TRAIL

Research School for Transport, Infrastructure and Logistics

TU Delft

TRAIL webinar

Planning and Operations of Mobility On-Demand

22 October 2020

13.30 h – 15.00 h

ZOOM

On 22 October 2020, TRAIL PhD researcher **Jishnu Narayan** will defend his PhD thesis entitled "***Design and Analysis of On-Demand Mobility Systems***" at Delft University of Technology. The defence is public, and you are cordially invited to join.

On the occasion of this public defence, TRAIL and TU Delft have set up a seminar on "Planning and Operations of Mobility On-Demand". The emergence of a plethora of on-demand services – ranging from platform-based ride-pooling (e.g. UberPool) to flexible public transport fleets – is currently disrupting the urban mobility landscape. Their unique characteristics require the development of new methods, tools and empirical knowledge on their dynamics and demand characteristics in order to support their planning and operations. What is the contribution of ride-pooling to congestion? What is the demand for shared mobility? How to design mobility on demand systems at scale? Some answers to these questions will be presented in this seminar by experts in the field of traffic flow theory, AI for transportation and transport system modelling. They will present recent developments pertaining to the incorporation of these modes into network-wide traffic assessment, the estimation of latent demand and their integration into transport simulation and optimization models.

Programme seminar
Chairman: Oded Cats

13.30 - 14.00 **Prof. Ludovic Leclercq**, *Univ. Gustave Eiffel*
Assessing the effect of ride-sharing services on congestion using trip-based MFD models

14.00 - 14.30 **Prof. Francisco Camara Pereira**, Technical University of Denmark (DTU)
Estimating latent demand for shared mobility using censored machine learning models

14:30 – 15:00 **Prof. Michael Hyland**, *University of California-Irvine*
Integrating Mobility-on-demand Fleet Models into Transportation System Simulation Models: A balancing act between computational efficiency and fleet performance

Registration
Participation is free, registration is required: click here.
You will receive a ZOOM invitation on 21 October at the latest.

The online public defence of Jishnu Narayan will take place at 10:00 h

13:30-14:00

Prof. Ludovic Leclercq, Univ. Gustave Eiffel

Assessing the effect of ride-sharing services on congestion using trip-based MFD models

This presentation will show how a simple aggregate modelling framework for urban mobility (the trip-based MFD model) can be used to assess the overall network performance when some trips are assigned to a ride-sharing service. The baseline scenario considers all individual trips at the city scale defined by their origin, destination and desired departure time. Depending on the market share and the willingness to share from individuals, the model predicts the congestion level over time. When considering the idealistic case where all requests are known 20-min in advance, making possible to fully optimize the fleet allocation, we will show that network performance can only be improved if the spatial scale of operation is large enough. Otherwise, extra distance travels by idle vehicles are not compensated by the travel distances save through sharing. The test cases correspond to the city of Lyon in France.

Ludovic Leclercq is a Research Director (eq. Full Professor) at Univ. Gustave Eiffel. He received his engineering and master's degrees in Civil Engineering in 1998, his Ph.D. in 2002, and his habilitation thesis (HDR) in 2009. He is currently deputy director of the LICIT laboratory and head of a research group about traffic modeling and analysis. He served as a scientific counselor for IFSTTAR in the field of “Analysis and innovation for sustainable and responsible transport and mobility” between 2009 and 2015. His research interests correspond to multiscale and multimodal dynamic traffic modeling and the related environmental externalities. Smart cities, mobility as a service, sustainable and reliable transportation systems are some of the applications his researches are targeting. He is a member of the editorial board of Transportation Research part B, CACAIE, and the Journal of Intelligent and Connected Vehicles, the committee "Traffic Flow Theory and Characteristics” of the TRB, the international advisory committee of ISTTT and is co-editor in chief for Transportation Control and Modelling section of the Frontiers in Future Transportation Journal and associate editor of Transportmetrica B and the Journal of Advanced Transportation. He has co-authored 85 publications in top peer-reviewed journals, has supervised 13 Ph.D., and is currently supervising 3 Ph.D. students. In 2015, he was awarded the most prestigious research grant in Europe, i.e. an ERC consolidator grant in Social Science and Humanities. In 2019, he is the recipient of the "Grand Prix de l'Université de Lyon", a career award for his research in Transportation engineering.

14:00-14:30

Prof. Francisco Camara Pereira, Technical University of Denmark (DTU)

Estimating latent demand for shared mobility using censored machine learning models

In any Transport systems book, demand and supply interactions are key to understanding and predicting for the optimization of mobility services. This is particularly important in shared-mobility, as vehicle placement (the supply) can diverge from where it's needed (the demand). As observed demand cannot be higher than available supply, historical transport data typically represents a biased, or censored, version of the true underlying demand pattern. Without explicitly accounting for this inherent distinction, predictive models of demand would necessarily represent a biased version of true demand, thus less effectively predicting the needs of service users. In this talk, I will present some recent work on using Machine Learning methods to address this problem. Experiments on artificial and real-world datasets show how taking into account the limiting effect of supply on demand is essential in the process of obtaining an unbiased predictive model of user demand behavior.

Francisco Camara Pereira is Professor at the Technical University of Denmark (DTU), where he leads the Machine Learning for Smart Mobility group (MLSM). His research is about the methodological combination of Machine Learning and Transport Research, and some applications include demand modeling, traffic prediction, data collection, or anomaly detection. He was twice Marie Curie fellow, and has published over 50 articles in both Machine Learning and Transport Research fields. Before joining DTU, he was Senior Research Scientist with SMART/MIT (2011-2015) and assistant professor in university of Coimbra (2005-2015).

14:30-15:00

Prof. Michael Hyland, University of California-Irvine

Integrating Mobility-on-demand Fleet Models into Transportation System Simulation Models: A balancing act between computational efficiency and fleet performance

Motivated by the presence and significant growth of mobility-on-demand (MOD) services provided by Transportation Network Companies in cities, over the past 6-7 years researchers have made significant advancements modeling MOD vehicle fleets. One stream of research has focused on optimizing fleet performance via developing smart (model-based) control policies and solution algorithms. A second stream of research has focused on integrating reasonable MOD vehicle fleet models into transportation system simulation models to analyze their potential transportation system impacts (e.g. congestion, mode choice, destination choice, accessibility, emissions, etc.). The scalability of the former set of MOD fleet models and control policies to very large vehicle fleets is questionable at best; whereas, the fleet performance of the latter set of MOD vehicle fleet models is typically poor. Hence, the goal of this research is to develop MOD fleet models and control policies that are computationally efficient yet reasonably resemble a MOD fleet operator focused on optimizing operational performance. To meet this goal, this study presents several modeling strategies that significantly reduce the computational complexity of the vehicle-traveler assignment problem, while not degrading the MOD fleet performance. The modeling strategies take advantage of the known spatial distribution of travelers and available vehicles at each time step. Computational results in medium (e.g. Bloomington, IN, USA) and large (e.g. Chicago, IL, USA) size cities/networks illustrate the very large computational benefits and the significant fleet performance benefits of the proposed strategies. The presentation will discuss the modeling and planning implications of this study.

Michael Hyland is an Assistant Professor of Civil and Environmental Engineering at the University of California-Irvine, where he is affiliated with the Institute of Transportation Studies. Michael works to improve the modeling, analysis, planning, and control of urban transportation systems to help create smarter (i.e. more efficient, sustainable, and affordable) cities through research and teaching. His research interests include emerging transportation systems such as bikesharing, ridesharing, and shared-use automated vehicle mobility services, as well as the integration of these emerging services with existing transportation modes. Before joining the faculty at UC Irvine, Michael earned his PhD in Civil and Environmental Engineering from Northwestern University and his B.S. and Master's degrees in Civil and Environmental Engineering from Cornell University. He is a two-time recipient of the Dwight David Eisenhower Transportation Fellowship and was named one of the Top 20 Future Leaders in Transportation by the Eno Center for Transportation in 2016. He has received best student paper awards from the Illinois Institute of Transportation Engineers and the Transportation Research Forum.