Workshop on

Activity-Based Modeling of Spatial and Temporal Patterns of Human Travel Behaviour

July 9-10, 2016

Tongji University, Shanghai, China

Course Directors

Dr. Chandra R. Bhat, CTR, University of Texas at Austin

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Background

The fundamental difference between the trip-based and activity-based approaches is that the former focuses directly on "travel choices" as the decision entities of interest, while the activity-based approach views travel as a demand derived from the need to pursue activities that are distributed in time and space and focuses on "activity participation behavior" as the underlying driver of travel demand. The philosophy of the activity-based approach is to understand the behavioral basis for individual decisions regarding participation in activities, and the resulting travel needs and choices. This behavioral basis includes all of the factors that influence the how, why, when, and where of activities and travel. Among these factors are the needs, preferences, prejudices, and habits of individuals (and households), the cultural/social norms of the community, and the service characteristics of the transportation system and surrounding built environment. The transport service characteristics themselves have to be dynamically represented across time and space, to reflect queue formation in specific parts of the transportation network through a completely integrated system of travel demand, spatial cognition, route choice, and network simulation. Such integrated time-dependent model systems enable the realistic representation of transportation network conditions and traveler behaviors. The real value of the integrated approach is in being able to evaluate the impacts of alternative traffic congestion alleviation, greenhouse gas emissions control, and energy consumption reduction policies, and the implications of new technologies such as connected and automated vehicles. A dynamic integrated model system of activity-travel behavior in transport networks would be capable of reflecting demand- side market adoption and use behaviors as well as supply- side network effects within an agent-based microsimulation framework operating at the level of individuals and households.

Why participate in the workshop?

This course will introduce attendees to the activity-based approach to travel behavior analysis, focusing on data-supported transportation planning and operations (D-STOP) opportunities, and a number of unique elements of the activity-based modeling framework that have been implemented in the Los Angeles area and are scheduled to be implemented in the New York area. The unified modeling framework, developed at the Center for Transportation Research (CTR) at The University of Texas at Austin, the Georgia Institute of Technology, the University of California at Santa Barbara, and many other universities worldwide, constitutes a pragmatic and field-tested comprehensive approach that is deeply embedded in the foundations of human behavioral decision-making. The model system, which has been extensively tested and applied in a number of settings, advances the state of the art of activity-travel demand forecasting beyond the daily activity-pattern and tour-based approaches employed in several metropolitan areas. It is a next-generation application platform that offers a more flexible solution to contemporary transportation policy analysis, offers a stronger foundation for meeting current and future model requirements, and can take advantage of new technologies and methods as they emerge.

In short, the course will enable researchers and practitioners alike to move to the forefront of model development to address the increasingly complex land-use, built environment, transport, and environmental policies, the analyses of which far exceed the capabilities of the usual modeling/simulation techniques.

Who should attend?

The course is designed for researchers interested in learning about cutting edge travel modeling methods founded in strong behavioural theories, and practitioners (from consulting, local, state, and federal planning agencies, and transit agencies) interested in learning about a flexible and practical suite of modeling tools that may be used to analyse the impacts of a variety of technology, pricing, and land-use policies to better plan, invest, design, and manage transportation systems. Attendees are expected to have a basic knowledge of transportation analysis methods and mathematical/statistical modeling techniques.

Instructors

The workshop directors are Professors Chandra R. Bhat (CTR, University of Texas at Austin), Ram M. Pendyala (Georgia Tech), and Konstadinos G. Goulias (University of California at Santa Barbara). The course is hosted by Professor Xin Ye (Tongji University). In addition, expert guest instructors may be invited to present specific workshop modules. All of the instructors have extensive experience in agent-based modeling of spatial and temporal patterns of human movements, and have been pioneers in the development of concepts and methods that are now widely adopted around the world.

Location and course fees

The course will be hosted by the College of Transportation Engineering of Tongji University, Shanghai—one of the key colleges of Tongji University, recognized worldwide for its leadership and scholarship in the field. The course will begin at 1:00 PM on Saturday, July 9, 2016 and conclude at 4:00 PM on Sunday, July 10, 2016. Early bird course fees (**valid until June 1**) are as follows:

- Regular Course Fee: $395
- Academic and Public Sector (Government) Professionals: $295
- Full-time Students (valid ID required): $145
- Full-time Students of Tongji University: $75

The course fee increases by $75 in each category after June 1. The course fee includes access to the complete set of notes and presentations, and program code for model estimation and application. Attendees are responsible for their own travel and accommodation arrangements. Light refreshments are provided during morning and afternoon breaks, as well as lunch on Day 2.

Unique elements of the modeling framework in this course

The modeling framework covered in this course is unique in that it (a) includes a population synthesizer that employs new algorithms to simultaneously consider household and person characteristics in the synthesis process, thus *producing a synthetic population that is congruent with external control totals* at both the household and person levels, (b) accommodates *intra-household interactions* in activity-travel choices among all individuals (children and adults) in a household, (c) incorporates spatial-temporal dependencies and constraints in activity-travel patterns between and within individuals of a household by using *continuous-time* as the overarching basis for pattern generation and activity scheduling, (d) adopts a behaviorally robust activity-based approach by focusing *explicitly on activity episode generation and scheduling characteristics* (including chaining into tours and travel choices associated with the activity episodes), (d) allows *enhanced sensitivity of travel demand and holistic assessment of traveler response to land-use attributes, built environment and development patterns, and multi-modal (and inter-modal) transportation policies and demographic changes in the population,* (e) incorporates *vehicle-driver allocation models* along with an explicit household *vehicle type choice simulator* (vehicle fleet composition defined by body type, fuel type, make/model, and vintage), (f) facilitates *environmental justice* analyses by incorporating the ability to examine the effects of policies on any defined segment of the population, and (g) allows *seamless interfacing and integration* with land-use and demographic model outputs, GIS/geo-database input layers, GIS output visualization abilities/needs, querying and reporting capabilities, population synthesizer outputs, and freight forecasting and external trip model outputs.

Workshop Logistics and Course Content

The workshop will be held at the College of Transportation Engineering in Tongji University, which is located at 1239 Siping Road, Shanghai, China. The specific building/room location and a complete set of directions with a map will be posted soon at the course registration website (http://ctr.utexas.edu/ABM). Overnight accommodation is available at a variety of nearby hotels. The website provides a list of lodging options at various price ranges. Individuals needing a visa to travel to the workshop may obtain a letter of invitation from the course organizers upon completion of course registration and payment of fee. Cancellations received by June 15 will be refunded in full, subject to a $75 cancellation fee. No refunds are offered after June 15.

The course will include a mix of presentations and demonstrations of model estimation and application using a variety of programs written in R, Gauss, and Python. Course participants will receive credentials for exclusive access to these programs and course materials upon completion of the course. The workshop will be interactive in nature, with course attendees encouraged and expected to ask questions and discuss the challenges and opportunities in the development and application of advanced travel forecasting models.

Module 1: Essentials of Activity-Travel Microsimulation (Day 1)

- Discrete choice models of activity-travel behavior – emerging approaches and behavioral paradigms
- Population synthesis methods and the PopGen (Population Generation) software
- Base year demographic models and demographic evolution models
- Spatio-temporal accessibility computations

Module 2: Behavioral Models – Estimation and Application (Day 2)

- Activity-based analysis of sense of place and space
- Understanding time-space geography, interactions, and constraints
- Activity-travel scheduling and the CEMDAP (Comprehensive Econometric Microsimulator for Daily Activity-travel Patterns) modeling structure, framework, and software system
- Estimation of multiple discrete continuous extreme value (MDCEV) models
- Forecasting with the MDCEV model – Applications to intra-household interactions and household vehicle fleet composition and utilization
- Sensitivity analysis and model validation
- Integration of activity-based models with dynamic network models

TO REGISTER: Please visit http://ctr.utexas.edu/ABM for details and registration. Please direct questions to Ms. Maureen Kelly (maureenk@mail.utexas.edu).

FOR MORE INFORMATION ABOUT THE WORKSHOP

Please contact Dr. Chandra Bhat (bhat@mail.utexas.edu), Dr. Ram Pendyala (ram.pendyala@ce.gatech.edu), or Dr. Konstadinos Goulias (goulias@geog.ucsb.edu).