Model 04 t-SNE and k-Means

2024-07-22

#Importing the necessary libraries

library(aricode)

## Warning: package 'aricode' was built under R version 4.3.3

library(mclust)

## Warning: package 'mclust' was built under R version 4.3.3

## Package 'mclust' version 6.1.1  
## Type 'citation("mclust")' for citing this R package in publications.

library(FactoMineR)

## Warning: package 'FactoMineR' was built under R version 4.3.3

library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library(factoextra)

## Warning: package 'factoextra' was built under R version 4.3.3

## Loading required package: ggplot2

## Warning: package 'ggplot2' was built under R version 4.3.3

## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa

library(Rtsne)

## Warning: package 'Rtsne' was built under R version 4.3.3

#Reading the data sourced from Data Preparation file

data <- read.csv('modeldata.csv')

class\_col<-ncol(data)  
  
colnames(data)[class\_col] <- "class"  
  
data$class <- factor(data$class, level=as.character(sort(unique(data$class))))  
  
levels(data$class)

## [1] "0" "1"

head(data)

## HouseHoldIncome Gender Age Race EthnicGroup Neighbourhood Hypertension  
## 1 4 2 62 1 1 3 1  
## 2 2 2 79 1 1 4 1  
## 3 3 1 60 1 1 3 1  
## 4 2 2 78 1 1 3 1  
## 5 2 1 80 1 1 4 1  
## 6 3 2 59 1 1 3 1  
## Diabetes Asthma Arithritis Stroke Exercise NoEat Depression Degree Hispanic  
## 1 0 0 1 0 0 1 1 5 0  
## 2 0 0 1 0 0 1 1 2 0  
## 3 1 0 1 0 0 1 1 2 0  
## 4 0 0 1 0 0 2 2 2 0  
## 5 0 0 0 0 0 1 1 2 0  
## 6 0 0 0 0 0 1 1 2 0  
## MaritalStatus JobStatus PhysicalHealth MentalHealth AttendChurchService  
## 1 1 1 4 4 3  
## 2 5 0 4 4 1  
## 3 1 1 3 5 5  
## 4 1 0 3 3 6  
## 5 5 0 3 3 5  
## 6 1 1 4 4 2  
## Bridge HealthDiscussions LiveAlone BMI class  
## 1 1 1 0 29.63854 0  
## 2 0 1 0 33.77728 1  
## 3 1 1 0 71.40351 1  
## 4 1 1 0 26.17371 0  
## 5 0 1 1 24.82300 0  
## 6 1 1 0 28.48473 0

# Splitting target variable in a different dataframe.

penddata <- dplyr::select(data, -class)  
penclass <- data$class

# Applying k-Means on the Original Dataset

set.seed(42)  
kmeans\_result <- kmeans(penddata, centers = 2, nstart = 25)  
penddata <- penddata %>% mutate(Cluster = kmeans\_result$cluster)  
penddata$class <- data$class  
head(penddata)

## HouseHoldIncome Gender Age Race EthnicGroup Neighbourhood Hypertension  
## 1 4 2 62 1 1 3 1  
## 2 2 2 79 1 1 4 1  
## 3 3 1 60 1 1 3 1  
## 4 2 2 78 1 1 3 1  
## 5 2 1 80 1 1 4 1  
## 6 3 2 59 1 1 3 1  
## Diabetes Asthma Arithritis Stroke Exercise NoEat Depression Degree Hispanic  
## 1 0 0 1 0 0 1 1 5 0  
## 2 0 0 1 0 0 1 1 2 0  
## 3 1 0 1 0 0 1 1 2 0  
## 4 0 0 1 0 0 2 2 2 0  
## 5 0 0 0 0 0 1 1 2 0  
## 6 0 0 0 0 0 1 1 2 0  
## MaritalStatus JobStatus PhysicalHealth MentalHealth AttendChurchService  
## 1 1 1 4 4 3  
## 2 5 0 4 4 1  
## 3 1 1 3 5 5  
## 4 1 0 3 3 6  
## 5 5 0 3 3 5  
## 6 1 1 4 4 2  
## Bridge HealthDiscussions LiveAlone BMI Cluster class  
## 1 1 1 0 29.63854 2 0  
## 2 0 1 0 33.77728 1 1  
## 3 1 1 0 71.40351 2 1  
## 4 1 1 0 26.17371 1 0  
## 5 0 1 1 24.82300 1 0  
## 6 1 1 0 28.48473 2 0

# NMI Score: k-Means on original dataset

penddata$Cluster <- ifelse(penddata$Cluster == 2, 0, 1)  
nmi\_value <- NMI(as.factor(penddata$class), as.factor(penddata$Cluster))  
cat("NMI:", nmi\_value, "\n")

## NMI: 0.05257165

# Appplying t-SNE on the Original Dataset

tsne\_results <- Rtsne(penddata, perplexity = 50, check\_duplicates = FALSE, pca = TRUE, theta = 0.2)

tsne\_df<-as.data.frame(tsne\_results$Y)  
  
tsne\_df<- cbind(tsne\_df, penclass)  
  
means <- tsne\_df %>%  
 group\_by(penclass) %>%  
 summarise(mean\_V1 = mean(V1),  
 mean\_V2 = mean(V2))

# Applying k-Means on the t-SNE results

set.seed(123)  
kmeans\_result2 <- kmeans(tsne\_df [,1:2], centers = 2, nstart = 25)  
tsne\_df <- tsne\_df %>% mutate(Cluster = kmeans\_result2$cluster)  
head(tsne\_df)

## V1 V2 penclass Cluster  
## 1 17.19033 6.321172 0 2  
## 2 -15.69533 -19.995085 1 1  
## 3 17.23681 -26.357454 1 2  
## 4 -22.52006 -6.811757 0 1  
## 5 -30.58366 -9.353901 0 1  
## 6 27.68775 9.412561 0 2

tsne\_df$Cluster <- ifelse(tsne\_df$Cluster == 1, 0, 1)  
nmi\_value <- NMI(as.factor(tsne\_df$penclass), as.factor(tsne\_df$Cluster))  
cat("NMI:", nmi\_value, "\n")

## NMI: 0.04099293