

# *Program of courses during the visit*

## *Understanding and extracting human mobility properties*

### **Description of course**

The analysis of geographic information, such as those describing human movements, is crucial due to its impact on several aspects of our society, such as disease spreading, urban planning, well-being, pollution, and more. This course will teach the fundamental concepts and techniques underlying the analysis of geographic and mobility data, presenting data sources (e.g., mobile phone records, GPS traces, geotagged social media posts), data preprocessing techniques, statistical laws, and predicting and generative algorithms.

### **Syllabus**

#### Introductory lesson

- Introduction to the course

#### Spatial and Mobility Data

- Trajectory and Flows
- Spatial Tessellations
- Digital spatial and mobility data
  - Mobile Phone Data
  - GPS data
  - Social media data
  - Census data
  - Other data (POIs, Road Networks, etc.)
- Preprocessing mobility data
  - filtering
  - compression
  - stop detection
  - trajectory segmentation
  - trajectory similarity and clustering

#### Patterns and Laws

- individual mobility laws
- predictability of individual mobility
- collective mobility laws

#### Predictive and Generative Models

- Prediction

- Next-location prediction
  - Crowd flow prediction
- Generation
  - Trajectory generation
  - Flow generation

## Applications

- demography and well-being
- estimation of pollution emissions