

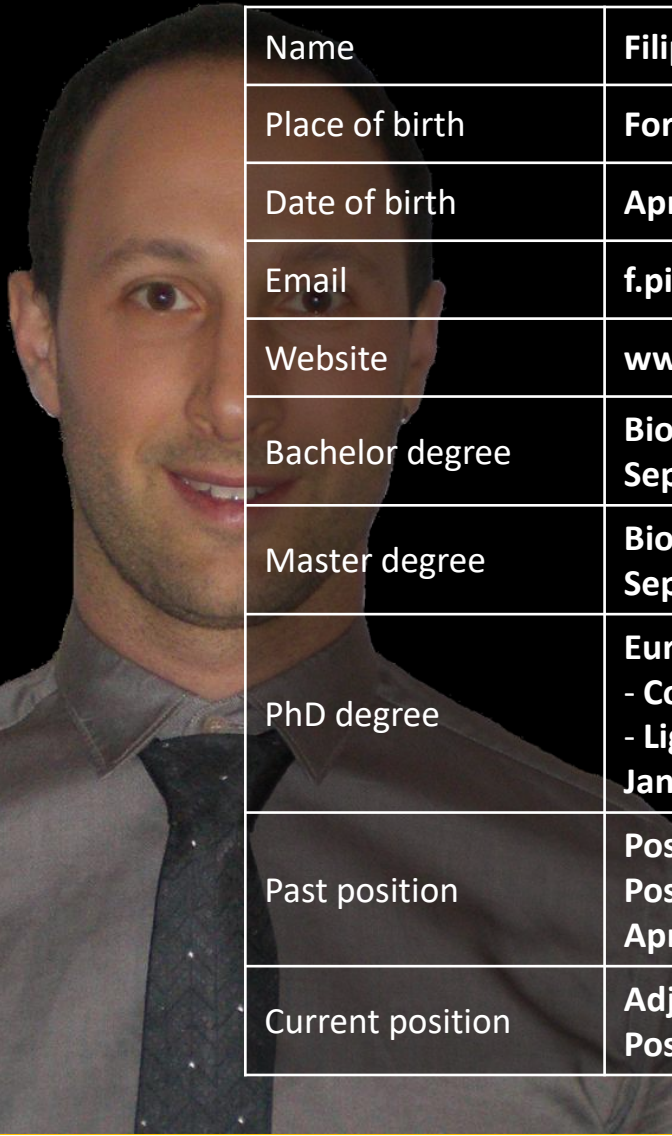


# **LABORATORY OF COMPUTER PROGRAMMING**

**Eng. Filippo Piccinini, PhD**  
**f.piccinini@unibo.it**

**School of Economics, Management and Statistics**  
**Alma Mater Studiorum, University of Bologna**  
**A.Y. 2017/2018**

# Filippo Piccinini



Name	<b>Filippo Piccinini</b>
Place of birth	<b>Forlimpopoli, FC, Italy</b>
Date of birth	<b>April 20, 1985</b>
Email	<b>f.piccinini@unibo.it</b>
Website	<b>www.filippopiccinini.it</b>
Bachelor degree	<b>Biomedical Engineer, University of Bologna, September 2004 - July 2007, score: 110 cum LAUDE</b>
Master degree	<b>Biomedical Engineer, University of Bologna September 2007 - October 2009, score: 110 cum LAUDE</b>
PhD degree	<b>European Doctorate in Information Technology - Computer Vision Group, University of Bologna - Light Microscopy and Screening Center, ETH Zurich January 2010 – April 2013 (3 years)</b>
Past position	<b>Postdoc Research Fellow, University of Bologna Postdoc Research Fellow, BRC Szeged, Hungary April 2013 – February 2017</b>
Current position	<b>Adjunct Professor, UniBO Postdoc Research Fellow, IRCCS-IRST</b>

# Software tools

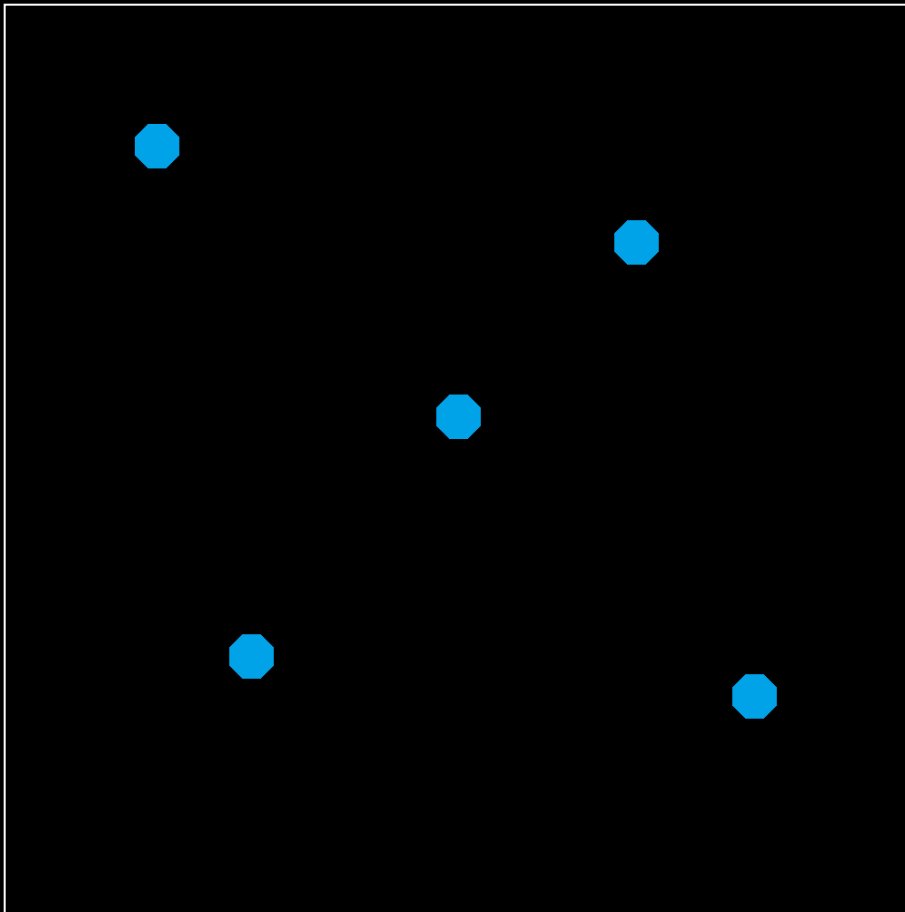
- **CellTracker**, for tracking cells cultured in vitro  
*<http://celltracker.website/>*
- **Advanced Cell Classifier**, for classifying cells in high-content screening images  
*<http://www.cellclassifier.org/>*
- **CIDRE**, for correcting the illumination field of microscopy images  
*<http://www.nature.com/nmeth/journal/v12/n5/full/nmeth.3323.html>*
- **MicroMos**, for building a panorama, starting from a set of overlapping images  
*<http://www.filippopiccinini.it/Mosaicing/index.html>*
- **ReViSP**, for volume estimation and 3D rendering of multicellular spheroids  
*<http://sourceforge.net/projects/revisp/>*
- **AnaSP**, software suite to segment brightfield images of multicellular spheroids  
*<http://sourceforge.net/projects/anasp/>*
- .....

Let's play!

**How many dots are there?**

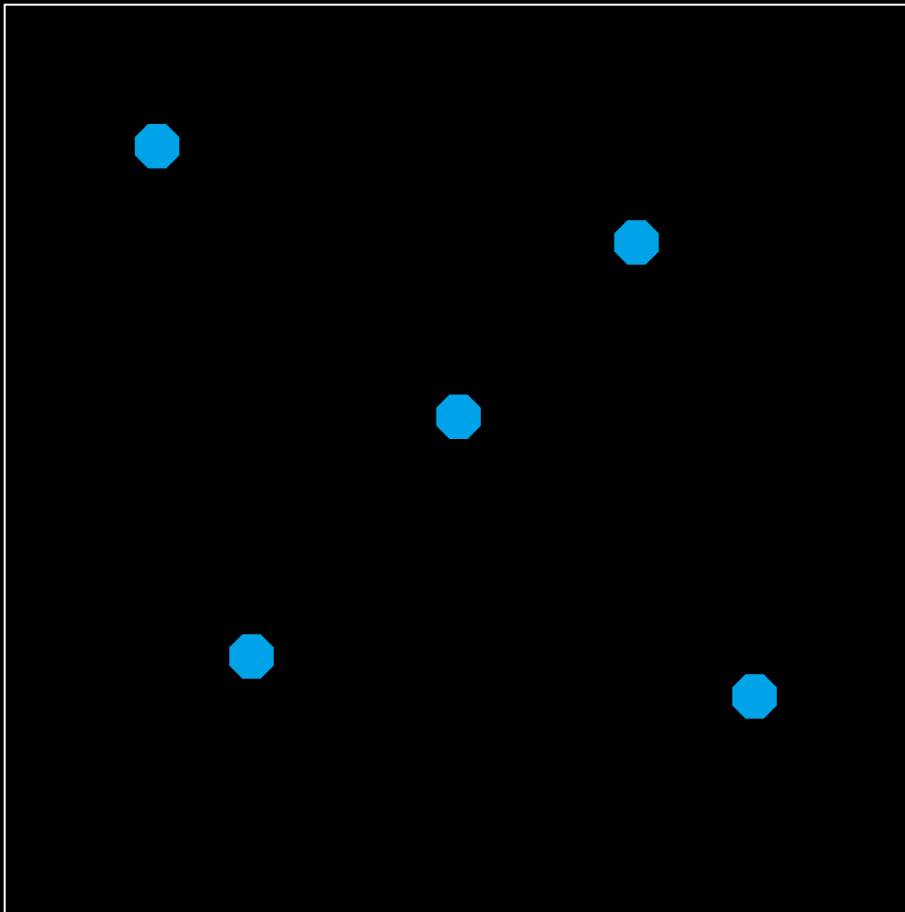
Let's play!

**How many dots are there?**



# Let's play!

**How many dots are there?**



**5 DOTS**

**PERFORMANCE:**

**Humans ~3 sec**

**Computers ~1 sec**

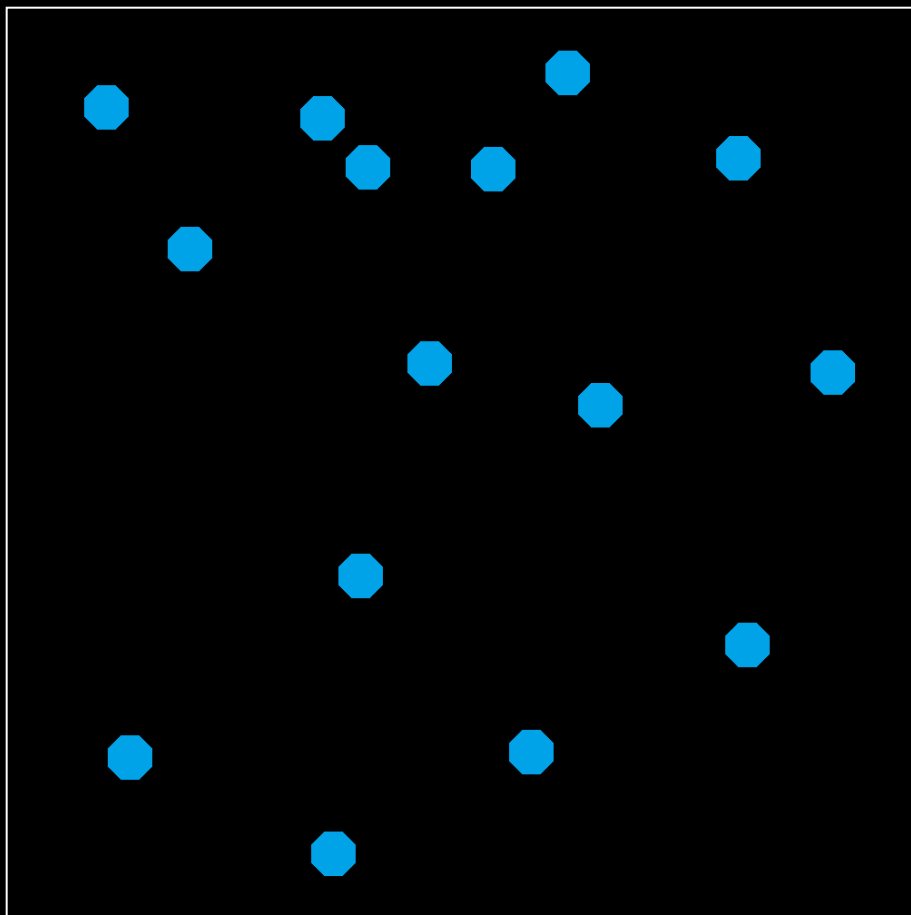
(using the standard Watershed segmentation algorithm)

Let's play!

**How many dots are there?**

Let's play!

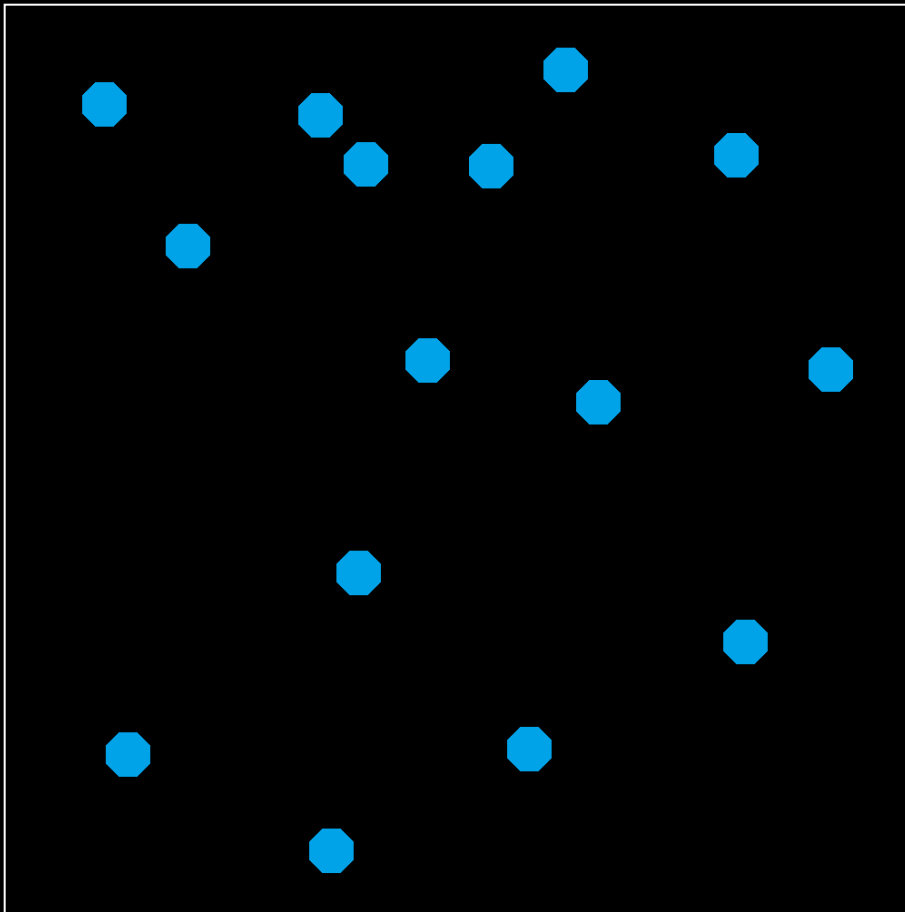
**How many dots are there?**





# Let's play!

**How many dots are there?**



**15 DOTS**

**PERFORMANCE:**

**Humans ~6 sec**

**Computers ~1 sec**

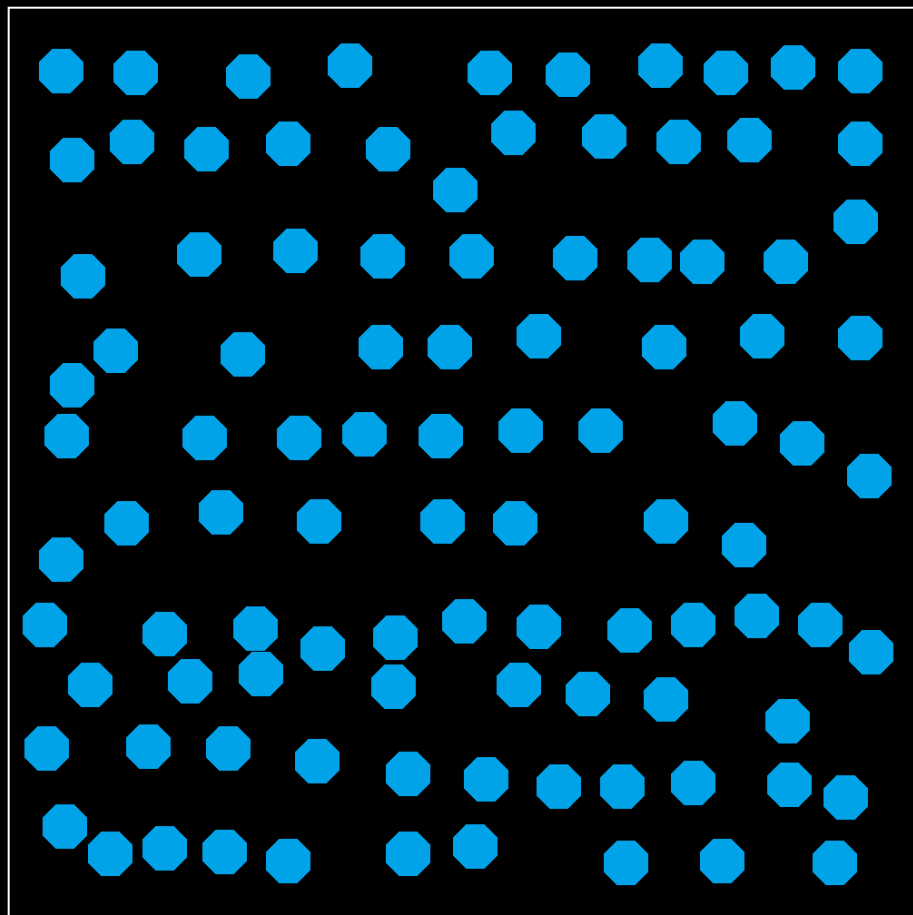
(using the standard Watershed segmentation algorithm)

Let's play!

**How many dots are there?**

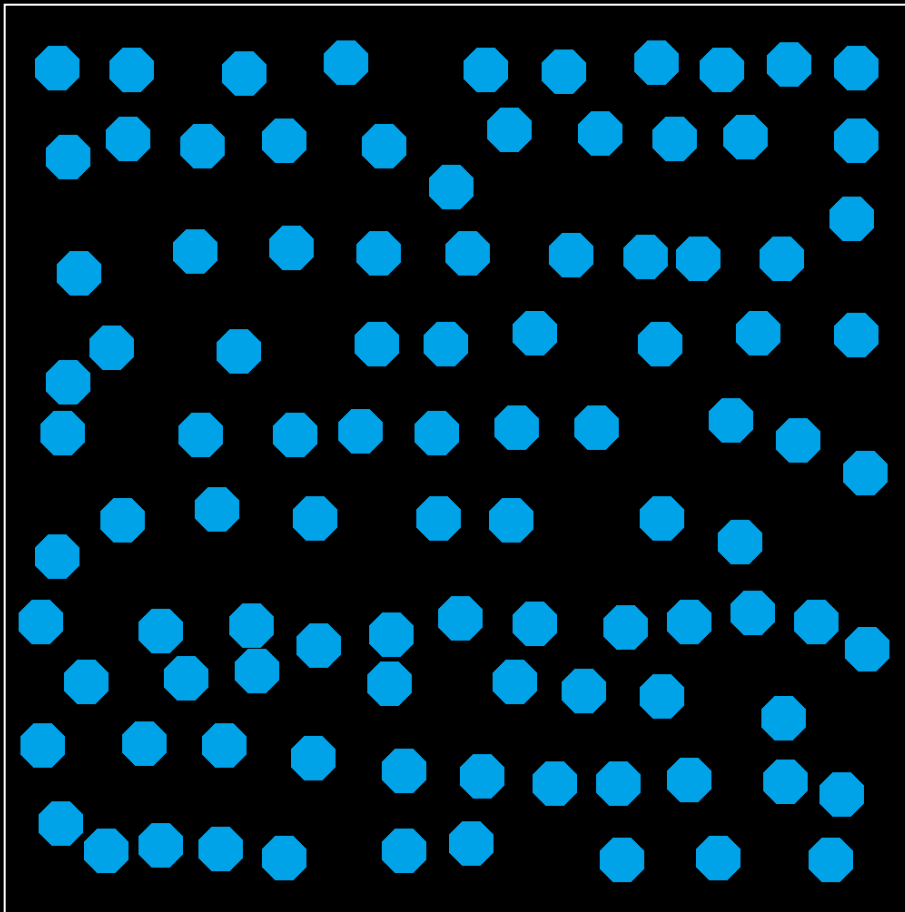
Let's play!

**How many dots are there?**



# Let's play!

**How many dots are there?**



**99 DOTS**

**PERFORMANCE:**

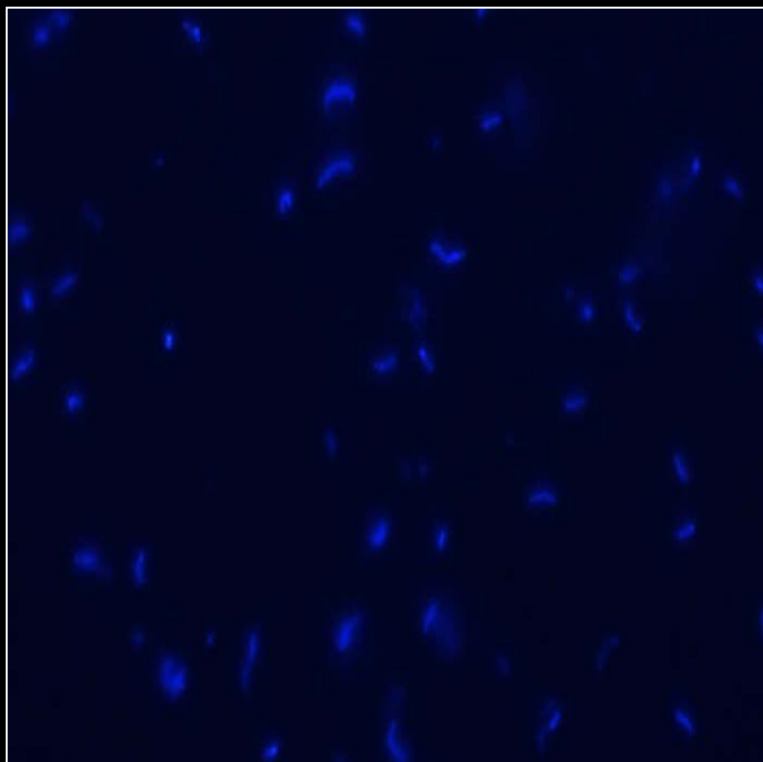
**Humans :- (**

**Computers ~1 sec**

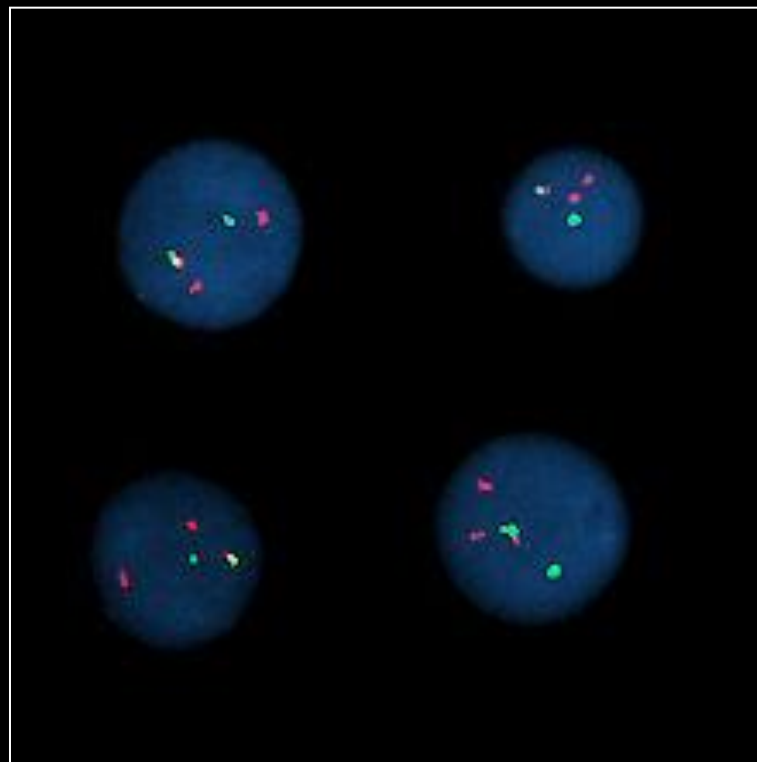
(using the standard Watershed segmentation algorithm)

# To be competitive we need customized algorithms!

Cell counting applications



FISH analysis



# Outline

- **Aim of the course**
- **References**
- **Lessons**
- **Final test**

# Outline

- **Aim of the course**
- **References**
- **Lessons**
- **Final test**

# Aim of the course

**IN THIS SHORT COURSE WILL WE LEARN THE BASICS OF PROGRAMMING**

**We will use the Python version 2.7 (note, no Python version 3) and IDLE,  
the Python's Integrated Development and Learning Environment.**

**PYTHON IS OPEN-SOURCE!**

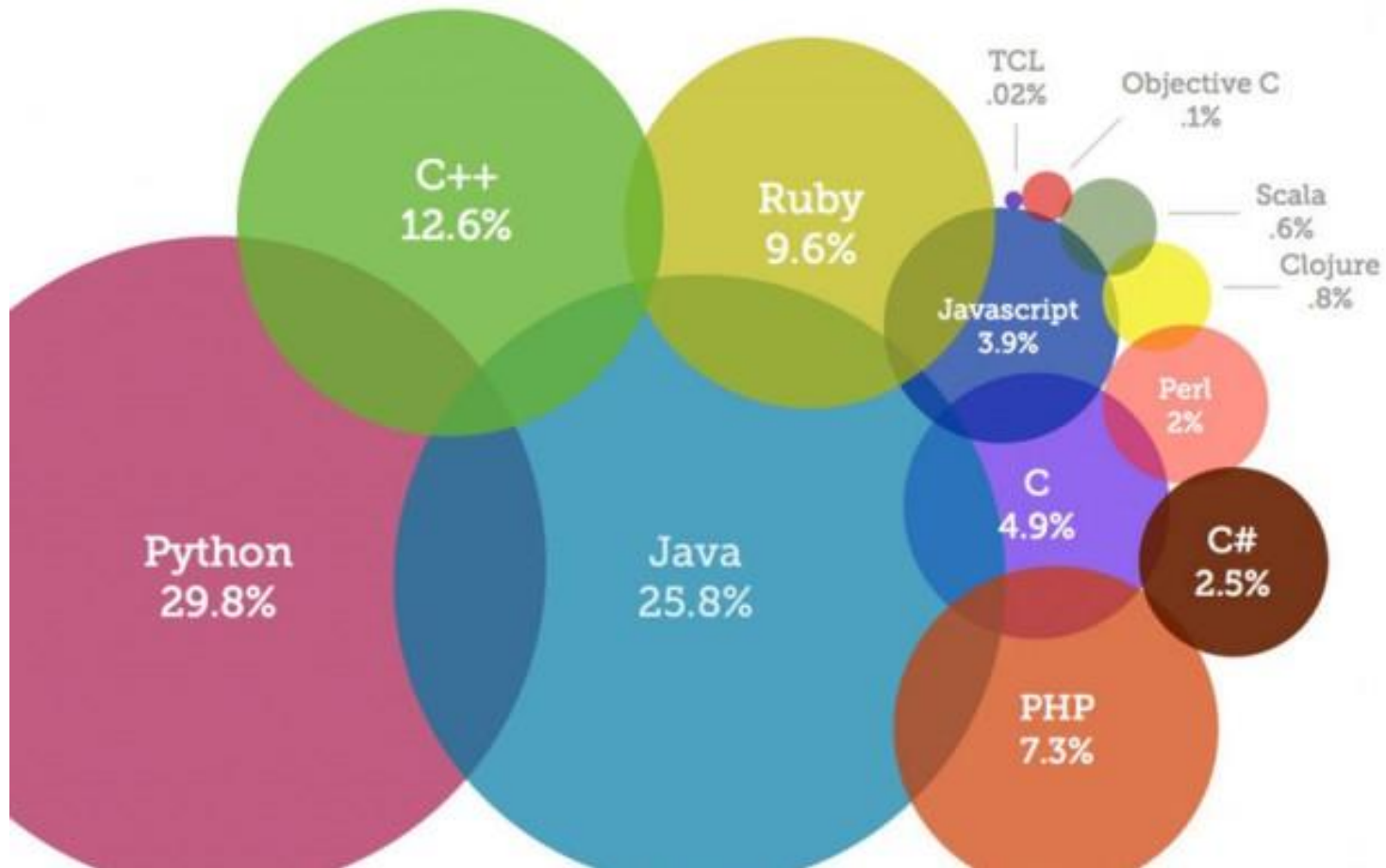
**You need just a computer and nothing more!**  
**[www.python.org](http://www.python.org)**





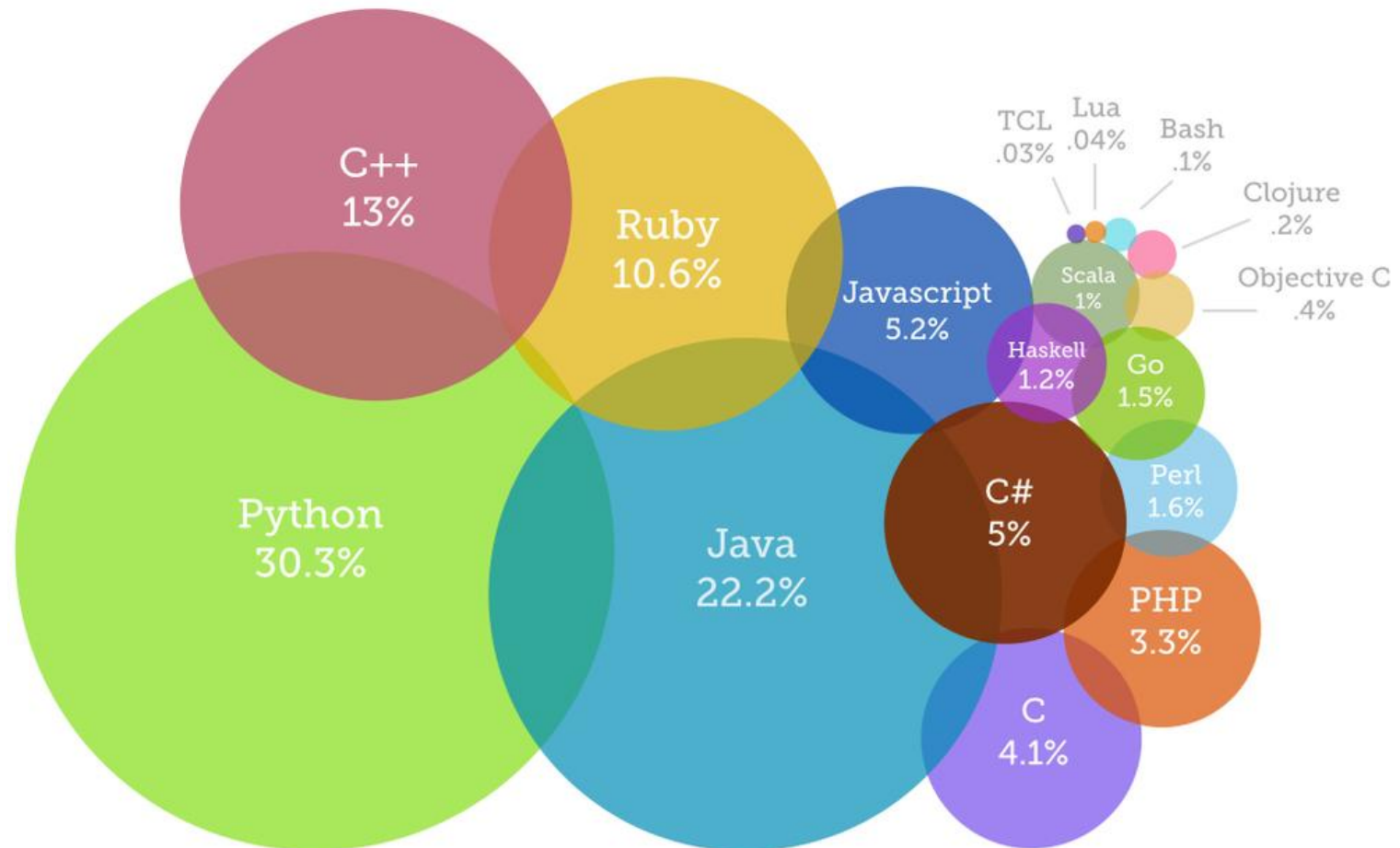
# Why Python?

Most Popular Coding Languages of 2013



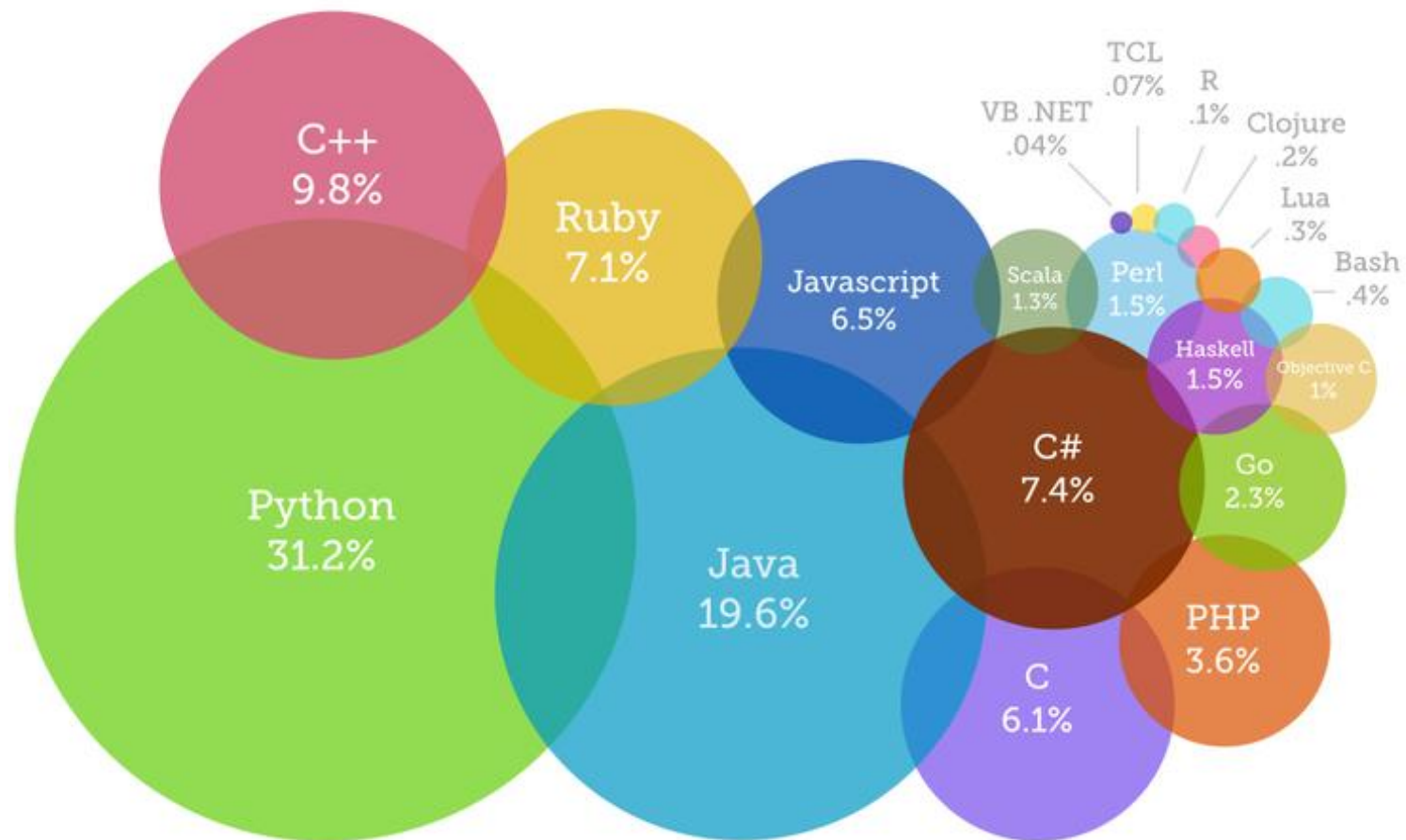
# Why Python?

Most Popular Coding Languages of 2014



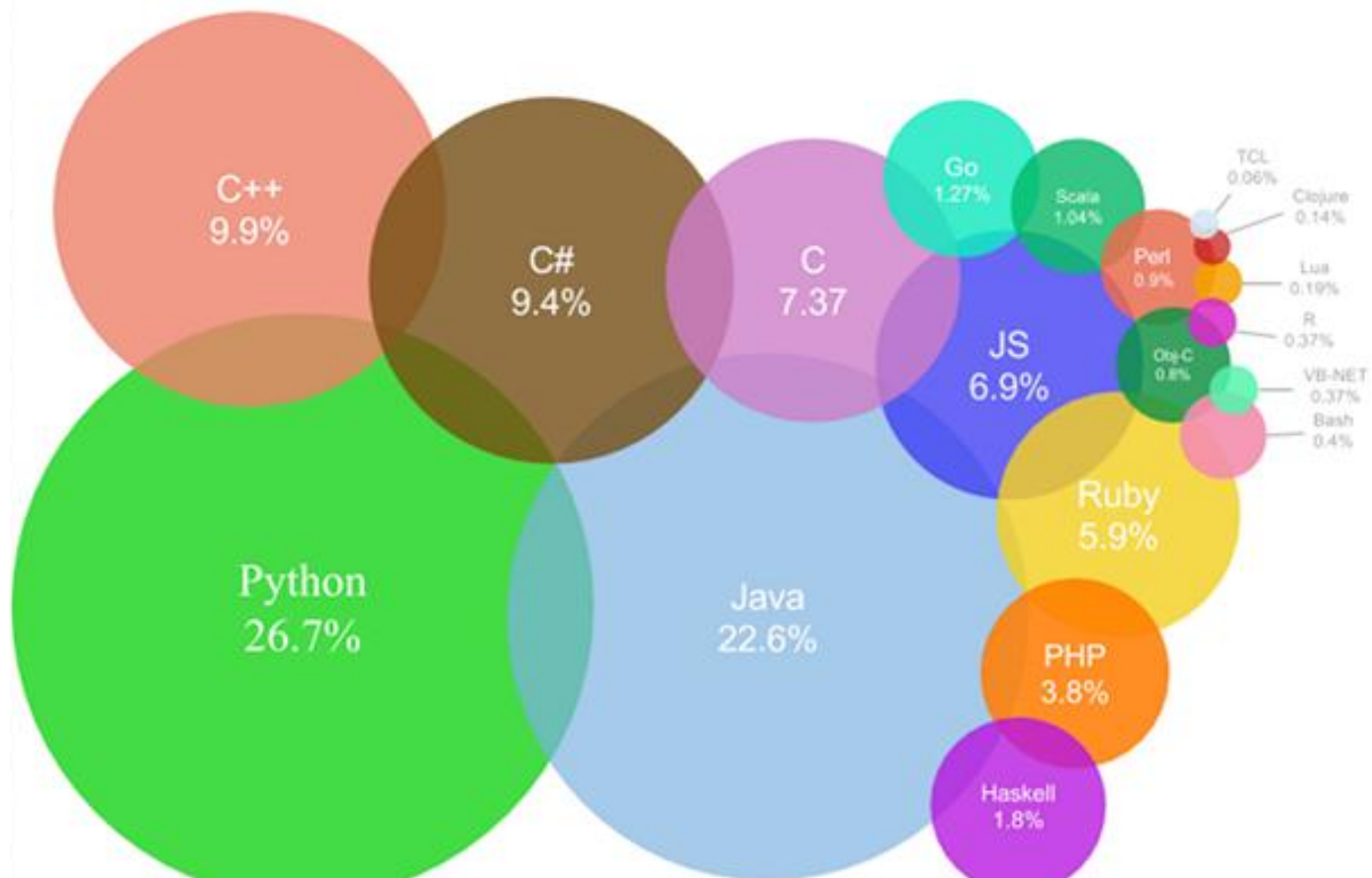
# Why Python?

Most Popular Coding Languages of 2015



# Why Python?

Most Popular Coding Languages of 2016



# Outline

- Aim of the course
- References
- Lessons
- Final test

# References

- **Official course's website:**

<http://www.ems.unibo.it/en/programmes/course-unit-catalogue/course-unit/2017/395217>

- **Piccinini's website:**

[www.filippopiccinini.it](http://www.filippopiccinini.it)

- **Book:**

"Python Crash Course: a hands-on, project-based introduction to programming"  
By Eric Matthes. Publisher: No Starch Press.

- **Book website:**

<https://ehmatthes.github.io/pcc/>

- **Python website (see the Downloads section):**

[www.python.org](http://www.python.org)

- **Free Python e-Books:**

<https://medium.mybridge.co/19-free-ebooks-to-learn-programming-with-python-8f6f0ad4a7f8>

- **Mailing list:**

Please, write me your email address

# References – other links

- **Interesting website for learning Python hints:**  
[www.learnpython.org](http://www.learnpython.org)
- **Timeline of programming languages:**  
[https://en.wikipedia.org/wiki/Timeline\\_of\\_programming\\_languages](https://en.wikipedia.org/wiki/Timeline_of_programming_languages)
- **Python (programming language):**  
[https://en.wikipedia.org/wiki/Python\\_\(programming\\_language\)](https://en.wikipedia.org/wiki/Python_(programming_language))
- **Python syntax and semantics:**  
[https://en.wikipedia.org/wiki/Python\\_syntax\\_and\\_semantics#Indentation](https://en.wikipedia.org/wiki/Python_syntax_and_semantics#Indentation)
- **How IDLE works:**  
[https://www.youtube.com/watch?v=kXbpB5\\_ywDw](https://www.youtube.com/watch?v=kXbpB5_ywDw)
- **Debugging under IDLE:**  
<https://www.cs.uky.edu/~keen/help/debug-tutorial/debug.html>
- **Python keywords:**  
<https://www.programiz.com/python-programming/keyword-list>
- **Parse strings in Python**  
<https://stackoverflow.com/questions/5749195/how-can-i-split-and-parse-a-string-in-python>

# Outline

- Aim of the course
- References
- Lessons
- Final test



# Course timetable

<http://www.ems.unibo.it/en/programmes/course-unit-catalogue/course-unit/2017/395217/orariolezioni>

Lesson period Feb 16, 2018 - Mar 27, 2018		
DATE	TIME	
<b>16</b> Friday February, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 11 Piano Primo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>23</b> Friday February, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 2 Piano Terra Piazza Antonino Scaravilli, 1-2 - Bologna
<b>9</b> Friday March, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 22 Piano Secondo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>16</b> Friday March, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 22 Piano Secondo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>23</b> Friday March, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 11 Piano Primo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>27</b> Tuesday March, 2018	14:00 - 17:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 31 Piano Terzo Piazza Antonino Scaravilli, 1-2 - Bologna

# Lesson plan

## FRIDAY FEBRUARY 16, 2018, LESSON 01

- L01H01:  
Course organization  
Presentation of the course's book.  
Presentation of the online material.  
Programming languages: history.
- L01H02:  
How to install Python.  
How IDLE works.
- L01H03:  
Variables and simple data types.  
The Zen of Python.
- L01H04:  
Exercises.

## FRIDAY FEBRUARY 23, 2018, LESSON 02

- L01H01:  
Debugging under IDLE.  
Introducing lists.
- L01H02:  
Exercises.
- L01H03:  
Working with lists.
- L01H04:  
Exercises.

# Lesson plan

## FRIDAY MARCH 09, 2018, LESSON 03

L01H01:  
    Parse strings  
    If statement.

L01H02:  
    Exercises.

L01H03:  
    User input.

L01H04:  
    Exercises.  
    Python keywords.

## FRIDAY MARCH 16, 2018, LESSON 04

L01H01:  
    While loops.

L01H02:  
    Exercises.

L01H03:  
    Functions.

L01H04:  
    Exercises.

# Lesson plan

## **FRIDAY MARCH 23, 2018, LESSON 05**

- L01H01:  
Files and exceptions.
- L01H02:  
Exercises.
- L01H03:  
Exercise “Hangman Game”.
- L01H04:  
Summary

## **TUESDAY MARCH 27, 2018**

FINAL TEST

# Outline

- Aim of the course
- References
- Lessons
- Final test

# Final test

## **Description**

The final test is composed by three exercises, to be solved using the Python language. The students cannot use computers, devices and any other type of material, just pens and paper!

## **Evaluation**

The final test is considered “positively past” if at least two out of the three exercises are perfectly solved.

## **What in case of “final test” positively past?**

If the student positively pass the final test of this crash course, he/she can attend the exam of the course “37262 - COMPUTER PROGRAMMING” by Prof. Mauro Gaspari, just discussing the project without the need of attending the “Basic Python Test” of that exam.

# Final test – Parts of an email by Prof. Gaspari

To the students of the Computer Programming Course at QF UNIBO.

Dear All,

I am sending you some information about the Crash Course (Laboratory of Computer Programming) and about the Computer Programming course scheduled in November 2018 in general.

- The Crash Course will start Friday the 16th of February, 14.00-18.00, Aula 5
- The Lecturer will be: Prof. Filippo Piccinini
- Concerning the Crash Course it is very important to know that the Exam of Computer Programming is organized in two sequential steps:

- 1) A PROGRAMMING TEST;

- 2) A DISCUSSION OF A PROJECT realized alone or in a group.

Note that the two steps are sequential: passing the PROGRAMMING TEST is mandatory for the PROJECT discussion and thus for doing the second step and passing the exam.

- The goal of the Crash course is to give students basic programming notions sufficient for following the Computer Programming course without problems and passing the PROGRAMMING TEST.

...

# Final test – Parts of an email by Prof. Gaspari

- One PROGRAMMING TEST will be scheduled just after the Crash Course, if you will pass this test, it is not necessary to participate to step 1 of the Computer Programming exam and you will be allowed to discuss your project.
- Passing this test early is a fundamental step and it will allow students to follow the Computer Programming course more actively (evaluated home work will be assigned starting from the first week) and, most importantly, to discuss their project early (note that for discussing a project all the members of the group must pass the PROGRAMMING TEST).
- Please also note that the first PROGRAMMING TEST after the main Computer Programming course will be scheduled in January 2019.
- Students of the Crash Course should bring their laptops/netbooks starting from the first lesson. Anyway having a laptop/netbook is not essential for all of you. Lectures are organized interactively and the students will be divided in small groups to solve exercises with the support of Prof. Piccinini.
- In the first lesson (only), He will also provide support to install in your computers the software required during the course (Python 2.7) if you have problems.



# Final test – Tuesday 27<sup>th</sup> March 2018, 14:00-17:00

## Lesson period Feb 16, 2018 - Mar 27, 2018

DATE	TIME	
<b>16</b> Friday February, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 11 Piano Primo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>23</b> Friday February, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 2 Piano Terra Piazza Antonino Scaravilli, 1-2 - Bologna
<b>9</b> Friday March, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 22 Piano Secondo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>16</b> Friday March, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 22 Piano Secondo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>23</b> Friday March, 2018	14:00 - 18:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 11 Piano Primo Piazza Antonino Scaravilli, 1-2 - Bologna
<b>27</b> Tuesday March, 2018	14:00 - 17:00	Laboratory of Computer Programming FILIPPO PICCININI AULA 31 Piano Terzo Piazza Antonino Scaravilli, 1-2 - Bologna

# Reception Days (to privately see the Final Test)

**Wednesday, 04 April 2018, whole day, by private appointment fixed via email.**

at: ARCES (Advanced Research Center on Electronic Systems, University of Bologna),  
via Toffano 2/2, Bologna

**Thursday, 05 April 2018, whole day, by private appointment fixed via email.**

at: ARCES (Advanced Research Center on Electronic Systems, University of Bologna),  
via Toffano 2/2, Bologna

# THANK YOU



Eng. Filippo Piccinini, PhD  
f.piccinini@unibo.it