# VG101 — Introduction to Computer and Programming

*Lab 4*

Manuel — UM-JI (Fall 2017)

**Goals of the lab**

- Use conditional statements in C
- Use loops in C
- Use external libraries

**Ex. 1 —** *Conditional statements and loops*

Write a C program where the computer selects a random number $r$ less than some user defined bound. When the user inputs its guess the program answers "larger", "smaller" or "win", depending whether the number input by the user is smaller, larger or equal to $r$. The program ends when the user wins.

**Ex. 2 —** *Loops*

On a user input of 10 marks, calculate: the mean, the median, the variance and the standard deviation. Each calculation should be done in a separate function.

**Ex. 3 —** *Loops, standard library, mathematical functions*

A projectile is fired into the air at an initial speed $v_0 = 30$ m.s$^{-1}$ and an initial angle $\theta_0 = 30°$, with an initial height of 1.5m. Its trajectory can be expressed as

$$y = 1.5 + \tan(\theta_0)x - \left(\frac{g}{2v_o^2 \cos^2 \theta_0}\right) x^2,$$

where $g = 9.81$ is the gravitational acceleration constant.

Implement the bisection method to determine when the projectile touches the ground. Use the constant FLT_EPSILON as the convergence tolerance and $[75, 85]$ as the initial interval for the bisection method.

*Hint 1:* the FLT_EPSILON constant is defined in the float.h file and the mathematical functions are defined in the math.h file

*Hint 2:* the trigonometric functions expect angles in radians