



POLITECNICO  
DI TORINO



e-Lite

# Course Introduction

## Ambient intelligence

Fulvio Corno

Politecnico di Torino, 2015/2016



<http://bit.ly/polito-ami>



# Basic information

- Title: **Ambient Intelligence**
- Code: 01QZPxx
- Year: 3, Semester: 2
- Credits: 6
- Language: English (almost...)

<http://bit.ly/polito-ami>

*Tattoo this!*

# Summary

- Goals and contents
- Organization
- Resources
- Exam
- 2015's projects and Showcase



Course Introduction

# GOALS AND CONTENTS

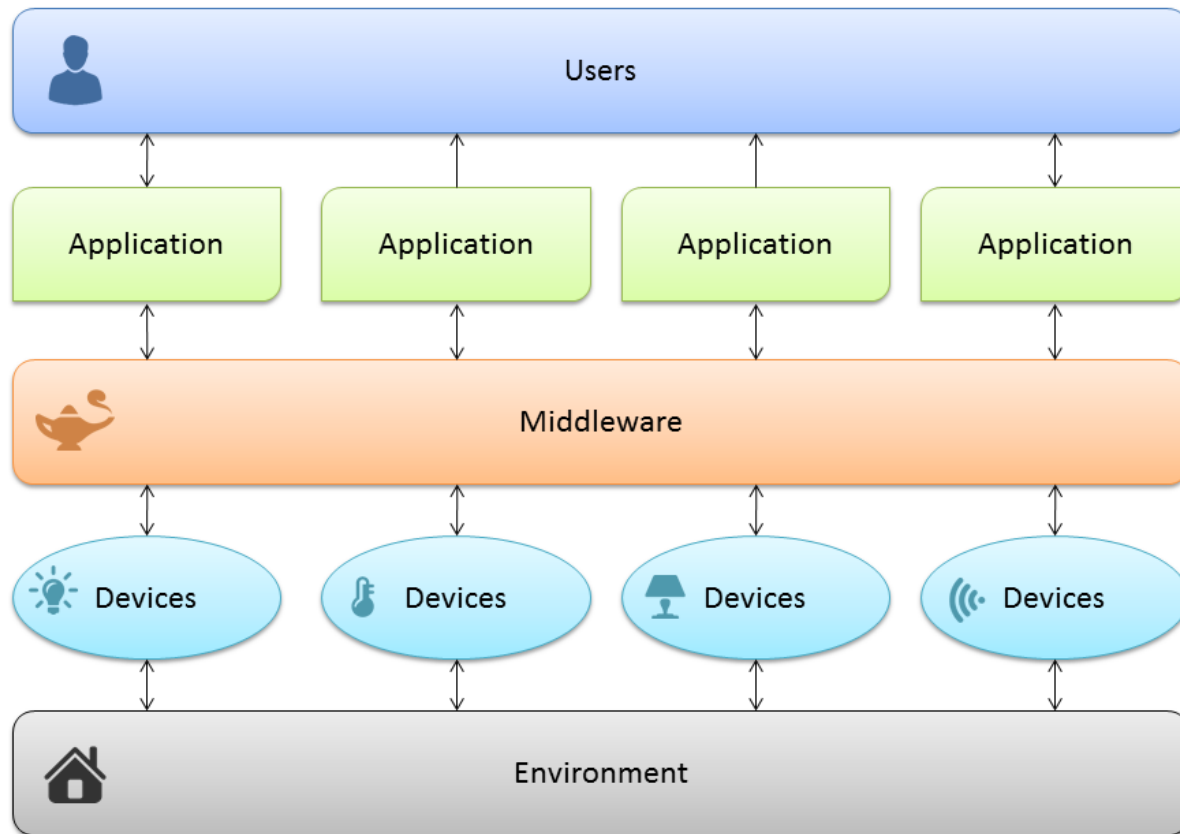
# Goals

- Designing and realizing environments that enrich the user experience and help householders in their activity
- Adopting a feature-driven design methodology, targeting open and reusable solutions
- Integrating existing devices and existing home- and building- automation systems (don't reinvent the wheel)
- Really building a (simple) working Aml system, in a multi-disciplinary team

# Definitions

- “An **Ambient Intelligence** system is a digital environment that proactively, but sensibly, supports people in their daily lives”
- “An **Intelligent Environment** is one in which the actions of numerous networked controllers (controlling different aspects of an environment) is orchestrated by self-programming pre-emptive processes (e.g., intelligent software agents) in such a way to create an interactive holistic functionality that **enhances occupants experiences.**”

# Reference architecture

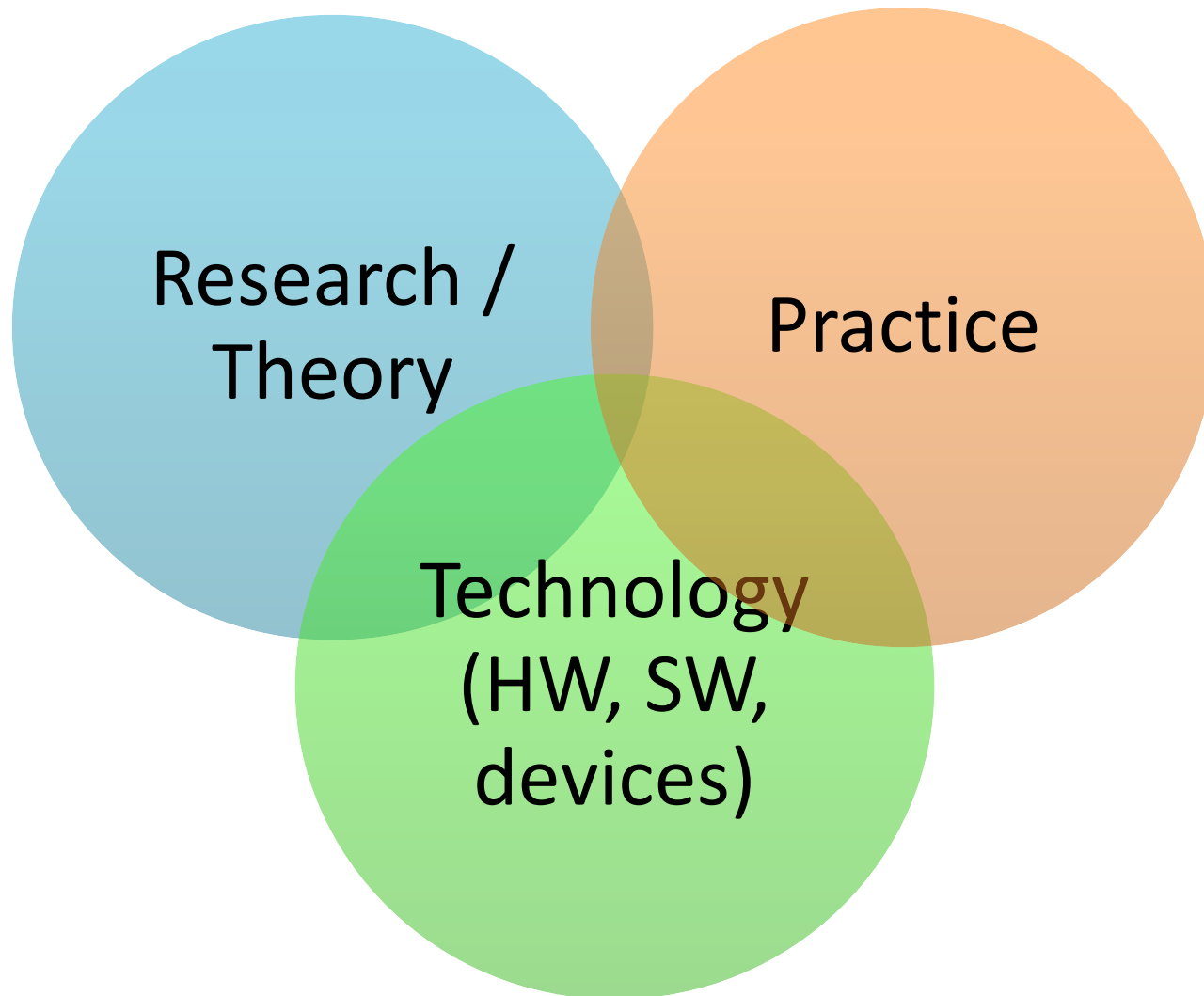


# Main contents

- Aml definitions, applications, systems: taxonomy and market overview
- Feature-driven design methodology
- Enabling technologies: Linux, hardware boards, python, Web, Dog3.0
- Some off-the-shelf automation technologies
- Rapid prototyping and development
- Group work (supervised and free)



# Approach



# Approach

- Mix of
  - Theory
  - Technology overview
  - Practical information
  - Hands-on experience
  - Group work
  - Industry information
  - Application areas
- Main focus
  - Practical approach
  - Sound design methodology
  - Open and reusable solutions
- *Learning to design and build a (working) Aml solution*



Course Introduction

# **ORGANIZATION**

# Teachers

- Fulvio Corno <fulvio.corno@polito.it>
- Luigi De Russis <luigi.derussis@polito.it>
- Teodoro Montanaro <teodoro.montanaro@polito.it>
  - Politecnico di Torino, Dipartimento di Automatica e Informatica
- ~20 hours each, mixed Lecture / Exercise / Lab

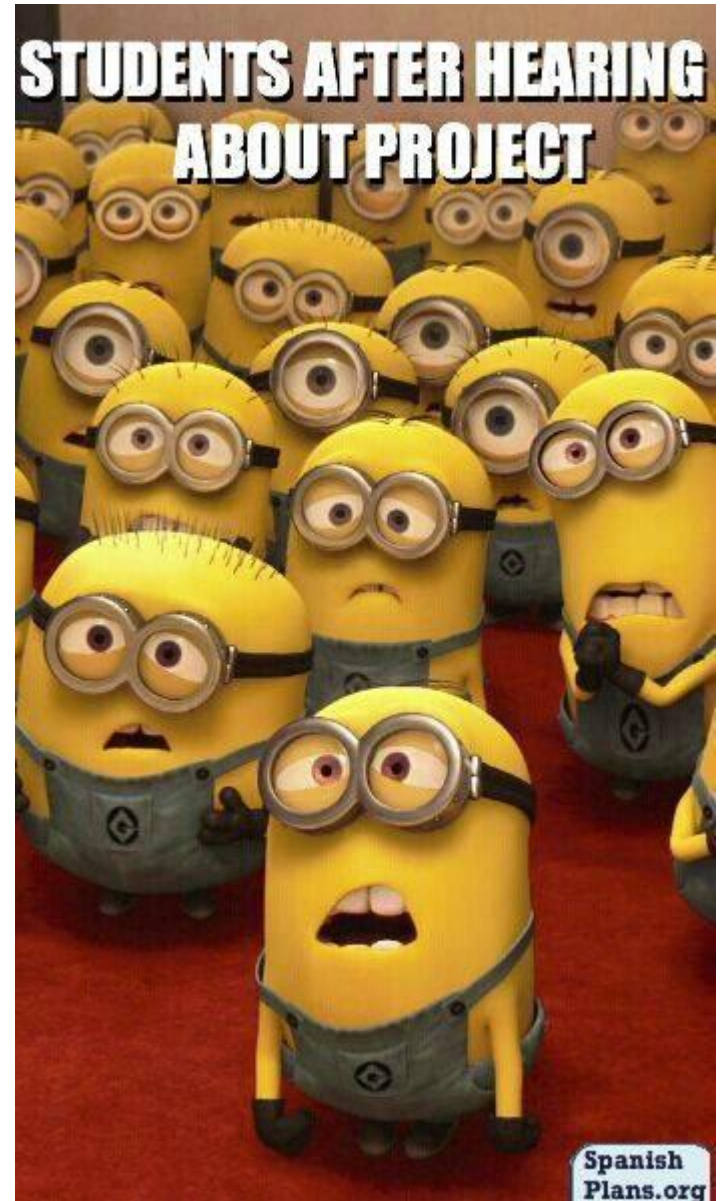
# Schedule

- Monday
  - 16:00-17:30
    - Room 4D (sometimes)
    - LADISPE (most of the times)
  - 17:30-19:00 (sometimes)
    - Room 4D / LADISPE
    - Free LADISPE access
- Thursday
  - 16:00-17:30
    - Room 3I
  - 17:30-19:00 (sometimes)
    - Room 3I


Updated week-by-week schedule on the course website (“Log” section)

# The Lab

- LADISPE
- Essential part of the course (the most important)
- Real smart home hardware and IoT devices
- 50% assigned exercises
- 50% supervised group work
  
- Group work



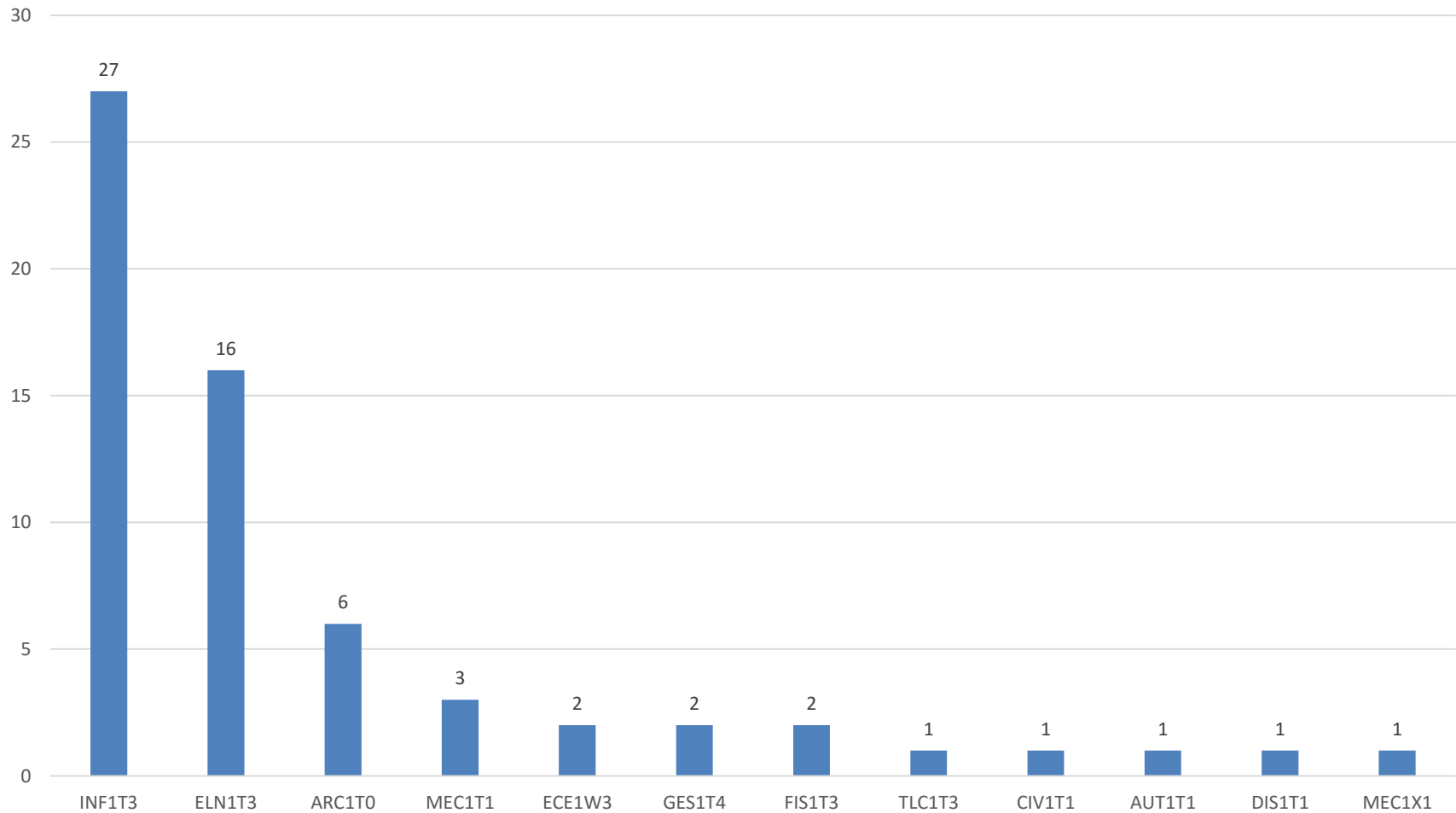
# The Skewed Schedule



Week	Classes	Exercises	Group Work
1	3		
2	3	1	
3	2	1	1
4	3	1	
5	2		2
6	3	1	
7	3	1	
8	1		1
9		1	1
10	1	1	1
11		1	1
12		1	1
13			1
14			1

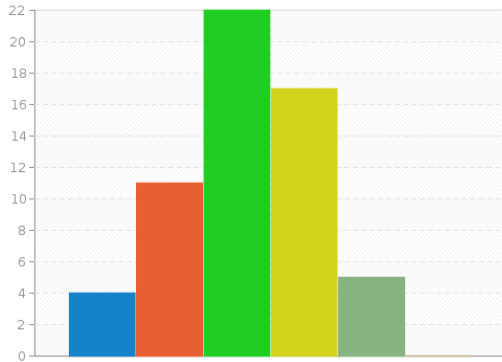
- Non-uniform distribution of hours
- Decreasing impact of classes
- Increasing time for supervised GW
- Increasing free time for developing the project

# Students (about you...)

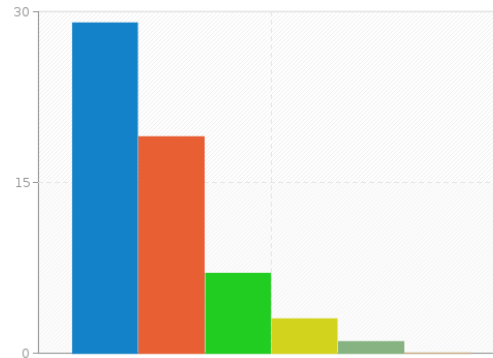




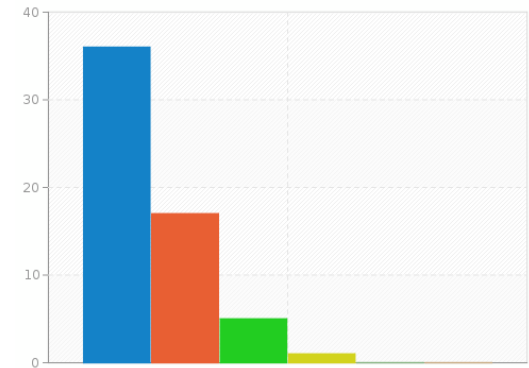
# Skills



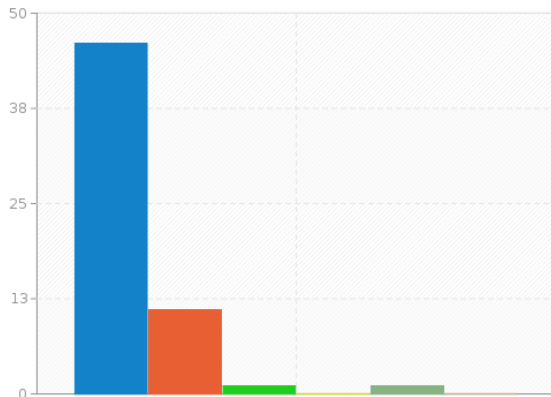
**Programming (in general)**



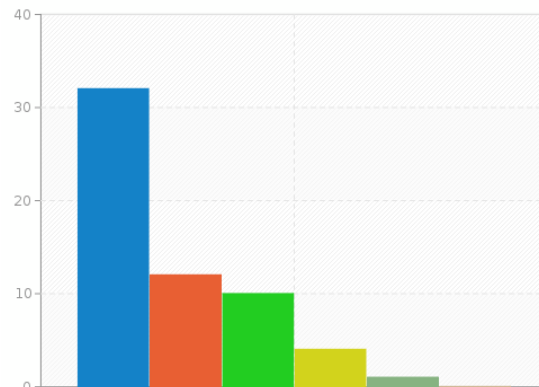
**Web architectures**



**Mobile development**

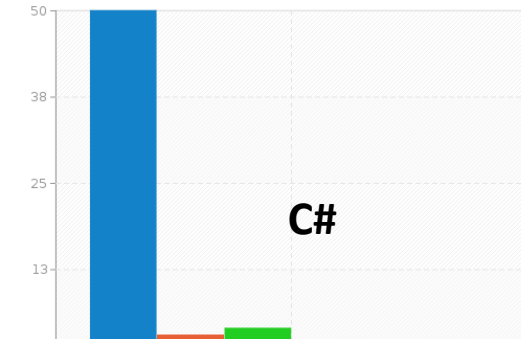
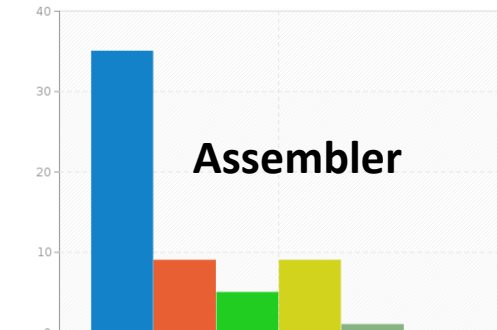
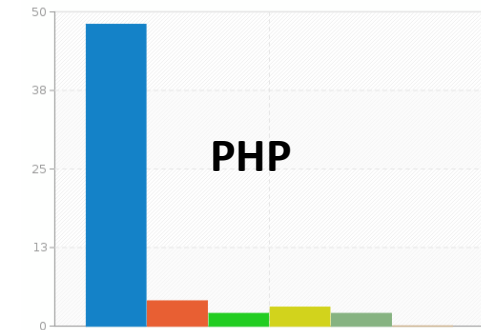
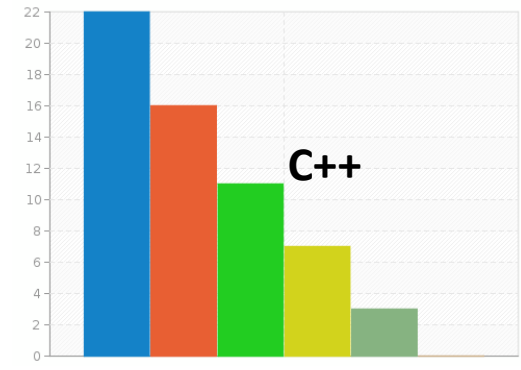
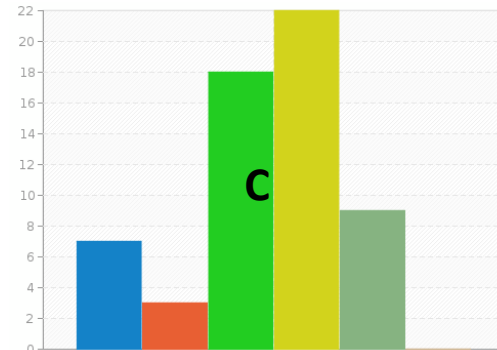
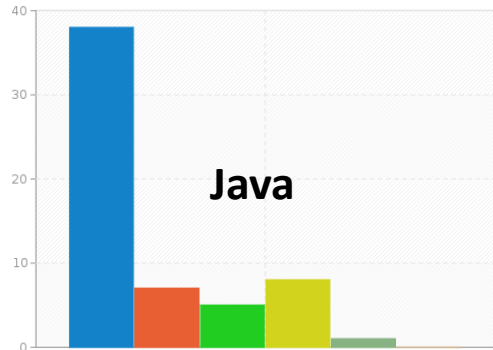
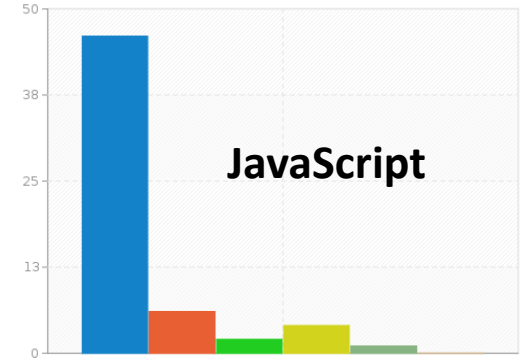
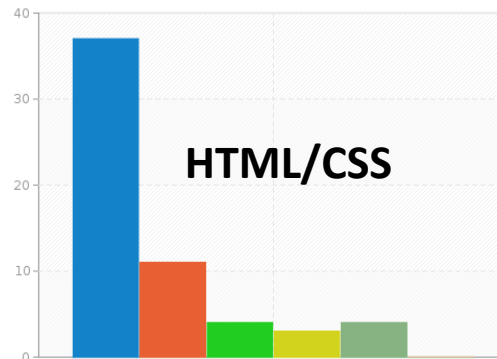
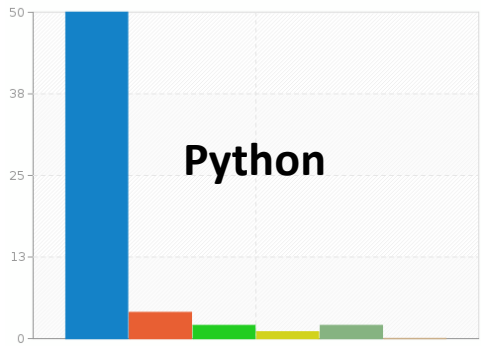


**Source control**



**Software requirements**

# Programming languages

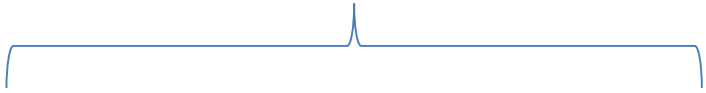


2015/2016

Ambient intelligence

# Don't worry... we'll get there

From initial survey

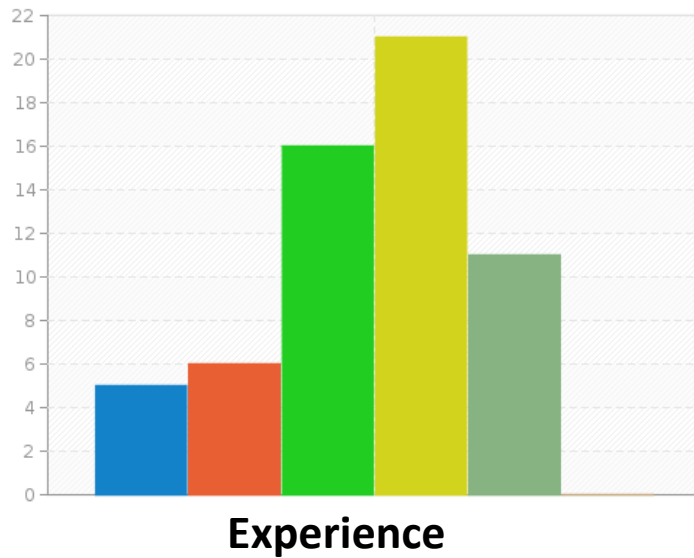


Topic	Low (1-2)	Average (3)	High (4-5)	Projects
Programming (in general)	13.21%	<b>41.51%</b>	35.85%	14/14
Web Architectures	<b>58.49%</b>	16.98%	15.09%	13/14
Mobile development	<b>83.02%</b>	3.77%	3.77%	8/14
Source Control management	<b>86.79%</b>	1.89%	1.89%	14/14
Software requirements specification	<b>75.47%</b>	11.32%	3.77%	14/14
Python	<b>86.79%</b>	0.00%	3.77%	14/14
HTML/CSS	<b>67.92%</b>	13.21%	9.43%	14/14
JavaScript	<b>81.13%</b>	5.66%	3.77%	12/14
Java	<b>73.58%</b>	11.32%	5.66%	8/14
C	13.21%	18.87%	<b>58.49%</b>	3/14



At exam-time

# Team working



Standard deviation	0.72
Average	3.32
Minimum	2.0000000000
1st quartile (Q1)	3
2nd quartile (Median)	3
3rd quartile (Q3)	4
Maximum	5.0000000000

**Best group size**



Course Introduction

# RESOURCES

# Course website

- <http://bit.ly/polito-ami>
- All lecture slides
- All exercise material (texts, solutions, examples, ...)
- Reference papers, links, ...
- Exams
- News and notices (official)
- Detailed (tentative) schedule
- Lecture video recordings
  - On your page on the Portale della Didattica

# Additional on-line resources

- Facebook group, for open discussion and information exchange:

<https://www.facebook.com/groups/polito.ami/>



- Slides will also be posted on slideshare (delayed w.r.t. the course website)



- Lectures will also be uploaded on youtube (at the end of the course)



# Study material

- No suitable textbook for the whole course
- Teachers' slides
- Lecture videos
- Suggested books for some of the topics
- Suggested papers
- On-line technical documents





Course Introduction

# EXAM

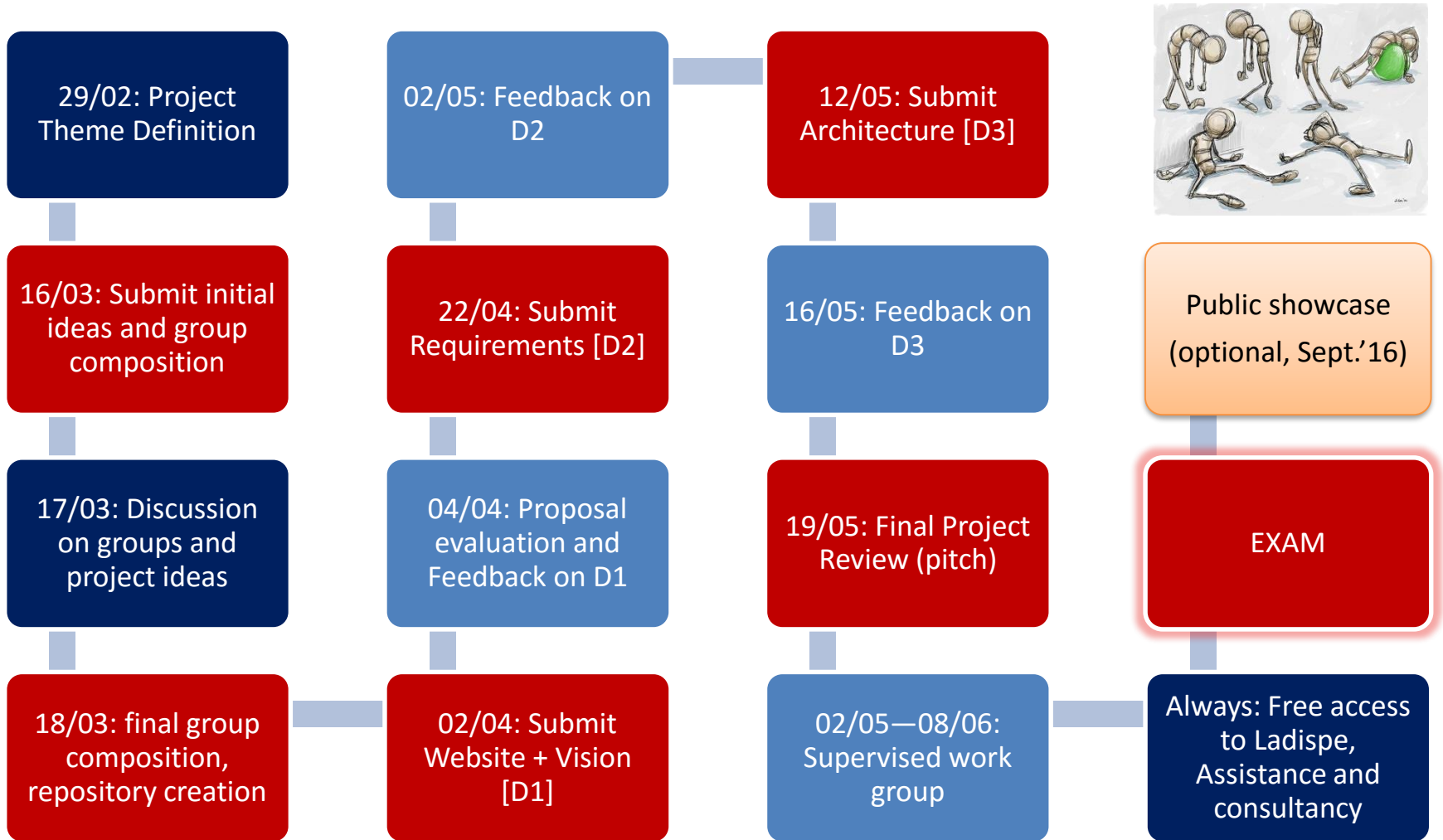
# Goal and rationale

- The exam should assess the capability to design and develop some Aml functionality
- Multiple skills and disciplines are needed in the process
- The course is highly lab-intensive
- A sound design process must be coupled with the capacity to deliver a working system
- You are close to graduation
- Some of you need to return to their home universities

# Exam rules

- The **exam** consists in **the evaluation of the Group Work** that is assigned during the course
  - Documents uploaded on-line
  - Presentation given at the exam date
- Work groups must be formed at the beginning of the course
- Topics are proposed by the group and approved by the teachers
- Many lab hours are devoted to group work development
  - LADISPE may be used in additional hours
- Ideally, developed **during** the course

# Work Group Development Process



# The exam (or, how to get 30+)

- Evaluation of documents (submitted in advance)
  - Project web site
    - Deliverable D1 (vision)
    - Deliverable D2 (requirements)
    - Deliverable D3 (architecture)
    - Presentation video
  - Project sources on github
- Oral exam
  - Presentation (15 minutes)
  - Demo (5 minutes)
  - Discussion (5 minutes)
- Individual contribution must emerge from the presentation

# First steps

- Identify a Working Group (WG)
  - 3 or 4 students
  - Possibly, with mixed skills
  - Avoid all-non-programmers groups
- Start developing ideas
  - The first two weeks' classes will give you suggestions, seeds, pointers, ...
  - Interact with the teachers

# Tips and suggestions

- Start sooner than later
  - Really
- Don't aim too high
  - Modular features
- Seek interaction
  - Ask for feedback and suggestion
  - ...and listen to them
- Exploit the LAB hours
  - Proposed labs, Supervised WG, Free hours, ...



Course Introduction

# **2015'S PROJECTS AND SHOWCASE**



# Successful projects

15 projects

End-user involvement

Different application domains

Multi disciplinary approach

Creativity, enthusiasm, technology

From the idea to a working prototype

<http://ami-2015.github.io/>

2015/2016

# Student's showcase @ I3P

11 projects

130+  
participants

5 sponsors

3 prizes



Open  
showcase

Contacts  
with  
enterprises



Stage  
opportunities

Voting  
contest

# And the winners were...

Student Showcase

## MARCO POLI

**Description**  
Giving everyone the opportunity to enhance their own campus experience is our mission. With MarcoPoli, students receive smart suggestions about the best places where to go. Moreover, stakeholders can monitor and gather statistics about the whole structure, or they can get sponsored on the platform. Avoid stress, avoid chaos: embrace MarcoPoli!

Riccardo Cappuzzo  
Roberto Marturano  
Luca Mezzatesta

**Adopted technologies**  
HTML5, jQuery, JavaScript, Raspberry Pi



**Keywords:** crowd detection • temperature • noise • maps • smart • responsive • place finder • expandable • adaptable

<http://ami-2015.github.io/MarcoPoli>

POLITECNICO DI TORINO Dipartimento di Automatica e Informatica  
Ambient Intelligence: technology and design 2015 edition <http://bit.ly/polito-ami>  
TreataBit The smart world for smart entrepreneurs by IP



Student Showcase

## Well Cleaned

**Description**  
W.C. is a mobile application that allows users to check on the Politecnico map where all the bathrooms are located and to see their condition in terms of toilet paper, trash and soap.

Alessandro Gaballo  
Christian Palmiero  
Eugenia Spano  
Federico Fallace

**Adopted technologies**  
Proximity sensors  
Raspberry Pi 2  
Phonegap  
Google Maps APIs

**Keywords:** campus map, real time information, bathroom, student, cleaning staff member, notification, schedule

<http://ami-2015.github.io/well-cleaned>

POLITECNICO DI TORINO Dipartimento di Automatica e Informatica  
Ambient Intelligence: technology and design 2015 edition <http://bit.ly/polito-ami>  
TreataBit The smart world for smart entrepreneurs by IP

Student Showcase

## MyBikePlace

**Description**  
MyBikePlace is a bike-parking managing system able to communicate with users through a dedicated mobile app. It suggests comfortable places for your bikes and protects them.

Marco Cornelio  
Michele di Girolamo  
Tommaso Laterza  
Damian Maiorano

**Adopted technologies**  
Raspberry  
Android OS  
MySQL  
Pressure sensors  
GPS localization  
NFC detection





**Keywords:** efficient environment, safer bike-parking, tool-free

<http://ami-2015.github.io/MyBP>

POLITECNICO DI TORINO Dipartimento di Automatica e Informatica  
Ambient Intelligence: technology and design 2015 edition <http://bit.ly/polito-ami>  
TreataBit The smart world for smart entrepreneurs by IP

# Ambient Intelligence?

Project	Sensitive	Responsive	Adaptive	Transparent	Ubiquitous	Intelligent
EasyPark	**	***	*	***	**	*
ItsYourTurn	***	**	**	***	*	**
MarcoPoli	***	**	***	***	***	**
MyBikePlace	**	*	*	**	**	*
NeverLate	**	**	**	***	***	**
NoNoise	**	*	*	***	**	*
Smart Make Your Bag	**	*	***	**	**	*
SmartClassSchedule	*	*	**	**	***	**
TrackDown	***	**	**	**	***	**
WC Info	**	*	*	***	*	*
Well Cleaned	***	**	**	***	*	**
Adaptive Online Radio	**	***	***	***	**	*
MyGuide	**	**	*	**	*	*
PoliRoute	*	***	***	**	***	**

# Questions?

## 01QZP AMBIENT INTELLIGENCE

Fulvio Corno

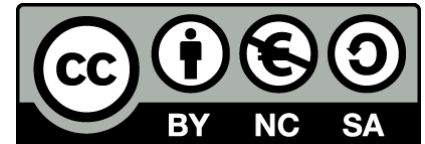
[fulvio.corno@polito.it](mailto:fulvio.corno@polito.it)



# References

- “Intelligent Environments: A manifesto”, Augusto et al., *Human-centric Computing and Information Sciences* 2013, 3:12, <http://www.hcis-journal.com/content/3/1/12>

# License



- These slides are distributed under a Creative Commons license “**Attribution – NonCommercial – ShareAlike (CC BY-NC-SA) 3.0**”
- **You are free to:**
  - **Share** — copy and redistribute the material in any medium or format
  - **Adapt** — remix, transform, and build upon the material
  - The licensor cannot revoke these freedoms as long as you follow the license terms.
- **Under the following terms:**
  - **Attribution** — You must give [appropriate credit](#), provide a link to the license, and [indicate if changes were made](#). You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
  - **NonCommercial** — You may not use the material for [commercial purposes](#).
  - **ShareAlike** — If you remix, transform, or build upon the material, you must distribute your contributions under the [same license](#) as the original.
  - **No additional restrictions** — You may not apply legal terms or [technological measures](#) that legally restrict others from doing anything the license permits.
- <http://creativecommons.org/licenses/by-nc-sa/3.0/>

