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)

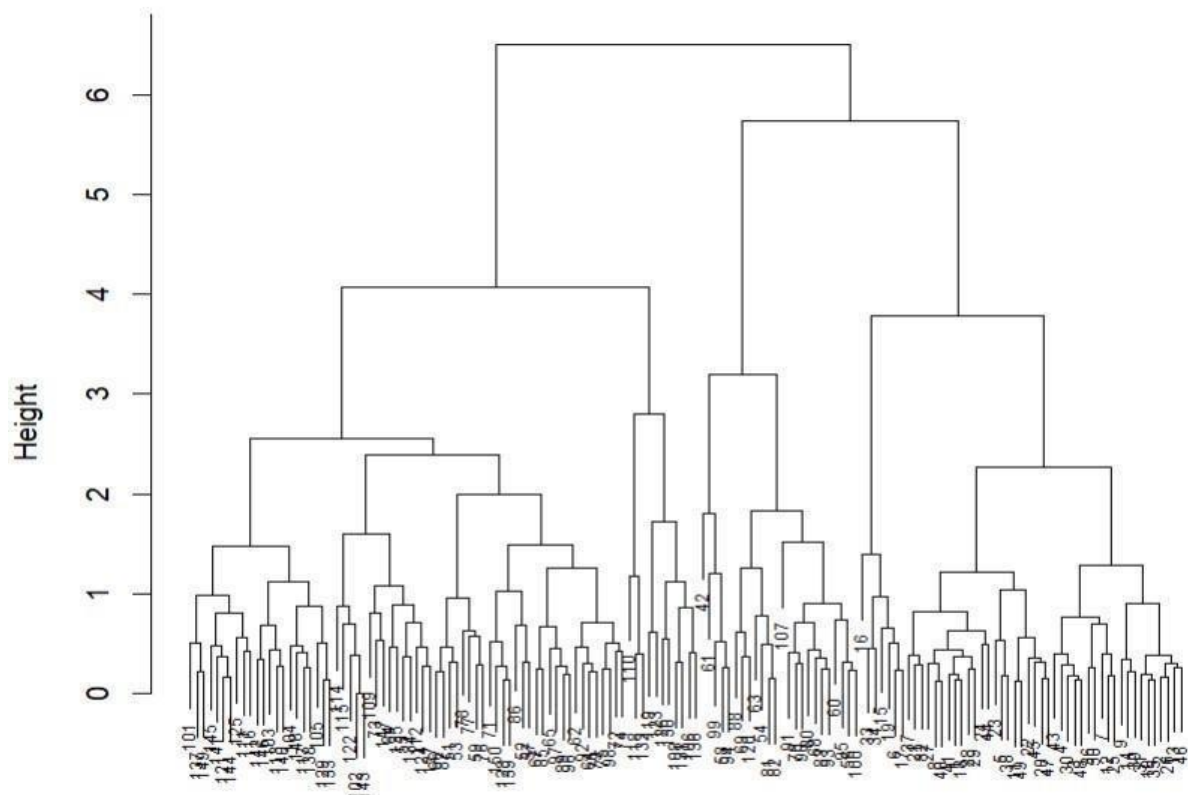# Display the first few rows of the updated dataset head(iris)

OUTPUT:

```
Hierarchial.R ×
        Source on Save   Q                                              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   # 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)
```

Files   Plots   Packages   Help   Viewer   Presentation

Zoom   Export   ⊗   ✎   Publish

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$Cluster <-
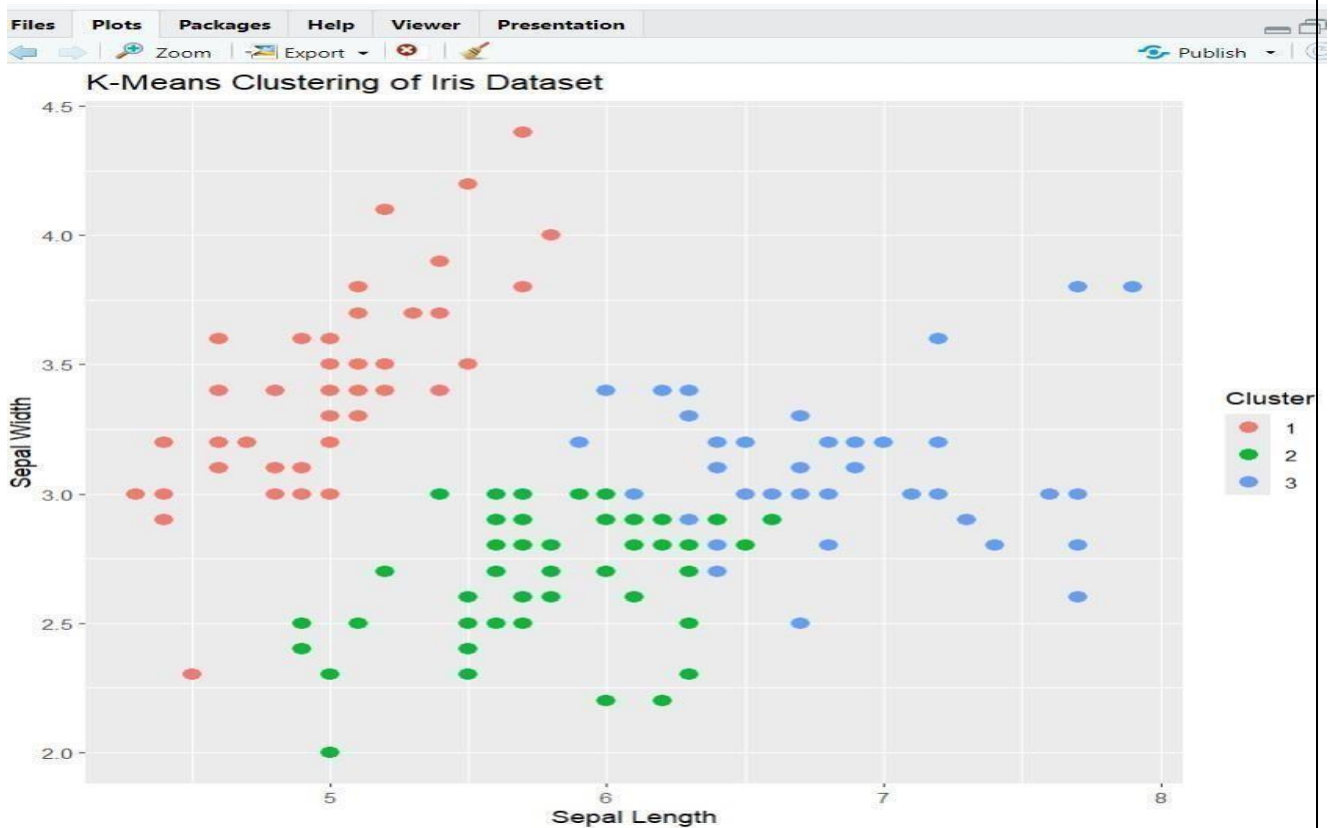as.factor(kmeans_result$cluster)

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:**

```
 1  # Load the iris dataset
 2  data(iris)
 3  # Load the iris dataset
 4  data(iris)
 5  # Use only the numeric columns for clustering (exclude the Species column)
 6  iris_data <- iris[, -5]
 7  # Standardize the data
 8  iris_scaled <- scale(iris_data)
 9  # Set the number of clusters
10  set.seed(123) # For reproducibility
11  k <- 3 # Number of clusters
12  # Perform K-Means clustering
13  kmeans_result <- kmeans(iris_scaled, centers = k, nstart = 25)
14  # Print the K-Means result
15  print(kmeans_result)
16  # Print the cluster centers
17  print(kmeans_result$centers)
18  # Add the cluster assignments to the original dataset
19  iris$Cluster <- as.factor(kmeans_result$cluster)
20  # Display the first few rows of the updated dataset
21  head(iris)
22  # Plot the clusters
23  library(ggplot2)
24  ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Cluster)) +
25    geom_point(size = 3) +
26    labs(title = "K-Means Clustering of Iris Dataset", x = "Sepal Length", y = "Sepal Width")
27  |
```


K-Means Clustering of Iris Dataset

RESULT:

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