Exploratory Data Analysis Clustering

Washim Ahmed

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Assignment 1 (A)

Write the R Program for the following steps.

(a)Load mtcars() dataframe

```
my_cars <- mtcars
head(my_cars)
```

```
##                   mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

(b) Add a column name qualCat, a new column which takes the value of A if mpg < 15 and B if mpg >=15

```
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
```

```
my_cars <- my_cars %>%
  mutate(qualCat = ifelse(mpg >= 15, "B", "A"))
head(my_cars,50)
```

```
##     mpg cyl  disp  hp drat    wt  qsec vs am gear carb qualCat
## 1  21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4       B
## 2  21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4       B
## 3  22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1       B
## 4  21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1       B
## 5  18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2       B
## 6  18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1       B
## 7  14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4       A
## 8  24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2       B
## 9  22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2       B
## 10 19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4       B
## 11 17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4       B
## 12 16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3       B
## 13 17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3       B
```

```
## 14 15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3       B
## 15 10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4       A
## 16 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4       A
## 17 14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4       A
## 18 32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1       B
## 19 30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2       B
## 20 33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1       B
## 21 21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1       B
## 22 15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2       B
## 23 15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2       B
## 24 13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4       A
## 25 19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2       B
## 26 27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1       B
## 27 26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2       B
## 28 30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2       B
## 29 15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4       B
## 30 19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6       B
## 31 15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8       B
## 32 21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2       B
```

(c) Save this data frame locally

```
write.csv(my_cars, file = "~/manipal_practice/mycars.csv") # Given my Unix system path
```

(d)Load this file on to RStudio and know the different types of variables

```
mycars <- read.csv("~/manipal_practice/mycars.csv")
str(mycars) # Display structure of variables with observations
```

```
## 'data.frame':    32 obs. of  13 variables:
##  $ X      : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ mpg    : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
##  $ cyl    : int  6 6 4 6 8 6 8 4 4 6 ...
##  $ disp   : num  160 160 108 258 360 ...
##  $ hp     : int  110 110 93 110 175 105 245 62 95 123 ...
##  $ drat   : num  3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
##  $ wt     : num  2.62 2.88 2.32 3.21 3.44 ...
##  $ qsec   : num  16.5 17 18.6 19.4 17 ...
##  $ vs     : int  0 0 1 1 0 1 0 1 1 1 ...
##  $ am     : int  1 1 1 0 0 0 0 0 0 0 ...
##  $ gear   : int  4 4 4 3 3 3 3 4 4 4 ...
##  $ carb   : int  4 4 1 1 2 1 4 2 2 4 ...
##  $ qualCat: Factor w/ 2 levels "A","B": 2 2 2 2 2 2 1 2 2 2 ...
```

```
summary(mycars) # Display summary
```

```
##        X                mpg              cyl              disp
##  Min.   : 1.00   Min.   :10.40   Min.   :4.000   Min.   : 71.1
##  1st Qu.: 8.75   1st Qu.:15.43   1st Qu.:4.000   1st Qu.:120.8
##  Median :16.50   Median :19.20   Median :6.000   Median :196.3
##  Mean   :16.50   Mean   :20.09   Mean   :6.188   Mean   :230.7
##  3rd Qu.:24.25   3rd Qu.:22.80   3rd Qu.:8.000   3rd Qu.:326.0
##  Max.   :32.00   Max.   :33.90   Max.   :8.000   Max.   :472.0
##        hp              drat             wt             qsec
##  Min.   : 52.0   Min.   :2.760   Min.   :1.513   Min.   :14.50
##  1st Qu.: 96.5   1st Qu.:3.080   1st Qu.:2.581   1st Qu.:16.89
##  Median :123.0   Median :3.695   Median :3.325   Median :17.71
```

```
##  Mean   :146.7   Mean   :3.597   Mean   :3.217   Mean   :17.85
##  3rd Qu.:180.0   3rd Qu.:3.920   3rd Qu.:3.610   3rd Qu.:18.90
##  Max.   :335.0   Max.   :4.930   Max.   :5.424   Max.   :22.90
##        vs               am              gear            carb       qualCat
##  Min.   :0.0000   Min.   :0.0000   Min.   :3.000   Min.   :1.000   A: 5
##  1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:3.000   1st Qu.:2.000   B:27
##  Median :0.0000   Median :0.0000   Median :4.000   Median :2.000
##  Mean   :0.4375   Mean   :0.4062   Mean   :3.688   Mean   :2.812
##  3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:4.000   3rd Qu.:4.000
##  Max.   :1.0000   Max.   :1.0000   Max.   :5.000   Max.   :8.000
```

```
colnames(mycars) # Display Columns
```

```
##  [1] "X"       "mpg"     "cyl"     "disp"    "hp"      "drat"    "wt"
##  [8] "qsec"    "vs"      "am"      "gear"    "carb"    "qualCat"
```

```
dim(mycars) # Display total observations and total variables
```

```
## [1] 32 13
```

Assignment 1 (B)

Write an R program for clustering the drinks.csv file using k-means clustering.

```
library(factoextra)
```

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

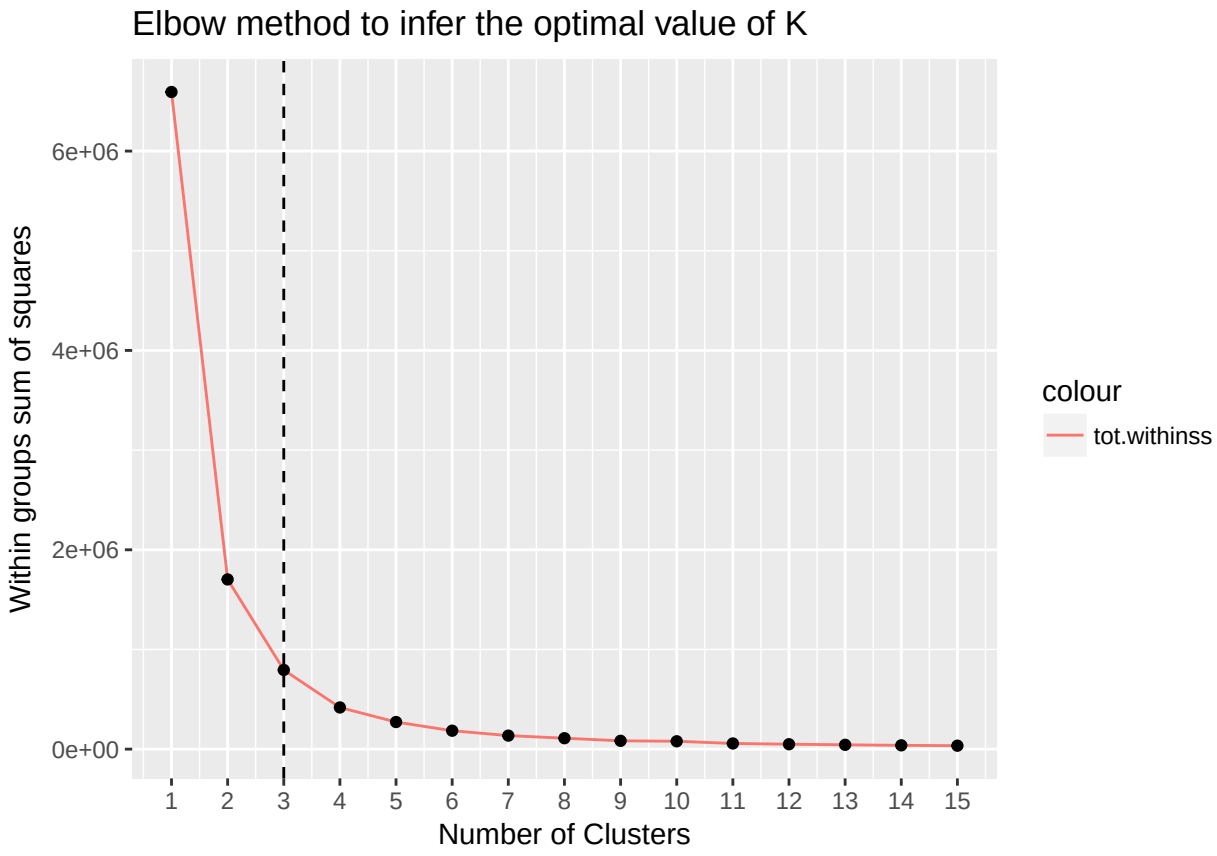
```
drinks <- read.csv(file = "~/manipal_practice/drinks.csv")
drinks <- na.omit(drinks)
set.seed(786)
cluster <- kmeans(drinks[-1], centers = 3)
fviz_cluster(cluster, data = drinks[-1], geom = "point", stand = FALSE)
```

Also use the elbow method to infer the optimal value of K

```
library(ggplot2)
drinks <- data.matrix(drinks)
maxk <- 15
wssdist <- sapply(1:maxk, function(y){
  k <- kmeans(drinks[-1], y, nstart = 10)
  return(k$tot.withinss)
})

distdf <- data.frame(cluster = 1:maxk, wssdist = wssdist)

g <- ggplot(data = distdf, aes(x = cluster, y = wssdist))
g <- g + geom_line(aes(color = "tot.withinss")) + geom_point()
g <- g + geom_vline(xintercept = 3, linetype = "dashed")
g <- g + ylab("Within groups sum of squares") + xlab("Number of Clusters")
g <- g + ggtitle("Elbow method to infer the optimal value of K")
g <- g + scale_x_continuous(breaks = 1:maxk)
g
```



Optimal value of K is 3