MATLAB Introduction

MATLAB stands for MATrix LABoratory

It provides an easy-to-use interface to perform mathematical computations, create plots, analyze data etc

- Variable definition: x = 5

- Matrix definition: A = [16 3 2 13; 5 10 11 8; 9 6 7 12; 4 15 14 1]

A =

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

In general : matrix = [line 1; line 2... ; line N]

Useful note: indices start from 1 and not from 0!

Lot of useful functions:

- sum
- mean
- median
- abs
- …

You can also create your own functions

as in every other programming language

- function [return variables] = function_name(arguments)
  - …
  - …
  - …
  - …
- end

And for loops...

- for i = starting value : step : ending value
  - …
  - …
  - …
  - …
- end

And if statements...

- if condition1==TRUE …
  - …
- elseif condition2==TRUE
  - …
- else
  - …
- end

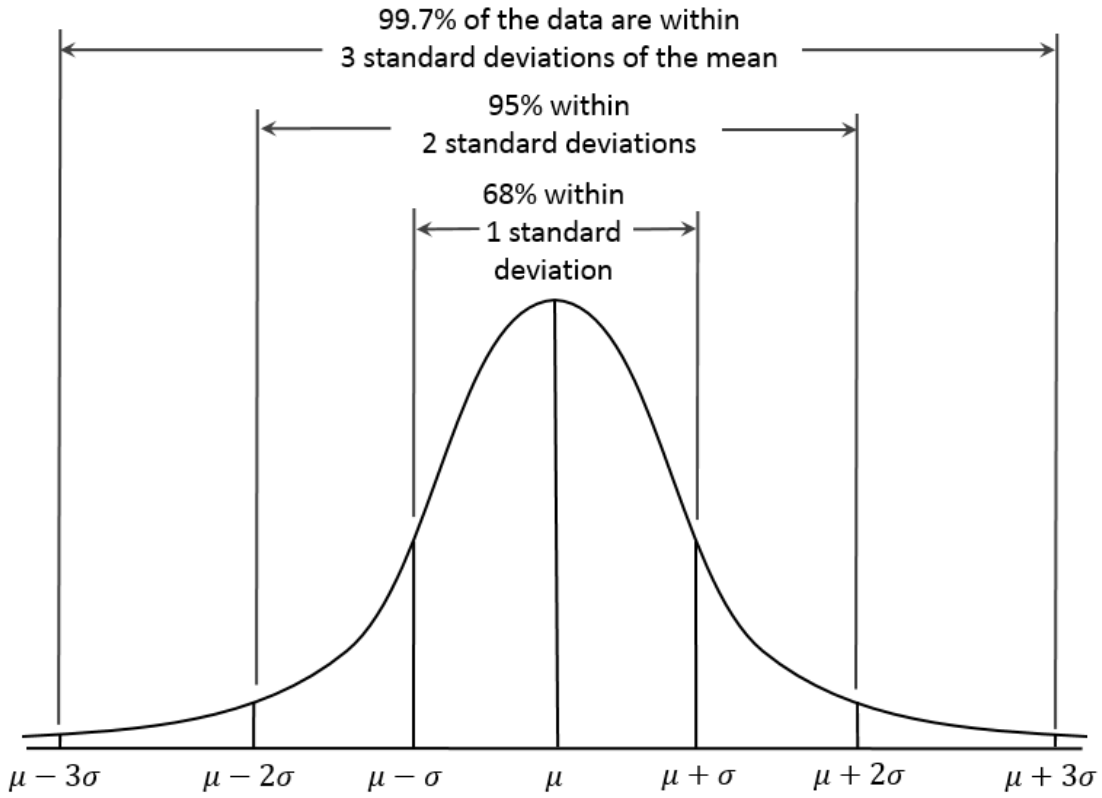
How to plot data:

- figure
- plot(x,y)
- xlabel(‘x axis name’)
- ylabel(‘y axis name’)
- title(‘title of plot’)
- legend(‘line 1’,’line 2’,...) % if you plot more than two lines

Standard deviation

std function

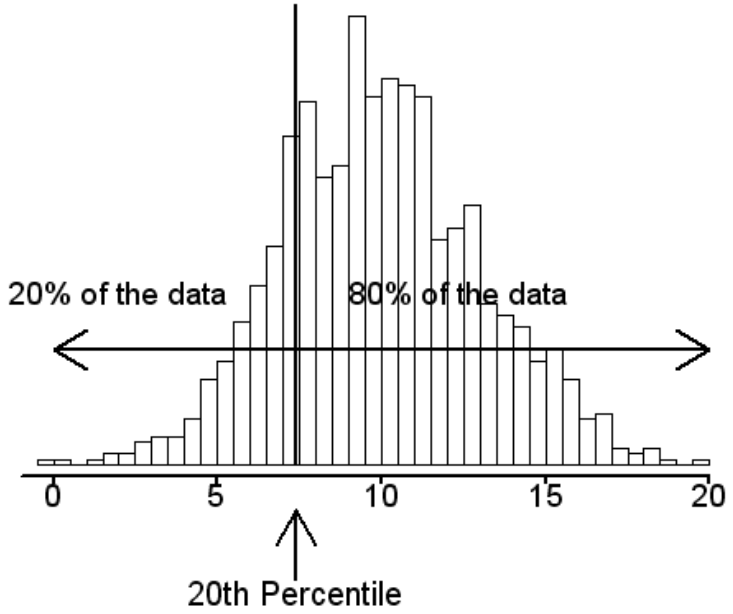
Gaussian distribution



Percentiles

a percentile is a number where a certain percentage of scores fall below that number

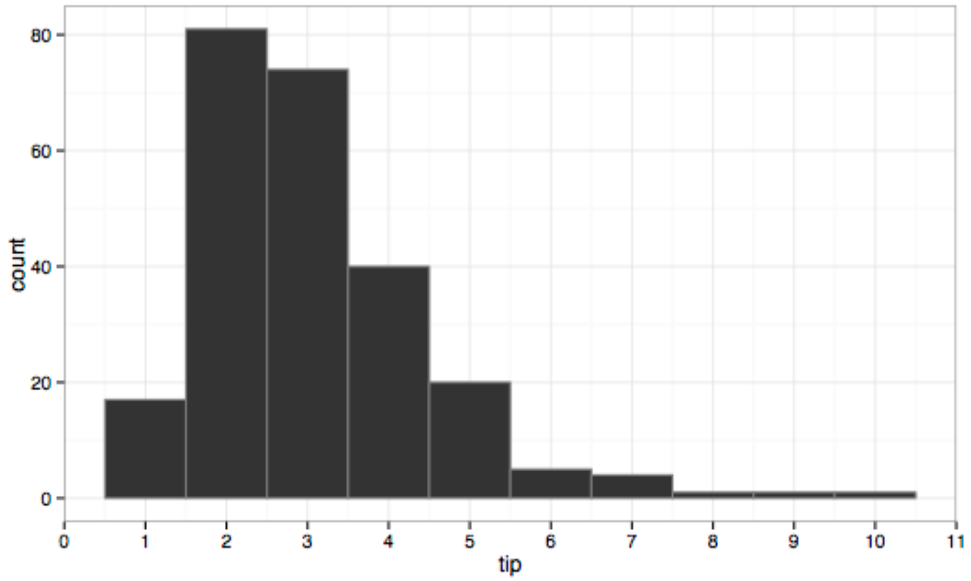
- x = prctile(vector, desired percentile)

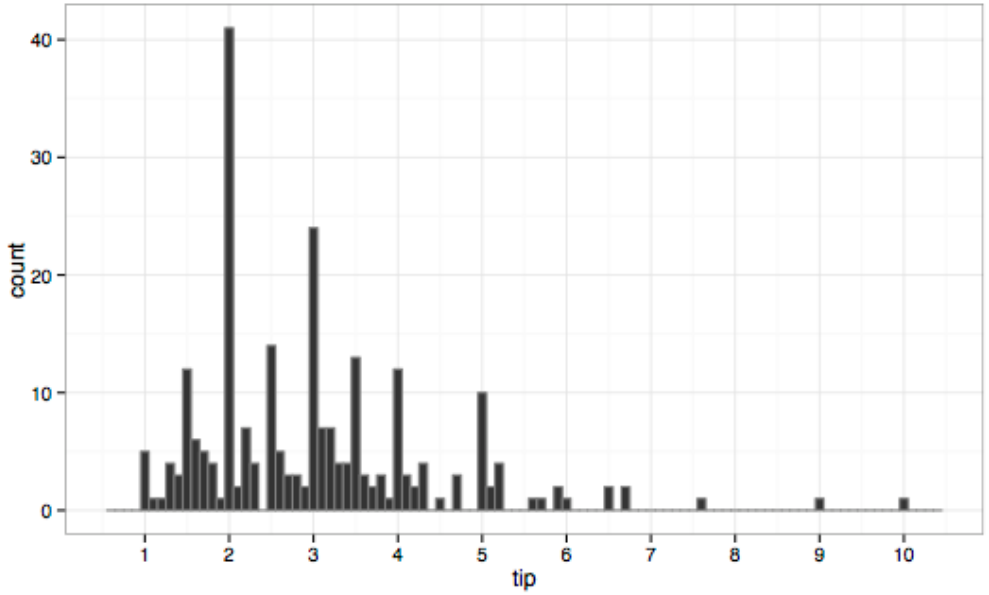


Question: What is the value of the 50th percentile on the Gaussian?

You can also see interesting things by creating a histogram

histogram(x)





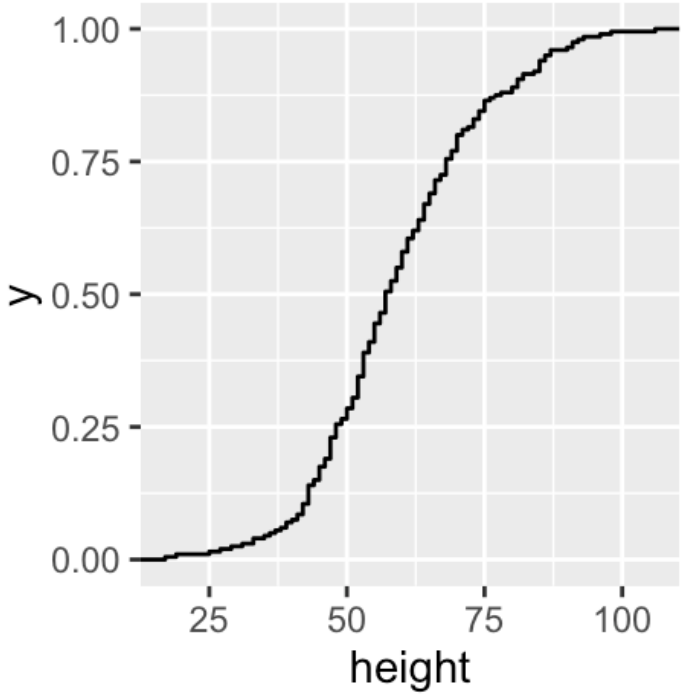
You can also specify the bins that are created by setting the number of bins

- histogram(x, bin_number)

Cumulative distribution function

a function whose value is the probability that a corresponding continuous random variable has a value less than or equal to the argument of the function

- [y ,x] = ecdf(vector);
- plot(x,y)



Can you spot the 50th percentile here?

K-S test
How to run and interpret

[hypothesis_result, pvalue] = kstest2(variable 1, variable 2)

This test examines if the two input distributions originate from the same distribution.

It calculates the maximum distance between the ECDFs of the two distributions.

It returns a p-value that expresses the possibility of two random selected samples (one of each distribution) having the max distance.

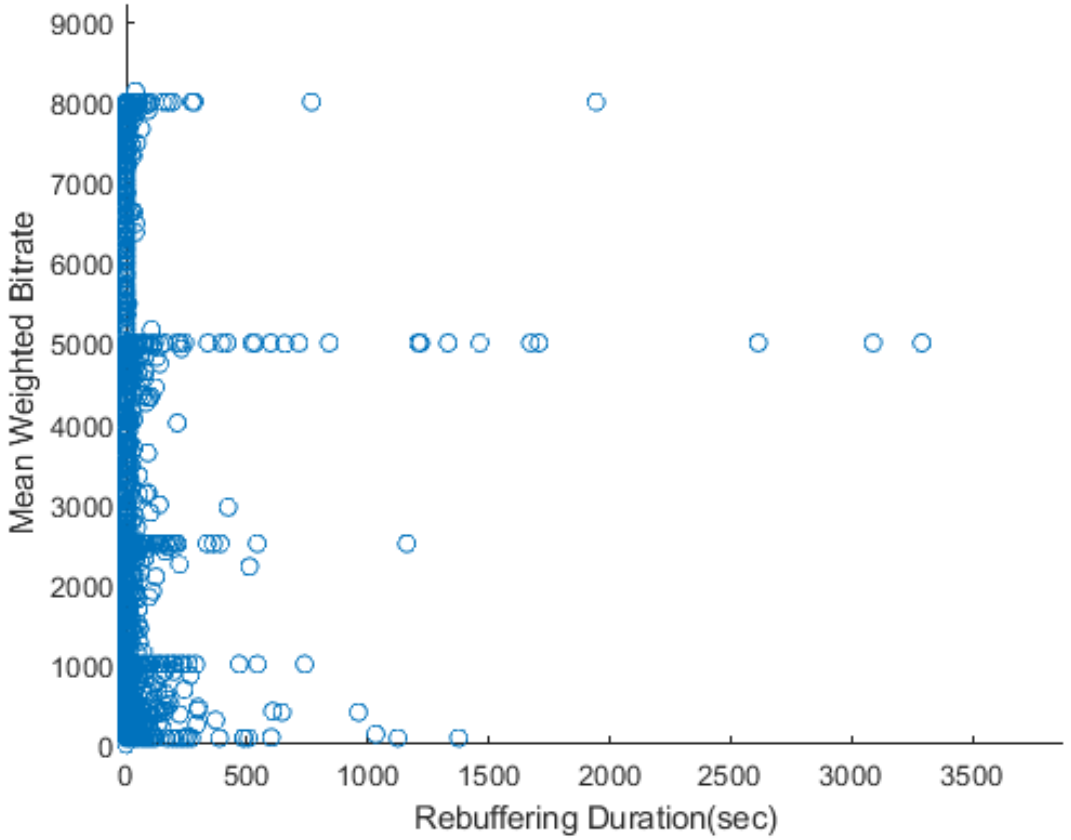
Null hypothesis: input distributions originate from the same distribution

p-value > 0.05 : if p-value is not in the 5% of the most extreme values, then the result is not statistical significant and the null hypothesis is not rejected.

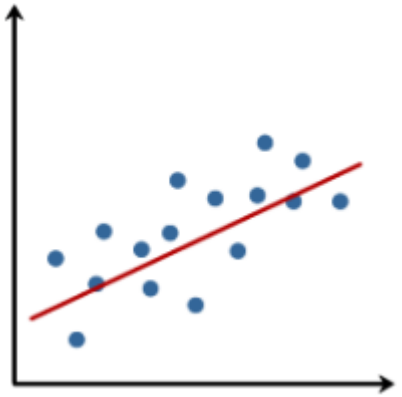
p-value < 0.05 : if p-value is in the 5% of the most extreme values, we reject the null hypothesis and consider the result statistically significant.

You can plot two variables together to discover how they are related!

- scatter(var1, var2)



Note that here we cannot see any linear relation between the variables



use **corr()** function to check if two variables are linearly correlated

corr(x,y) - Pearson Correlation

How to interpret it?

Pearson Correlation is a measure of the linear correlation between two variables.

It takes values in [-1, 1]

- *Negative value* (negative correlation) means that when x is incrementing, y is decreasing.
- *Positive value* (positive correlation) means that when x is incrementing, y is incrementing too.
- *Zero* correlation means that data are randomly distributed.

For more information about MATLAB

https://www.mathworks.com/help/

or Google it :)