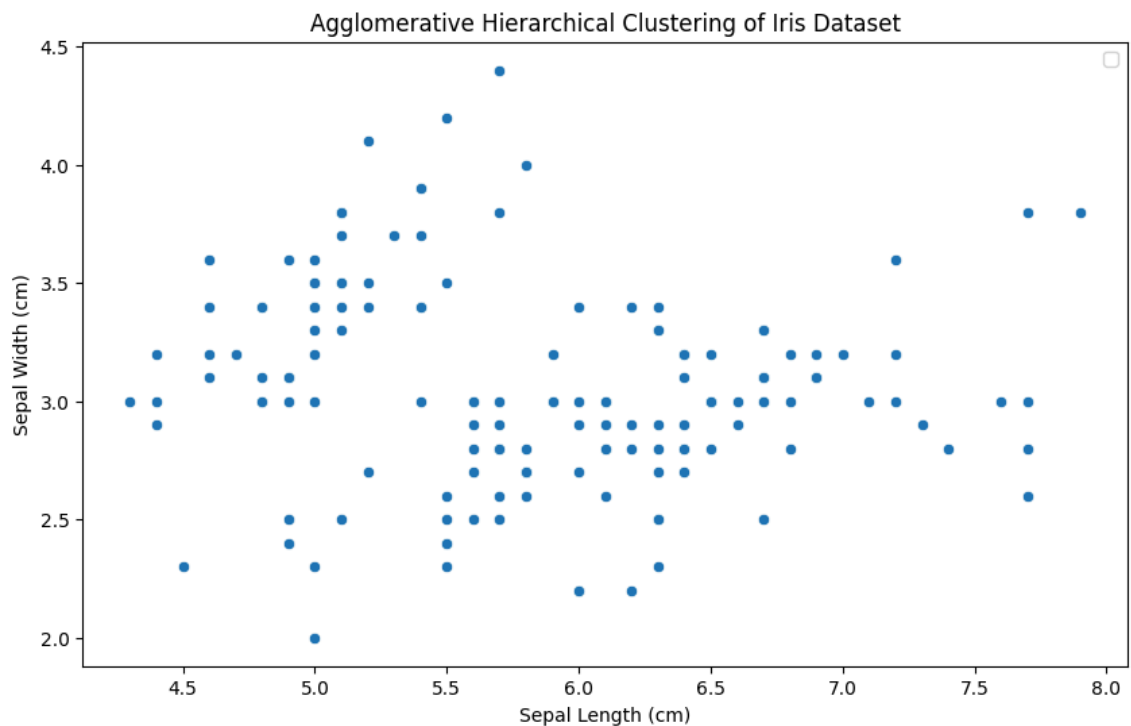
```
In [6]: model = AgglomerativeClustering(n_clusters=3)
clusters = model.fit_predict(X)
```

```
In [12]: plt.figure(figsize=(10, 6))
sns.scatterplot(x='sepal length (cm)', y='sepal width (cm)', data=data, pal
plt.title('Agglomerative Hierarchical Clustering of Iris Dataset')
plt.xlabel('Sepal Length (cm)')
plt.ylabel('Sepal Width (cm)')
plt.legend()
plt.show()
```

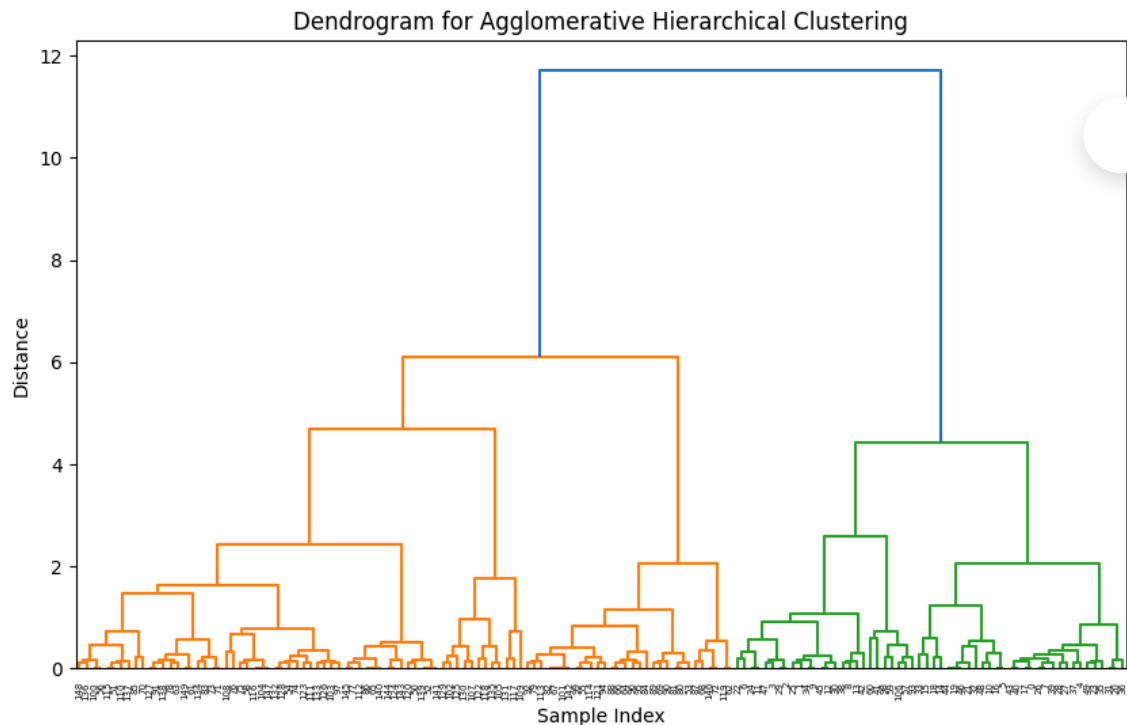
C:\Users\dell\AppData\Local\Temp\ipykernel_19404\1407221189.py:2: UserWarning: Ignoring `palette` because no `hue` variable has been assigned.

```
sns.scatterplot(x='sepal length (cm)', y='sepal width (cm)', data=data,
palette='viridis')
```

No artists with labels found to put in legend. Note that artists whose bel start with an underscore are ignored when legend() is called with no a rgument.



```
In [13]: plt.figure(figsize=(10, 6))
linked = linkage(X, method='ward') # 'ward' minimizes variance within clus
dendrogram(linked, orientation='top', labels=data.index, distance_sort='des')
plt.title('Dendrogram for Agglomerative Hierarchical Clustering')
plt.xlabel('Sample Index')
plt.ylabel('Distance')
plt.show()
```



```
In [14]: test_variable = np.array([[5.5, 2.4]])
```

```
In [15]: test_cluster = model.fit_predict(np.vstack([X, test_variable]))[-1]
```

```
In [16]: print(f"Test variable: Sepal Length = {test_variable[0][0]}, Sepal Width = 
print(f"The test variable belongs to Cluster: {test_cluster}")
```

Test variable: Sepal Length = 5.5, Sepal Width = 2.4
The test variable belongs to Cluster: 2

```
In [ ]:
```