جامعة نيويورك أبوظبي

NYU ABU DHABI

6th NYUAD TRANSPORTATION SYMPOSIUM

CONVENED BY

SAMER MADANAT, Dean of Engineering NYUAD

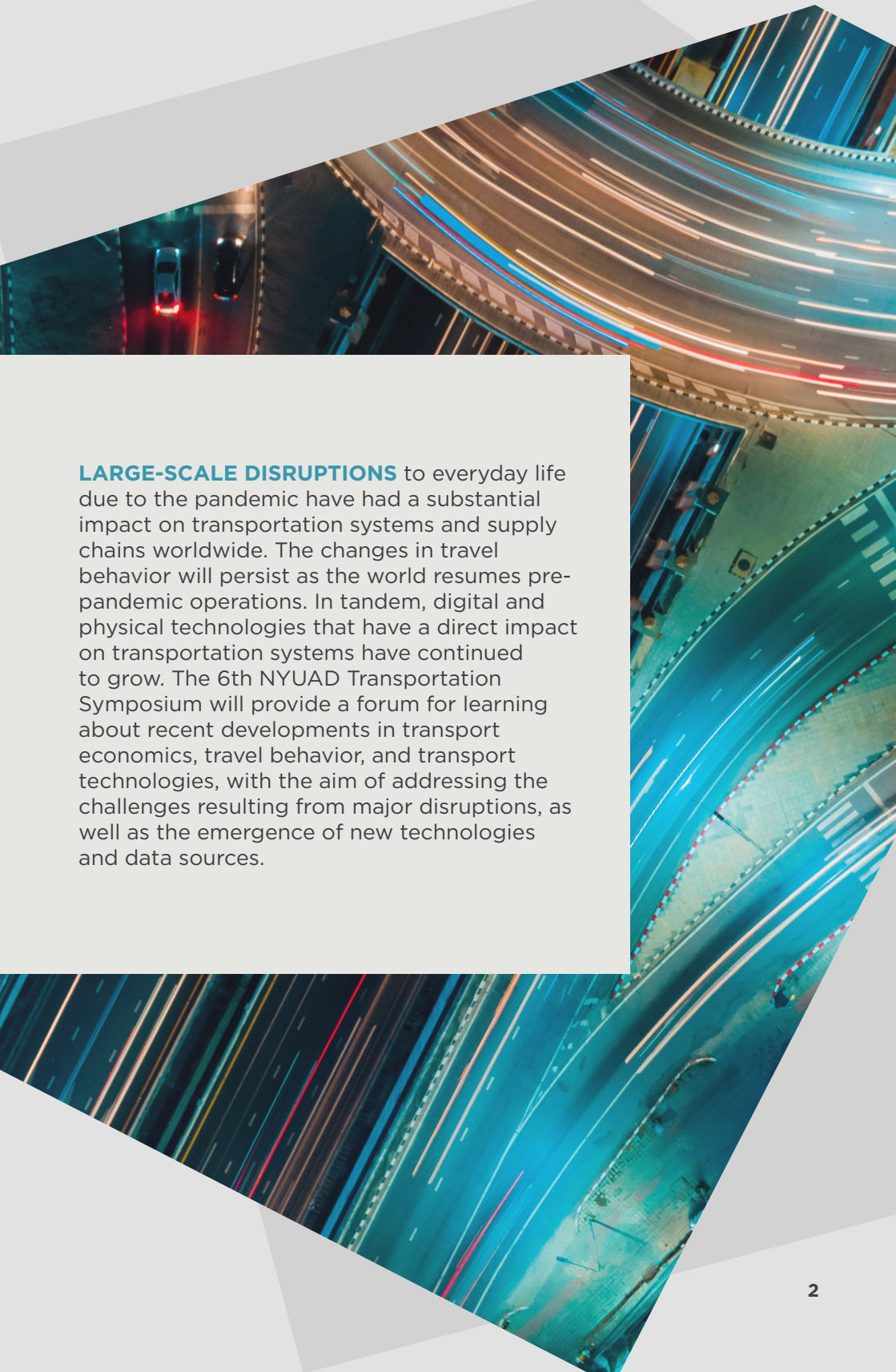
MONICA MENENDEZ, Associate Dean for Graduate Programs; Director of the Research Center for Interacting Urban Networks (CITIES); Professor of Civil and Urban Engineering

SAIF EDDIN JABARI, Associate Professor of Civil and Urban Engineering

جامعة نيويورك ابوظبي

NYU ABU DHABI

INSTITUTE



LARGE-SCALE DISRUPTIONS to everyday life due to the pandemic have had a substantial impact on transportation systems and supply chains worldwide. The changes in travel behavior will persist as the world resumes pre-pandemic operations. In tandem, digital and physical technologies that have a direct impact on transportation systems have continued to grow. The 6th NYUAD Transportation Symposium will provide a forum for learning about recent developments in transport economics, travel behavior, and transport technologies, with the aim of addressing the challenges resulting from major disruptions, as well as the emergence of new technologies and data sources.

SPEAKERS

ABOUT THE SPEAKER

JOAN WALKER, UC Berkeley

JOAN WALKER is a Professor of Civil and Environmental Engineering at UC Berkeley. She currently serves as Co-Director of the Center for Global Metropolitan Studies and as Vice Chair of Diversity, Equity, Inclusion and Belonging (DEIB) for the Department of Civil and Environmental Engineering. Her research focus is behavioral modeling, with an expertise in discrete choice analysis and travel behavior. She works to improve the models that are used for transportation planning, policy, and operations. She received her Bachelor's degree in Civil Engineering from UC Berkeley and her Master's and PhD degrees in Civil and Environmental Engineering from MIT. She is the recipient of a number of awards, including the ITS Faculty of the Year, the Zephyr Leaderships Award, and the Presidential Early Career Award for Scientists and Engineers (PECASE). She has served as Chair of the Committee on Transportation Demand Forecasting (ADB40) for the Transportation Research Board of the National Academies and as Acting Director of UC Berkeley's Institute of Transportation Studies (ITS).

MORNING SESSION THEME 1
Travel behavior and Demand Modeling
9:15-10AM

MOVING FROM CITATIONS TO COLLECTIVE WISDOM IN TRAVEL DEMAND RESEARCH

This talk focuses on the disconnect between the incentives for academic researchers and the production of collective wisdom to inform transportation planning and policy. Thoughts are presented on how incentives may be realigned to increase societal impact of academic research in travel demand. Research related to autonomous vehicles, telecommuting, and public transportation will be included.

ABOUT THE SPEAKER

ABDUL RAWOOF PINJARI, Indian Institute of Science (IISc)

ABDUL RAWOOF PINJARI is an Associate Professor in Civil Engineering and Chair of the Centre for infrastructure, Sustainable Transportation and Urban Planning (CiSTUP) at the Indian Institute of Science (IISc). His research is in mathematical modelling of human behaviour in infrastructure service systems, particularly in transportation systems, with applications to travel demand analysis and transport planning. He is currently the Chair of the International Association for Travel Behaviour Research (IATBR), an Associate Editor of Transportation Research Part B, and serves on the editorial boards of Journal of Choice Modelling, Transportation, and Transportation in Developing Economies.

MORNING SESSION THEME 1
Travel behavior and Demand Modeling
10-10:45AM

METHODS FOR SIMULTANEOUS IDENTIFICATION OF VARIOUS SOURCES OF VARIABILITY IN TRAVEL CHOICE MODELS

Discrete choice models are widely used for travel behaviour analysis and demand estimation. A large body of literature in this area focuses on treating the coefficients on explanatory variables as random to recognize population heterogeneity in travel behaviour. However, there are strong reasons to consider the explanatory variables themselves as stochastic. These include, for example, the inherent variability in attributes describing choice alternatives (e.g., day-to-day variability in travel times) and variability due to differences in analyst's measurements and traveler-perceived values. This talk will briefly discuss two different methods to simultaneously identify stochastic variables and random coefficients on those variables in discrete choice models: (1) integrated choice and latent variable (ICLV) models and (2) choice models with revealed preference (RP) and stated preference (SP) data. Further, the talk will delve deeper into an application of the ICLV framework to formulate a joint model of travel time and route choice, where travel time is treated as stochastic and travelers' sensitivity to travel time is heterogeneous. It will be shown that a model that neglects stochasticity in travel time results in a downward bias in the mean and variance of sensitivity to travel time.

ABOUT THE SPEAKER

MAYA ABOU ZEID, American University of Beirut (AUB)

MAYA ABOU ZEID is an Associate Professor of Civil and Environmental Engineering at the American University of Beirut (AUB). She earned her PhD degree in Transportation from the Massachusetts Institute of Technology (MIT) in 2009, her MS degree in Transportation from MIT in 2003, and her BE degree in Civil and Environmental Engineering from AUB in 2001. Her research and professional interests are in the areas of travel behavior modeling and forecasting, urban transportation planning, and driving behavior and road safety.

MORNING SESSION THEME 1
Travel behavior and Demand Modeling
11-11:45AM

ANALYZING DISTRACTION WHILE DRIVING USING DRIVING SIMULATION, PHYSIOLOGICAL SENSORS, AND EYE TRACKING

Road safety remains an issue of global relevance as road crashes are believed to be a leading cause of death, particularly for children and young adults. In the United States, it is estimated that 94% of crashes involve driving error. One of the important sources of driving error is distraction while driving, which has become a major concern with the wide availability of in-vehicle devices and smartphones that compete for drivers' attention.

In this talk, I will describe a set of studies of driving distraction that we conducted at the American University of Beirut. In one study, we designed an experimental protocol that induces auditory-vocal mental workload. Using driving simulator measures of driving performance and physiological measures of cognitive workload and stress such as heart rate, we modeled the dynamic impact of stress on driving performance (such as speed, reaction time, and decision to violate a red light). Such models can be used in traffic microsimulators to enhance the fidelity of driving behavior models used in these simulators, as well as within vehicular technologies to warn drivers when their performance significantly deteriorates. In subsequent studies, we investigated the impact of browsing social media and voice messaging while driving on performance and attention using driving simulation and eye tracking, and showed that both could be as detrimental to attention as texting while driving. I will discuss the policy and technology implications of findings from these studies for enhancing road safety.

ABOUT THE SPEAKER

JONAS ELIASSON, Linköping University (LiU)

JONAS ELIASSON is Director of Transport Accessibility at the Swedish National Transport Administration, professor of transport systems at Linköping university and chair of the Civil Engineering division of the Royal Academy of Engineering Sciences. He was Director of the Stockholm City Transportation Administration 2016-2019 and professor of transport systems analysis at the Royal Institute of Technology (KTH) 2007-2016.

His research interests focus on transport policy design and evaluation, including areas such as cost-benefit analysis, transport pricing, railway capacity allocation, transport demand modeling, congestion charges, decision making in the transport sector, public and political acceptability of transport policies, and valuations of travel time and reliability. Prof. Eliasson is among the world's most cited academics in the transport economics field, and is a member of several scientific committees and editorial boards.

Prof. Eliasson also has a long involvement in analyzing, developing and applying transport policies and appraisal methodologies. He has been engaged as expert advisor to a large number of urban, regional and national governments around the world regarding strategic transportation issues, often involving sustainable transport planning, transport pricing and social and economic appraisal. He directed the design and evaluation of the Stockholm congestion pricing system, in operation since 2006, and has subsequently been heavily involved with its evaluation and redesign, as well as the design and evaluation of the Gothenburg congestion pricing system, in operation since 2013. In 2016-2019 he was Director of the Stockholm City Transport Administration (with overall responsibility for transportation and infrastructure in Stockholm City), and from 2019 he is Director of Transport Accessibility at the National Transport Administration (with overall responsibility for strategic evaluation of national transport accessibility).

JONAS ELIASSON, Linköping University (LiU)

MORNING SESSION THEME 1
Travel behavior and Demand Modeling
11:45AM-12:30PM

PRICING PARKING: COST-BENEFIT ANALYSIS, OPTIMAL PRICING AND A STOCKHOLM CASE STUDY

Parking pricing and regulation is a powerful and nearly ubiquitous tool for urban transport planning. Due to its technical simplicity, it is a much more common policy instrument than more advanced transport pricing instruments such as congestion charges or distance-based taxes. Despite this, a broader literature on the theory and empirical effects of parking pricing has developed only relatively recently – the last decade or two.

This presentation focuses on the question of welfare analysis of parking charges and determining optimal parking charges. In a recent working paper, we develop a model than can be used for empirical evaluation of the social costs and benefits of street parking charges. From the model, we derive an expression for optimal parking charges and occupancy levels. The central insight is that optimal parking charges balance drivers' search costs against the lost value of unused parking spaces. Contrary to commonly used rules-of-thumb, optimal occupancy levels are not constant; they depend on parking turnover rates and parking search costs (including possible external costs from car traffic). In contexts with high turnover and high search costs (such as city centers), optimal occupancy rates are higher than in contexts with low turnover and low search costs (such as residential suburbs).

We demonstrate the model's applicability in a case study from Stockholm, where parking charges were recently introduced in suburban residential areas. The charges had considerable effects on parking demand, but our analysis shows that the overall welfare effect was a substantial welfare loss. Using parameters and demand functions estimated from the case study, we calculate optimal parking charges and occupancy levels, and show that the welfare loss arises because the introduced charges were considerably higher than the optimal ones.

**The presentation is based on the paper Eliasson & Börjesson (2022) Costs and benefits of parking charges in residential areas.*

ABOUT THE SPEAKER

S.TRAVIS WALLER, Technical University of Dresden (TU Dresden)

STEVEN "TRAVIS" WALLER is the Lighthouse Professor and Chair of Transport Modeling and Simulation at the Technical University of Dresden, Germany, as well as a Professor at the Australian National University (ANU). Until recently he was Head of School at UNSW Sydney where he led a new School vision of "Ethical Civil Infrastructure and Sustainable Environments". He began his tenure-track and tenured career at the University of Illinois at Urbana-Champaign and, subsequently, at the University of Texas at Austin (where he was promoted to full Professor in 2011).

Travis is a global research leader in the domain of transportation network modelling and simulation particularly integrated planning models (including emerging technology as well as ethics/equity metrics), dynamic traffic assignment, and adaptive network equilibrium. He has published more than 300 peer reviewed papers, supervised 39 completed PhD students and conducted over 60 funded research projects for 40 global sponsors.

In 2003, Prof. Waller was named one of the top 100 innovators in science and engineering in the world under 35 years of age by MIT's Technology Review magazine for his work on dynamic traffic analysis. In 2004, he received the U.S. National Science Foundation CAREER award for his proposed research and teaching plan on adaptive network equilibrium. In 2006, he was the recipient of the Annual New Faculty Award sponsored by the Council of University Transportation Centers and the American Road and Transportation Builders Association. In 2007, he was named a Fellow of the Clyde E. Lee Endowed Professorship in Transportation Engineering. In 2008, he was named to the Phil M. Ferguson Teaching Fellowship in Civil Engineering. In addition, he received the Fred Burggraf Award in 2009, the Hojjat Adeli Award for Innovations in Computing in 2012, the TRB Pyke Johnson Award in 2019 and named a Fellow of the Institution of Engineers Australia in 2021.

S.TRAVIS WALLER, Technical University of Dresden (TU Dresden)

AFTERNOON SESSION THEME 2
Advanced Technology in Transportation
1:30-2:15PM

HOW WE MOVE INTO THE FUTURE: AUTOMATED TRANSPORT PLANNING THAT LEVERAGES PERVASIVE DATA AND EVOLUTIONARY ALGORITHMS FOR HUMANCENTRIC MOBILITY

This talk will discuss research into a broad range of transport network modelling approaches which synthesize pervasive data, evolutionary algorithms, and complex network equilibrium models. Traditionally, transport planning is an intensive process involving lengthy surveys and finely calibrated strategic models for entire regions. Further, transport planning and optimization often require the incorporation of specific behavioral models to meet the needs of domain stakeholders, funding mandates and political processes. As a result, the primary research problems of interest involve traveler equilibrium and related paradigms. The presented research utilizes such models as a sub-component which often necessitates mixed optimization/ evolutionary algorithm solution methods. In addition, this talk will focus on a range of problems which leverage the rise of broadly available, pervasive, data which enable a new range of preliminary planning applications that can be examined on a much broader scale than traditional transport planning approaches generally address. Finally, a connection will be made to long-term research spanning ethical concerns, health impacts, and information adaptivity to better envision the evolving role of quantitative modelling-based planning for future human mobility.

ABOUT THE SPEAKER

HWASOO YEO, KAIST

HWASOO YEO was born in Seoul, South Korea, in 1972. He received the B.S. degree in civil engineering from Seoul National University, Seoul, in 1996, and the M.S. and Ph.D. degrees in civil and environmental engineering from the University of California at Berkeley, Berkeley, CA, USA, in 2008. He is currently a Professor with the Department of Civil and Environmental Engineering, KAIST. His current research interests include AI mobility, traffic flow and traffic operations, and intelligent transportation systems

AFTERNOON SESSION THEME 2
Advanced Technology in Transportation
2:15-3PM

URBAN TRAJECTORY ANALYTICS: EMERGING TRENDS AND AI-BASED APPLICATIONS

Recent progress in sensing and data processing techniques has enabled full-scale trajectory data acquisition, which will provide new perspectives to transportation engineers. Urban trajectory analytics provide rich and new information which have not been provided by the traditional sensors, and can deal with diverse problems from microscopic level such as pedestrian-vehicle risk analysis to macroscopic dynamic route choice predictions. This talk will introduce the concept of urban trajectory analytics, data acquisition, data analysis and processing trends and will provide overview on the AI-based applications including urban trajectory prediction and generation, and area-based traffic signal control.

ABOUT THE SPEAKER

HANS VAN LINT, TU Delft

VAN LINT received his MSc degree in 1997. After 4 years' work as programmer and project engineer at a large engineering consultant and a municipality, he returned to academia and received his PhD in AI/Transportation in 2004, after which he started an academic career at TU Delft. He was awarded an Anthonie van Leeuwenhoek full professorship by the TU Delft Executive board in 2013, at the Transport and Planning department of the Civil Engineering and Geosciences (CEG) faculty. He is director of the data analytics and traffic simulation laboratory (**DiTTLAB**) and serves as chair of the academic career committee at the CEG faculty.

His research focusses on two closely intertwined themes. The first is multi-scale modelling and simulation of traffic supply and demand, ranging from estimating and predicting origin-destination flows and reservoir dynamics, to continuum modelling of traffic at the level of carriageways, and agent-based modelling of detailed driving behaviour. The second theme is hybrid modelling, that is, combining fundamentals from traffic and network flow theory with data assimilation techniques ranging from Kalman filters to AI and advanced data analytics.

Van Lint (co)authored close to 90 articles in peer reviewed international journals and over 150 peer reviewed conference papers. He supervises/d 26 PhD students (of whom 14 graduated) and served as external examiner in PhD committees for 50+ other PhD students at TU Delft, and other universities in the Netherlands and abroad. He (co)wrote successful grants worth over 7.6ME sponsored by NSF, EU, national government and Industry, amongst which an STW/Veni early career grant in 2007. Van Lint is on the editorial board of the IEEE Transactions on Intelligent Transportation Systems and Transportation Research Part C.

HANS VAN LINT, TU Delft

AFTERNOON SESSION THEME 2
Advanced Technology in Transportation
3:15-4PM

HOW PREDICTABLE IS ROAD TRAFFIC?

With how much certainty can we—at least in theory—predict vehicular movement, interactions and congestion patterns over corridors and networks? How well can we predict the parameters and boundary conditions that govern the evolution of such traffic patterns and their consequences in terms of e.g. travel times? And how predictable are the underlying traffic demand patterns and mobility behaviours that govern those dynamics over minutes, hours, days, weeks, and years? Generally put: can we, at different levels of spatial and temporal scale and of behavioural abstraction, determine the (irreducible?) limits of predictability of traffic demand and supply dynamics in road traffic networks?

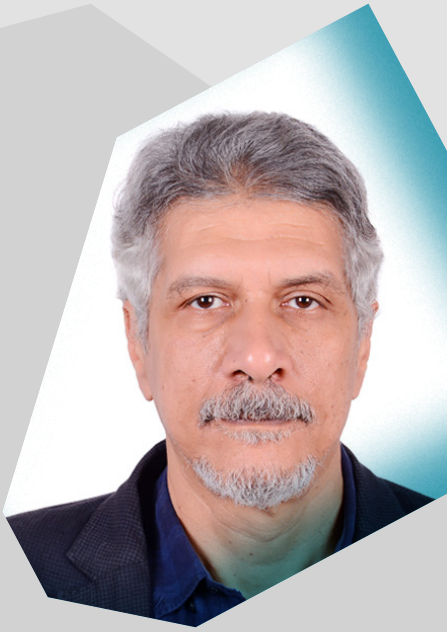
That such predictability limits exist at different levels of scale is well-understood. The ultra-short summary of this common understanding is that some of the supply-dynamics (e.g. propagation of congestion waves) are reasonably predictable, but that many emerging phenomena (e.g., congestion breakdown, spillback dynamics) and most of the underlying interactions and human behaviours (related to driving and traveling) are highly ill-predictable.

This understanding, however, is predominantly qualitative and supported by the likelihood of a limited number of data sets given our assumptions, rather than by the (posterior) probability of these assumptions over a large range of circumstances. In other words, we know which phenomena are predictable (within reasonable bounds) with which (existing) mathematical models; and we know which phenomena are very difficult to predict with any (existing) model. What we don't know is how much and in which dimensions improvements in our predictive capability are possible, and whether this requires better models (whatever that means) and/or more (detailed) data, or both.

I am convinced that such a quantitative understanding of the predictability of traffic is fundamentally important to make much needed progress in transportation science. In this talk I explore this "predictability question" and hope to leave you with a few new insights and most probably with more questions than answers.

ABOUT THE SPEAKER

YASER E. HAWAS, The German University in Cairo



YASER E. HAWAS is the recipient of the H.H. Shiekh Khalifa (the UAE President) Educational Award in the Category of "Distinguished University Professor in the Field of Scientific Research," for the year 2011-2012. He is also a winner of the local academic category award of "Dubai World Challenge on Self Driving Transport", Dubai (2019), and the UAE University Chancellor Award on Innovation-Transport (2020). He obtained his Ph.D. from the University of Texas at Austin in 1996. He currently serves as a Professor at the German University in Cairo. He served as a Professor at the Department of Civil and Environmental Engineering at the UAE University (1998-2020). He also served as the Director of the Roadway, Transportation, and Traffic Safety Research Center (RTTSRC) at the UAE University. Prof. Hawas has carried out as the principal investigator and the project manager of more than 35 external research studies and services projects in UAE with a value exceeding 30,000,000 AED in total funding. Prof. Hawas primary areas of expertise include the development of Intelligent Transportation Systems tools for modeling and analysis, advanced control systems, traffic management and operation, development of AI algorithms for real-time control, behavioral modeling, advanced computational tools for network optimization, planning, and design, and traffic safety analysis.

YASER E. HAWAS, The German University in Cairo

AFTERNOON SESSION THEME 2
Advanced Technology in Transportation
4-4:45PM

EVALUATION OF REAL-TIME ROUTE GUIDANCE IN INTER-VEHICULAR COMMUNICATION URBAN NETWORKS

The presentation shall address the technology, the laboratory and the field testing of the embedded system that enables inter-vehicular communication for real-time route guidance and other potential traffic management and safety applications. In specific, it presents a developed prototype (software and hardware) of the V2V-based Route Guidance technology (RG). For efficient communication and to prevent data overflow, the RG technology enables message exchange among vehicles only within the so-called geo-fence regions, in the vicinity of urban network intersections. The utilization of exchanged data among vehicles for real-time navigation and best route finding follows a specific protocol and screening conditions to minimize the data overflow and communication requirements. The presentation shall address how the detailed system's functional analysis was performed, and subsequently, the technical requirements were identified. Based on these requirements, the On-Board Units (OBU's) were designed, and the functionality was validated with different test cases in the lab. To further investigate the performance of the system in real-world, different field scenarios were conducted. The description of each scenario and the results are discussed in detail.

AGENDA

NYUAD Campus,
Conference Center A6 - 001A&B
November 22, 2022 | 9AM - 5PM

BREAKFAST
8-9AM

ARLIE PETTERS, NYUAD PROVOST
WELCOME REMARKS
9-9:15AM

MORNING SESSION | THEME 1

TRAVEL BEHAVIOR AND DEMAND MODELING
Moderated by **SAMER MADANAT**, Dean of Engineering at NYUAD

JOAN WALKER, UC BERKELEY
Moving from Citations to Collective Wisdom in Travel Demand Research
9:15-10AM

ABDUL RAWOOF PINJARI, INDIAN INSTITUTE OF SCIENCE (IISC)
Methods for simultaneous identification of various sources of variability in travel choice models
10-10:45AM

COFFEE BREAK
10:45-11AM

MAYA ABOU ZEID, AMERICAN UNIVERSITY OF BEIRUT (AUB)
Analyzing Distraction while Driving using Driving Simulation, Physiological Sensors, and Eye Tracking
11-11:45AM

JONAS ELIASSON, LINKÖPING UNIVERSITY (LIU)
Pricing parking: cost-benefit analysis, optimal pricing and a Stockholm case study
11:45-12:30PM

LUNCH
Institute Conference Center, Meeting Room Foyer
12:30-1:30PM

NYUAD Campus,
Conference Center A6 - 001A&B
November 22, 2022 | 9AM - 5PM

AFTERNOON SESSION | THEME 2

ADVANCED TECHNOLOGY IN TRANSPORTATION
Moderated by **SAIF EDDIN JABARI,** Associate Professor of Civil and Urban Engineering at NYUAD

STEVEN TRAVIS WALLER, TU DRESDEN
How We Move into the Future: Automated Transport Planning that Leverages Pervasive Data and Evolutionary Algorithms for Human Centric Mobility
1:30-2:15AM

HWASOO YEO, KAIST
Urban Trajectory Analytics: Emerging Trends and AI-based Applications
2:15-3PM

COFFEE BREAK
Institute Conference Center, Meeting Room Foyer
3-3:15PM

HANS VAN LINT, TU DELFT
How Predictable is Road Traffic?
3:15-4PM

YASER HAWAS, THE GERMAN UNIVERSITY IN CAIRO
Evaluation of real-time route guidance in inter-vehicular communication urban networks
4-4:45PM

CLOSING
4:45-5PM