Transportation Science and Logistics Society

President's Note
Maciek Nowak

Thanks for taking a moment to catch up on TSL news at this hectic time of year. Your TSL Board has had a busy, and I believe productive, year up to this point. We have been primarily focused on addressing two items that will hopefully improve the TSL membership experience and create a stronger society. As we strive to bring more attention to our five SIGs (Freight Transportation, Facility Logistics, Urban Transportation, Intelligent Transportation Systems and Air Transportation), we introduced a set of SIG Outstanding Paper awards that will be selected from the Best Paper award submissions. We hope that this will recognize some of the best work that is being done within each SIG and expose our members to the wide variety of research within the society. We also introduced two new TSL sponsored grants intended to spur collaborative research across regional boundaries. For more on these grants, please see the announcement within this newsletter.

Time is clearly flying by as we only have a couple months until the INFORMS Annual Meeting in Nashville. I hope to see everyone at the **TSL Business Meeting Monday, Nov. 14 at 6:15 PM** (look for the location in the INFORMS Meeting Program). As part of the meeting we will have a celebration of the 50th Anniversary of *Transportation Science*, with a look back on the journal's greatest hits and with some special guests in attendance. The TSL Best Paper and Best Dissertation Committees are hard at work in making their selections and these awards (along with the SIG awards) will be announced during the meeting. And, of course, there will be plenty of time to catch up with old friends over wine and cheese.

One more item: keep on the lookout for an email regarding the upcoming TSL elections. As with any election, it's important that you make your voice heard. And I can promise you two much less controversial candidates for our presidency than a certain other election.

I hope to see you in Nashville!

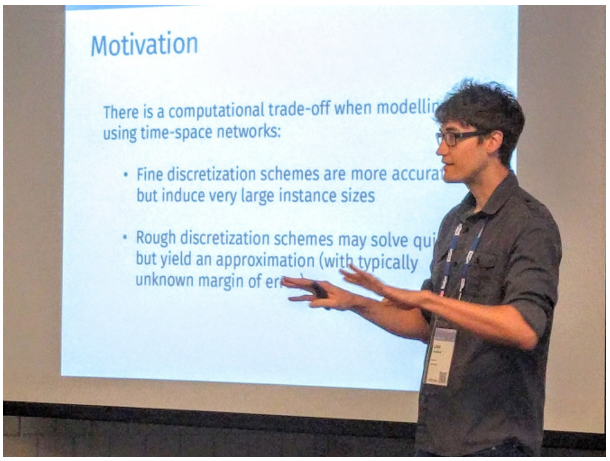
Maciek

2016 INFORMS TSL Workshop in Atlanta

The Stewart School of Industrial and Systems Engineering of the Georgia Institute of Technology hosted the 2016 TSL Workshop. The event took place June 19-22 on the Tech campus, with a theme of "Analytics and Automation in Logistics".

The organizing committee included Alan Erera, Sebastian Pokutta and Alejandro Toriello, with advisory members Martin Savelsbergh and Chip White. 45 participants attended 30 technical talks, plus an industry panel moderated by Chip White that discussed analytics in supply chain and logistics management, and included the participation of the CEOs of Chainalytics and Scientific Logistics, as well as the Director of Business Development from the Georgia Ports Authority, which oversees the Port of Savannah.

In addition, participants attended a welcome reception in the Ramblin' Wreck Club Room of the Georgia Tech Hotel, visited the Center for Civil and Human Rights and the Centennial Park area, and the conference dinner was held at the historic Georgian Terrace Hotel.



New TSL Sponsored Grants

Two new TSL sponsored grants have been created as part of our efforts to generate more collaboration across the four TSL regions (North America, Central and South America, Europe and Africa, and Asia, Australia and New Zealand). The grants and application process are described in full detail below, with one grant aimed at doctoral students hoping to study abroad and the other more broadly focused at driving collaborative research. Importantly, note that the Cross-region Collaborative Grant has an additional $2000 grant that is part of an agreement with VeRoLog and that is available to EURO members.

We hope that these grants will be awarded on an annual basis, but this is contingent on available funding in the TSL budget.

Submission materials may be sent to Maciek Nowak at *mnowak4@luc.edu*. The deadline for submission is December 15, 2016. The awards will be announced by March 1, 2017. The selection committee will be composed of the three International Liaisons and one representative appointed by VeRoLog, and will be chaired by the outgoing TSL President (Past President in 2017). We hope that they will serve to generate more international interest in TSL and VeRoLog and the research that our members undertake.

Picture: madpixblue – Fotolia.com

Cross-region Collaborative Grant ($2000)

This grant is open to any two or more TSL members, located in at least two of the four TSL regions (North America, Central and South America, Europe and Africa, or Asia, Australia and New Zealand), who intend to collaborate on a research project. In the interest of generating new collaborative ties across boundaries, proposals from junior faculty and those who have not already conducted this type of collaborative research are most heavily encouraged. Preference will be shown to those who have exhibited a commitment to TSL. This grant may be used to fund travel, lodging or other expenses incurred in bringing the collaborators together.

As part of a collaborative agreement with **VeRoLog**, an additional $2000 grant is available to the best submission where at least one applicant is a member in good standing of a national society that is part of the Association of European Operational Research Societies (EURO). If the best overall submission has both a EURO and TSL member, the submission receives a total of $4000. Otherwise, two $2000 grants are awarded, one to the best overall submission and one to the best submission with a EURO member.

It is expected that the grant recipients will present their research at the earliest possible INFORMS, TSL conference, or VeRoLog conference (if applicable). The grant application should consist of the following:

Description of the Project: Describe in appropriate detail the proposed activity, including:

a. A brief description of the project, including its relevance and contribution to the TSL community (and to EURO/VeRoLog if applicable) as well as its broader impact on society.

b. Describe how this project relates to the applicants' research programs, including their qualifications and future projects/proposals.

c. Describe (briefly) the discussions that the collaborators have already conducted. Applicants should limit the body of this description to no more than 750 words, delivered in double-spaced format.

Timeline and Proposed Budget:
a. Describe how and when you anticipate disseminating the results of this project.

b. Give a budget for the project, indicating how the grant dollars will be spent towards that budget. This could be as simple as indicating that the budget will be spent on travel expenses. Also, indicate what other funds are available to support this research.

Curriculum Vitae: Full and current Curriculum Vitae for each applicant — attach at end of application.

Cross-region Doctoral Grant ($2000)

This grant is open to any TSL member currently working towards their PhD who would like to spend time studying at an institution located outside of his/her home region. This grant may be used to fund travel, lodging or other expenses incurred during the grantee's visit. It is expected that the grant recipient will present their research at the earliest possible INFORMS or TSL conference. The grant application should consist of the following:

Description of the Visit: Describe in appropriate detail the proposed activity, including:

a. The objectives of the doctoral candidate's visit. A brief description of the project, including its relevance and contribution to the TSL community as well as its broader impact on society.

b. Describe how this project relates to the applicant's thesis.
Applicants should limit the body of this description to no more than 500 words, delivered in double-spaced format.

Timeline and Proposed Budget:
a. Delineate the projected timeline for the proposed visit.

b. Provide a brief budget for how the grant will be spent. This could be as simple as indicating that the budget will be spent on travel expenses. Also, indicate what other funds are available to support this visit.

Letter of Invitation from the Host Institution: This should provide a brief outline of the expectations for the candidate's visit. Limited to one page.

Letter of Recommendation from the candidate's advisor: This should indicate how the visit will advance the completion of the candidate's thesis. Limited to one page.

Curriculum Vitae: Full and current Curriculum Vitae — attach at end of application.

CALL FOR ABSTRACTS

INFORMS Transportation and Logistics Society

First Triennial Conference
Hosted at Loyola University Chicago
Chicago, Illinois, USA
July 26 - 29, 2017
www.informs.org/Community/TSL/TSL-Conference

The Transportation Science and Logistics Society Conference has been created to provide an opportunity for all members to gather on a triennial basis to present and to discuss the state-of-the-art in transportation science and logistics. The conference welcomes abstracts on all transportation science and logistics topics including air transportation, facility logistics, freight transportation and logistics, intelligent transportation systems, and urban transportation planning and modeling. Abstracts supporting the conference theme, MOBILITY 2020: Traffic, Transportation and Logistics in a Cyber Connected World, are highly encouraged. Submissions focusing on innovation in transportation and logistics will receive special attention.

Abstract submission: goo.gl/zZpqv5
Abstracts should be 3-5 pages in length. To ensure all presentations are of the highest quality, abstracts should highlight the main contributions of the research and include outcomes of computational studies, if applicable.

Dates of interest:
- Abstract submission deadline: 12/15/2016
- Notification of acceptance: 2/1/2017
- Deadline for early registration: 4/1/2017
- Conference: 7/26/2017-7/29/2017

Registration:
Early Bird Registration (before 4/1/2017): $375
Regular Registration: $425
On-site Registration: $500
Student Registration (does not include welcome reception or conference dinner): $150
Guest Registration (welcome reception and conference dinner): $200
Non-TSL members add $25 to each registration above. Some registration scholarships will be available for PhD students.
The goal is to keep the conference small enough for deep interactions and large enough to accommodate the TSL Society's wide interests. With this in mind, there may be at most one paper presentation per registered presenter. Also, each presentation must be accompanied by at least one full paid registration.

Program: The conference will be organized around a small number of parallel tracks. The conference will also include plenaries organized around the theme MOBILITY 2020: Traffic, Transportation and Logistics in a Cyber Connected World. The organizing committee plans plenaries from both industry and academic speakers.

Social agenda: In addition to a broad look at the future of transportation, this workshop will provide numerous opportunities to network with colleagues and establish new working relationships.
A welcome reception overlooking downtown Chicago will start the event on Wednesday evening. On Friday evening, we will adjourn for dinner at the Chicago Museum of Contemporary Art, with an opportunity to explore the collection prior to and after dinner.
Lunches will be provided on site each day of the conference.

Lodging: The conference hotel will be the MileNorth Hotel, located just off of Michigan Avenue in the heart of downtown Chicago (http://www.milenorthhotel.com/). A special conference rate will be available and more information will be provided as the conference approaches.

Venue: The conference will be held on Loyola's Water Tower Campus, located along Pearson Street, just off North Michigan Avenue, Chicago's famed "Magnificent Mile". The Water Tower Campus derives its name from the famous Chicago Water Tower, which survived the Great Chicago Fire in 1871. The campus sits in the shadow of the iconic John Hancock Center. Other nearby architectural landmarks are the Tribune Tower, the Wrigley Building, the Trump Tower, and the site of Fort Dearborn, around which the city of Chicago was founded. Holy Name Cathedral and the Roman Catholic Archdiocese of Chicago are located just south of campus, across Chicago Avenue. Cultural points of interest include the Museum of Contemporary Art, the Newberry Library, and Navy Pier. In addition to the unparalleled shopping on Michigan Avenue, the Water Tower Campus is also within a few minutes' walk of numerous dining and entertainment options.

Organizing Committee:
Pitu Mirchandani, Chair – Arizona State University
Maciek Nowak, Local Chair – Loyola University Chicago
Mike Ball – University of Maryland
Mike Hewitt – Loyola University Chicago
Warren Powell – Princeton University
Barry Thomas – University of Iowa

TSL Dissertation Prize Abstracts

In 2015, a total of 12 excellent dissertations were submitted to the competition. Below we are pleased to publish the dissertation abstracts.

New Capacity Allocation Policies in Revenue Management

Dr. Nursen Aydin
Sabanci University
Advisor: S. Ilker Birbi

Revenue management's focus on the techniques and strategies in product availability and pricing makes it one of the most important operations research practices. In this dissertation, we study three emerging problems in revenue management. First problem is about optimal capacity allocation in single-leg airline revenue management with overbooking. We propose new static and dynamic models. The static problems are difficult to solve optimally. Therefore, we introduce approximate models, which provide upper and lower bounds on the optimal expected revenues. In the dynamic case, we propose a model based on two streams of events; the arrivals of booking requests and cancellations. Following the characterization of the optimal policy, we also present the nested structure of the optimal allocations.

Second problem is about optimal capacity allocation in the presence of a contingent commitment option. This option has been recently offered by airline systems to provide purchase flexibility to the customers. The problem becomes finding the revenue maximizing policy for contingent commitments and advance bookings. We first propose a dynamic programming model. Since it is computationally intractable, we develop an alternate dynamic model based on geometric approximation. In our numerical study, we investigate the effect of the commitment option on various test instances.

In the third problem, we investigate optimal room allocation policies in hotel revenue management. Long-term stays are very common in hotel industry. Therefore, it is crucial to consider allocation of multiple-day capacities when responding to a request. This requirement leads to solving large-scale network problems, which are computationally challenging. Therefore, we work on various decomposition methods to find reservation policies for walk-in and stay-over customers. We also devise solution algorithms to solve large problems efficiently.

The International Wine Supply Chain: Challenges from Bottling the Glass

Dr. Alejandro Mac Cawley Vergara
Georgia Institute of Technology
Advisor: John J. Bartholdi III

Wine companies face two important challenges in their supply chain: the international shipping temperatures and their effect on the perceived quality of the wine and the optimization of the bottling schedule. The wine maker takes special care in producing the best quality product, which is then shipped to the importer/distributor or consumer, generally in non-refrigerated containers at the mercy of the prevailing environmental conditions. The contributions of this work is that it is the first to measure, for a signifcant period of time, the temperatures along the international wine supply chain and to link them to the specific supply chain processes. It is also the first study which analyses the effect of shipping temperature on the perceived quality of the product by those who make the purchase decision for importers, restaurants and supermarkets. Results indicate that the wine is very likely to have been exposed to extreme temperatures during shipping. For white wines which have been exposed to high shipping temperatures, tasters are able to detect differences and show a preference towards them. For red wines, they are unable to detect differences.

Our contribution on the second challenge was the development of a model that produces solutions for the wine bottling lot sizing and scheduling problem with sequence dependent setup times, in an adequate time-frame, which can be implemented by large wineries. We have developed a model and algorithm that produces fast, good and robust solutions for the winery lot sizing and scheduling problem with sequence dependent setup times. We implemented an effective decomposition algorithm that uses the structure of the problem, that can be applied to other families of sequence dependent scheduling and lot sizing problem. Results indicate that the model achieves reductions of 30% in the total plan costs.

Resource Allocation Problems Under Uncertainty in Humanitarian Supply Chains

Dr. Melih Celik
Georgia Institute of Technology
Advisors: Professor Ozlem Ergun and Professor Eric Feron

Uncertainty in humanitarian supply chains is inherent in many different aspects. Before the catastrophic event, the type, magnitude, and the effects of the event are generally not known in advance. Even after the event, there is uncertainty related to supplies (type, timing, quantity), demand (location, quantity, type), infrastructure (status, extent of damage), and resources (equipment and personnel availability). Furthermore, in the aftermath of these events, information related to uncertain aspects becomes known over time, and therefore must be incorporated into models that address problems faced by decision makers in humanitarian supply chains as it becomes available. The inherent uncertainty in the system and gradual information availability over time call for the development of dynamic and stochastic models to represent the decision making environments in humanitarian supply chains.

This thesis considers resource allocation problems in three applications of humanitarian, emergency response and public health supply chains, namely (i) post-disaster debris clearance, (ii) allocation of perishable relief commodities in a developing country setting, and (iii) specialized nutritious foods supply chain design. These three problems are motivated by real-life applications and pose challenges due to their costly and complicated nature. The thesis contributes to the body of knowledge on humanitarian supply chains by means of: (1) development of novel models and solution approaches that consider the uncertainty in the corresponding system and devising methods for incorporating the information updates as events unfold, (2) using structural analysis of the problems and computational experiments, assessment of the value of considering the uncertainty and information updates by comparing proposed approaches to those that ignore these two aspects, and (3) quantification of the improvements resulting from proposed approaches by comparison to those that mimic the methods used in practice by means of computational experiments based on real data.

Optimal Deployment and Operations of Public Charging Infrastructure for Plug-In Electric Vehicles

Dr. Fang He
University of Florida
Advisor: Yafeng Yin

Plug-in electric vehicles (PEVs) are vehicles whose battery packs can be recharged from power grids, and the electricity stored on board propels or contributes to propel the vehicles. PEVs include battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). Interests in PEVs have increased dramatically in recent years due to advances in battery technologies, rising prices of petroleum, and growing concern over environment issues. Many governments have incentive policies, such as offering purchase subsidies and deploying public charging infrastructure in convenient locations, to promote the deployment of PEVs.

Building public charging infrastructure has a profound impact and is typically associated with a high capital cost. To assist policy makers to optimize the investment, this dissertation is devoted to developing a hierarchical modeling framework where a strategic planning model captures interactions between a regional transportation network and power transmission grids to determine a budget allocation plan for public charging stations among metropolitan areas in the region while a tactic planning model considers the spatial distribution of PEVs and optimizes the locations and operations of charging stations in a metropolitan area.

More specifically, at the regional planning level, a static game-theoretic approach is applied to investigate interactions among the availability of public charging stations, destination choices of PEVs, and prices of electricity. The interactions lead to an equilibrium state that can be formulated into a convex mathematical program. We then examine how to allocate the public charging station budget among metropolitan areas in a particular region to maximize social welfare associated with the coupled transportation and power networks. For a particular metropolitan area, given the allocated budget limit, we consider the problem of how to determine the number, locations and types of charging stations within the budget limit. Assuming the locations and types of public charging stations are given, we first develop network equilibrium models with BEVs. Based on the proposed equilibrium models, station location plans are then optimized to maximize social welfare. Lastly, we investigate the operations of public charging stations with a focus on optimizing the prices of electricity at public charging stations.

Static and Dynamic Mathematical Models of Behavior

Dr. Aurélie Glerum
Swiss Federal Institute Of Technology Lausanne
Advisor: Professor Michel Bierlaire

This thesis proposes to address two fundamental issues of choice modeling: the characterization of heterogeneity in choice behavior and the importance of dealing with variations in the choice behavior over time. We address the first issue by developing static choice models integrating psychological elements and the second issue by formulating dynamic choice modeling frameworks involving past decisions and expectations about the future. This thesis further gives a strong focus on the relevance of the developed methods in practice. The latter have hence been tested on no less than six real case studies in the field of travel behavior.

The first part of this thesis deals with the importance of psychological constructs in the characterization of heterogeneity of choice behavior. Our contributions lie in three areas: data exploitation, modeling and forecasting. In terms of data exploitation, we enhance choice models by integrating adjectives freely reported by individuals as measures of their perceptions. Regarding modeling, we propose a computationally efficient formulation of an integrated choice and latent class model integrating psychometric indicators. Finally, our contribution in forecasting is based on the development of an operational modeling framework to predict the demand for a new technology.

The second part focuses on the development of frameworks integrating past behavior and ex-pectations about the future. In the first case, we formulate a model that predicts product-switching in the presence of market events. In the second case, we develop a dynamic discrete-continuous choice model framework integrating three complex aspects of demand modeling: forward-looking agents, the joint choice of product acquisition and usage, and the simultaneous choice of multiple products.

The methodological contributions have been tested on a set of case studies, focusing either on predicting transportation mode choice behavior or vehicle choice behavior. The range of applica-tions have been demonstrating the importance of the developments in practice.

Contributions to Exact Approaches in Combinational Optimization

Dr. Timo Gschwind
Johannes Gutenberg University Mainz
Advisor: Stefan Irnich

In this thesis, we develop new exact solution approaches to different combinatorial optimization problems in the area of vehicle routing and logistics optimization. In all approaches, some knowledge about the problem at hand is exploited to individualize and enhance algorithms. In particular, we present new ideas to cut off the identical parts of the solution space of the highly symmetric Circular Traveling Tournament Problems using group theo-ry arguments. Second, we consider two different Vehicle Routing Problems with temporal intra-route synchronization constraints and propose new integer column-generation (CG) approaches for their solution. For the first time, the difficult temporal constraints of these problems are handled in the CG subproblems. New dominance rules for their effective solution by dynamic programming algorithms are derived. Finally, we extend previous work on stabilized CG using dual-optimal inequalities (DOIs) by deriving new theoretical results, identifying more general classes of DOIs, and proposing new algorithmic concepts like the dynamic generation of DOIs and the use of dual-inequalities that are not (prova-bly) DOIs. The technique is applied to bin packing, cutting stock, graph coloring, and bin packing with conflicts. For all approaches presented in the thesis, we conduct extensive computational results demonstrating the effectiveness of the proposed methods.

Integrated Allocation and Utilization of Airport Capacity To Mitigate Airport Congestion

Dr. Alexandre Jacquillat
Massachusetts Institute of Technology
Advisor: Amedeo R. Odoni

Most flight delays are created by imbalances between demand and capacity at busy airports. Absent large increases in capacity, airport congestion can only be mitigated through improvements in (i) the utilization of airport capacity to enhance operating efficiency at the tactical level (over each day of operations) and/or (ii) the allocation of airport capacity to the airlines to limit over-capacity scheduling at the strategic level (months in advance of the day of operations). This thesis develops an integrated approach to airport congestion mitigation that jointly optimizes capacity utilization and the design of capacity allocation mechanisms, subject to scheduling, capacity and delay reduction constraints. First, the capacity utilization part involves controlling the runway configuration and the balance of arrival and departure service rates to minimize congestion costs, as a function of observed congestion and operating conditions. It is formulated as a Dynamic Programming model. Then, the capacity allocation part involves designing a mechanism for airport scheduling interventions. It starts with an airline preferred schedule of flights, and reschedules a selected set of flights to reduce the demand-capacity mismatches while minimizing interference with airline competitive scheduling. We develop an original modeling architecture that integrates a Stochastic Queuing Model of airport congestion and a Dynamic Programming model of capacity utilization into an Integer Programming model of scheduling interventions. We develop an iterative solution algorithm that converges in reasonable computational times. Extensive computational results for JFK Airport suggest that (i) our model of airport capacity utilization can reduce congestion costs significantly at busy airports and (ii) very substantial delay reductions can be achieved through limited and equitable adjustments in airline schedules of flights. It is also shown that the proposed integrated approach to airport congestion mitigation performs significantly better than the typical sequential approach where scheduling and operational decisions are made separately.

On Improving Operational Planning and Control in Public Transportation Networks Using Streaming Data: A Machine Learning Approach

Dr. Luis Moreira-Matias
University of Porto
Advisor: João Mendes Moreira

In the last decades, public road transportation companies played a central role in major urban areas, especially by providing fast short distance transportation services. Today, there are multiple sources of rich spatiotemporal data explaining the urban human mobility. One of the most well-known examples of such sources is the GPS (Global Positioning System). This location-based data contain patterns that can lead to a global optimization of the way that people can travel from one point to another.

This thesis is focused on improving both Operational Planning and Control of Public Road Transportation (PT) Networks (i.e. buses and taxis) leveraging on this particular data source. The main technical motivation behind such goal is to provide sustainable frameworks (in a computational point of view) to handle this massive sources of (big) data. Ultimately, from a high level perspective, we want to extract information useful to improve Human Mobility on major urban areas through a data driven optimization of the available public transport resources.

Three concrete problems were addressed on this thesis: (1) Automatic Evaluation of the Schedule Plan's Coverage; (2) Real-Time Mitigation of Bus Bunching occurrences; (3) Real-Time Smart Recommendations about the most adequate stand to head to in each moment according to the current network status. To address such related problems, we developed Machine Learning frameworks able to advance the State-of-The-Art on such topics. They were addressed using real world data collected from two major public road transportation companies running in Porto, Portugal: i) one million of trajectories regarding taxi services run by a fleet with 450 vehicles and ii) one year of AVL data collected from 18 routes running in the biggest bus operator in town. Experimental results validated the contributions of these methods to improve PT operations. Moreover, these contributions also resulted into 16 high-quality peer-reviewed publications.

Modal Shift Estimation and Financial Viability of High Speed Rail in India: The Case Study of Ahmedabad – Mumbai Corridor

Dr. Ramakrishnan T.S.
Indian Institute of Management
Advisor: G. Raghuram

The share of rail in passenger transport in India has declined rapidly, primarily due to severe capacity constraints and inability of railways to increase the speed of travel. Other countries facing similar problems have found High Speed Rail to be the solution. The Indian Government has identified the Ahmedabad – Mumbai corridor with stops at Vadodara and Surat as being best suited for High Speed Rail. Accordingly, in this thesis, the modal shift and financial viability of High Speed Rail in passenger transport in the Ahmedabad – Mumbai corridor has been estimated to evaluate its potential in catering to the increasing passenger travel demand in this corridor.

The modal shift towards High Speed Rail has been estimated using discrete choice models from actual data of common carrier modes considering travel cost by income, production hours and non-production hours of travel time and end to end travel penalty (a comprehensive variable which included access-egress, terminal penalty, in-vehicle discomfort, crowding penalties) as the explanatory variables assuming 2025-26 to be the first year of operation. Based on the estimated modal shift, the financial viability has been estimated for various internal rates of return. The results show that the HSR project would recover the investment within ten years of operation from the tariffs alone for a reasonable financial internal rate of return.

It was also estimated that HSR would get at least 48 million end to end passengers in 2025-26, the first year of commercial operation. With an annual passenger growth rate of 15.32% between 2025-26 and 2030-31, the end to end ridership would be at least 97 million in 2030-31 and with 11.63% between 2030-31 and 2035-36, the end to end passengers for HSR would reach at least 170 million in 2035-36. This kind of expected mammoth ridership would facilitate the recovery of the entire investment cost of the project making this as the most successful HSR project in the world. Some policy measures have also been recommended to ensure the successful implementation of the High Speed Rail project and increases its ridership further.

This thesis contributes to literature by way of evolving a methodology for the estimation of modal shift using actual data of the common carrier modes, inclusion of variables of production hours and non-production hours of travel and total travel penalty that have not been considered by the previous modal shift studies. This methodology provides a comprehensive, robust and new framework for modal shift estimation and financial viability of High Speed Rail projects in developing countries similar to India.

Modelling Mode and Route Choices on Public Transport Systems

Dr. Sebastián Raveau
Pontificia Universidad Católica de Chile
Advisor: Juan Carlos Muñoz A.

Understanding travellers' behaviour is a key element in transportation planning, particularly when analysing travel decisions such as mode and route choices. In traditional public transport models, travellers are usually assumed to simply minimize travel time or consider a limited set of attributes. This study seeks to understand how travellers choose their modes and routes when travelling in a public transport system, identifying the relevant factors that are taken into account and quantifying the impact that different characteristics of the system have on the preferences of travellers. The results show that a wide variety of attributes and characteristics are significant, such as: different time components, fare and income, transfer experience, train crowding, and network topology. The different route choice strategies that public transport users can follow (related to the decision of either waiting for a particular public transport line, or boarding the first line that arrives to the stop) are also analysed. Marginal rates of substitution between the various time components are obtained, as well as transfer valuations by transfer station physical characteristics, which can be used for valuation public transportation policies. Lastly, this study presents an integrated methodological framework to apply the proposed choice models to public transport planning.

Network Routing and Equilibrium Models for Urban Parking Search

Dr. Shoupeng Tang
The University of Texas at Austin
Advisor: Stephen D. Boyles

Drivers searching for parking in urban areas is a major contributor to traffic congestion, comprising up to half of traffic volumes in certain neighborhoods and times of day. Despite this, parking is typically neglected in transportation planning and operational studies. This dissertation develops three network models to represent parking search behavior. These models all explicitly capture stochasticity in the availability of parking spaces, are behavioral in nature and reflect the dependence of drivers' search patterns on the probability of finding parking in different locations, and are tractable and scale well to networks of practical size.

The dissertation considers three specific problems. The first is modeling a single driver's parking search process. This searching process is modeled as a Markov decision process, and formulated as a stochastic shortest path problem. The main innovation introduced is the concept of "asymptotic reset," a form of history dependence more realistic than the "full reset" or "no reset" variants considered in prior literature. The second problem models how multiple drivers simultaneously search for parking, representing the mutual dependence of parking availability on search patterns and search patterns on where parking is liiely available. An equilibrium principle is introduced to resolve this dependency. This results in a network flow problem with nonlinear flow conservation constraints, which presents unique challenges in obtaining network flows from driver choices. The mathematical properties of this structure are explored (existence, uniqueness, con-vergence of algorithms), with affirmative results under reasonable regularity conditions. The third problem is a dynamic version of the parking equilibrium model. In contrast to the second problem, which provides an analytical approach for the steady-state problem, this third problem uses a simulation-based approach, integrating parking dynamics and searching behavior with the cell transmission model. Case studies and sensitivity analyses are undertaken for each of the three models.

Transit Network Assignment, Simulation and Frequency Setting: Integrated Approaches and Large Scale Application

Dr. I. Ömer Verbas
Northwestern University
Advisor: Hani S. Mahmassani

Transit systems in the United States are facing the problem of under-utilization in small urban areas and the opposite problem of crowding in large urban areas. The solution to both of these problems lies in better allocation of the limited resources. In order to achieve that, one needs tools that would re-allocate the resources optimally or at least closer to optimum. Furthermore, developing these tools requires a better understanding of traveler behavior, transit operations and the interaction between the two, and this needs to be done in a computationally efficient manner to obtain solutions for large-scale transit networks.

The allocation of resources translates to network re-design at the planning level and to frequency setting at the strategic level. This dissertation focuses on the strategic level, where the purpose is to develop integrated approaches to transit network modeling and frequency setting that is applicable to large scale networks. First, a stand-alone transit frequency setting platform under a fixed route design is developed. A detailed problem formulation that captures the use of different service patterns for a given route; the spatial and temporal variation of ridership elasticities with respect to headways; and the vehicle load constraints at every stop of the system is developed for an entire day. Mathematically, optimal solutions are achieved. However, the shortcoming of this formulation is that it does not capture the complicated interactions happening in the network.

To capture the interaction between the supply and demand in a deeper fashion, first, a multi-modal transit least cost hyperpath algorithm is developed. This time and approach-dependent algorithm, which by itself can serve as a network evaluation tool, is used as part of a model that assigns travelers to the transit vehicles, walking and biking paths. Furthermore, a transit assignment-simulation tool is developed that both simulates the travelers and the vehicles to provide very detailed evaluations of an assignment instance coupled with a gap-driven solution approach to reach fast convergence for the assignment problem. Finally, an assignment based frequency setting algorithm is developed to overcome the shortcomings of the stand-alone frequency setting algorithm.

News and Notes

The Railway Application Section (RAS) Problem Solving Competition is underway and open for registration. For further information visit: https://goo.gl/bqBqzL

The latest issue of **ACCESS Magazine** has been released and can be downloaded here: http://goo.gl/m4DDnV

The **12th Metaheuristics International Conference (MIC 2017)** will be held in Barcelona in July 2017. Further Information including key dates can be found here: http://goo.gl/jMpDpl

Book release – **Forecasting Urban Travel** by David Boyce and Huw Williams has recently been published. For further information visit: http://goo.gl/YpgrG9

Prof. Carolina Osorio (MIT) has been invited as a speaker to the upcoming National Academy of Engineering's (NAE) EU-US Frontiers of Engineering (EU-US FOE) symposium, to talk on the topic of "The Road to Future Urban Mobility". For more information visit: https://goo.gl/SnE2E4

Call for Papers – IEEE Intelligent Transportation Systems Magazine special issue on **'High Performance Computing in Simulation and Optimization of Dynamic Transportation Networks'**. For further information visit: http://goo.gl/Beqeja

Call for Papers – Transportation Research Part C: Emerging Technologies special issue on **'Advances in Modeling, Simulation and Optimization of Dynamic Network Traffic'**. For further information visit: http://goo.gl/BxOnzs

The annual conference of the German Operations Research Society **OR2017** will be held in Berlin Sept 6 – Sept 8, 2017. The special theme will be **'Decision Analytics for the Digital Economy'**. For further information visit: http://www.or2017.de

To suggest items for future newsletters, contact Jan Fabian Ehmke at *janfabian.ehmke@fu-berlin.de* or Mike Hewitt at *mhewitt3@luc.edu*.