

Implement clustering techniques – Hierarchical and K-Means**AIM:**

To Implement clustering techniques Hierarchical and K-Means using R programming in R Studio.

a) HIERARCHIAL CLUSTERING

```
# Load the iris dataset data(iris)

# Use only the numeric columns for clustering (exclude the Species column) iris_data
<- iris[, -5]

# Standardize the data
iris_scaled <- scale(iris_data)

# Compute the distance matrix distance_matrix <-
dist(iris_scaled, method = "euclidean")

# Perform hierarchical clustering using the "complete" linkage method hc_complete
<- hclust(distance_matrix, method = "complete")

# Plot the dendrogram plot(hc_complete, main = "Hierarchical Clustering Dendrogram",
xlab = "", sub = "", cex =
0.6)

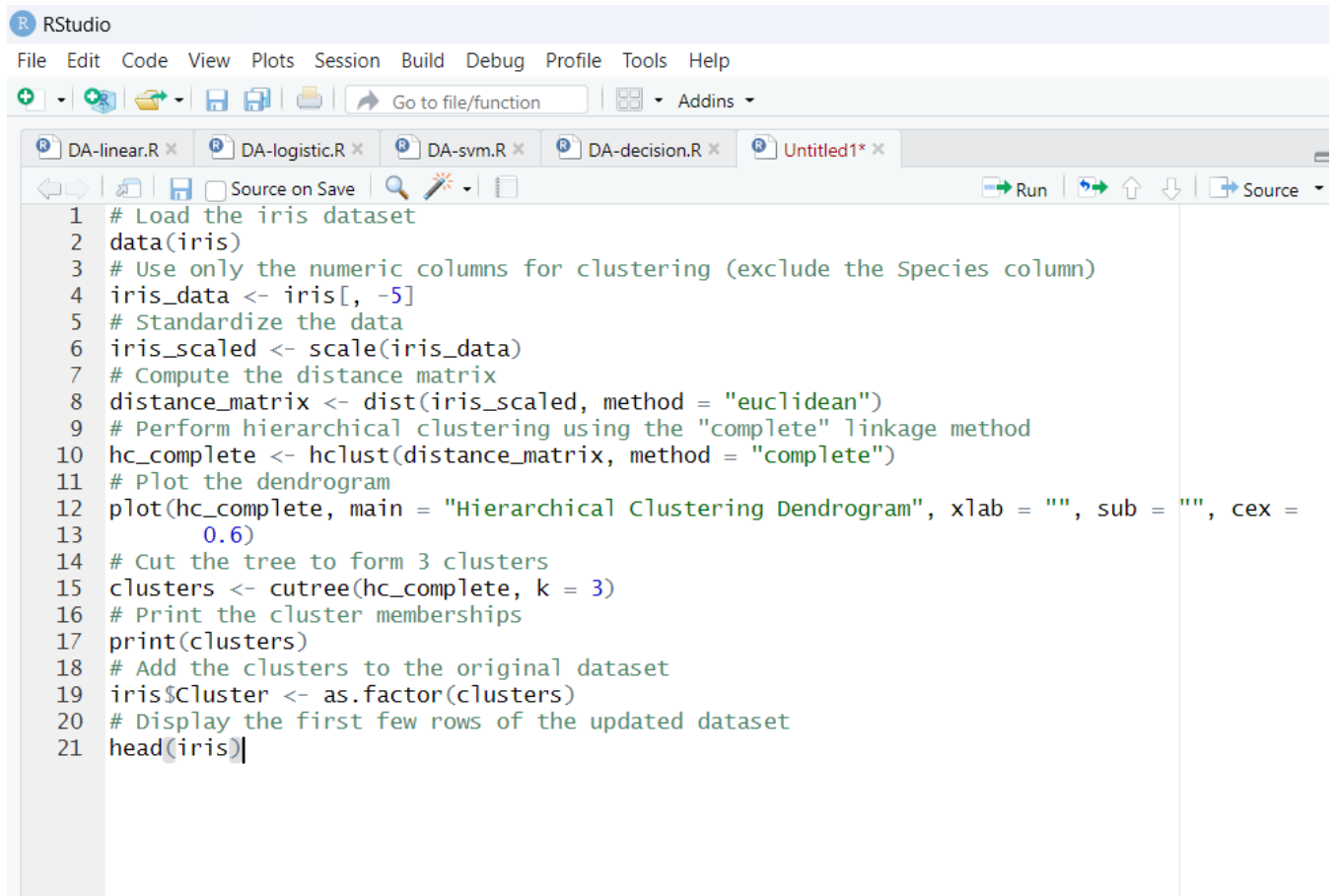
# Cut the tree to form 3 clusters
clusters <- cutree(hc_complete, k = 3)

# Print the cluster memberships print(clusters)

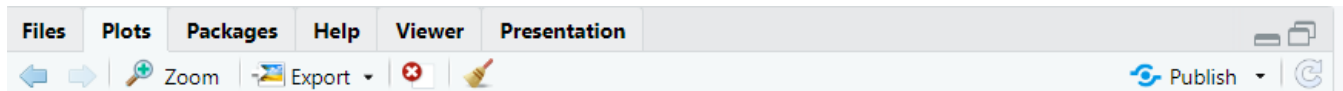
# Add the clusters to the original dataset
iris$Cluster <- as.factor(clusters)

# Display the first few rows of the updated dataset head(iris)
```

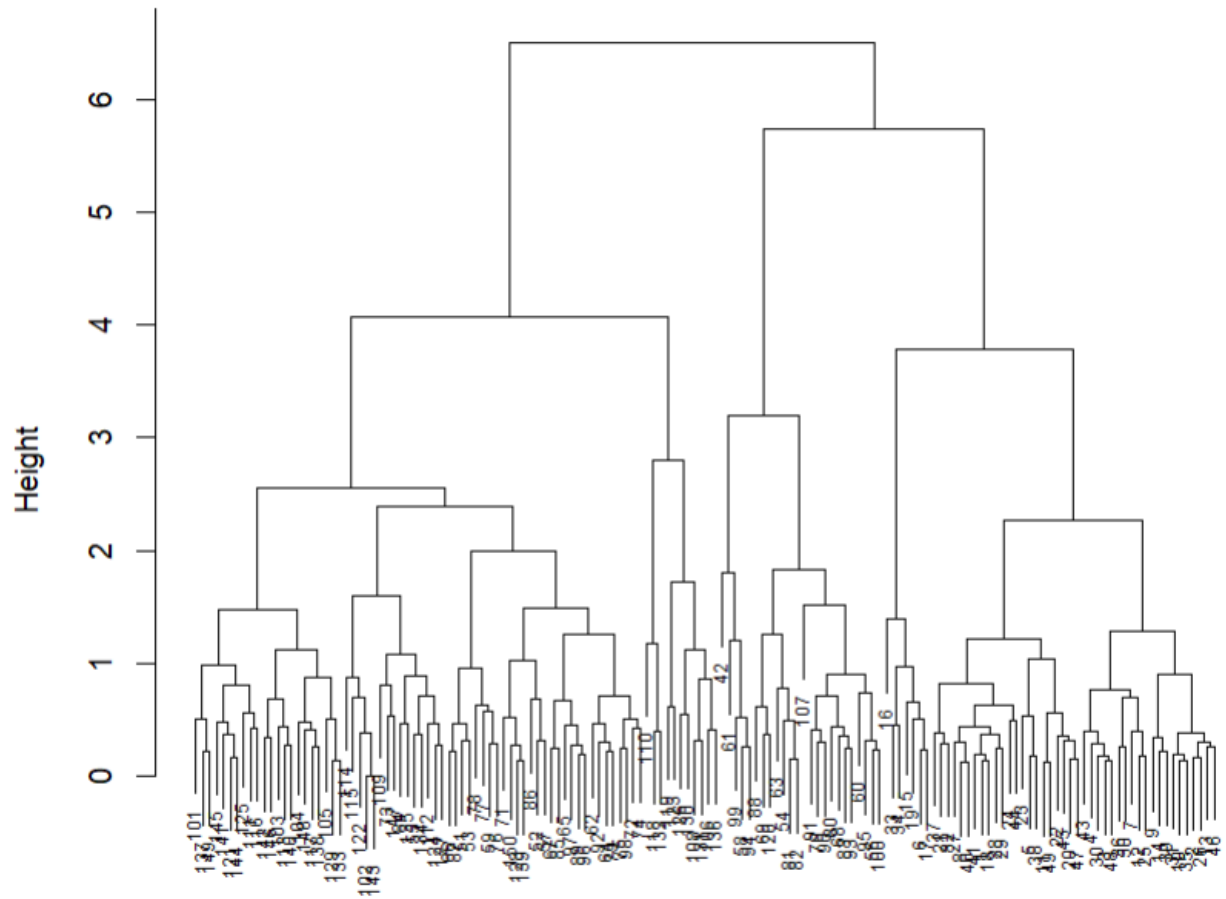
OUTPUT:



```
1 # Load the iris dataset
2 data(iris)
3 # Use only the numeric columns for clustering (exclude the Species column)
4 iris_data <- iris[, -5]
5 # Standardize the data
6 iris_scaled <- scale(iris_data)
7 # Compute the distance matrix
8 distance_matrix <- dist(iris_scaled, method = "euclidean")
9 # Perform hierarchical clustering using the "complete" linkage method
10 hc_complete <- hclust(distance_matrix, method = "complete")
11 # Plot the dendrogram
12 plot(hc_complete, main = "Hierarchical Clustering Dendrogram", xlab = "", sub = "", cex =
13      0.6)
14 # Cut the tree to form 3 clusters
15 clusters <- cutree(hc_complete, k = 3)
16 # Print the cluster memberships
17 print(clusters)
18 # Add the clusters to the original dataset
19 iris$Cluster <- as.factor(clusters)
20 # Display the first few rows of the updated dataset
21 head(iris)
```



Hierarchical Clustering Dendrogram



b) K-MEANS CLUSTERING

```
# Load the iris dataset data(iris)

# Use only the numeric columns for clustering (exclude the Species column) iris_data
<- iris[, -5]

# Standardize the data
iris_scaled <- scale(iris_data)

# Set the number of clusters set.seed(123)
# For reproducibility
k <- 3 # Number of clusters

# Perform K-Means clustering
kmeans_result <- kmeans(iris_scaled, centers = k, nstart = 25)

# Print the K-Means result
print(kmeans_result)

# Print the cluster centers
print(kmeans_result$centers)

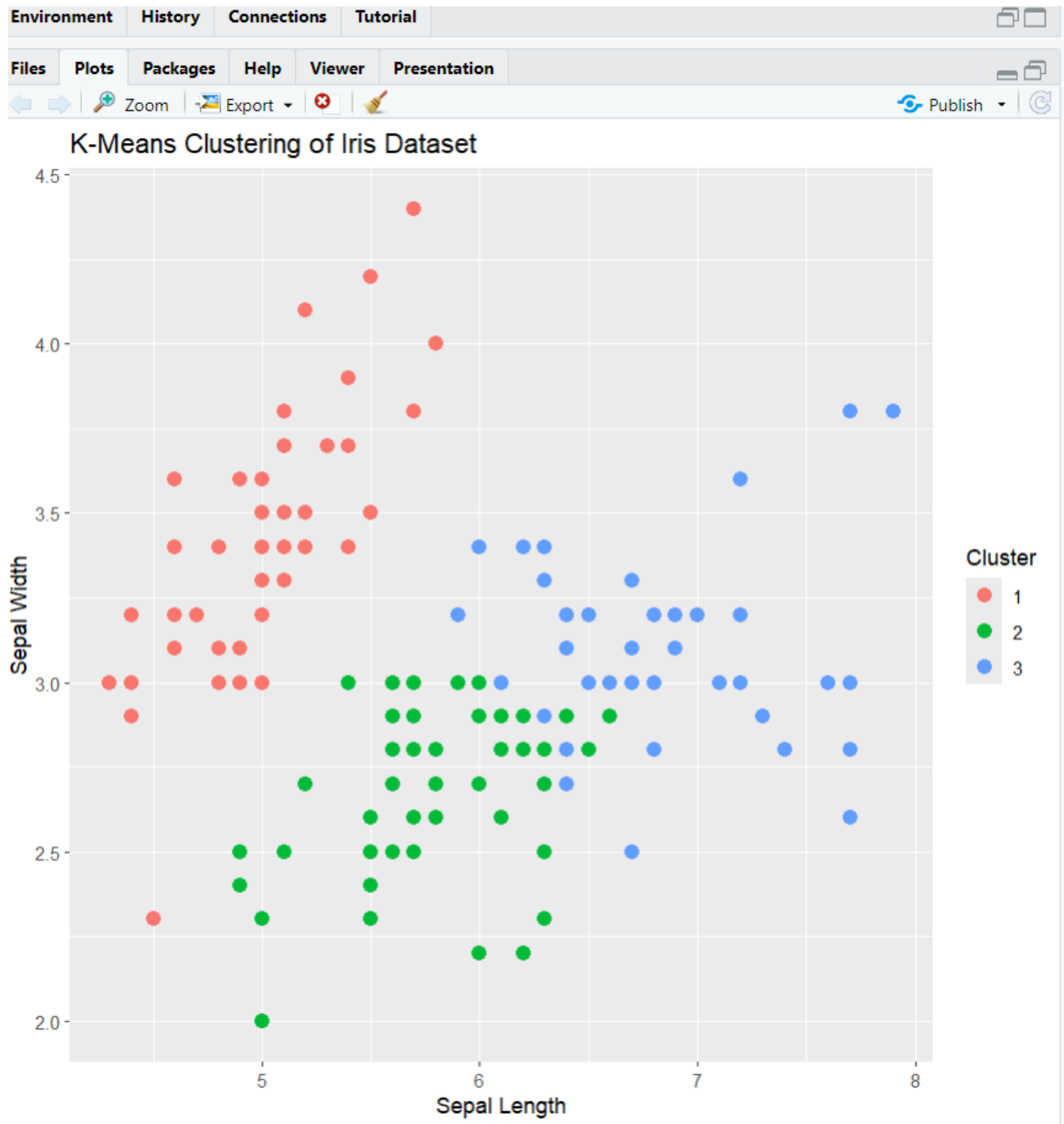
# Add the cluster assignments to the original dataset iris$Cluster
<- as.factor(kmeans_result$cluster)

# Display the first few rows of the updated dataset head(iris)

# Plot the clusters library(ggplot2)
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Cluster)) +
  geom_point(size = 3) +
  labs(title = "K-Means Clustering of Iris Dataset", x = "Sepal Length", y = "Sepal Width")
```

OUTPUT:

```
A-hierarchial_clustering.R x DA-kmeans.R x DA-scatterplot.R x DA-barchart.R x DA-histogram.R x DA-boxplot.R x
Source on Save Run Source
1 # Load the iris dataset
2 data(iris)
3 # Use only the numeric columns for clustering (exclude the Species column)
4 iris_data <- iris[, -5]
5 # Standardize the data
6 iris_scaled <- scale(iris_data)
7 # Set the number of clusters
8 set.seed(123) # For reproducibility
9 k <- 3 # Number of clusters
10 # Perform K-Means clustering
11 kmeans_result <- kmeans(iris_scaled, centers = k, nstart = 25)
12 # Print the K-Means result
13 print(kmeans_result)
14 # Print the cluster centers
15 print(kmeans_result$centers)
16 # Add the cluster assignments to the original dataset
17 iris$Cluster <- as.factor(kmeans_result$cluster)
18 # Display the first few rows of the updated dataset
19 head(iris)
20 # Plot the clusters
21 library(ggplot2)
22 ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Cluster)) +
23   geom_point(size = 3) +
24   labs(title = "K-Means Clustering of Iris Dataset", x = "Sepal Length", y = "Sepal Width")
```

**RESULT:**

Thus, the Implement clustering techniques Hierarchical and K-Means using R programming in R Studio have been successfully executed.