

International Research Seminar on

“New Trends on Design, Operation and Evaluation of Mobility Services”

Hosted by Nagoya University COI-NEXT My-mobility Co-creation Center,
in collaboration with
Institute of Transport and Logistics Studies, Sydney University Business School and
Illinois Advanced Research Center at Singapore

Date: 17th, March, 2026 13:00-18:00

Venue: Seminar Room, Level 2, CREATE Tower, NUS U-Town Campus
(1 Create Way, CREATE Tower, 138602 Singapore)

Objective:

This workshop aims to explore emerging trends in the design, operation, and evaluation of mobility services, with a particular emphasis on data-driven and user-centred approaches. As transport systems face rapid societal changes - including demographic shifts, labour shortages, digitalisation, and increasing demand for flexible mobility - there is a growing need for innovative frameworks that integrate technology, public policy, and behavioural insights. Through presentations and interactive discussions, the event aims to develop a common understanding of how mobility services can be designed and operated more effectively in both urban and rural contexts. The workshop seeks to accelerate knowledge co-creation and contribute to the broader goals of the COI-NEXT “My-mobility Co-creation Center,” which is working toward future mobility systems that are resilient, inclusive and sustainable.

Speakers:

Invited Speakers:

Prof. Cynthia Chen, University of Washington

Prof. Qiang Meng, National University of Singapore

Prof. Yafeng Yin, University of Michigan

Speakers from ITLS, Sydney University Business School:

Prof. Michael G H Bell

Prof. John Nelson

Assoc. Prof. Chinh Ho

Speakers from My-mobility Co-creation Center:

Prof. Fumitaka Kurauchi (GU)

Dr. Yurie Toyama (NU)

Dr. Gen Hayauchi (NU)

Program:

13:00 - 13:10	Welcome	Fumitaka Kurauchi and Jonas Joerin
13:10 - 13:35	Repurposing City Streets: Assessing Congestion and VMT Impacts with City-scale System Dynamics and Site-specific Data-driven Analysis	Cynthia Chen
13:35 - 14:00	Simulating Agent Motion in Low Speed Shared Space Environments Taking Uncertain Agent Behaviour into Account	Michael Bell
14:00 - 14:25	How Can We Enhance Mobility and Induce Activity in the City Center? Lessons from Nagoya	Gen Hayauchi
14:25 - 14:50	<i>Coffee Break</i>	
14:50 - 15:15	Integrated Community Shuttle Network Design and Service Operations with Modular Autonomous Vehicles	Qiang Meng
15:15 - 15:40	Recent Developments in Flexible Transport Services.	John Nelson
15:40 - 16:05	Bus Lane Design Problem with Tree Constraints	Fumitaka Kurauchi
16:05 - 16:20	<i>Break</i>	
16:20 - 16:45	Inverse Learning of Route Choice Behavior in Transportation Networks	Yafeng Yin
16:45 - 17:10	Scaling MaaS for Resilient Urban Mobility: Evidence from Australia and Japan	Chinh Ho
17:10 - 17:35	The Invisible Burden of Family Escorting: A Qualitative Analysis Based on Resident Interviews	Yurie Toyama
17:35 - 18:00	Wrap up	Toshiyuki Yamamoto

Abstracts:

Speaker: Prof. Cynthia Chen (University of Washington)

Title: “Repurposing City Streets: Assessing Congestion and VMT Impacts with City-scale System Dynamics and Site-specific Data-driven Analysis”

Abstract: Alternate street uses (ASUs) capitalize upon existing public space to meet societal needs. One widely-adopted strategy catalyzed by the COVID-19 pandemic is reallocating roadway space from vehicular travel to other purposes, such as nonmotorized mobility, commercial use, or social/recreational space. This study examines the effects of ASU policies on congestion and VMT impacts using both a city-scale system dynamics (SD) scenario analysis and data-driven site analysis with LBS data. The SD analysis investigates downstream and interacting effects of ASU policies and allocation in two cities with contrasting land use characteristics: Seattle, WA and Phoenix, AZ. The site analysis focuses on four sites in Seattle. Both analyses—city-scale or site-specific—show that repurposing city streets do not lead to congestion. In fact, it can reduce congestion and VMT and increase pedestrian traffic and dwell time. We conclude that at least in higher-density cities like Seattle, the reallocation of street space is not a zero-sum game; those who still choose to drive experience reduced congestion, and the non-drivers receive safety and capacity enhancements. Furthermore, reduced total VMT supports broader traffic safety and emissions reduction goals.

Speaker: Prof. Michael Bell (University of Sydney)

Title: “Simulating Agent Motion in Low Speed Shared Space Environments Taking Uncertain Agent Behaviour into Account”

Abstract: Shared spaces are characterised by the absence of lanes, the presence of street furniture and low speeds (in Australia the maximum permitted speed in a shared space is 10kph). These are typically found in areas where streetscape and liveability are important. Current traffic simulators for such spaces, like PTV Viswalk, are based on the social force (SF) model, which estimates the current velocity of each agent and its acceleration or deceleration as the outcome of a desired velocity, interaction forces and fixed obstacle effects. This presentation explores an alternative framework offered by the Schroedinger Bridge (SB) model. Agent locations are not known with certainty. Agents navigate the space to minimise expected energy use given probabilistic information about the locations of other agents, while also navigating fixed objects. While the SF model delivers individual agent trajectories, the SB model generates an ensemble of trajectories, which takes agent decision-making under uncertainty into account. This is akin to a hyperpath in transit assignment. While both approaches can deliver heat maps of agent density, the SF heat map does not allow for uncertainty in agent behaviour. The SB heat map, by contrast, is interpretable in terms of expected flows and agent density likelihood. It is argued that the SB model is better suited to the design of shared spaces where there is an element of uncertainty associated with agent behaviour.

Speaker: Dr. Gen Hayauchi (Nagoya University)

Title: “How Can We Enhance Mobility and Induce Activity in the City Center? Lessons from Nagoya”

Abstract: This presentation examines approaches that not only respond to travel demand but also actively shape it. The first part reports results from an incentive-based field experiment conducted in Nagoya, Japan, via a smartphone app. The findings suggest that incentives can prompt individuals who already frequent nearby areas to visit new places. To further stimulate urban activity through more seamless mobility, the second part presents a stated-preference analysis of a proposed ticketing scheme for commuters traveling to central Nagoya.

Speaker: Prof. Qiang Meng (National University of Singapore)

Title: “Integrated Community Shuttle Network Design and Service Operations with Modular Autonomous Vehicles”

Abstract: Community shuttle services connecting residential areas to major transportation hubs are often planned and operated independently for each community in a traditional hub-and-spoke manner. This fragmented approach can result in redundant vehicle trips and underutilized fleet capacity. We address these issues by proposing an integrated community shuttle service network design (CSSND) to serve demand-responsive feeder trips for residential requests. In the proposed system, a fleet of modular autonomous vehicles (MAVs) can operate individually or physically couple together to form larger units called complete MAVs (CMAVs). This flexibility enables the sharing of CMAV capacities across communities. We formulate the CSSND as a two-stage stochastic integer program under demand uncertainty. The first stage determines the shuttle network configuration and vehicle dispatch schedule. The second stage optimizes detailed routing itineraries for the realized demand using a path-based formulation. The objective is to minimize operating cost while satisfying route duration and stop coverage requirements. To handle the integer decisions in both stages and solve the path-based model to optimality, we propose a two-phase combined decomposition algorithm that embeds column generation within a branch-and-Benders-cut framework (CG-BBC). We also develop a tailored label-setting method as part of the CG procedure to efficiently solve the second-stage pricing problems, thereby generating improved paths with negative reduced cost. We evaluate the computational performance of CG-BBC on real-world case studies from Singapore and compare it to a unified branch-and-Benders-cut (UBBC) method, an integer L-shaped (ILS) method, and a commercial solver. The results show that CG-BBC produces higher-quality solutions than UBBC, ILS, and Gurobi within the same time limit. In addition, the integrated CSSND within a CMAV fleet achieves a 29.16% reduction in total operating cost relative to conventional one-to-one shuttle services.

Speaker: Prof. John Nelson (Sydney University)

Title: “Recent Developments in Flexible Transport Services.”

Abstract: Flexible transport services (FTSs) are collective services provided for passengers that are flexible in one or more of the dimensions of route, vehicle allocation, vehicle operator, type and time of payment,

and passenger category; they can complement and/or substitute to fixed-route networks. This presentation takes a broad perspective on the contemporary understanding of FTS to include mainstream and special needs transport and reflects on how lessons learned from experience can be used to refine the FTS product. Issues are explored encompassing: the stability of the FTS market, the contribution of technology, other forms of shared transport and its impact on flexible transport, mobility as a service (MaaS) and the potential role of FTS as an integrating mode with potential to contribute to the net zero agenda.

Speaker: Prof. Fumitaka Kurauchi (Gifu University)

Title: “Bus Lane Design Problem with Tree Constraints”

Abstract: Transit network design plays a crucial role in public transport planning. This paper first introduces the concept of a spanning tree to design a public transit network that accounts for both passenger and operator utilities by minimizing total passenger-kilometres and vehicle-kilometres, respectively. The problem is formulated as a mixed-integer optimisation model. To efficiently generate high-quality spanning tree solutions, a tabu search-based heuristic is proposed. The effectiveness of the proposed heuristic is demonstrated using real-world bus network data. The model is further extended to incorporate a Steiner tree structure, allowing practical road geometry to be explicitly considered. In addition, the impact of reduced capacity for private vehicles resulting from the introduction of bus lanes is examined. To address the vast solution space associated with these extensions, we develop a new sensitivity analysis method based on bush-based user equilibrium assignment, and propose an efficient tabu search algorithm to obtain high-quality approximate solutions.

Speaker: Prof. Yafeng Yin (University of Michigan)

Title: Inverse Learning of Route Choice Behavior in Transportation Networks

Abstract: This work uses a perturbed utility modeling framework to model route choice and to inversely learn traveler behavior from empirical data. Framing route choice as an optimization problem with perturbations provides a behaviorally grounded alternative to traditional models and avoids explicit choice set generation. We discuss estimation and modeling choices that balance computational tractability, statistical efficiency, and flexibility, and illustrate the approach using large-scale empirical data. The results highlight the potential of perturbed utility theory as a unifying framework for learning route choice behavior.

Speaker: Dr. Chinh Ho (Sydney University)

Title: “Scaling MaaS for Resilient Urban Mobility: Evidence from Australia and Japan”

Abstract: Smart mobility schemes such as Mobility as a Service (MaaS) are increasingly promoted as scalable solutions to urban transport congestion, emissions, and car dependence. Drawing on evidence from the Sydney MaaS trial and comparative stated-preference experiments in Australia and Japan, this presentation examines how multiservice where mobility is bundled with non-mobility services can enhance user appeal while advancing sustainability goals. The findings show that context-sensitive bundle design and cross-subsidisation are critical to scaling MaaS beyond pilots, positioning smart mobility platforms as

viable demand-management tools in diverse urban settings.

Speaker: Dr. Yurie Toyama (Nagoya University)

Title: “The Invisible Burden of Family Escorting: A Qualitative Analysis Based on Resident Interviews”

Abstract: Family escorting is widely expected to function as a key mobility option in areas with limited public transport. At the same time, the burden placed on those who provide escorting within the household—its role in everyday life, as well as the sense of responsibility and fulfillment it may involve—has remained largely underexplored. In this presentation, drawing on interviews with residents who regularly provide family escorting, we aim to clarify the mechanisms underlying household escorting practices.