Activity-Based Modeling Symposium

PROGRAM

Seeon Abbey, Germany
September 12th to September 14th, 2022

Contents

Welcome!

Welcome to the Seeon Symposium on Activity-Based Models!

As we better understand the limitations of trip-based models, get access to new data sources and work with increased computing power, more researchers and agencies have moved towards activity-based models (ABMs). However, ABMs are not as widespread as their potential would suggest. They require extensive calibration, tend to be driven by constants, lead to comparatively long runtimes, and suffer from stochastic differences between runs.

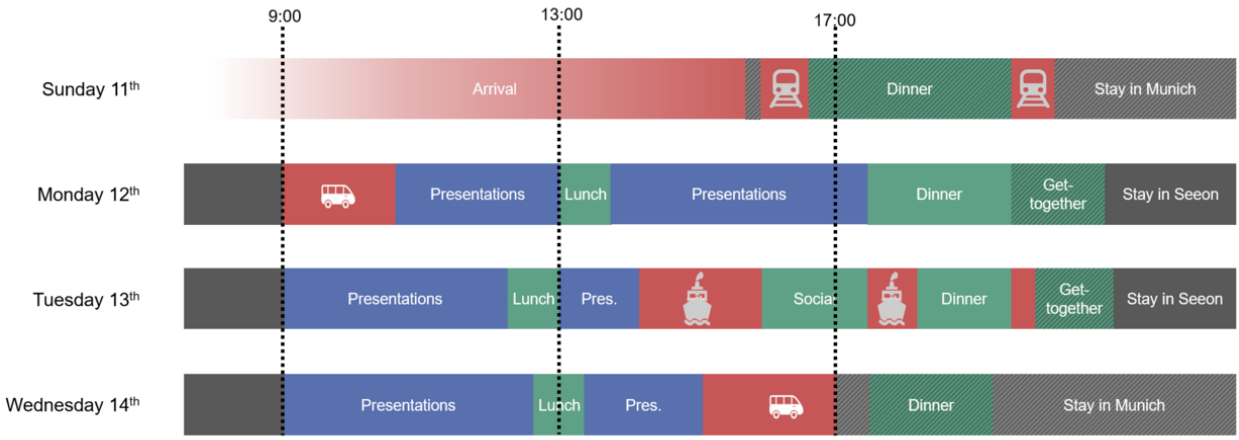
Our daily activity patterns are changing with the advent of new transport modes such as AV and EV, along with ubiquitous digitalization enabling ride-sharing, e-commerce, etc. With these rapid changes, ABMs are more relevant than ever before. The impact of habitual behavior and attitudes on travel choices suggests that we keep track of the agents' travel experiences from the past. From a health perspective, the pandemic has shown that transport models also need to account for social networks to better understand who meets whom on a regular basis to model disease transmission. It is time to rethink what the new generation of ABMs needs to accomplish, and think on what we have to do to achieve this.

This symposium brings together the most relevant ABM researchers and selected outstanding travel behavior researchers who understand what these models need. Most attendees will give succinct 15 – 20 minute presentations on their latest relevant research, leaving ample time for brainstorming and discussion both during the sessions and informally in the breaks.

The site at the Seeon Abbey provides a beautiful setting for innovative thinking. Wolfgang Amadeus Mozart enjoyed his stay here and was so inspired as to write two Offertories in 1766 and 1771. Let us follow in his footsteps and compose the next activity-based models. I very much look forward to spending these days with you steeped in the Bavarian countryside and immersing ourselves in the future of transport modeling.

The symposium is supported the Technical University of Munich, the H2020 European Research Council through the GLASST project under grant n° 817754 and the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under grant n° 506594427.

Program



For more information or dynamically updated information, please consult the program webpage: *https://www.mos.ed.tum.de/en/tb/workshops/abm/*

Sunday, September 11th

	Arrive at Sure Hotel by Best Western, München Hauptbahnhof, Arnulfstr. 12, Munich
Optional program:	
5:00 PM	*Meet in Sure Hotel lobby and walk to main train station to board 5:25 Suburban Train*
5:25 PM	*Suburban train departure*
6:00 PM	*Dinner at Rolf's backyard*

Monday, September 12th

8:00 - 9:00 AM	*Breakfast at Sure Hotel, Munich*
9:00 AM	*Van transfer from Munich to Seeon Abbey (75 min bus ride)*
10:30 AM	*Arrive at Seeon Abbey, store luggage near reception*
10:30 – 11:00 AM	*Short coffee break*
11:00 – 11:30 AM	**Opening of the symposium**
11:30 AM – 12:15 PM	**Kay Axhausen**: Dilemma of transport policy, the e-bike city and can we model all of the changes?
12:15 – 1:00 PM	**Greg Erhardt:** Beyond forecasting: transport models for science and policy
1:00 - 2:00 PM	*Lunch*
2:00 – 2:45 PM	**Aruna Sivakumar:** Activities while traveling or trade-off between in-person and online activities

2:45 – 3:30 PM	**Chandra Bhat**: The interplay between in-person and virtual activity participations for shopping
3:30 – 4:00 PM	*Coffee break*
4:00 - 4:45 PM	**David Ory:** Consistency across time, space, and vehicle allocation in practical activity-based travel models
4:45 – 5:30 PM	**Rick Donnelly:** The lost art of forecasting with activity-based models
5:30 – 6:00 PM	*Adjourn and check into hotel rooms*
6:00 PM	*Dinner at Seeon Abbey*
8:00 PM	*Get-together in Klosterstüberl Bar and bowling (optional)*

Tuesday, September 13th

7:00 - 9:00 AM	*Breakfast*
9:00 – 9:45 AM	**Kouros Mohammadian:** Enhancing ADAPTS/POLARIS agent-based framework
9:45 – 10:30 AM	**Carlos Llorca & Joanna Ji**: ABIT - Activity-Based Incremental Travel Demand Model
10:30 – 11:00 AM	*Coffee break*
11:00 – 11:45 AM	**Janody Pougala:** An optimization framework for activity-based models
11:45 AM – 12:30 PM	**Eric Miller:** 8 days a week: moving beyond single-day activity-travel models
12:30 – 1:30 PM	*Lunch*
1:30 – 2:15 PM	**Kai Nagel:** Integration between activity-based demand modelling and person centric traffic assignment
2:15 – 2:30 PM	*Short coffee break*
2:30 PM	*Bus transfer to Gstadt at Lake Chiemsee (15 min ride)*
3:25 - 3:40 PM	*Take boat from Gstadt to Herreninsel*
3:40 PM	*Walk to Herrenchiemsee New Palace by King Ludwig II of Bavaria (20 min walk)*
4:30 – 5:15 PM	*Private tour of Herrenchiemsee New Palace*
5:15 PM	*Walk back to peer (20 min walk)*
6:15 – 6:40 PM	*Take boat from Herrenchiemsee to Gstadt*
6:40 PM	*Bus transfer to Seebruck*
7:00 – 8:15 PM	*Dinner at Hafenwirt in Seebruck*
8:15 PM	*Bus transfer to Seeon Abbey*
8:30 PM	*Get-together in Klosterstüberl Bar (optional)*

Wednesday, September 14th

7:00 - 9:00 AM	*Breakfast*
	Check out from hotel rooms, store luggage near reception
9:00 – 9:45 AM	**Patricia Mokhtarian:** Examining the treatment effect of teleworking on vehicle-miles driven: A close look into the role of travel stress
9:45 -10:30 AM	**Ram Pendyala:** Time use and time poverty in a post-pandemic era: an activity-based approach focused on human well-being
10:30 – 11:00 AM	*Coffee break*
11:00 - 11:45 AM	**James Woodcock & Corin Staves**: Use of activity based models for simulating health related exposures and behaviours
11:45 AM – 12:30 PM	**Klaus Bogenberger:** A large-scale real-life experiment: effects of the 9-euro flat rate ticket for public transport
12:30 – 1:30 PM	*Lunch*
1:30 – 2:15 PM	**Kelly Clifton**: Opportunities and challenges in representing the use of non-motorized modes in activity-based transport models
2:15 PM	**Closing session**
3:30 PM	*Departure of bus to Munich (75 min ride)*
	Estimated arrival time in Munich 5:00 PM
6:00 PM	*Dinner at Paulaner am Nockherberg in Munich (optional)*
	Participants may choose stay another night at Motel One, München-Deutsches Museum, Rablstr. 2, Munich, or travel home

List of Participants

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Abstracts

Dilemma of transport policy, the e-bike city and can we model all of the changes?

Kay Axhausen (ETH Zurich)

Transport policy is in a dead end, as most acceptable policies are likely to be counterproductive given their induced demand effects: capacity expansion; e-cars; automated vehicles; the effective policies are politically unacceptable: mobility pricing; CO2 pricing. The talk will discuss this dilemma and will argue that we need new visions to approach the dilemma in the search for a new compromise. The e-bike city is such a vision: a city, where 50% of road space is dedicated to the slow modes, but with a base load public transport system to move large number of persons. The second part of the talk will highlight the modelling challenges which such a radical redesign would bring. It will ask if we have the tools and highlight the missing pieces.

Beyond forecasting: transport models for science and policy

Greg Erhardt (University of Kentucky)

For many decades, planners have used transport models to forecast the long-term effects of proposed projects and evaluate alternatives. However, many important decisions are made outside the bounds of this traditional “rational planning model”. Using a series of examples—including growing congestion, decreasing transit ridership and induced demand--this talk explores the role of transport models in understanding recent trends and informing policy. It goes on to consider the implications for model design.

Activities while traveling or trade-off between in-person and online activities

Aruna Sivakumar (Imperial College London)

Activity-travel behaviour of individuals has evolved rapidly due to developments in information and communication technologies (ICTs) in recent years. In addition, we have seen a large-scale shift towards in-home and digital activities (e.g., teleworking, e-shopping, home entertainment) in the wake of the Covid-19 pandemic. In this talk, I will present two ongoing research threads.

The first piece of research examines travel time use, looking at specific mobile work tasks and their interaction with trip planning, expectations, ICT, and travel conditions. The second research thread is focused on developing a time allocation model that allocates the agent’s time to activity episodes, where each episode contains attributes of activity type, location (in home, out of home), modality (physical, virtual/digital), time-of-day and duration. These research threads will jointly contribute toward the development of an agent-based activity-travel model which is compatible with the increasingly digitalised lifestyles.

The interplay between in-person and virtual activity participations for shopping

Chandra Bhat (University of Texas at Austin)

In this presentation, we examine non-domestically cooked meal (NDCM) preferences for dinner meals by studying the monthly count of NDCMs by channel type: eat-out, eat-in takeout, and eat-in delivery. Data from a 2022 online survey collected in Texas is employed to estimate a multivariate joint model. The results highlight the impact of workplace location on dining choice. The results also indicate complementary and substitution effects; the delivery channel complements eating-out but substitutes takeout. Similarly, eat-out substitutes takeout. The developed models may be embedded within larger agent-based activity-travel systems by modeling additional location and mode dimensions in downstream models for each forecasted NDCM activity occasion

Consistency across time, space, and vehicle allocation in practical activity-based travel models

David Ory (WSP)

All practical activity-based travel models used in the United States make simplifications when constructing individual travel itineraries that result in inconsistencies in time, space, and/or vehicle allocation. In this presentation, I first describe typical use cases; motivate the need for consistency with an emphasis on the role automated vehicles are likely to play in lifting mobility constraints; and suggest directions for future research to make practitioners and academics more aware of the problem in the hope of motivating robust solutions.

The lost art of forecasting with activity-based models

Rick Donnelly: (Semi-retired consultant, formerly WSP)

Transport planners seek to inform decision-makers about likely impacts of policies and investments that will irrevocably shape our cities and regions. In the past, we've assumed that tomorrow will simply be a more crowded, prosperous, and congested version of our existing world. Such an approach increasingly lacks credibility with politicians and investors. Our commendable advances in activity-based modelling have mostly focused on the tools rather than outcomes. A vision of the future will be presented where scenario thinking is used with data-driven models, machine learning, and big data analytics to complement the advances in activity-based models.

Enhancing ADAPTS/POLARIS agent-based framework

Kouros Mohammadian (University of Chicago)

The Agent-based Dynamic Activity Planning and Travel Simulation (ADAPTS) is an activity-based model that is formulated as a dynamic model of how the activity planning and scheduling process is implemented for an individual over time. The ADAPTS model components have been reorganized to more closely fit the agent-based paradigm and have been implemented using the POLARIS framework. This presentation will discuss ADAPTS new modules that were developed and implemented since its initial development, as well as several components that are being extended or upgraded to deliver more realistic simulation outcomes. These include impacts of telework, e-shopping, e-learning during the COVID pandemic and beyond on travel demand, as well as new models for conflict resolution and mode choice involving TNC, micro-mobility, and parking effects.

ABIT - Activity-Based Incremental Travel Demand Model

Carlos Llorca & Joanna Ji (Technical University of Munich)

The Activity-Based Incremental Travel Demand Model (ABIT) is an activity-based model that generates travel demand individually for every person in the study area and updates it incrementally over time. The demand generated are tour plans consisting of chains of activities and trips over a weekly period. ABIT will be integrated with the land use model SILO, and instead of ordinarily regenerating the travel plans from year to year, the plans will be partially kept as long as the person, the household or the traffic situation remains stable. We posit the incremental approach will keep travel plans mostly similar and shorten runtimes. Our aim is to develop an activity-based travel demand model as a fully integrated component of our already existing agent-based and open-sourced modeling suite. This presentation will go over the current development and vision for ABIT.

An optimization framework for activity-based models

Janody Pougala (EPFL)

We propose an integrated framework for the simulation of daily activity schedules based on mixed-integer optimization: individuals derive a utility from performing activities, and they schedule them as to maximize the total utility. The parameters of the model are estimated by defining a discrete choice model where the alternatives for each individual are full daily schedules. The maximum likelihood estimators of the parameters (e.g. scheduling penalties, desired start times and durations, constants…) are evaluated on a choice set of daily schedules sampled using the Metropolis-Hastings algorithm. The estimation and simulation methodologies are applied on a sample of individuals from the 2015 Swiss Mobility and Transport Microcensus.

8 days a week: moving beyond single-day activity-travel models

Eric Miller (University of Toronto)

This presentation discusses the motivation for developing practical week-long agent-based microsimulation models of urban activity and travel. It first presents the case for developing such models from both behavioural representation and policy analysis perspectives. It then briefly reviews the (limited) literature on multi-day/week-long modelling. Next, it sketches how the current TASHA (Travel/Activity Scheduler for Household Agents) conceptual framework can be extended to a week-long application. Practical challenges in modelling at the weekly level are then discussed, leading to brief concluding comments on next research steps.

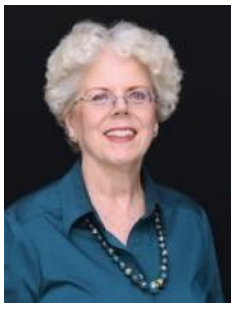
Integration between activity-based demand modelling and person centric traffic assignment

Kai Nagel (Technical University Berlin)

When doing activity-based modelling, it is useful at some point to assign the resulting travel to the network. Static assignment is not a good match here, since much of the expressivity of the person-centric modelling then gets lost. A better match is obtained when using a person-centric assignment, where all persons (and vehicles etc.) are individually resolved, and they follow daily plan and/or can make within-day decisions. Our own MATSim (Multi-Agent Transport Simulation) software is a possible platform here, which does not only do route assignment, but also (departure) time choice, mode choice, and (secondary) activity location choice. An issue then becomes which of these decisions are part of the assignment, and which are rather done upstream. I will report on practical experiences of integrating MATSim with CEMDAP, with FEATHERS, with ActiTopp, and with SILO/MITO.

Examining the treatment effect of teleworking on vehicle-miles driven: A close look into the role of travel stress

Patricia Mokhtarian (Georgia Institute of Technology)



We apply endogenous switching regression models to data from the Dallas-Ft. Worth and Washington, DC regions (N = 1,584), to identify factors that influence teleworking adoption and weekly vehicle-miles driven (VMD) while accounting for self-selection biases. We find that, on average, teleworking reduces VMD; however, it does so much more for workers who are travel-stressed than for those who are not. For non-travel-stressed teleworkers, teleworking may have a limited impact on reducing their pre-existing VMD, and/or may generate more new VMD due to teleworking. The paper also includes visualizations of factual and counterfactual effects.

Time use and time poverty in a post-pandemic era: an activity-based approach focused on human well-being

Ram Pendyala (Arizona State University)

The COVID-19 pandemic has brought about considerable changes in activity-travel and time use patterns, with important implications for human well-being. Using data from the American Time Use Survey (ATUS) series of 2019 and 2020, changes in activity-travel and time use patterns are assessed. The analysis employs two methods – a well-being scoring method and a time poverty based method – to evaluate the impacts of activity and time use changes on people's lives. The results show that individuals experienced diminished well-being during the pandemic even though their time poverty statistics showed an improvement. The presentation will describe an activity-based model of well-being, together with a time poverty analysis, to explain the how and why of post-pandemic activity-travel patterns.

Applying activity-based models to explore the effects of urban systems on health

James Woodcock & Corin Staves (University of Cambridge)

Transport is a key determinant of urban population health. As people travel around cities they breathe in air pollution, hear noise, and risk traffic injuries. They also generate physical activity — a health benefit — especially if their travels involve walking and cycling. The effects of transport on health are complex and vary over space, time, and demographic. We present an activity-based open-source microsimulation modelling framework for assessing transport health exposures impacts at high resolution.

Activity-based models are especially advantageous as they allow health exposures to be evaluated not only during transport but rather throughout the entire day (e.g. air pollution at the workplace, physical activity at the park). We present our progress toward expanding our trip-based model into an agent-based one and discuss future directions for modelling health with activity-based models, from momentary assessment to the exposome.

A large-scale real-life experiment: effects of the 9-euro flat rate ticket for public transport

Klaus Bogenberger (Technical University of Munich)

In spring 2022, the German federal government agreed on a set of measures that aimed at reducing households' financial burden resulting from a recent price increase. These measures included among others, a nation-wide public transport ticket for 9,- EUR per month and a fuel tax cut that reduced fuel prices by more than 15%. We observe this natural experiment with a three-wave survey and an app-based travel diary on a sample of 1.000 participants as well as an analysis of traffic counts. In this presentation I will provide first findings from the surveys and the travel diary data.

Opportunities and challenges in representing the use of non-motorized modes in activity-based transport models

***Kelly Clifton* (*University of British Columbia*)**

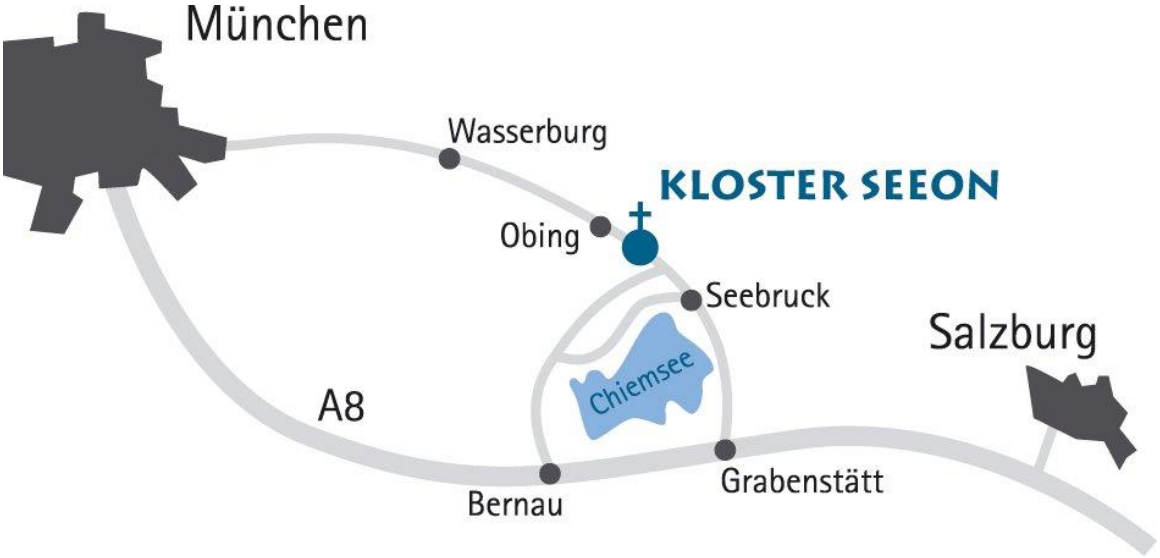
With the improvement and availability of spatially-explicit walking behavior data and information about the built and natural environment, research on walking behaviors and pedestrian demand has increased. Travel demand models have been relatively slow to incorporate this knowledge and improve the representation of pedestrians. This presentation will show a pedestrian-centric framework – called the Model of Pedestrian Demand (MoPeD)- and its incorporation pathway into transport models. First, we will present the success of integrating MoPeD with a trip-based travel demand model (MITO). Then we will discuss some opportunities and challenges in representing the use of non-motorized modes in activity-based transport models.

Venue

The ABM symposium will take place at the picturesque Seeon Abbey (Kloster Seeon). The abbey is situated between Munich and Salzburg, on the banks of Lake Klostersee, which is north of the large Lake Chiemsee.

Founded in 994 AD, it the site of a former Benedictine monastery. The main church is built in a Romanesque style with Gothic alterations, the insides decorated with Renaissance frescos. It was a center of culture and learning, hosting famous composers Joseph Haydn and Mozart, the latter of whom stayed at Seeon from 1767 – 1769.

In the modern day, it is now a venue for events, retreats, workshops. The amenities include breakfast from 7 to 9 AM, a bar on site (the Klosterstüberl), wireless internet throughout the facility, with complimentary bowling. The spacious grounds are perfect for a walk or jog. One may walk around the abbey in 5 min, walk around the small lake in 15 min (which passes the Mozart Oak Tree) or walk or job around the big lake for 3.6 km. Basking in the historical surroundings and the picturesque lakeside is sure to refresh the body and mind, and provide both a stimulating and relaxing setting for the exchange of ideas.



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