Decison-Aid Methodologies in Transportation

Iliya Markov

Transport and Mobility Laboratory
EPFL

May 27, 2014

Who we are

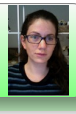
Michel
professor

Marianne
secretary

Anne
IT

Discrete Choice

Amanda
postdoc



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PhD

Eva
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Anna
PhD

Operations Research

Jiang Hang
postdoc

Shadi
postdoc

Iliya
PhD

Tomáš
PhD

Stefan
PhD

Pedestrian Simulation

Riccardo
postdoc

Marija
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PhD

Antonin
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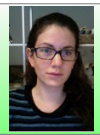

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... and what they are doing

ELECTRIC VEHICLE ADOPTION DYNAMICS: EXPLORING MARKET POTENTIALS

This project proposes innovative methods to identify the determinants of acceptance of alternative vehicles and their impact on everyday mobility.

The greatest challenge faced by the promoters of the transition towards this low carbon engine technology lies in understanding how consumers accept the financial and lifestyle investments associated with the leap from traditional to electric powertrains. This project proposes innovative methods to identify the determinants of acceptance of alternative vehicles and their impact on everyday mobility. A deeper understanding of adoption dynamics is critical to predict who will opt for EVs when and under which conditions.

This project will focus on innovative data-collection and modelling methodologies to uncover the acceptance of EVs at different stages of market-penetration (considering inexperienced/experienced users, early pioneers/late-adopters). A thorough analysis of the consumer decision-making process will lead to uncovering the barriers and success factors related to EV uptake and to forecast buying and usage behaviours related to new vehicle classes.

Principal investigator	Michel Bierlaire
Project manager	Amanda Stathopoulos
Sponsor	Nissan
Period	April 01, 2014-March 31, 2017
Collaborator	Anna Fernandez Antolin LaTeX description

... and what they are doing

REVISITING ROUTE CHOICE MODELS: A MULTI-LEVEL MODELING FRAMEWORK FOR ROUTE CHOICE BEHAVIOR

FNSNF
FONDS NATIONAL SUISSE
SCHWEIZERISCHER NATIONALFONDS
FONDO NAZIONALE SVIZZERO
SWISS NATIONAL SCIENCE FOUNDATION

The objective of this work is to set the foundations of an innovative framework that facilitates the analysis and prediction of route choice behavior in a realistic manner. The framework builds on solid ground of the current state of the art and adds on it by suggesting a new approach that reduces model complexity and brings about great flexibility. The approach is inspired by the fact that people break down the complexity of the environment by forming representations of their surrounding space. Within the proposed framework, the current approach of representing the routes as paths, consisting of sequences of links, is replaced by a more aggregate representation. The key concept in representing the routes is designated as Mental Representation Item (MRI). An MRI is a geo-marked element of the network. A hierarchical ordering of the MRIs is established based on varying levels of abstraction with respect to the transportation network. The interest lies in capturing individual's decision in the various levels of abstraction. The innovation of the approach lies i) in tackling the large size and latent nature of the choice set and ii) in the potential to reduce the combinatorial complexity of the route choice models, by simplifying the correlation structure. In addition, this approach is more behaviorally realistic in describing and explaining route choices in a mesoscopic level. The trade off between complexity and realism can be explicitly controlled by the analyst, depending on the availability of data and the application. The project benefits from an existing rich smartphone dataset which will provide a proof of concept for the methodological development and input for the estimation of the models.

Principal investigator	Michel Bierlaire
Project manager	Amanda Stathopoulos
Sponsor	Swiss National Science Foundation
Period	October 01, 2013-September 30, 2016

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Simulation

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... and what they are doing

PEDFLUX: PEDESTRIAN FLOW MODELING IN TRAIN STATIONS

SBB CFF FFS

The aim of this collaborative research project between the Swiss Federal Railways (SBB-CFF-FFS) and EPFL's transportation center is to analyze, model and optimize pedestrian flows in train stations. In recent years, the growing number of passengers has led to difficulties related to pedestrian flows in major train stations. Congestion of pedestrian walkways is increasingly becoming a problem during peak hours, but also due to clustering of people caused by major events or the beginning or end of holiday season. When capacity limits for pedestrian facilities are reached, normal operation of train schedules can be significantly impaired. Since train stations are important nodes within the multimodal public transportation system, it is of major importance that they are operated as efficiently as possible. In addition to the increase in passenger numbers, train stations have been undergoing a profound transformation from simple transit nodes towards versatile hubs that provide interface to short and long-distance train connections, to other modes including private transport by foot, bike and car, as well as to the city offering public space for shopping, eating and alike. This transformation leads to a further increase in pedestrian numbers and additionally introduces new behavior patterns. A sound understanding of pedestrian flows within a train station can help improve overall level of service, customer experience and safety. The main focus of this study lies on the development of a methodology allowing to estimate pedestrian origin-destination (OD) demand within a train station. Specifically, train time table, customer survey data and flow observations from an exhaustive camera system are used as sources of information in this process. Subsequently, the modeling frame work is applied to several case studies in Switzerland.

Principal investigator	Michel Bierlaire
Project managers	Michaël Thémans, Riccardo Scarinci
Sponsor	Swiss Federal Railways (SBB)

... and what they are doing

PEDESTRIAN DYNAMICS: FLOWS AND BEHAVIOR

This project aims at developing mathematical models of pedestrian dynamics, both at aggregate and disaggregate levels. Integrated and holistic mathematical models will handle the complexity of this unique transport mode and help us to answer open research questions. in the future, such foundations will also allow to create the tools society needs to better understand pedestrian dynamics.

FNSNF
Fonds national suisse
Schweizerischer Nationalfonds
Fondo nazionale svizzero
Swiss National Science Foundation

Principal investigator	Michel Bierlaire
Project manager	Bilal Farooq
Sponsor	Swiss National Science Foundation
Period	April 01, 2012-March 31, 2015
Collaborators	Antonin Danalet, Flurin Hänseler, Marija Nikolic LaTeX description

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Operations research

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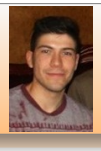

Stefan
PhD

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... and what they are doing

MODULAR LOGISTICS UNITS IN SHARED CO-MODAL NETWORKS

The objective is to achieve the first genuine contribution to the development of intercontinental logistics at the European level, in close coordination with North America partners and the international Physical Internet Initiative. The goal of the project is to enable operations with developed iso-modular logistics units of size adequate for real modal and co-modal flows of fast-moving consumer goods, providing a basis for an interconnected logistics system for 2030.

Principal investigator	Michel Bierlaire
Project manager	Jianghang Chen
Sponsor	European Commission
Period	July 01, 2012-June 30, 2015
Collaborator	Jianghang Chen LaTeX description

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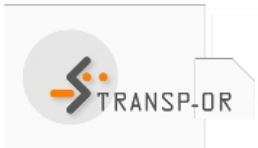
... and what they are doing

AIR NAVIGATION PLATFORM: FLIGHTS PLANNING BY USING REAL-TIME WEATHER DATA



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Flying safer, cheaper, faster are keywords of this new service. This project aims at integrating an automatic route planning system, tightly coupled with the real-time meteorological data, taking into account energy consumption of the mobile device hosting the application. The route will be computed in real time on mobile devices using the information of weather forecast and respecting to the constraints such as airspace/airport restriction and terrain avoidance, etc. The energy efficient implementation of the routing application is crucial, to provide routing information to the pilot during the entire trip. This becomes challenging, as automatic route planning often requires complex algorithms. In this project, we will target at a three-dimensional flight route-planning problem and design an efficient but robust algorithm to solve the problem. The project will last 18 months. It is conducted by TRANSP-OR in collaboration with the Xample Sàrl, ICARE Institut de recherche and Haute Ecole Spécialisée de Suisse Occidentale (HES-SO).

Principal investigator	Michel Bierlaire
Project manager	Jianghang Chen
Sponsor	Commision pour la technologie et de l'innovation, Office Fédéral de la formation professionnelle et de la technologie.
Period	March 02, 2014-September 02, 2015
External collaboration	Xample Sàrl
External collaboration	ICARE Institut de recherche
External collaboration	Haute Ecole Spécialisée de Suisse Occidentale LaTeX description

Courses

SPRING 2014

Decision-aid methodologies in transportation

Section(s): Civil Engineering
Lecturers: Amanda Stathopoulos, Jianghang Chen
Teaching assistant: Iliya Markov, Anna Fernandez Antolin
Webpage: http://transp-or.epfl.ch/courses/decisionAid2014

Enjeux mondiaux

Section(s): All sections
Lecturer: Michel Bierlaire
Teaching assistant: Stefan Binder, Antonin Danalet
Webpage: http://moodle.epfl.ch/course/view.php?id=13982

Optimization and Simulation

Section(s): Doctoral program in Civil and Environmental Engineering
Lecturers: Michel Bierlaire, Riccardo Scarinci, Jianghang Chen
Teaching assistant: Tomáš Robenek, Marija Nikolic
Webpage: http://transp-or.epfl.ch/courses/OptSim2014/

Courses

FALL 2013

Introduction à l'optimisation différentiable

Section(s): Mechanical Engineering, Electrical and Electronics Engineering, Chemistry and Chemical Engineering, Computer science
Lecturer: Michel Bierlaire
Teaching assistant: Nitish Umang
Webpage: http://transp-or.epfl.ch/courses/optimizationfall2013/

Mathematical modeling of behavior

Section(s): Mathematics, Master in Financial Engineering
Lecturers: Michel Bierlaire, Amanda Stathopoulos
Teaching assistant: Evanthia Kazagli, Anna Fernandez Antolin
Webpage: http://transp-or.epfl.ch/courses/dca2013/

Recherche opérationnelle

Section(s): Civil Engineering, Environmental Sciences and Engineering
Lecturer: Michel Bierlaire
Teaching assistant: Nitish Umang
Webpage: http://transp-or.epfl.ch/courses/rofall2013/

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Projects for students

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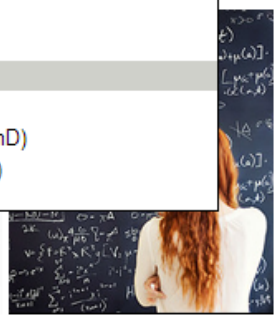

Expertise

Transportation Research
Operations Research
Discrete Choice Models

Methods

Modeling, optimization, simulation

Directed by Michel Bierlaire, the Transport and Mobility Laboratory is active in modeling, optimization and simulation of transportation systems, with a specific emphasis on the mobility of individuals.

Amanda Stathopoulos appointed professor at Northwestern University

02.03.14 Dr Amanda Stathopoulos, a post-doc in the laboratory, starts in September as Assistant Professor at Northwestern University. »

Prof. Michel Bierlaire se voit confier une chaire Francqui

01.11.13 La Fondation Francqui (Belgique) a décidé de confier une chaire Francqui 2013-2014 au Prof. Michel Bierlaire sur le thème "Mathematical modeling of choice behavior: from theory to practice". »

CONTACTS

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HOT LINKS

» EURO Journal on Transportation and Logistics

» Discrete Choice Analysis: Predicting Demand and Market

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Expertise

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Discrete Choice Models

Methods

Modeling, optimization, simulation

	Submitted on
Incorporation of a stochastic fundamental diagram into PedCTM	November 13, 2013
Prediction of pedestrian travel demand within railway stations	September 26, 2013
A discrete choice model for class attendance	August 06, 2013

COMMENTS

Click on the project title to obtain the description.
If you are interested in a project, contact the person in charge
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