



POLITECNICO
DI TORINO



e-Lite

Course Introduction

Ambient intelligence

Fulvio Corno

Politecnico di Torino, 2016/2017



<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!

This is the
Ambient
Intelligence
course

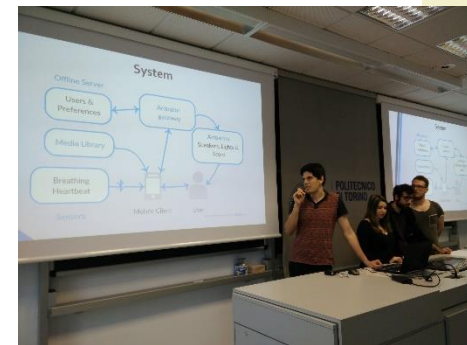
Aml is... Projects



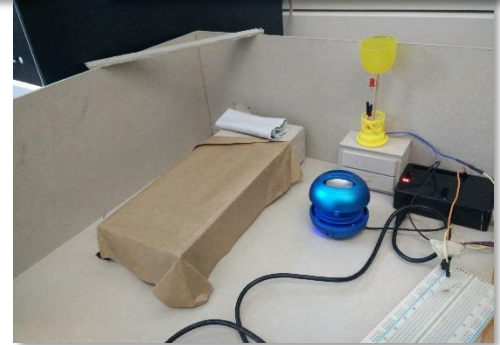
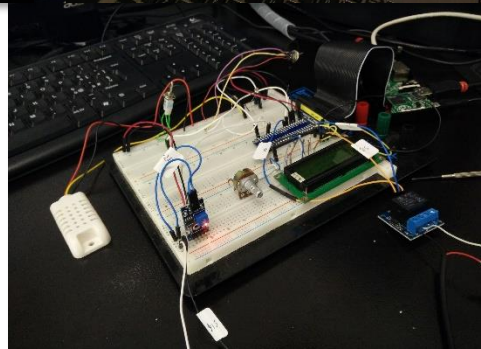
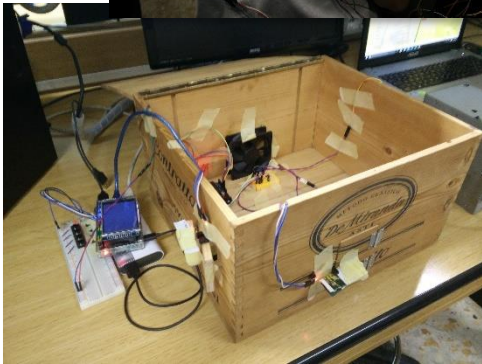
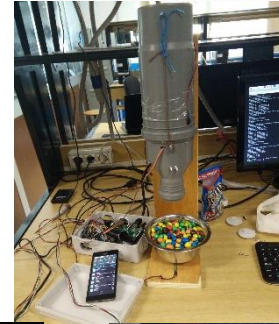
2016/2017

Ambient intelligence

Aml is... Teams



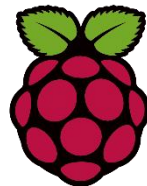
Aml is...Technology



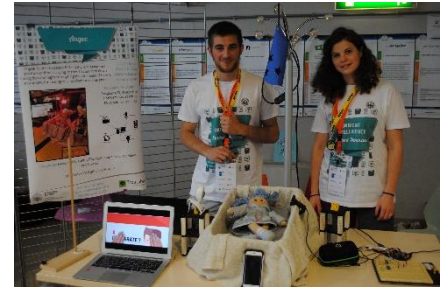
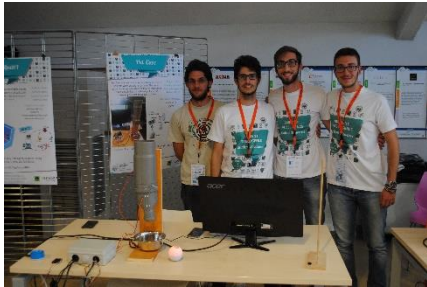
2016/2017

Ambient intelligence

Aml is... Tools



Aml is... Showcase



Aml is... Industries

reti spa



At the heart of the image



Treatabit
powered by I3P



Aml is... Outreach



Summary

- Goals and contents
- Organization
- Resources
- Exam
- 2016's projects and Showcase



Course Introduction

GOALS AND CONTENTS

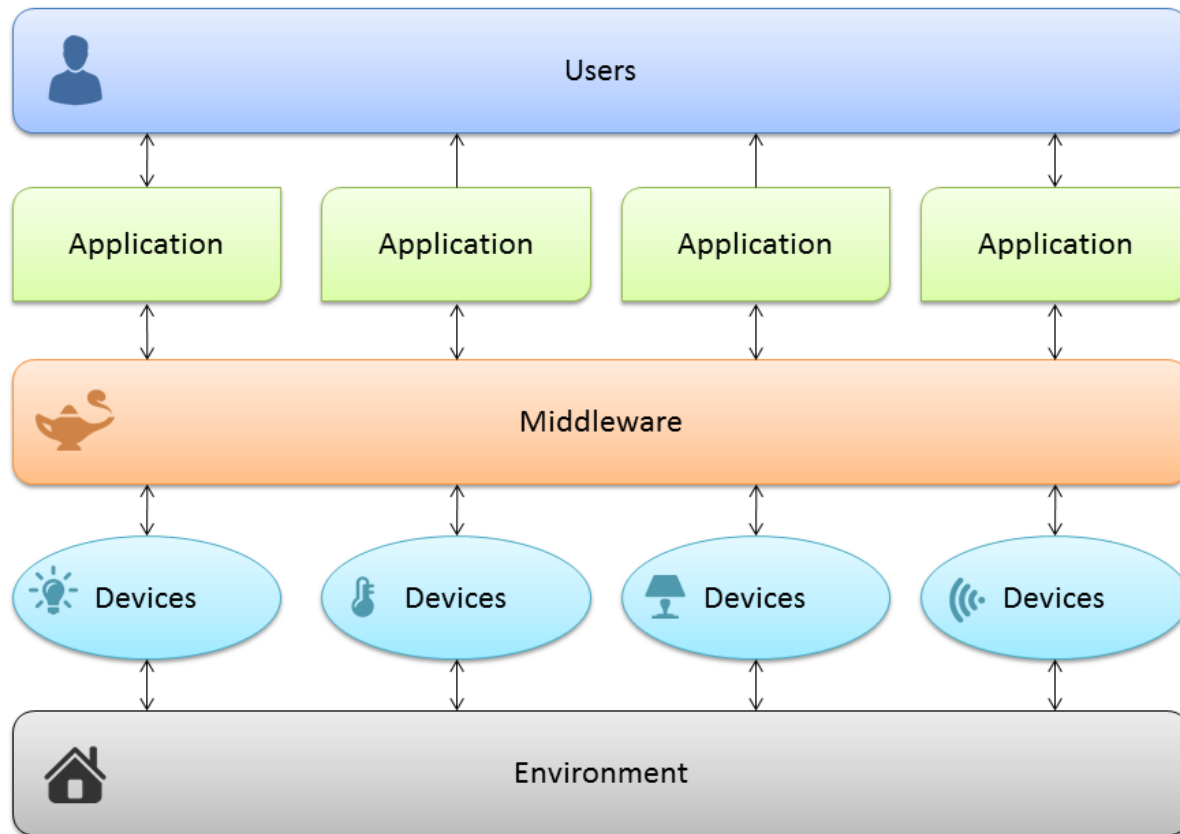
Goals

- 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.**”

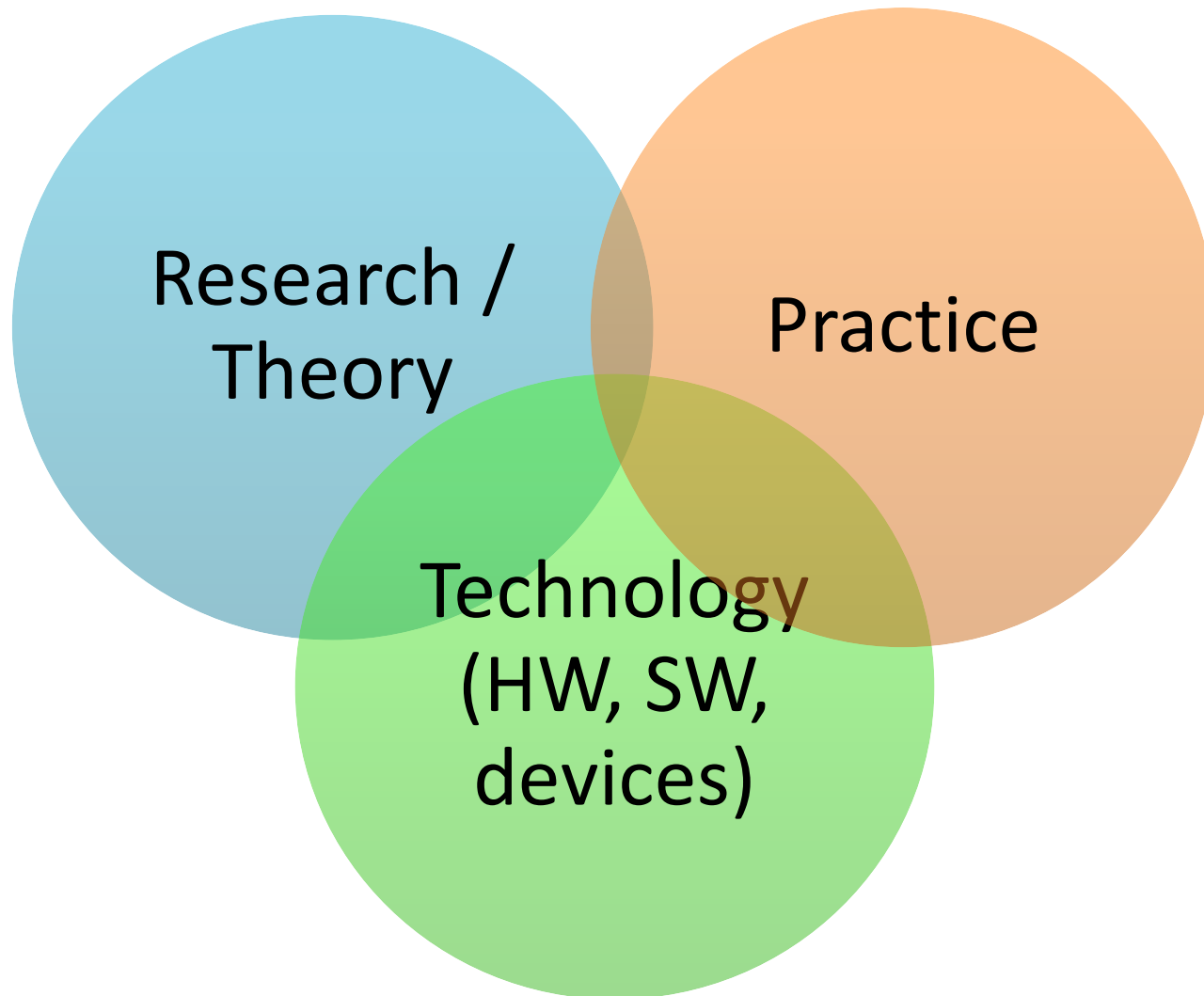
Reference architecture



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

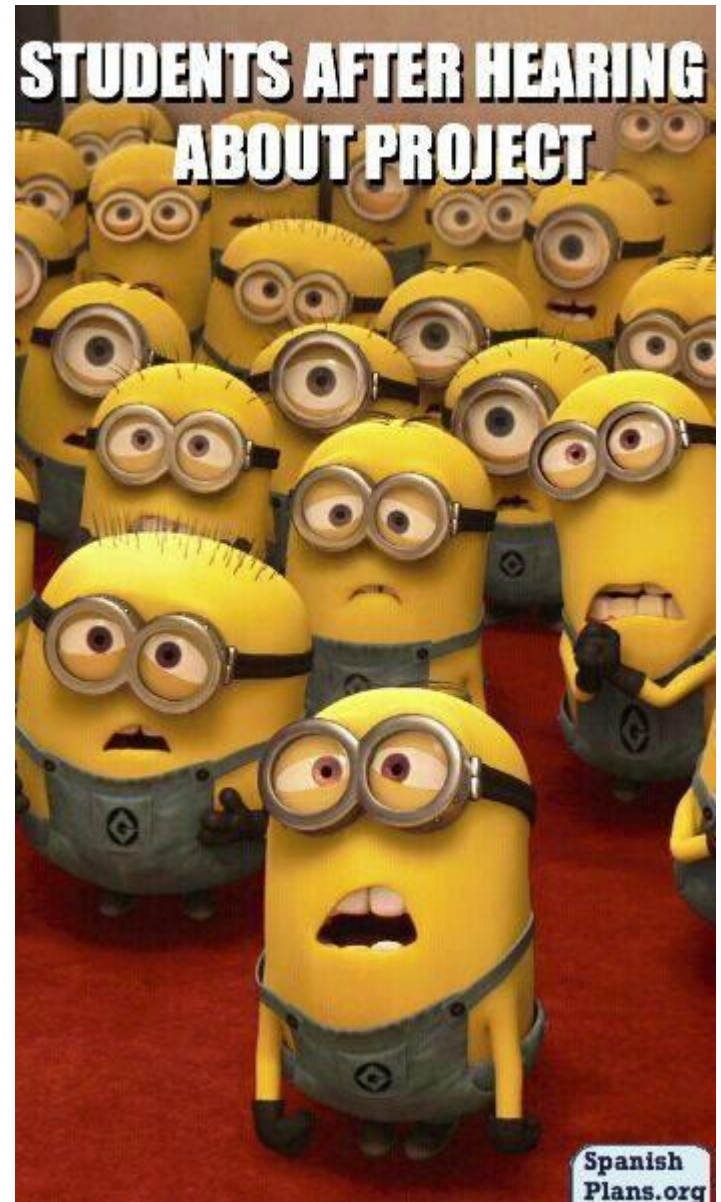
- Monday
 - 16:00-17:30
 - LADISPE
 - 17:30-19:00
 - Room 8l
- Thursday
 - 16:00-17:30
 - Room 8l
 - 17:30-19:00
 - Room 8l

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



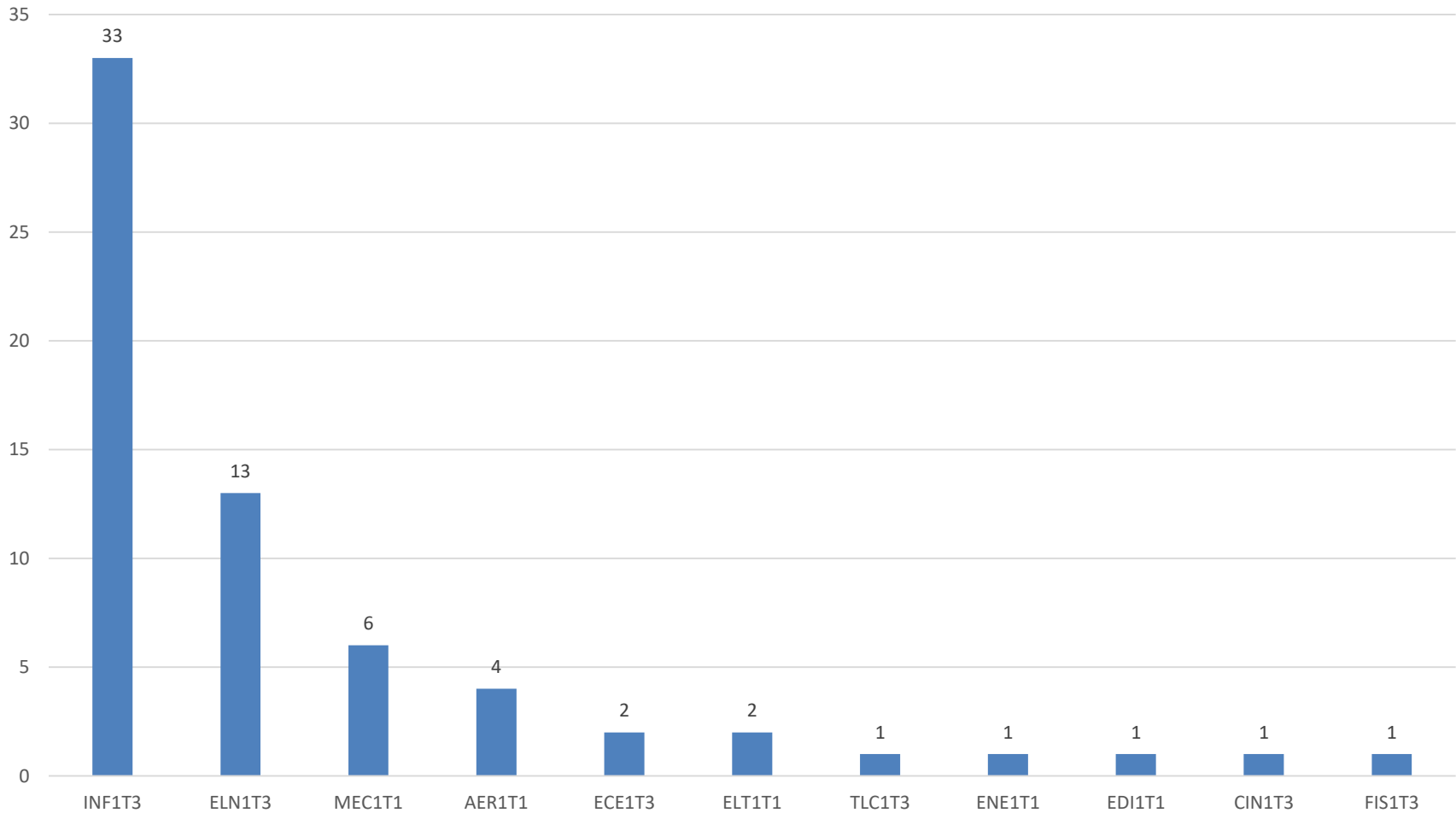
The Skewed Schedule



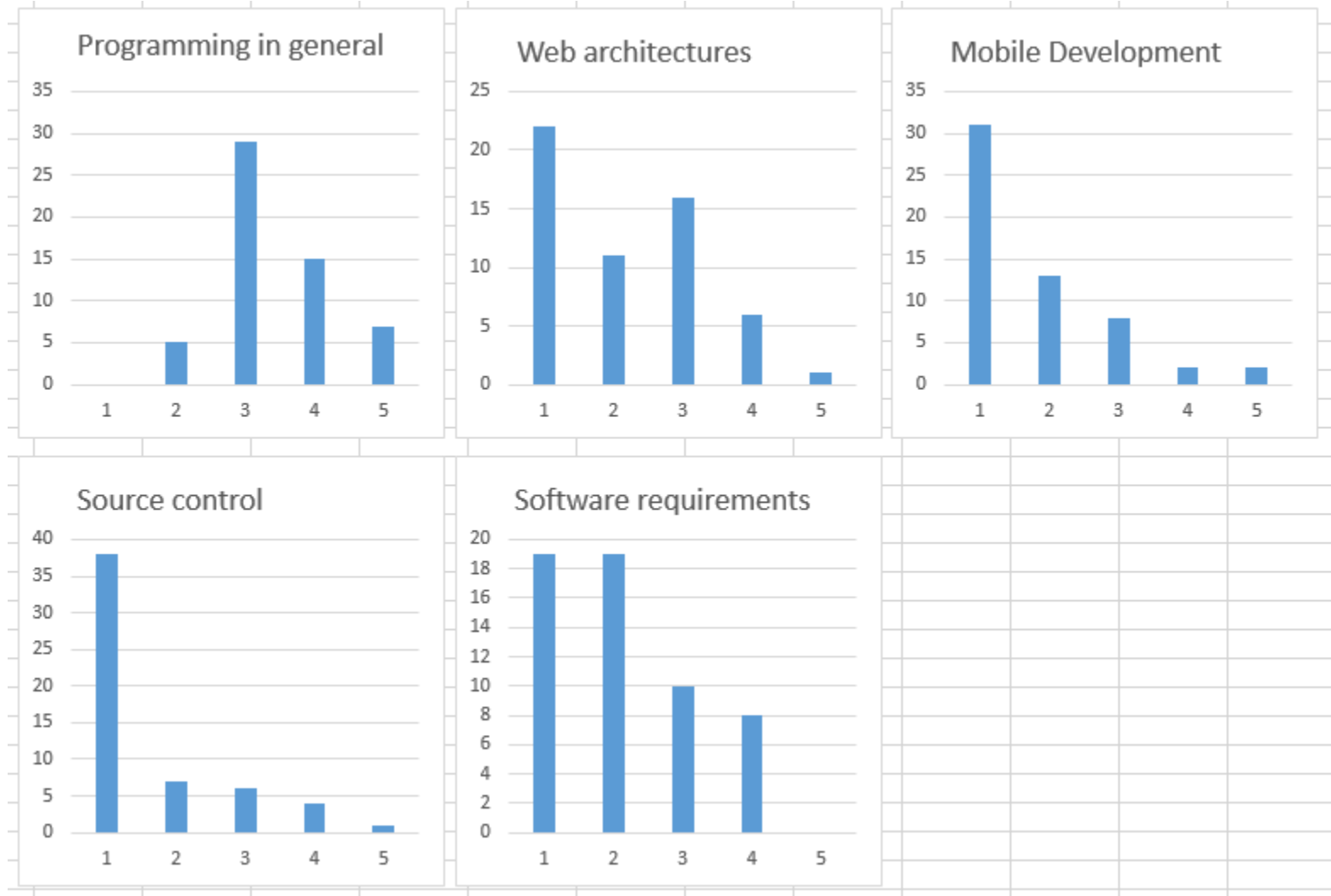
Week	Classes	Exercises	Group Work
1	3		
2	3	1	
3	2	1	1
4	3	1	
5	2		2
6	3	1	
7	3	1	
8	1		1
9		1	1
10	1	1	1
11		1	1
12		1	1
13			1
14			1

- 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



Program- ming languages

Others:

Objective C

Swift

Scheme

Lua

Go

Matlab

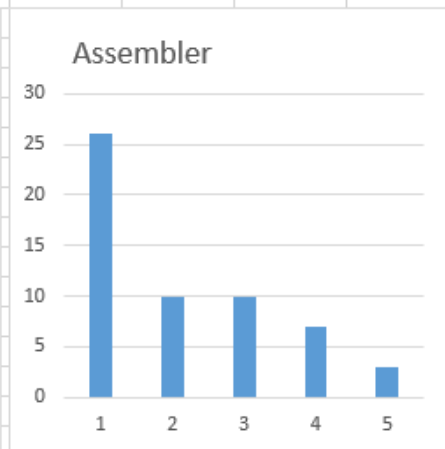
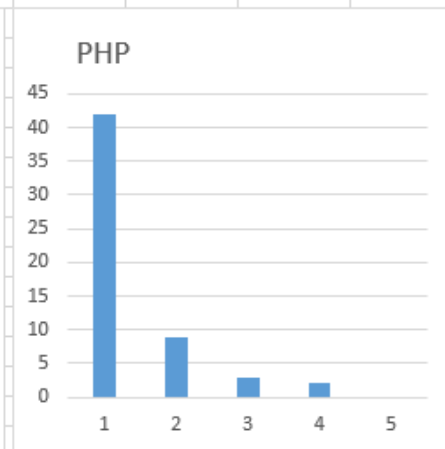
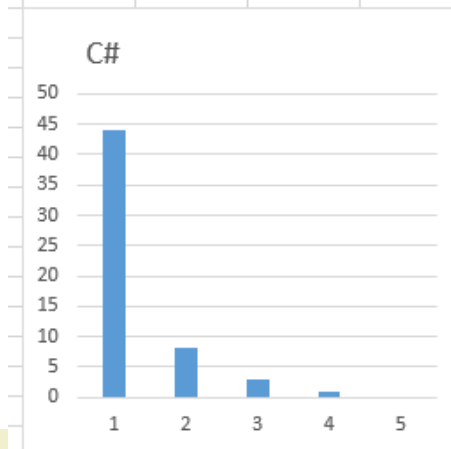
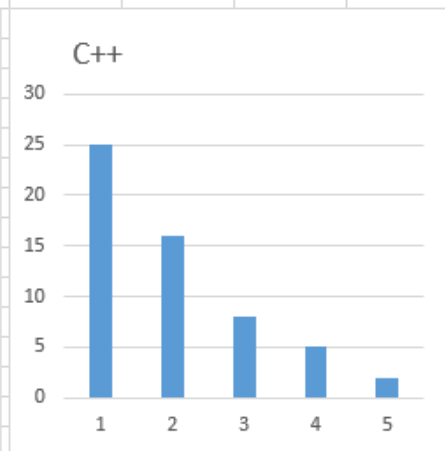
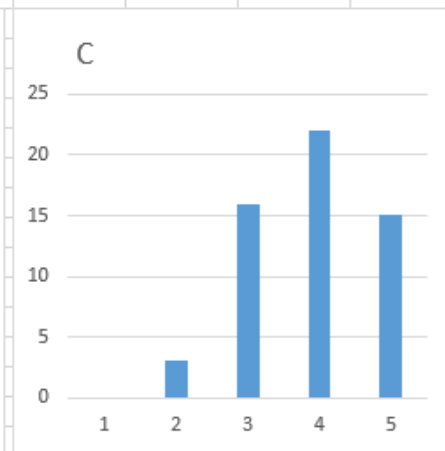
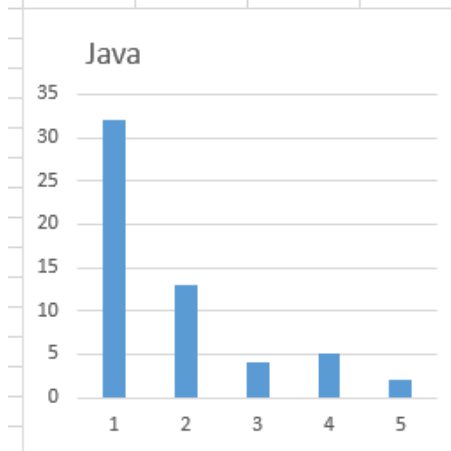
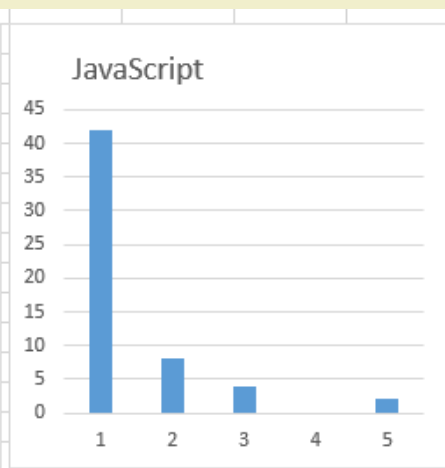
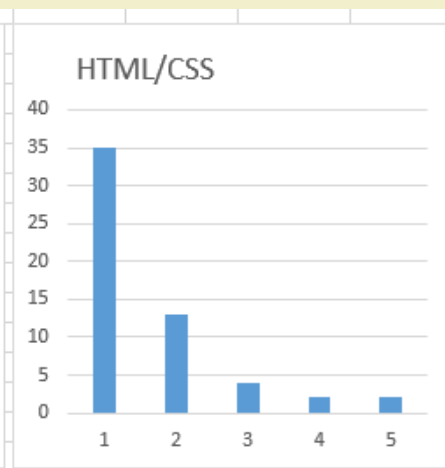
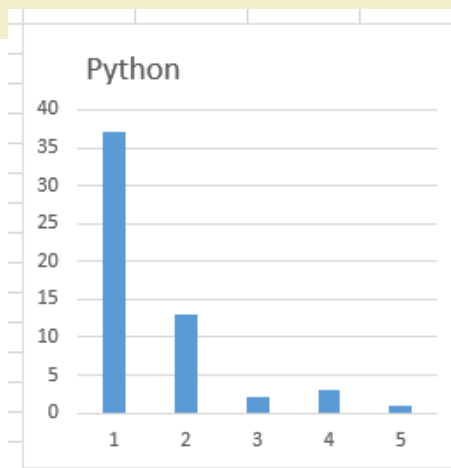
AWK

BASH

Turbo Pascal

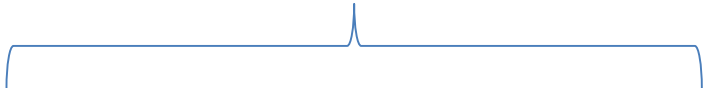
Arduino

VHDL



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%	41.51%	35.85%	14/14
Web Architectures	58.49%	16.98%	15.09%	13/14
Mobile development	83.02%	3.77%	3.77%	8/14
Source Control management	86.79%	1.89%	1.89%	14/14
Software requirements specification	75.47%	11.32%	3.77%	14/14
Python	86.79%	0.00%	3.77%	14/14
HTML/CSS	67.92%	13.21%	9.43%	14/14
JavaScript	81.13%	5.66%	3.77%	12/14
Java	73.58%	11.32%	5.66%	8/14
C	13.21%	18.87%	58.49%	3/14



At exam-time



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/>
- Lectures will also be uploaded on youtube (at the end of the course)
- Collaboration on Google Drive
- Projects on GitHub:
<https://github.com/Aml-2017>



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

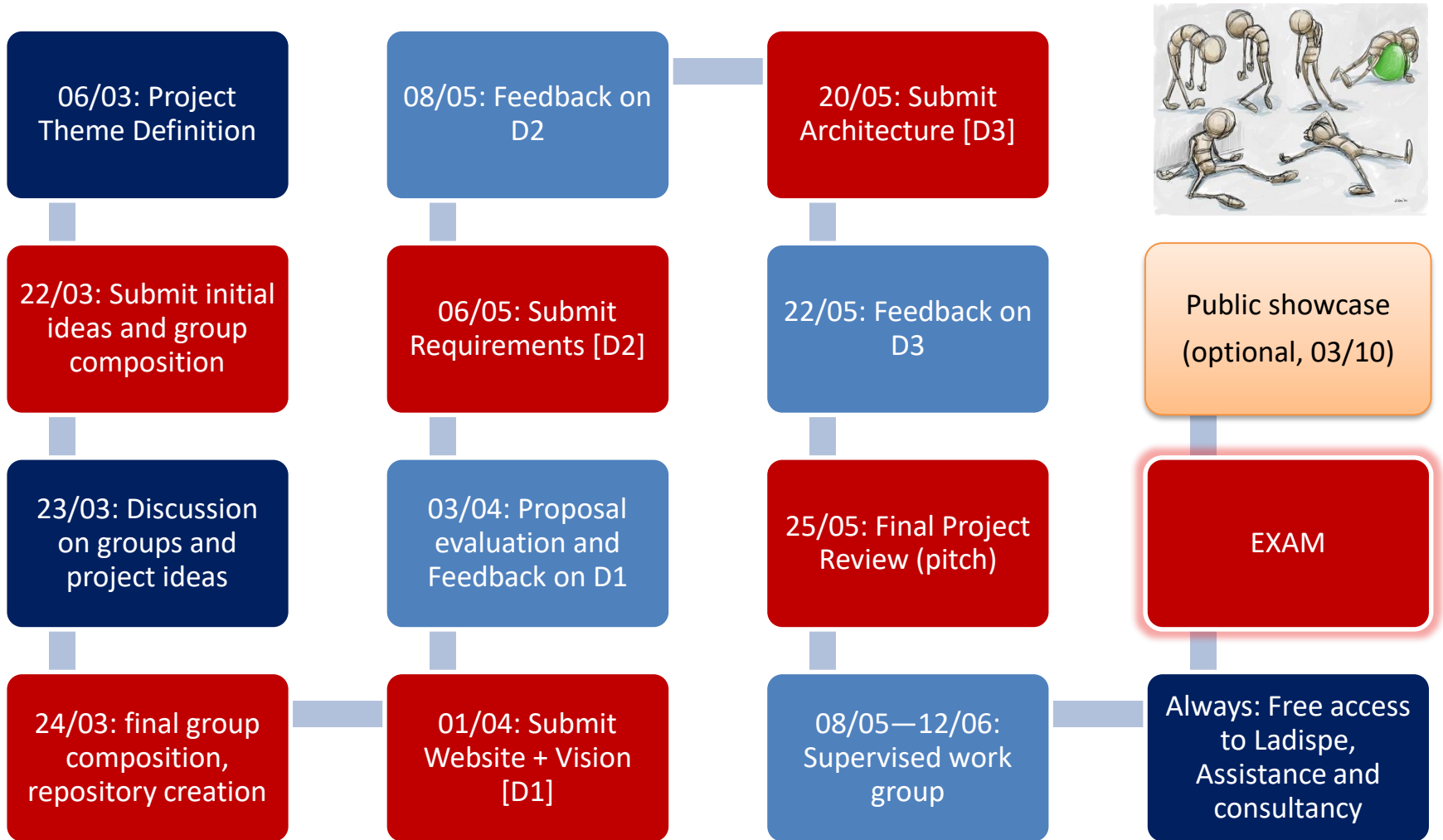
Goal and rationale

- 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)
 - 4 students (exceptionally: 3)
 - 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

PROJECT EXAMPLES

Past projects

Year	Theme	URL
2015	Smart “Cittadella Politecnica” (smart university campus)	https://ami-2015.github.io/
2016	Health and Well-Being	https://ami-2016.github.io/

2015 winners

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, RaspberryPi



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>

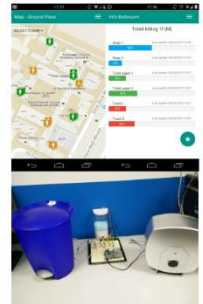


Student Showcase
Well Cleaned

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>




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>



2016 winners


Safety Mama


SafetyMama helps women to attain a peaceful pregnancy. It collects and monitors data pertaining to their physical well-being and tries to make them feel unstressed. She receives notification about her stress status and daily activity through a mobile application. If she is stressed, and at home, the Home Relaxation System starts automatically.

Adopted technologies
 Raspberry Pi+Razberry
 Z-Wave
 Philips Hue Lamp
 Android Application

Keywords:
 Stress Detection, Automatic presence recognition, Daily steps' control

<http://ami-2016.github.io/SMa/>





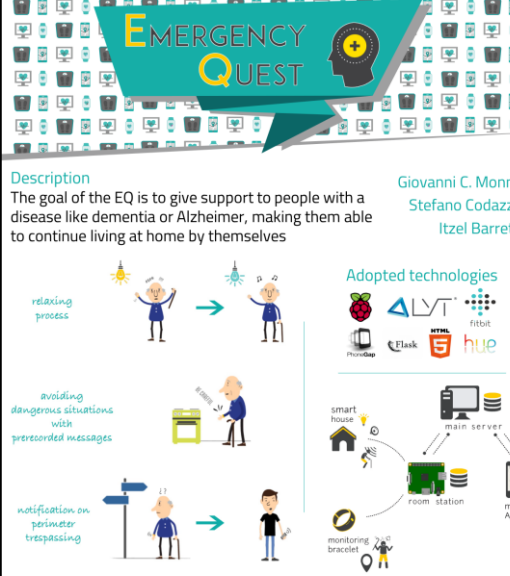
EMERGENCY QUEST


Description
 The goal of the EQ is to give support to people with a disease like dementia or Alzheimer, making them able to continue living at home by themselves

Adopted technologies
 Raspberry Pi, LVT, freibit, Elask, HTML5, hue, smart house, main server, room station, mobile App, monitoring bracelet

Keywords: room station • bracelet • caregiver • map • notifications • agitation detection • mobile application

<https://ami-2016.github.io/EQ/>





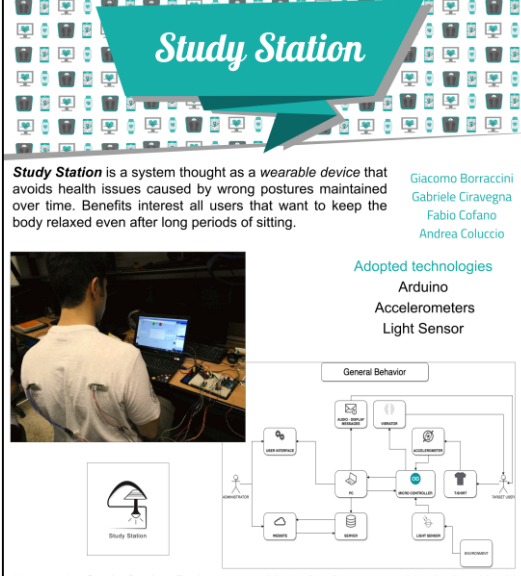
Study Station


Study Station is a system thought as a *wearable device* that avoids health issues caused by wrong postures maintained over time. Benefits interest all users that want to keep the body relaxed even after long periods of sitting.

Adopted technologies
 Arduino
 Accelerometers
 Light Sensor

Keywords: Study Station Project, wearable technology, wearable device, Health and Well-Being, Biomedical

<http://ami-2016.github.io/StS/>





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



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>

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