



09 MARS

🕒 14h00 à 16h00

📍 Campus Saint-Germain-des-Prés, U.
Paris Cité

THÈSES ET HDR

Paul RIVERAIN : Integrating prior knowledge into unsupervised learning algorithms for urban transportation

Direction : Mohamed NADIF

Soutenance le 09/03/22

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CALENDRIER

Title

Integrating prior knowledge into unsupervised learning algorithms for urban transportation

Abstract

In a transportation network, supervision plays a key role to ensure smooth operations and satisfied voyagers. In this thesis, we address the conception of new data-driven algorithmic tools to help urban railway operators in the task of supervision of the transportation network. As many decisions of the operators depend on how the trips of the users are distributed on the network, we seek to provide synthetic information about the current passenger flow and its evolution.

Given the entries and exits of the users on the network, the passenger flow can be seen as a discrete-time dynamic graph whose nodes are the stations of the network and whose edges count the number of trips between any two pairs of stations. We focus on summarizing this dynamic graph using model based clustering techniques including the Stochastic Block Model and the Latent Block Model while also taking into account contextual information such as the actions of the operators on the train regulation.

We first present an extension of the Stochastic Block Model for discrete-time dynamic networks that takes into account the variability in node degrees, allowing us to model a broad class of networks. We then propose to leverage prior knowledge in the form of pairwise semi-supervision using Hidden Markov Random Fields in both row and column space to improve the clustering performances of the algorithms derived from the Latent Block Model.

