Data management

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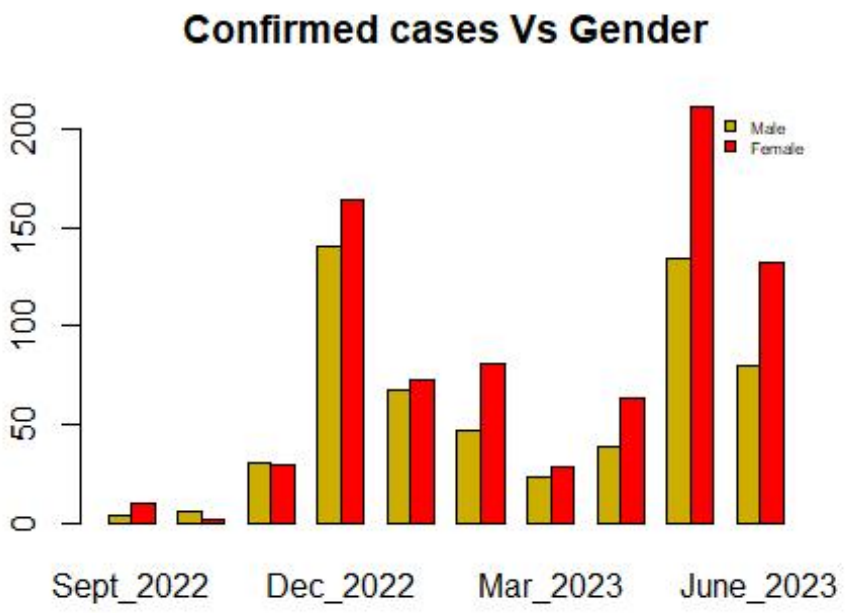
2025-10-01

Data Visualization and Data management

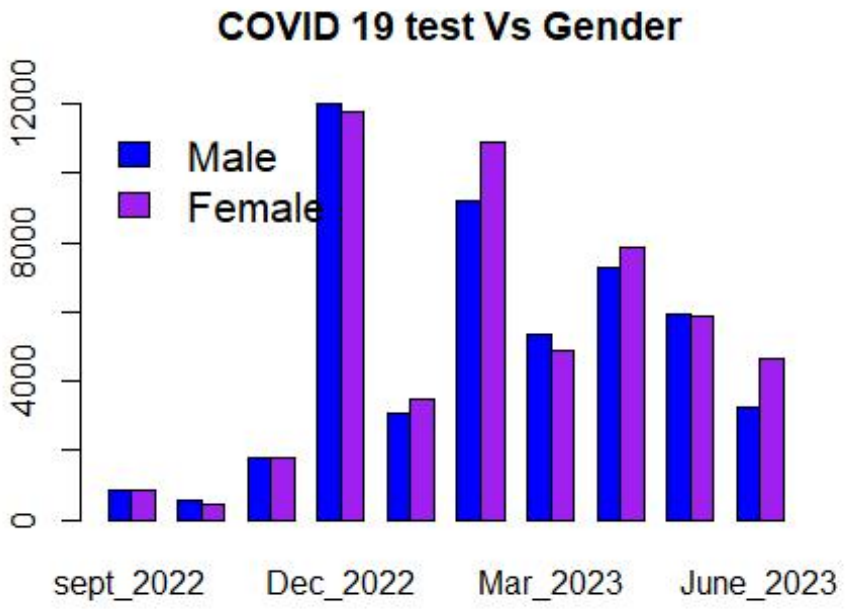
Test to treat data

```
data1<- read.table(text="Sept_2022 Oct_2022 Nov_2022 Dec_2022 Jan_2023
Feb_2023 Mar_2023 Apr_2023 May_2023 June_2023
1 4 6 30 140 67 47 23 39 134 80
2 10 2 29 164 72 81 28 63 211 132",header=TRUE)
barplot(as.matrix(data1),main="Confirmed cases Vs Gender",beside=TRUE,c
ol=c("gold3","red"))
legend("topright", c("Male","Female"),cex = 0.5,bty="n",fill = c("gold3
","red"))
```

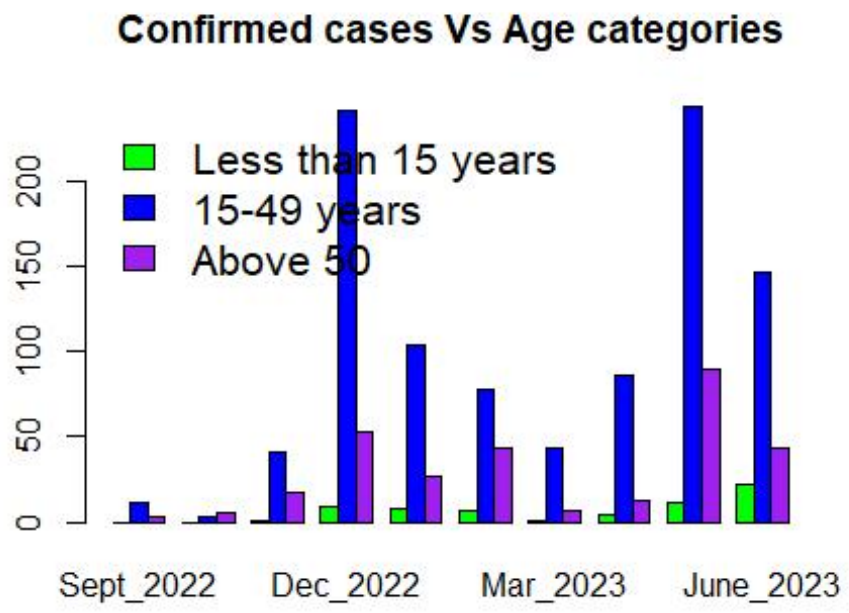



```
data3<- read.table(text="sept_2022 Oct_2022 Nov_2022 Dec_2022 Jan_2023
Feb_2023 Mar_2023 Apr_2023 May_2023 June_2023
1  867  582 1802    12003   3059    9205    5346    7269    5933    324
5
2  842  436 1805    11785   3508    10908   4902    7883    5901    464
6 ",header=TRUE)
```

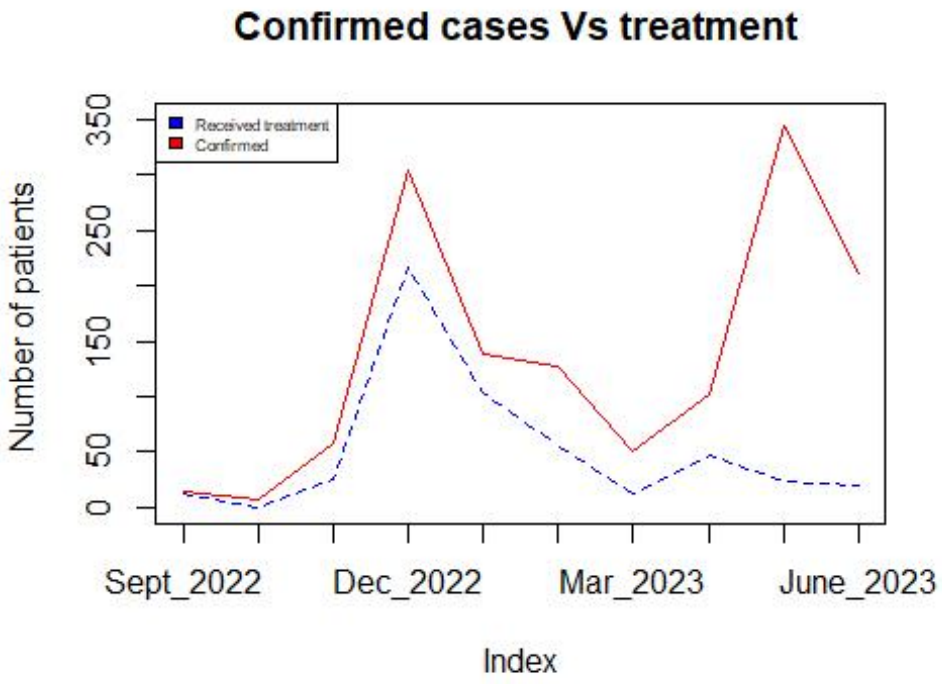
```
barplot(as.matrix(data3),main=" COVID 19 test Vs Gender",beside=TRUE,co
l=c("blue","purple"))
legend("topleft", c("Male","Female"),cex = 1.3,bty="n",fill = c("blue",
"purple"))
```



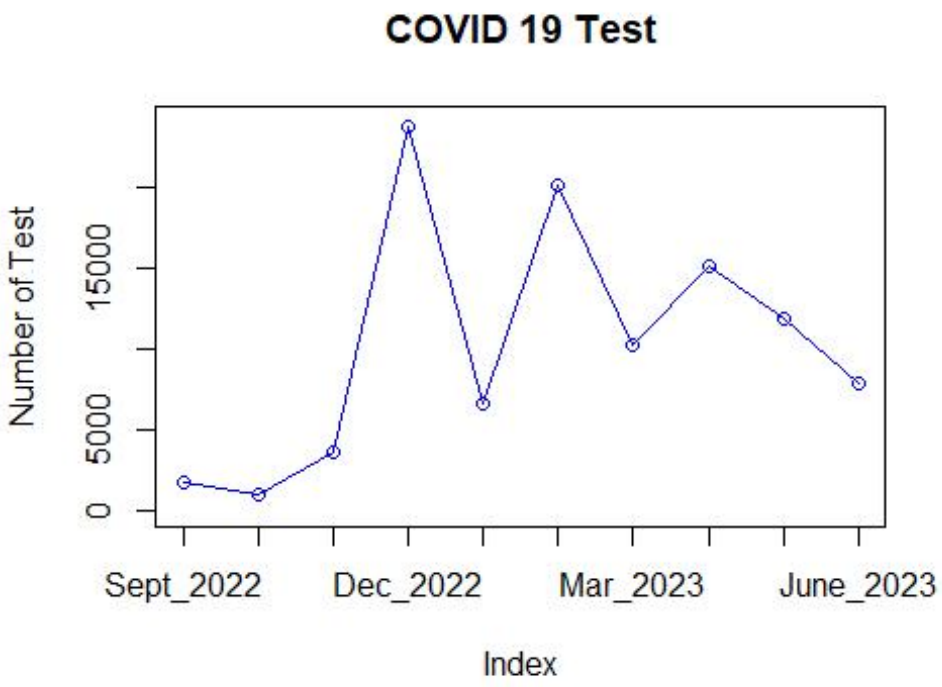

```
data2<- read.table(text="Sept_2022 Oct_2022 Nov_2022 Dec_2022 Jan_2023
Feb_2023 Mar_2023 Apr_2023 May_2023 June_2023
1 0 0 1 9 8 7 1 4 11 22
2 11 3 41 242 104 78 44 86 244 147
3 3 5 17 53 27 43 6 12 90 43 ",header=TRUE)
barplot(as.matrix(data2),main="Confirmed cases Vs Age categories",besid
e=TRUE,col=c("green","blue","purple"))
barplot(as.matrix(data2),main="Confirmed cases Vs Age categories",besid
e=TRUE,col=c("green","blue","purple"))
legend("topleft", c("Less than 15 years","15-49 years","Above 50"),cex
= 1.3,bty="n",fill = c("green","blue","purple"))
```




```
months<-c("Sept_2022","Oct_2022","Nov_2022","Dec_2022", "Jan_2023","Feb
_2023","Mar_2023","Apr_2023","May_2023","June_2023")
Confirmed_covid<-c(14,8,59,304,139,128,51,102,345,212)
plot(Confirmed_covid, type = "l",pch=21, col = "red",ylim=c(0,350),
     xaxt="n", ylab = "Number of patients ",
     main = "Confirmed cases Vs treatment ")
treatment<- c(12,0,26,217,104,57,12,47,23,20)

lines(treatment, col="blue",lty=2)

legend("topleft", legend=c("Received treatment", "Confirmed"),cex=0.5,
fill = c("blue","red"))
axis(1,at=1:10,lab=c("Sept_2022","Oct_2022","Nov_2022","Dec_2022", "Jan
_2023","Feb_2023","Mar_2023","Apr_2023","May_2023","June_2023"))
```




```
months<-c("sept_2022","Oct_2022","Nov_2022","Dec_2022", "Jan_2023","feb
_2023","Mar_2023","Apr_2023","May_2023", "June_2023")
number_of_test<-c(1709, 1018,   3607,23788,6567,20113,10248,15152,11834,
7891)
plot(number_of_test, type = "o", col = "blue",ylim=c(0,24000),
     xaxt="n", ylab = "Number of Test",
     main = "COVID 19 Test")
axis(1,at=1:10,lab=c("Sept_2022","Oct_2022","Nov_2022","Dec_2022", "Jan
_2023","Feb_2023","Mar_2023","Apr_2023","May_2023","June_2023"))
```



ggplot2

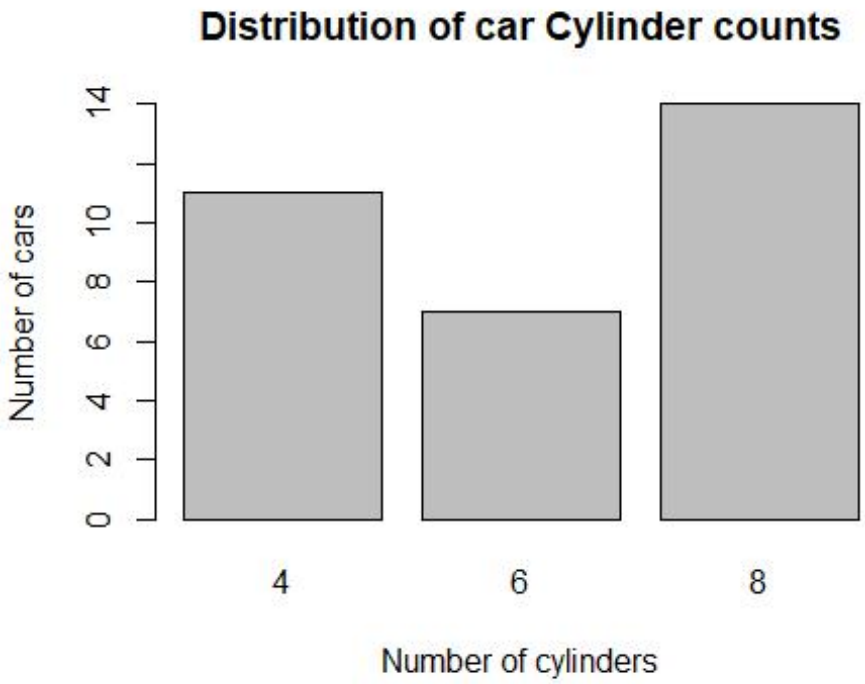
ggplot2 provides a set of tools that allows you to visualize complex data sets in a new creative way -some work need some packages to get done. -some of the graph are created using R's base graphics system

Library ggplot2

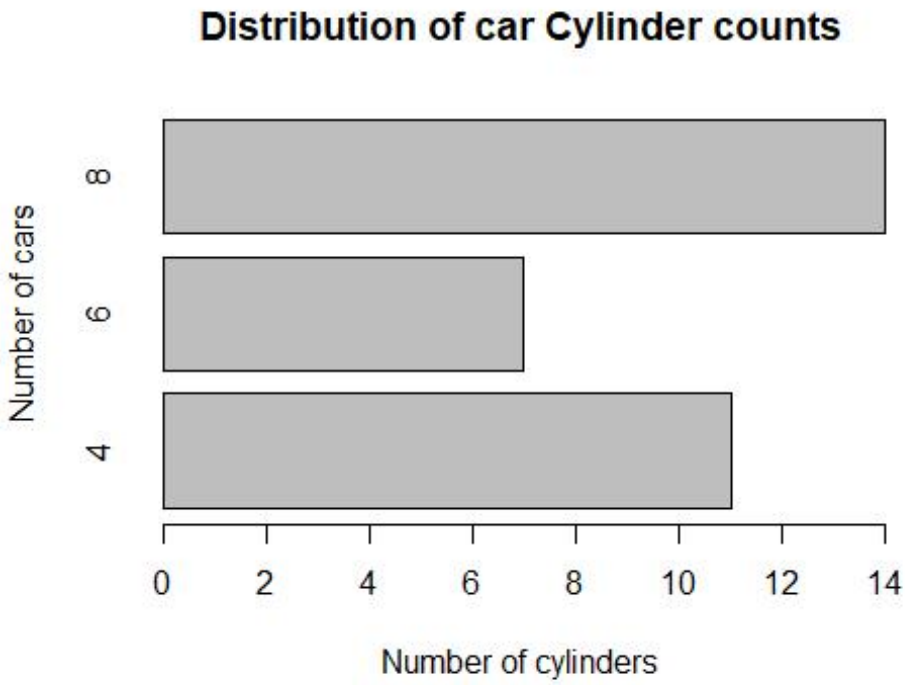
```
###install.packages("ggplot2")
library(ggplot2)
```

let us explore the data mcars

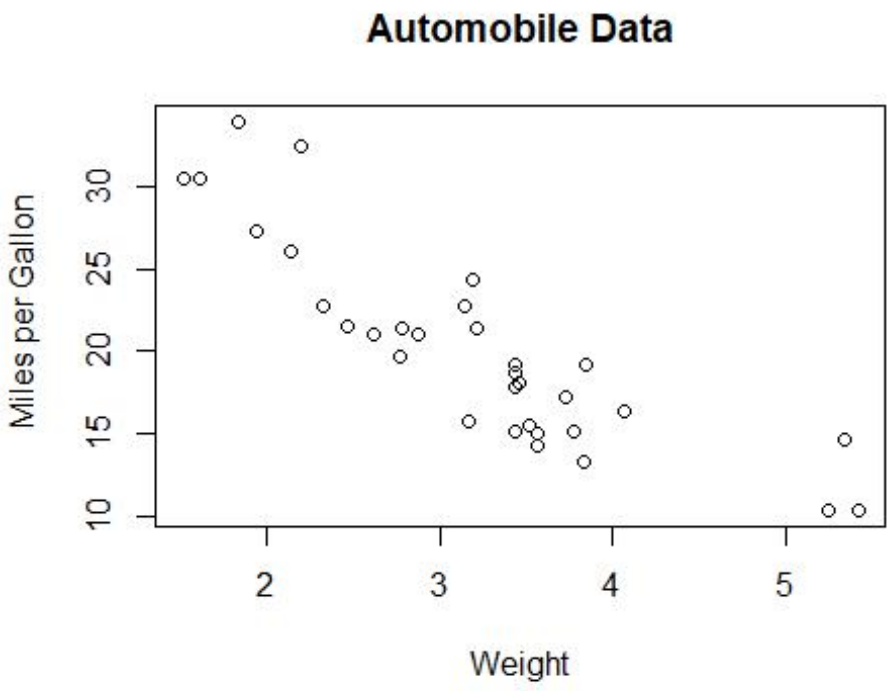
```
data(mtcars)
#dotchart(mtcars$mpg,labels=row.names(mtcars),ce#x = 0.,main="miles per
 Gallon of car #model",xlab = "MPG")

table(mtcars$cyl)

##
##  4  6  8
## 11  7 14

#barplot(mtcars$cyl)
barplot(table(mtcars$cyl),main="Distribution of car Cylinder counts",xl
ab="Number of cylinders",ylab = "Number of cars")
```



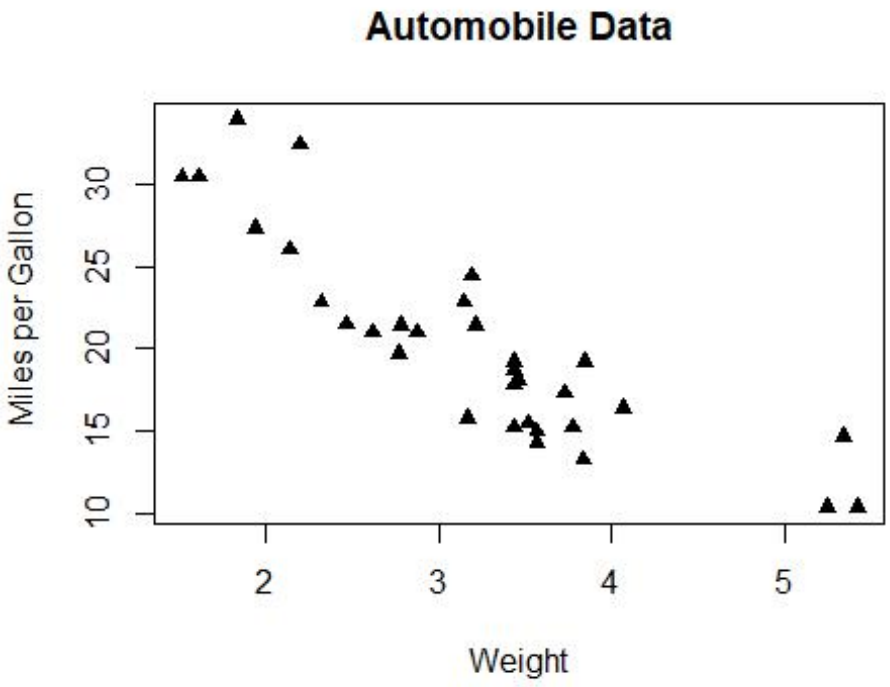

```r
barplot(table(mtcars$cyl),main="Distribution of car Cylinder counts",xlab="Number of cylinders",ylab = "Number of cars",horiz=TRUE)
```



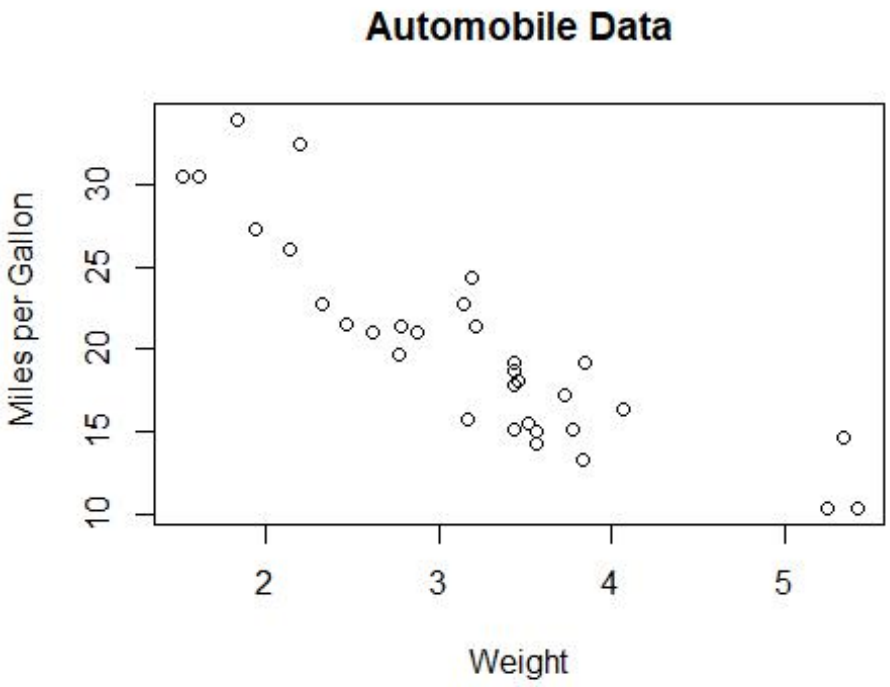
```
plot(mtcars$mpg~mtcars$wt,main="Automobile Data",xlab="Weight",ylab=" M
iles per Gallon")
```



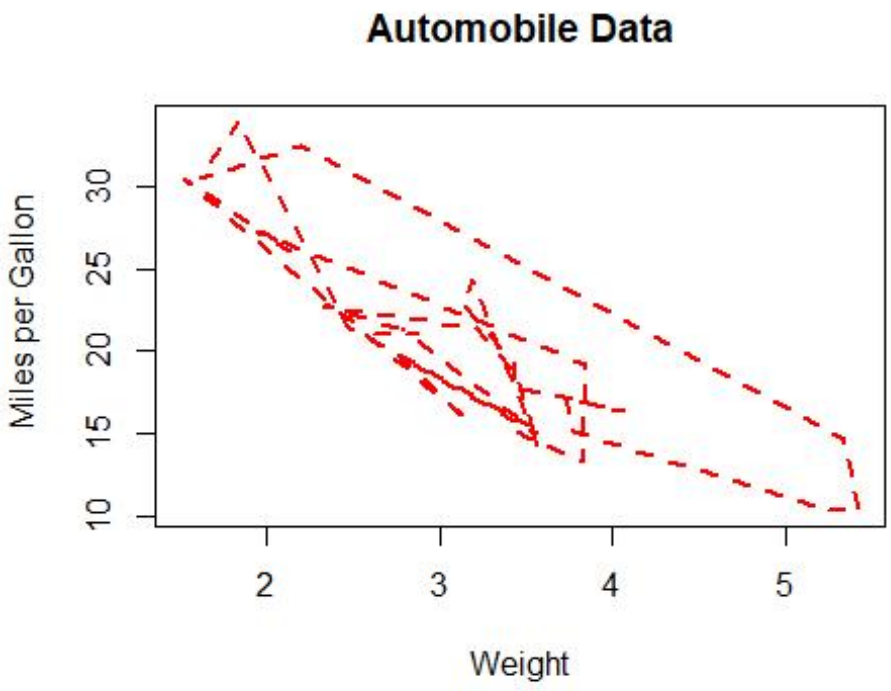

```
plot(mtcars$mpg~mtcars$wt,main="Automobile Data",xlab="Weight",ylab=" M
iles per Gallon")
plot(mtcars$mpg~mtcars$wt,pch=17,main="Automobile Data",xlab="Weight",y
lab=" Miles per Gallon")
```




```
plot(mtcars$mpg~mtcars$wt,pch=21,main="Automobile Data",xlab="Weight",y
lab=" Miles per Gallon")
```



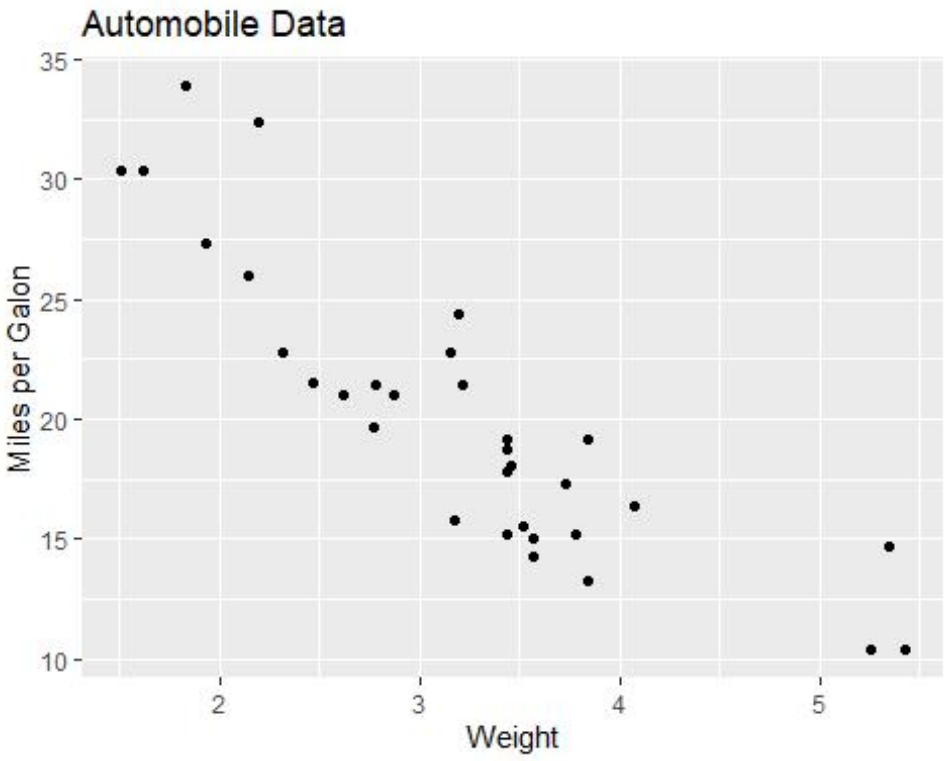
```
plot(mtcars$mpg~mtcars$wt,type="l", lty=2, lwd=2,col="red",main="Automo
bile Data",xlab="Weight",ylab=" Miles per Gallon")
```



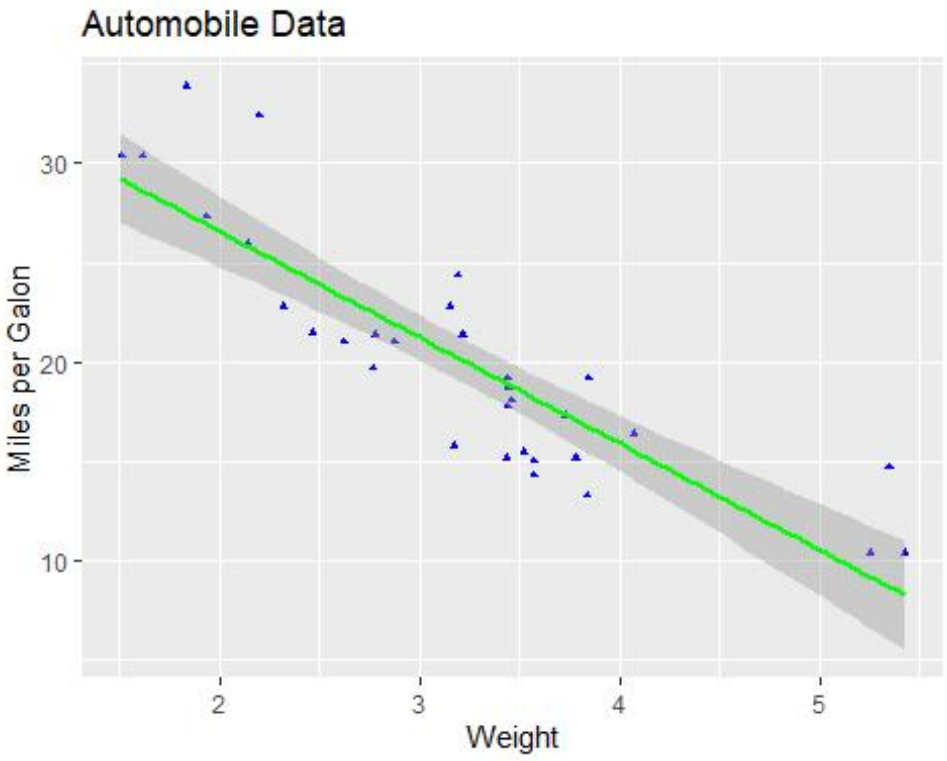
in ggplot2, plots are created by chaining together function using (+)sign. Each function modify the

##plot created up to that point

```
library(ggplot2)
ggplot(data=mtcars, aes(x=wt,y=mpg))+geom_point()+
  labs(title = "Automobile Data",x="Weight",y="Miles per Galon")
```

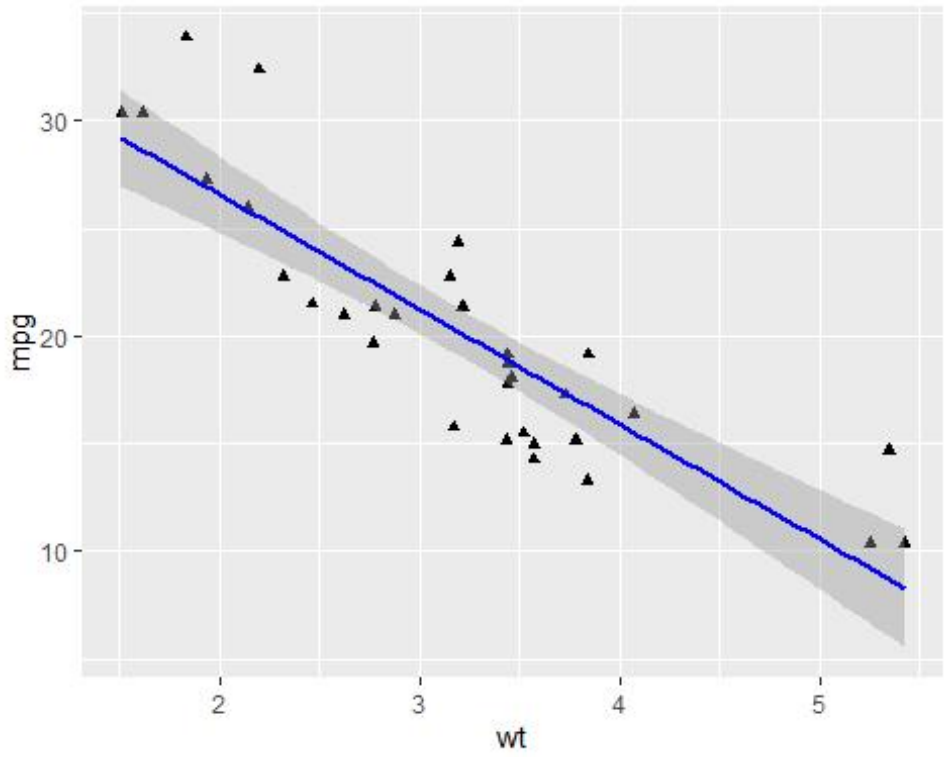



```
ggplot(data=mtcars, aes(x=wt,y=mpg))+geom_point(pch=17,color="blue",siz
e=1)+
  geom_smooth(method="lm",color="green")+
  labs(title = "Automobile Data",x="Weight",y="Miles per Galon")

## `geom_smooth()` using formula = 'y ~ x'
```

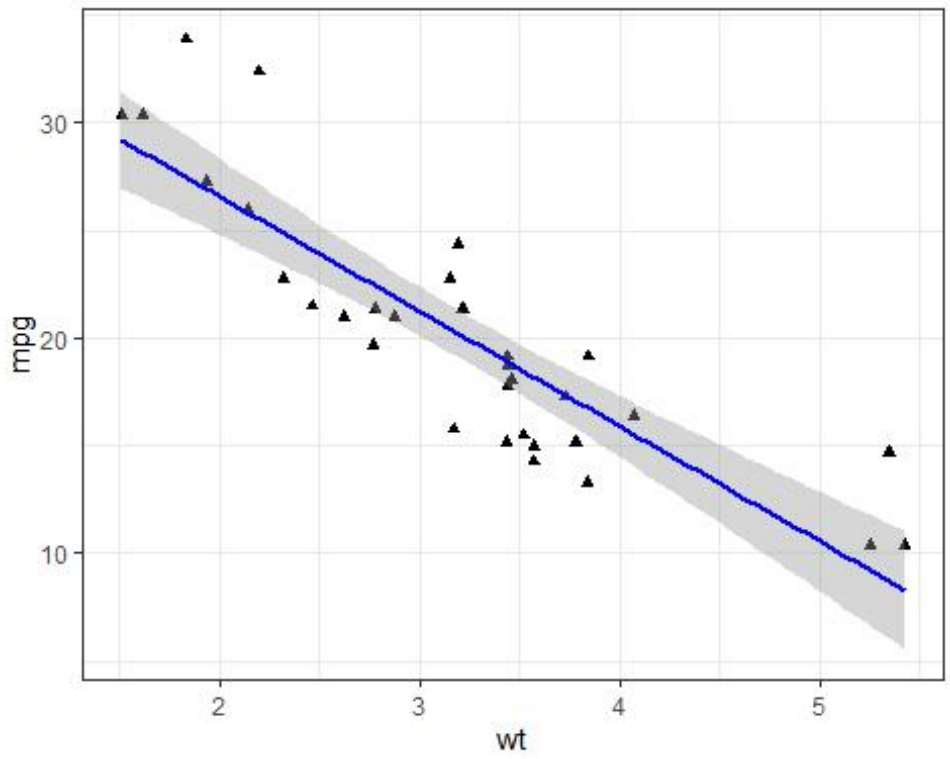



```
f0<-ggplot(data=mtcars, aes(x=wt,y=mpg))+geom_point(shape=24, fill=1,si
ze=1)+
  geom_smooth(method="lm",color="blue")

f0
```

```
## `geom_smooth()` using formula = 'y ~ x'
```

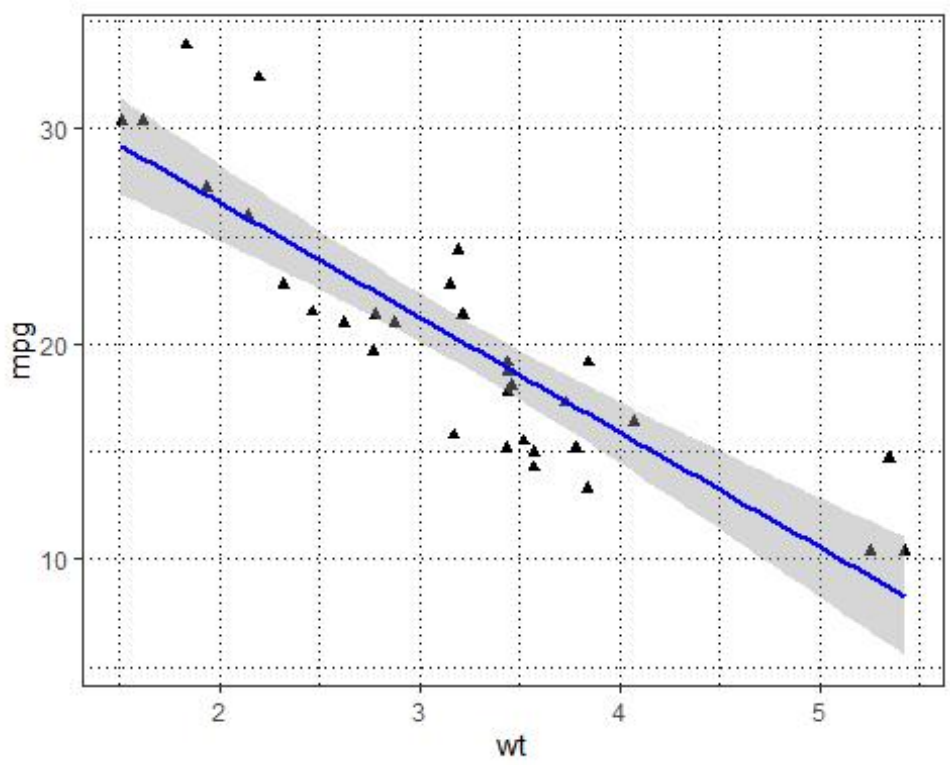



```
f1<-f0+theme_bw()
f1

## `geom_smooth()` using formula = 'y ~ x'
```



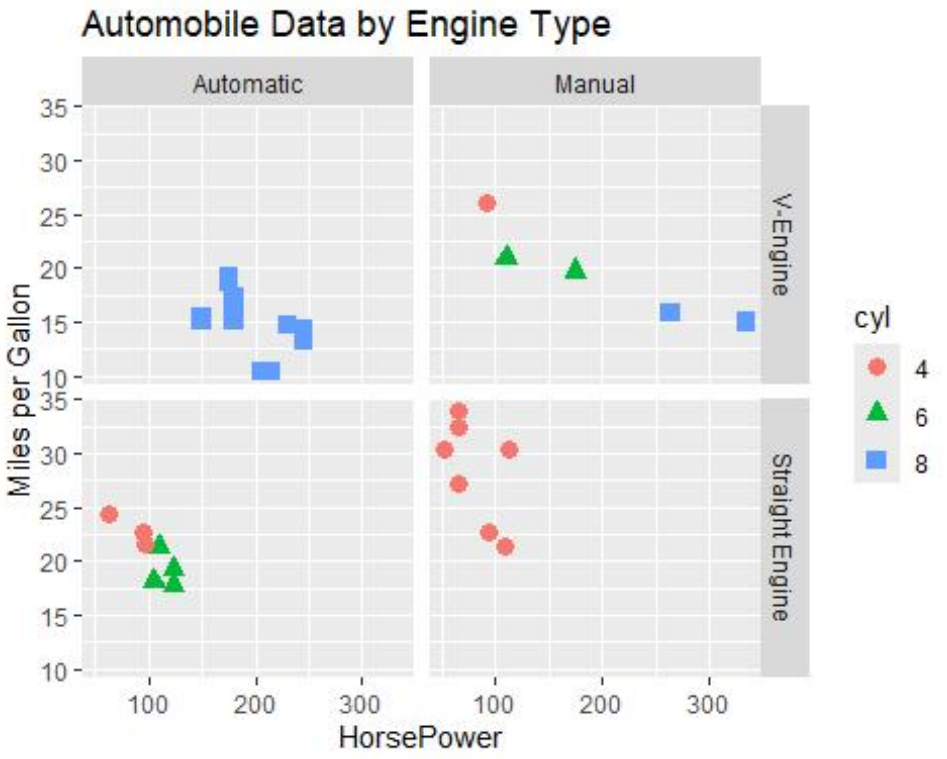

```
f2<-f1+
  theme(panel.grid = element_line(linetype = "dotted",color = "Black"))
f2
```

```
## `geom_smooth()` using formula = 'y ~ x'
```

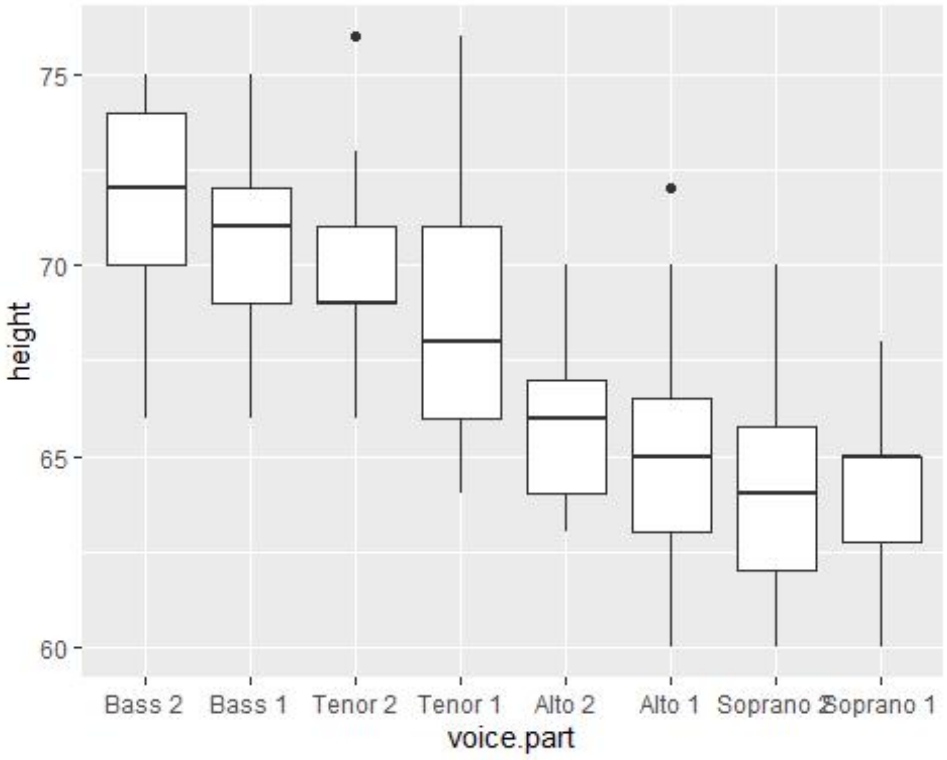


Grouping displays two or more groups of observations in a single plot

```
data(mtcars)

mtcars$am<-factor(mtcars$am, levels =c(0,1),
                  labels= c("Automatic","Manual"))
mtcars$vs<-factor(mtcars$vs, levels =c(0,1),
                  labels=c("V-Engine","Straight Engine"))
mtcars$cyl<-factor(mtcars$cyl)
ggplot(data=mtcars,aes(x=hp,y=mpg,shape=cyl,color=cyl))+
  geom_point(size=3)+
  facet_grid(vs~am)+
  labs(title = "Automobile Data by Engine Type",x="HorsePower",y="Miles
 per Gallon")
```




```
data(singer,package="lattice")
ggplot(singer,aes(x=voice.part,y=height))+geom_boxplot()
```



How work

Use the following function:

geom_bar() geom_boxplot() geom_density() geom_histogram() geom_hline() geom_jitter() geom_line() #geom_point() geom_rug() #geom_smooth() geom_text() geom_violin() geom_vline() ## Basic data management

cbind and rbind

While combining column wise, the number of rows must match but row names are ignored. when combining row-wise, both the number and the names of columns must match.

```
data2<- data.frame(x=1:3, y=c("a","b","c"))
str(data2)
```

```
## 'data.frame':    3 obs. of  2 variables:
##  $ x: int  1 2 3
##  $ y: chr  "a" "b" "c"
```

```
(cbind(data2,data.frame(z=3:1)))
```

```
##   x y z
## 1 1 a 3
## 2 2 b 2
## 3 3 c 1
```

```
(rbind(data2,data.frame(x=10,y="z")))
```

```
##    x y
## 1  1 a
## 2  2 b
## 3  3 c
## 4 10 z
```

Create another Variable

```
data_class<-read.table("C:\\Users\\Pacy\\OneDrive\\Desktop\\Big data course\\class_data.txt")
variable.names(data_class)
```

```
## [1] "HEIGHT" "WEIGHT"
```

```
head(data_class,n=5)
```

```
##   HEIGHT WEIGHT
## 1    161     50
## 2    155     49
## 3    158     42
## 4    170     65
## 5    160     60
```

```
tail(data_class)
```

```
##    HEIGHT WEIGHT
## 37    155     52
## 38    164     47
## 39    163     52
## 40    168     55
## 41    157     48
## 42    164     58
```

```
data_class[,1]
```

```
##  [1] 161 155 158 170 160 156 162 158 158 167 160 155 154 155 157 157
 160 158 160
## [20] 160 152 154 150 161 162 164 161 155 159 163 159 160 158 165 156
 163 155 164
## [39] 163 168 157 164
```

```
summary(data_class$WEIGHT)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    42.0    48.0    52.0    52.4    56.0    65.0
```

```
length(data_class$WEIGHT)
```

```
## [1] 42
```

```
data_class[,-1]
```

```
##  [1] 50 49 42 65 60 52 58 46 45 51 60 42 53 48 48 48 53 52 51 53 44
56 63 52 57
## [26] 49 52 54 46 50 61 55 45 63 60 56 52 47 52 55 48 58
```

```
attach(data_class)
(BMI<-WEIGHT/(HEIGHT/100)^2)
```

```
##  [1] 19.28938 20.39542 16.82423 22.49135 23.43750 21.36752 22.10029
18.42653
##  [9] 18.02596 18.28678 23.43750 17.48179 22.34778 19.97919 19.47341
19.47341
## [17] 20.70312 20.83000 19.92187 20.70312 19.04432 23.61275 28.00000
20.06095
## [25] 21.71925 18.21832 20.06095 22.47659 18.19548 18.81892 24.12879
21.48437
## [33] 18.02596 23.14050 24.65483 21.07720 21.64412 17.47472 19.57168
19.48696
## [41] 19.47341 21.56454
```

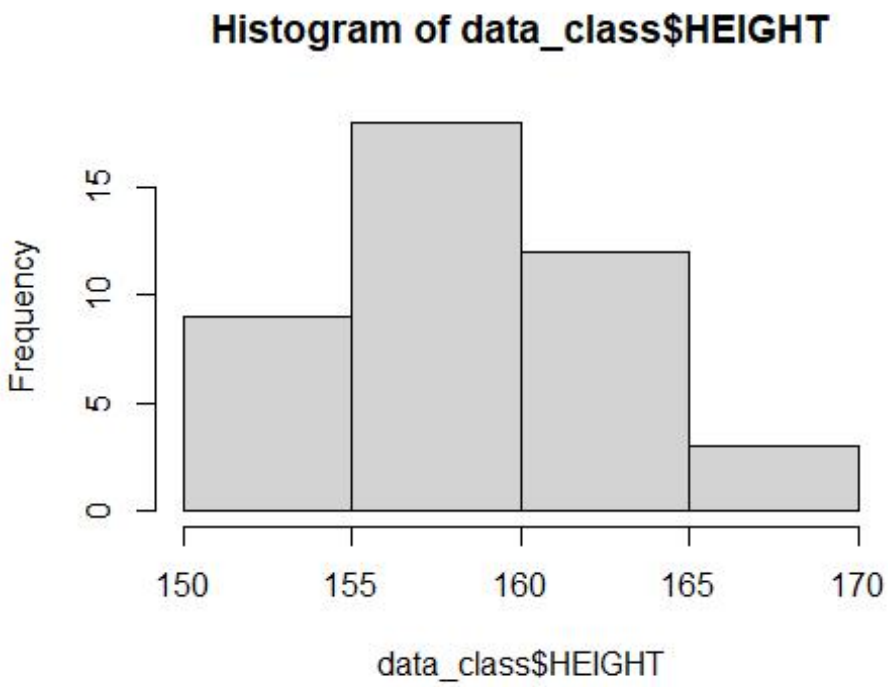
```
(BMI<-round(WEIGHT/(HEIGHT/100)^2,digit=1))
```

```
##  [1] 19.3 20.4 16.8 22.5 23.4 21.4 22.1 18.4 18.0 18.3 23.4 17.5 22.
3 20.0 19.5
## [16] 19.5 20.7 20.8 19.9 20.7 19.0 23.6 28.0 20.1 21.7 18.2 20.1 22.
```

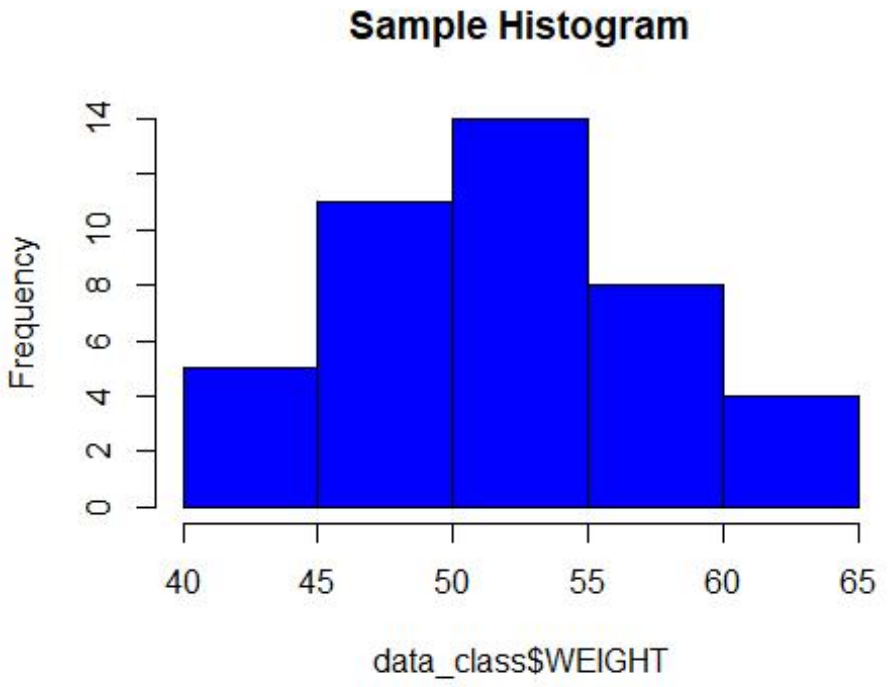
```
5 18.2 18.8
## [31] 24.1 21.5 18.0 23.1 24.7 21.1 21.6 17.5 19.6 19.5 19.5 21.6

head(cbind(data_class,BMI))

##   HEIGHT WEIGHT  BMI
## 1    161     50 19.3
## 2    155     49 20.4
## 3    158     42 16.8
## 4    170     65 22.5
## 5    160     60 23.4
## 6    156     52 21.4

tail(cbind(data_class,BMI),n=10)

##    HEIGHT WEIGHT  BMI
## 33    158     45 18.0
## 34    165     63 23.1
## 35    156     60 24.7
## 36    163     56 21.1
## 37    155     52 21.6
## 38    164     47 17.5
## 39    163     52 19.6
## 40    168     55 19.5
## 41    157     48 19.5
## 42    164     58 21.6

detach(data_class)
```

Summary of BMI

```
summary(BMI)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   16.80   19.07   20.25   20.64   22.00   28.00

hist(data_class$HEIGHT)
```




```r
hist(data_class$WEIGHT,col = "blue",main = "Sample Histogram")
```




```r
stem(BMI,scale=2)
```

```
##
##   The decimal point is at the |
##
##   16 | 8
##   17 | 55
##   18 | 0022348
##   19 | 03555569
##   20 | 0114778
##   21 | 145667
##   22 | 1355
##   23 | 1446
##   24 | 17
##   25 |
##   26 |
##   27 |
##   28 | 0
```

Subsetting

Use of $, []. or [[]]

Creation of leadership data Interest: How men and women differ in the way they lead their organizations. 5 questions were asked in this study. Example of the question: Do men and women in management position differ in the degree to which they defer to superiors? 1: strongly disagree, 2: disagree, 3:neither agree nor disagree,4: agree, 5: strongly agree

```
manager <- c(1,2,3,4,5)
country<- c("US","US","UK","UK","UK")
gender<-c("M","F","F","M","F")
age<-c(32,45,25,39,99)
q1<-c(5,3,3,3,2)
q2<-c(4,5,5,3,2)
q3<-c(5,2,5,4,1)
q4<-c(5,5,5,NA,2)
q5<-c(5,5,2,NA,1)
leadership<-data.frame(manager,country, gender, age, q1,q2,q3,q4,q5, st
ringsAsFactors = FALSE)
leadership<-data.frame(manager,country, gender, age, q1,q2,q3,q4,q5)
str(leadership)
```

```
## 'data.frame':    5 obs. of  9 variables:
##  $ manager: num  1 2 3 4 5
##  $ country: chr  "US" "US" "UK" "UK" ...
##  $ gender : chr  "M" "F" "F" "M" ...
##  $ age    : num  32 45 25 39 99
##  $ q1     : num  5 3 3 3 2
##  $ q2     : num  4 5 5 3 2
##  $ q3     : num  5 2 5 4 1
```

```
##  $ q4      : num  5 5 5 NA 2
##  $ q5      : num  5 5 2 NA 1
```

```
names(leadership)
```

```
## [1] "manager" "country" "gender"  "age"     "q1"      "q2"      "q3"

## [8] "q4"      "q5"
```

What you can do - combine the score of the five questions -handle the missing values - create a dataset of what you want -create age group or age categories - 99 indicate the value is missing

Missing value

```
leadership$age[leadership$age==99]<-NA

leadership$agecat[leadership$age >75]<-"Elder"
leadership$agecat[leadership$age>=35 & leadership$age<=75]<-"Middle Age
d"
leadership$agecat[leadership$age <35]<- "Young"
```

One way to handle missing value

Deleting all observations with missing data (Listwise deletion) is one of the several methods of handling incomplete datasets. Note: You can also replacing the missing value by the average of the remaining data.

```
is.na(leadership[,5:9])
```

```
##         q1    q2    q3    q4    q5
## [1,] FALSE FALSE FALSE FALSE FALSE
## [2,] FALSE FALSE FALSE FALSE FALSE
## [3,] FALSE FALSE FALSE FALSE FALSE
## [4,] FALSE FALSE FALSE  TRUE  TRUE
## [5,] FALSE FALSE FALSE FALSE FALSE
```

```
newdata<-na.omit(leadership)
newdata
```

```
##   manager country gender age q1 q2 q3 q4 q5      agecat
## 1       1      US      M  32  5  4  5  5  5       Young
## 2       2      US      F  45  3  5  2  5  5 Middle Aged
## 3       3      UK      F  25  3  5  5  5  2       Young
```

Sorting data

```
order(leadership$age)
```

```
## [1] 3 1 4 2 5
```

```
newdata2<-leadership[order(leadership$age),]
```

Merging data sets

To merge two data frame horizontally, you use merge() function. In most cases, two data frames are joined by one or more common key variables. -example 1: merge(dataframeA, dataframeB,by="ID") -example 2: merge(dataframeA,dataframeB, by=c("ID","country"))

the second merge the two dataframes by ID and country

To join two data frame(datasets) vertically, use rbind() function: Note that the two data set must have the same variables

Subset (selecting variables,dropping variables,selecting observation)

```
newdata3<-leadership[,c(5:9)]
myvars<-c("q1","q2","q3","q4","q5")
newdata3<-leadership[myvars]
newdata4<-leadership[,c(-1,-2)]
newdata4<-leadership[,-(1:5)]
newdata5<-leadership[,c(-1,-7)]
leadership[[4]]

## [1] 32 45 25 39 NA

leadership$age

## [1] 32 45 25 39 NA

newdata6<-leadership[c(-1,-3),]
newdata6<-leadership[c(2,4,5),]
newdata7<-subset(leadership,age>=35|age<24,select=c(q1,q2,q3,q4,q5))

attach(leadership)

## The following objects are masked _by_ .GlobalEnv:
##
##     age, country, gender, manager, q1, q2, q3, q4, q5

#newdata7<-leadership[gender="M" & age>30,]
newdata7<-leadership[gender=="M" & age>30,]
detach(leadership)
```

Data management with dyplr

Data source from the package nycflights13 and ggplot2 This data contains all 336,776 flights that departed from New York city in 2013.

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```r
#install.packages("nycflights13")
#install.packages("tidyverse")
library(nycflights13)
```

```
## Warning: package 'nycflights13' was built under R version 4.2.3
```

```r
#install.packages("dplyr")
library(dplyr)
```

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

```
##
## 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(tidyverse)
```

The function filter()

#rm(list = ls())

```r
str(flights)
```

```
## tibble [336,776 × 19] (S3: tbl_df/tbl/data.frame)
##  $ year          : int [1:336776] 2013 2013 2013 2013 2013 2013 2013
 2013 2013 2013 ...
##  $ month         : int [1:336776] 1 1 1 1 1 1 1 1 1 1 ...
##  $ day           : int [1:336776] 1 1 1 1 1 1 1 1 1 1 ...
##  $ dep_time      : int [1:336776] 517 533 542 544 554 554 555 557 55
7 558 ...
##  $ sched_dep_time: int [1:336776] 515 529 540 545 600 558 600 600 60
0 600 ...
##  $ dep_delay     : num [1:336776] 2 4 2 -1 -6 -4 -5 -3 -3 -2 ...
##  $ arr_time      : int [1:336776] 830 850 923 1004 812 740 913 709 8
38 753 ...
##  $ sched_arr_time: int [1:336776] 819 830 850 1022 837 728 854 723 8
46 745 ...
##  $ arr_delay     : num [1:336776] 11 20 33 -18 -25 12 19 -14 -8 8 ...
##  $ carrier       : chr [1:336776] "UA" "UA" "AA" "B6" ...
##  $ flight        : int [1:336776] 1545 1714 1141 725 461 1696 507 57
08 79 301 ...
##  $ tailnum       : chr [1:336776] "N14228" "N24211" "N619AA" "N804JB
"  ...
##  $ origin        : chr [1:336776] "EWR" "LGA" "JFK" "JFK" ...
##  $ dest          : chr [1:336776] "IAH" "IAH" "MIA" "BQN" ...
```

```
##  $ air_time      : num [1:336776] 227 227 160 183 116 150 158 53 140
 138 ...
##  $ distance      : num [1:336776] 1400 1416 1089 1576 762 ...
##  $ hour          : num [1:336776] 5 5 5 5 6 5 6 6 6 6 ...
##  $ minute        : num [1:336776] 15 29 40 45 0 58 0 0 0 0 ...
##  $ time_hour     : POSIXct[1:336776], format: "2013-01-01 05:00:00"
"2013-01-01 05:00:00" ...
```

```
#attach(flights)
jan<-filter(flights,month==1)
jan
```

```
## # A tibble: 27,004 × 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sche
d_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>
     <int>
##  1  2013     1     1      517            515         2      830
       819
##  2  2013     1     1      533            529         4      850
       830
##  3  2013     1     1      542            540         2      923
       850
##  4  2013     1     1      544            545        -1     1004
      1022
##  5  2013     1     1      554            600        -6      812
       837
##  6  2013     1     1      554            558        -4      740
       728
##  7  2013     1     1      555            600        -5      913
       854
##  8  2013     1     1      557            600        -3      709
       723
##  9  2013     1     1      557            600        -3      838
       846
## 10  2013     1     1      558            600        -2      753
       745
## # ℹ 26,994 more rows
## # ℹ 11 more variables: arr_delay <dbl>, carrier <chr>, flight <int>,
## #   tailnum <chr>, origin <chr>, dest <chr>, air_time <dbl>, distanc
e <dbl>,
## #   hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
newyear<-filter(flights,month==1, day==1)
newyear
```

```
## # A tibble: 842 × 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sche
d_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>
     <int>
```

```
##  1  2013     1     1      517            515         2      830
       819
##  2  2013     1     1      533            529         4      850
       830
##  3  2013     1     1      542            540         2      923
       850
##  4  2013     1     1      544            545        -1     1004
      1022
##  5  2013     1     1      554            600        -6      812
       837
##  6  2013     1     1      554            558        -4      740
       728
##  7  2013     1     1      555            600        -5      913
       854
##  8  2013     1     1      557            600        -3      709
       723
##  9  2013     1     1      557            600        -3      838
       846
## 10  2013     1     1      558            600        -2      753
       745
## # ℹ 832 more rows
## # ℹ 11 more variables: arr_delay <dbl>, carrier <chr>, flight <int>,
## #   tailnum <chr>, origin <chr>, dest <chr>, air_time <dbl>, distanc
e <dbl>,
## #   hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
dec25<-filter(flights,month==12, day==25)
dec25
```

```
## # A tibble: 719 × 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sche
d_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>
     <int>
##  1  2013    12    25      456            500        -4      649
       651
##  2  2013    12    25      524            515         9      805
       814
##  3  2013    12    25      542            540         2      832
       850
##  4  2013    12    25      546            550        -4     1022
      1027
##  5  2013    12    25      556            600        -4      730
       745
##  6  2013    12    25      557            600        -3      743
       752
##  7  2013    12    25      557            600        -3      818
       831
##  8  2013    12    25      559            600        -1      855
       856
```

```
##  9  2013    12    25      559            600        -1      849
       855
## 10  2013    12    25      600            600         0      850
       846
## # ℹ 709 more rows
## # ℹ 11 more variables: arr_delay <dbl>, carrier <chr>, flight <int>,
## #   tailnum <chr>, origin <chr>, dest <chr>, air_time <dbl>, distanc
e <dbl>,
## #   hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
jan_dec<-filter(flights,month==1|month==12)
jan_dec
```

```
## # A tibble: 55,139 × 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sche
d_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>
     <int>
##  1  2013     1     1      517            515         2      830
       819
##  2  2013     1     1      533            529         4      850
       830
##  3  2013     1     1      542            540         2      923
       850
##  4  2013     1     1      544            545        -1     1004
      1022
##  5  2013     1     1      554            600        -6      812
       837
##  6  2013     1     1      554            558        -4      740
       728
##  7  2013     1     1      555            600        -5      913
       854
##  8  2013     1     1      557            600        -3      709
       723
##  9  2013     1     1      557            600        -3      838
       846
## 10  2013     1     1      558            600        -2      753
       745
## # ℹ 55,129 more rows
## # ℹ 11 more variables: arr_delay <dbl>, carrier <chr>, flight <int>,
## #   tailnum <chr>, origin <chr>, dest <chr>, air_time <dbl>, distanc
e <dbl>,
## #   hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
nov_dec<-filter(flights,month %in% c(11,12))
#detach(flights)
```

The function arrange()

This change the order

```
data_10<-arrange(flights,year,month,day)
arrange(flights,desc(arr_delay))
```

```
## # A tibble: 336,776 × 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sche
d_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>
     <int>
##  1  2013     1     9      641            900      1301     1242
      1530
##  2  2013     6    15     1432           1935      1137     1607
      2120
##  3  2013     1    10     1121           1635      1126     1239
      1810
##  4  2013     9    20     1139           1845      1014     1457
      2210
##  5  2013     7    22      845           1600      1005     1044
      1815
##  6  2013     4    10     1100           1900       960     1342
      2211
##  7  2013     3    17     2321            810       911      135
      1020
##  8  2013     7    22     2257            759       898      121
      1026
##  9  2013    12     5      756           1700       896     1058
      2020
## 10  2013     5     3     1133           2055       878     1250
      2215
## # ℹ 336,766 more rows
## # ℹ 11 more variables: arr_delay <dbl>, carrier <chr>, flight <int>,
## #   tailnum <chr>, origin <chr>, dest <chr>, air_time <dbl>, distanc
e <dbl>,
## #   hour <dbl>, minute <dbl>, time_hour <dttm>
```

The function select

This helps to selects only the variables you are interested in

```
time_var<-select(flights, year,month, day)
select(flights, year:day)
```

```
## # A tibble: 336,776 × 3
##     year month   day
##    <int> <int> <int>
##  1  2013     1     1
##  2  2013     1     1
##  3  2013     1     1
##  4  2013     1     1
##  5  2013     1     1
##  6  2013     1     1
##  7  2013     1     1
```

```
##  8  2013     1     1
##  9  2013     1     1
## 10  2013     1     1
## # ℹ 336,766 more rows
```

```
select(flights,-(year:day))
```

```
## # A tibble: 336,776 × 16
##    dep_time sched_dep_time dep_delay arr_time sched_arr_time arr_del
ay carrier
##       <int>          <int>     <dbl>    <int>          <int>     <db
l> <chr>
##  1      517            515         2      830            819
11 UA
##  2      533            529         4      850            830
20 UA
##  3      542            540         2      923            850
33 AA
##  4      544            545        -1     1004           1022       -
18 B6
##  5      554            600        -6      812            837       -
25 DL
##  6      554            558        -4      740            728
12 UA
##  7      555            600        -5      913            854
19 B6
##  8      557            600        -3      709            723       -
14 EV
##  9      557            600        -3      838            846
-8 B6
## 10      558            600        -2      753            745
 8 AA
## # ℹ 336,766 more rows
## # ℹ 9 more variables: flight <int>, tailnum <chr>, origin <chr>, de
st <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_h
our <dttm>
```

The function mutate

This is useful in adding a new Variable

```
## create a small data set
flights2<-select(flights,year:day,ends_with("delay"),distance,air_time)
(mutate(flights2,gain=arr_delay-dep_delay,
       speed=distance/air_time*60))
```

```
## # A tibble: 336,776 × 9
##     year month   day dep_delay arr_delay distance air_time  gain spe
ed
##    <int> <int> <int>     <dbl>     <dbl>    <dbl>    <dbl> <dbl> <db
```

```
l>
##  1  2013     1     1          2         11     1400      227      9  37
0.
##  2  2013     1     1          4         20     1416      227     16  37
4.
##  3  2013     1     1          2         33     1089      160     31  40
8.
##  4  2013     1     1         -1        -18     1576      183    -17  51
7.
##  5  2013     1     1         -6        -25      762      116    -19  39
4.
##  6  2013     1     1         -4         12      719      150     16  28
8.
##  7  2013     1     1         -5         19     1065      158     24  40
4.
##  8  2013     1     1         -3        -14      229       53    -11  25
9.
##  9  2013     1     1         -3         -8      944      140     -5  40
5.
## 10  2013     1     1         -2          8      733      138     10  31
9.
## # ℹ 336,766 more rows
```