

# Computing session 3

## Pooling and back on the raspberry

**Abstract:**

The aim of this computing session is to use the developments made during the previous session and improve the program running on raspberry.

**Pedagogical goals:****Software handling**

- Browsing efficiently software documentation
- Understanding the description of ROOT classes
- Reading and understanding code examples. Extracting relevant information useful for the development of your programs

**ROOT skills**

- Reading data file (csv and ROOT format)
- Reading and writing trees
- Creating and customizing graphics
- Fitting data distributions according to model functions
- Writing results in several formats

**Compiling/linking**

- Creating an executable file from a simple source file using ROOT classes
- Using a Makefile with links to the ROOT libraries

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# 1 Pooling

During the previous computing session, three classes have been developed:

- `StatisticsCalculator`
- `PixelWriter`
- `PsychrometricCalculator`

We will select the best version of those classes and save them on our raspberry (through USB key).

# 2 Back on the raspberry

We can now come back to the raspberry and improve the codes developed during the first session:

- Using the class `StatisticsCalculator` it is possible to compute the mean and the standard deviation for the quantities of interest.
- Using the class `PsychrometricCalculator` it is possible to compute the dew temperature based on the measured temperature and pressure.
- Using the class `PixelWriter`, it is possible to display messages on the LED matrix.
- By combining the three above functionalities, write a program which will periodically write the mean and std-dev values of the temperature, the relative humidity as well as the dew temperature.
- As the project know contains several classes, it is convenient to use a Makefile and even create a shared library which embed the new three classes used as well as `SenseHat` .
- **Warning mode:** Based on the difference between the temperature and the dew temperature, it is possible to define a threshold and send a warning message.

### 3 Going further

- **Configuration:** Several information can be parametrized with a dedicated configuration file such as
  - the data measurement frequency (or delay)
  - the quantities to be display (use your own nomenclature)
  - the display frequency
  - the name of the directory in which all results will be stored
- **Warning mode:** The threshold controlling the difference between the measured temperature and the dew one can be defined in a configuration file.
- **Unstable conditions:** It is possible to check if the quantities are evolving with time. At the beginning of the execution, the program can measure the mean value of each quantities which a good accuracy, later on if the quantities are varying too far from the initial conditions, send a warning message.
- **Trend graphic:** It is possible to extend the display of the temperature on a LED line (8 pixels) by displaying its evolution with time. The value is coded on 8 pixels in the y-axis while the x-axis represents the time.