# EXP NO:9 Implement clustering techniques – Hierarchical and K-Means

#### AIM:

To Implement clustering techniques – Hierarchical and K-Means using R.

## **PROCEDURE:**

- Collect and load the dataset from sources like CSV files or databases.
- Clean and preprocess the data, including handling missing values and scalingfeatures.
- Determine the number of clusters (K) for K-Means, or decide on the stoppingcriterion for Hierarchical Clustering.
- Choose the appropriate clustering algorithm: K-Means for partitioning, Hierarchical for nested clustering.
- Apply the K-Means algorithm using fit\_predict to assign data points to clusters.
- Apply the Hierarchical Clustering algorithm using Agglomerative Clustering for hierarchical clusters.
- Visualize the clusters with scatter plots for K-Means, and dendrograms for Hierarchical Clustering.
- Evaluate clustering performance using metrics like silhouette score or inertia(for K-Means).
- Fine-tune the clustering by adjusting the number of clusters or linkage criteria.
- Interpret the results to understand the structure and relationships within thedata.

#### CODE:

head(iris)

#### **Hierarchical Clustering.R:**

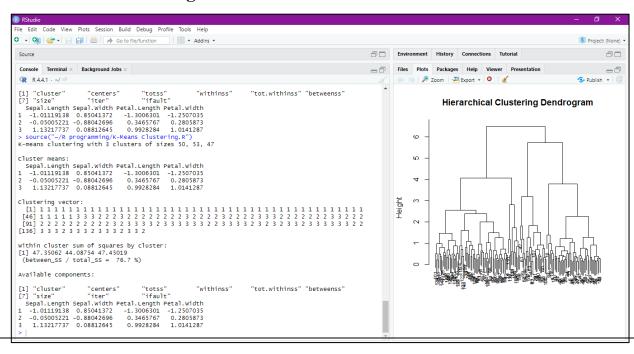
```
# Load the iris dataset
data(iris)
# Use only the numeric columns for clustering (exclude the Species column)
iris_data <- iris[, -5]
# Standardize the data
iris_scaled <- scale(iris_data)</pre>
# Compute the distance matrix
distance_matrix <- dist(iris_scaled, method = "euclidean")
# Perform hierarchical clustering using the "complete" linkage method
hc_complete <- hclust(distance_matrix, method = "complete")</pre>
# 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)</pre>
# Display the first few rows of the updated dataset
```

### **K-Means Clustering.R:**

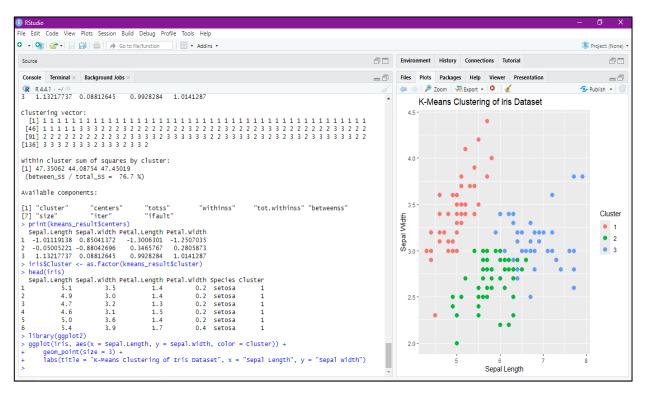
```
# Load the iris dataset
data(iris)
# Use only the numeric columns for clustering (exclude the Species column)
iris data <- iris[, -5]
# Standardize the data
iris scaled <- scale(iris data)
# Set the number of clusters
set.seed(123) # For reproducibility
k <- 3 # Number of clusters
# Perform K-Means 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)</pre>
# 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:**

## **Hierarchical Clustering:**



# **K-Means Clustering:**



## **RESULT:**

Thus, to implement clustering techniques – Hierarchical and K-Means using R has been successfully executed.