Hierarchical Clustering Implementation

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn import datasets
```

In [3]:
```
# Import IRIS Dataset
iris = datasets.load_iris()
```

In [4]:
```
iris_data = pd.DataFrame(iris.data)
```

In [7]:
```
iris_data.columns = iris.feature_names
```

In [8]:
```
iris_data
```

Out[8]:

	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
...	...	...	...	...
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 [9]:
```
# Standard Scaler
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
```

In [10]:
```
X_scaled = scaler.fit_transform(iris_data)
```

In [11]:
```
X_scaled
```

Out[11]:
```
array([[-9.00681170e-01,  1.01900435e+00, -1.34022653e+00,
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        -1.31544430e+00],
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        -1.31544430e+00],
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```

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```

In [12]:
```
X_scaled.shape
```

Out[12]: (150, 4)

In [14]:
```
# apply the pca
from sklearn.decomposition import PCA
```

In [15]:
```
pca = PCA(n_components=2)
```

In [16]:
```
pca
```

Out[16]:
```
▾ PCA
▶ Parameters
```

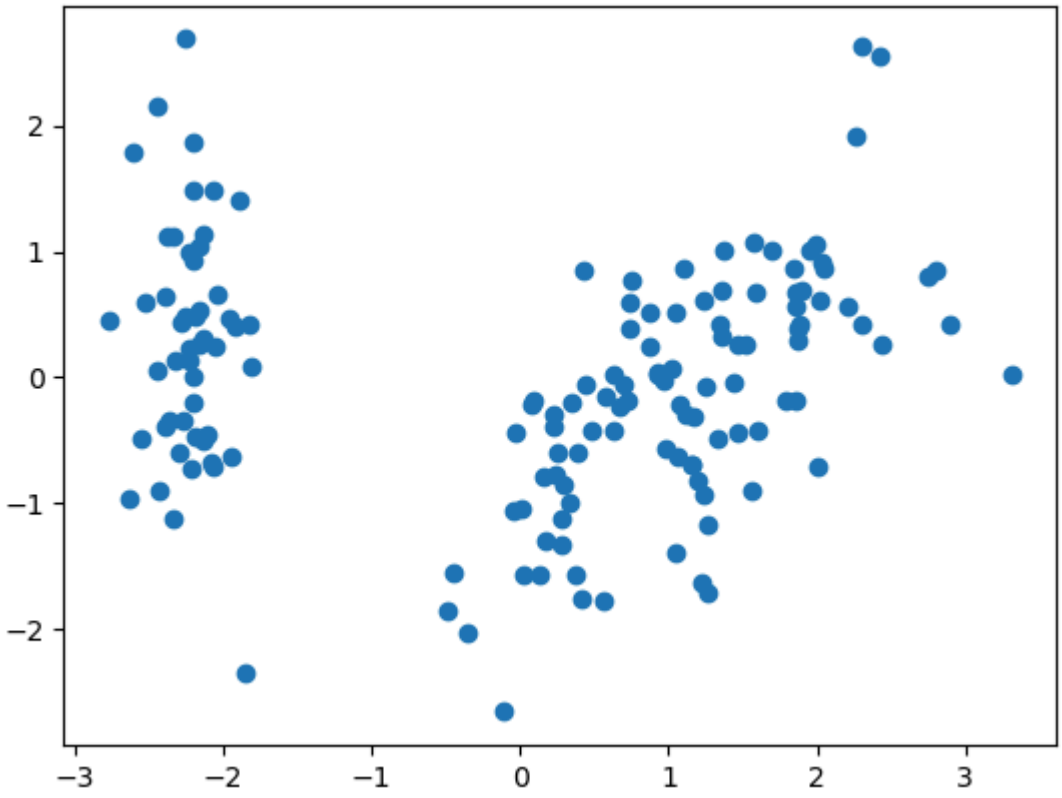
In [17]:
```
pca_scaled =pca.fit_transform(X_scaled)
```

In [19]:
```
pca_scaled.shape
```

Out[19]: (150, 2)

In [20]:
```
plt.scatter(pca_scaled[:,0],pca_scaled[:,1])
```

Out[20]: <matplotlib.collections.PathCollection at 0x237e818fc90>

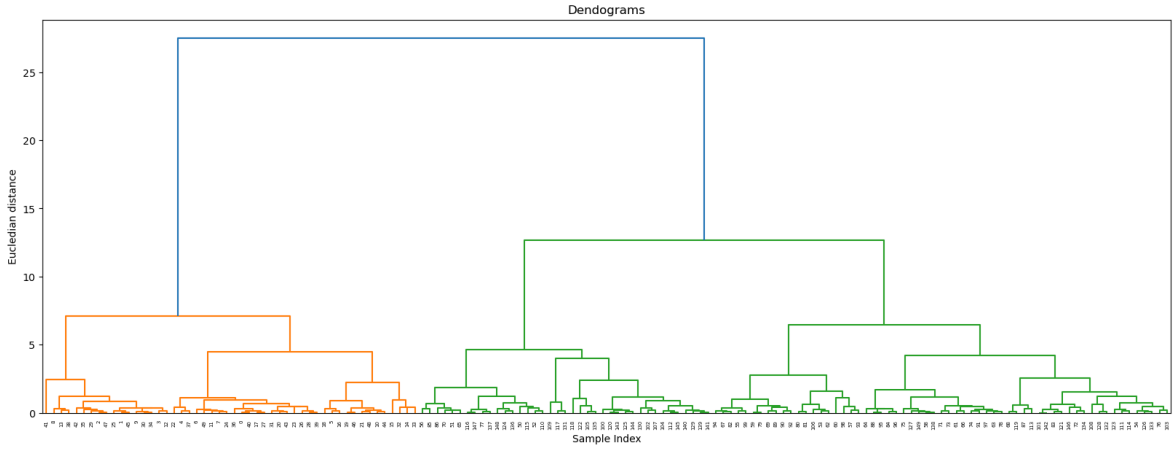


In [23]:
```
## Agglomerative Clustering
import scipy.cluster.hierarchy as sc

plt.figure(figsize=(20,7))
plt.title("Dendograms")
```

```
# craete dendograms
sc.dendrogram(sc.linkage(pca_scaled,method='ward'))
plt.title('Dendograms')
plt.xlabel('Sample Index')
plt.ylabel('Eucledian distance')
```

Out[23]:
```
Text(0, 0.5, 'Eucledian distance')
```



In [26]:
```
from sklearn.cluster import AgglomerativeClustering
cluster = AgglomerativeClustering(n_clusters=2,metric='euclidean',linkage='ward'
cluster.fit(pca_scaled)
```

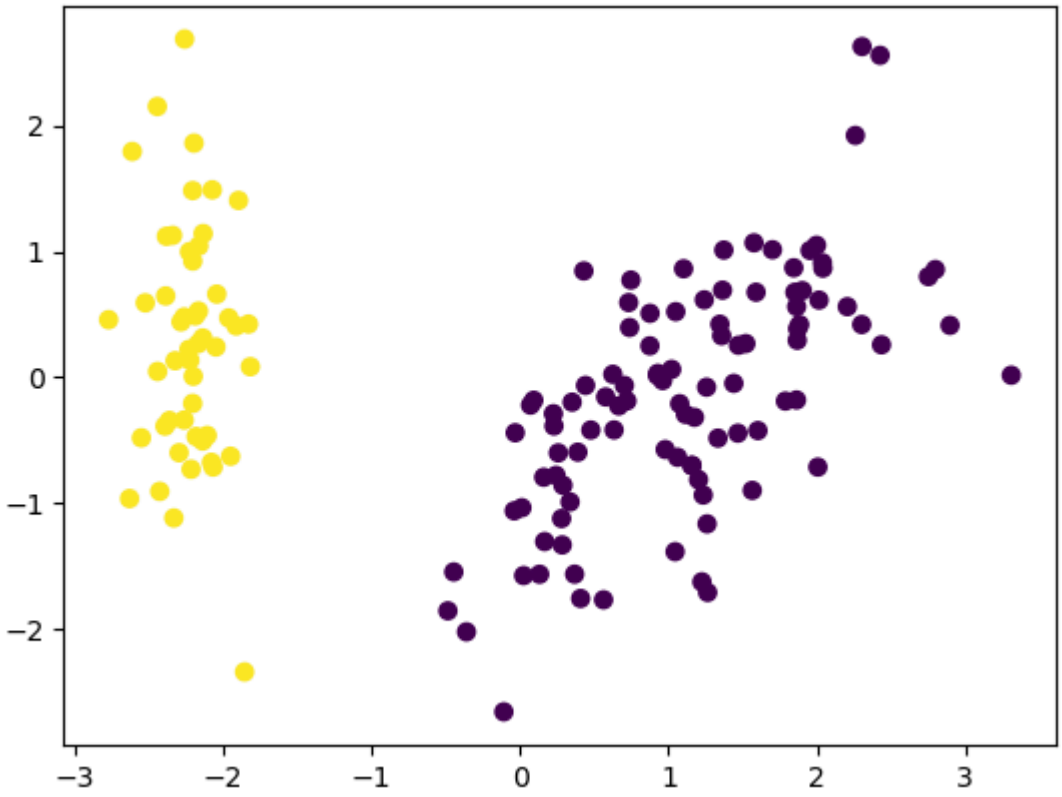
Out[26]:
```
AgglomerativeClustering
▶ Parameters
```

In [27]:
```
cluster.labels_
```

Out[27]:
```
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, 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, 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, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], dtype=int64)
```

In [28]:
```
plt.scatter(pca_scaled[:,0],pca_scaled[:,1],c=cluster.labels_)
```

Out[28]:
```
<matplotlib.collections.PathCollection at 0x237ea7616d0>
```



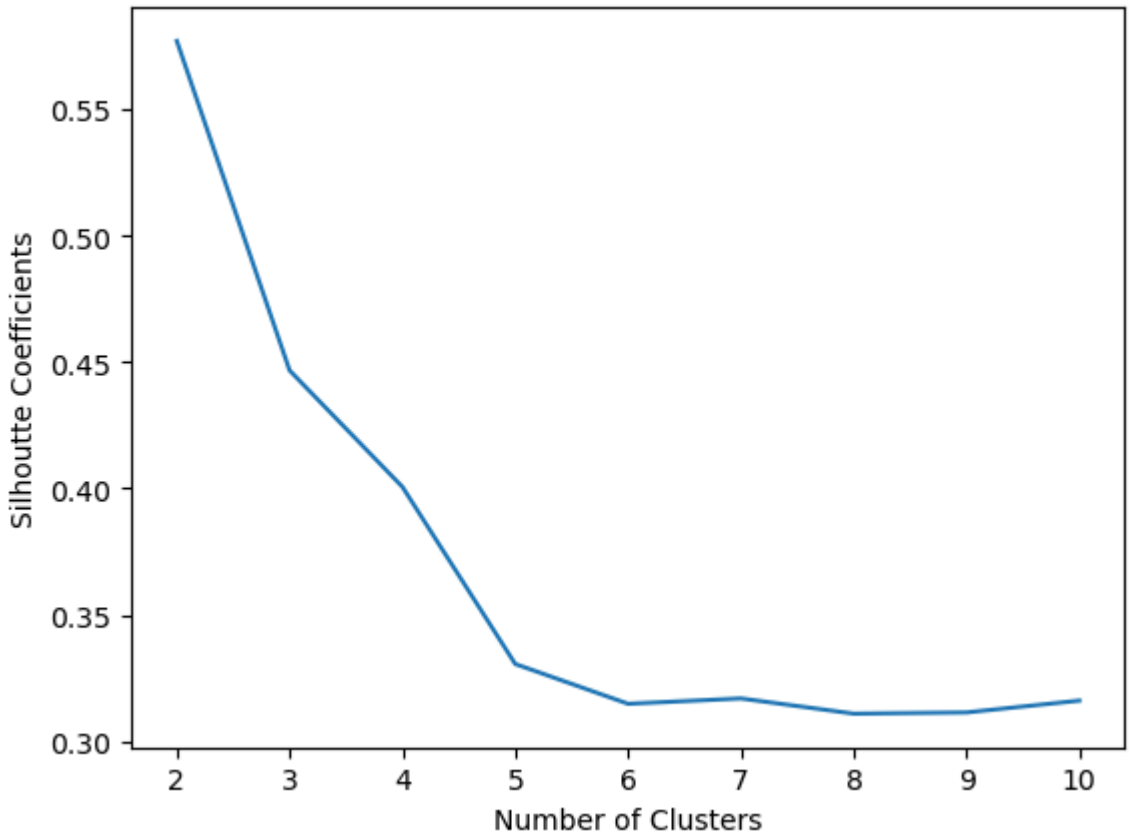
In [29]:
```
# performance metrics
# silhoutte score
from sklearn.metrics import silhouette_score
```

In [32]:
```
silhouette_coefficients = []
for k in range(2,11):
    agglo = AgglomerativeClustering(n_clusters=k,metric='euclidean',linkage='war
    agglo.fit(X_scaled)
    score = silhouette_score(X_scaled, agglo.labels_)
    silhouette_coefficients.append(score)
```

In [33]:
```
silhouette_coefficients
```

Out[33]:
```
[0.5770346019475988,
 0.4466890410285909,
 0.4006363159855973,
 0.33058726295230545,
 0.31485480100512825,
 0.316969830299128,
 0.310946529007258,
 0.31143422475471655,
 0.3161120375980681]
```

In [34]:
```
# plot the silhouette score
plt.plot(range(2,11),silhouette_coefficients)
plt.xticks(range(2,11))
plt.xlabel("Number of Clusters")
plt.ylabel("Silhoutte Coefficients")
plt.show()
```


Silhoutte Coefficients
0.55
0.50
0.45
0.40
0.35
0.30
2
3
4
5
6
7
8
9
10
Number of Clusters

In [ ]: