# Exercise 4 - Mathematical and Statistical Programming with Numpy

# import necessary libraries  
import numpy as np

# create data to work with   
x = np.arange(10)  
x

array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])

Display the first 5 elements.

Display every other element.

Display the elements from index 5 in reverse order.

# two dimensional array  
y = np.array([[12, 5, 2, 4],  
 [ 7, 6, 8, 8],  
 [ 1, 6, 7, 7]])

Display the first 2 rows and the first 3 columns.

Display the first column of y.

Display the first row of y.

Read the contents of file cdc\_1.csv, containing heights, weights and ages, into array data.

Calculate the minimum, maximum and mean height, weight and age.

### Descriptive statistics with numpy

# import necessary libraries  
import numpy as np  
import scipy.stats

Read the contents of file cdc\_nan.csv, containing heights, weights and ages, into array data.

Separate the heights (column 0) and the weights (column 1)

### Univariate

#### Measures of central tendency

##### Median

Calculate the median for the heights and the weights and assign the values to variables.

What has happened? Check if the arrays contain missing values.

Array weights contain 3 nan values. Find their positions.

Now calculate the median for the weights ignoring the nan values.

##### Mode

xx = [1, 4, 4, 5, 5, 8, 2, 7, 7, 7]  
xxx = [1, 4, 4, 5, 5, 8, 2, 7, 7]  
  
yy = np.array(xx)  
yyy = np.array(xxx)

##### Mean

Calculate the mean values for heights and weights.

#### Measures of spread (variability)

##### Range

Calculate the range of the heights and the weights. Range is the difference between the maximum and the minimum value.

##### Interquartile Range (IQR)

Find the quartiles for the heights and the weights, and the Interquartile Range (IQR).

##### Variance

Calculate population and sample variance for heights and weights.

##### Standard deviation

Calculate population and sample standard deviation for heights and weights.

### Bivariate

#### Covariance

Find the covariance between heights and weights and comment on its direction and strength.

Positive covariance - height and weight both increase. We cannot judge the strength of the relationship. For that we have to calculate the correlation.

#### Correlation

Find the correlation between heights and weights and comment on its direction and strength.

Positive correlation - height and weight both increase. Weak correlation (<0.5).