Contribution ID: **86** Type: **not specified**

Statistical Analysis of Traffic Flow Profiles through Functional Graphical Models

Wednesday, 18 September 2024 14:20 (20 minutes)

Traffic flow estimation plays a key role in the strategic and operational planning of transport networks. Although the amplitude and peak times of the daily traffic flow profiles change from location to location, some consistent patterns emerge within urban networks. In fact, the traffic volumes of different road segments are correlated with each other from spatial and temporal perspectives. The spatial and temporal correlation estimate on road networks represents an important issue for many applications such as traffic inference, missing data imputation, and traffic management and control. In particular, exploring the pairwise correlation between sensors paves the path for inferring data on broken sensors based on data observed on other mostly correlated still-working sensors.
In this setting, we propose a clustering-based functional graphical model (CBFGM) method to explore the spatial (i.e., link-to-link) conditional dependence structure of daily traffic flow profiles. After a smoothing phase, observations are clustered by applying a functional clustering method. Then, for each cluster, a functional graphical model is fitted through a specified estimation method. Based on functional data analysis techniques, the method can efficiently treat the high dimensionality of the problem, avoiding the well-known issue of compressing the information into pattern-specific and arbitrarily chosen features. The CBFGM is applied to a dataset collected using the traffic flow monitoring system installed in the city of Turin with the main aim of building a graphical network of daily traffic flow profiles measured at different sensor locations.

Acknowledgements The present work was developed within the project funded by "Programma per il finanziamento della ricerca di Ateneo –Linea B" of the University of Naples Federico II (ref. ALTRI_CdA_75_2021_FRA_LINEA_B).

Type of presentation

Talk

Classification

Both methodology and application

Keywords

functional graphical models; functional data analysis; daily traffic flow profiles.

Primary authors: LEPORE, Antonio (Università degli Studi di Napoli Federico II); Prof. PALUMBO, Biagio (Università degli Studi di Napoli Federico II); CAPEZZA, Christian (Università degli Studi di Napoli Federico II); FORCINA, Davide (Università degli Studi di Napoli Federico II); SIMONELLI, Fulvio (Università degli Studi di Napoli Federico II); PARIOTA, Luigi (Università degli Studi di Napoli Federico II); Prof. LONGOBARDI, Maria (Università degli Studi di Napoli Federico II)

Presenter: FORCINA, Davide (Università degli Studi di Napoli Federico II)

Session Classification: Functional data

Track Classification: Process modelling and Control