A propos du centre ou de la direction fonctionnelle

Located at the heart of the main national research and higher education cluster, member of the Université Paris Saclay, a major actor in the French Investments for the Future Programme (Idex, LabEx, IRT, Equipex) and partner of the main establishments present on the plateau, the centre is particularly active in three major areas: data and knowledge, safety, security and reliability; modelling, simulation and optimisation (with priority given to energy).

The 450 researchers and engineers from Inria and its partners who work in the research centre's 28 teams, the 60 research support staff members, the high-level equipment at its disposal (image walls, high-performance computing clusters, sensor networks), and the privileged relationships with prestigious industrial partners, all make Inria Saclay Ile-de-France a key research centre in the local landscape and one that is oriented towards Europe and the world.

Contexte et atouts du poste

Understanding individual mobility patterns is of fundamental importance for many fields such as epidemic prevention, city planning, traffic engineering, or economic forecasting [1]. In recent years, the availability of mobile-phone records along with the increasing usage of Global Positioning System (GPS) equipped devices, provide us with grounding tools to capture and analyse human movements [1], [2] and [3].

Mobility research focuses on modeling the mechanisms ruling the movements of individuals as well as forecasting their future visits. The seminal work by Song revealed the high potential predictability of human trajectories reaching scores up to 93% [2]. Yet, existing models systematically fail in reproducing individuals’ movements and substantially deviate from empirical results [4]. Moreover, regardless of the applied methods (e.g., Markov chains, Naive Bayes, neural networks), the type of prediction (i.e., next-cell or next place) or the used data sets (e.g., GPS, DCR, surveys), current predictors show limited bounded predictive performance [2][3]. The reasons are manifold: (i) the lack of ground truth data, (ii) the inherent complexity of human movements, and (iii) the poor understanding of individuals’ tendency to visit new unknown locations.

While the first two elements are hard to tackle, understanding individuals’ tendencies to discover new places is an accessible domain of study. More importantly, it is a critical aspect of human mobility behavior that should be carefully addressed to design generic models and develop accurate predictors [1][4].

Mission confiée

Research goal: This internship will focus on individuals’ attractivity to explore new areas. The goal will be to integrate the exploration modeling methodology of an on-going PhD thesis as input to a practical predictor (to be defined), which will result in an exploration-enhanced predictor: For this mobility trajectories to be predicted have to be assigned to a level of trust (LoT) parameter indicating per time unit, the level of accuracy we can expect from a predictor in terms of “the next location where an individual will probably be”. This LoT will then be used to influence the prediction output, and consequently, its accuracy. The internship will involve data analytics, mobility data manipulation, programming, mobility modeling, and practical prediction. This internship will be the first to integrate the heterogeneity of individuals’ propensity to explore in a predictor.

Principales activités

Scope of the internship: During the internship, the student will get acquainted with the statistical laws governing individuals’ mobility and existing mobility models and predictors. Three significant steps involved in this internship are:

1. The biography studying the individuals’ tendency to visit new areas and develop an advanced approach to detect moments of exploration;
2. The ‘level of trust’ assignment to each spatiotemporal point of a trajectory;
3. The design of an exploration-enhanced predictor that considers individuals’ susceptibilities to discover new places;
4. The open-source development of such predictor and its evaluation using real-world mobility traces.

References:


Compétences
The applicants must be involved in a master's degree or in a PhD degree (preferable) in one of the following or closely related disciplines: computer science, electrical engineering, or applied mathematics.

Eligible applicants must have demonstrable experience with computer programming, machine learning, and data analytics.

Good communication and documentation skills in English

**Avantages**

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities