

Research theme title:

“Data analysis and planning for smart mobility schemes”

Description:

Smart mobility is the main topic of this research theme which is specifically devoted to the definition of modelling and planning schemes based on data acquisition and processing. The considered context is related to transportation networks which can be devoted to passengers' movements and/or freight transportation operations.

Data from the field are supposed to be available and the first step of this research will be dedicated to the definition of data-based modelling approaches to be used as predictive modules. Then, the methods, techniques, and procedures necessary to obtain a suitable predictive capability from the available datasets will be the objective of the first phase of this research theme. The developed modelling framework will also be compared with existing traditional approaches in which the physics of the process is, instead, used to define the representation of its dynamic behaviour. The comparison is aimed at evaluating the effectiveness of the proposed modelling approach and, also at possibly designing hybrid models in which the data-based part is integrated with a physics-based one.

Once the modelling framework will be available, it will constitute the predictive basis on which planning and control approaches will be devised. The structure of the planning and control schemes to be designed will also depend on the features of the modelling framework, it can already be assumed that these schemes will have a structure similar to Model Predictive Control schemes, but in which the modelling component will be used for prediction.

References:

H.Yu, S.Park, A.M.Bayen, M.Krstic, “Reinforcement learning versus PDE backstepping and PI control for congested freeway traffic”, IEEE Transactions on Control Systems Technology, 30:4, 2021.

Y.Yuan, Z.Zhang, X.T.Yang, S.Zhe, “ Macroscopic traffic flow modeling with physics regularized Gaussian process: A new insight into machine learning applications in transportation”, Transportation Research Part B, 146, , 2021.

C. Caballini, M. D. Gracia, J. Mar-Ortiz, S. Sacone, "A combined Data Mining - Optimization Approach to Manage Trucks Operations in Container Terminals with the use of a TAS. Application to an Italian and a Mexican port", Transportation Research E, 142, 2020

Type of scholarship:

DM 117/2023 – Project on PNRR (Italy's Recovery and Resilience Plan)

Hosting University/Research Centre

University of Genova, Italy

Department:

Department of Informatics, Bioengineering, Robotics and Systems Engineering
Via Opera Pia 13, 16145 Genova, Italy
www.dibris.unige.it

Tutors:

Prof. Simona Sacone - simona.sacone@unige.it

Study and research period outside the Hosting Institution:

Study and research period at the company:

Aitek S.p.A. (www.aitek.it)