Assignment 5 FML

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2023-04-16

```r
library(cluster)
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
```

```r
library(caret)
```

```
## Loading required package: ggplot2
```

```
## Loading required package: lattice
```

```r
library(dendextend)
```

```
##
## ---------------------
## Welcome to dendextend version 1.16.0
## 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/i
ssues
## 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(knitr)
library(factoextra)
```

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

```
library(readr)
```

#Importing the dataset

```
Cereals <- read.csv("C:/Users/ADMIN/Downloads/Cereals.csv")
```

```
head(Cereals)
```

```
##                         name mfr type calories protein fat sodium fiber carbo
## 1                  100%_Bran   N    C       70       4   1    130  10.0   5.0
## 2          100%_Natural_Bran   Q    C      120       3   5     15   2.0   8.0
## 3                   All-Bran   K    C       70       4   1    260   9.0   7.0
## 4 All-Bran_with_Extra_Fiber   K    C       50       4   0    140  14.0   8.0
## 5             Almond_Delight   R    C      110       2   2    200   1.0  14.0
## 6   Apple_Cinnamon_Cheerios   G    C      110       2   2    180   1.5  10.5
##   sugars potass vitamins shelf weight cups   rating
## 1      6    280       25     3      1 0.33 68.40297
## 2      8    135        0     3      1 1.00 33.98368
## 3      5    320       25     3      1 0.33 59.42551
## 4      0    330       25     3      1 0.50 93.70491
## 5      8     NA       25     3      1 0.75 34.38484
## 6     10     70       25     1      1 0.75 29.50954
```

```
dim(Cereals)
```

```
## [1] 77 16
```

#Omitting the NUll values

```
Cereals <- na.omit(Cereals)
dim(Cereals)
```

```
## [1] 74 16
```

```
head(Cereals)
```

```
##                          name mfr type calories protein fat sodium fiber carbo
## 1                   100%_Bran   N    C       70       4   1    130  10.0   5.0
## 2           100%_Natural_Bran   Q    C      120       3   5     15   2.0   8.0
## 3                    All-Bran   K    C       70       4   1    260   9.0   7.0
## 4 All-Bran_with_Extra_Fiber   K    C       50       4   0    140  14.0   8.0
## 6   Apple_Cinnamon_Cheerios   G    C      110       2   2    180   1.5  10.5
## 7                 Apple_Jacks   K    C      110       2   0    125   1.0  11.0
##   sugars potass vitamins shelf weight cups   rating
## 1      6    280       25     3      1 0.33 68.40297
## 2      8    135        0     3      1 1.00 33.98368
## 3      5    320       25     3      1 0.33 59.42551
## 4      0    330       25     3      1 0.50 93.70491
## 6     10     70       25     1      1 0.75 29.50954
## 7     14     30       25     2      1 1.00 33.17409
```

#Creating a dataset with the Numeric Values

```
df1<- data.frame(Cereals[,4:16])
df2<- na.omit(df1)
```

#Normalizing the data

```
df1 <- scale(df1)
head(df1)
```

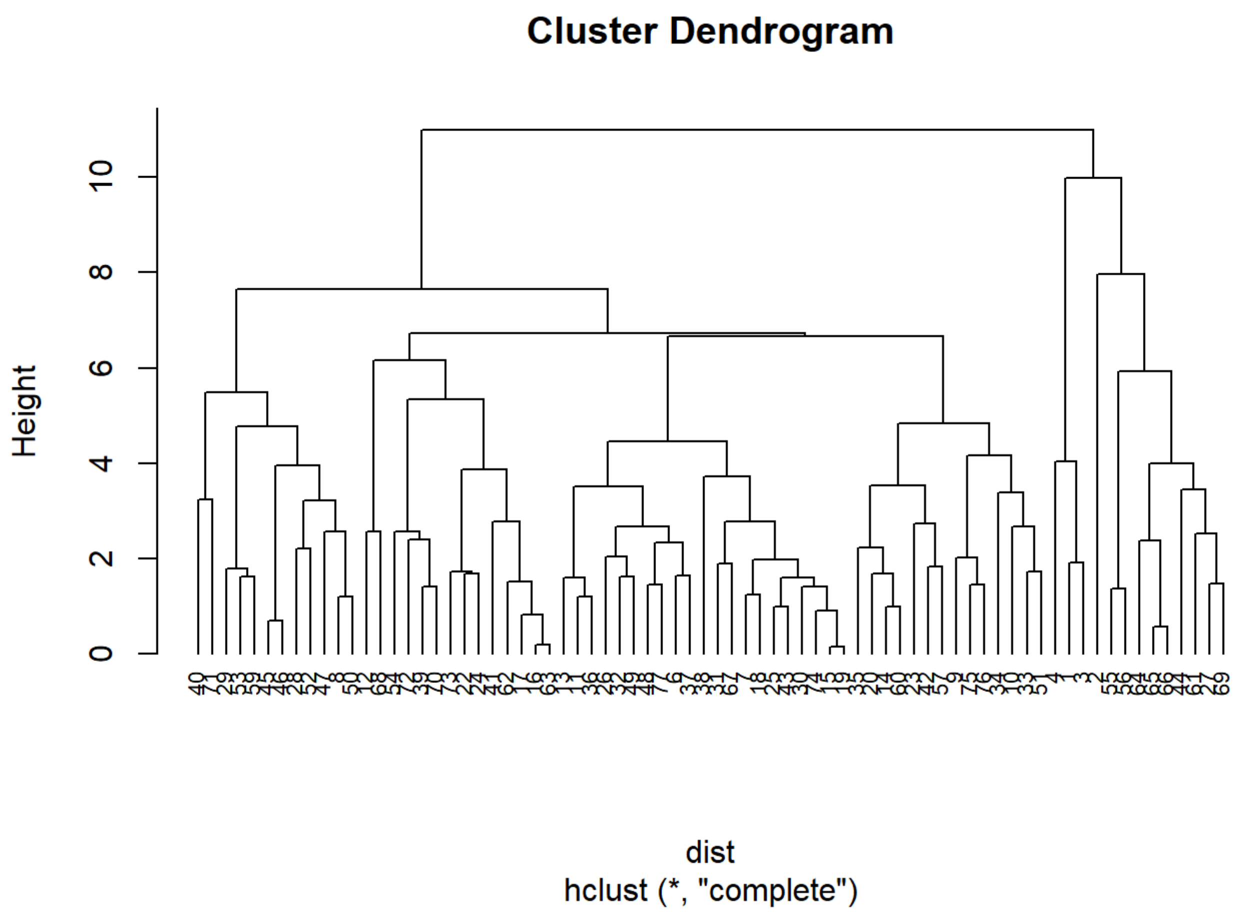
```
##     calories    protein        fat     sodium       fiber      carbo     sugars
## 1 -1.8659155  1.3817478  0.0000000 -0.3910227  3.22866747 -2.5001396 -0.2542051
## 2  0.6537514  0.4522084  3.9728810 -1.7804186 -0.07249167 -1.7292632  0.2046041
## 3 -1.8659155  1.3817478  0.0000000  1.1795987  2.81602258 -1.9862220 -0.4836096
## 4 -2.8737823  1.3817478 -0.9932203 -0.2702057  4.87924705 -1.7292632 -1.6306324
## 6  0.1498180 -0.4773310  0.9932203  0.2130625 -0.27881412 -1.0868662  0.6634132
## 7  0.1498180 -0.4773310 -0.9932203 -0.4514312 -0.48513656 -0.9583868  1.5810314
##       potass   vitamins      shelf     weight       cups     rating
## 1  2.5605229 -0.1818422  0.9419715 -0.2008324 -2.0856582  1.8549038
## 2  0.5147738 -1.3032024  0.9419715 -0.2008324  0.7567534 -0.5977113
## 3  3.1248675 -0.1818422  0.9419715 -0.2008324 -2.0856582  1.2151965
## 4  3.2659536 -0.1818422  0.9419715 -0.2008324 -1.3644493  3.6578436
## 6 -0.4022862 -0.1818422 -1.4616799 -0.2008324 -0.3038480 -0.9165248
## 7 -0.9666308 -0.1818422 -0.2598542 -0.2008324  0.7567534 -0.6553998
```

#Applying hierarchical clustering using Euclidean distance method.

```
dist <- dist(df1, method= "euclidean")
Hist_clust <- hclust(dist, method = "complete")
```

#Plotting of the dendogram

```
plot(Hist_clust, cex = 0.7, hang = -1)
```



#Using Agnes function to perform clustering with single linkage, complete linkage average linkage and Ward.

```
hc_single <- agnes(df1, method = "single")
hc_complete <- agnes(df1, method = "complete")
hc_average <- agnes(df1, method = "average")
hc_ward <- agnes(df1, method ="ward")
```

#Determining the best method

```
print(hc_single$ac)
```

```
## [1] 0.6067859
```

```
print(hc_complete$ac)
```

```
## [1] 0.8353712
```

```
print(hc_average$ac)
```

```
## [1] 0.7766075
```

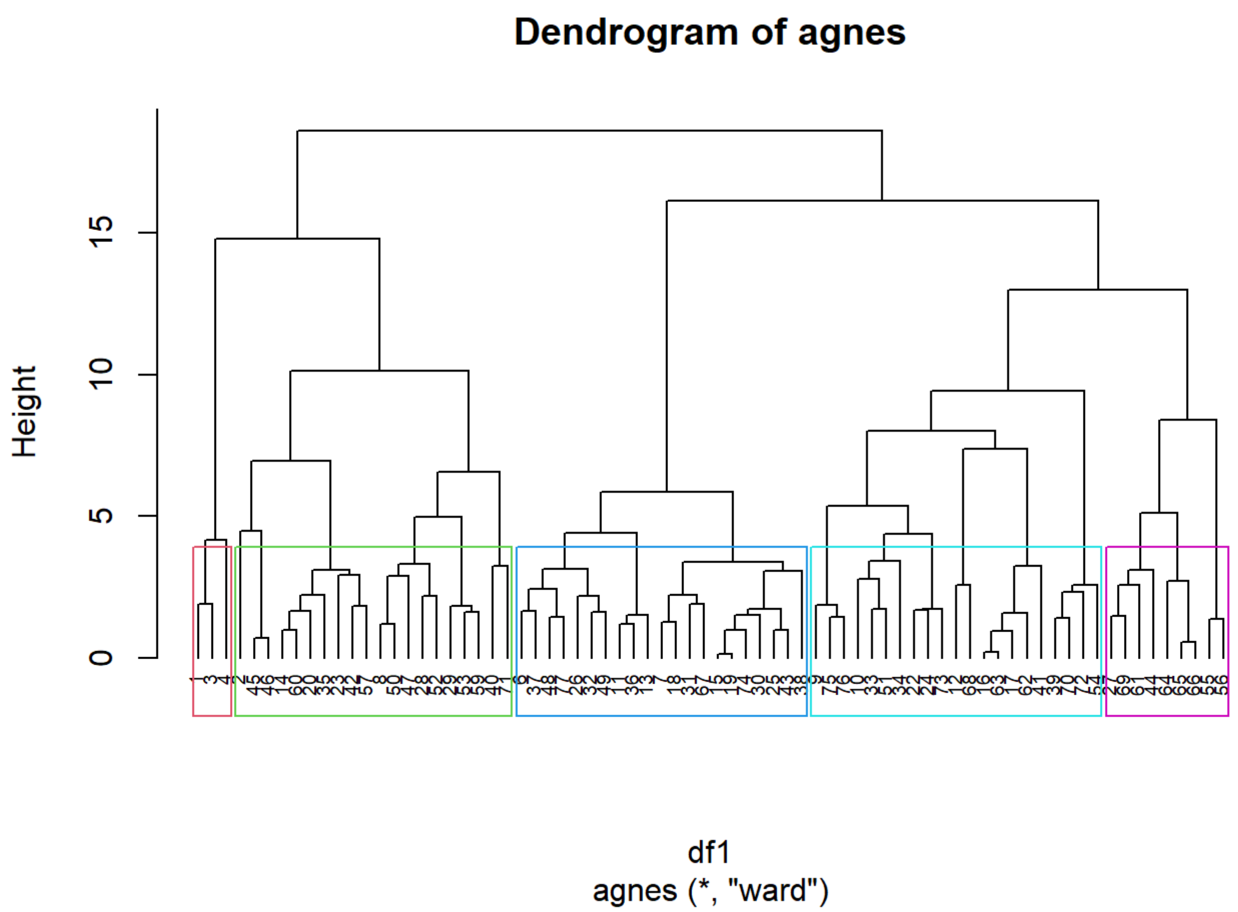
```
print(hc_ward$ac)
```

```
## [1] 0.9046042
```

```
#The ward method is the best as compared to the other methods with a value of 0.9046042
```

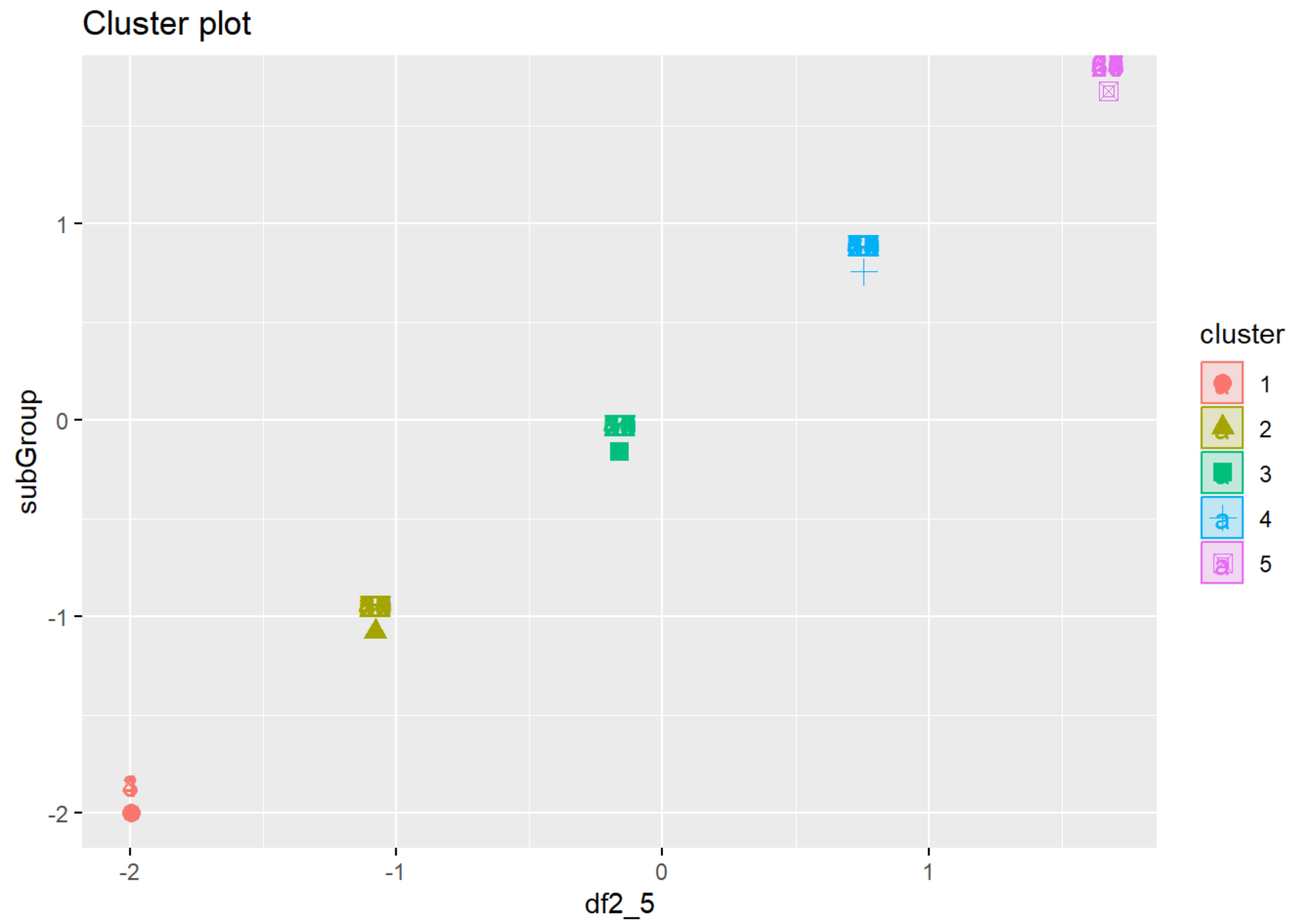
#Choosing the number of clusters

```
pltree(hc_ward, cex = 0.6, hang = -1, main = "Dendrogram of agnes")
df2_5<-cutree(hc_ward, k = 5)
rect.hclust(hc_ward , k=5, border = 2:7)
```




```
subGroup <- cutree(hc_ward, k=5)
```

```
df2_5 <- as.data.frame(cbind(df2_5,subGroup))
fviz_cluster(list(data=df2_5, cluster = subGroup))
```



#Creating Partitions

```
set.seed(123)
df_A <- df2 [1:55,]
df_B <- df2 [56:74,]
```

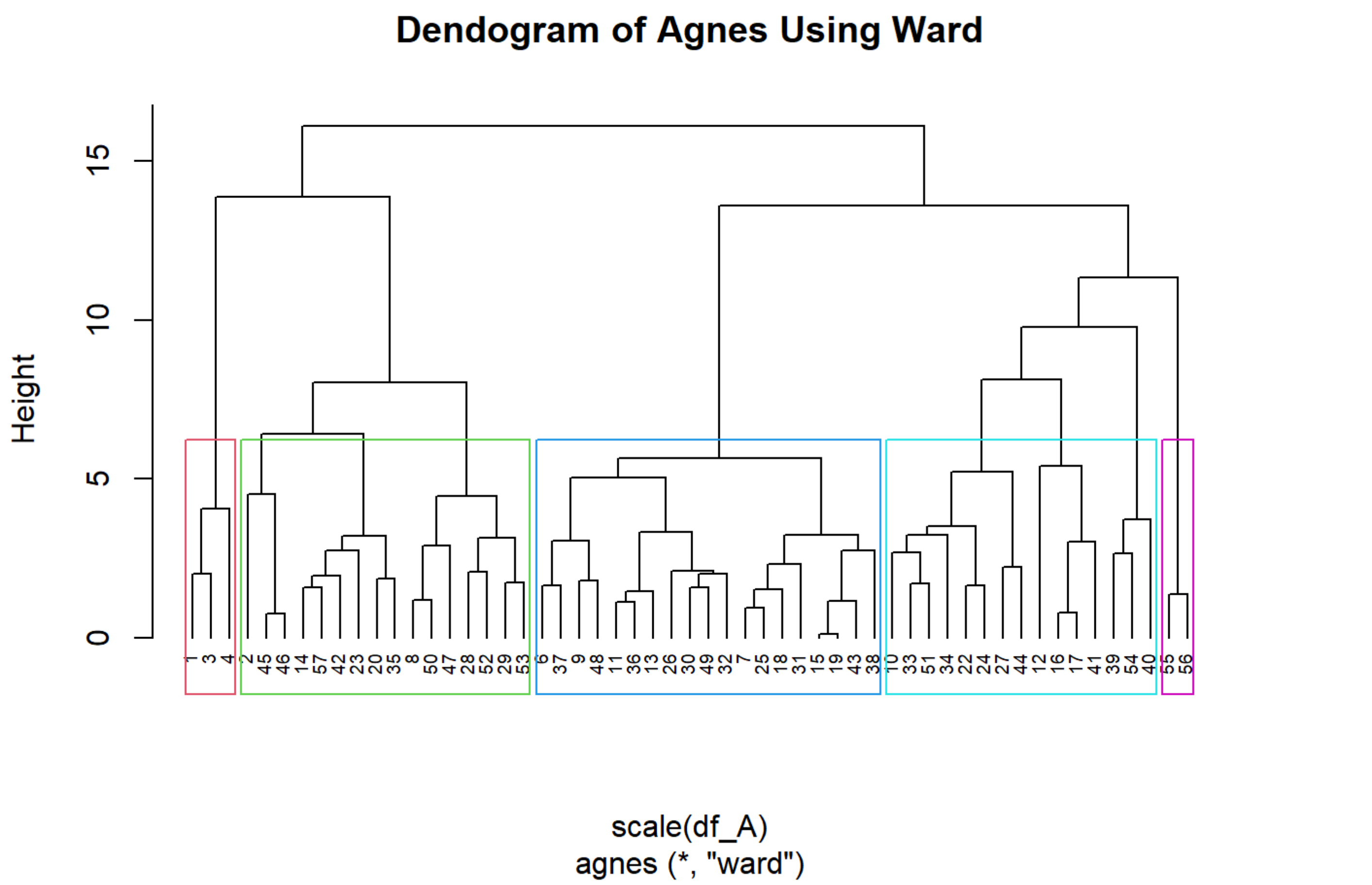
#Performing Hierarchial Clustering,considering k = 5.

```
Ag_single <- agnes(scale(df_A), method = "single")
Ag_complete <- agnes(scale(df_A), method = "complete")
Ag_average <- agnes(scale(df_A), method = "average")
Ag_ward <- agnes(scale(df_A), method = "ward")
```

```
cbind(single= Ag_single$ac , complete=Ag_complete$ac , average= Ag_average$ac , ward= Ag_ward
$ac)
```

```
##         single  complete   average      ward
## [1,] 0.6564842 0.8120228 0.7449303 0.8808195
```

```
pltree(Ag_ward, cex = 0.6, hang = -1, main = "Dendogram of Agnes Using Ward")
rect.hclust(Ag_ward, k = 5, border = 2:7)
```




```
cut2 <- cutree(Ag_ward, k = 5)
```

#Calculating the centroids.

```
Result <- as.data.frame(cbind(df_A, cut2))
Result[Result$cut2==1,]
```

```
##   calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 1       70       4   1    130    10     5      6    280       25     3      1
## 3       70       4   1    260     9     7      5    320       25     3      1
## 4       50       4   0    140    14     8      0    330       25     3      1
##   cups   rating cut2
## 1 0.33 68.40297    1
## 3 0.33 59.42551    1
## 4 0.50 93.70491    1
```

```
Centroid1 <- colMeans(Result[Result$cut2==1,])
Result[Result$cut2==2,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 2       120       3   5     15   2.0   8.0      8    135        0     3   1.00
## 8       130       3   2    210   2.0  18.0      8    100       25     3   1.33
## 14      110       3   2    140   2.0  13.0      7    105       25     3   1.00
## 20      110       3   3    140   4.0  10.0      7    160       25     3   1.00
## 23      100       2   1    140   2.0  11.0     10    120       25     3   1.00
## 28      120       3   2    160   5.0  12.0     10    200       25     3   1.25
## 29      120       3   0    240   5.0  14.0     12    190       25     3   1.33
## 35      120       3   3     75   3.0  13.0      4    100       25     3   1.00
## 42      100       4   2    150   2.0  12.0      6     95       25     2   1.00
## 45      150       4   3     95   3.0  16.0     11    170       25     3   1.00
## 46      150       4   3    150   3.0  16.0     11    170       25     3   1.00
## 47      160       3   2    150   3.0  17.0     13    160       25     3   1.50
## 50      140       3   2    220   3.0  21.0      7    130       25     3   1.33
## 52      130       3   2    170   1.5  13.5     10    120       25     3   1.25
## 53      120       3   1    200   6.0  11.0     14    260       25     3   1.33
## 57      100       4   1    135   2.0  14.0      6    110       25     3   1.00
##    cups   rating cut2
## 2  1.00 33.98368    2
## 8  0.75 37.03856    2
## 14 0.50 40.40021    2
## 20 0.50 40.44877    2
## 23 0.75 36.17620    2
## 28 0.67 40.91705    2
## 29 0.67 41.01549    2
## 35 0.33 45.81172    2
## 42 0.67 45.32807    2
## 45 1.00 37.13686    2
## 46 1.00 34.13976    2
## 47 0.67 30.31335    2
## 50 0.67 40.69232    2
## 52 0.50 30.45084    2
## 53 0.67 37.84059    2
## 57 0.50 49.51187    2
```

```
Centroid2 <- colMeans(Result[Result$cut2==2,])
Result[Result$cut2==3,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 6       110       2   2    180   1.5  10.5     10     70       25     1      1
## 7       110       2   0    125   1.0  11.0     14     30       25     2      1
## 9        90       2   1    200   4.0  15.0      6    125       25     1      1
## 11      120       1   2    220   0.0  12.0     12     35       25     2      1
## 13      120       1   3    210   0.0  13.0      9     45       25     2      1
## 15      110       1   1    180   0.0  12.0     13     55       25     2      1
## 18      110       1   0     90   1.0  13.0     12     20       25     2      1
## 19      110       1   1    180   0.0  12.0     13     65       25     2      1
## 25      110       2   1    125   1.0  11.0     13     30       25     2      1
## 26      110       1   0    200   1.0  14.0     11     25       25     1      1
## 30      110       1   1    135   0.0  13.0     12     25       25     2      1
## 31      100       2   0     45   0.0  11.0     15     40       25     1      1
## 32      110       1   1    280   0.0  15.0      9     45       25     2      1
## 36      120       1   2    220   1.0  12.0     11     45       25     2      1
## 37      110       3   1    250   1.5  11.5     10     90       25     1      1
## 38      110       1   0    180   0.0  14.0     11     35       25     1      1
## 43      110       2   1    180   0.0  12.0     12     55       25     2      1
## 48      100       2   1    220   2.0  15.0      6     90       25     1      1
## 49      120       2   1    190   0.0  15.0      9     40       25     2      1
##    cups   rating cut2
## 6  0.75 29.50954    3
## 7  1.00 33.17409    3
## 9  0.67 49.12025    3
## 11 0.75 18.04285    3
## 13 0.75 19.82357    3
## 15 1.00 22.73645    3
## 18 1.00 35.78279    3
## 19 1.00 22.39651    3
## 25 1.00 32.20758    3
## 26 0.75 31.43597    3
## 30 0.75 28.02576    3
## 31 0.88 35.25244    3
## 32 0.75 23.80404    3
## 36 1.00 21.87129    3
## 37 0.75 31.07222    3
## 38 1.33 28.74241    3
## 43 1.00 26.73451    3
## 48 1.00 40.10596    3
## 49 0.67 29.92429    3
```

```
Centroid3 <- colMeans(Result[Result$cut2==3,])
Result[Result$cut2==4,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 10       90       3   0    210     5    13      5    190       25     3    1.0
## 12      110       6   2    290     2    17      1    105       25     1    1.0
## 16      110       2   0    280     0    22      3     25       25     1    1.0
## 17      100       2   0    290     1    21      2     35       25     1    1.0
## 22      110       2   0    220     1    21      3     30       25     3    1.0
## 24      100       2   0    190     1    18      5     80       25     3    1.0
## 27      100       3   0      0     3    14      7    100       25     2    1.0
## 33      100       3   1    140     3    15      5     85       25     3    1.0
## 34      110       3   0    170     3    17      3     90       25     3    1.0
## 39      110       2   1    170     1    17      6     60      100     3    1.0
## 40      140       3   1    170     2    20      9     95      100     3    1.3
## 41      110       2   1    260     0    21      3     40       25     2    1.0
## 44      100       4   1      0     0    16      3     95       25     2    1.0
## 51       90       3   0    170     3    18      2     90       25     3    1.0
## 54      100       3   0    320     1    20      3     45      100     3    1.0
##    cups   rating cut2
## 10 0.67 53.31381    4
## 12 1.25 50.76500    4
## 16 1.00 41.44502    4
## 17 1.00 45.86332    4
## 22 1.00 46.89564    4
## 24 0.75 44.33086    4
## 27 0.80 58.34514    4
## 33 0.88 52.07690    4
## 34 0.25 53.37101    4
## 39 1.00 36.52368    4
## 40 0.75 36.47151    4
## 41 1.50 39.24111    4
## 44 1.00 54.85092    4
## 51 1.00 59.64284    4
## 54 1.00 41.50354    4
```

```
Centroid4 <- colMeans(Result[Result$cut2==4,])
Centroids <- rbind(Centroid1, Centroid2, Centroid3, Centroid4)
x2 <- as.data.frame(rbind(Centroids[,-14], df_B))
```

#Calculating the Distance.

```
Dist1 <- get_dist(x2)

Matrix <- as.matrix(Dist1)

data.frame <- data.frame(data=seq(1,nrow(df_B),1), Clusters = rep(0,nrow(df_B)))

for(i in 1:nrow(df_B))
{data.frame[i,2] <- which.min(Matrix[i+4, 1:4])}
data.frame
```

```
##    data Clusters
## 1     1        1
## 2     2        2
## 3     3        2
## 4     4        3
## 5     5        4
## 6     6        2
## 7     7        2
## 8     8        2
## 9     9        3
## 10   10        4
## 11   11        2
## 12   12        4
## 13   13        2
## 14   14        4
## 15   15        4
## 16   16        3
## 17   17        4
## 18   18        4
## 19   19        3
```

```
cbind(df2$SubGroup[51:74], data.frame$Clusters)
```

```
##       [,1]
##  [1,]    1
##  [2,]    2
##  [3,]    2
##  [4,]    3
##  [5,]    4
##  [6,]    2
##  [7,]    2
##  [8,]    2
##  [9,]    3
## [10,]    4
## [11,]    2
## [12,]    4
## [13,]    2
## [14,]    4
## [15,]    4
## [16,]    3
## [17,]    4
## [18,]    4
## [19,]    3
```

```
table(df2$SubGroup[51:74] == data.frame$Clusters)
```

```
## < table of extent 0 >
```

```
#We can conclude that it is partially stable.
```

#Clustering Healthy Cereals.

```
Healthy_Cereals <- Cereals
Healthy_Cereals_na <- na.omit(Healthy_Cereals)
Clusthealthy <- cbind(Healthy_Cereals_na, subGroup)

Clusthealthy[Clusthealthy$subGroup==1,]
```

```
##                         name mfr type calories protein fat sodium fiber carbo
## 1                  100%_Bran   N    C       70       4   1    130    10     5
## 3                   All-Bran   K    C       70       4   1    260     9     7
## 4 All-Bran_with_Extra_Fiber   K    C       50       4   0    140    14     8
##   sugars potass vitamins shelf weight cups   rating subGroup
## 1      6    280       25     3      1 0.33 68.40297        1
## 3      5    320       25     3      1 0.33 59.42551        1
## 4      0    330       25     3      1 0.50 93.70491        1
```

```
Clusthealthy[Clusthealthy$subGroup==2,]
```

```
##                                       name mfr type calories protein fat sodium
## 2                        100%_Natural_Bran   Q    C      120       3   5     15
## 8                                  Basic_4   G    C      130       3   2    210
## 14                                Clusters   G    C      110       3   2    140
## 20                      Cracklin'_Oat_Bran   K    C      110       3   3    140
## 23                  Crispy_Wheat_&_Raisins   G    C      100       2   1    140
## 28 Fruit_&_Fibre_Dates,_Walnuts,_and_Oats   P    C      120       3   2    160
## 29                           Fruitful_Bran   K    C      120       3   0    240
## 35                      Great_Grains_Pecan   P    C      120       3   3     75
## 40                  Just_Right_Fruit_&_Nut   K    C      140       3   1    170
## 42                                    Life   Q    C      100       4   2    150
## 45       Muesli_Raisins,_Dates,_&_Almonds   R    C      150       4   3     95
## 46      Muesli_Raisins,_Peaches,_&_Pecans   R    C      150       4   3    150
## 47                     Mueslix_Crispy_Blend   K    C      160       3   2    150
## 50               Nutri-Grain_Almond-Raisin   K    C      140       3   2    220
## 52                     Oatmeal_Raisin_Crisp   G    C      130       3   2    170
## 53                    Post_Nat._Raisin_Bran   P    C      120       3   1    200
## 57                      Quaker_Oat_Squares   Q    C      100       4   1    135
## 59                             Raisin_Bran   K    C      120       3   1    210
## 60                         Raisin_Nut_Bran   G    C      100       3   2    140
## 71                       Total_Raisin_Bran   G    C      140       3   1    190
##    fiber carbo sugars potass vitamins shelf weight cups   rating subGroup
## 2    2.0   8.0      8    135        0     3   1.00 1.00 33.98368        2
## 8    2.0  18.0      8    100       25     3   1.33 0.75 37.03856        2
## 14   2.0  13.0      7    105       25     3   1.00 0.50 40.40021        2
## 20   4.0  10.0      7    160       25     3   1.00 0.50 40.44877        2
## 23   2.0  11.0     10    120       25     3   1.00 0.75 36.17620        2
## 28   5.0  12.0     10    200       25     3   1.25 0.67 40.91705        2
## 29   5.0  14.0     12    190       25     3   1.33 0.67 41.01549        2
## 35   3.0  13.0      4    100       25     3   1.00 0.33 45.81172        2
## 40   2.0  20.0      9     95      100     3   1.30 0.75 36.47151        2
## 42   2.0  12.0      6     95       25     2   1.00 0.67 45.32807        2
## 45   3.0  16.0     11    170       25     3   1.00 1.00 37.13686        2
## 46   3.0  16.0     11    170       25     3   1.00 1.00 34.13976        2
## 47   3.0  17.0     13    160       25     3   1.50 0.67 30.31335        2
## 50   3.0  21.0      7    130       25     3   1.33 0.67 40.69232        2
## 52   1.5  13.5     10    120       25     3   1.25 0.50 30.45084        2
## 53   6.0  11.0     14    260       25     3   1.33 0.67 37.84059        2
## 57   2.0  14.0      6    110       25     3   1.00 0.50 49.51187        2
## 59   5.0  14.0     12    240       25     2   1.33 0.75 39.25920        2
## 60   2.5  10.5      8    140       25     3   1.00 0.50 39.70340        2
## 71   4.0  15.0     14    230      100     3   1.50 1.00 28.59278        2
```

```
Clusthealthy[Clusthealthy$subGroup==3,]
```

```
##                         name mfr type calories protein fat sodium fiber carbo
## 6  Apple_Cinnamon_Cheerios   G    C      110       2   2    180   1.5  10.5
## 7              Apple_Jacks   K    C      110       2   0    125   1.0  11.0
## 11            Cap'n'Crunch   Q    C      120       1   2    220   0.0  12.0
## 13    Cinnamon_Toast_Crunch  G    C      120       1   3    210   0.0  13.0
## 15             Cocoa_Puffs   G    C      110       1   1    180   0.0  12.0
## 18               Corn_Pops   K    C      110       1   0     90   1.0  13.0
## 19           Count_Chocula   G    C      110       1   1    180   0.0  12.0
## 25             Froot_Loops   K    C      110       2   1    125   1.0  11.0
## 26          Frosted_Flakes   K    C      110       1   0    200   1.0  14.0
## 30          Fruity_Pebbles   P    C      110       1   1    135   0.0  13.0
## 31            Golden_Crisp   P    C      100       2   0     45   0.0  11.0
## 32          Golden_Grahams   G    C      110       1   1    280   0.0  15.0
## 36         Honey_Graham_Ohs  Q    C      120       1   2    220   1.0  12.0
## 37      Honey_Nut_Cheerios   G    C      110       3   1    250   1.5  11.5
## 38              Honey-comb   P    C      110       1   0    180   0.0  14.0
## 43            Lucky_Charms   G    C      110       2   1    180   0.0  12.0
## 48     Multi-Grain_Cheerios  G    C      100       2   1    220   2.0  15.0
## 49        Nut&Honey_Crunch   K    C      120       2   1    190   0.0  15.0
## 67                  Smacks   K    C      110       2   1     70   1.0   9.0
## 74                    Trix   G    C      110       1   1    140   0.0  13.0
## 77      Wheaties_Honey_Gold  G    C      110       2   1    200   1.0  16.0
##    sugars potass vitamins shelf weight cups   rating subGroup
## 6      10     70       25     1      1 0.75 29.50954        3
## 7      14     30       25     2      1 1.00 33.17409        3
## 11     12     35       25     2      1 0.75 18.04285        3
## 13      9     45       25     2      1 0.75 19.82357        3
## 15     13     55       25     2      1 1.00 22.73645        3
## 18     12     20       25     2      1 1.00 35.78279        3
## 19     13     65       25     2      1 1.00 22.39651        3
## 25     13     30       25     2      1 1.00 32.20758        3
## 26     11     25       25     1      1 0.75 31.43597        3
## 30     12     25       25     2      1 0.75 28.02576        3
## 31     15     40       25     1      1 0.88 35.25244        3
## 32      9     45       25     2      1 0.75 23.80404        3
## 36     11     45       25     2      1 1.00 21.87129        3
## 37     10     90       25     1      1 0.75 31.07222        3
## 38     11     35       25     1      1 1.33 28.74241        3
## 43     12     55       25     2      1 1.00 26.73451        3
## 48      6     90       25     1      1 1.00 40.10596        3
## 49      9     40       25     2      1 0.67 29.92429        3
## 67     15     40       25     2      1 0.75 31.23005        3
## 74     12     25       25     2      1 1.00 27.75330        3
## 77      8     60       25     1      1 0.75 36.18756        3
```

```
Clusthealthy[Clusthealthy$subGroup==4,]
```

```
##                          name mfr type calories protein fat sodium fiber carbo
## 9                   Bran_Chex   R    C       90       2   1    200     4    15
## 10                Bran_Flakes   P    C       90       3   0    210     5    13
## 12                   Cheerios   G    C      110       6   2    290     2    17
## 16                  Corn_Chex   R    C      110       2   0    280     0    22
## 17                Corn_Flakes   K    C      100       2   0    290     1    21
## 22                    Crispix   K    C      110       2   0    220     1    21
## 24                Double_Chex   R    C      100       2   0    190     1    18
## 33          Grape_Nuts_Flakes   P    C      100       3   1    140     3    15
## 34                 Grape-Nuts   P    C      110       3   0    170     3    17
## 39 Just_Right_Crunchy__Nuggets   K    C      110       2   1    170     1    17
## 41                        Kix   G    C      110       2   1    260     0    21
## 51          Nutri-grain_Wheat   K    C       90       3   0    170     3    18
## 54                 Product_19   K    C      100       3   0    320     1    20
## 62                  Rice_Chex   R    C      110       1   0    240     0    23
## 63              Rice_Krispies   K    C      110       2   0    290     0    22
## 68                  Special_K   K    C      110       6   0    230     1    16
## 70          Total_Corn_Flakes   G    C      110       2   1    200     0    21
## 72          Total_Whole_Grain   G    C      100       3   1    200     3    16
## 73                    Triples   G    C      110       2   1    250     0    21
## 75                 Wheat_Chex   R    C      100       3   1    230     3    17
## 76                   Wheaties   G    C      100       3   1    200     3    17
##    sugars potass vitamins shelf weight cups   rating subGroup
## 9       6    125       25     1      1 0.67 49.12025        4
## 10      5    190       25     3      1 0.67 53.31381        4
## 12      1    105       25     1      1 1.25 50.76500        4
## 16      3     25       25     1      1 1.00 41.44502        4
## 17      2     35       25     1      1 1.00 45.86332        4
## 22      3     30       25     3      1 1.00 46.89564        4
## 24      5     80       25     3      1 0.75 44.33086        4
## 33      5     85       25     3      1 0.88 52.07690        4
## 34      3     90       25     3      1 0.25 53.37101        4
## 39      6     60      100     3      1 1.00 36.52368        4
## 41      3     40       25     2      1 1.50 39.24111        4
## 51      2     90       25     3      1 1.00 59.64284        4
## 54      3     45      100     3      1 1.00 41.50354        4
## 62      2     30       25     1      1 1.13 41.99893        4
## 63      3     35       25     1      1 1.00 40.56016        4
## 68      3     55       25     1      1 1.00 53.13132        4
## 70      3     35      100     3      1 1.00 38.83975        4
## 72      3    110      100     3      1 1.00 46.65884        4
## 73      3     60       25     3      1 0.75 39.10617        4
## 75      3    115       25     1      1 0.67 49.78744        4
## 76      3    110       25     1      1 1.00 51.59219        4
```

#Mean ratings to determine the best cluster.

```
mean(Clusthealthy[Clusthealthy$subGroup==1,"rating"])
```

```
## [1] 73.84446
```

```
mean(Clusthealthy[Clusthealthy$subGroup==2,"rating"])
```

```
## [1] 38.26161
```

```
mean(Clusthealthy[Clusthealthy$subGroup==3,"rating"])
```

```
## [1] 28.84825
```

```
mean(Clusthealthy[Clusthealthy$subGroup==4,"rating"])
```

```
## [1] 46.46513
```

```
#As cluster 1 has the greatest value, it can be concluded that it should be chosen. In light
of this, cluster 1 can be regarded as a Healthy Cluster.
```