Ex no: 9 **210701168**

Implement clustering techniques – Hierarchical and K-Means

Aim:

To implement clustering techniques – Hierarchical and K-Means using RStudio.

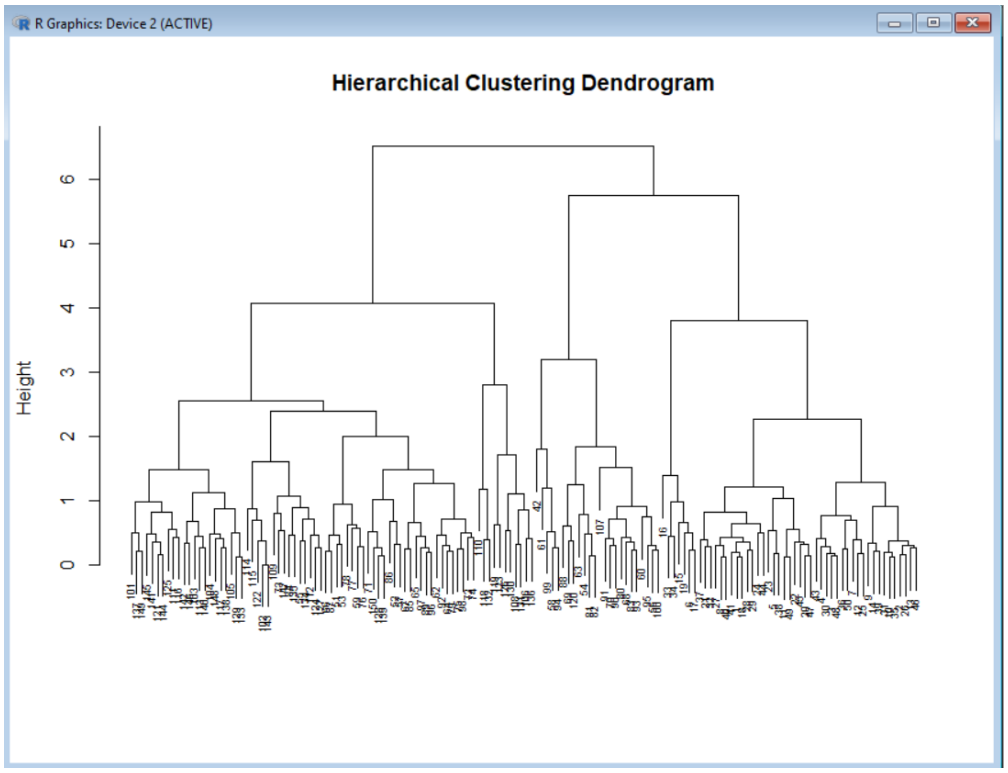
Procedure:

a) HIERARCHICAL 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:

```
R Console
> # 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$
> # Cut the tree to form 3 clusters
> clusters <- cutree(hc_complete, k = 3)
> # Print the cluster memberships
> print(clusters)
  [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
 [38] 1 1 1 1 2 1 1 1 1 1 1 1 3 3 3 2 3 2 3 2 3 2 2 3 2 3 3 3 3 2 2 2 3 3 3 3
 [75] 3 3 3 3 3 2 2 2 2 3 3 3 3 2 3 2 2 3 2 2 2 3 3 3 2 2 3 3 3 3 3 3 2 3 3 3 3
[112] 3 3 3 3 3 3 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
[149] 3 3
> # Add the clusters to the original dataset
> iris$Cluster <- as.factor(clusters)
> # Display the first few rows of the updated dataset
> head(iris)
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species Cluster
1          5.1         3.5          1.4         0.2  setosa       1
2          4.9         3.0          1.4         0.2  setosa       1
3          4.7         3.2          1.3         0.2  setosa       1
4          4.6         3.1          1.5         0.2  setosa       1
5          5.0         3.6          1.4         0.2  setosa       1
6          5.4         3.9          1.7         0.4  setosa       1
>
```



b) K-MEANS CLUSTERING

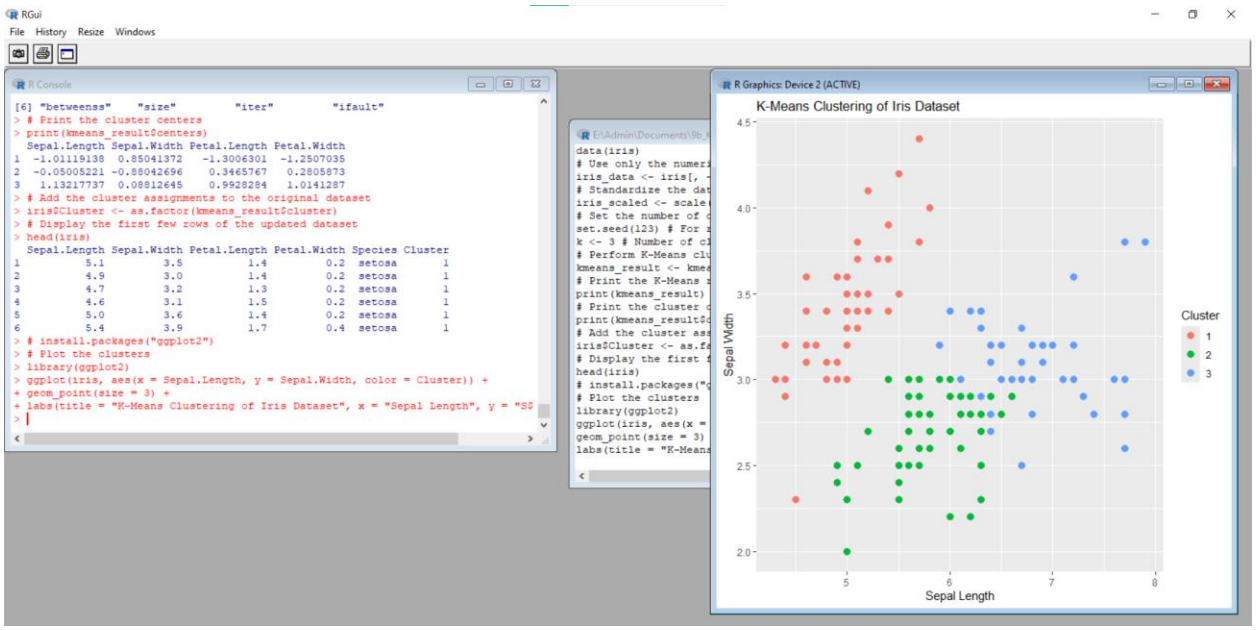
Load the iris dataset

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:



Result:

Thus, clustering techniques – Hierarchical and K-Means using R and RStudio was implemented successfully.