**Heart Team Exercise**

You have been tasked with the most crucial job there is, implementing a tracking program!

You program will track a moving car! (sort of)

The car only moves **forward** (in one dimension, meaning only x axis) but changes its acceleration along the way.

Attached to this document there are some csv files with 2 columns, "time" and "location" which represents the location of the car on the x axis in a current time, this location is actually the distance that the car made from the starting point (valued 0 In this exercise) .

Your job is to implement a tracking system that will predict in real time the cars next location, and at the end of the cars route, presents a graph comparing your predictions to the cars real track.

Those csv files are the only input to your program.

In real life, you would have gotten the cars location from the Israel Aerospace Industries sensors which are not perfect (to say the least), so in real life the data will be noised, meaning the received location of the car will not be its exact location but a location with a statistical error you'll also receive from the sensor.

So, lets define exactly what you need to do:

* First you should "noise" the data you get. It means you need to add a statistical error to the locations of the car at each second. Use **gaussian noise** for it.
* Using **Kalman Filter**, you will need to implement a program that will predict in each second the next location of the car. Please notice, in the input you get the car's location every 0.5 seconds, you need to predict the cars location in **resolution of 1 second**.
* The output of your program should include 2 results –
  + First, csv file with your predictions at each second
  + Second, a graph that represent your tracking compare to the input csv file you’ve got and the "noised" image of the cars track that you created.

You can use any programming language you like, we recommend **java or python**. in any case we recommend using **PyPlot** for representing your result graph.

Good Luck!

Feel free to contact us for clarification or consult.