THE JOY OF *STATISTICS* WITH *R*

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Correlation

- - What is correlation?
- - How can we calculate it?
- - How can we discuses about the result?
- - Calculating correlation coefficients with R.
- - Plotting Correlation with R.

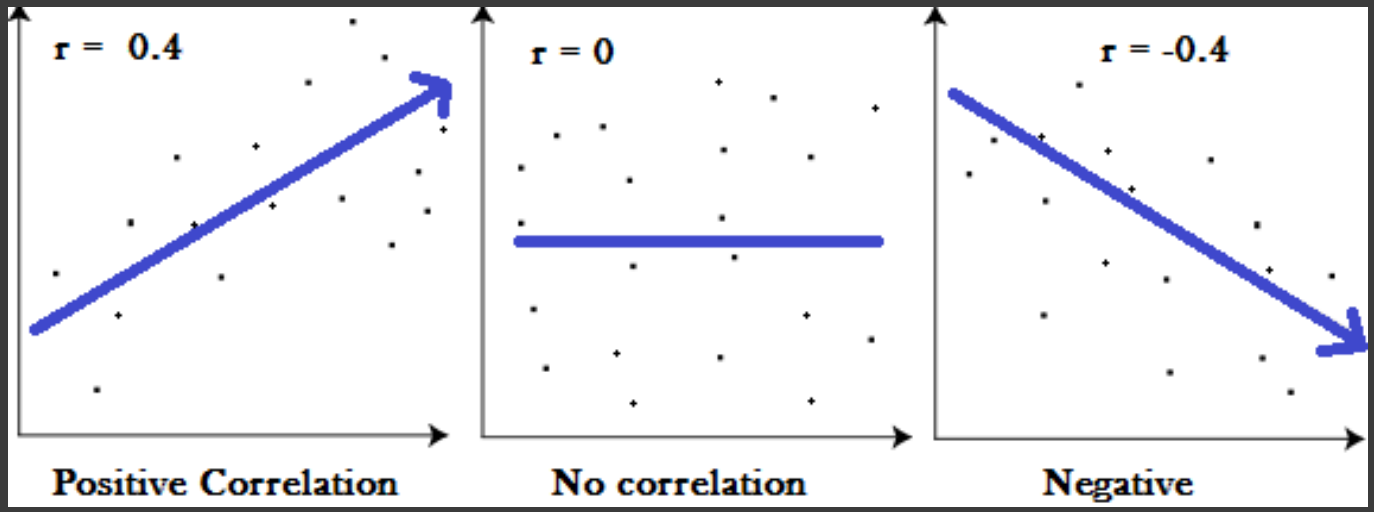
What is correlation?

- Measure and describe the relationship between two variable.
- It can be range between [+1, -1].
- Pearson's correlation (also called Pearson's *R*) is a **correlation coefficient** *commonly* used in *linear regression*

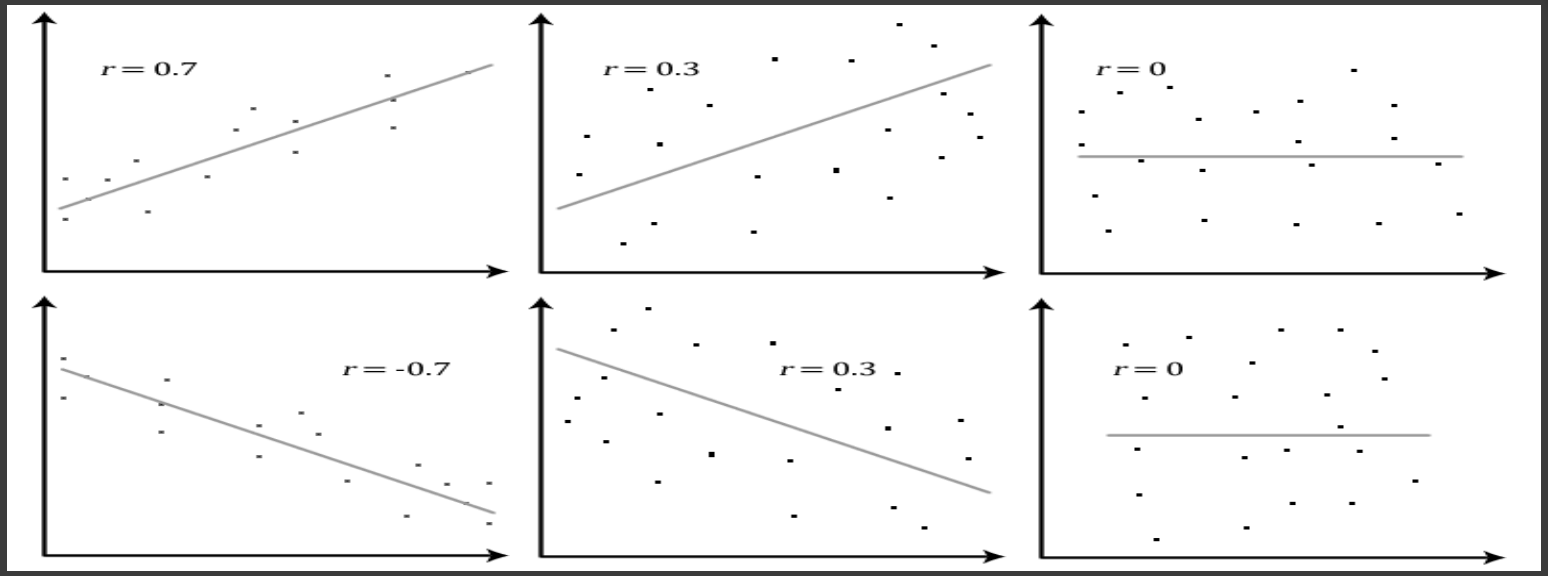
How can we calculate correlation?

- Pearson's correlation = $\frac{S_{x\,y}}{S_x S_y}$
- (S_x and s_y are the sample standard deviations, and s_{xy} is the sample covariance).

How can we discuss the results?



More examples



Covariance provides the DIRECTION(Positive, Negative,Zero) of the linear relationship, between two variable.
Correlation provides DIRECTION and STRENGTH.
Bigger than **|0.70|.** A strong linear relationship
|0.50| To **|0.70|.** A moderate relationship
Smaller than **|0.30|.** A weak linear relationship
0. No linear relationship

Calculating correlation coefficients with R

- You can use the format **cor(X, Y)** or **rcorr(X, Y)** to generate correlations between the columns of X and the columns of Y.
- *method = "pearson", "kendall", "spearman"))*

- Example:
- X<- sample(10) ; Y <- sample(10); cor(X,Y, method = "pearson")

- Result:
- x : 6 3 5 8 4 2 7 1 9 10
- y : 1 4 8 3 2 6 7 5 10 9
- cor(x,y, method = "pearson") : 0.4060606

Correlation of matrix

- The rcorr( ) function in the Hmisc package produces correlation and significance levels for pearson and spearman correlations.
- However, input must be a matrix.
- Example:
- Mat <- matrix(sample(18),ncol=3)

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

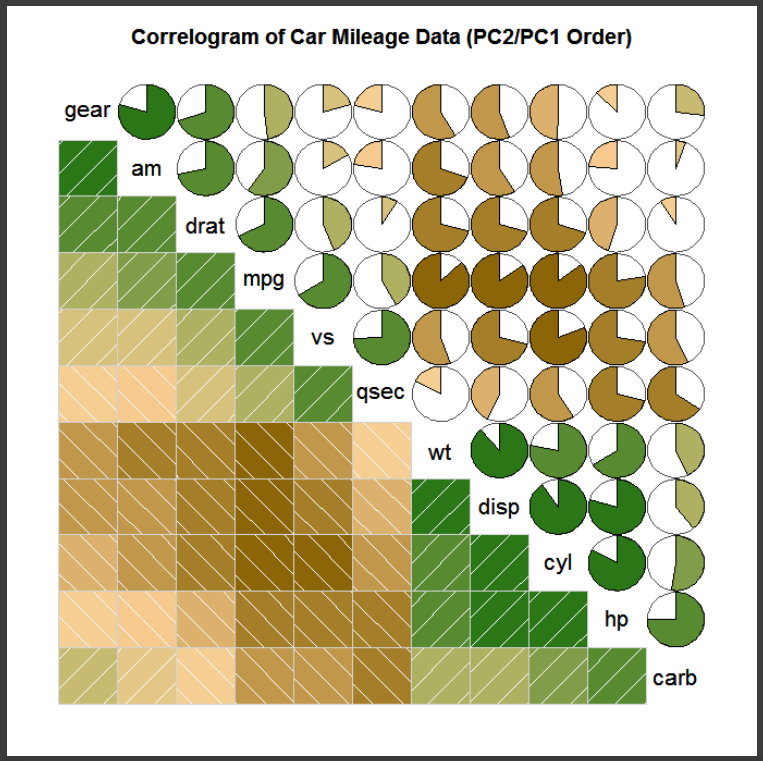
- rcorr(Mat) :
- X Y Z
- X 1.00 0.05 0.04
- Y 0.05 1.00 0.25
- Z 0.04 0.25 1.00 n= 6

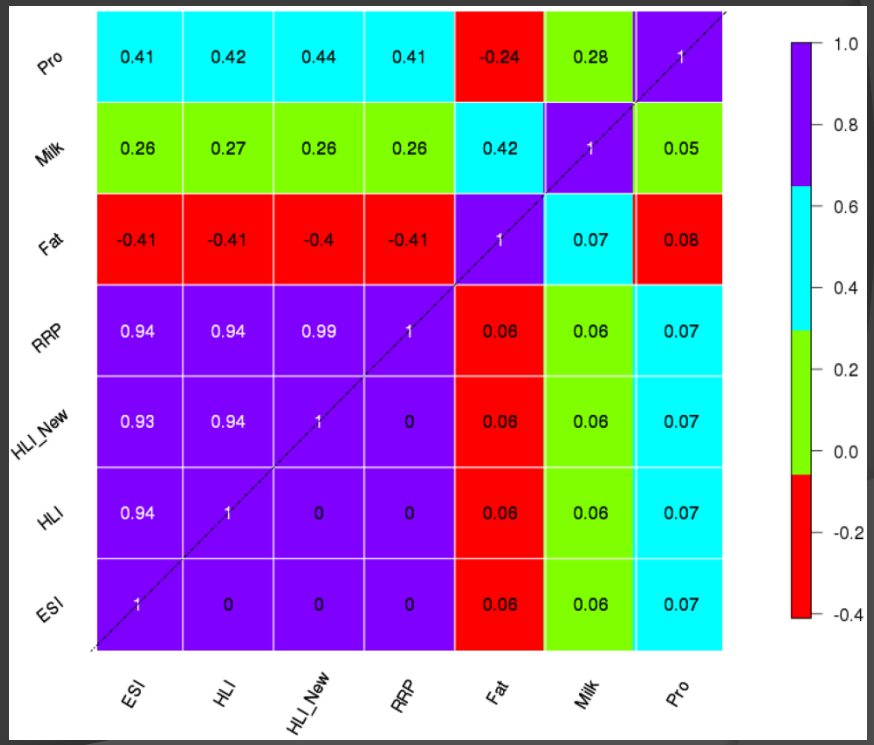
P-Value

	[,1]	[,2]	[,3]
[1,]		0.9287	0.0562
[2,]	0.9287		0.6389
[3,]	0.9358	0.6389	

Plotting Correlation with R

- Visualizing Correlations by **corrgram** and **image plot**.





R workshop

- On Wednesday 14th February at 13:30

- Introducing R (5 Min)
- Doing practice on input/ out put (10 Min)
- Writing first program about Correlation and plotting the result. (10 Min)

SMILING WITH STATISTICS AND R