Research School for
Operations Management
and Logistics

Beyond Uber: From On-Demand Bus Routing to Integrated Mobility

Lissa Melis
Maastricht University

What if booking a bus ride were as easy as ordering an Uber? The On-Demand Bus Routing Problem (ODBRP) explores this idea by dynamically assigning passengers to a fleet of shared minibuses that operate without fixed routes or timetables. Special to the ODBRP, is the inclusion of bus stop assignment, which balances user convenience with system efficiency.

Over the past years, several variants of the ODBRP have been developed to address real-world complexities. In this talk, I will touch on these variants and present heuristic algorithms capable of planning thousands of passengers across hundreds of vehicles within seconds. I will discuss how integrating bus stop assignment into the routing model can substantially reduce travel times and improve service reliability compared to systems where passengers select their own stops.

Building on these results, my current research investigates the integrated design of on-demand buses with fixed-route public transport networks. This combined design aims to enhance network coverage, reduce operational costs, and offer a flexible yet efficient alternative to both individual ride-hailing services and rigid fixed-route bus services. The presentation will conclude with open research questions on solution algorithms and strategic design of these systems.

Dr. Lissa Melis is an Assistant Professor of Operations Research at the School of Business and Economics of Maastricht University. Her research focuses on the development and analysis of heuristic algorithms for urban transport and logistics, with a strong emphasis on real-world applications. More recently, she has been investigating Explainable Artificial Intelligence (XAI) and its potential synergy with Operations Research techniques, while collaborating with industry partners such as MUMC+ to address practical optimization challenges.