2018-00287 - Big Data Analysis and Modeling of Road Traffic

Niveau de diplôme exigé : Bac + 4 ou équivalent
Fonction : Stagiaire de la recherche

A propos du centre ou de la direction fonctionnelle

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center’s staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)".

Contexte et atouts du poste

There exists nowadays a variety of road traffic data sources (magnetic loop detectors, video cameras, floating car data, bluetooth, etc), which can be used for traffic management either for calibration of traditional models [1], or to directly infer traffic forecasts by statistical techniques [2], or even by combining modeling and data analysis techniques. In particular, the heterogeneity of traffic conditions in congested regimes makes it hard to obtain a good matching between simulations and reality, thus preventing from obtaining reliable traffic state predictions beyond short time horizons (30 min). Indeed, traffic models are usually set on a unique choice of the fundamental diagram (flux-density relation), independently of the time of the day and the day of the week. Yet, model parameters may be time dependent, as some traffic conditions and driver behavior may be correlated to specific time ranges. Besides, data analysis techniques may help in opening new perspectives in the interpretation of data and the modeling of road traffic [3].

ACUMES Project-Team has an established experience in (macroscopic) traffic models, and disposes of a large set of data coming from 135 loop detectors placed on the freeways in the North of Marseille (A7, A51, A50 and A55). The data-set was provided by the Direction Interdépartementale des Routes Méditerranée (DIRMED) and covers 3 months, from September 1st to November 30th, 2015.

On the other side, ZENITH Project-Team masters the analysis of large amount of data, by means of parallel and distributed approaches [4, 5]. Here, analysis covers different goals such as feature correlation detection, clustering or time series similarity queries [6].

Mission confiée

Within the framework of a partnership (you can choose between)

- collaboration between 2 Inria teams: Acumes and Zenith

We aim to study the trac data-set mentioned above by time series similarity techniques to extract new knowledge in synergy with modeling and simulation to improve trac forecast and control.

Principales activités

The study will be based on the following steps:

1. Data preparation. Before analysis, data need to be sorted by sensor and direction, and aggregated over time periods (usually 1 or 6 minutes) to obtain averaged quantities measuring density, mean velocity and flow.

2. Data analytics. Analysis will rely on time series data mining using the Matrix Profile. The goal is to extract correlations between time series.

3. Match with macroscopic models. The information derived by the previous analysis will be gathered and possible impact on modeling techniques will be investigated. If possible, the combination of the two aspects (modeling and data analysis) will be tested on simple configurations.

Compétences

Technical skills and level required: background in statistical methods, knowledge of R, Python, Matlab.

Languages: French, English

Avantages sociaux

- Subsidised catering service
- Partially-reimbursed public transport
- Flexible working hours
- Sports facilities

Informations générales

- Thème/Domaine: Approches stochastiques
  Statistiques (Big data) (BAP E)
- Ville: Sophia Antipolis
- Centre Inria: CRI Sophia Antipolis - Méditerranée
- Date de prise de fonction souhaitée: 01/03/2018
- Durée de contrat: 6 mois
- Date limite pour postuler: 20/02/2018

Contacts

- Equipe Inria: ACUMES
- Recruteur:
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L'essentiel pour réussir

- Last year of MSc (Master 2) in Mathematics, Engineering or Computer Sciences.
Conditions pour postuler

Sécurité défense :
Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

Politique de recrutement :
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d’autres canaux n’est pas garanti.