Joint Seminar with HKSTS and ORSHK

Department of Systems Engineering
香港城市大學
City University of Hong Kong

Train scheduling optimization with consideration of passenger flows during disturbed operations

Optimization models for railway traffic management tackle the problem of determining, in real-time, control actions to reduce the effect of disturbances. Two main research streams can be identified. On the one hand, train scheduling models are designed to include all conditions relevant to achieve feasible and efficient operation of rail services, keeping as much as possible train punctuality. On the other hand, delay management models focus on the impact of rescheduling decisions on the quality of service perceived by passengers. The resulting objectives are conflicting whenever train delay reduction requires cancellation of some connected services, causing extra waiting times to transferring passengers. The infrastructure manager and the train operating companies need to discuss on which connections to keep or drop.

This talk investigates hybrid railway traffic optimization approaches, merging these two streams of research. First, we consider the bi-objective problem of minimizing train delays and missed connections to provide a set of feasible non-dominated schedules, supporting the decisional process. We use a detailed alternative graph model to ensure schedule feasibility and develop heuristic algorithms to compute the Pareto front of non-dominated schedules. Second, we introduce a comprehensive mathematical model, incorporating the traffic regulations and the passenger rerouting options at a microscopic level. Third, we study this problem as a game theoretical approach, focusing on the solutions corresponding to Nash equilibria of a game involving passengers and infrastructure managers. Computational results based on a conventional Dutch railway network quantify the trade-off between the minimization of train delays and passenger travel times.

Andrea D'Ariano received the B.S. and M.S. degrees in Computer Science, Automation and Management Engineering at Roma Tre University. In November 2003, he joined TRAIL Research School and Department of Transport and Planning, Faculty of Civil Engineering and Geosciences, Delft University of Technology. In April 2008, he successfully concluded his Ph.D. studies under the supervision of Prof. Ingo A. Hansen. In 2018 and 2022, he got the Full Professor Italian Scientific Habilitation in Operations Research and Transportation Science. He served as Expert and Rapporteur for European Commission and numerous national research foundations. Currently, he is working as Full Professor at Department of Civil, Computer Science and Aeronautical Technologies Engineering, Roma Tre University. He is the coordinator of the AIRO (Italian Association of Operations Research) Chapter on "Optimization in Public Transport and Shared Mobility". He is Associate Editor of well-known international journals (e.g., Transportation Research Part B, C, E) and conferences (e.g., IEEE Int. Conf. on Intelligent Transportation Systems). His main research interest is the development of novel scheduling and routing methods with application to public transportation and logistics. In SCOPUS (24/9/24), he has 153 documents, 5119 citations, 41 h-index. Andrea D'Ariano is listed in the 2024 career ranking of Top 2% of the world's best scientists.

Prof. Andrea D'Ariano

Roma Tre University, Italy

5 Sep, 2025 (Fri)

4:00 pm - 5:00 pm

YEUNG - P7303

Yeung Kin Man Academic Building
City University of Hong Kong

All are welcome