



# ESIPAP COMPUTING SESSION 2

WEDNESDAY 14:00 – 17:15

# REMINDER OF SESSION 1

Photo prise pendant la session 1

- Acquiring sensor data (temperature, pressure, relative humidity) with your own code.
- Saving data into a CSV file
- Displaying the current temperature on the LEDs with a bar chart.

# WHAT ARE THE NEXT STEPS ?

Photo prise pendant la session 1

- First analysis of the acquired data.
- Computing the dew temperature and warning the user if we are close to the condensation point.
- Improving the display with the LEDs.
- Celebrating Saint-Valentin?

# 3 CLASSES TO IMPLEMENT

## StatisticsCalculator

Computing statistical information over data acquired in session 1

For instance: average, standard deviation, mediane, ...

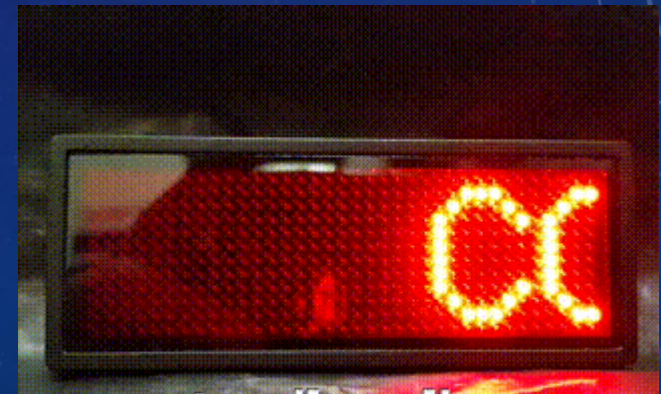
## PsychrometricCalculator

Computing properties of the humid air from data acquired in session 1,

In particular: the dew temperature

## PixelWriter

Displaying any messages with 8x8 LEDs of the Sense Hat board





# IMPLEMENTATION STEP-BY-STEP

## Step 1

First implementation of the class

Test with a main program



## Step 2

Enriching the functionalities of the class

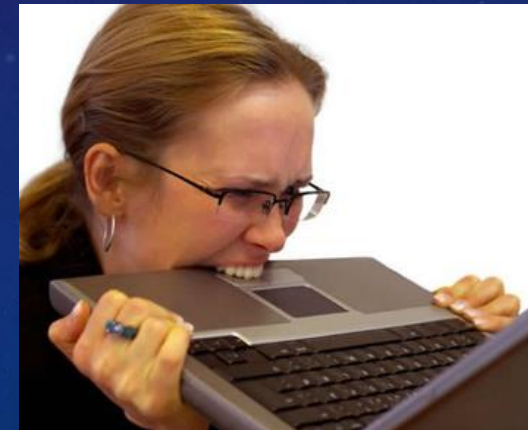
Adding an algorithm part to the work



## Step 3

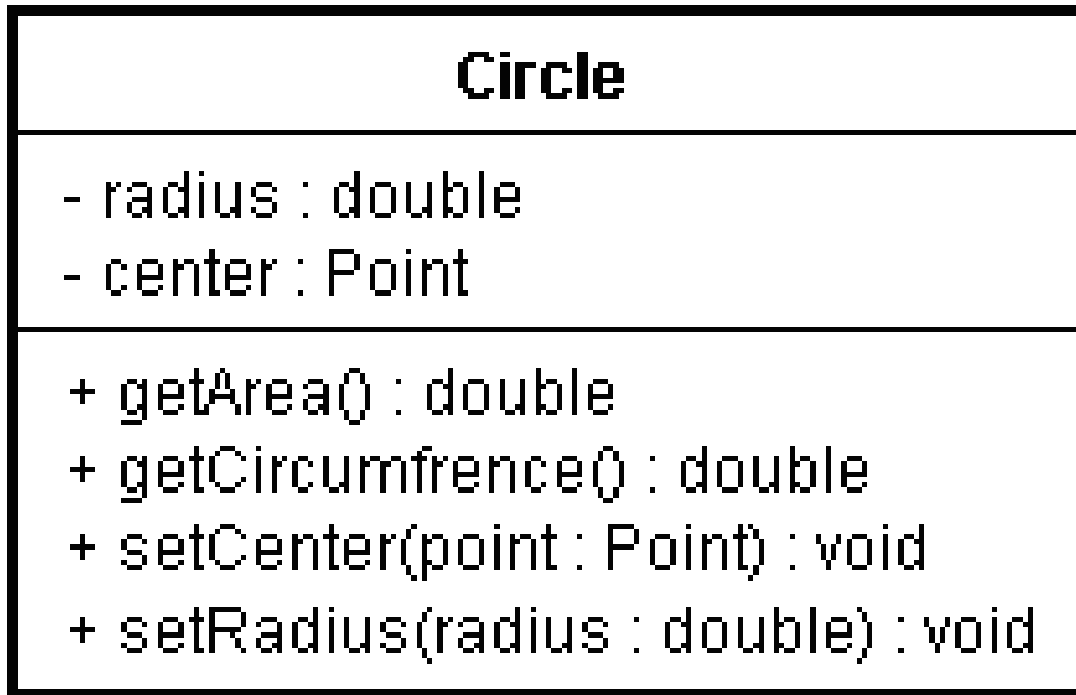
Enriching the structure of the class

Copy constructor, overloading operators, ...



# UML DIAGRAM

Visual representation of  
the content of a class



# CHOOSE YOUR CLASS

## StatisticsCalculator

Difficulty:  
+

- Tricky parts:
- Sorting table
  - Reading CSV files

Development machine:  
PC or Raspberry

## PsychrometricCalculator

Difficulty:  
++

- Tricky parts:
- Coding math formulas
  - Finding zero of functions

Development platform:  
PC or Raspberry

## PixelWriter

Difficulty:  
+++

- Tricky parts:
- Using external libraries
  - Scrolling screen

Development platform:  
Raspberry only

# SAVING CODE



- End of session: sending your code to the supervisors for assement
- Using a web service: [www.wetransfer.com](http://www.wetransfer.com)
  - destination: eric.conte@iphc.cnrs.fr
  - author: filling your address email
- A URL link is created: put it on the following spreadsheet

[https://docs.google.com/spreadsheets/d/1UKm\\_ru84b0pMdHv--8WfJ5mx6NpKm6bGwDjhFNYkqsA/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1UKm_ru84b0pMdHv--8WfJ5mx6NpKm6bGwDjhFNYkqsA/edit?usp=sharing)



# UML DIAGRAMS

## StatisticsCalculator

```
-nmax_ : unsigned int = 100000
-data_ : ARRAY = empty

+StatisticsCalculator()
+StatisticsCalculator(nmax: unsigned int)
+~StatisticsCalculator()

+Clear()
+Print()
+AddValue(value: double): bool

+GetMin(): double
+GetMax(): double
+GetMean(): double
+GetRMS(): double
+GetStandardDeviation(): double
+GetMediane(): double
+ReadCSVfile(filename: std::string,
              column: unsigned int)
```

## PsychrometricCalculator

```
-t_ : double
-ah_ : double
-p0_ : double

+PsychrometricCalculator()
+PsychrometricCalculator(t: double, ah: double, p0: double)
+~PsychrometricCalculator()

+Clear()
+Print()
+SetTemperatureAbsoluteHumidityPressure(t: double, ah:
                                         double, p0: double)

+GetTemperature(): double
+GetDryTemperature(): double
+GetAbsoluteHumidity(): double

+SetTemperatureRelativeHumidityPressure(t: double, rh:
                                         double, p0: double)

+GetVapourPressure(): double
+GetRelativeHumidity(): double
+GetSpecificVolume(): double
+GetDensity(): double
+GetSpecificEnthalpy(): double
```

## PixelWriter

```
-device_ : SenseHat*
-forecolor_ : SenseHatColor::Color_t =
              SenseHatColor::WHITE
-backcolor_ : SenseHatColor::Color_t =
              SenseHatColor::BLACK

+PixelWriter()
+PixelWriter(device: SenseHat*)
+~PixelWriter()

+SetDevice(device: SenseHat*)
+SetForecolor(color: SenseHatColor::Color_t)
+SetBackcolor(color: SenseHatColor::Color_t)
+GetDevice(): SenseHat*
+GetForecolor(): SenseHatColor::Color_t
+GetBackcolor(): SenseHatColor::Color_t

+ClearPixels(): bool
+DisplayPattern(pixels: ARRAY): bool
+DisplayCharacter(character: char)
+DisplaySentence(sentence: std::string)
```

Color code:

STEP 0 (data members) - STEP 1 (constructors, destructor, accessors, mutators) - STEP2 (specific methods) - STEP 3 (advanced methods)