# 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 pointsto 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 KMeans).
- 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:

## 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)

# 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)
```

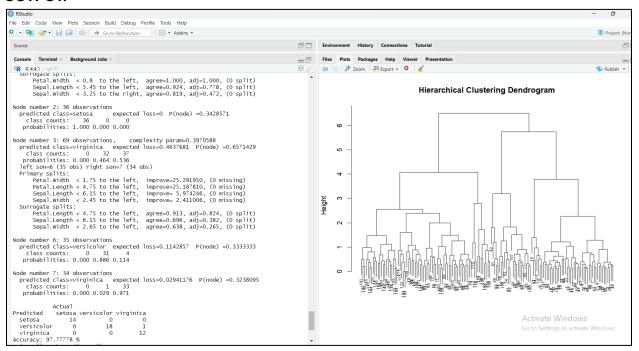
```
# Print the cluster memberships
print(clusters)
# Add the clusters to the original dataset
iris$Cluster <- as.factor(clusters)</pre>
# Display the first few rows of the updated dataset
head(iris)
KMEANS.R
# Load the iris dataset
data(iris)
# Use only the numeric columns for clustering (exclude the Species column)
iris data <- iris[, -5]
# Standardize the data
iris scaled <- scale(iris data)
# Set the number of clusters
set.seed(123) # For reproducibility
k <- 3 # Number of clusters
# Perform K-Means clustering
kmeans result <- kmeans(iris scaled, centers = k, nstart = 25)
# Print the K-Means result
print(kmeans result)
# Print the cluster centers
print(kmeans result$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)
```

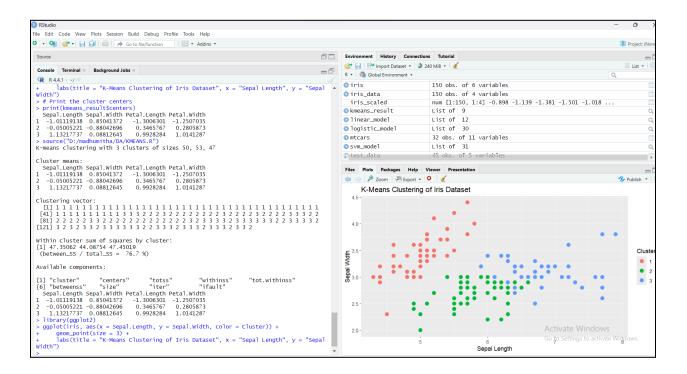
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Cluster)) +

labs(title = "K-Means Clustering of Iris Dataset", x = "Sepal Length", y = "Sepal Width")

geom point(size = 3) +

## **OUTPUT:**





#### **RESULT:**

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