



ALIASGHAR MEHDIZADEH DASTJERDI

POSITION

Postdoctoral fellowship

BACKGROUND

Ph.D. Transport Modelling

SUPERVISED BY

Catherine Morency

DATA ANALYTICS IN URBAN TRANSPORTATION

PROJECT GOALS

- Quantify the impacts of the underlying explanatory variables influencing travelers' decisions
- Forecast travelers' behavior under hypothetical scenarios
- Predict future traffic conditions on urban networks

PROJECT DESCRIPTION

Today, traffic data from different sources are collected to estimate and predict travel demand, explore behavioral regularities, quantify service reliabilities, and evaluate travel demand management programs. Statistical methods and Machine Learning models could be a highly promising approach for data analysis by delivering a greater accuracy, reduced cost, and deeper insights. In this context, transit route choice modeling and bike-sharing demand prediction are two data-driven projects in Montreal which aim at supporting knowledge-based decision making in urban transport policy.

CHALLENGES

- Data quality including incomplete dataset or lack of access
- Data preprocessing such as data cleaning, preparation and fusion
- Stochastic and complex nature of advanced methods such as Deep Learning in addition to their computational expensiveness





NAZMUL AREFIN KHAN

POSITION

Postdoctoral fellowship

BACKGROUND

Ph.D. Civil Engineering

SUPERVISED BY

Catherine Morency
Martin Trépanier

ECONOMETRIC MODELLING, TRAVEL DEMAND MODELLING

PROJECT GOALS

- Project 1: To define and model various types of intra-household ridesharing using travel survey data and to formulate scenarios
- Project 2: To estimate and forecast anticipated travel outcomes as a result of COVID-19 pandemic
- To formulate scenarios able to contribute to the reduction of GHG emissions in Quebec

PROJECT DESCRIPTION

Take advantage of econometric models to support the formulation of mobility scenarios, including the potential impacts of the pandemic.

CHALLENGES

- Developing typologies of intra-household ridesharing based on travel characteristics
- Developing various econometric modelling methods
- Forecasting individuals' anticipated travel outcomes considering extensive pandemic situations such as COVID-19





**CAMILLE
GARNIER**

POSITION

Ph.D.

BACKGROUND

B.Eng. Industrial Engineering

SUPERVISED BY

Martin Trépanier
Catherine Morency

METHODOLOGIES FOR IMPROVING PARATRANSIT SERVICES

PROJECT GOALS

- Adjusting dwell time for paratransit services with a multiple linear regression model
- Plan the integration of paratransit trips into a regular transit network
- Forecast medium-term demand for paratransit services by considering the demographics and the evolution of the mobility behavior of the target population

PROJECT DESCRIPTION

Paratransit is a door-to-door ride sharing service for people who live with a disability that prevents them from using the regular transit network. The aim of this project is to develop methodologies to optimize operational, tactic and strategic aspects of paratransit services.

CHALLENGES

- To use and analyse big data on paratransit demand in combination with demographic data of Statistique Canada
- Integration of paratransit into regular service planning tools
- Obtain data on trips made by people with disabilities with alternatives other than paratransit





**JÉRÔME
LAVIOLETTE**

POSITION

Ph.D.

BACKGROUND

B.Eng. Civil Engineering
M.A.Sc. Civil Engineering

SUPERVISED BY

Catherine Morency
Owen Waygood
Kostadinos Goulias

MODELING THE FACTORS INFLUENCING CAR OWNERSHIP AND CAR DEPENDENCE

PROJECT GOALS

- Assess the factors of influence of car ownership and its evolution
- Assess the influence of built environment and accessibility on household mobility tools ownership
- Characterize the dimensions of car dependence

PROJECT DESCRIPTION

The project aims to improve our understanding of factors influencing car ownership and car dependence. First, various modeling methods are used (aggregated, disaggregated) to measure the influence of built environment characteristics, including accessibility to mobility resources and opportunities, on motorization rates and household mobility tool ownership. Second, a perception module of a web-survey will be developed to measure travel and car related perceptions and attitudes. These dimensions will be used to build a typology of car dependence.

CHALLENGES

- To construct a complete database for modeling car ownership with various data sources at different spatial scales
- To identify the right modeling framework to control for endogenous factors (ex.: social influence) on household mobility tool ownership
- Include psychological dimensions of mobility behavior (attitudes, perceptions, norms, values) in a web-survey design





ELODIE DESCHAINTRÉS

POSITION

Ph.D.

BACKGROUND

Graduate diploma in
Engineering
M.A.Sc. Civil Engineering

SUPERVISED BY

Catherine Morency
Martin Trépanier

MODELING INTERACTIONS BETWEEN MODES OF TRANSPORT

PROJECT GOALS

- Qualify and quantify different types of interactions between modes of transport at the individual and systemic levels
- Integrate various data sources to allow longitudinal monitoring of the use of different modes of transport
- Develop models to explain/contextualize the interactions between modes and assess their impacts on travel demand

PROJECT DESCRIPTION

In a context where mobility is increasingly multimodal, this research aims at better understanding the correlations between the use of different modes of transport. To this end, a data fusion procedure will be developed in order to monitor the evolution of modal shares. In addition, indicators will be proposed to measure the multimodality of mobility behaviors and the complementarity (or competitiveness) of modes. Finally, causal inference and time series analysis methods will be applied to estimate the effect of various factors on these indicators and on travel demand.

CHALLENGES

- Merge data from a regional household survey and passive data streams
- Assess the impact of planning strategies on modal shares and multimodal travel behavior
- Build longitudinal models including several modes of transport





**YUXUAN
WANG**

POSITION

Ph.D.

BACKGROUND

MCRP

M.Sc. Civil Engineering

SUPERVISED BY

Catherine Morency

Martin Trépanier

EVALUATING TRANSIT TRAVEL TIME VARIABILITY AND RELIABILITY

PROJECT GOALS

- Evaluate transit travel time variability and service reliability for passengers using GTFS RT and transit demand data
- Identify any temporal patterns or changes related to transit service reliability
- Examine equity impacts of services reliability for different groups of people

PROJECT DESCRIPTION

This project aims to analyse the differences between the planned and operated transit services as well as the impact of the differences between both on service quality for travelers. In addition, these analysis will be conducted at various levels namely, stop level, route level, transfer level, as well as network level. The methodologies developed from this project will be able to help agencies identify their operational deficiencies and improve service reliability. The accounting of travelers features will provide opportunities for segmented analysis.

CHALLENGES

- Combine multiple data sources, such as GTFS Real Time, smart card, or travel survey data
- Resolve issues related to processing large datasets, such as database design, methodology, and potential performance concerns
- Propose indicators and metrics which are replicable and relevant for transit operators





**ASAD
YARAHMADI**

POSITION

Ph.D.

BACKGROUND

Graduate diploma in
Natural Resources Engineering,
GIS and Remote Sensing

SUPERVISED BY

Catherine Morency
Martin Trépanier

A FRAMEWORK TO DEVELOP OPTIMAL SETS OF DRIVING CYCLES FOR A REGION

PROJECT GOALS

- To identify the most relevant driving cycle(s) in typical classes of driving conditions
- To develop a typology of road segments relevant for the modelling of driving behaviours
- To gain insight into the impacts of exogenous factors on driving patterns and to realize the most deterministic factors on variability of driving cycle

PROJECT DESCRIPTION

Driving Cycle is one of the main inputs of vehicle emissions models. Exogenous factors like road features can make variability in driving cycle which leads to uncertainty in vehicle emissions estimation. To solve this problem, this project puts forward a framework to develop and to identify optimal sets of driving cycles required to represent a full set of conditions observed in an urban area. To do this, first a typology of road network will be proposed then relevant driving cycles for each road segments under various driving conditions will be developed and identified.

CHALLENGES

- Classifying influencing factors features so that each class has different influence(s) from other classes while values in a group have same effects on DCs
- To determine the optimal number of driving cycles required to represent the diversity of road segment types
- Availability of required data for long-term period specially for trajectory and weather data





**KAVEH
REZVANI DEHAGHANI**

POSITION

Ph.D.

BACKGROUND

B.Sc. Civil Engineering

SUPERVISED BY

Catherine Morency

ROBUSTNESS ANALYSIS OF URBAN TRANSPORTATION NETWORKS

PROJECT GOALS

- To introduce a framework to assess the robustness of multimodal urban transportation networks
- To explore various methods to model the impacts of incidents and events in urban transportation networks
- To identify the important links and vulnerable points of AN urban transportation network

PROJECT DESCRIPTION

Disruptions such as accidents, incidents, weather conditions and events can affect the performances of urban transportation networks. A disruption on one link may rapidly impact surrounding links and if not addressed, this sequence may affect a considerable portion of the network and generate inconveniences for travelers. This project aims to assess the robustness of unimodal and multimodal networks as well as to evaluate the potential of multimodality approaches to face various types of events.

CHALLENGES

- Constructing and formulating unimodal and multimodal networks
- Identifying parameters useful to describe network performance and assess their impact on network robustness
- Propose indicators and metrics to quantify the robustness of urban networks





GABRIEL LEFEBVRE-ROPARS

POSITION

Ph.D.

BACKGROUND

B.Sc. Urban Planning
M.A.Sc. Civil Engineering

SUPERVISED BY

Catherine Morency
Paula Negron-Poblete

A METHODOLOGY FOR THE ASSESSMENT OF STREET SPACE AND TIME ALLOCATION

PROJECT GOALS

- Develop measures of urban street space and time allocation
- Assess the equity of street and time allocation in Montréal
- Model the impacts of current allocation parameters (safety, mode choice...)

PROJECT DESCRIPTION

This project aims at developing an automated tool to measure the allocation of space and time of urban streets to users according to the mode they use and the activities they carry out. Once the allocation is measured, its equity will be assessed using indicators developed for this purpose. The impacts of the current allocation parameters on mode choice and road safety will also be modelled. Alternate scenarios based on these models will then allow to make recommendations on the reallocation of space and time in urban streets.

CHALLENGES

- Fusion of large datasets
- Application of equity frameworks to street space and time allocation
- Treatment of both spatial and temporal dimensions of the street





MOHAMED KHACHMAN

POSITION

Ph.D.

BACKGROUND

Graduate diploma in
Engineering
M.A.Sc. Civil Engineering

SUPERVISED BY

Catherine Morency
Francesco Ciari

SPATIAL POPULATION SYNTHESIS METHOD

PROJECT GOALS

- Define and test different synthesis methods for a population of individuals and households
- Define and test spatialization methods of the different types of synthetic households at the housing unit scale
- Develop indicators to measure the quality of synthesis and spatial disaggregation

PROJECT DESCRIPTION

This project aims to develop a spatialized synthesis method of a population of households and individuals based on the OD survey sample and the public use micro-data files to support travel demand forecasting in Quebec. The method will be tested for the Montreal area. First, a synthetic population of individuals and households is generated. Then, households are spatialized according to the spatial distribution of household types in the OD survey. Finally, indicators are developed to measure the quality of the synthetic population.

CHALLENGES

- Application of population synthesis approaches to travel demand forecasting in Quebec
- Adaptation of spatial analysis methods (regression, filtering and expansion) to the population synthesis exercise
- Including totals fit and resemblance of joint distributions in quality indicators





**JOLIANN
MORISSETTE**

POSITION

M.A.Sc.

BACKGROUND

B.B.A. (trilingual track)

SUPERVISED BY

Martin Trépanier
Catherine Morency

ESTIMATING CARSHARING'S ENVIRONMENTAL IMPACTS

PROJECT GOALS

- Evaluate the potential of carsharing to replace private vehicles
- Calculate Montreal's latent demand for station-based carsharing
- Compare members and non member's characteristics and mobility habits

PROJECT DESCRIPTION

The research aims to contribute to the understanding of carsharing services environmental impacts. In addition to estimating how behaviors are different for members of a shared mobility service and people with no memberships, the socio demographic information that play a role in said memberships are evaluated. The folder containing the answers of the satisfaction survey from Communauto, the transactional historical data from the company and the results from the 2008 and 2018 Origin-Destination survey are used.

CHALLENGES

- Databases' connectivity is limited since there is no common key to join them
- It is difficult to obtain precise results regarding GHG emissions for members and non members since no information on the type of vehicle used is given
- The data being limited, no deep understanding of Communauto members can be obtained on the impacts of their membership on their habits other than their opinion





CHARLOTTE POIRIER

POSITION

M.A.Sc.

BACKGROUND

B.Sc. Urban Planning

SUPERVISED BY

Catherine Morency

DIVERSITY OF TRANSIT ALTERNATIVES USING RELATIVE AND ABSOLUTE QUALITY

PROJECT GOALS

- Develop a method to assess the quality of alternatives (paths) for various OD pairs
- Evaluate the diversity of alternatives and identify deserts of alternatives
- Validate that adding an access mode improves the quality and diversity of transit alternatives

PROJECT DESCRIPTION

This project aims to develop a method to assess the diversity of transit alternatives based on relative and absolute quality (quality and diversity of routes). The underlying assumption is that some alternatives do not reach a minimum quality threshold. To validate this assumption, alternatives will be generated and evaluated for OD pairs and will then be filtered according to their quality and diversity. The impact of adding a transit access mode will also be assessed with respect to its contribution to improve quality and diversity of available routes.

CHALLENGES

- There is few research on the diversity of alternatives
- Threshold distances to access public transportation for each mode are often set arbitrarily
- Considering the frequency of transit in the analysis is complex





FOROUZ ALAHYARI FARD

POSITION

M.A.Sc.

BACKGROUND

B.Eng. Civil Engineering

SUPERVISED BY

Geneviève Boisjoly
Catherine Morency

SPATIO-TEMPORAL MODELING OF TAXI TRIPS

PROJECT GOALS

- Develop a model to explain taxi trip demand
- Experiment various types of models (with spatial components, multi-levels) and compare their performances
- Identify factors able to explain the spatial-temporal fluctuations of taxi trips

PROJECT DESCRIPTION

This project aims to develop a model able to explain taxi trip demand able to correctly represent its spatial-temporal variations. A descriptive analysis first allows to evaluate the level of taxi use variability in space and time. Multiple variables are then explored in order to identify the most promising ones i.e. those to include in a model. Various models will be tested and their performances will be compared. The project will also allow to assess the impacts of various supply scenarios on potential demand.

CHALLENGES

- Taxi is often used for irregular and occasional trips, making it harder to identify spatial and temporal explanatory factors
- No demographic information is available regarding the taxi user
- Estimating taxi latent demand is a complex task





MOHAMED SAUDI HASSANI

POSITION

M.A.Sc.

BACKGROUND

B.Eng. Civil Engineering

SUPERVISED BY

Catherine Morency

ANALYSING THE INTERACTIONS BETWEEN URBAN SPRAWL AND ROAD SUPPLY

PROJECT GOALS

- Quantify the evolution of urban sprawl using various quantitative indicators
- Quantify the evolution of transport supply and demand
- Put the evolution of transport supply and demand into perspective with the different growth profiles of the territories

PROJECT DESCRIPTION

The objective of this project is to analyze the interactions between urban sprawl, road supply and mobility behaviors. By putting the result of the indicator calculations into perspective, it is possible to explain the impact of the increase in road capacity on the evolution of travel times and distances, on the activity space of the population of a given sector and on the densification of territories. It is also expected to clarify the interaction between the urban development pattern, the transport supply and induced demand.

CHALLENGES

- Characterize urban sprawl using quantifiable indicators
- Analyze trends and interactions between urban sprawl, transport supply and demand
- Integrate the results into a viable model allowing short and long term projections





**EYA
CHEKIR**

POSITION

M.A.Sc.

BACKGROUND

Graduate diploma in
Hydraulic Engineering

SUPERVISED BY

Catherine Morency

INTERACTION BETWEEN WALKABILITY AND PUBLIC TRANSPORT ATTRACTIVENESS

PROJECT GOALS

- Propose metrics to evaluate pedestrian access to transit nodes for various types of trips and travellers
- Evaluate the effect of pedestrian system quality on the public transport attractiveness.
- Develop scenarios for improving the pedestrian pathways.

PROJECT DESCRIPTION

This project aims to study the relationship between the features of the pedestrian route to transit nodes and public transit attractiveness. To do this, various metrics allowing to account for walking conditions (for various types of trips and travelers) must be developed. Refining the estimations of transit access conditions will allow to evaluate the global network accessibility as well as the impacts of various improvement scenarios on current and potential users of the system.

CHALLENGES

- To identify measurable factors that impact the perceived quality of walking conditions towards transit nodes
- Compute walking trajectories to reach transit nodes for a synthetic population
- Develop latent demand scenarios (impact of access improvement on potential users)





**HUGO
ROBERT**

POSITION

M.A.Sc.

BACKGROUND

Graduate diploma in
Engineering

SUPERVISED BY

Catherine Morency

ASSESSING THE POTENTIAL MARKET FOR A E-CARSHARING SERVICE IN OUTAOUAIS

PROJECT GOALS

- Evaluate the potential market for a e-carsharing service in a low-density area
- Determine the mobility needs of the population, especially in a post-COVID period
- Construct multi-perspective knowledge of the area (demography, opportunities, transportation supply)

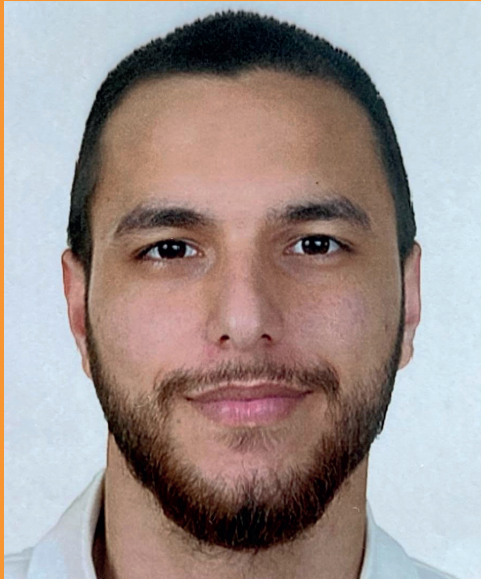
PROJECT DESCRIPTION

This project aims to evaluate the potential market for a a carsharing service in a non-urban area. The project consists to describe the area (demography, transport supply, mobility behavior), completed by a literature review dedicated to carsharing services in low-density areas and strategies to reduce car ownership. Then, the administration of a survey will allow to determine the mobility needs of the population. Finally, collected data will allow to estimate the potential market for such service as well as to identify key parameters to account for in the design of the service.

CHALLENGES

- To make a literature review of e-carsharing in non-urban territories and strategies to decrease car ownership
- To develop a survey able to assist in the evaluation of the potential market of a e-carsharing service
- To analyze data and to propose components of scenarios for the potential carsharing service





**MOHAMAD ABDUL
MAJID DABBOUSSI**

POSITION

M.A.Sc.

BACKGROUND

B.Eng. Civil Engineering

SUPERVISED BY

Catherine Morency
Geneviève Boisjoly

MODE CHOICE MODELLING THAT CONSIDERS TRIP CHAINS

PROJECT GOALS

- Understand how trip chaining patterns have evolved over time and space and within different population segments
- To develop an updated mode choice model which accounts for the structure of trip chains, namely complex chains
- To evaluate how trip chain structure could affect possible modal alternatives

PROJECT DESCRIPTION

Typical mode choice models do not account for the structure of trip chains, and instead focus on independent trips. This project aims to illustrate the effect of accounting for trip chains in mode choice models, by comparing a trip based model against a trip chain one, while also trying to evaluate how changing the structure of a trip chain could possibly improve the potential for alternative modes of transportation.

CHALLENGES

- Generation of mode alternatives especially for complex trip chains
- Accounting for all factors having an incidence on mode choice
- Identifying a suitable corridor or population segment to conduct the study





**IKRAM
SELMI**

POSITION

M.A.Sc.

BACKGROUND

Graduate diploma in
Applied Mathematics and
Modelling

SUPERVISED BY

Martin Trépanier
Catherine Morency

DESTINATION ESTIMATION OF TRANSIT USERS USING SMART CARD DATA

PROJECT GOALS

- Propose various improvements to the destination imputation algorithm for transit users
- Analyse the sensitivity of the algorithm performances for various types of transit users
- To account for transit user behaviours in the identification of the algorithm parameters

PROJECT DESCRIPTION

This project aims to refine a destination estimation algorithm in order to determine the alighting point for each boarding of a public transport user based on the historical data collected by smart cards according to the frequency use, on user behavior and on the assumptions considered. It covers the adjustment of walking distance, transfer time, and departure and travel times.

CHALLENGES

- The unavailability of the actual destination for the validation of the estimation
- Find the destination locations for unliked trips
- The presence of erroneous data recorded in the database





**HAMED
ALI ZADEH**

POSITION

M.A.Sc.

BACKGROUND

B.Eng. Civil Engineering

SUPERVISED BY

Catherine Morency
Martin Trépanier

SUPPLY AND DEMAND IN QUEBEC INTERCITY TRAVEL CORRIDORS

PROJECT GOALS

- Propose a typology of corridors for intercity trips in Quebec
- Develop a method to estimate travel demand in the main intercity Quebec corridors
- Propose various service supply scenarios and assess the applicability of various mobility options

PROJECT DESCRIPTION

The project focus on intercity travel in Quebec. It aims to define and characterise the main intercity travel corridors using various attributes of linked regions, transport supply and travel demand. Various datasets are used in this project namely data from the EVRC (Enquête sur les voyages des résidents du Canada) which feed the development of a trip generation model.

CHALLENGES

- Develop a more precise understanding of intercity travel, often composed of irregular trips
- Develop a travel demand forecasting model for intercity trips in the main corridors
- Propose a relevant and adaptable definition, for the various regions, on long-distance travel in Quebec





ANTONIN DARROU

POSITION

M.A.Sc.

BACKGROUND

Graduate diploma in
Engineering

SUPERVISED BY

Catherine Morency
Martin Trépanier

MODELLING TRANSIT RIDERSHIP

PROJECT GOALS

- Identify factors influencing the variations in bus ridership
- To develop a model allowing to forecast ridership for strategic use (medium-term)
- Develop scenarios regarding the evolution of various explanatory factors

PROJECT DESCRIPTION

The Société de transport de l'Outaouais (STO) is one of the major transportation company of the Gatineau-Ottawa region. In the recent years, its ridership has significantly increased, generating important strategic planning needs. Forecasting ridership on a transit network allows to anticipate what improvements are required as well as the necessity to invest in equipment and infrastructures. STO is aiming to better understand the factors having an incidence on its ridership in order to be more agile in the adaptation and bonification of its services.

CHALLENGES

- Picture current status in terms of transport, land-use and demography of the Ottawa-Gatineau region
- Assess the performance of several forecasting models to select the most relevant and fitted ones to the study context
- Develop scenarios concerning the recovery of travel habits following current disruptive events





HUBERT PERREAULT

POSITION

Research internship

BACKGROUND

B.Eng. Civil Engineering

SUPERVISED BY

Catherine Morency

E-BIKE'S POTENTIAL AND THE FACTORS CONDUCTIVE TO ITS EMERGENCE

PROJECT GOALS

- Propose and apply an estimation method on e-bikes potential
- Establish an annualization strategy to estimate e-bike's potential, considering weather conditions
- Analyze the data collected on e-bikes commutes in order to identify the journeys targeted by this new mode of transport

PROJECT DESCRIPTION

The project consists of exploring the scientific literature on Electrically Assisted Bicycles (e-bikes), proposing a methodology for evaluating the potential of this mode and analyzing the data collected during pilot-project in order to identify the share of the mobility market that could eventually be taken by e-bikes.

CHALLENGES

- Deepen knowledge about e-bikes' usage and incentive programs across the world
- Establish an evaluation method to collect data required for studying e-bikes' potential
- Build a large enough database to reflect the place of e-bikes in urban areas

