



CONNECTION LAB AND
INNOVATION KITCHEN

Challenge@PoliTO_By Students

Mapping PoliTO spaces – Kickoff meeting

6-7 March 2025

Sala dello Zodiaco, Castello del Valentino



Mapping PoliTO spaces

Prof: Elisabetta Colucci, Emere Arco, Andrea Ajmar, Tommaso Calò, Simone Preziosi

Mentor: Alessandra Spreafico, Tommaso Calò, Simone Preziosi, Emere Arco

Clik Team: Orazio Maria Pennisi, Laura Ronchetto



Politecnico
di Torino
1693

Technology
Transfer
System

SDG11
lab

G4CH
Global 4 Change

Kick off agenda DAY 1

6 March – Sala Vigliano, Castello del Valentino

8.45 – 9.00: Open Door

9.00 – 10.00: Welcome – Orazio Maria Pennisi, Click & Elisabetta Colucci

10.00 – 11.00: Challenge idea & POLITO Maps & Mapping Party – Prof. E. Colucci

11.00 – 11.15: Coffee Break

11.15 – 13.00: GIS & OSM – Prof. Emere Arco

13.00 – 14.30: Lunch (free time)

14.30 – 15.30: Presentation and Project Management - Prof. S. Preziosa

15.30 – 17.30: Team Formation

Kick off agenda DAY 2

7 March – Sala Vigliano, Castello del Valentino

8.45 – 9.00: Open Door

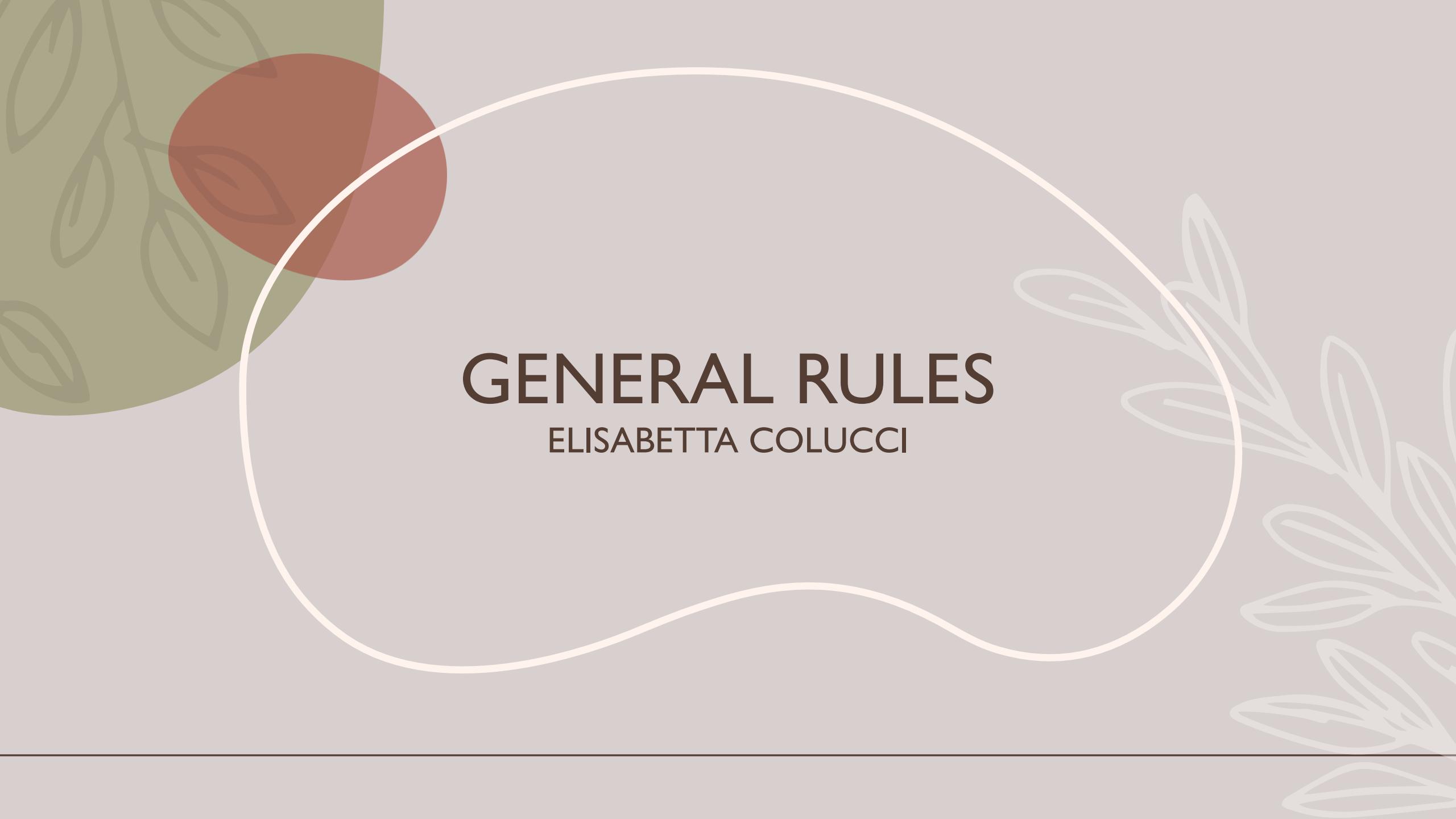
9.00 – 11.00: Databases - Prof. Andrea Ajmar & Prof. Emere Arco

11.00 – 11.30: Coffee break

11.30 – 13.00: Network analysis - Prof. Andrea Ajmar & Prof. Emere Arco

13.00 – 14.30: Lunch (free time)

14.30 – 17.30: Human-Computer Interaction – Prof. Tommaso Calò



GENERAL RULES

ELISABETTA COLUCCI

Challenge @ PoliTo – Staff

Supervisor & Mentors:

Elisabetta Colucci

Andrea Ajmar

Emere Arco

Alessandra Spreafico

Simone Preziosa

Tommaso Calo'

elisabetta.colucci@polito.it

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simone.preziosa@polito.it

tommaso.calo@polito.it

CLIK Staff:

Orazio Pennisi

clik@polito.it



Politecnico
di Torino



Interdisciplinary Challenge



ELISABETTA COLUCCI
Rtd-A DAD



ALESSANDRA SPREFACO
Assegnista DAD



EMERE ARCO
Rtd-A DIST



ANDREA AJMAR
PA DIST

Geomatics



Computer Engineering



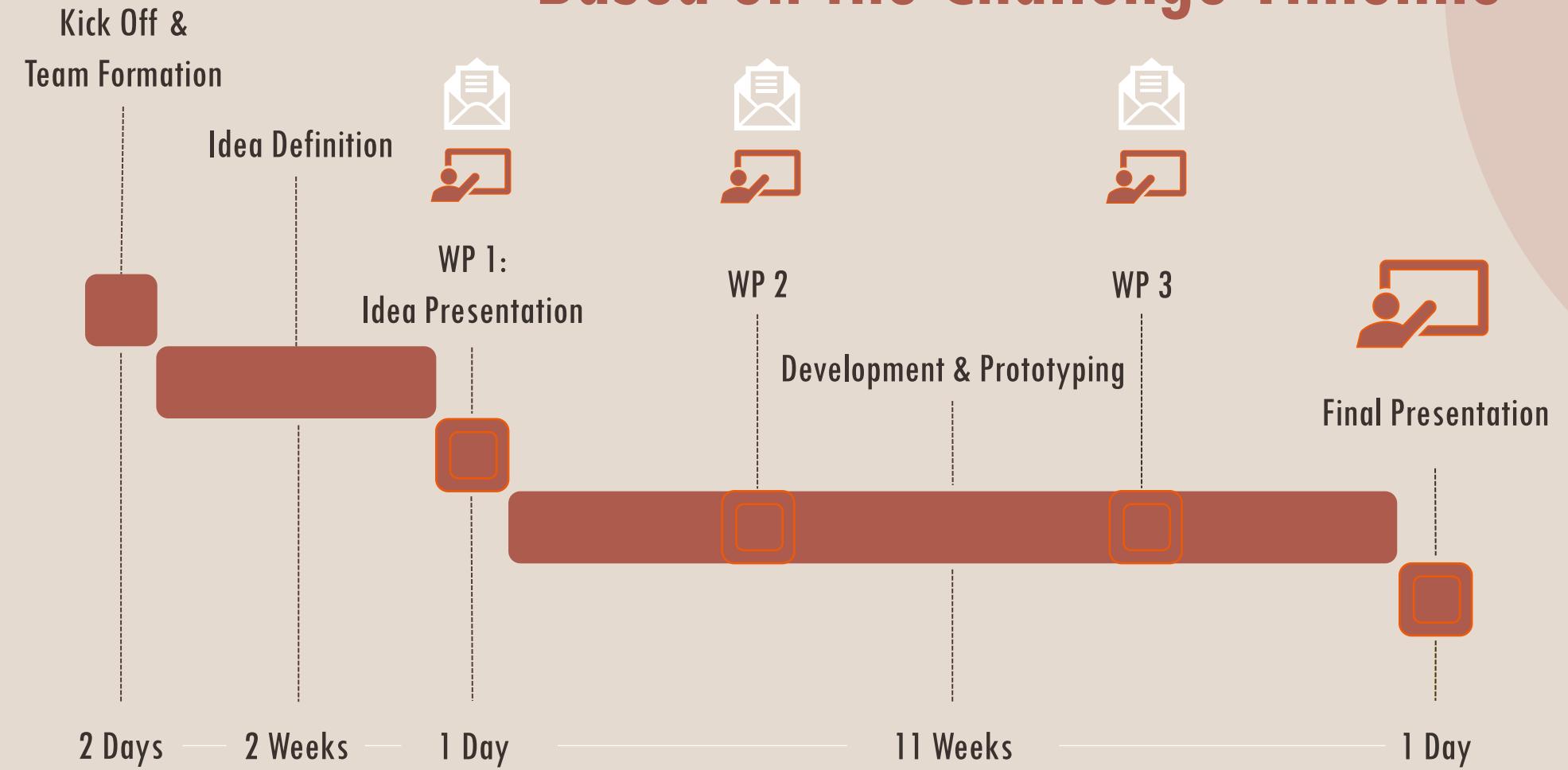
TOMMASO CALÒ
Dottorando



SIMONE PREZIOSA
Dottorando

Management Engineering

Milestones: Based on the Challenge Timeline



Milestones

1. Kick-off: 6 and 7 March – Sala Zodiaco
2. WP 1 + Report 1: 27/03- h. 9.30-13.00 at 6D
3. WP 2 + Report 2: 16/04 – h. 14.30 – 17.00 at 6D
4. WP 3 + Report 3: 7/05 – h. 14.30 – 17.00
- 5. Final Presentation:** 29/05 → to be confirmed
6. Final Report: 19/06

RULES

The official platform for the challenge is **Microsoft Teams**. We have created a Team for the “Mapping” challenge. For each Team, we will create a private channel on it.

Every team will self-organize its own working time and methodology.

Each team must spend about **1.5 hours per week with a mentor**, either remotely in a space proposed by the mentor or in the 6D room (all the group components have to be present).

To book a meeting with a mentor, the **TEAM LEADER** must email the desired mentor. The meeting is booked only if the mentor confirms it. You have to ask at least 3 days in advance! Please put in any mail/communication to the mentors at clik@polito.it in CC.

There is a OneDrive folder with presentations and useful materials; we have sent you the link.



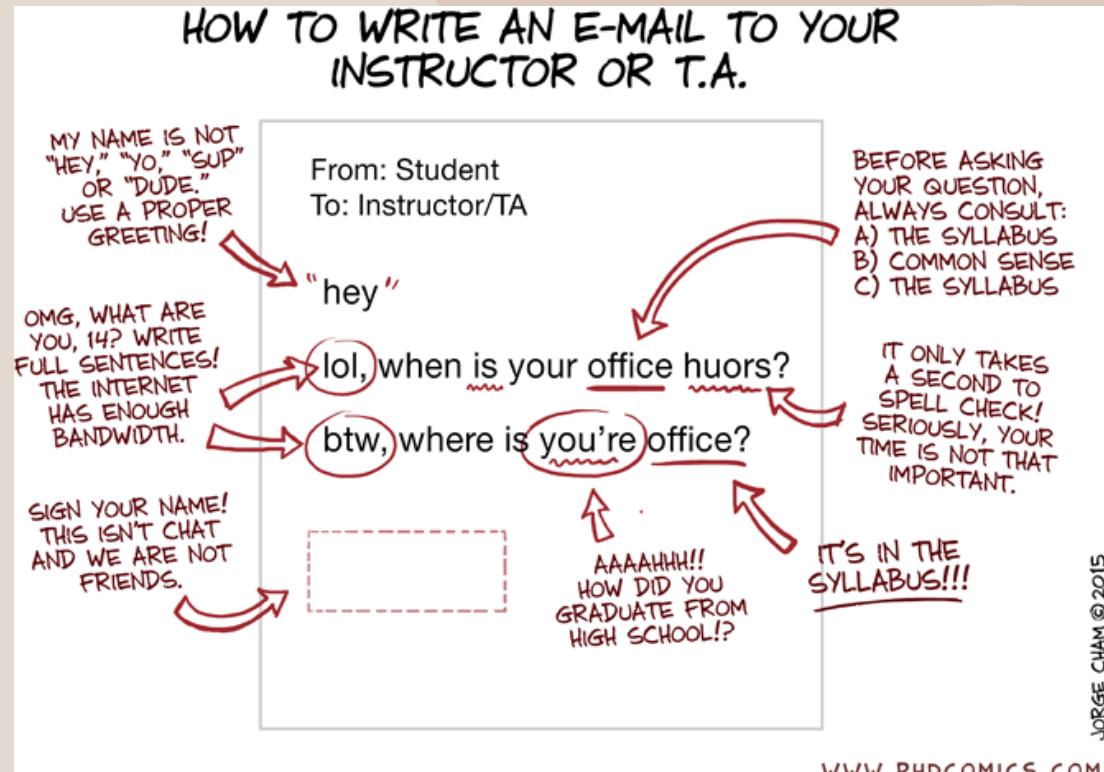
Mentors Availability

Prof/Mentor	email address	Monday	Tuesday	Wednesday	Thursday	Friday	notes
Elisabetta Colucci	elisabetta.colucci@polito.it			on request			
Andrea Ajmar	andrea.ajmar@polito.it			-			
Simone Preziosa	simone.preziosa@polito.it		3.30-5.30 pm		10.00 am - 1.00 pm, 2.30 - 5.30 pm		
Tommaso Calo'	tommaso.calo@polito.it		3.00-5.00 pm		3.00-5.00 pm		
Emere Arco	emere.arco@polito.it		3.00-5.00 pm		3.00-5.00 pm		
Alessandra Spreafico	alessandra.spreafico@polito.it	3-5 pm			9-10 am		Between 12 and 23 May only on request, between 5 and 7 pm

Please put in any mail/communication to the mentors clik@polito.it in CC.

To write an e-mail.....

- 1. Account... → Polito Mail only**
- 2. Always specify Challenge name, team number, your name**
- 3. Please put in any mail/communication clik@polito.it in cc**
- 4. Use «Reply to All» instead of «Reply»**



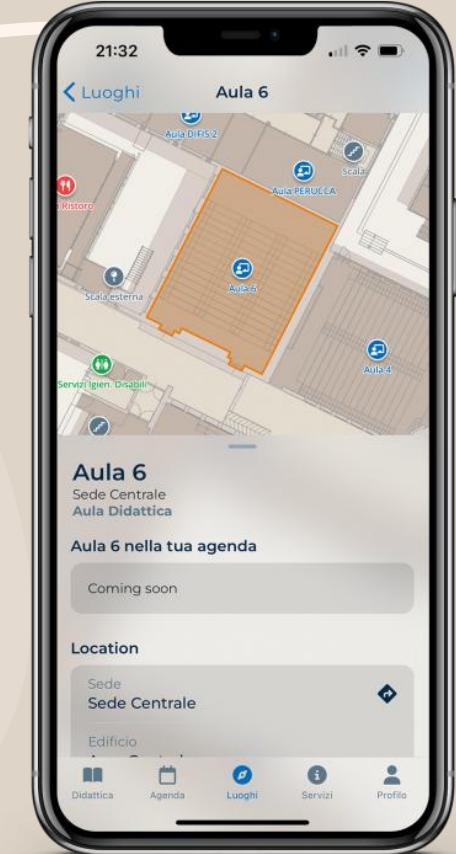


CHALLENGE IDEA & POLITICO MAPS

ELISABETTA COLUCCI

What: Polito maps improvements

The screenshot shows the Politecnico di Torino website's map feature. On the left, a sidebar lists various campus locations: Bank, Bookshops, Bicycle area, Cafe/Restaurant, Computer laboratories, Conference rooms, Departments entry, Elevators, Emergency meeting point, Infirmary, Kindergarten, and Laboratories. The main area is a detailed map of the university campus with several points of interest marked: 'Disabled toilets', 'R1', 'CLASSROOM 1M', 'CLASSROOM 1P', 'Classroom 27', 'Toilet', 'Classroom 10', 'Classroom 1', and 'CLASSROOM 15'. A search bar at the top says 'Find a place' with a magnifying glass icon. To the right of the map is a dropdown menu for 'Ground floor' which includes options for First Basement Floor, Ground floor, First floor, Second floor, Third floor, Fourth floor, and Fifth floor. At the top of the page, there are buttons for 'SERVICES STATUS', 'LOGIN', and language selection ('EN').



Involved Departments & Groups

ISIAD, IT SERVICES and Digital Administration

- COORDINATION
- GRAPHIC MATERIALS PREPARATION
- CREATION OF INTERFACE API WITH THE FACTOTUM DATABASE
- CREATION OF MOBILE (AND WEB) INTERFACE

CALOS

- SUPPLY OF FACTOTUM PLANS (AND RELOADING IN FACTOTUM AFTER THE APPROPRIATE CHANGES MADE BY ISIAD)
- CONSULTANCY ON DB FACTOTUM

PROGES, Building Heritage, Management, Design and Construction and Workplace Safety

- GENERAL CONSULTANCY ON PROJECT SETUP
- DEFINITION OF PROCEDURES TO KEEP PLANS UPDATED IN THE EVENT OF CONSTRUCTION WORK AND WORKS

DIATI – DAD – DIST (Geomatics), Departments of Environment, Architecture & Planning

- GIS PROJECT CONSULTING
- NETWORK ANALYSIS AND INDOOR NAVIGATION CONSULTING AND EXPERIMENTATION

DAUIN, Department of Control and Computer Engineering

- IT CONSULTING AND ALGORITHMS

Steps of the project

1. Create an **interface map in the app** that represents internal plans with various levels of detail based on zoom
 - The maps will be represented in such a way as to highlight the horizontal distribution (corridors, atriums,...) and vertical (stairs, elevators) and identify schematically the main categories of rooms of the University
 - The rooms searched by the user will be highlighted by colouring the entire room (thanks to the creation of *geojson files* for each room saved in the Database) using the representation of a pin
2. **Experimentation of indoor navigation system**
3. Evaluation of the opportunity to **improve the navigation system through the use of technologies** that can identify the user's position (POLITO innovative courses)

What has been done

- Identification of the necessary graphic formats and the workflow that allows to generate them
- Verification of **dwg plans** of the Sede Centrale, Cittadella, Castello del Valentino, Mirafiori, Morgari
- **Installation of the geodatabase (geoDB) populated with OSM data** and with plans of the Polytechnic
- Creation of an algorithm that creates and saves in the DB the individual *geojson* of the rooms and categorizes the shapes to stylize the maps and create the tiles
- Creation of a **mobile interface**
- Insertion of all the above-mentioned locations into the ***PostgreSQL database***
- Implementation of the **factotum app-db** APIs
- Development of algorithms that, based on the drawings inserted in Postgres, **categorize the rooms based on the data contained in Factotum**
- Design of the symbology for the main categories of rooms in the interface

Some criticalities

- Inaccuracies in the representation of the rooms (plans)
- Georeferencing has been done using a polynomial method (not just roto-translation) to make the floor plans coincide as much as possible with the shapes of the buildings represented on OSM. In this way, the representation is not precise and accurate ☹
- Mezzanines: by convention, in factotum (Polito), the “small” mezzanines (which are not as large as the floor on which they insist) are represented in the same drawing as the floor immediately below
- Not all the shapes have been vectorialised
- The graphs are made in local coordinates
- Others (that U will find ☺)

Possible solutions

- Automation of workflow for graphic documents: starting from dwg files to get to documents that can be loaded on the DB
- Uniformity of layers within dwg
- GIS/CAD interoperability: QGIS does not correctly import AutoCAD regions

This means that each room in the dwg is represented by a region and not by a polyline; it is necessary to intervene manually with a series of operations that are rather expensive in terms of time ☹

....
**many steps are done, but there are still many
gaps to fill in & improvements to make**

....

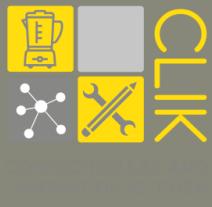
Why the Polito challenge by students: *Mapping PoliTO spaces*



Technology
Transfer
System



SDG11
lab



Challenge by student

Challenge _by Students Mapping PoliTo spaces

/ innovative teaching project aimed at bringing out proposals for innovative solutions by students for the **creation of an increasingly precise and functional map of the university spaces**



Background

Several Areas of PoliTO, in collaboration with some faculty members, are working on developing the new university app.

One of the proposed features is the digitalization of **maps** within the application.

The goal of the challenge, with a focus on *the inclusivity of the PoliTO community*, is to involve the students in the development and definition of the feature requirements.



This challenge will help students develop new skills that can be valuable in the job market, either with new startup companies specializing in these systems or as employees in innovative companies.

! MAIN AIMS

*The challenge focuses on exploring innovative solutions for **indoor space mapping**, aiming to enable tools for **indoor navigation**. Possible development directions include:*

1. **Creating an indoor navigation app**, applicable to the spaces of the Politecnico but extendable to other structures.
2. **Managing cartographic data**, which can be modelled on specific DBMS or integrated into OpenStreetMap.
3. **Focusing on indoor mapping projects**, with particular attention to building modelling to optimize indoor navigation.



working on
INDOOR SPACES
of Politecnico of Turin
to enhance the POLITO existing
maps, also available in the
POLITO Students APP

Why/for who

- / data update and verification (CAD and OSM plans)
- / implementation of routing apps
 - / student involvement
 - / OSM knowledge and update

Other outcomes

WHY INDOOR

Mapping the distribution of internal spaces allows to:

- / enable **indoor navigation** within the Politecnico di Torino
- / reuse data for **simulations on emergency planning and flow optimization**
- / **support building maintenance and BIM** (Building Information Model)

The Challenge

Specific lessons (today & tomorrow) are organized to help students understand the process of designing the **database behind the app** and possible **routing apps**.

The “make” phase will focus on testing in **public spaces**, with the dual goals of completing the app through application-supporting maps.

TO DO before the app development (AIMS 1-2-3).

Functions to be tested on the field:

- Verifying the presence of **ramps and accessible routes** for disabled individuals;
- Assessing the **accessibility of restrooms**;
- Evaluating the accessibility of the cafeteria and the **location of student services**;
- Mapping the location of *information points*;
- Assessing the accessibility of student office services;
- ...

What we did already ...



The PoliTO Mapping Party

Indoor Buildings: testing the new PolitoAPP maps

Geomatics group, PoliTO (DAD, DIST, DIATI)



With the support of _

/ PROGES Department - Building Heritage, Management, Designand Construction and Workplace Safety, Gregorio Cangialosi

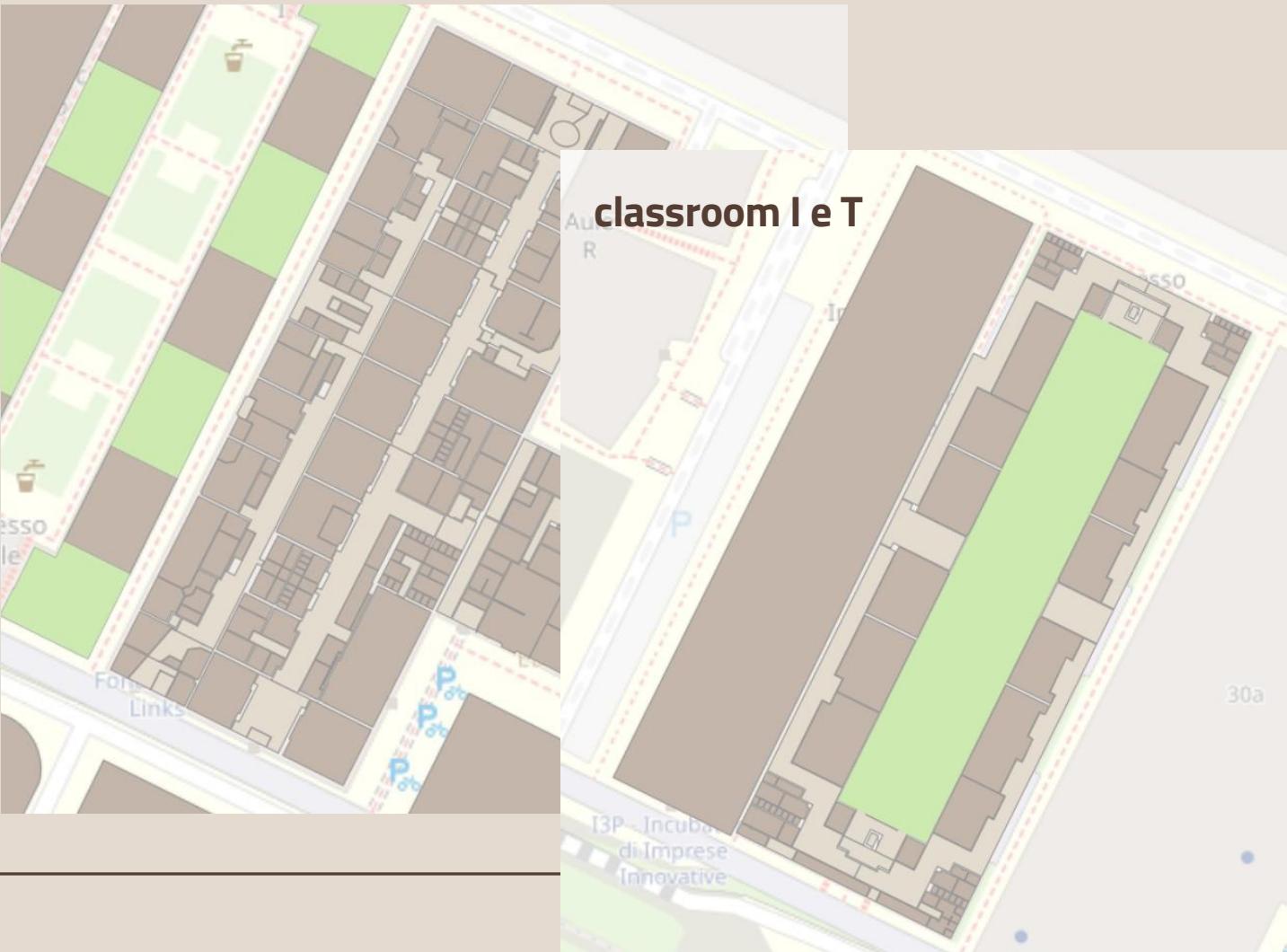
/ CLIK (Connection Lab & Innovation Kitchen)

/ Fulvio Corno, Full Professor - Department of Control and Computer Engineering (DAUIN), Vice-Rector for Education

With the collaboration of:

/ Cristina Ferrian & Federico Cucinella

What we mapped



Autonomous Mapping by students

Using printed maps of
classroom **I & T** of Politecnico
di Torino to take notes of:
location & attributes
(information) of indoor
elements
following the OpenStreetMap
structure

The event: the Mapping Party



**PolitoMaParty
pp
in
G**

INDOOR
BUILDINGS

4-11th of November 2024

- 4th of November h. 18:00/20:00 - Sala riunioni DIATI 3
Project presentation and networking party with finger food!
- 5-10th of November
Autonomous mapping Classrooms I & T
- 11th of November h. 15:00/19:00 - Sala riunioni DIATI 3
Data upload in OSM with tutors, bring your laptop!

Polito **Politecnico di Torino**

A silhouette of the Politecnico di Torino skyline, featuring its characteristic dome and towers. Overlaid on the skyline are several location pins in various colors (grey, yellow, green, red) of different sizes, scattered across the silhouette.

4-11 November 2025

25 students

10 tutors

The event: the Mapping Party



1. DATA PREPARATION

- Data organisation
- Day1: OSM lecture & data presentation

2. DATA COLLECTION

- 1 week of autonomous work
- Telegram data sharing
- Collection of plans & data attributes (tags)

3. OSM EDITING

- Osminedit 1 day
- Editing issues

1. Data preparation

Reshape on **Polito tiles**

/ URL ground floor:

<https://app.didattica.polito.it/tiles/int-light-xpte/{z}/{x}/{y}.png>

/ URL basement floor:

<https://app.didattica.polito.it/tiles/int-light-xs01/{z}/{x}/{y}.png>



1. Data preparation

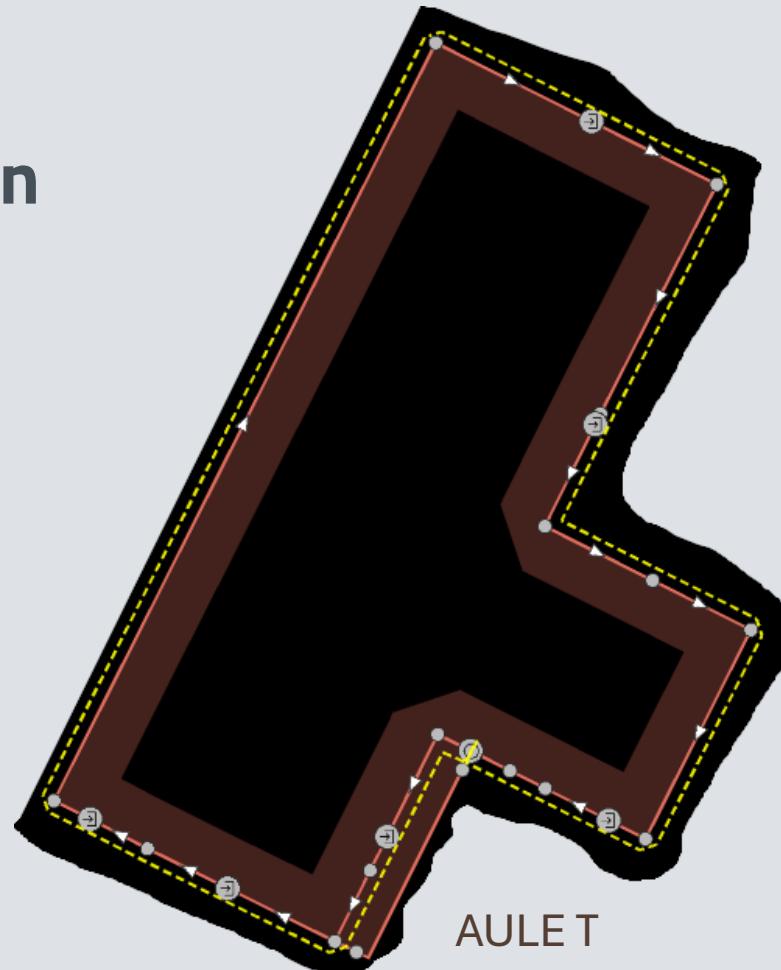
EDITING OSM

New building

+

reshape on

polito tiles



Tags

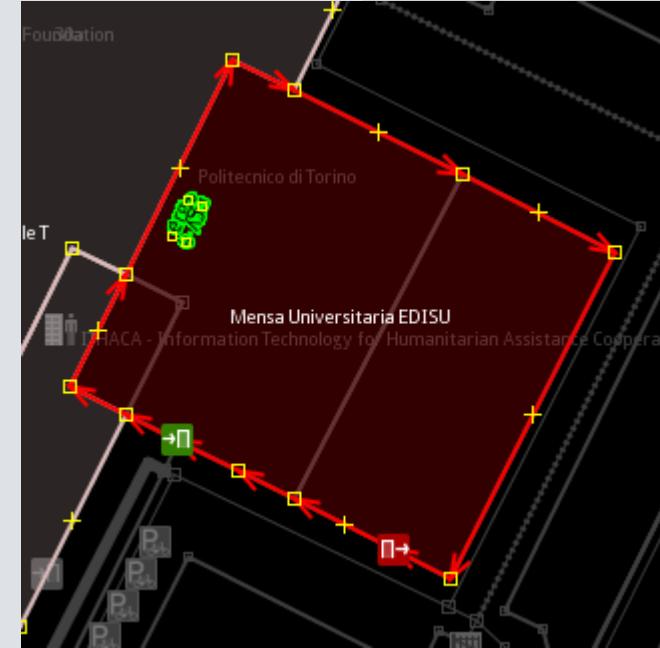
Etichette (7)	
addr:city	... ▾ Torino
addr:housenumber	30a
addr:postcode	10129
addr:street	Corso Castelfidardo
building	yes
building:levels	2
height	20

1. Data preparation

Creation of
buildings parts



AULE T



mensa

Key	Value
amenity	food_court
building:part	yes
level	0
name	Mensa Universitaria EDISU
opening_hours	Mo-Fr 11:30-14:00, 19:00-20:00; Sa 12:00-14:00, 19:00-20:00; Su off
operator	EDISU



Aula studio

Key	Value
building:part	yes
level	0
name	aula studio EDISU

1. Data preparation

Creation of
buildings parts



Key	Value
building:part	yes
level	0
name	Aule T

AULE T



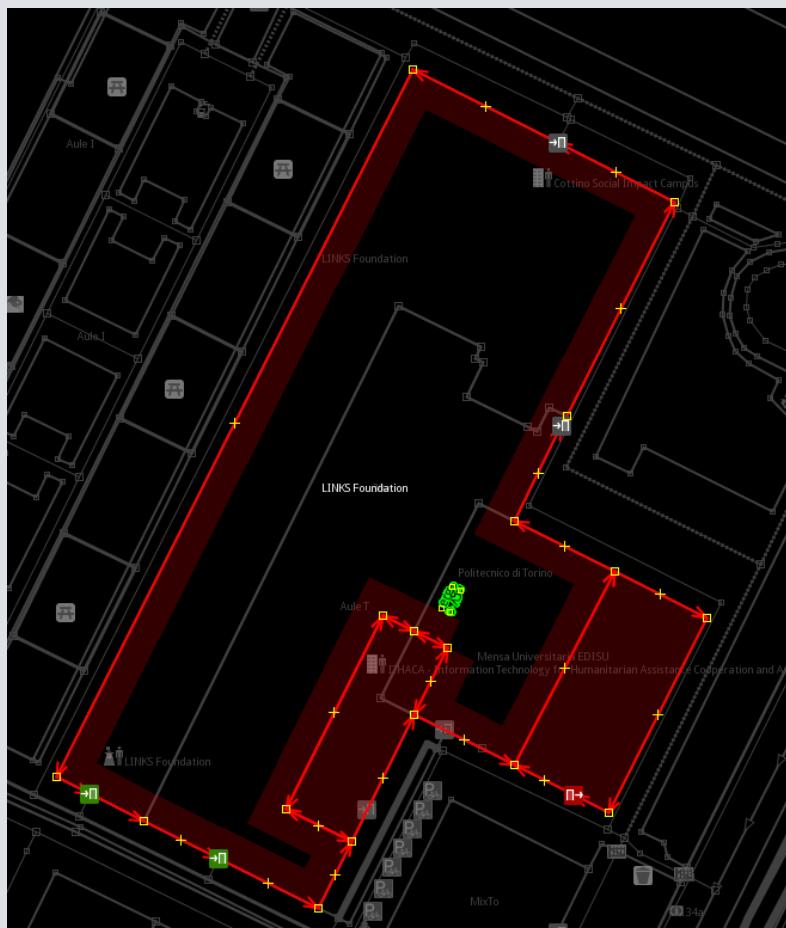
Key	Value
building:part	yes
level	0
name	LINKS Foundation

LINKS foundation

1. Data preparation

Creation of relationships

Relations/Building ...	
Key	Value
type	building
Persons	
Role	Refers to
part	LINKS Foundation (19 nodes)
part	aula studio EDISU (6 nodes)
part	Mensa Universitaria EDISU (5 nodes)
outline	House number 30a at Corso Castelfidardo...
part	LINKS Foundation (14 nodes)
part	aula studio EDISU (6 nodes)
part	Aule T (19 nodes)
part	Mensa Universitaria EDISU (12 nodes)



LINKS Foundation

Key	Value
building:part	yes
level	1
name	LINKS Foundation



Mensa

Key	Value
building:part	yes
level	1
name	Mensa Universitaria EDISU



Aula Studio

Key	Value
building:part	yes
level	1
name	aula studio EDISU

1. Data preparation

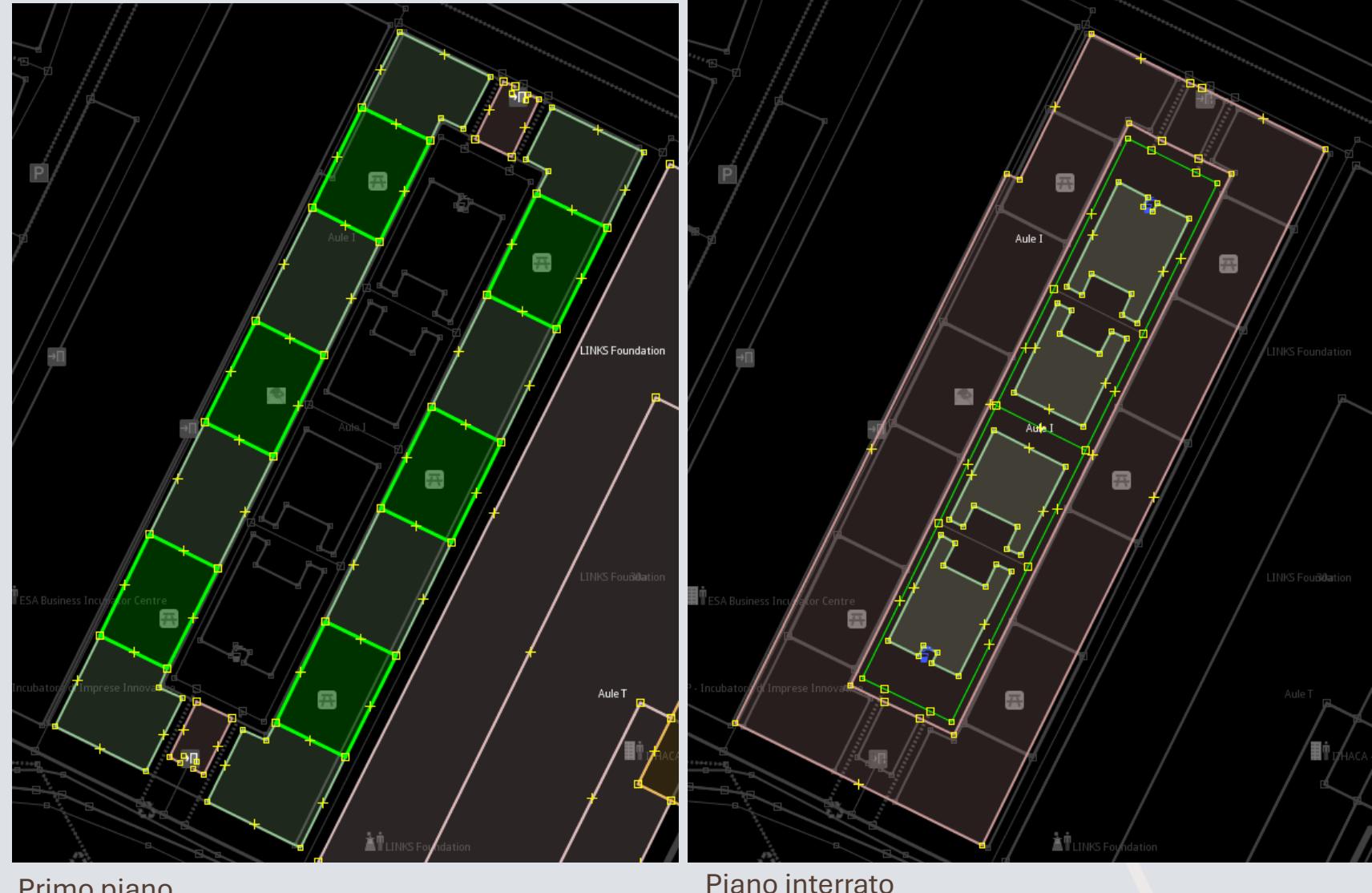
ROOM I

reshape of areas
& buildings

Key	Value
building	yes
building:levels	0
building:levels:underground	1
layer	-1
level	-1
name	Aule I
type	multipolygon

Layers

Role	Refers to
outer	1320518339 (8 nodes)
inner	Aule I (8 nodes)



Mapping Party day1

- / OSM lecture
- / Groups subdivisions
- / Data presentation
- / Elements description



Why OSM indoor mapping

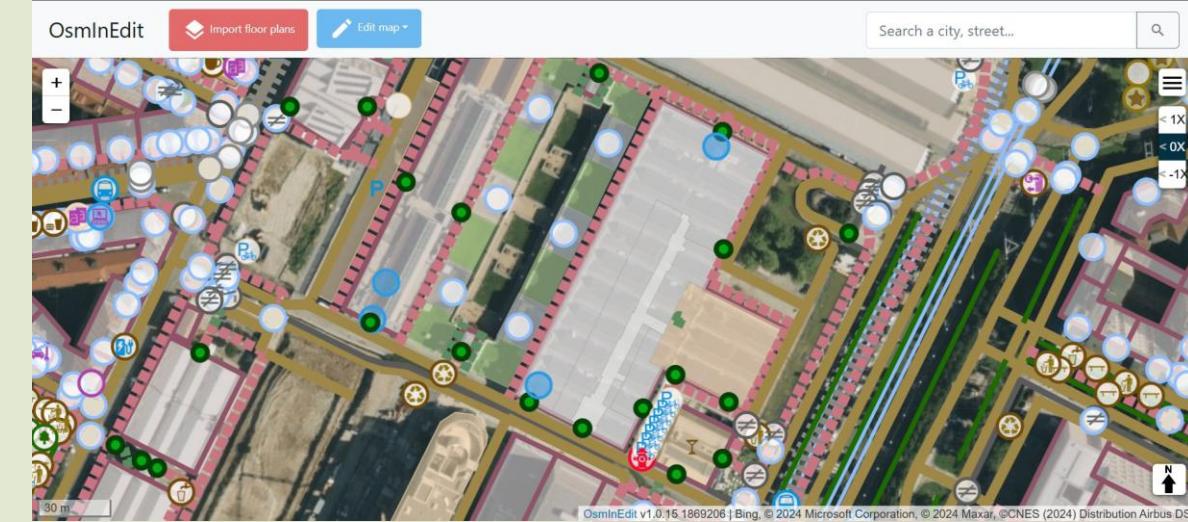
OSM Simple Indoor Tagging

It allows to model **indoor areas of public spaces**:

- / indoor navigation
- /routing
- / 3D visualisation

OSM editor

OsmInEdit OpenStreetMap Indoor Editor



editor web focus on indoor mapping

- / offers dedicated interior features
- / multilevel
- /multistory
- / import of images, building plans and custom TMS as background images
- / easy editing of interior data (add or edit every single object in a particular level of a building with the support of dedicated presets: room, corridors, doors, furniture... and all common features)

OSM editor: OsmInEdit

Adding new elements

Toilets	Facilities --> Facilities --> Toilets/Restrooms
Reception	Building structure --> Room
Storage local	Building structure --> Room
Elevator	Building structure --> Elevator
Stairs	Building structure --> Staircase
Vending machine	Shops --> Vendingmachine
Fire extinguisher	Facilities --> Emergency --> Fire extinguisher
Defibrillator	Facilities --> Emergency --> Automatic defibrillator
Bicycle parking	Transport --> Bicycle --> Parking
Water point	Facilities --> Facilities --> Drinking water
Bench	Facilities --> Facilities --> Bench

OSM editor: OsmInEdit

Adding new elements

Scroll down to see the list of the tags
and **add** or **adjust values**

add capacity key and set the value

add wheelchair key and set the value

adjust the value **from class to classroom**

Click on **Done** button on
the top of the panel



Es: stanza

level	0	X	i
indoor	room	X	i
room	classroom	 	i
access	yes	X	i
name	1T	X	i
capacity	90	 	i
wheelchair	yes	X	i
+			

Cards for mapping elements

Indoor elements to map

Classrooms (including study rooms and laboratories)

level=*

indoor=room

room=classroom/laborator

y name=*

capacity=*

access=yes

wheelchair=yes/no



Area surrounded by walls and doors



Cards for mapping elements

Indoor elements to map

Toilets

level=*

indoor=room

amenity=toilets

access=yes

wheelchair=yes/no



Area where all toilets are collected



Cards for mapping elements

Indoor elements to map

Reception

level=*

indoor=room

room=reception

access=private



Storage local

level=*

indoor=room

room=storage

access=private

Area surrounded by walls and doors



Cards for mapping elements

Indoor elements to map

Elevator

level=* {min:max}
indoor=room
highway=elevator
wheelchair=yes/no



Stairs

level=* {min:max}
indoor=room
stairs=yes

Area surrounded by walls and doors



Cards for mapping elements

Indoor elements to map

Corridor

level=*

indoor=corridor



Area surrounded by walls and doors



Cards for mapping elements

Indoor elements to map

Door

level=*

indoor=door

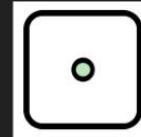
door=yes

wheelchair=yes/no

access=yes



Node shared between the rooms which the door connects



Cards for mapping elements

Indoor elements to map

Vending machine

level=*

indoor=yes

vending_machine=yes

vending=food

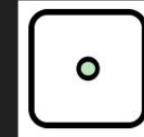


Fire extinguisher

level=*

indoor=yes

emergency=fire_extinguisher



Defibrillator

level=*

indoor=yes

emergency=defibrillator

Cards for mapping elements

Outdoor elements to map

Bicycle parking

amenity=bicycle_parking
bicycle_parking=stands



Tree

natural=tree
leaf_type=broadleaved



Water point



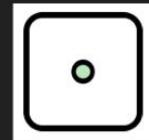
Bench



amenity=bench

Emergency

emergency=assembly_point

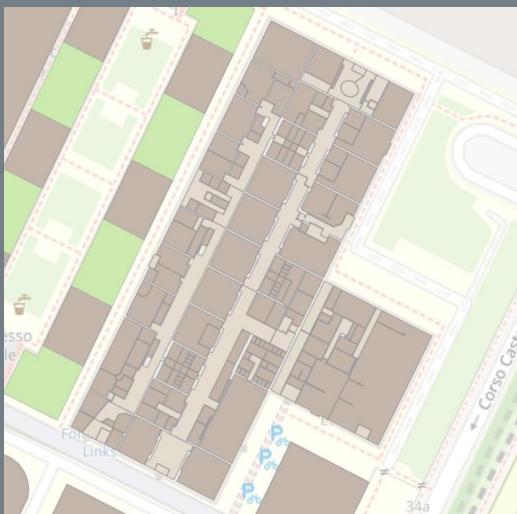


2. DATA COLLECTION

ROOM I -> GROUPS 2, 4, 5

ROOM T -> GROUPS 1, 3

MULTI-LEVEL



🚀 Let's get started with mapping! 🌎

From today until Sunday, you and your group will work on a practical field activity. Whenever you have time between lessons, please go to the designated areas to work on your field maps (or use the PDF on your tablet). 📄 Groups 1, 3, and 5 should map the area around Rooms T, while Groups 2 and 4 will focus on the area around Room I.

👉 As you map, remember to take note of various elements (refer to the presentation and PDF file for details) and include relevant tags (you can find them in the slides & in the PDF file pinned above).

📐 If you'd like, bring a measuring tape to record the dimensions of specific features (such as stairs, elevators, and wheelchair-accessible doors).

👤 Natal and @Graziaaaaaa will be part of Group 5. If you're in Group 5, you can pick up your materials in the Laboratory of Topography at DIATI (location: Polito Map). Please contact Nives for access.

📅 On Monday, we'll all meet in the classroom to add our collected data to the OSM editors.

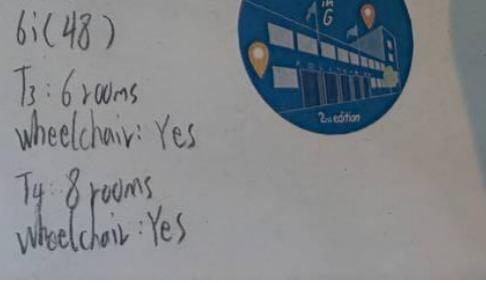
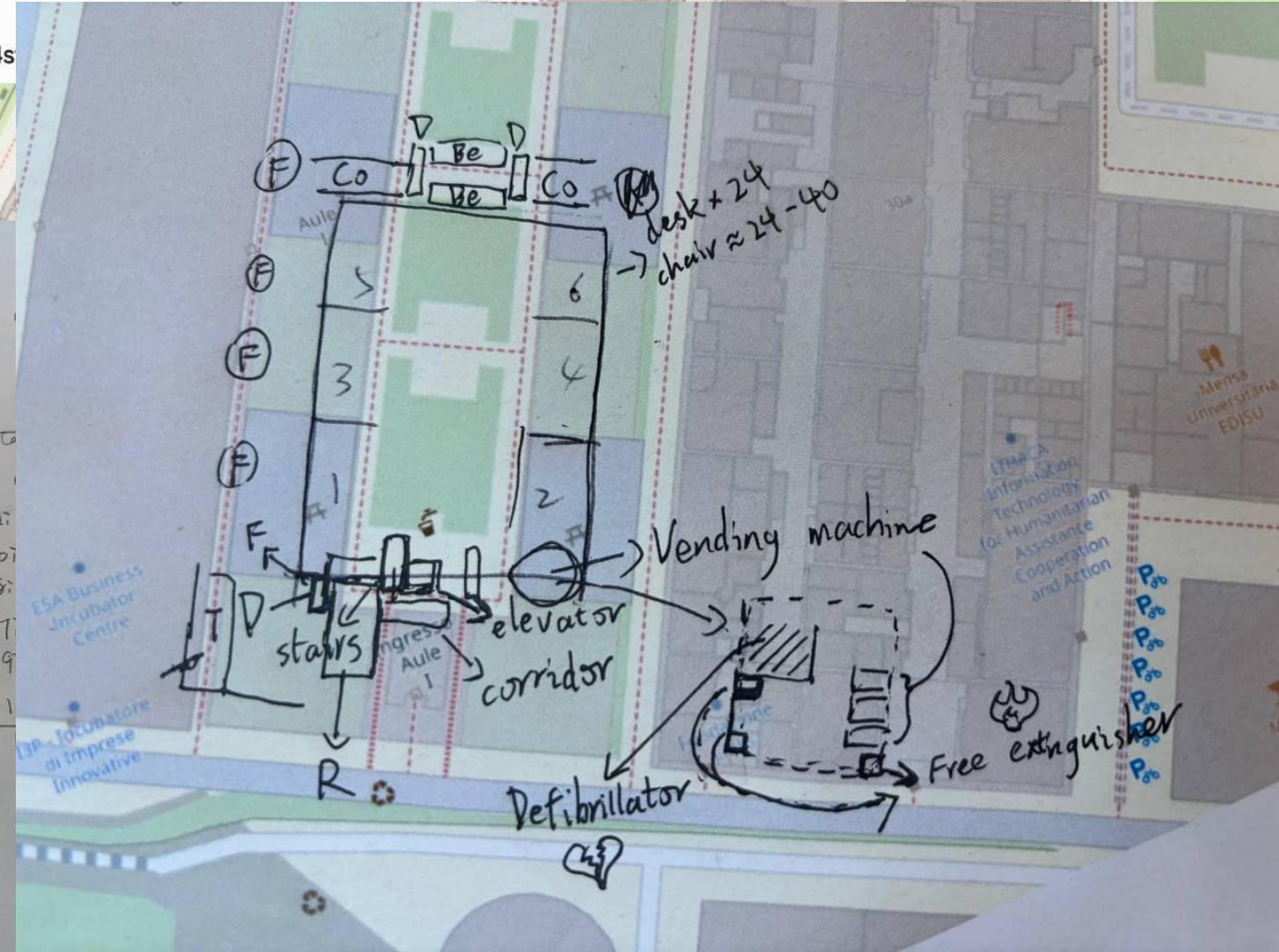
Feel free to reach out if you have any questions! 💬

📋 Group Subdivision (below the file): If you're not yet in a group, please let us know so we can add you to one!



📍 10:59 ✓

2. DATA COLLECT



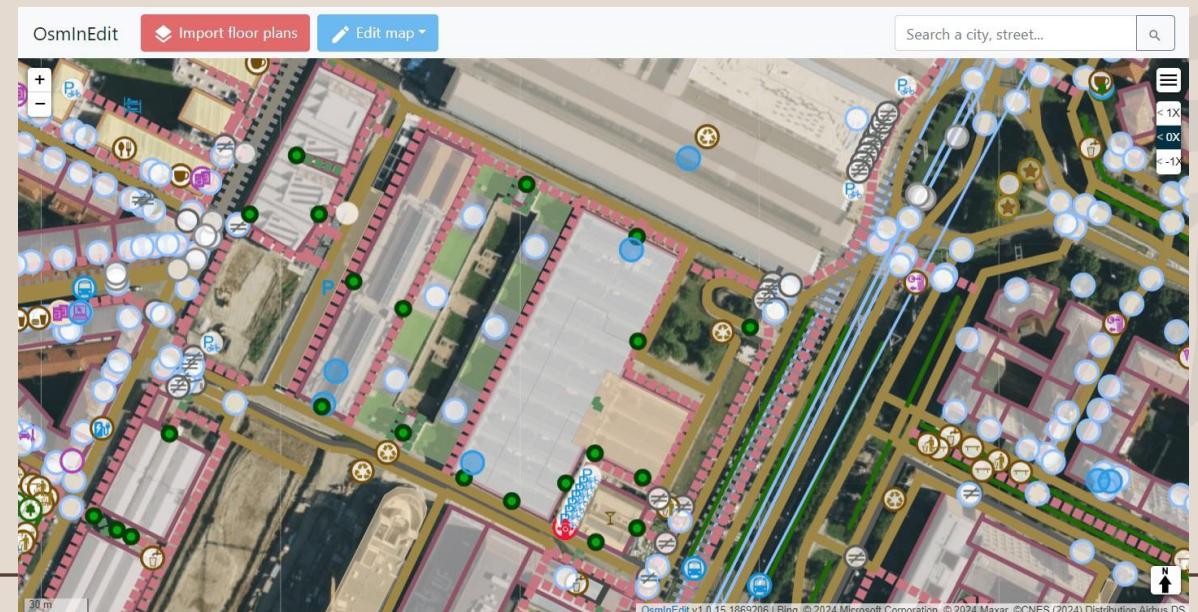
3. DATA UPLOAD PHASE

During meeting of the 11 November we will upload all your data together

We will use **OsmInEdit** editor, a specific **web editor** focused on **indoor mapping**

ID Editor indeed missing of:

- function to filter data by level
- Simple Indoor Tagging presets
- indoor specific validation rules



3. EDITING OSM

GROUPS WORKS IN
CLASSROOM
MULTI LEVEL

Adding missing attributes
WHEELCHAIR= YES

TAG
#POLITOMAPPINGPARTY
2024

OSMINEDIT:
adding geometries

! OVERLAP PROBLEMS
DURING SAVINGS

3. EDITING OSM

OsmlnEdit Importa planimetrie Modifica la mappa ▾

Tutti gli edifici Edificio Oggetti (livello 0)

Aggiungi caratteristiche

Cerca un tipo di oggetto...

+ -

Stanza

Struttura dell'edificio

Arredamento

Barriere

Trasporto

Strutture

Sport

Creato dall'uomo

Negozi

Uffici

Artigiano

Preview Salva (6)

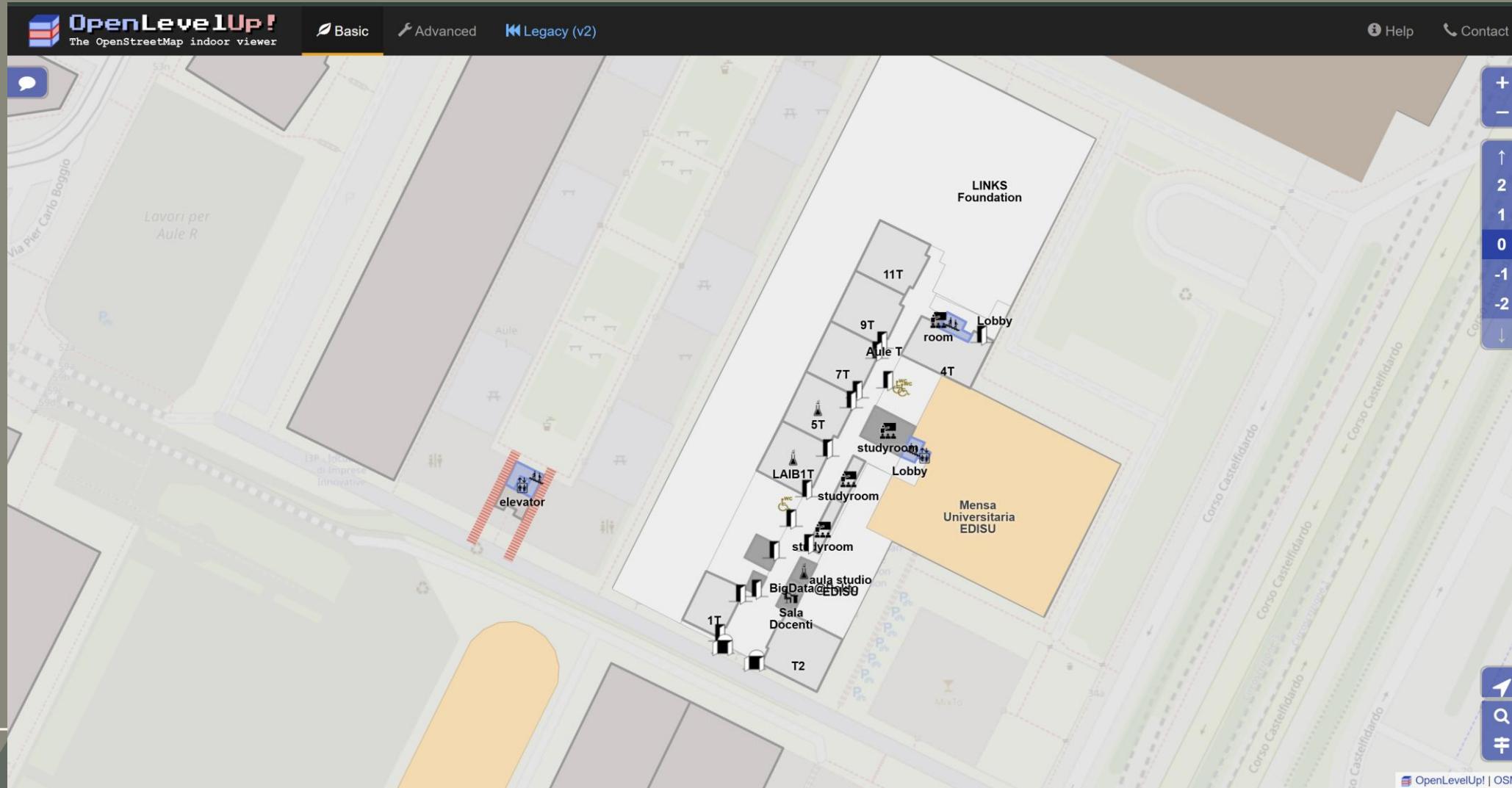
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10 m

N

OsmlnEdit v1.0.15 1869206

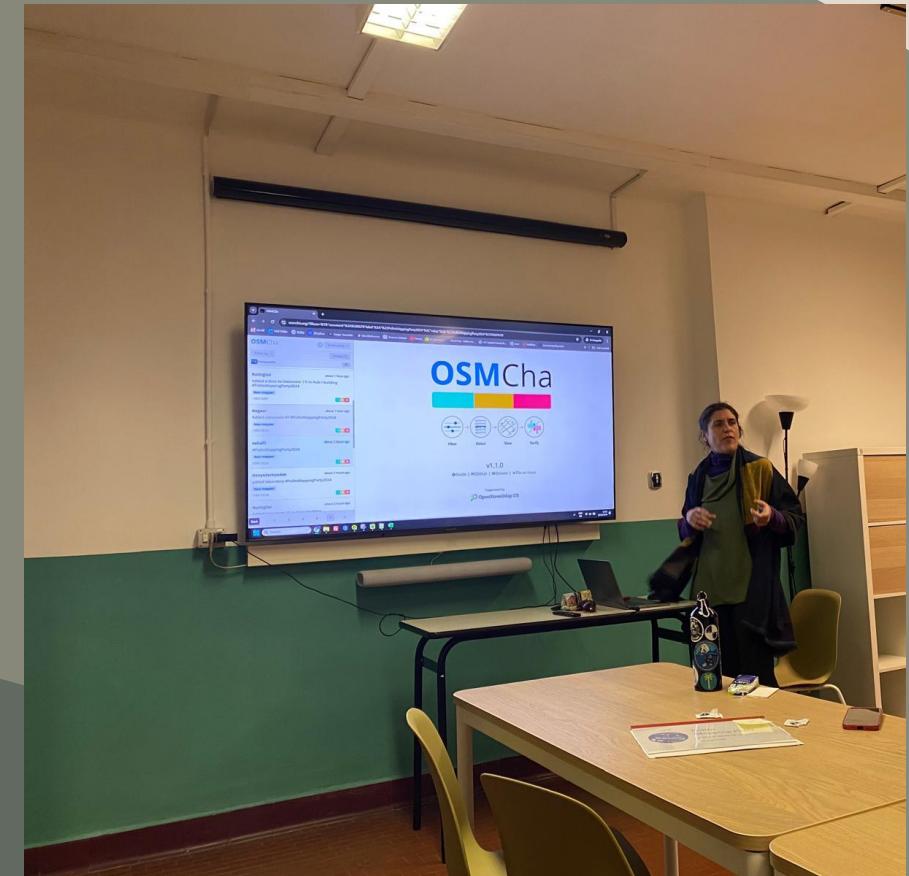
Results



Results

from OsmCha:
More than 170 changesets

	I	T
ROOMS	11	6
LAB	0	3
STUDY ROOM	0	3
OFFICE	0	1
RECEPTION	1	1
TECHNICAL ROOM	1	2
TOILETS	4	2
DOOR	55	52
CORRIDOR	6 (4 lobby)	4 (3 lobby)
STAIRS	2	2
ELEVATOR	2	1
VENDING MACHINE	3	0
GARBAGE	0	1
SEAT	0	8
BENCHES	8	0
FIRE EXTINGUISHERS	25	10



Conclusions of the Mapping Party



- opportunities of **collaboration for students**
- **acquisition of new technical skills** in the field of free geographic information
- actively participate in the construction of a tool useful for the entire **Politecnico community**
- know the **potential and limits of the indoor editing** tool for shared mapping

and now it's
YOUR TURN!



Politecnico
di Torino

Technology
Transfer
System



GEOMATICS
ab



SDG11
lab



SDG4CH
Sustainable Development through Geomatics

