# Data science methods toward understanding human mobility at multiple time-scales

This internship is funded by Hi! PARIS – Paris Artificial Intelligence for Society & Business.

**CONTEXT**:

Why do people move? It is well-known and intuitive that "moving" is not an activity that has an interest per-se. People move in order to access *opportunities*.[Be19] Opportunities can be of different types: jobs, schools, grocery stores, hospitals, restaurants, etc. The ease of reaching opportunities starting from a certain location has been quantified via *accessibility* measures.[Bi19] For instance, accessibility can be computed as the amount of opportunities that can be reached via a certain mode of transport (e.g., car, public transport, bike) in a certain amount of time.[Mi19] Accessibility jointly depends on transport services and choices related to urbanism, i.e., deciding where opportunities are located in the urban area. In this sense, accessibility is tightly coupled with concepts as the 15-minute city, gaining momentum nowadays.[Mo21]

Accessibility measures are mainly based on static information on **long time-scales**, like public transport schedules and the geographical distribution of opportunities. On the other hand, human mobility is not only dictated by accessibility and opportunities, but also by other human factors, more difficult to predict.[Te19] For these latter, it is required to analyze data at finer **time-granularity**, e.g., datasets with trajectories collected from mobile phones or apps. The scientific communities focused on the study of these two time scales have remained separated up to now. However, to have a full understanding and predictability of human mobility, we need both approaches to converge.

**MISSION**

We will study human mobility under the two aforementioned time-scales. We will then attempt to answer questions that require jointly studying both time-scales, crossing open-datasets and mobility traces.

*1. How does accessibility change mobility habits?*

We will quantify the impact of accessibility in actual people movement. We expect an increase of accessibility also implies richer interaction with the surrounding space. We aim to quantify this aspect.

*2. Can we improve mobility prediction via accessibility?*

In current studies on trajectory prediction, accessibility is ignored, mainly because the two related communities do not talk to each other. We believe instead that accessibility could be the main predictor and we will verify our assumption experimentally.

**REQUIRED SKILLS**

The internship is open to MSc 2 students in Engineering, Transportation or Computer Science and related fields. Good programming skills in python and capability to work with remote Linux servers will be needed. If the student has not yet acquired such skills, he/she will need to acquire them in the first 3 weeks of internship.

**ADMINISTRATIVE INFORMATION**

**Scholarship**: 570€/month (+other scholarships, e.g. Erasmus, if available)

**Where**: Institut Polytechnique de Paris (IPP) and Institut national de recherche en informatique et en automatique (INRIA).

**When**: 2023

**Supervisors**: Assoc. Prof. Andrea Araldo (IPP) - andrea.araldo@telecom-sudparis.eu
         Dr. Aline Carneiro Viana (INRIA) - aline.viana@inria.fr

Interested candidates should send a CV and the list of all courses attended at the BSc and MSc level with the marks.

**REFERENCES**

[Be19] AA.VV. Designing Accessibility Instruments. Ed. by C. Silva, L. Bertolini, and N. Pinto. 2019.

[Bi19] Biazzo, I., Monechi, B., & Loreto, V. (2019). General scores for accessibility and inequality measures in urban areas. Royal Society Open Science, 6(8).

[Mi19] Miller, E. (2019). Measuring Accessibility : Methods and Issues. International Transport Forum Roundtable on Accessibility and Transport Appraisal.

[Te19] Teixeira, D. D. C., **Viana, A. C.**, Alvim, M. S., & Almeida, J. M. (2019, November). Deciphering predictability limits in human mobility. In Proceedings of the 27th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (pp. 52-61).