Scuola universitaria professionale della Svizzera italiana

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**UNIVERSITÄT BERN**

**SUPSI**

# Analysis and Prediction of People Aggregation in Online and Offline Social Networks

*Luca Luceri*
PhD Student

# *Outline*

- Swiss Sense Synergy

- VIVO

- VIVO: Context Data

- Social Networks Fundamentals

- People Aggregation Classification

- Social and Mobility Analysis

- Waiting for VIVO, available Datasets

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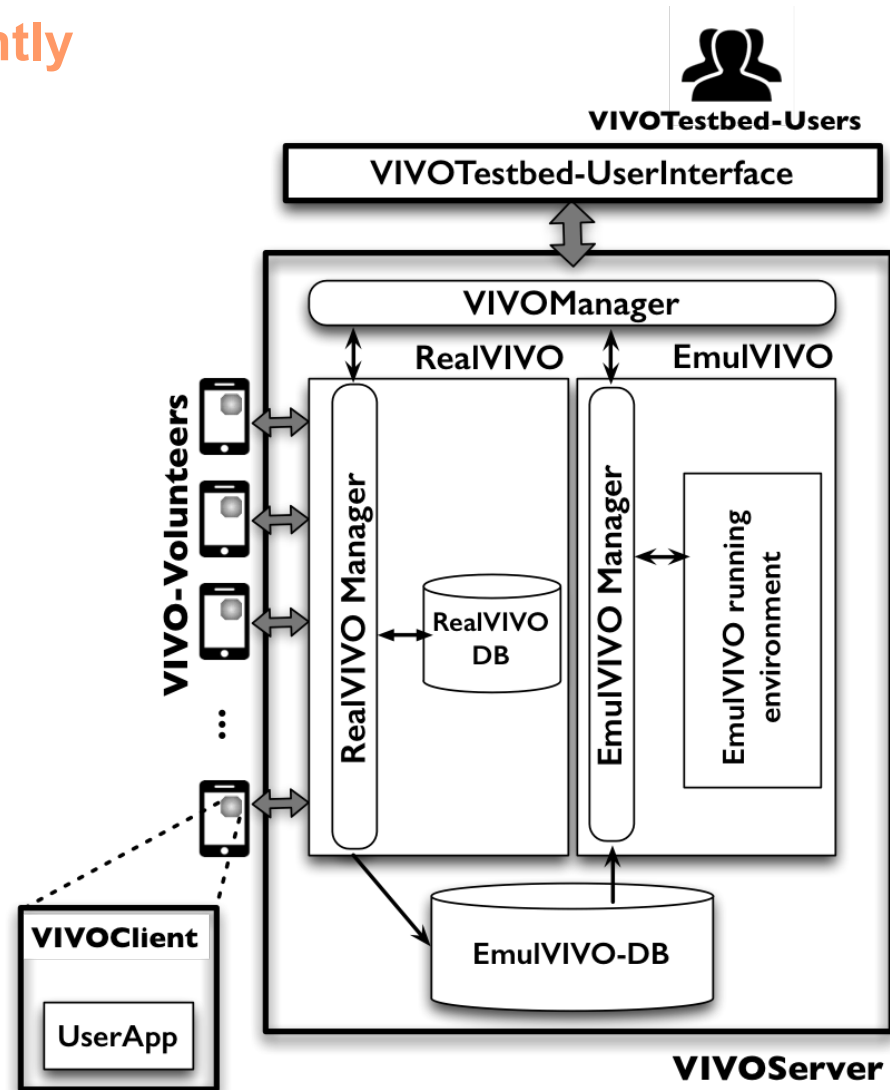
# Swiss Sense Synergy

- The project aims to derive semantically-rich insights about people (activity, preferences, intentions) from low level measurements, from social interactions and from a combination of these.

- Approach: capture the interactions between users and their context, in addition to those among users, in order to have a more holistic and user-centric perspective.

# VIVO
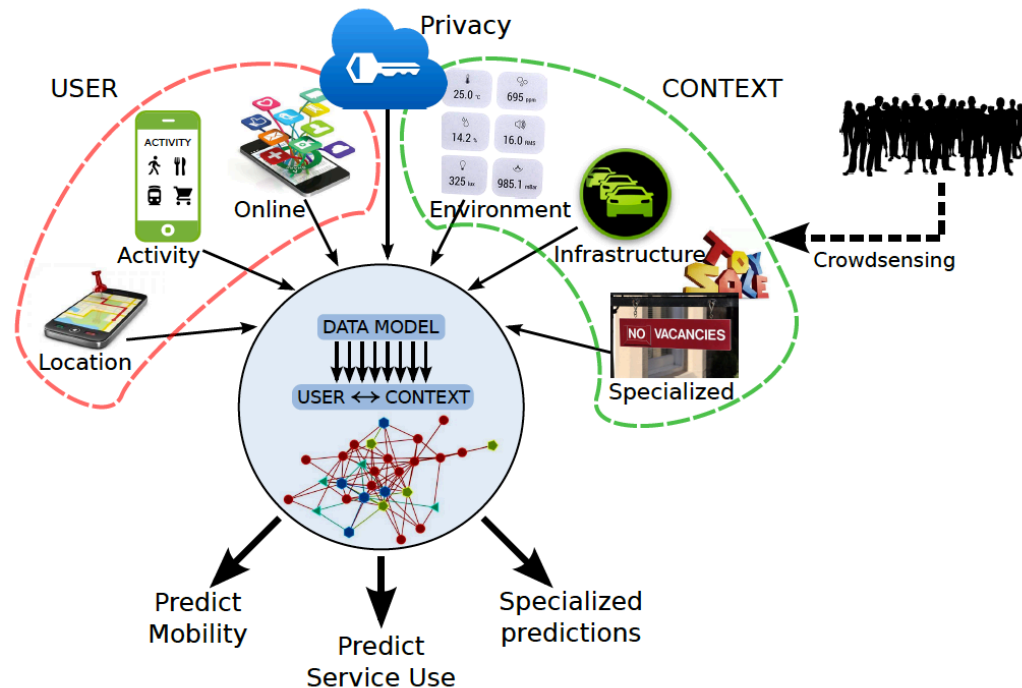
- A novel human- and sensor-based testbed based on the concept of enrolled crowdsourcing.

- A secure and privacy-respecting platform for _testbed users_ to collect social, physical and environmental data.

- It allows testing algorithms and solutions, without any extra hardware requirements, by scheduling and running them in real time on _volunteers_ mobile phone.

- _Testbed users_:
    - can dynamically deploy their own application on each volunteer's device;
    - are provided with a web user interface for uploading the source code and launching the experiments;
    - receive the experimental results in a secured way.

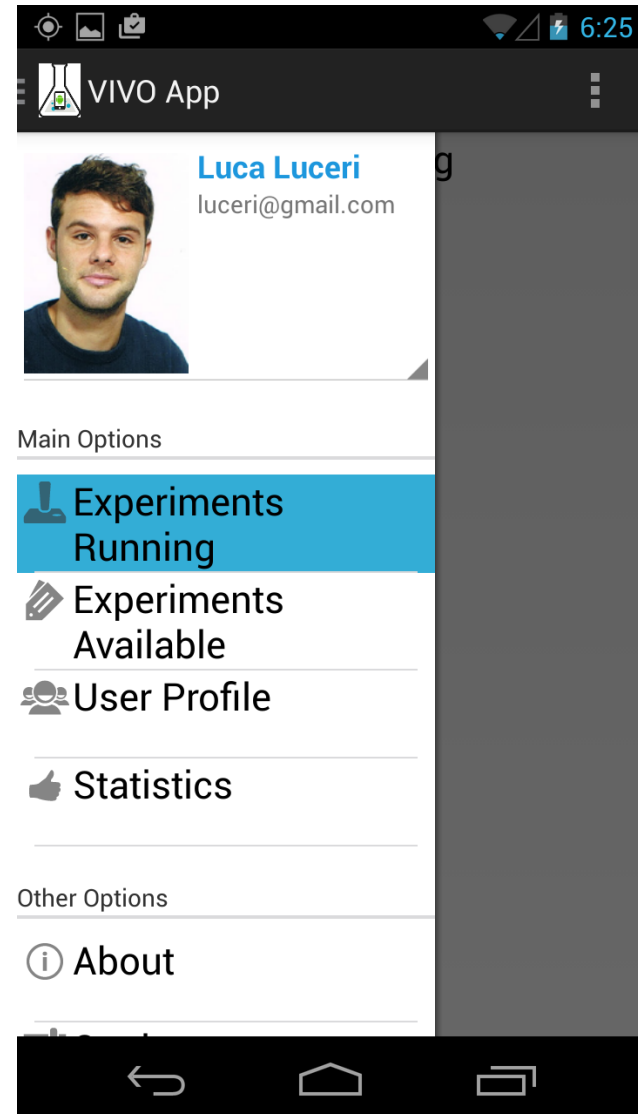- _Volunteers_: people equipped with personal device who accept to run experiments.

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# VIVO Testbed

**Our team in SUPSI is currently working on:**

- Web User Interface
- RealVIVO Server
- RealVIVO DB
- VIVO App

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# VIVO: Context Data

- **Physical Context:**
  - GPS
  - WLAN
  - Cell-ID
  - Phone sensors

- **Social Context:**
  - Bluetooth proximity
  - Call/sms log
  - Web social networks
  - Contacts

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**Online VS Offline Social Network**

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# VIVO: Context Data

- **Physical Context:**
  - GPS
  - WLAN
  - Cell-ID
  - Phone sensors

  → **Mobility and tracking**

- **Social Context:**
  - Bluetooth proximity
  - Call/sms log
  - Web social networks
  - Contacts

  → **Online VS Offline Social Network**

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# Social Networks Fundamentals

## Social Network

- A structure of social interactions and personal relationships.

- A set of social actors (nodes) and a set dyadic ties (edges/arcs) between these actors.
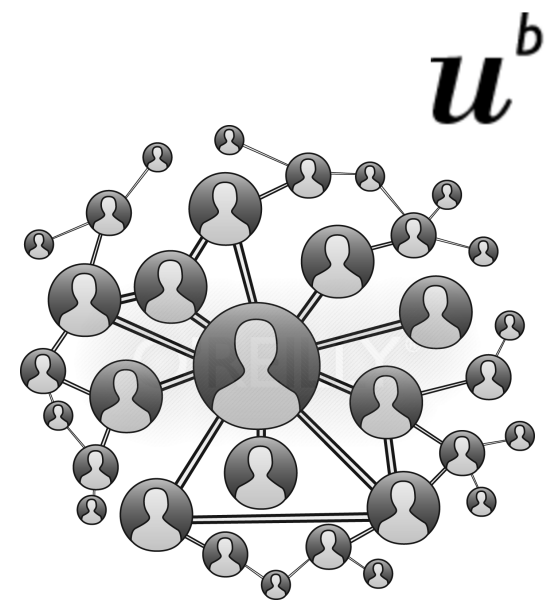
## Social Network Properties

- Global patterns (degree distributions, path lengths, etc.).

- Segregation patterns (node types and homophily).

- Local patterns (clustering, transitivity, etc.).

- Position in the network (neighborhoods, centrality, influence).

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# Social Networks Fundamentals
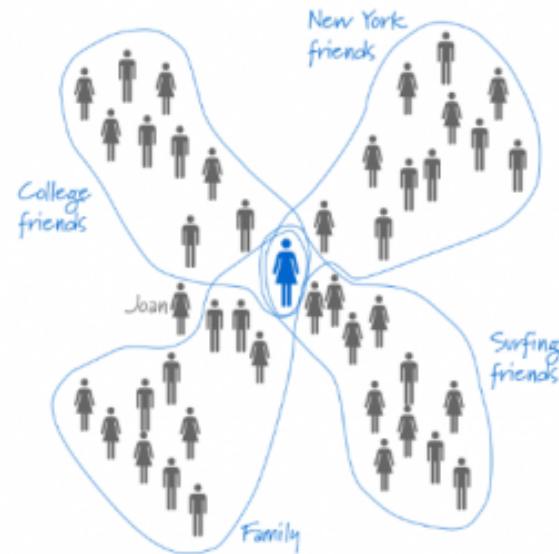
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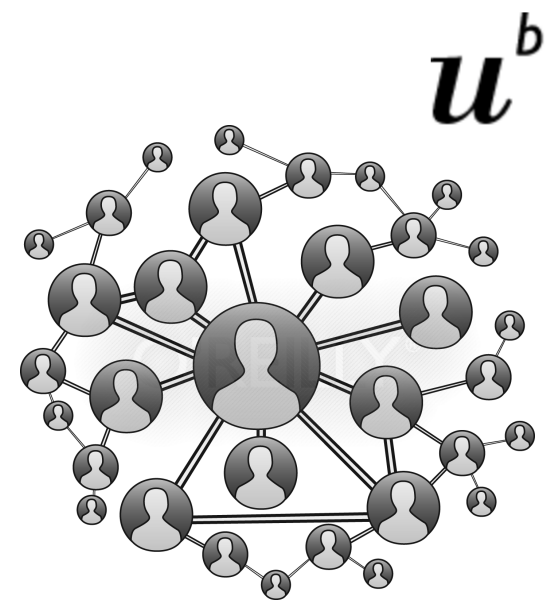


## Online Social Network
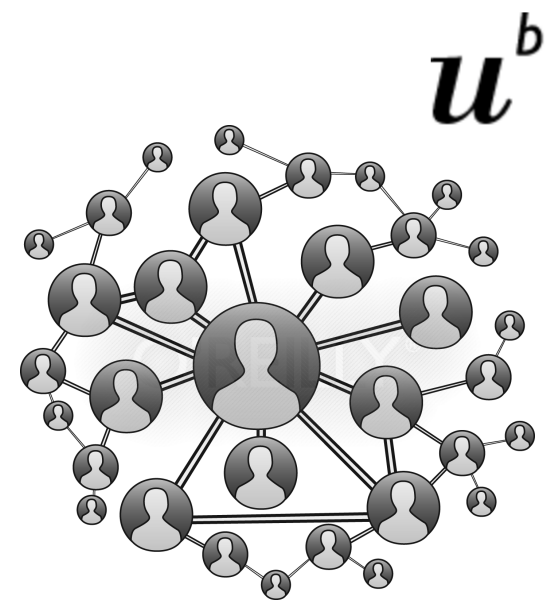


## Offline Social Network



*Why do social groups arise?*

# Social Networks Fundamentals
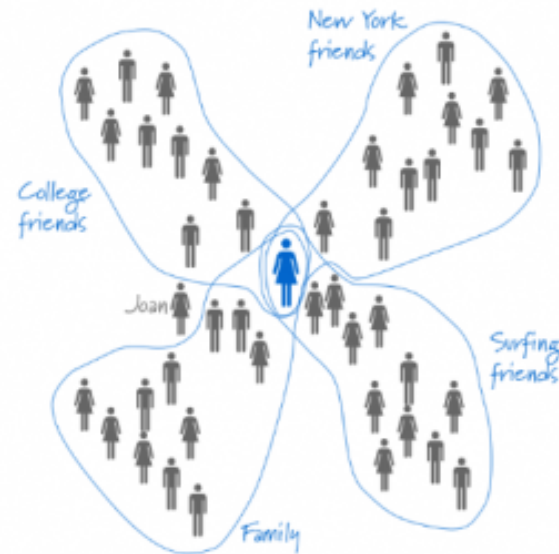
## Social Network

- A structure of social interactions and personal relationships.

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## Online Social Network



## Offline Social Network



*Why do social groups arise? Common identity VS Common bond theory.*

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# People Aggregation Classification

**Mobility and tracking**          **Online/Offline Social Network**

**Meeting Analysis**

What do we mean by "meeting"? → Offline (physical) social aggregation of people, ranging from get-togethers to big events.

# People Aggregation Classification

## Mobility and tracking
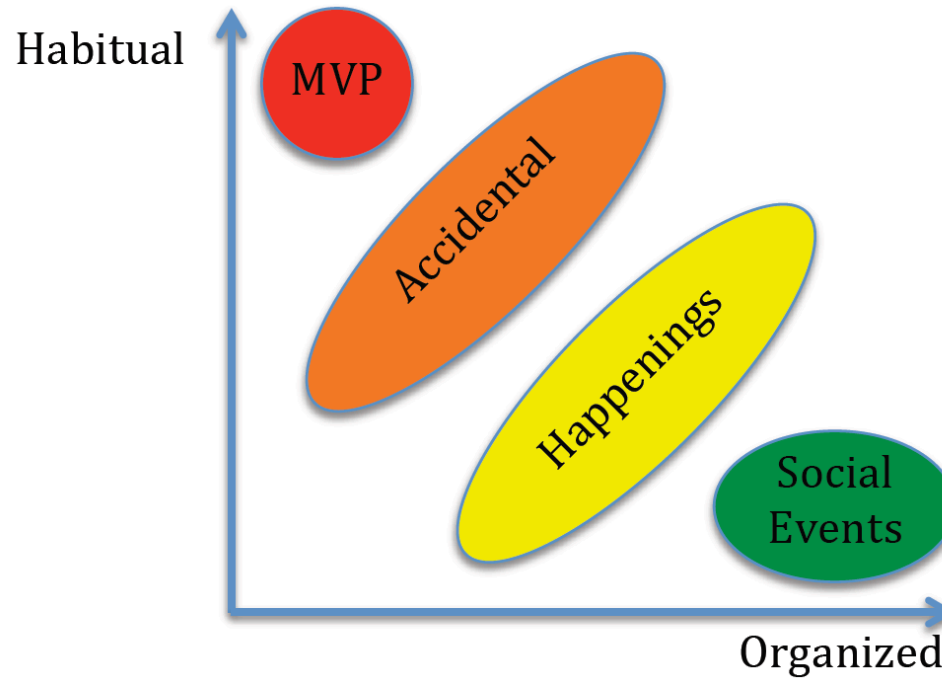
## Online/Offline Social Network

## Meeting Analysis

What do we mean by "meeting"? → Offline (physical) social aggregation of people, ranging from get-togethers to big events.

We can distinguish four classes of aggregation:

- *"Social Events"* (e.g. concerts, sport matches, festivals, etc.)
- *"Most Visited Place (MVP) Meetings"* (e.g. @home, @work, etc.)
- *"Happening Events"* (spontaneous user aggregation: e.g. people in a square, in a park, etc.)
- *"Accidental Meetings"* (involuntary user aggregation: e.g. people waiting for a bus, people moving for personal interests, etc.)
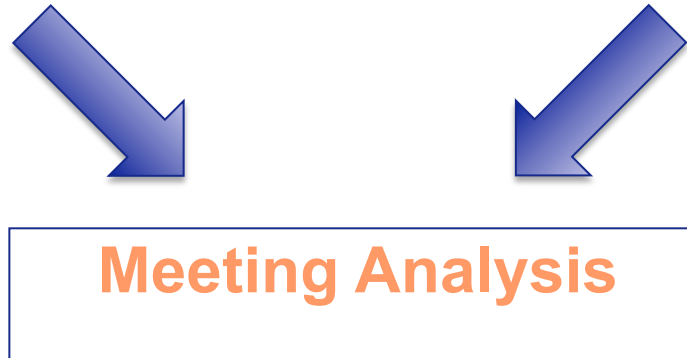
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# People Aggregation Classification

**Mobility and tracking**              **Online/Offline Social Network**

**Meeting Analysis**

We can distinguish four classes of aggregation:

- *"Social Events*
- *"MVP Meetings"*
- *"Happening Events"*          ***how?***          Tracking + Social Networks + Features
- *"Accidental Meetings"*

Features can be: duration, frequency, relevance, popularity, etc.

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# Social and mobility analysis

- **Offline VS Online social network:**
    - Global patterns (degree distributions, path lengths, etc.)
    - Segregation patterns (node types and homophily)
    - Local patterns (clustering, transitivity, etc.)
    - Position in the network (neighborhoods, centrality, influence)
    - Study of matching, differences, correlation, etc.
    - People aggregation VS Community.

- **Users classification, based on:**
    - Social engagement: degree of participation\involvement in a community (both online/offline).
    - Interests: points of interests, events and happenings attended.
    - Mobility entropy, as a measure of person predictability.
    - Online/Offline social group size.
    - Social contagious VS Social influence.

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# Social and mobility analysis

- **Homophily study, in terms of:**
  - Interests: point of interests, events and happenings attended.
  - Mobility patterns.
  - Social contagious.
  - Social influence.

- **Correlation evaluation:**
  - User position in the network VS Homophily.
  - User position in the network VS Friends attendance to an event/happening.
  - User attendance VS Event/happening popularity (social contagion).
  - Homophily VS Events/happening attendance.

- **Meetings prediction based on social (and mobility) analysis:**
  *"Social aspects play a major role in determining the likelihood of a user to participate in an event."*
  - MVP
  - Events
  - Happenings

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  - Events
  - Happenings      Network formation: common bonds or common identity?

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# Waiting for VIVO, available Datasets

- **Mobile Data Challenge (MDC) Dataset**
  - Physical and Social Context data of 100 users

- **Event-Based Social Network Datasets**
  - Meetup Dataset (4M users)
  - Plancast Dataset (93K users)

- **Social Blue Conn** (35 users)
  - Bluetooth proximity
  - Facebook friendships
  - Users self-declared interests

- **Location-Based Social Network Datasets**
  - Gowalla
  - Foursquare

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# Thank you for your attention!