



# WeMap

Interdisciplinary project

Supervisors:  
Professor M. Piras

**MATTEO NISI**  
**NAVID YAMINI**  
**STEFANO CALLERIS**

# Outlines

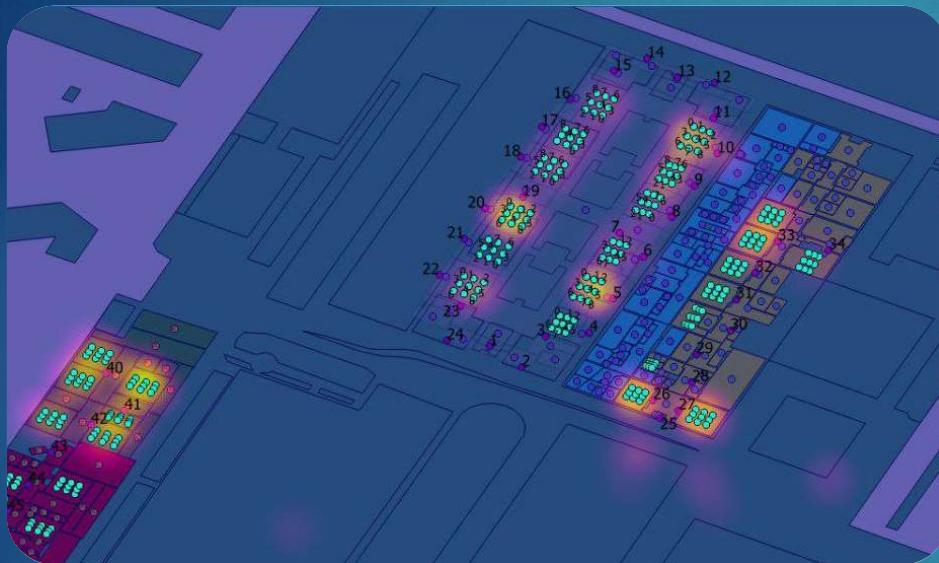
- ▶ Motivation
- ▶ Introduction
- ▶ Objectives & Challenges
- ▶ Tools
- ▶ Data Gathering
- ▶ Data Cleaning
- ▶ Data Analysis
- ▶ Data Visualization and Results
- ▶ Suggestions for Further Work

# Motivations

- ▶ Does the Polito Wi-Fi coverage work well?
- ▶ What students can do to improve it?



# Introduction



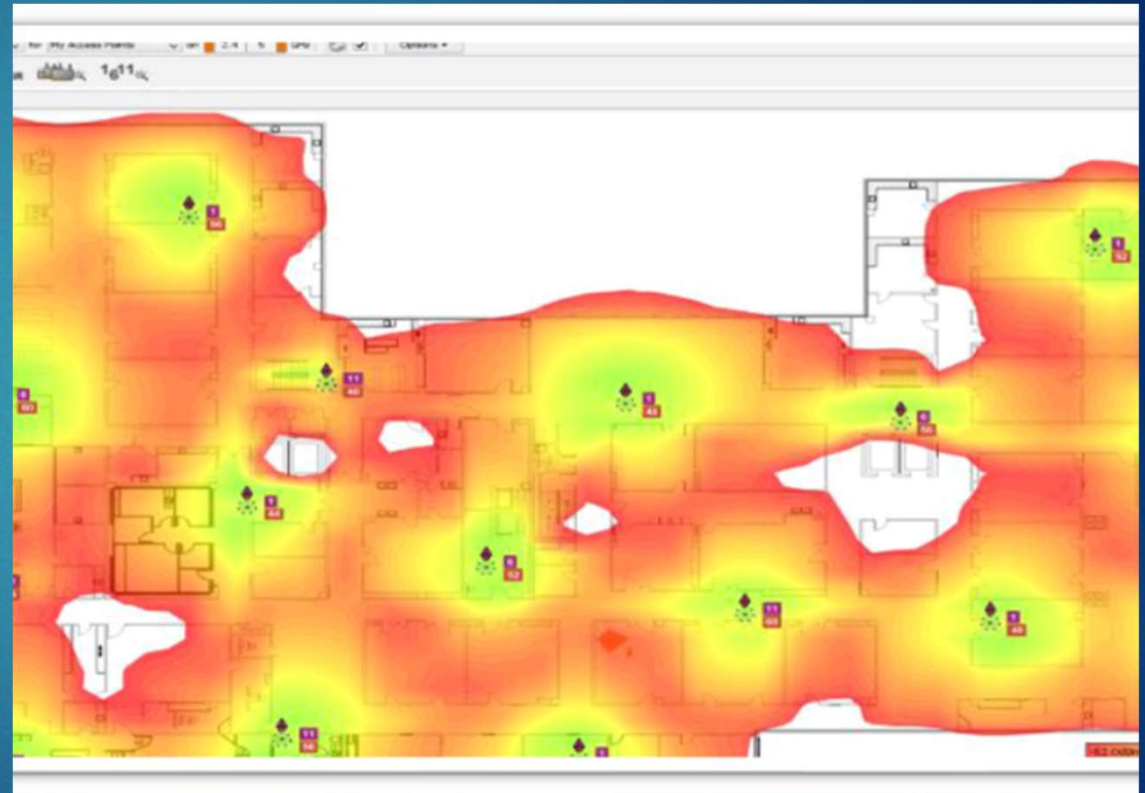
## What is WeMap?

WeMap is a collaborative tool that aims at measuring the Wi-Fi speed and power in all the area of Politecnico.



# Objectives & Challenges

- ▶ User friendly interface
- ▶ Create an heat map with GIS for Politecnico Area
- ▶ Better Understand of Wi-Fi behavior
- ▶ Analyze weaknesses in the Wi-Fi network of Politecnico



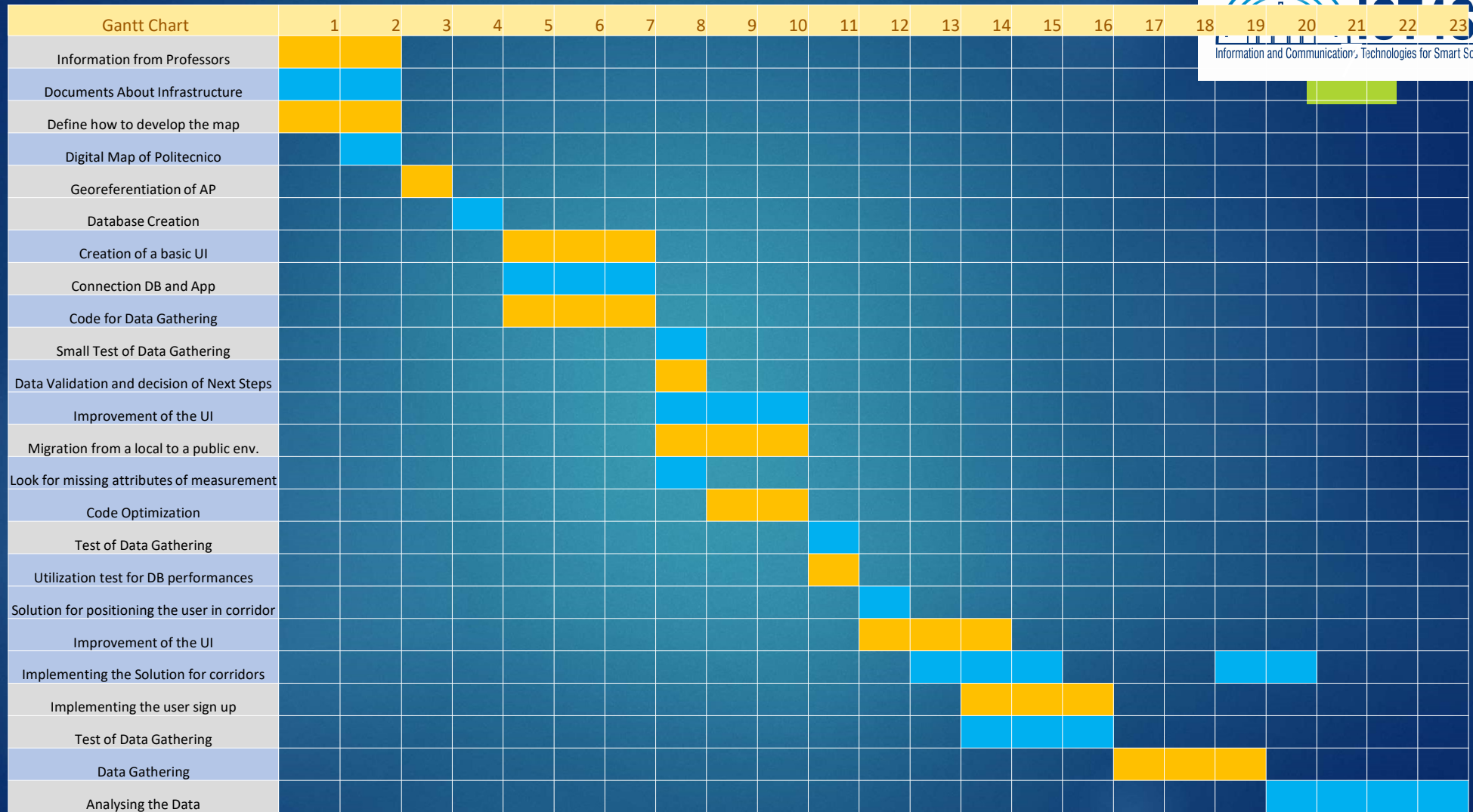
Georeferencing Politecnico Map

Data Gathering

Data Cleaning

Data Analysis

Data Visualization and Results



# Georeferencing Maps





# Digitalizing Maps – Implementation

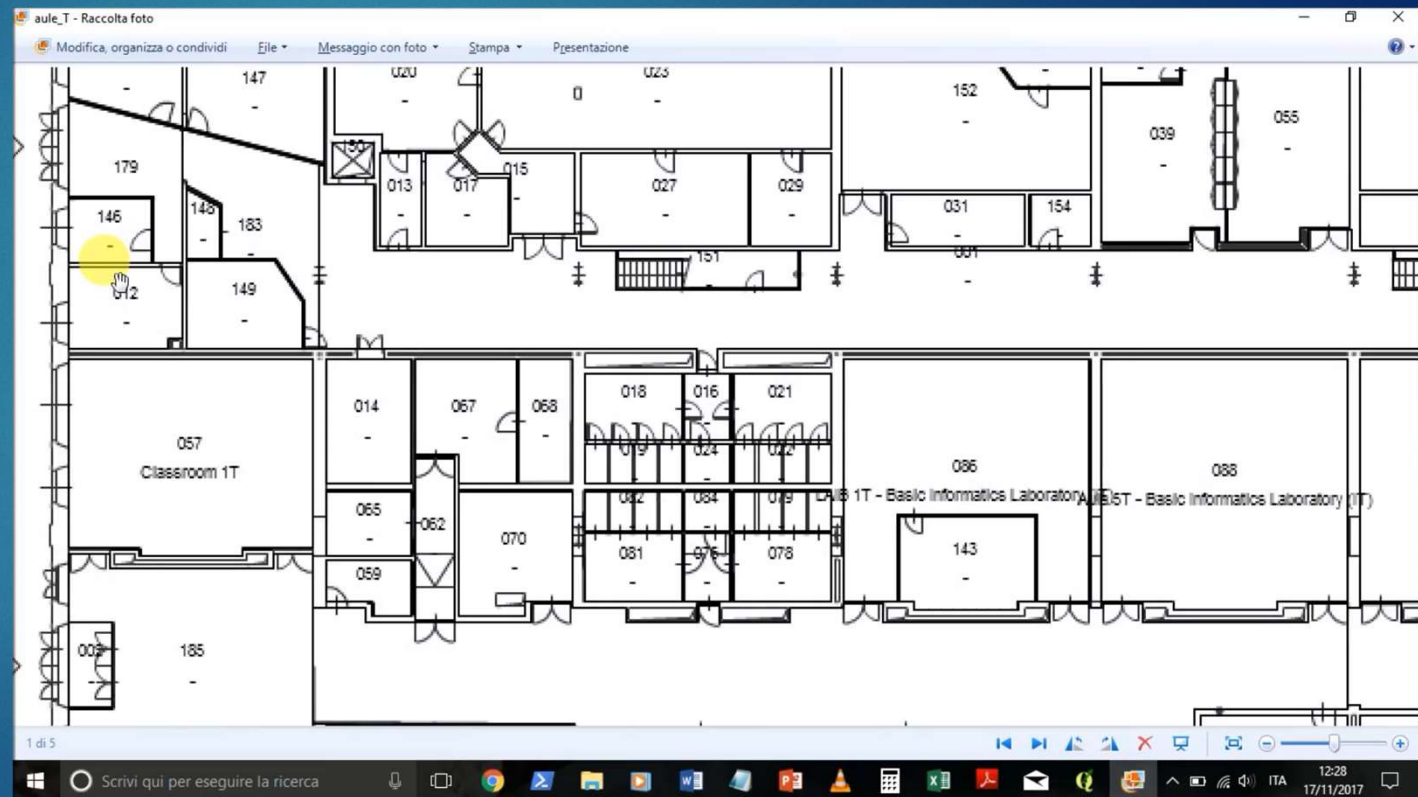
Taking Map  
Images



Georeferencing



Digitalizing



# Data gathering tools



# Data Gathering Tool

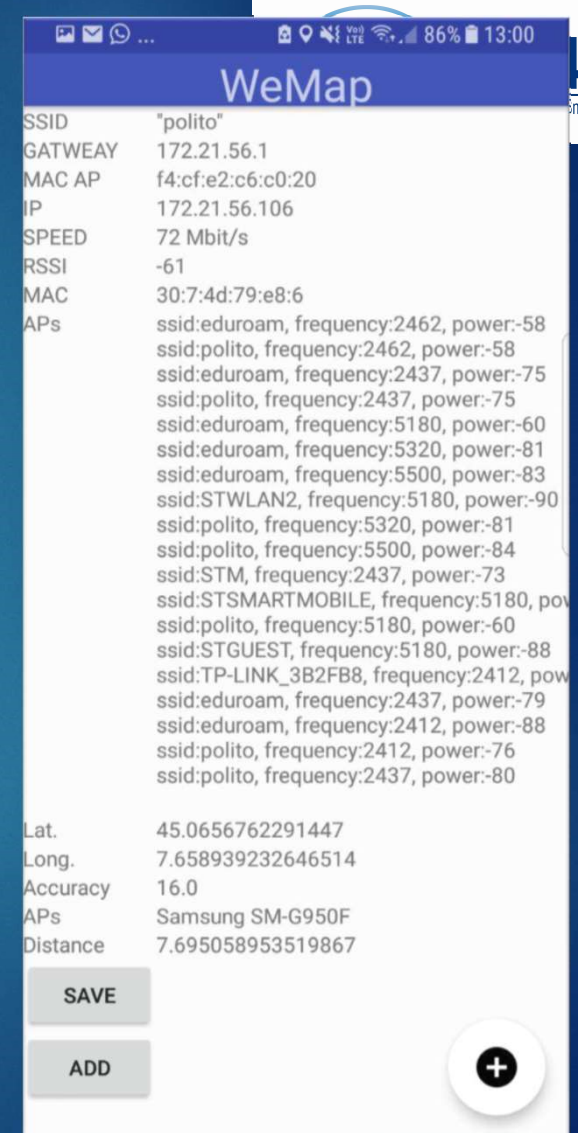
Designing DataBase

Creating the App

Get Wi-Fi informations

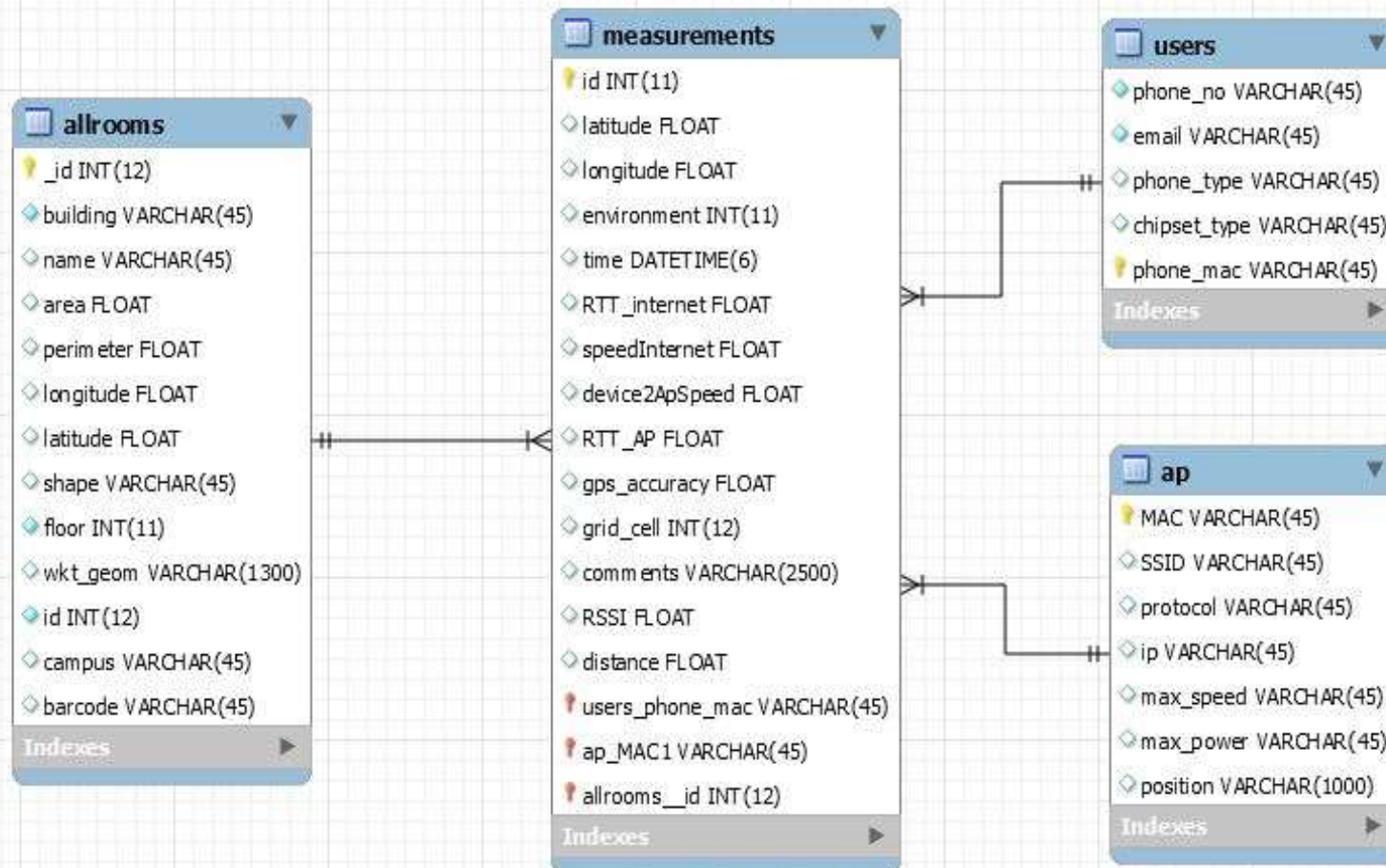
Get user position and accuracy  
of the measurement

Send the collected data to our  
database



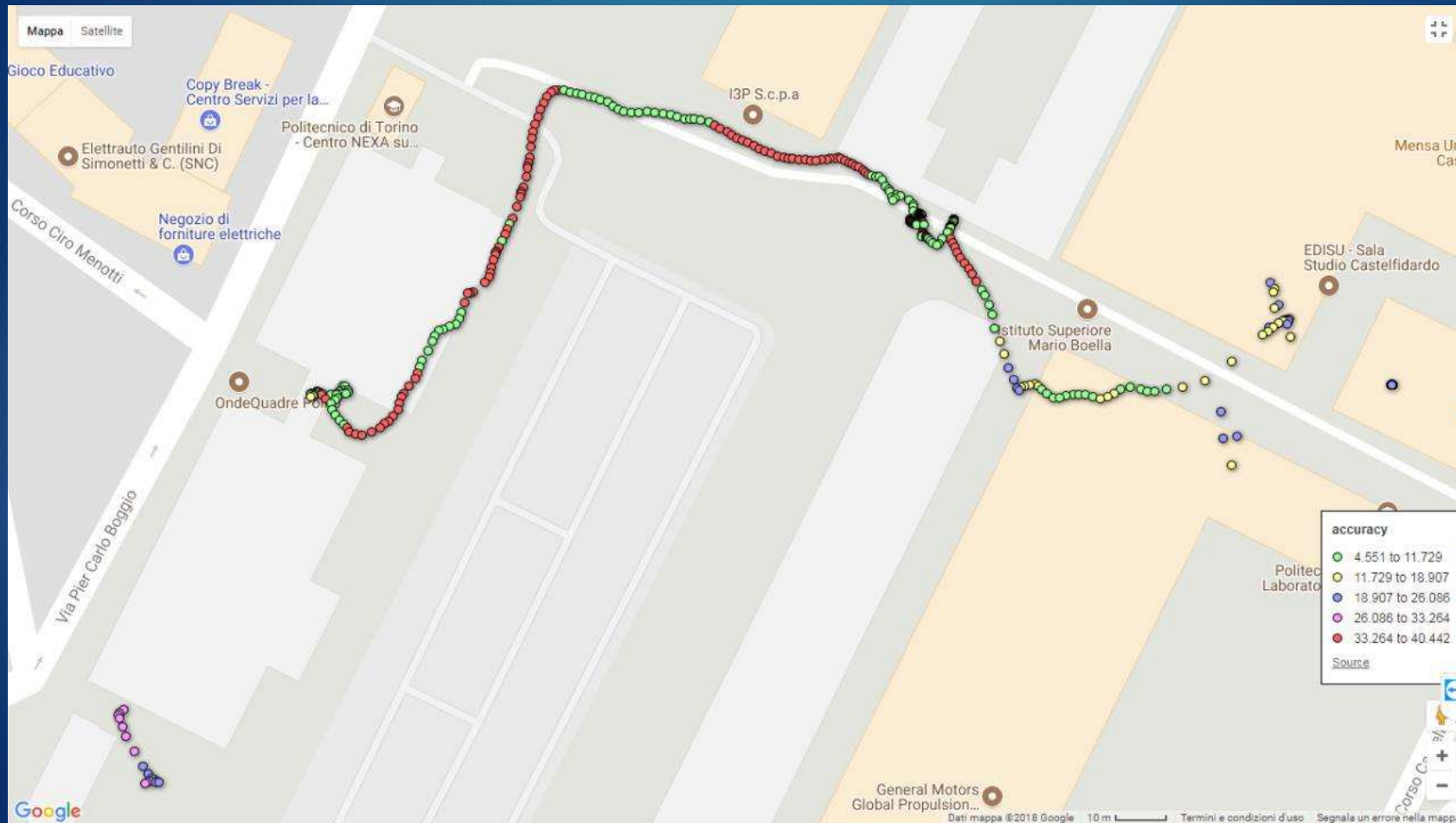


# WeMap Database ER Diagram





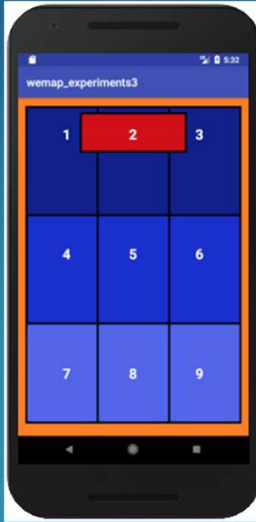
# Outdoor and Indoor Accuracy



**GPS LOGGER**

# Solutions

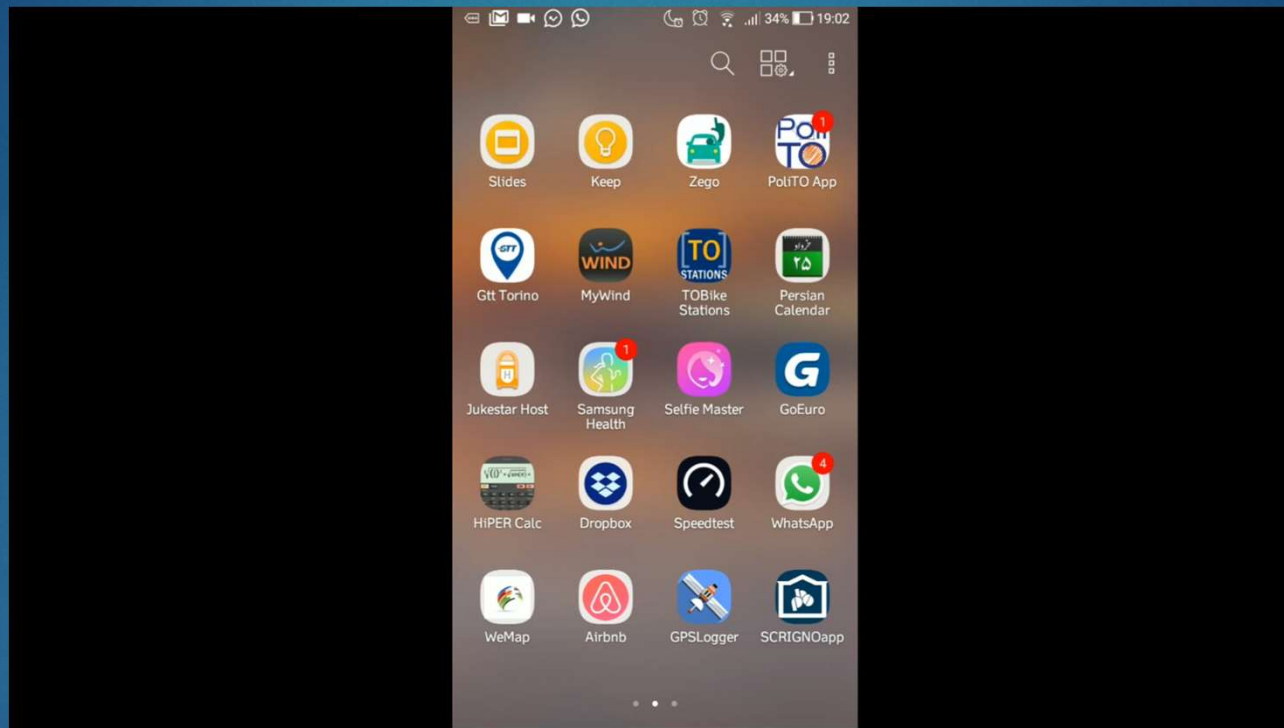
- Using Grid for the rooms



- Using QR Code For Position of User in the Corridor



# The Final App



# Data Gathering

- ▶ Try to understand change of pattern with different users and smartphones
  - ▶ Collecting Data by Using 5 Different Devices
  - ▶ Asking other People Help
- ▶ Understand different behavior due to timeline
  - ▶ Checking signal strength and Internet Speed During the Class time



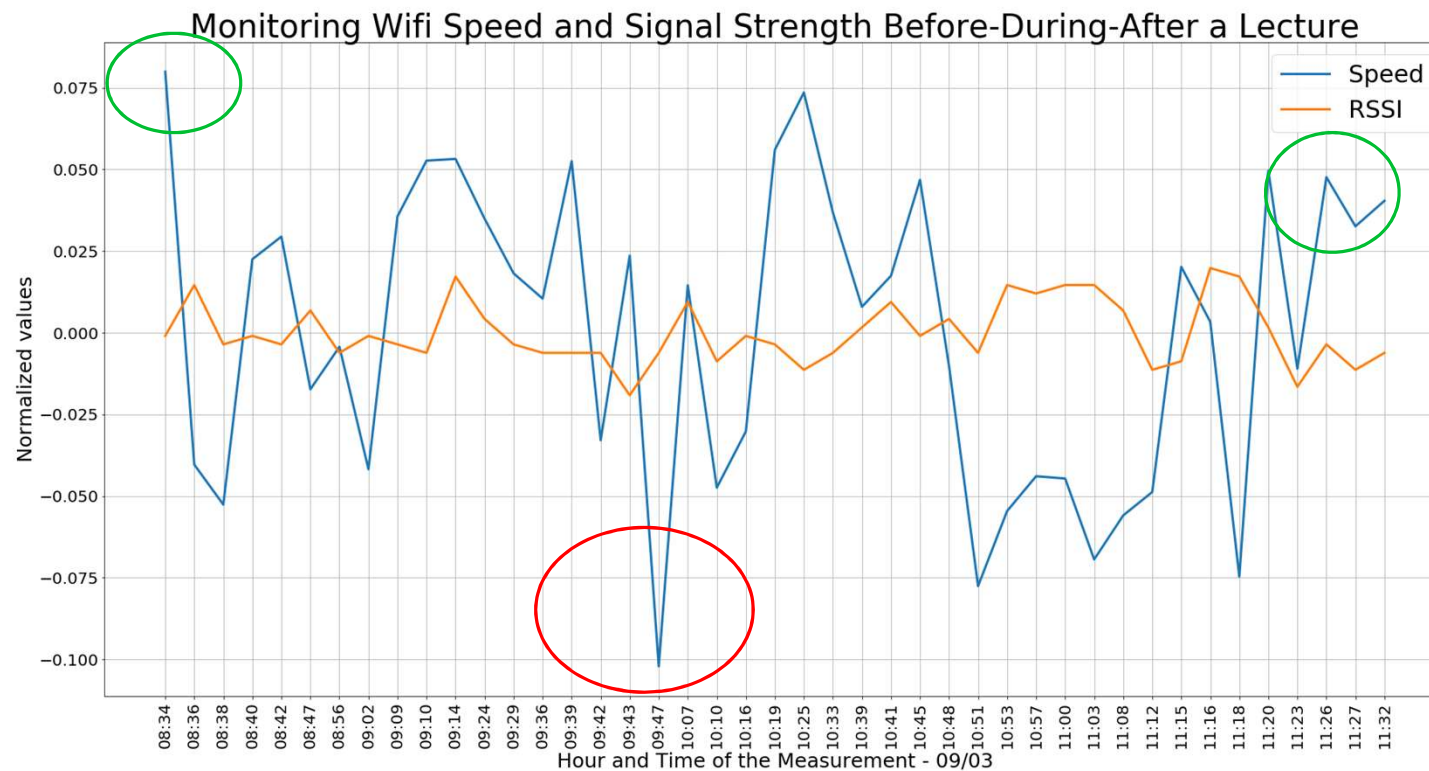
# Data Analysis



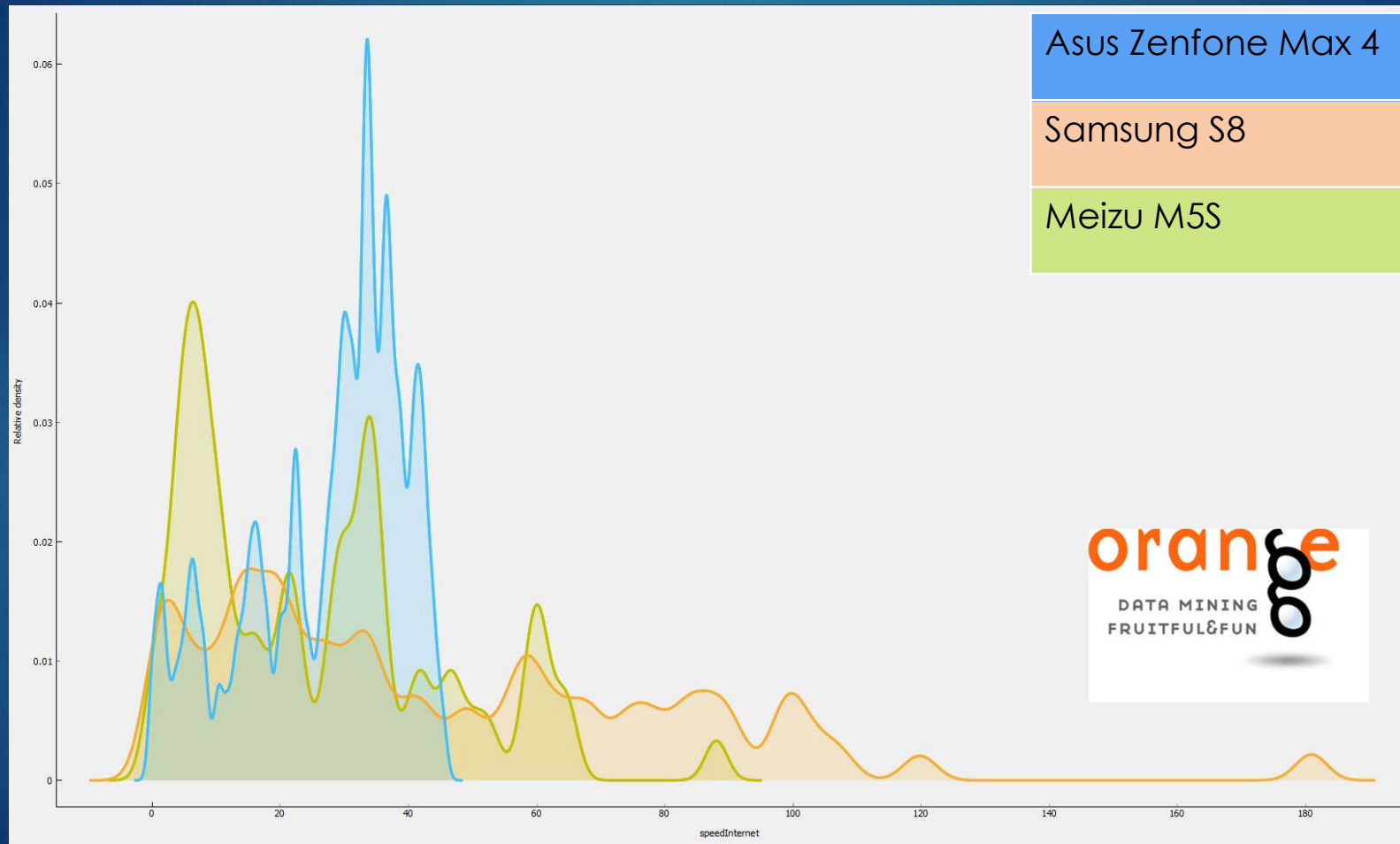
# Data Analysis

- ▶ Checking Internet Speed before-during-after an lecture
  - ▶ Evaluation of changing speed related to events (start, breaks ...)
- ▶ Taking Median For 3D Models and Heat Map
  - ▶ To cut off outliers
  - ▶ To avoid that the most active user is leading the measurement (i.e. taking mode)
  - ▶ Skewed shape of the results

# Wi-Fi speed or student attention?

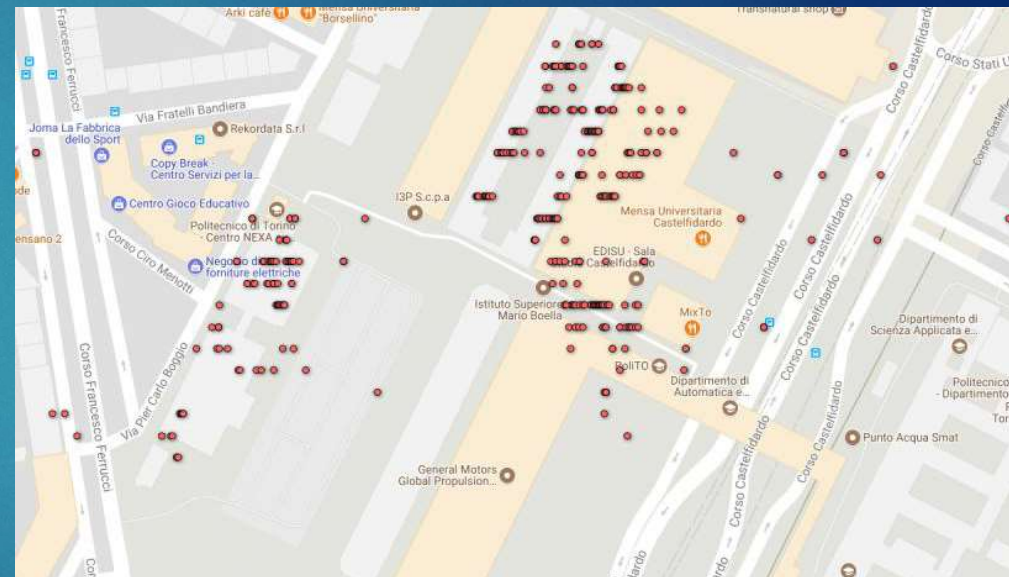
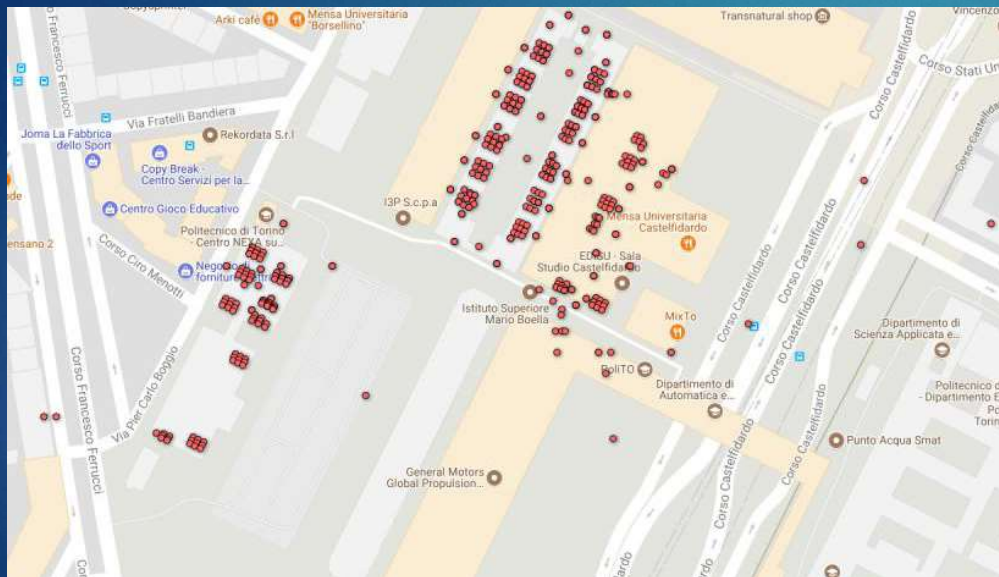


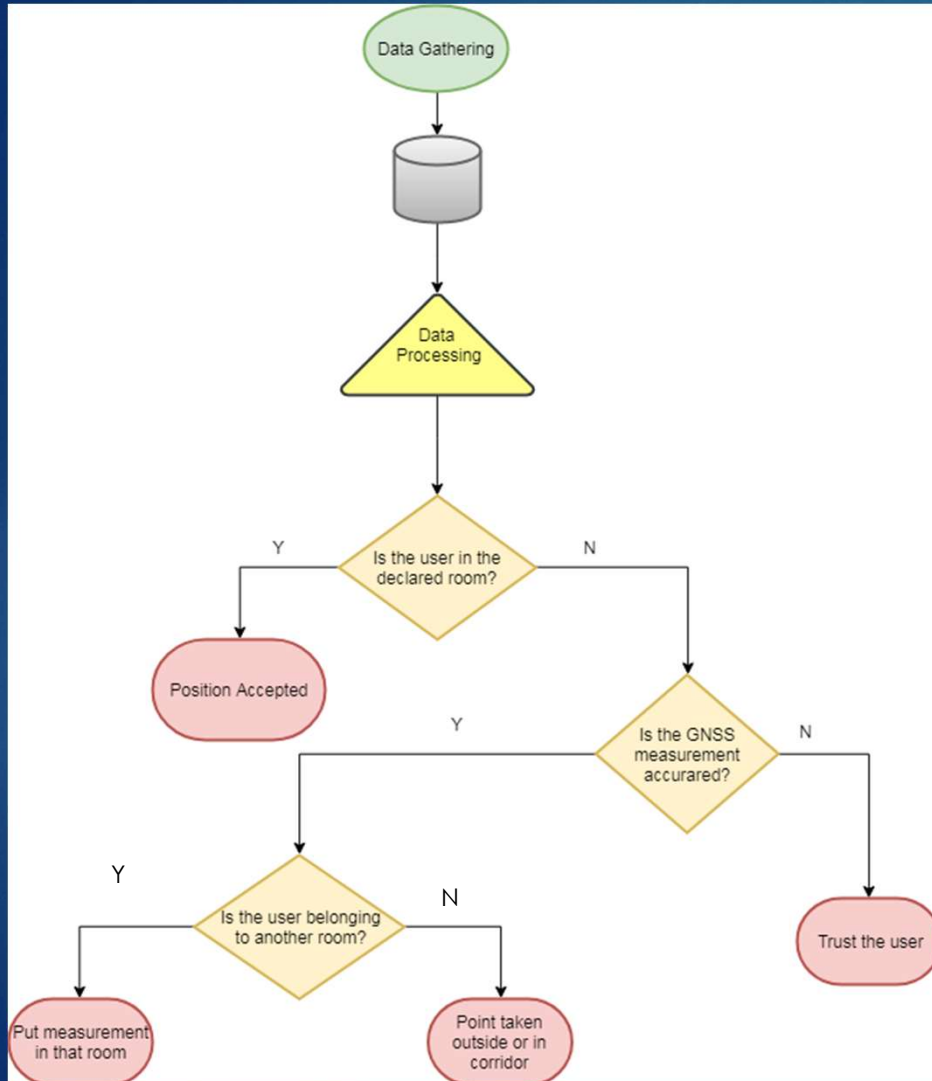
# PDF of Speed per Device





# Stated position vs Real Position





# Some examples of Data Cleaning

# Some example of Data Cleaning

# Total Data	705
# Total User	23
# Total AP	93

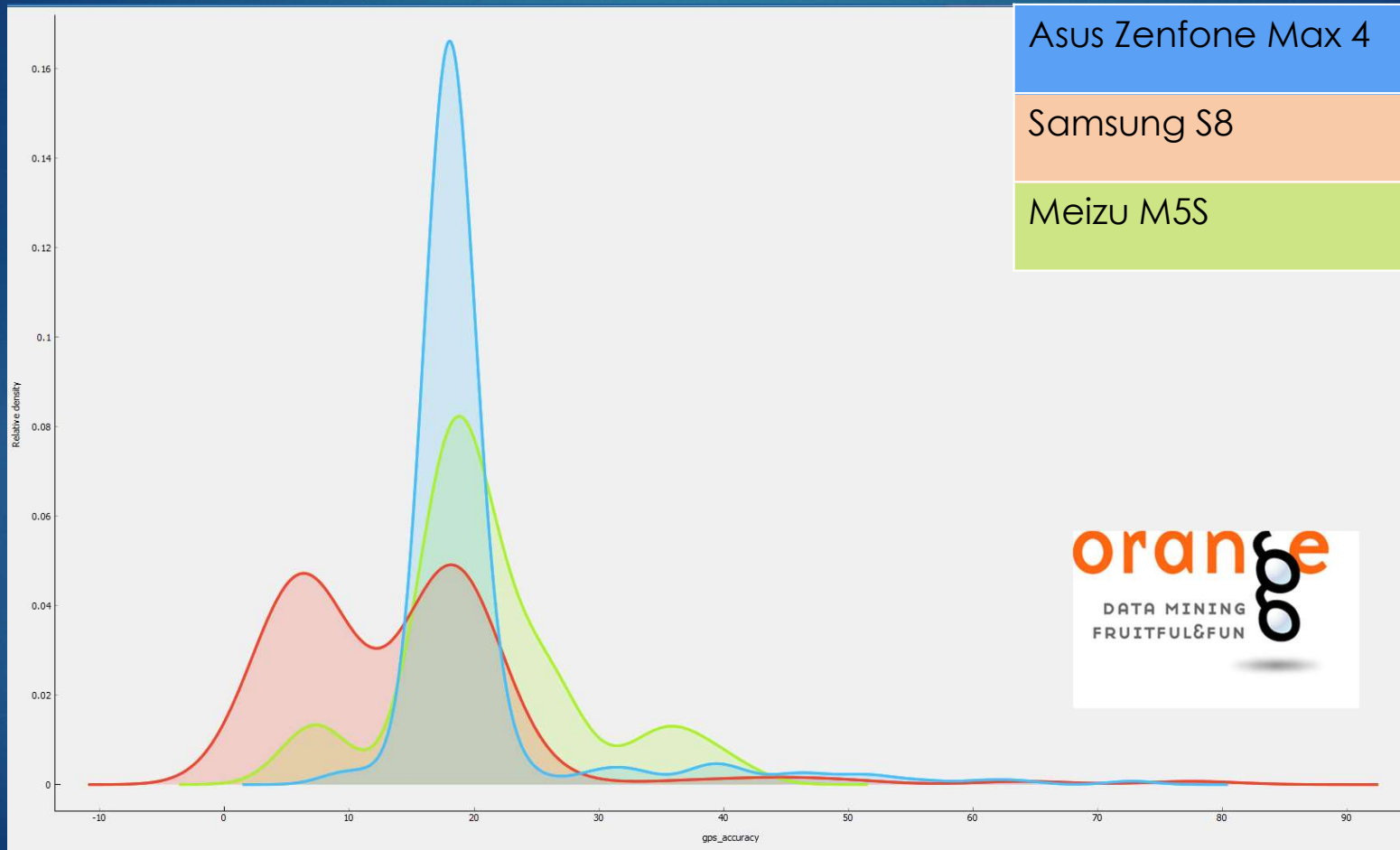
**Collected Data**



# Total Data	595
# Total User	16
# Total AP	70

**First Filtering Result**

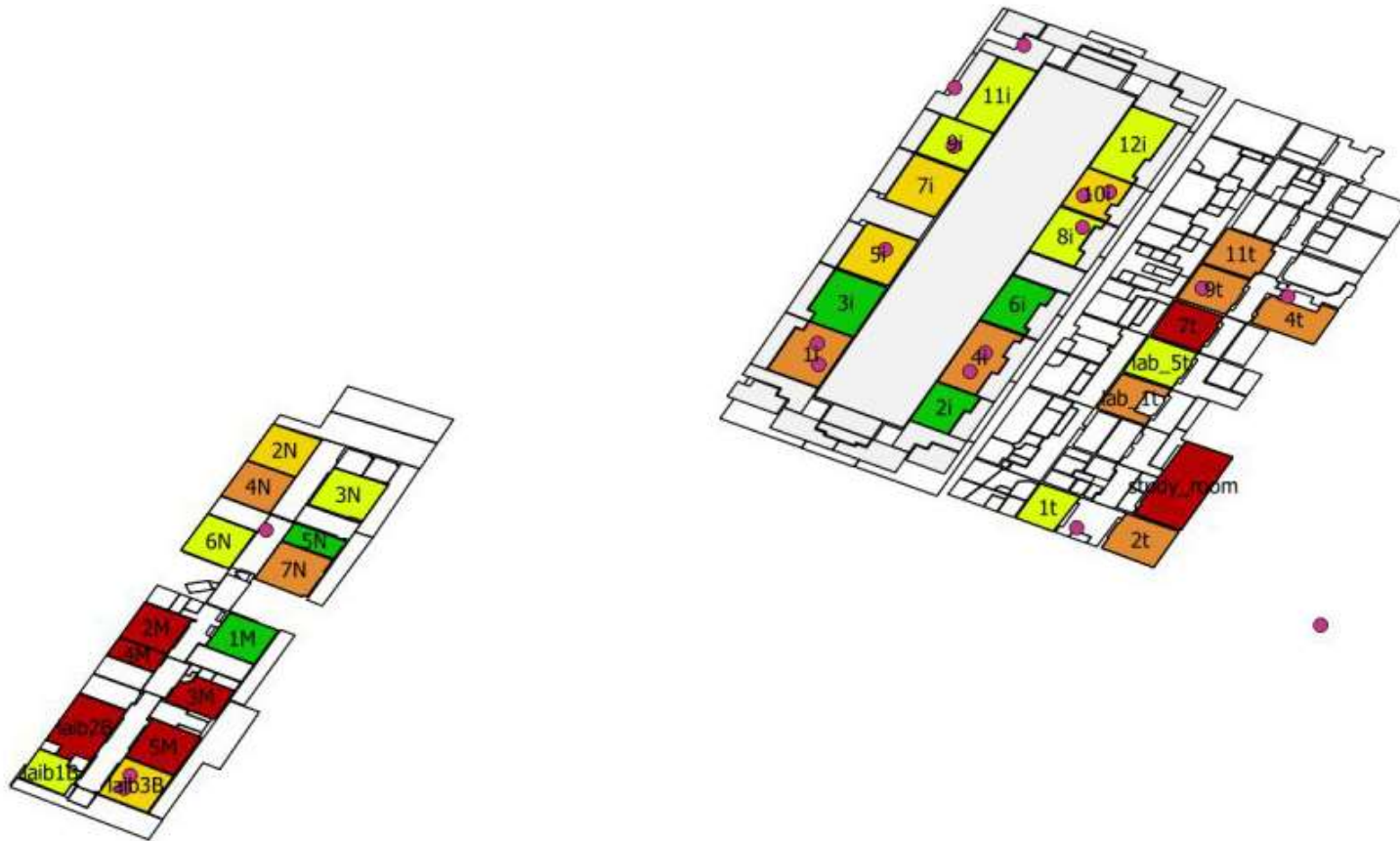
# PDF of Accuracy per Device





# Estimation of AP position

In the  
given





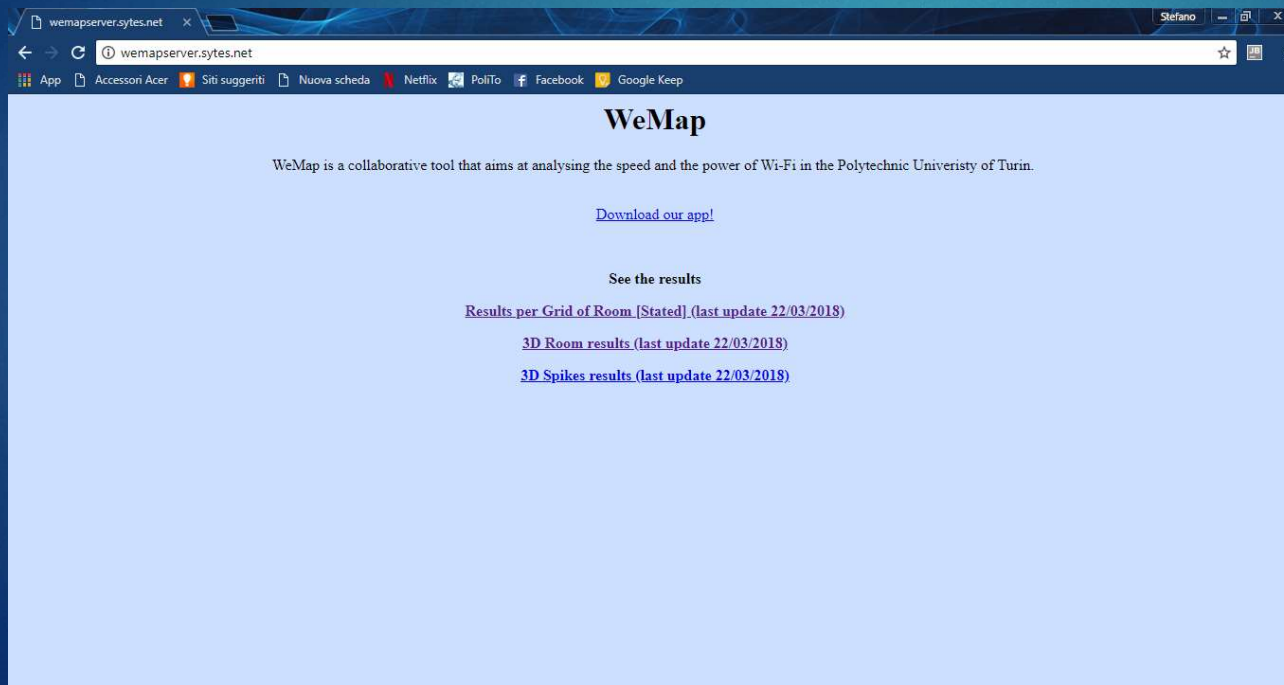
# Data Visualization



# The Website

.... We do have a website!

<http://wemapserver.sytes.net/>

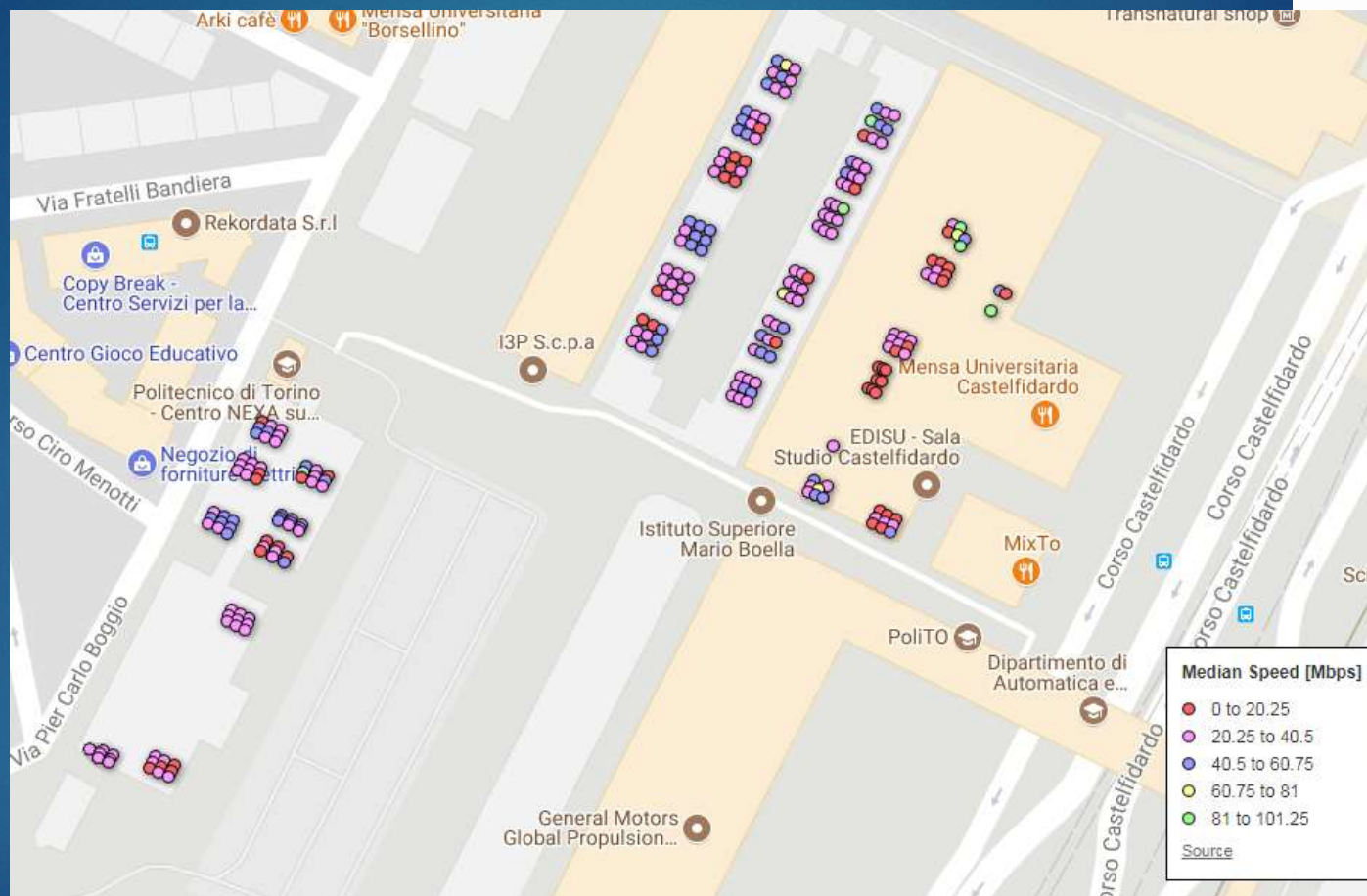


There you can:

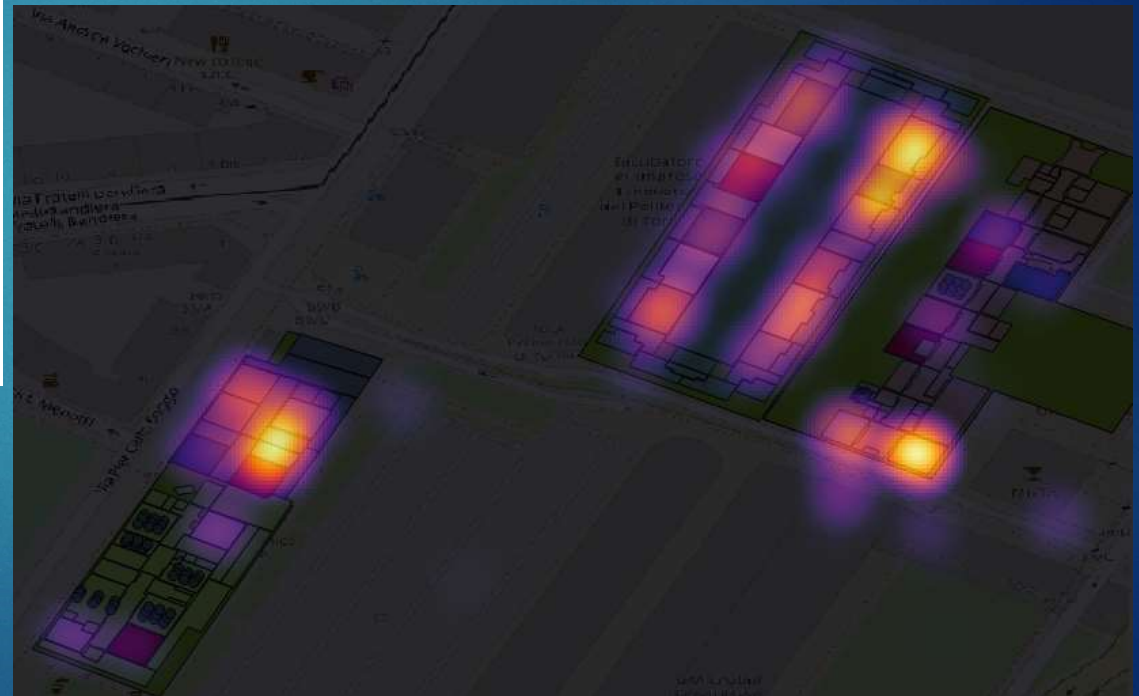
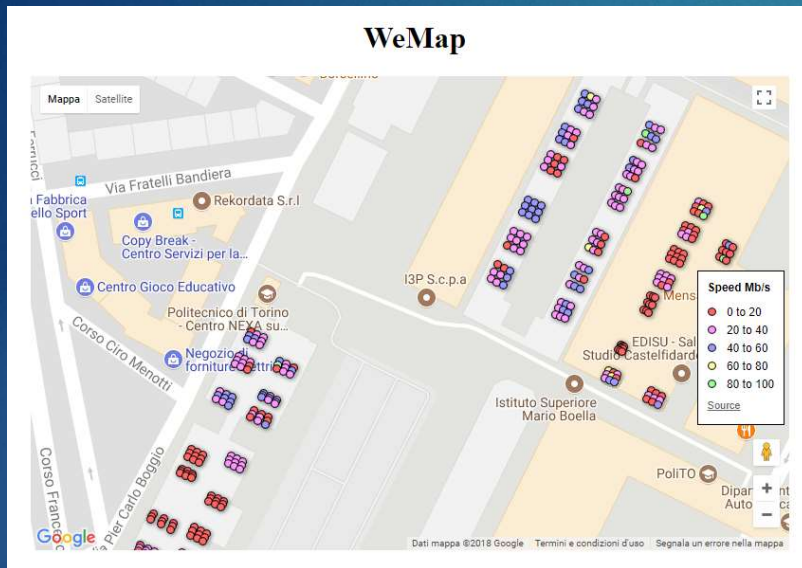
- ❖ Download the app
- ❖ See the results so far



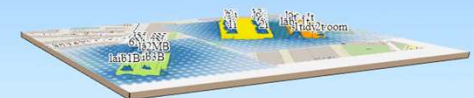
# First Filtered Results per Each Grid



# 2D results



# 3D results





# Project is Multi Disciplinary!

- ▶ ICT for Geomatics: GNSS knowledge, GIS
- ▶ Programming for IoT: REST request, webservice
- ▶ Statistical Signal Processing: Signal Analysis
- ▶ ICT For Transport System: Handle big amount of data and results classification
- ▶ Mobile Application Development: Android Application
- ▶ Management and content delivery for Smart Networks, Mobile and Sensor Networks: Wi-Fi knowledge



Thank You.  
Q & A