



## Inside

**Susan Tighe, Professor**, undertakes pavement research. (Page 4)

**Kyrylo Cyril Rewa, Masters Candidate**, is undertaking research to understand Region of Waterloo cyclist demographics and their travel behaviour. (Page 5)

**Amir Ghods, PhD Candidate**, is developing new algorithms to model the over-taking behaviour of driver on two-lane rural highways. (Page 6)



## Message from the UW-ITE SC

**David Duong, UW-ITE SC Secretary:** The University of Waterloo Institute of Transportation Engineers Student Chapter (UW-ITE SC) is currently under new management after its 2011-2012 elections. The 2011-2012 executive board members are:

President – **Amir Ghods**, PhD Candidate.

Vice President – **Soroush Salek Moghaddam**, PhD Candidate.

Secretary – **David Duong**, PhD Candidate.

Treasurer – **Kyrylo Cyril Rewa**, MASc Candidate.  
Treasurer – **Akram Nour**, PhD Candidate.

Webmaster – **Deborah Santiago**, MASc Candidate.

Academic Events Director – **Roshanak Taghipour**, MASc Candidate.

Social Events Director – **Mohab El-Hakim**, PhD Candidate.

Our chapter is composed of 50+ transportation graduate students, whom strive to do their best in the transportation field. We

will continue our goal of promoting the transportation profession within the University of Waterloo. Within the last two academic terms we have been highly successful in winning grants from the University's Graduate Student Endowment Fund (GSEF), which are used for our social and academic events. Learn more about our academic events (page 3) social events (page 4) in this newsletter.



# Message from the President

Welcome to the first issue of the University of Waterloo Institute of Transportation Engineers Student Chapter (UW-ITE SC) newsletter (WatMoves). It is an honor for me to write the first welcome message of WatMoves. In spite of its bumpy beginning, we are happy that our inaugural issue of WatMoves is being published today. From now on, an issue of WatMoves will be provided every term. WatMoves includes recent news and information about activities in the UW-ITE Student Chapter and Transportation Systems Research Groups at the University of Waterloo. I thank all the executive members for making this issue possible specially David Doung and Deborah Santiago for providing editorial works.

Currently our student chapter membership is around 50 + graduate and undergraduate students. Our membership is growing rapidly as the transportation engineering program at the University of Waterloo is expanding. The activities of our student chapter include holding

academic seminars, guest lecturers, social events, organizing technical tours and visits. The academic seminars and guest lecturers are in different transportation areas, e.g. traffic engineering, road safety, ITS, pavement, winter maintenance, and planning. Our social events include transportation group BBQ, yearly Grad House get-together to introduce new group members and facilitate networking, paintball, bowling and much more. The UW-ITE student chapter is proud of our continued energetic activities over the years that enhance students' knowledge in the field of transportation engineering.

I hope you enjoy the issue and follow up with WatMoves periodically.

Yours truly,

**Amir Ghods**  
Chapter President



## "Accident Prediction Models for Signalized Intersections in Fortaleza City - Brazil".

Dr. Flavio Cunto

## Academic Events

### Expanding the Mind

In 2011, the UW-ITE SC has hosted six seminars on various transportation-related topics. The objective of our seminar series is to provide a forum where transportation engineers from Canada and around the world can share their knowledge. Four of these seminars included presenters from China, Italy, Brazil and USA. The UW Graduate Student Endowment Fund and Transport Group professors provide funding for these seminars.

**1) Jonathan Kwon, PhD Candidate (UW)**, June 8, 2011 on "SAR Remote sensing of Canadian coastal waters using total variation optimization segmentation Approaches". Jonathan's research can be adopted to derive geometric parameters (e.g. curvature, grades, etc) of road segments from aerials or satellite photos.

**2) Dr. Xumei Chen, PhD, Visiting Scholar (China)**, June 21, 2011 on "Micro-simulation study of the effect of median bus lanes with midblock stop on capacity of urban signalized intersection"

**3) Vincenzo Pasquale Giofrè, PhD Candidate, Visiting Scholar (Italy)**, June 24, 2011 on "Economical method for collecting traffic data". Vincenzo demonstrated his trajectory extraction algorithm that works through image recognition and can be used on videotape data.

**4) Dr. Flavio Cunto, Assistant Professor, Federal University of Ceará (Brazil)**, July 26,

2011 on "Accident Prediction Models for Signalized Intersections in Fortaleza City - Brazil". Flavio showcased his statistical crash prediction models fitted using Brazilian data from the city of Fortaleza. His research is part of a national project funded by the government of Brazil to improve their road safety assessment methods.

**5) Mohab El Hakim, PhD Candidate (UW)**, September 21, 2011 "Evaluation of field strain in asphalt perpetual pavements using laboratory testing". The project included the construction of a test section on Highway 401, and is currently utilized by collecting data from various sensors embedded in the pavement layers. This research is implemented by Centre for Pavement and Transportation Technology (CPATT) in UW.

**6) Dr. James Tsai, Associate Professor, Georgia Institute of Technology (USA)**, October 17, 2011 "Sensor-based and Spatial-enabled Pavement/Asset Management". This project is a US national demonstration research project, sponsored by the US Department of Transportation. Dr. Tsai is in charge of this project to develop an intelligent roadway asset inventory system with a van equipped with lasers, LiDAR, GPS, Inertia Measurement Unit (IMU), Distance Measurement Unit (DMI), and cameras.

We look forward to hosting more of these academic seminars as we head into the Winter term.

# Social Events

## UW-ITE Pizza, Pop and Play

Our social events provide a place where transportation students and professors network, talk, and share their ongoing experiences in the field. To start the Fall term off, a “Pizza, Pop, and Play” event was held in late-September at Waterloo Park. New and old students and professors attended. The UW-ITE SC executive board was re-introduced to everyone. Transportation engineers need to maintain a good work-life balance. We like the motto of “work hard and play hard”.



We like the motto of “work hard and play hard”.



## UW-ITE BBQ

During the summer term a BBQ was held at the local Waterloo Park. The BBQ was a great success with 20+ members attending along with their family members. The group played Frisbee and soccer afterwards.





## Christmas Party Expanding the Mind

The Student Chapter hosted its first annual Christmas party on Tuesday, December 13, 2011 at the Grad House. Approximately 40 students, professors and their families came out for the festive event. This event allowed for networking opportunities between students and professors, where they could talk shop over snacks and drinks. There were four door prizes awarded at the event and the winners were: i) Roshanak Taghipour, ii) Jianyi Fu, iii) Professor Jeff Casello, and iv) Samantha Pinto (basket prize winner). Special thanks to the organizing committee members (David, Amir, Reza, Deborah, Kyrylo and Soroush) for making this event successful. Seasons greeting to all our readers.

Happy Holidays from  
UW-ITE Student  
Chapter!



**Professor Highlight**  
**Susan L. Tighe**  
**PhD, PEng Canada**  
**Research Chair and the**  
**Norman W. McLeod**  
**Professor in Sustainable**  
**Pavement Engineering**



**By Mohab El-Hakim, PhD Student**

Professor Tighe is a national and international leader in the field of pavement engineering and infrastructure management research. She is currently leading major national project to develop the new Transportation Association of Canada 2012 Pavement Asset Design and Management Guide. She is working on advancing sustainability and climate change impact on infrastructure. She has been involved in projects in Africa, Australia, China, Chile, New Zealand and the United States. She held prestigious visiting professor fellowships including the Royal Academy of Engineering, United Kingdom as a visiting professor at University of Nottingham. In addition, she was awarded the Erskine Fellowship at the University of Canterbury in New Zealand. As a result for her Canadian and international contributions, she received various awards including “Canada’s Top 40 under 40” award in 2006, the

Professional Engineers Young Engineer Award and featured as a Woman of Waterloo 2010.

As the Director of the Centre for Pavement and Transportation Technology (CPATT) at the University of Waterloo, Professor Tighe has a broad research interest related to sustainable pavement engineering and management, evaluation of climate change on roads, application of asset management to highway and airport operations, designing and building safer roads, life cycle analysis of roads and solar technology in roads and pavement infrastructure. This wide range of research interest has a unique effect on the quality of her graduate students. Her graduate students are working on various research projects. The members of her research group gain invaluable experience. They are highly sought after by industry and assume a variety of leadership roles in public agencies, private companies and academia. Professor Tighe encourages her research group to collaborate and work together. Thus, all students in the group participate in laboratory testing, field work, data collection and surveys. Graduate students supervised by Professor Tighe usually extend their knowledge through participation in conferences and professional training beyond their main research topics so they are well-prepared for the challenges of the real world.

Feature projects currently ongoing by Professor Tighe’s group include the evaluation of pavement distress management for the Town of Markham, quantifying pavement sustainability in the Town of

**“She received various awards including “Canada’s Top 40 under 40” award in 2006, the Professional Engineers Young Engineer Award and featured as a Woman of Waterloo 2010.”**

Markham, perpetual pavement evaluation project with Ministry of Transportation of Ontario and various partners, automated performance measures for contract administration, development of evaluation of breaking availability testing device, recycling asphalt shingles and evaluation of pervious pavement technology.

Professor Tighe is married and has two daughters. In her spare time, she enjoys running, skiing, golfing and spending time with her family.

# Masters Candidate Highlight

Kyrylo Cyril Rewa

UW-ITE Student Chapter – Treasurer, Masters Candidate



Kyrylo Rewa is currently a Transportation Engineering master’s candidate within the Department of Civil and Environmental Engineering at the University of Waterloo, under the supervision of Dr. Jeff Casello. Kyrylo also completed his undergraduate studies at the University of Waterloo’s School of Planning. He is also a recipient of a 2011-2012 Canadian Transportation Research Forum Scholarship (worth \$6,000).

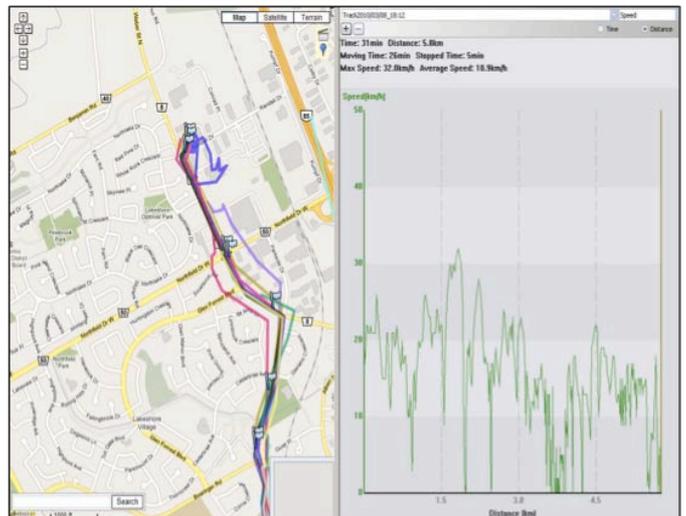
The focus of Kyrylo’s graduate research is a joint study with The Regional Municipality of Waterloo in which the demographic profiles of cyclists are gathered through surveys and are matched with cyclists’ revealed travel preferences, which are gathered by GPS units. The two data sources are used to understand

whom the regional cyclists are and how to better plan and design bicycle facilities as well as predict travel demands. The objective of Kyrylo’s research is to translate results of his work in the continued development of Regional policies, programs and designs for cycling activity.

When asked about his current experience as a member of the student chapter executive board, he stated “I found the UW-ITE Student Chapter a great resource in my transition of fields, from planning to engineering, as well as getting involved in academic and social activities. As a member of the executive board, I have had a chance to extend the same courtesy to new students, and find UW- ITE a great common ground for new students whether they are from Canada or International. I am very proud of the progress and look forward to continue to working with our executive board and student members.”



**“I found the UW-ITE Student Chapter a great resource in my transition of fields, from planning to engineering.”**



## Doctoral Candidate Highlight

**Amir Ghods**  
**UW-ITE Student Chapter President,**  
**PhD Candidate**

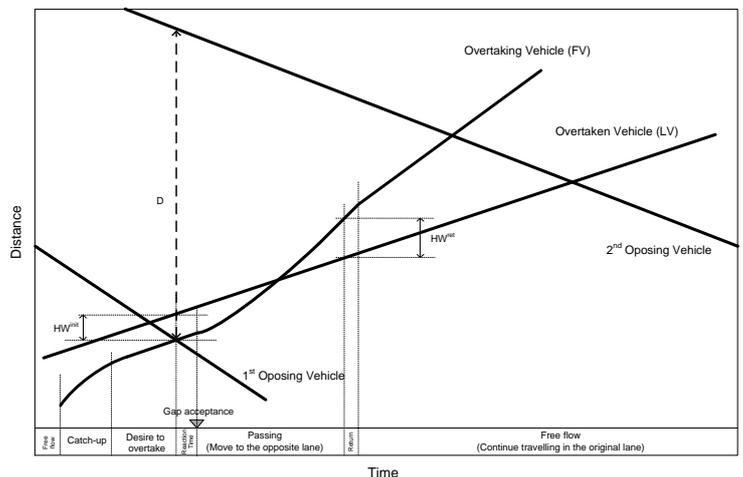
Amir is currently undertaking his doctoral studies in Transportation Engineering in the Department of Civil and Environmental Engineering at the University of Waterloo, under the supervision of Professor Frank Saccomanno. His Masters degree is from the University of Tehran, Iran, in Electrical Engineering on the development of new ramp metering algorithms that incorporates variable speed limit signs. This year he has received a Transportation Association of Canada Foundation Scholarship – specifically, the Canadian Council of Motor Transport Administrators scholarship (\$5,000) –, as well as a Queen Elizabeth II (QEII) Graduate Scholarship in Science and Technology (\$5,000).

His research interests lie in the area of road safety, driving behavior simulation, intelligent transportation systems, and traffic control. His PhD research topic is to propose a microscopic simulation model to better explain overtaking behavior on rural two-lane highways. The overtaking maneuver is one the most complex driving regimes on two-lane highways, and plays an important role in highway safety and operational efficiency. In spite of advances in modeling driving behaviors, the understanding of overtaking on rural two-lane highways has not kept pace with the understanding of other driving regimes, such as, car-following, gap acceptance at intersections, and lane-changing. Video recording of a two-lane highway segment, where the overtaking is allowed, is used to calibrated the propose overtaking model.

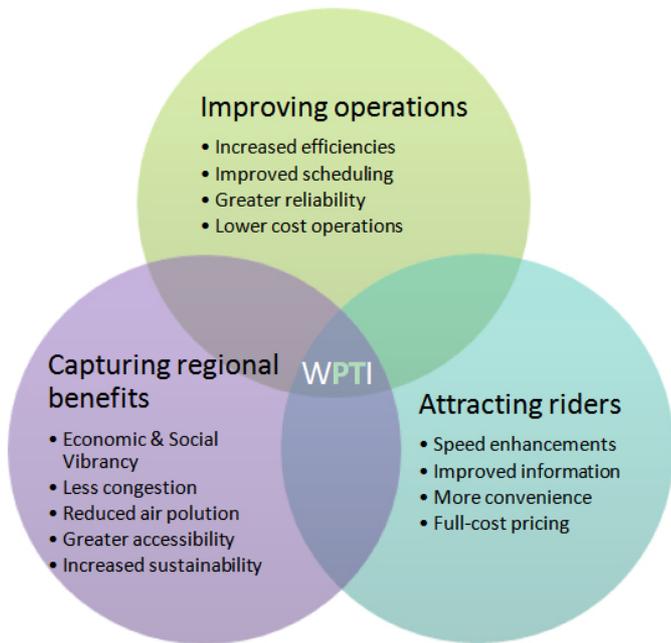
Amir has served in the UW-ITE student chapter as Vice-President and Webmaster before taking on the role of President. Amir is married and enjoys swimming, playing basketball, volleyball, and soccer in his spare time.



**“My main future goal is to make the student chapter in close touch with the transportation industry”**



# Research Group Highlight



## WATERLOO PUBLIC TRANSPORTATION INITIATIVE

The Waterloo Public Transportation Initiative (WPTI) is a research group at the University of Waterloo led by Professors Jeff Casello and Bruce Hellinga. WPTI aims to provide expertise in the fields of urban transportation planning and engineering - with an emphasis on transit - to address the challenges relevant to Canadian and global cities.

Most broadly defined, WPTI's research focuses on the intersection of public transit's three primary goals: (1) attracting riders, (2) improving transit operations, and (3) capturing the regional benefits where the transit agency operates.

WPTI's research team holds a wealth of experience in the transit industry and covers a broad range of research areas, including:

### Attracting riders

(1) Developing methods to quantify ridership impacts of potential capital investments or operational improvements; (2) Determining the feasibility of transport / land use policy measures; (3) Evaluating methodologies in assessing alternative transit modes in cities of varying land-use and socio-demographic characteristics; (4) Evaluating information technologies for transit to attract and retain riders.

### Improving operations

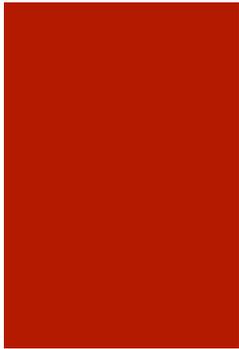
(1) Determining ways for transit planners to use data collected from new technology to optimize routes and schedules; (2) Quantifying operating costs and travel time savings from the implementation of new transit technologies; (3) Examining best practices in monitoring and benchmarking system performance through the use of data from transit information technologies; (4) Developing methods to evaluate the long-term impacts of new fare collection technologies, including reduced dwell times, lower fare evasion and reduced costs; (5) Evaluating the optimal roles of private sector involvement in financing, supporting or operating transit service.

### Capturing regional benefits

(1) Developing quantitative and qualitative models to document the achievement of environmental goals as a function of mode split or operational practices; (2) Quantifying the benefits of transit in promoting sustainable land use patterns; (3) Measuring land value increases adjacent to transit investments as a means to generate public revenue; (4) Quantifying the benefits of transit in providing social mobility.

If you wish to find out how WPTI can help you develop solutions for efficient, competitive, socially-supportive public transit, please visit us at <http://www.civil.uwaterloo.ca/wpti>.

# Transportation Systems Research Group (TSRG) Highlights



## A sample of Dr. Hellinga's Current Research

### Using Smart phones to obtain travel behaviour data:

This research investigates the use of Blackberry smart phones to automatically collect travel data using the device's GPS. The user simply starts the custom application and the data are automatically collected and sent wirelessly to our server where algorithms automatically extract travel behaviour characteristics such as trip origin, destination, route, intermediate activity stops, modes, etc.



### Predicting arterial and highway travel times using Bluetooth data:

Bluetooth detectors are a low cost option that can be used to measure vehicle travel times over defined sections of roadway. Using these data, this research is developing algorithms for predicting the travel times that will be experienced by motorists over the next 5 to 30 minutes. In cooperation with MTO (Ministry of Transportation of Ontario) and TPA North America (a Bluetooth detector vendor), a test site has been established in Waterloo Region on three provincial highway sections and field evaluations of the freeway travel time prediction algorithms are to be completed over the first quarter of 2012.



### Using transit AVL and APC data to prioritize intersections for priority treatment:

One of the challenges that transit agencies and municipalities face is the prioritization of intersections for transit priority treatments. Typical methods include the use of dedicated data collection surveys to measure transit vehicle delays. However, these surveys are resource intensive and provide data for limited routes and days. This research has developed methods by which archived AVL/APC (Automatic Vehicle Location/Automatic Passenger Counter) data can be used to estimate transit vehicle delays at signalized intersections and estimate the maximum length of the queues that form at these intersections. This work is being conducted in co-operation with Grand River Transit, the transit agency in the Region of Waterloo.



### The influence of pedestrians on roundabout operations

There is currently a substantial interest in the use of roundabouts as an

intersection treatment in many Canadian urban centres. A wide range of analysis methods/tools exist to estimate the expected operations of a planned roundabout. However, all of the existing analytical methods fail to capture all of the effects that pedestrians have on roundabout capacity and delays. In particular, existing methods consider only the influence that pedestrians have on vehicles attempting to enter the roundabout. However, vehicles must also yield to pedestrians when leaving the roundabout. This research resulted in the development of an analytical model for roundabouts with single lane circulating roadways that explicitly considers all impacts of pedestrians on roundabout operations.



Photo credits: 1. SimonQ; 2. Danielle Scott; 3. Wikipedia; 4. Ian Britton;

# Transportation Systems Research Group (TSRG) Highlights

## A sample of Dr. Fu's Current Research

### Development of Output and Outcome Models for End-results Based Winter Road Maintenance Standards:

(Funded by MTO, Aurora, Salt Institute): This research investigates the quantitative relationship between road safety and traffic mobility (maintenance outcome) and various road weather, traffic and environmental factors including road surface conditions (maintenance output). The results will be used to evaluate alternative performance measures for benchmarking winter road maintenance operations and to develop improved maintenance service standards.



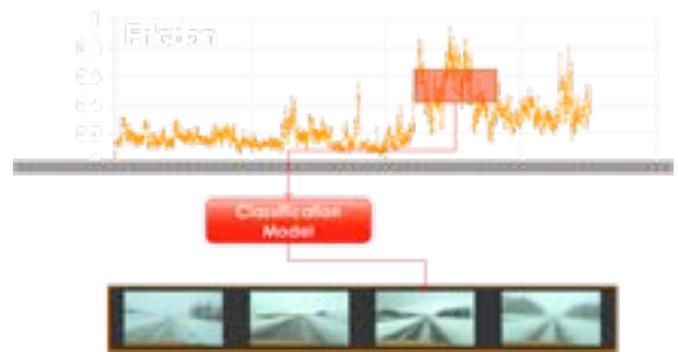
### Optimum Deicing and Anti-icing for Parking Lots and Sidewalks:

(Funded by NSERC - CRD, Landscape Ontario, Go Transit, Region of Waterloo, MTO, OGRA, SIMA, TRCA): The objective of this project is to determine the optimum salt application rates for parking lots and sidewalks through a series of rigorous field tests. The results from the research are expected to be used by all maintenance contractors to improve their practice and environmental stewardship, while reducing over-salting and operational costs.



### Evaluation of the Field Performance of Organic Products for Snow and Ice Control:

(Funded by City of Burlington, Town of Oakville, MTO): The objective of this project is to quantify the effectiveness of several bio-based products for deicing and anti-icing operations. In particular, the research attempts to determine the relative field performance of these new chemicals as compared to regular salts under specific climate and weather conditions, and the optimal mixing ratios and application rates when used in combination of regular salts and brines.



### Other Research Topics:

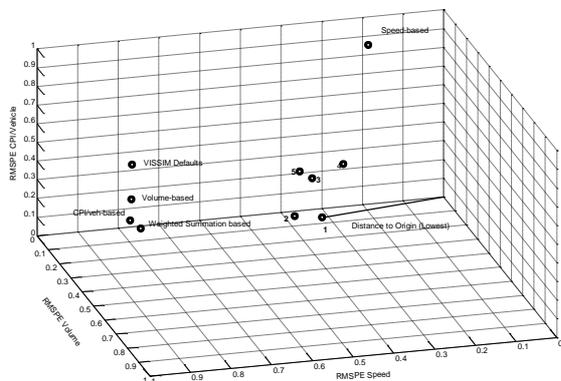
- Spatial Mapping and Prediction of Road Surface Conditions
- Optimization of RWIS Sensor Density and Location
- Development of Performance Measurement Tool ([www.iwinman.com](http://www.iwinman.com))
- Micro- and Macroscopic Driver Choice Behavior under Adverse Winter Weather Conditions
- Development of Winter Driving Risk Index
- Image Based Automated Road Condition Monitoring
- Models for Hotspot Identification and Countermeasure Analysis of Highway-Railway Grade Crossings ([www.gradex.ca](http://www.gradex.ca))

# Transportation Systems Research Group (TSRG) Highlights

## A sample of Dr. Saccomanno's Current Research

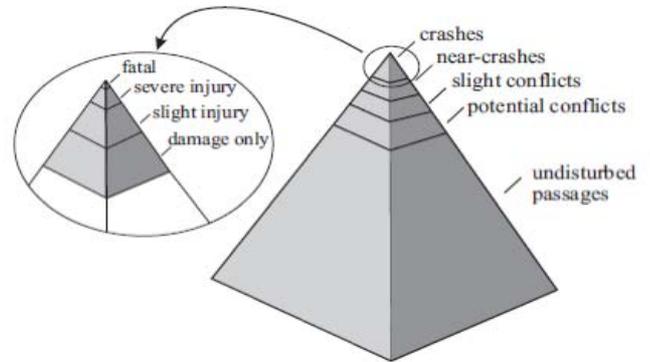
### Calibration of Simulation Models

With the advent of cheaper and faster computing power, in combination with more sophisticated algorithms that can adequately simulate individual drivers in a virtually road environment, it is now possible to evaluate road safety in-lieu of observational data. However, these microscopic traffic simulation packages are comprised of underlying parameterized car-following, lane-changing and gap acceptance models that need calibration. This research seeks to improve the calibration procedure to allow for more reliable models that will give valid outputs. The intent of calibration is to match observed metrics (speed, volume, safety performance) with simulated metrics by changing the parameters of the underlying models. The proposed methodology introduces a multi-criteria concept of 'trade offs', where improving one metric may increase the error in another metric. The result so far have been promising, as the proposed method gives better calibration results compared to the current state-of-the-art.



### Integrating Observational and Traffic Simulation Models For Priority Ranking of Unsafe Intersections

Observational models based on reported accident history is the most common approach used to identify unsafe sites for priority intervention. Observational models are good at predicting higher severity accidents but ignore higher risk vehicle interactions that failed to result in accidents in the historical data (e.g. near misses). Proponents of microscopic simulation models argue that ignoring these higher risk interactions can severely understate the safety problem at a given site and lead to misallocation of scarce treatment funds. A complete understanding of safety problem at a given site can only emerge if both accident potential and traffic conflicts are taken into account. A priority ranking model can be presented such that it integrates estimates from observational accident prediction models with an analysis of traffic conflicts. Traffic conflicts can be based on simulated vehicle interactions and deceleration requirements for different traffic scenarios.



### Traffic Safety Analysis for Two-lane Rural Highways using Traffic Microscopic Simulation

In spite of the growth in freeway construction, two-lane highways are still the dominant highway type in North America and Europe. Traffic safety poses special challenges for two-lane highway operations, and one of the major aspects is to provide safe overtaking opportunities. More than 60% of accident fatalities took place on these types of highways. Overtaking related accidents on rural two-lane highways tend to be more serious in large part due to the possibility of high speed head-on collisions. The characteristic of the traffic stream on two-lane highways is influenced by traffic conditions in both directions. Furthermore, overtaking behavior is influenced by factors such as available gaps in the opposing traffic stream, traffic and driver characteristics, and road conditions. The purpose of this research is to develop a simulation model with an emphasis on overtaking maneuver; The proposed model will be employed to assess safety aspect of driving regimes such as overtaking head-on and car-following rear-end potential crashes.



# Recent Awards

## Received by UW-ITE Student Chapter Members

Student	Program	Awards
Leanne Whiteley-Lagace	PhD	TAC
Mohab El-Hakim	PhD	TAC, AISIM 7 Presentation Award
Amir Ghods	PhD	TAC
David Duong	PhD	TAC, CITE Student Paper, CITE Dr. Michel Van Aerde Memorial
Daniel Baggio	MASc	TAC
Mehran Kafi Farashah	MASc	TAC
Andrew Northmore	MASc	TAC
Samantha Pinto	MASc	TAC
Kyrylo Rewa	MASc	CTRF
Matthew Casswell	BSc	TAC



David Duong winner of the CITE Student Paper Award and Michel Van Aerde Memorial

## Closing Remarks

The new executive board has seen two opportunities that the UW-ITE Student Chapter can work on. The first is that we need to make greater efforts in recruiting undergraduate members, and the second one to gain more sponsors from the industry.

The UW-ITE Student Chapter is proud of continuous energetic activities that enhance students' knowledge in the field of transportation engineering.

Look forward to our next WatMoves issue in the Winter Term!



### UW-ITE Student Chapter

Contact:

[uw.ite.sc@gmail.com](mailto:uw.ite.sc@gmail.com)

[www.civil.uwaterloo.ca/transportation/ite](http://www.civil.uwaterloo.ca/transportation/ite)



### Dr. Bruce Hellinga Professor, Student Chapter Faculty Advisor

I am extremely pleased to be able to work with this group of very talented, motivated, and personable students. They have heightened the sense of excitement and energy within the Student Chapter and increased the profile of transportation engineering within the Department and University. Through all of their activities they have been outstanding ambassadors for the profession and for the University. I am sure that when they graduate from the University of Waterloo and

enter the workforce in Canada or elsewhere, they will continue to apply their sense of purpose and enthusiasm – giving me a great deal of confidence in the future of our profession. But until then, I am looking forward to their continued involvement within the Student Chapter activities for this upcoming year.

**“I am extremely pleased to be able to work with this group of very talented, motivated, and personable students.” Dr. Bruce Hellinga**

# Sponsors

## UW-ITE Sponsors

If you would like to get more information on sponsorship opportunities, please contact Amir Ghods at [uw.ite.sc@gmail.com](mailto:uw.ite.sc@gmail.com). For more information on the student chapter please visit our new revamped website, [www.civil.uwaterloo.ca/transportation/ite](http://www.civil.uwaterloo.ca/transportation/ite). We also welcome companies who are interested in coming down to Waterloo to present on unique transportation projects that they are undertaking.

**Visit our website for more information on sponsorship opportunities.**

# TSRG

Transportation Systems Research Group



# GSEF

Graduate Studies Endowment Fund

# iTSS LAB

# WPTI

