Mderangu

2023-12-04

#Loading the required packages and reading the cereals file.  
  
library(factoextra)

## Warning: package 'factoextra' was built under R version 4.2.3

## Loading required package: ggplot2

## Warning: package 'ggplot2' was built under R version 4.2.3

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

library(dendextend)

## Warning: package 'dendextend' was built under R version 4.2.3

##   
## ---------------------  
## Welcome to dendextend version 1.17.1  
## Type citation('dendextend') for how to cite the package.  
##   
## Type browseVignettes(package = 'dendextend') for the package vignette.  
## The github page is: https://github.com/talgalili/dendextend/  
##   
## Suggestions and bug-reports can be submitted at: https://github.com/talgalili/dendextend/issues  
## You may ask questions at stackoverflow, use the r and dendextend tags:   
## https://stackoverflow.com/questions/tagged/dendextend  
##   
## To suppress this message use: suppressPackageStartupMessages(library(dendextend))  
## ---------------------

##   
## Attaching package: 'dendextend'

## The following object is masked from 'package:stats':  
##   
## cutree

library(cluster)  
library(tidyverse)

## Warning: package 'tidyverse' was built under R version 4.2.3

## Warning: package 'tibble' was built under R version 4.2.3

## Warning: package 'tidyr' was built under R version 4.2.3

## Warning: package 'readr' was built under R version 4.2.3

## Warning: package 'purrr' was built under R version 4.2.3

## Warning: package 'dplyr' was built under R version 4.2.3

## Warning: package 'stringr' was built under R version 4.2.3

## Warning: package 'forcats' was built under R version 4.2.3

## Warning: package 'lubridate' was built under R version 4.2.3

## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──  
## ✔ dplyr 1.1.3 ✔ readr 2.1.4  
## ✔ forcats 1.0.0 ✔ stringr 1.5.0  
## ✔ lubridate 1.9.2 ✔ tibble 3.2.1  
## ✔ purrr 1.0.2 ✔ tidyr 1.3.0

## ── Conflicts ────────────────────────────────────────── tidyverse\_conflicts() ──  
## ✖ dplyr::filter() masks stats::filter()  
## ✖ dplyr::lag() masks stats::lag()  
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors

library(readr)  
cereals <- read\_csv("D:/Manisha/ASS-5/Cereals.csv")

## Rows: 77 Columns: 16  
## ── Column specification ────────────────────────────────────────────────────────  
## Delimiter: ","  
## chr (3): name, mfr, type  
## dbl (13): calories, protein, fat, sodium, fiber, carbo, sugars, potass, vita...  
##   
## ℹ Use `spec()` to retrieve the full column specification for this data.  
## ℹ Specify the column types or set `show\_col\_types = FALSE` to quiet this message.

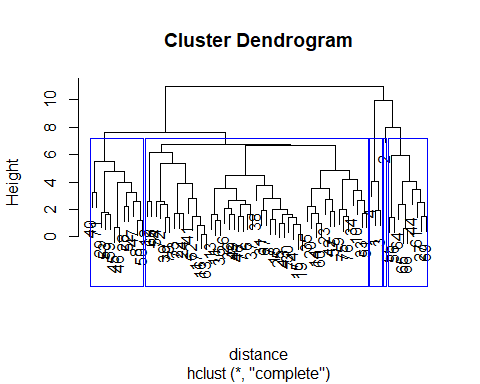
View(cereals)  
numericaldata = data.frame(cereals[,4:16])  
spec(cereals)

## cols(  
## name = col\_character(),  
## mfr = col\_character(),  
## type = col\_character(),  
## calories = col\_double(),  
## protein = col\_double(),  
## fat = col\_double(),  
## sodium = col\_double(),  
## fiber = col\_double(),  
## carbo = col\_double(),  
## sugars = col\_double(),  
## potass = col\_double(),  
## vitamins = col\_double(),  
## shelf = col\_double(),  
## weight = col\_double(),  
## cups = col\_double(),  
## rating = col\_double()  
## )

#Data prepocessing - Normalize the measurements to ensure that variables with different scales do not disproportionately influence the clustering.  
missing = na.omit(numericaldata)  
  
#normalizing and scaling the data  
normalise = scale(missing)  
  
#measuring the distance using the euclidian distance and computing the dissimilarity matrix  
distance = dist(normalise, method = "euclidian")  
  
#Hierarchical clustering is a method of cluster analysis which seeks to build a hierarchy of clusters.performing hierarchial clustering using complete linkage and representing in plot.Hierarchical clustering can be divided into two main types: agglomerative and divisive.  
hierarchial\_clustering = hclust(distance,method = "complete")  
plot(hierarchial\_clustering)  
  
#rounding off the decimals  
round(hierarchial\_clustering$height, 5)

## [1] 0.14315 0.19616 0.57455 0.69797 0.82806 0.90354 1.00349 1.00405  
## [9] 1.20088 1.20325 1.25377 1.37772 1.40832 1.42074 1.45357 1.46326  
## [17] 1.47393 1.51732 1.60758 1.61061 1.61576 1.62451 1.65040 1.68700  
## [25] 1.69233 1.72023 1.73046 1.79488 1.83892 1.89651 1.91874 1.98210  
## [33] 2.01539 2.04628 2.20301 2.22359 2.33886 2.38139 2.39401 2.52225  
## [41] 2.56304 2.57436 2.57921 2.66832 2.68196 2.73397 2.77641 2.78680  
## [49] 3.22925 3.23622 3.38498 3.45069 3.51004 3.53516 3.71686 3.86639  
## [57] 3.95737 4.00466 4.03105 4.16760 4.45568 4.77888 4.83870 5.34168  
## [65] 5.48793 5.91994 6.16858 6.66865 6.73123 7.64963 7.96381 9.97867  
## [73] 10.98389

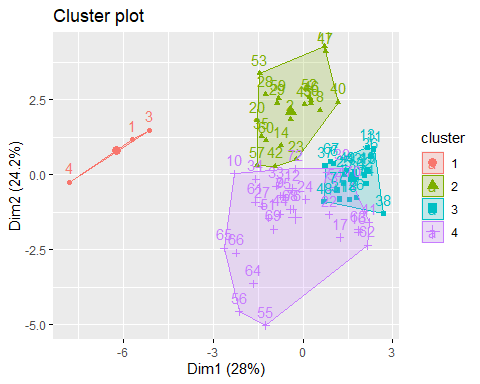
#Look at the dendrogram plot and observe where the blue rectangles are drawn. Each rectangle corresponds to a cluster, and the number of rectangles indicates the specified number of clusters (in this case, 5).  
  
plot(hierarchial\_clustering)  
rect.hclust(hierarchial\_clustering,k = 5, border = "blue")



#The agnes function in R is part of the cluster package, and it is used to perform agglomerative hierarchical clustering. Agglomerative hierarchical clustering is a bottom-up approach where individual data points start as their own clusters and are successively merged based on their pairwise similarity until a single cluster containing all the data points is formed.  
  
# Data matrix, data frame, or dissimilarity matrix   
# Metric for calculating dissimilarities: "euclidean" or "manhattan"   
# Standardize measurements if TRUE  
# Clustering method: "average", "single", "complete", "ward"  
  
  
#performing clustering using AGNES  
HCsingle = agnes(normalise, method = "single")  
HCcomplete = agnes(normalise, method = "complete")  
HCaverage = agnes(normalise, method = "average")  
HCward = agnes(normalise, method = "ward")  
  
#performing clustering using AGNES  
HCsingle = agnes(normalise, method = "single")  
HCcomplete = agnes(normalise, method = "complete")  
HCaverage = agnes(normalise, method = "average")  
HCward = agnes(normalise, method = "ward")  
  
#using the ward method for hierarchial clustering and Ward's method minimizes the variance within each cluster. It selects the pair of clusters to merge such that the increase in the total within-cluster variance is minimized.  
HC1 <- hclust(distance, method = "ward.D2" )  
subgrp <- cutree(HC1, k = 4)  
table(subgrp)

## subgrp  
## 1 2 3 4   
## 3 20 21 30

cereals <- as.data.frame(cbind(normalise,subgrp))  
  
#It is used for visualizing clustering results obtained from various clustering algorithms. visualising the results on scatterplot  
fviz\_cluster(list(data = normalise, cluster = subgrp))



#choosing the healthy cereal cluster  
data <- cereals  
data\_omit <- na.omit(data)  
Clust <- cbind(data\_omit, subgrp)  
Clust[Clust$subgrp==1,]

## calories protein fat sodium fiber carbo sugars  
## 1 -1.865915 1.381748 0.0000000 -0.3910227 3.228667 -2.500140 -0.2542051  
## 3 -1.865915 1.381748 0.0000000 1.1795987 2.816023 -1.986222 -0.4836096  
## 4 -2.873782 1.381748 -0.9932203 -0.2702057 4.879247 -1.729263 -1.6306324  
## potass vitamins shelf weight cups rating subgrp subgrp  
## 1 2.560523 -0.1818422 0.9419715 -0.2008324 -2.085658 1.854904 1 1  
## 3 3.124867 -0.1818422 0.9419715 -0.2008324 -2.085658 1.215196 1 1  
## 4 3.265954 -0.1818422 0.9419715 -0.2008324 -1.364449 3.657844 1 1

Clust[Clust$subgrp==2,]

## calories protein fat sodium fiber carbo  
## 2 0.6537514 0.4522084 3.9728810 -1.78041856 -0.07249167 -1.72926320  
## 8 1.1576848 0.4522084 0.9932203 0.57551356 -0.07249167 0.84032469  
## 14 0.1498180 0.4522084 0.9932203 -0.27020566 -0.07249167 -0.44446926  
## 20 0.1498180 0.4522084 1.9864405 -0.27020566 0.75279812 -1.21534562  
## 23 -0.3541153 -0.4773310 0.0000000 -0.27020566 -0.07249167 -0.95838683  
## 28 0.6537514 0.4522084 0.9932203 -0.02857160 1.16544301 -0.70142805  
## 29 0.6537514 0.4522084 -0.9932203 0.93796466 1.16544301 -0.18751047  
## 35 0.6537514 0.4522084 1.9864405 -1.05551637 0.34015322 -0.44446926  
## 40 1.6616182 0.4522084 0.0000000 0.09224544 -0.07249167 1.35424227  
## 42 -0.3541153 1.3817478 0.9932203 -0.14938863 -0.07249167 -0.70142805  
## 45 2.1655516 1.3817478 1.9864405 -0.81388230 0.34015322 0.32640711  
## 46 2.1655516 1.3817478 1.9864405 -0.14938863 0.34015322 0.32640711  
## 47 2.6694849 0.4522084 0.9932203 -0.14938863 0.34015322 0.58336590  
## 50 1.6616182 0.4522084 0.9932203 0.69633060 0.34015322 1.61120105  
## 52 1.1576848 0.4522084 0.9932203 0.09224544 -0.27881412 -0.31598986  
## 53 0.6537514 0.4522084 0.0000000 0.45469653 1.57808790 -0.95838683  
## 57 -0.3541153 1.3817478 0.0000000 -0.33061417 -0.07249167 -0.18751047  
## 59 0.6537514 0.4522084 0.0000000 0.57551356 1.16544301 -0.18751047  
## 60 -0.3541153 0.4522084 0.9932203 -0.27020566 0.13383078 -1.08686623  
## 71 1.6616182 0.4522084 0.0000000 0.33387950 0.75279812 0.06944832  
## sugars potass vitamins shelf weight cups  
## 2 0.20460407 0.51477378 -1.3032024 0.9419715 -0.2008324 0.7567534  
## 8 0.20460407 0.02097226 -0.1818422 0.9419715 1.9501886 -0.3038480  
## 14 -0.02480049 0.09151534 -0.1818422 0.9419715 -0.2008324 -1.3644493  
## 20 -0.02480049 0.86748914 -0.1818422 0.9419715 -0.2008324 -1.3644493  
## 23 0.66341318 0.30314456 -0.1818422 0.9419715 -0.2008324 -0.3038480  
## 28 0.66341318 1.43183372 -0.1818422 0.9419715 1.4287290 -0.6432404  
## 29 1.12222230 1.29074758 -0.1818422 0.9419715 1.9501886 -0.6432404  
## 35 -0.71301417 0.02097226 -0.1818422 0.9419715 -0.2008324 -2.0856582  
## 40 0.43400862 -0.04957081 3.1822385 0.9419715 1.7546413 -0.3038480  
## 42 -0.25420505 -0.04957081 -0.1818422 -0.2598542 -0.2008324 -0.6432404  
## 45 0.89281774 1.00857529 -0.1818422 0.9419715 -0.2008324 0.7567534  
## 46 0.89281774 1.00857529 -0.1818422 0.9419715 -0.2008324 0.7567534  
## 47 1.35162686 0.86748914 -0.1818422 0.9419715 3.0582904 -0.6432404  
## 50 -0.02480049 0.44423070 -0.1818422 0.9419715 1.9501886 -0.6432404  
## 52 0.66341318 0.30314456 -0.1818422 0.9419715 1.4287290 -1.3644493  
## 53 1.58103142 2.27835060 -0.1818422 0.9419715 1.9501886 -0.6432404  
## 57 -0.25420505 0.16205841 -0.1818422 0.9419715 -0.2008324 -1.3644493  
## 59 1.12222230 1.99617831 -0.1818422 -0.2598542 1.9501886 -0.3038480  
## 60 0.20460407 0.58531685 -0.1818422 0.9419715 -0.2008324 -1.3644493  
## 71 1.58103142 1.85509216 3.1822385 0.9419715 3.0582904 0.7567534  
## rating subgrp subgrp  
## 2 -0.59771126 2 2  
## 8 -0.38002951 2 2  
## 14 -0.14048876 2 2  
## 20 -0.13702824 2 2  
## 23 -0.44147911 2 2  
## 28 -0.10366038 2 2  
## 29 -0.09664548 2 2  
## 35 0.24511896 2 2  
## 40 -0.42043579 2 2  
## 42 0.21065609 2 2  
## 45 -0.37302488 2 2  
## 46 -0.58658904 2 2  
## 47 -0.85924775 2 2  
## 50 -0.11967375 2 2  
## 52 -0.84945049 2 2  
## 53 -0.32287913 2 2  
## 57 0.50878106 2 2  
## 59 -0.22179377 2 2  
## 60 -0.19014120 2 2  
## 71 -0.98185009 2 2

Clust[Clust$subgrp==3,]

## calories protein fat sodium fiber carbo  
## 6 0.1498180 -0.4773310 0.9932203 0.2130625 -0.27881412 -1.08686623  
## 7 0.1498180 -0.4773310 -0.9932203 -0.4514312 -0.48513656 -0.95838683  
## 11 0.6537514 -1.4068705 0.9932203 0.6963306 -0.89778146 -0.70142805  
## 13 0.6537514 -1.4068705 1.9864405 0.5755136 -0.89778146 -0.44446926  
## 15 0.1498180 -1.4068705 0.0000000 0.2130625 -0.89778146 -0.70142805  
## 18 0.1498180 -1.4068705 -0.9932203 -0.8742908 -0.48513656 -0.44446926  
## 19 0.1498180 -1.4068705 0.0000000 0.2130625 -0.89778146 -0.70142805  
## 25 0.1498180 -0.4773310 0.0000000 -0.4514312 -0.48513656 -0.95838683  
## 26 0.1498180 -1.4068705 -0.9932203 0.4546965 -0.48513656 -0.18751047  
## 30 0.1498180 -1.4068705 0.0000000 -0.3306142 -0.89778146 -0.44446926  
## 31 -0.3541153 -0.4773310 -0.9932203 -1.4179675 -0.89778146 -0.95838683  
## 32 0.1498180 -1.4068705 0.0000000 1.4212328 -0.89778146 0.06944832  
## 36 0.6537514 -1.4068705 0.9932203 0.6963306 -0.48513656 -0.70142805  
## 37 0.1498180 0.4522084 0.0000000 1.0587817 -0.27881412 -0.82990744  
## 38 0.1498180 -1.4068705 -0.9932203 0.2130625 -0.89778146 -0.18751047  
## 43 0.1498180 -0.4773310 0.0000000 0.2130625 -0.89778146 -0.70142805  
## 48 -0.3541153 -0.4773310 0.0000000 0.6963306 -0.07249167 0.06944832  
## 49 0.6537514 -0.4773310 0.0000000 0.3338795 -0.89778146 0.06944832  
## 67 0.1498180 -0.4773310 0.0000000 -1.1159249 -0.48513656 -1.47230441  
## 74 0.1498180 -1.4068705 0.0000000 -0.2702057 -0.89778146 -0.44446926  
## 77 0.1498180 -0.4773310 0.0000000 0.4546965 -0.48513656 0.32640711  
## sugars potass vitamins shelf weight cups rating  
## 6 0.6634132 -0.4022862 -0.1818422 -1.4616799 -0.2008324 -0.3038480 -0.9165248  
## 7 1.5810314 -0.9666308 -0.1818422 -0.2598542 -0.2008324 0.7567534 -0.6553998  
## 11 1.1222223 -0.8960877 -0.1818422 -0.2598542 -0.2008324 -0.3038480 -1.7336066  
## 13 0.4340086 -0.7550015 -0.1818422 -0.2598542 -0.2008324 -0.3038480 -1.6067177  
## 15 1.3516269 -0.6139154 -0.1818422 -0.2598542 -0.2008324 0.7567534 -1.3991551  
## 18 1.1222223 -1.1077169 -0.1818422 -0.2598542 -0.2008324 0.7567534 -0.4695120  
## 19 1.3516269 -0.4728292 -0.1818422 -0.2598542 -0.2008324 0.7567534 -1.4233777  
## 25 1.3516269 -0.9666308 -0.1818422 -0.2598542 -0.2008324 0.7567534 -0.7242706  
## 26 0.8928177 -1.0371738 -0.1818422 -1.4616799 -0.2008324 -0.3038480 -0.7792531  
## 30 1.1222223 -1.0371738 -0.1818422 -0.2598542 -0.2008324 -0.3038480 -1.0222542  
## 31 1.8104360 -0.8255446 -0.1818422 -1.4616799 -0.2008324 0.2476647 -0.5073029  
## 32 0.4340086 -0.7550015 -0.1818422 -0.2598542 -0.2008324 -0.3038480 -1.3230814  
## 36 0.8928177 -0.7550015 -0.1818422 -0.2598542 -0.2008324 0.7567534 -1.4608034  
## 37 0.6634132 -0.1201139 -0.1818422 -1.4616799 -0.2008324 -0.3038480 -0.8051733  
## 38 0.8928177 -0.8960877 -0.1818422 -1.4616799 -0.2008324 2.1567472 -0.9711880  
## 43 1.1222223 -0.6139154 -0.1818422 -0.2598542 -0.2008324 0.7567534 -1.1142648  
## 48 -0.2542051 -0.1201139 -0.1818422 -1.4616799 -0.2008324 0.7567534 -0.1614556  
## 49 0.4340086 -0.8255446 -0.1818422 -0.2598542 -0.2008324 -0.6432404 -0.8869714  
## 67 1.8104360 -0.8255446 -0.1818422 -0.2598542 -0.2008324 -0.3038480 -0.7939263  
## 74 1.1222223 -1.0371738 -0.1818422 -0.2598542 -0.2008324 0.7567534 -1.0416692  
## 77 0.2046041 -0.5433723 -0.1818422 -1.4616799 -0.2008324 -0.3038480 -0.4406694  
## subgrp subgrp  
## 6 3 3  
## 7 3 3  
## 11 3 3  
## 13 3 3  
## 15 3 3  
## 18 3 3  
## 19 3 3  
## 25 3 3  
## 26 3 3  
## 30 3 3  
## 31 3 3  
## 32 3 3  
## 36 3 3  
## 37 3 3  
## 38 3 3  
## 43 3 3  
## 48 3 3  
## 49 3 3  
## 67 3 3  
## 74 3 3  
## 77 3 3

Clust[Clust$subgrp==4,]

## calories protein fat sodium fiber carbo  
## 9 -0.8580487 -0.4773310 0.0000000 0.45469653 0.75279812 0.06944832  
## 10 -0.8580487 0.4522084 -0.9932203 0.57551356 1.16544301 -0.44446926  
## 12 0.1498180 3.2408266 0.9932203 1.54204982 -0.07249167 0.58336590  
## 16 0.1498180 -0.4773310 -0.9932203 1.42123279 -0.89778146 1.86815984  
## 17 -0.3541153 -0.4773310 -0.9932203 1.54204982 -0.48513656 1.61120105  
## 22 0.1498180 -0.4773310 -0.9932203 0.69633060 -0.48513656 1.61120105  
## 24 -0.3541153 -0.4773310 -0.9932203 0.33387950 -0.48513656 0.84032469  
## 27 -0.3541153 0.4522084 -0.9932203 -1.96164410 0.34015322 -0.18751047  
## 33 -0.3541153 0.4522084 0.0000000 -0.27020566 0.34015322 0.06944832  
## 34 0.1498180 0.4522084 -0.9932203 0.09224544 0.34015322 0.58336590  
## 39 0.1498180 -0.4773310 0.0000000 0.09224544 -0.48513656 0.58336590  
## 41 0.1498180 -0.4773310 0.0000000 1.17959872 -0.89778146 1.61120105  
## 44 -0.3541153 1.3817478 0.0000000 -1.96164410 -0.89778146 0.32640711  
## 51 -0.8580487 0.4522084 -0.9932203 0.09224544 0.34015322 0.84032469  
## 54 -0.3541153 0.4522084 -0.9932203 1.90450091 -0.48513656 1.35424227  
## 55 -2.8737823 -1.4068705 -0.9932203 -1.96164410 -0.89778146 -0.44446926  
## 56 -2.8737823 -0.4773310 -0.9932203 -1.96164410 -0.48513656 -1.21534562  
## 61 -0.8580487 -0.4773310 -0.9932203 -1.96164410 -0.07249167 0.06944832  
## 62 0.1498180 -1.4068705 -0.9932203 0.93796466 -0.89778146 2.12511863  
## 63 0.1498180 -0.4773310 -0.9932203 1.54204982 -0.89778146 1.86815984  
## 64 -1.3619821 -0.4773310 -0.9932203 -1.96164410 0.34015322 0.32640711  
## 65 -0.8580487 0.4522084 -0.9932203 -1.96164410 0.75279812 1.09728348  
## 66 -0.8580487 0.4522084 -0.9932203 -1.96164410 0.34015322 1.35424227  
## 68 0.1498180 3.2408266 -0.9932203 0.81714763 -0.48513656 0.32640711  
## 69 -0.8580487 -0.4773310 -0.9932203 -1.78041856 0.34015322 0.06944832  
## 70 0.1498180 -0.4773310 0.0000000 0.45469653 -0.89778146 1.61120105  
## 72 -0.3541153 0.4522084 0.0000000 0.45469653 0.34015322 0.32640711  
## 73 0.1498180 -0.4773310 0.0000000 1.05878169 -0.89778146 1.61120105  
## 75 -0.3541153 0.4522084 0.0000000 0.81714763 0.34015322 0.58336590  
## 76 -0.3541153 0.4522084 0.0000000 0.45469653 0.34015322 0.58336590  
## sugars potass vitamins shelf weight cups  
## 9 -0.25420505 0.37368763 -0.1818422 -1.4616799 -0.2008324 -0.64324039  
## 10 -0.48360961 1.29074758 -0.1818422 0.9419715 -0.2008324 -0.64324039  
## 12 -1.40122785 0.09151534 -0.1818422 -1.4616799 -0.2008324 1.81735475  
## 16 -0.94241873 -1.03717383 -0.1818422 -1.4616799 -0.2008324 0.75675340  
## 17 -1.17182329 -0.89608768 -0.1818422 -1.4616799 -0.2008324 0.75675340  
## 22 -0.94241873 -0.96663076 -0.1818422 0.9419715 -0.2008324 0.75675340  
## 24 -0.48360961 -0.26120003 -0.1818422 0.9419715 -0.2008324 -0.30384795  
## 27 -0.02480049 0.02097226 -0.1818422 -0.2598542 -0.2008324 -0.09172768  
## 33 -0.48360961 -0.19065695 -0.1818422 0.9419715 -0.2008324 0.24766475  
## 34 -0.94241873 -0.12011388 -0.1818422 0.9419715 -0.2008324 -2.42505066  
## 39 -0.25420505 -0.54337232 3.1822385 0.9419715 -0.2008324 0.75675340  
## 41 -0.94241873 -0.82554461 -0.1818422 -0.2598542 -0.2008324 2.87795610  
## 44 -0.94241873 -0.04957081 -0.1818422 -0.2598542 -0.2008324 0.75675340  
## 51 -1.17182329 -0.12011388 -0.1818422 0.9419715 -0.2008324 0.75675340  
## 54 -0.94241873 -0.75500154 3.1822385 0.9419715 -0.2008324 0.75675340  
## 55 -1.63063240 -1.17825998 -1.3032024 0.9419715 -3.4599552 0.75675340  
## 56 -1.63063240 -0.68445846 -1.3032024 0.9419715 -3.4599552 0.75675340  
## 61 -0.25420505 0.16205841 -0.1818422 0.9419715 -0.2008324 -1.36444931  
## 62 -1.17182329 -0.96663076 -0.1818422 -1.4616799 -0.2008324 1.30826610  
## 63 -0.94241873 -0.89608768 -0.1818422 -1.4616799 -0.2008324 0.75675340  
## 64 -1.63063240 -0.04957081 -1.3032024 -1.4616799 -1.3089342 0.75675340  
## 65 -1.63063240 0.58531685 -1.3032024 -1.4616799 -0.2008324 -0.64324039  
## 66 -1.63063240 0.30314456 -1.3032024 -1.4616799 -0.2008324 -0.64324039  
## 68 -0.94241873 -0.61391539 -0.1818422 -1.4616799 -0.2008324 0.75675340  
## 69 -0.48360961 -0.12011388 -0.1818422 -0.2598542 -0.2008324 0.75675340  
## 70 -0.94241873 -0.89608768 3.1822385 0.9419715 -0.2008324 0.75675340  
## 72 -0.94241873 0.16205841 3.1822385 0.9419715 -0.2008324 0.75675340  
## 73 -0.94241873 -0.54337232 -0.1818422 0.9419715 -0.2008324 -0.30384795  
## 75 -0.94241873 0.23260148 -0.1818422 -1.4616799 -0.2008324 -0.64324039  
## 76 -0.94241873 0.16205841 -0.1818422 -1.4616799 -0.2008324 0.75675340  
## rating subgrp subgrp  
## 9 0.48087533 4 4  
## 10 0.77969576 4 4  
## 12 0.59807496 4 4  
## 16 -0.06603869 4 4  
## 17 0.24879639 4 4  
## 22 0.32235640 4 4  
## 24 0.13959735 4 4  
## 27 1.13821301 4 4  
## 33 0.69155685 4 4  
## 34 0.78377123 4 4  
## 39 -0.41671824 4 4  
## 41 -0.22308231 4 4  
## 44 0.88922515 4 4  
## 51 1.23068291 4 4  
## 54 -0.06186866 4 4  
## 55 1.31001152 4 4  
## 56 1.47030646 4 4  
## 61 0.92358705 4 4  
## 62 -0.02656845 4 4  
## 63 -0.12909114 4 4  
## 64 1.84299757 4 4  
## 65 2.28743193 4 4  
## 66 2.16834997 4 4  
## 68 0.76669214 4 4  
## 69 1.21081332 4 4  
## 70 -0.25168258 4 4  
## 72 0.30548275 4 4  
## 73 -0.23269772 4 4  
## 75 0.52841741 4 4  
## 76 0.65701831 4 4

#here we calculate the mean rating in order determine the healthy cluster cereals  
mean(Clust[Clust$subgrp==1,"rating"])

## [1] 2.242648

mean(Clust[Clust$subgrp==2,"rating"])

## [1] -0.2928786

mean(Clust[Clust$subgrp==3,"rating"])

## [1] -0.9636465

mean(Clust[Clust$subgrp==4,"rating"])

## [1] 0.6455402