ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

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A Bayesian Estimation of Pedestrian Activities using Sensors Data

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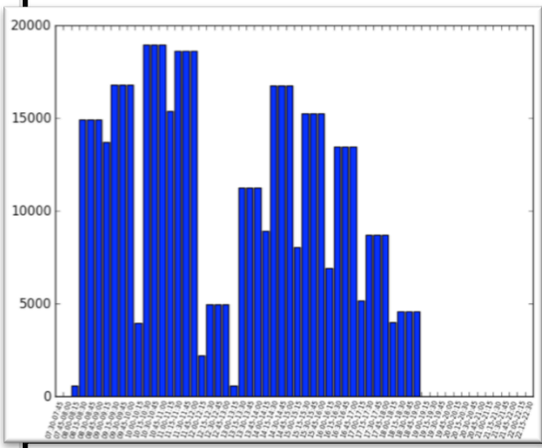
Motivation

- Pedestrian modeling is a tool for designing and optimizing infrastructures.
- In particular, walking in transportation hubs such as railway stations and airports is the key for an efficient multimodal transport systems.
- Data collections are needed in estimating the demand for these infrastructures.

Data input

Capacity

Schedules are common in pedestrian facilities (trains, concerts, classes, opening hours).



Cumulative number of students having classes per quarter of an hour on EPFL campus.

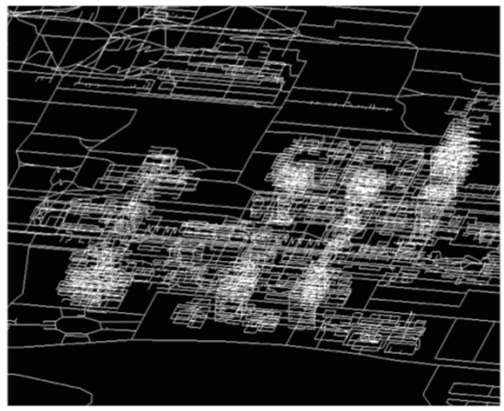
WiFi data

Triangulation from access points proposes full coverage and is cheap, but offers low precision.

Density of WiFi access point on campus. We used a tool by Cisco for localization.

Pedestrian map

A pedestrian graph allows for computing shortest path and defining pedestrian destinations.



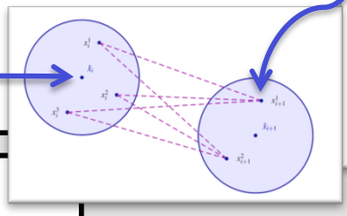
3D pedestrian graph of EPFL campus. In the foreground, GC, GR and CM buildings. In the background, the RLC.

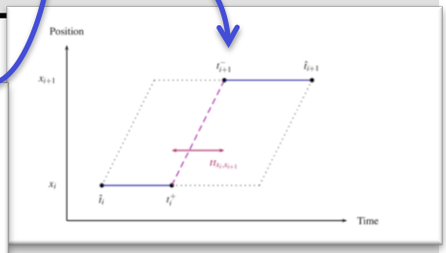
Prior ***Measurement equation*** ***Possible destinations*** ***Activity time***

Activity probability

$$P(\text{dest.}|\text{signals}) = \frac{P(\text{dest.}) \cdot P(\text{signals}|\text{dest.})}{\sum P(\text{dest.}) \cdot P(\text{signals}|\text{dest.})}$$

Candidate generation





Results

Time	Destinations	Type	Walking dist. to truth (m)
8:33-10:38	CE1105	Classroom	0
10:40-11:51	GCB3444	Office	7
11:54-12:50	Ornithorynque	Restaurant	0
12:54-13:23	GCB3444	Office	7
13:26-13:58	Satellite	Bar	0
14:00-19:45	GCB3444	Office	7
19:47-19:52	Atelier GM	GM vs metro	366

366 ← Metro station was not properly covered by WiFi

Conclusion

- Prior is necessary.
- These data can further be used in destination choice models in order to understand pedestrian behavior and forecast demand for future scenarios.
- Possible applications: railway stations, airports, music festivals.