

National Institute for Advanced Transportation Technology

NIATT

ANNUAL REPORT
2017/2018



University of Idaho

National Institute for Advanced
Transportation Technology

advancing transportation innovations through research and education

THEME: Advancing Transportation Innovations through Research and Education

MISSION

To develop engineering solutions (knowledge and technology) for transportation problems in the state of Idaho, the Pacific Northwest, and the United States while preparing our students to be leaders in the design, deployment, and operation of our nation's complex transportation systems.

VISION

Our vision is to be one of the premier transportation research and education institutes in the United States.

- NIATT is a national leader in developing technology to reduce urban and rural congestion, improve mobility and safety for all users, reduce the environmental impacts of transportation-related operations, and improve the durability and sustainability of the nation's transportation infrastructures.
- NIATT faculty and students engage in multidisciplinary research to solve challenging, practical, and relevant transportation problems that have regional and national significance. We create interdisciplinary research and development teams of undergraduate and graduate students that are mentored by our expert faculty. To ensure our work is relevant and responsive to stakeholder needs, we seek collaborative partnerships with transportation organizations in the public and private sectors. These practices engage our students in meaningful, experiential, learning-centered environments that add value to their education.
- We integrate our research with the educational mission of the University of Idaho and provide life-long learning opportunities for transportation professionals in Idaho and the Northwest at all levels of practice.
- NIATT's work is carried out in the context of a commitment to preserving and protecting natural and pristine environments. Our research on, and development of, clean vehicles, alternative fuels, efficient infrastructure construction and management practices, and efficient traffic control systems contributes to the sustainability of these environments.

Table of Contents

Director's Letter	4
Advisory Board	5
Meet Barb — Our New Assistant to the Director	9
Affiliate Faculty	10
Faculty Highlight	11
Project Highlights	13
Faculty and Student Awards	31
Student Highlights	34
Student Teams	41
Financial Report	42
List of All Projects	46

To access an electronic copy of this report and to read more about the research, education, and outreach activities in which our students and faculty, we invite you to visit <http://NIATT.org>

National Institute for Advanced
Transportation Technology
University of Idaho
875 Perimeter Drive, MS 0901
Moscow, ID 83844-0901

Telephone (208) 885-0576
Fax (208) 885-2877

Credits: Jeff Jones, Enas Amin, Chuck Jaworski, Julene Ewert



From the Director

It is our honor, once again, to share with you highlights of some of the great research, education, and outreach activities conducted by our dedicated and talented faculty and students. In the past two years, NIATT has experienced a healthy growth in several areas: we have increased our research expenditures, the number of graduate and undergraduate students involved in research, the number of proposals submitted, and the number of publications, presentations, and webinars that resulted from our activities.

Last year, we started working with our partners in two University Transportation Centers (UTCs) that were authorized as part of the Fixing America's Surface Transportation (FAST-Act) Transportation Bill. The UTC centers are funded for five years, FY17-FY21. The first UTC is a continuation of our regional consortium – The Pacific Northwest Transportation Center (PacTrans), led by University of Washington and includes, in addition to the University of Idaho, Oregon State University, Washington State University, and the University of Alaska-Fairbanks. Boise State University and Gonzaga University have been added to the consortium as education partners. The primary focus area for this regional center is "improving mobility for people and goods". The second UTC center is the Center for Safety Equity in Transportation (CSET) – A tier-1 UTC that is led by the University of Alaska-Fairbanks, and includes, in addition to the University of Idaho, University of Washington and University of Hawaii. The center mission is to improve the safety and mobility of rural, isolated, tribal, and indigenous communities - a goal that we are all passionate about here in NIATT. The two UTC centers will ensure continuous funding for NIATT during the FY17-FY21 period with a funding level of approximately \$750K per year.

In addition to these two UTC centers, our cooperative research program with the Idaho Transportation Department is also growing, covering research topics in areas such as safety, traffic operations, and pavement materials and structures. We have also established partnerships with private industries such as AVISTA Utilities and Evolutionary Markings Incorporated, an Idaho-based company.

This annual report highlights research projects from FY17 and FY18 by our researchers' different areas: transportation infrastructure, traffic operations and control, and clean vehicle technology. We also highlight our educational activities with a special emphasis on our exceptional students and their involvement. While NIATT offers career-building opportunities for our students, it is their contributions that make our work possible and worthwhile.

As NIATT's work continues, we look forward to many more years of innovative transportation research, education, and workforce development activities that educate tomorrow's transportation professionals.

We invite you to read on about our activities and plans for the future.

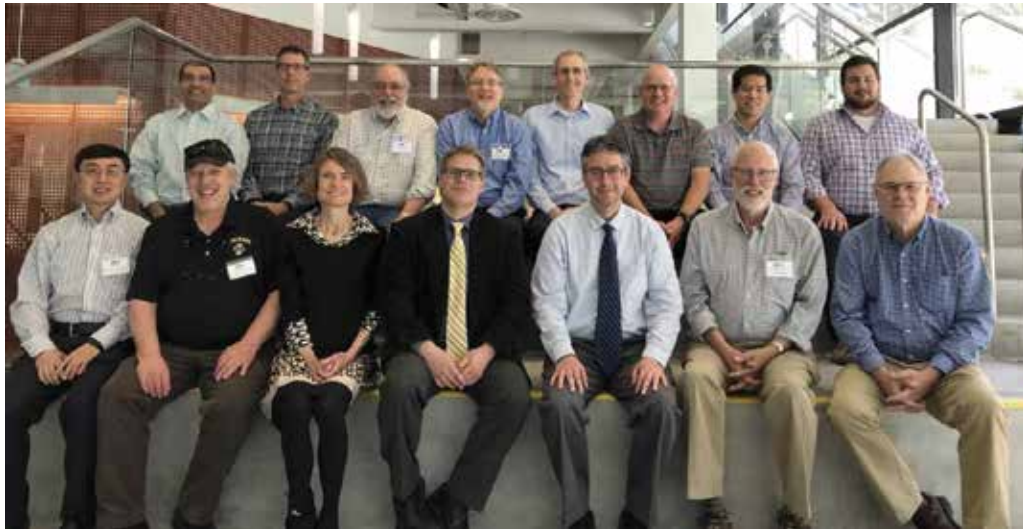
Sincerely,

A handwritten signature in blue ink, appearing to read "Ahmed".

Ahmed Abdel-Rahim

"NIATT focuses on using technological advances to develop data-driven solutions for the diverse transportation needs of the State, the region, and the Nation"

Advisory Board



The NIATT advisory board met April 25-26, 2018. The meeting opened with the annual board dinner on April 25 in the Best Western Hotel in Moscow, Idaho. During dinner, a diverse group of NIATT students presented some of their research activities to the advisory board members and guests. The presentations covered topics such as improving safety in rural roads, structural impact of heavy farm equipment on rural bridges, and mobility opportunities in autonomous on-demand vehicles. The presentations also included an update from our snowmobile team, who shared with the board and guests their achievements, accomplishments, and awards in the 2018 Clean Snowmobile Competition.

On April 26, the board had an all-day meeting in the University's Integrated Research and Innovation Center (IRIC). As part of the morning meeting, the board members and faculty discussed NIATT's funding trends and ways to align NIATT's research with the new USDOT strategic plan by identifying possible mobility-focused research areas. The advisory board also reviewed NIATT's 2018-2019 communication plans and provided input on how to improve NIATT's outreach and visibility throughout the state, the northwest, and the nation.

The afternoon advisory board meeting was dedicated to discussing and identifying possible research topics in the areas of safety and infrastructure. NIATT faculty updated the board members on their research activities. Dr. Sorour presented highlights of his innovative research in the area of autonomous and connected vehicles and Dr. Chang presented current and future research activities in the Center for Safety Equity in Transportation (CSET).

"Our research, education, workforce development, and outreach activities provide life-long learning opportunities for transportation professionals at all levels of practice"



Bruce Christensen received his civil engineering degree from the University of Utah in 1994 and has worked in South Central Idaho as the Idaho Transportation Department District 4 Traffic Engineer for the last 18 years. He designs and operates traffic signals and studies speed limit

changes, developer traffic impacts, signing requests, and traffic and pedestrian safety concerns. He is a past president of the Institute of Transportation Engineers Intermountain Section (2014) and likes hiking, bowling, and traveling with his family.



James Colyar is a Transportation Specialist with the Federal Highway Administration (FHWA), Office of Operations. He has been with FHWA for over 15 years and has experience in traffic engineering, analysis and modeling, intelligent transportation systems (ITS), and transportation systems management and operations (TSMO). He received his M.S. in Civil Engineering from

North Carolina State University and his M.A. in Transportation, Policy, and Logistics from George Mason University. Outside of work, James enjoys outdoor activities, coaching his son's soccer team, and collecting Pez dispensers and coffee mugs from around the country.



John Crockett is the Communication Coordinator for the Biodiesel Education Project. He was with the Idaho Office of Energy Resources for 16 years where he served as Idaho's representative on renewable energy resources and alternative fuels.

John holds a B.S. in Mechanical Engineering and a B.S. in Environmental Science and Architecture from the University of Idaho. John enjoys long drives to Boise, camping and yard work.



Greg Davis is a Professor of Mechanical Engineering at Kettering University, formerly known as GMI Engineering & Management Institute, teaching courses in the Automotive and Thermal Science disciplines. He also the director of the Advanced Engine Research Laboratory, where he

conducts research in alternative fuels and engines. Greg received his doctorate in Mechanical Engineering from the University of Michigan in 1991. Prior to this, he worked as an engineer for both the automotive and electric utility industries. Greg is also a registered professional engineer in the state of Michigan. He actively develops and teaches professional education courses for practicing engineers.



Gary Duncan is the former Chief Technology Officer and currently serves as an Executive Advisor to Econolite. He has over 44 years of experience in the transportation industry and has been instrumental in the development of a number of industry standards. Gary graduated from the University of California Los Angeles (UCLA) with a

Bachelor of Science in Engineering in 1970. He also completed UCLA's Graduate School of Management's Executive Program in Management in 1984.



John Duval has his MS in Civil Engineering specializing in Geotechnical Engineering from the University of Washington. He also earned a MS in Systems Management from the University of Southern California. He served as chief of the US Air Force Pavement Evaluation Team, directing the military team in evaluating pavement

systems at over 40 airfields across multiple continents. John now has an engineering consultation practice and works with clients to improve the quality roadway and airport pavement systems. He enjoys cycling and hiking across the Pacific Northwest and traveling and discovering new cultures with his family.



Peter Koonce – P.E., manages the City of Portland Bureau of Transportation’s Signals, Street Lighting, & ITS Division and oversees the annual budget of \$21 Million and 55 professionals. He has served as an adjunct professor at Portland State University teaching graduate level courses in transportation engineering. He is a member of the Bicycle Technical Committee of the National Committee on Uniform Traffic Control Devices and was appointed chair of the Transportation Research Board’s Committee on Traffic Signal Systems. Peter is active with multiple professional societies including Institute of Transportation Engineers, the National Association of City Transportation Officials, and the Association of Pedestrian and Bicycle Professionals.



Julia Kuhn has participated in and managed a number of challenging long-range transportation plans, environmental studies, campus master plans, highway corridor plans, and interchange refinement plans. As part of this work, she assisted a number of jurisdictions in updating their development codes, policies, and ordinances to comply with statewide planning multimodal goals and requirements.



Michael Kyte is an emeritus professor of Civil Engineering at the University of Idaho. His research focuses traffic signal systems, highway capacity and transportation engineering education. He received his doctorate in civil engineering from the University of Iowa, master’s in civil engineering from the University of California – Berkeley, and bachelor’s in systems engineering from the University of California – Los Angeles.



Tom LaPointe spent 21 years as a CED of Valley Transit. He worked at University of Idaho spent 13 years building a public transportation system which covered portions of 2 states, 4 counties and 8 cities. He is currently retired and enjoys traveling with his wife.



Joseph Marek is the Transportation Safety Program Manager for Clackamas County in Northwest Oregon where he has lived and worked for over 25 years. He oversees the traffic engineering group, Drive-to-Zero Program and the Motor Carrier Safety Program. Joseph led the effort to create the county’s first Transportation Safety Action Plan (TSAP) which was adopted by the Board of County Commissioners in 2012. Clackamas County is the only county in Oregon with an adopted TSAP.



Yuri Mereszczak is an Associate Engineer with Kittelson & Associates, Inc. in Boise, Idaho, where he has worked since graduating from the University of Idaho with an MS in Civil Engineering in 2005. Yuri’s involvement with NIATT began in 2001 when he was offered the opportunity as an undergraduate to conduct transportation research with Dr. Abdel-Rahim. Upon receiving his B.S. in Civil Engineering, NIATT provided Yuri with a once-in-a-lifetime opportunity to participate in a comprehensive, national research project on roundabouts in the US. Outside of work, Yuri enjoys camping, fishing, golfing, and chasing his two young kids all over town.



Jim Larsen has been with the Ada County Highway District (ACHD) in Boise, ID for the past 22 years. He was the district’s traffic operations engineer and is currently the congestion management supervisor. Jim manages the ACHD Traffic Management Center, signal timing staff, and servers for the district’s ITS projects. He graduated from Washington State University with a B.S. in Civil Engineering.



Paul R. Olson has retired from the FHWA Resource Center and has formed P.R.Olson Associates Ltd to provide consulting services. Mr. Olson has been working in Intelligent Transportation Systems since 1980. He has worked for Washington State DOT (8 years), Federal Highway Administration (18 years) and as a private consultant (10 years). He graduated with a BSCE from Washington

State University and received a Certificate in Telecommunications Engineering from University of California at Berkeley.



Ned Parish serves as Research Program Manager for the Idaho Transportation Department (ITD). He joined the department in 2007, and is responsible for coordinating ITD research, development, and technology transfer activities. Ned serves as Idaho's state representative to the Transportation Research Board (TRB) and represents ITD on the American Association of State Highway

and Transportation Officials (AASHTO) Research Advisory Committee. He also serves on the advisory board for PacTrans, the regional University Transportation Center (UTC) for the Pacific Northwest. He received a Master of Public Administration degree from Arizona State University.



Phil Rust is currently a traffic engineer with the City of San Diego and a chair on the ITE Standing Committee on Roundabouts. He has previously worked for the Ada County Highway District in Boise, Idaho and for the Washington State Department of Transportation. Phil earned degrees from the University of Idaho and Washington State University.

Phil is an avid runner and ran California International Marathon in 4 hours.



Zong Tian obtained his Ph.D. degree from Texas A&M University. He has been a member of two committees of the Transportation Research Board (TRB): the Highway Capacity and Quality of Service Committee, and the Traffic Signal Systems Committee. He is the paper review chair for the Highway Capacity and Quality of

Service Committee of TRB, handling over 60 paper reviews each year. Zong is a member of the Scientific Committee of the World Conference on Transport Research Society (WCTRS) where he chairs the Special Interest Group (SIG-C2) focusing on Urban Transport Operations. He has been serving as a co-organizer for the International Conference on Traffic and Transportation Studies (ICTTS) since 2004 and has been the co-editor of the conference proceedings.



Brian Walsh is the State Traffic Design Engineer for the Washington State Department of Transportation (WSDOT) based out of Olympia. He has 32 years of experience in the traffic engineering field and has been involved in many areas of transportation including numerous research topics with safety and operations, traffic signal and roadway geometric design, volume analysis,

project delivery, temporary traffic control, innovative and practical design and pavement markings.



Jerry Whitehead has an extensive background in transportation. He established a trailer manufacturing business in Boise four decades ago and continues to serve as President and owner of Western Trailers. He has been a member of the Idaho Motor Carrier Advisory

Committee the past 16 years and is past chairman of the Idaho Trucking Association and Idaho Truck Pac Inc.

Meet Barb — Our New Assistant to the Director



Barbara Smith is excited to join NIATT as the new Assistant to the Director. Originally from Tacoma (WA), she studied Animal Science at Washington State University and is a long-time Palouse region resident. For that past 20 years, she has held numerous leadership positions in higher education, managed stakeholder relations and fiscal activities in various academic and non-academic units.



Smith has a track record of achievement, receiving numerous awards for her contributions, including Washington State University's President's Award, which recognizes outstanding excellence in administrative professionalism and service. She is especially passionate about working with faculty, students, and her community. She founded the Albion Youth Association, managed Camp Larson's summer program for underprivileged and terminal ill children, family reunions, ropes course, the National Youth Sports Summer Programs, was a 4-H leader and volunteer for many years, has lead food drives and gifting trees for students and families in need, and has coordinated community cleanup initiatives.

When she is not in the office, you can find Barb working in her yard, gardening, canning, enjoying water sports, circuit training, being at the ocean, and spending time with her family—especially her adorable granddaughter.

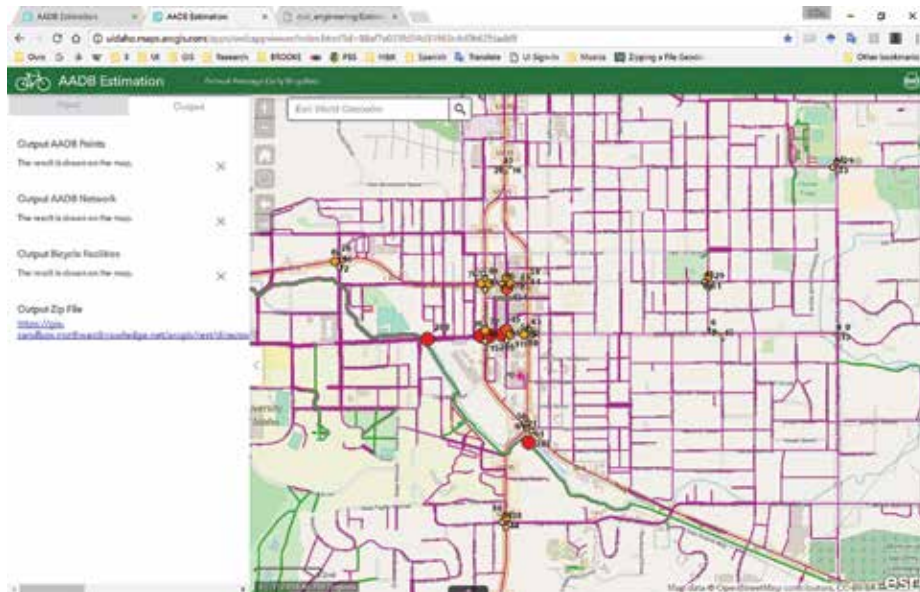
Affiliate Faculty

Ahmed Abdel-Rahim Professor, Civil Engineering Director, NIATT	Ahmed Ibrahim Assistant Professor, Civil Engineering	Professor and Interim Program Head, Interior Design
John Anderson Associate Professor, Virtual Technology & Design	Brian Johnson Professor, Schweitzer Engineering Laboratories Endowed Chair in Power Engineering	Behnaz Rezaie, Ph.D., P.E. Assistant Professor, Mechanical Engineering
Suat Ay Associate Professor, Electrical and Computer Engineering	Emad Kassem Assistant Professor, Civil Engineering	Robert Rinker Associate Professor, Computer Science Professor, Civil Engineering
Fouad Bayomy Professor, Civil Engineering	Axel Krings Professor, Computer Science	Dilshani Sarathchandra Assistant Professor, Sociology
Steven Beyerlein Chair, Mechanical Engineering	Kamal Kumar Assistant Professor, Mechanical Engineering	Sameh Sorour Assistant Professor, Electrical and Computer Engineering
Helen Brown Clinical Faculty, Movement Sciences	Michael Kyte Professor Emeritus, Civil Engineering	Tao Xing Associate Professor, Mechanical Engineering and Anthropology
Kevin Chang Associate Professor, Civil Engineering	Felix Liao Assistant Professor, Geography	
Dan Cordon Clinical Faculty Assistant Professor, Mechanical Engineering	Michael Lowry Associate Professor, Civil Engineering	
Brian Dyre Associate Professor, Psychology and Communication Studies	Armando McDonald Professor, Forest, Rangeland, and Fire Sciences	
Jim Frenzel Associate Professor, Electrical and Computer Engineering	Aman McLeod Assistant Professor, Political Science	
Robert Heckendorn Associate Professor, Computer Science	Richard J. Nielsen Associate Professor, Civil Engineering	
Mohamed Hefeida Clinical Faculty, Electrical and Computer Engineering	Edwin Odom Professor, Mechanical Engineering	
Herbert Hess Professor, Electrical and Computer Engineering	Chin-An Peng Professor and Chair, Biological Engineering	
	David Pimentel Associate Professor, Law	
	Rula Awwad Rafferty	

Faculty Highlight — Mike Lowry Sabbatical in Spain



Dr. Michael Lowry spent last year as a visiting scholar at the Polytechnic University of Valencia, Spain. He worked on three research projects as part of his sabbatical experience. One project was funded by the Spanish government to improve cyclist safety on rural roads. Dr. Lowry and his colleagues developed a new method to estimate cyclist volumes and quantify exposure to dangerous road segments. Another project was funded by the Washington State Department of Transportation to create a guidebook and toolbox that communities can use to improve bicycle count programs and monitor bicycle traffic. The third project was funded by the Idaho Transportation Department to create an online geographic database of bicycle infrastructure. While in Europe Dr. Lowry met with engineers and planners in various cities to gain new perspective on non-motorized transportation, including a four week course that he attended in the Netherlands. Dr. Lowry was joined by his wife and three young children who loved seeing Europe, learning Spanish, and eating lots of Paella.



Summer Transportation Course in Spain

This summer Dr. Michael Lowry returned to Valencia, Spain to teach a transportation course. Last year he had spent his sabbatical there and was invited back to give a class to American students participating in a study abroad program. The course, Urban Transportation, was focused on how transportation systems are designed, function, and evolve through time. Through field trips and meetings with local engineers, Dr. Lowry's students were able to compare US and European infrastructure. They learned about the historical, political, and cultural forces that have made Europe more bicycle and pedestrian friendly and have produced more efficient public transportation systems.

Projects Highlights

Aerogel Insulation System - An Innovative Energy Efficient Thermal Wall

Principal Investigators: Ahmed Ibrahim, Tao Xing, and Brian Johnson

Funding Agency: AVISTA Utilities

Energy sustainability is a crucial issue for humanity's development in the modern era, which can significantly impact future quality of life and the environment. The industry is moving towards the construction of sustainable-energy efficient buildings. The main objective of this project is to investigate the efficiency of Aerogel insulation blankets as a new insulation material for residential buildings. The research tasks are conducted using field measurements and computer simulations.

The field measurements were collected from a real apartment where walls were insulated with the Aerogel blankets. Thirty thermocouple sensors were placed in one room of the apartment. Sensors were mounted on all walls in the room to record data with existing insulation and with Aerogel.

On top of field measurements, an aerogel cube was designed for small scale-testing in order to validate the aerogel conductivity and the finite element simulations. The aerogel cube consisted of a cubical frame with all walls made from pure Aerogel. The temperatures at multiple locations across the box were measured and were used to verify the computer simulations.

In parallel, a computational fluid dynamic (CFD) code was developed to validate the field data and perform additional key parameters. The purpose of using CFD is to determine the heat conductivity of the Aerogel by comparing the predicted inner wall temperature with the measurements.

Overall, the feasibility of using Aerogel blankets as a super insulator has been verified using small scale laboratory test, large scale field test and high-fidelity computer simulations. The final cost analysis showed that one layer of aerogel saves 23% of the heat transferred and two layers save 38% of the heat transferred compared to the control case (no aerogel).

OBJECTIVE: In 2015, about 40% of the total U.S. energy consumption was consumed in residential and commercial buildings, and the government promotes renovation of existing buildings to meet minimum energy performance requirements. The main objective of this project is to investigate the efficiency of Aerogel insulation blankets as a new insulation material for residential buildings. The research tasks are conducted using field measurements and computer simulations. The field measurements are being collected from a real apartment where walls were insulated with the Aerogel blankets. In parallel, a computational fluid dynamic (CFD) code is developed to validate the field data and perform additional key parameters.



Figure 1: Aerogel Blankets



Figure 2: a) View of apartment, b) thermocouples in the third



Figure 3: Small scale box of Aerogel Walls

BUSINESS VALUE: It is anticipated that the use of Aerogel reduces the heat transfer across building envelopes and therefore will reduce the annual heat loss by 50% compared to the currently used insulation material(s). In addition, a life cycle cost analysis with a full consideration of service life-cost will be performed and compared to the performance of conventional insulation materials.

INDUSTRY NEED: Energy sustainability is a crucial issue for the humanity's development in modern era, which can significantly impact future quality of life and the environment. The industry is moving towards the construction of sustainable-energy efficient buildings. The outcomes of the current research will be applied to help Avista customers save energy, reducing need for natural gas and electricity.

The Aerogel blankets will be efficiently used in retrofitting existing structures.

BACKGROUND: Aerogel, also called solid smoke, is a synthetic porous material with remarkable properties.

Aerogels are dried gels with a very high porosity. It was discovered in the early 1930s. Aerogel molecules do not decompose at high temperatures and do not release harmful gases. Even at 800°C, the thermal conductivity of Aerogel is only 43 mW/(m·K). More information could be found in https://www.aerogel.com/_resources/common/userfiles/file/Data%20Sheets/Space-loft-European-Datasheet-EN.pdf.

SCOPE: Acceptable insulation materials need to achieve as low thermal conductivity as possible, enabling a high thermal resistance as well as a low thermal transmittance. The scope of this project is mainly focused on evaluating the ability of the Aerogel blankets to save energy through a comprehensive study which is broken down as follows:

Task 1: Literature Survey

Various studies have reported on the characterization of Aerogel, along with preliminary investigation of its implementation as a super insulator, (Somana 2012, Huang 2012, Neugebauer 2004, and New York State of Energy 2013).

Task 2: Aerogel Acquisition

The team has purchased 800 ft² of the Aerogel blankets. The commercial product name is Spaceloft. It has a 10mm thickness, and it was delivered as a roll. The team also purchased a Campbell Scientific data logger, thermocouples and two heat flux sensors to collect data from walls insulated by the Aerogel with other needed supplies.

Task 3: Field Data Collection

Dr. Ibrahim and his team has conducted field data collection. Thirty thermocouple sensors have been placed in one room of the apartment. Sensors have been mounted on all walls in the room to record data with existing insulation and with Aerogel. Figure 2 shows the thermocouples attached to two walls of the room, while Figure 3 shows the small-scale testing of an aerogel cube

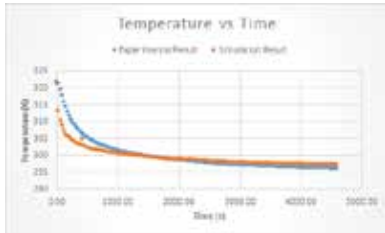


Figure 4: Temperature versus time for the south wall

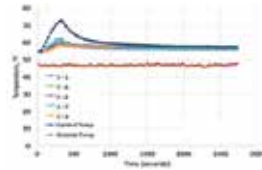


Figure 5: Comparison between the predicted inner wall temperature using CFD and experimental measurements for a square Aerogel box.

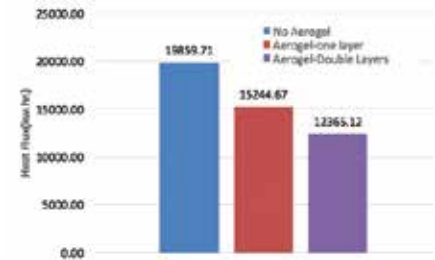


Figure 6: Heat Flux Comparisons between all Aerogel Cases.

that was used in the validation of the aerogel conductivity and the finite element simulations. Figure 4 shows Temperature vs. time for the south wall (without Aerogel). The Team has built a cubical frame with all walls made from a pure Aerogel. The temperatures at multiple locations across the box were measured and will be used to verify the computer simulations.

Task 4: Modeling and Simulation

Dr. Tao Xing, his Postdoctoral Fellow Dr. Rabijit Dutta, and his graduate student are using computational fluid dynamics (CFD) to simulate a square box built using the Aerogel and are using EnergyPlus to simulate the apartment under test. The purpose of using CFD is to determine the heat conductivity of the Aerogel by comparing the predicted inner wall temperature with the measurements. Figure 5 shows the comparison. Ongoing work includes trying different mesh resolutions, boundary conditions, and wall models. Once heat conductivity of the Aerogel is determined, the value will be used for apartment simulations using EnergyPlus.

Task 5: Cost Analysis

The cost analysis showed that one layer of aerogel saves 23% of the heat transfer and two layers save 38% of the heat transferred compared to the control case (no aerogel) as shown below in Figure 6.

CONCLUSIONS

The feasibility of using Aerogel blankets as a super insulator has been verified using small scale laboratory test, large scale field test and high-fidelity computer simulations. The following conclusions have been drawn from the project tasks conducted:

- CFD was proved to be a promising tool to identify the exact thermal conductivity (k) using a small-scale laboratory test
- k of one layer (0.40 inch) of the aerogel blankets is 0.014 W/m-K.
- CFD for an apartment/room needs to be improved by removing assumptions/approximations, which will be addressed in Phase II.
- EnergyPlus has limitations on predicting the real energy savings for buildings
- Based on theoretical analysis of experimental measurements, one layer and two layers of aerogel saves 43% and 68% of the energy consumption, respectively, compared to the control case (no aerogel).
- Saving percentage are typically affected (and limited) by original house insulation; and also, the window quality and configurations.
- One layer of aerogel saves 23% of the heat transfer and two layers save 38% of the heat transferred compared to the control case (no aerogel) as shown below.
- Payback analysis after incentive showed the that one layer of the aerogel payback time is 0.2 years and the two layers payback is 0.1 years.

Safety Impacts of Using Wider Pavement Marking in Two-Lane Rural Highways in Idaho

Principal Investigators: Ahmed Abdel-Rahim, Kevin Chang, and Emad Kassem

Funding Agency: Idaho Transportation Department (ITD)

In the State of Idaho, based on the 2015 crash data, the largest contributors to single vehicle crashes have been the inability of the driver to maintain his or her lane position (22%) and the driver's travel speed (22%). One of the factors related to maintaining lane position is the width of lane markers. The purpose of this research is to determine if the use of wider longitudinal pavement markings for center lines, lane lines, and edge lines can provide critical information to drivers that will help them to better identify the roadway alignment and maintain appropriate lane position.

The safety effects of wider pavement markings on rural two-lane highways in Idaho were evaluated using two analyses: a before-and-after study using two different methods (a before-and-after comparison group analysis and an Empirical Bayes before-and-after analysis) and a driver simulation study. Furthermore, the study examined and modeled the deterioration characteristics of pavement marking used in Idaho highways.

Before-and-after study

- The findings of the Empirical Bayes analysis were consistent with those obtained from the comparison group.
- Both showed that wider pavement markings reduce the number of crashes by 17 percent and fatal and severe injury crashes by 14 percent, reducing crash rates at 5.53 percent and 12.59 percent respectively.
- The reduction in crash rates for total crashes is statistically significant at the 90 percent confidence level while the reduction in crash rates for fatal and severe injury crashes is statistically significant at the 95 percent confidence level.

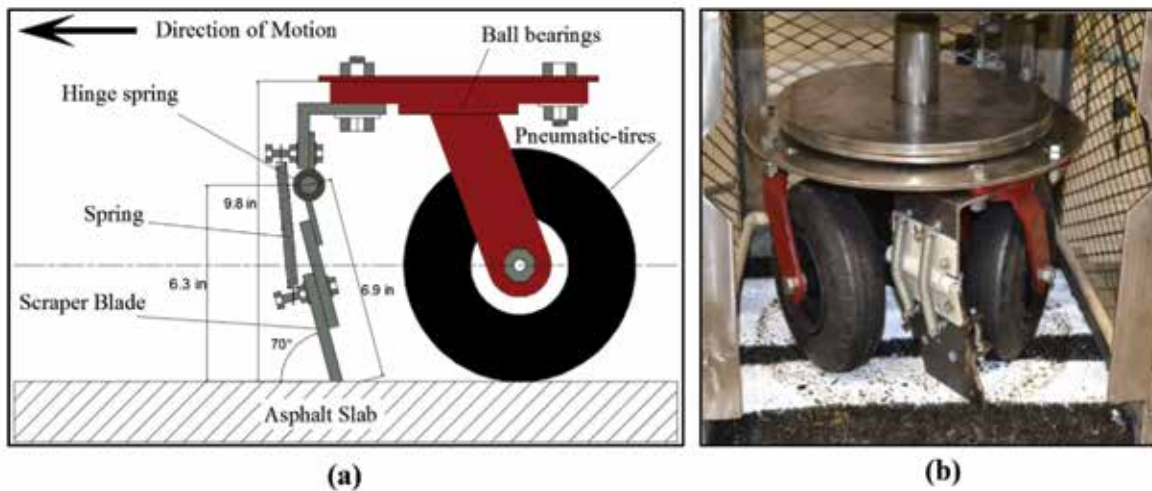


Driver Simulation-Based Studies

- Two different pavement marking widths (4 and 6 inch) and four different deterioration levels (0%, 25%, 50%, and 75%) were assessed in daytime and nighttime conditions as part of this study.
- The results revealed that while wider 6-inch longitudinal edgeline pavement markings compared with standard four inch edgeline markings did not cause any significant changes in driver lane deviation during the day, statistically significant differences were observed in nighttime driving conditions.
- For public agencies who are responsible for the operations of highway facilities, proper maintenance and upkeep of edgeline markings ensures that vehicle operators will maintain lane position when visibility of these markings is highest.

Retroreflectivity Deterioration Analysis

- The pavement markings deterioration analysis showed that a logarithmic decay function was the best fit curve to predict waterborne pavement markings retroreflectivity deterioration.
- Retroreflectivity deterioration was modeled in the laboratory using a two wheel polishing device (TWP) under four loading scenarios (pneumatic, steel, pneumatic with scraper blade, and scraper blade). Color retention and percent loss due to the same loading scenarios were monitored and used to validate the results from the retroreflectivity data.
- The results also showed that the six-inch-wide pavement markings provided better retroreflectivity levels and degraded at a slower rate than the four-inch-wide markings.

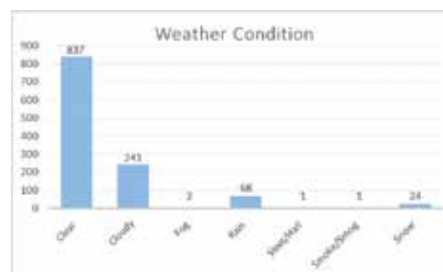


Improving the Safety of Left-Turn Operations at Signalized Intersections for High-Risk Groups

Principal Investigators: Ahmed Abdel-Rahim

Funding Agency: The Pacific Northwest Transportation Consortium (PacTrans) - Federal Region 10 University Transportation Center

Left-turning movements at signalized intersection approaches operating during the permitted phase are considered the most hazardous traffic movements at the intersection, since left-turning vehicles must cross during allowable gaps in the oncoming through traffic. Navigating through intersections during the permitted left-turn phase requires the ability to make rapid decisions, react quickly, and accurately judge speeds and distances. As these abilities can deteriorate through aging, distraction, or impairments, several driver groups, such as mature drivers, young drivers, impaired, and distracted drivers face more difficulties and are more likely to be involved in a crash at these locations.



This study analyzed a total of 1962 left-turn related crashes at signalized intersections in Idaho (2006-2015) to document the underlying factors that are associated with left-turn crashes and identify crash types that prevail among different high-risk driver groups. Through comparative analysis, the characteristics of intersections at which frequent crashes occur and those at which few crashes occur were compared to identify intersection design and control elements that may have contributed to left-turn crashes. The analysis consisted of looking at the relationship between left-turn related crashes at signalized intersection approaches, the mode of the left-turn control used at the intersection (protected, permitted, or permitted-protected), and the left-turn signal display used at the intersections that operate under protected-permitted mode or operations (dog-house or flashing yellow arrow).

Key Findings

- The majority of crashes (84.41%) occurred during the period from 9:00 AM to 9:00 PM with only 15.59% of the crashes occurring during night and early morning hours. This can be attributed to the fact that, at night and early morning hours, the traffic volume for the through movements that conflict with the left-turn permissive movements are very low.

Age	Total Crashes	Fatal crashes and A Injuries	Number Of drivers	Age rate
Under 19	369	21	33005	0.01118
20-64	625	45	431905	0.00145
65-74	64	10	68346	0.00094
> 75	69	8	37184	0.00186

Highest Contributing Circumstances	Total Crashes	Percentages
Failed to Yield	340	34.52
Failed to Obey Signal	231	23.45
Inattention	176	17.87
Improper Turn	139	14.11
Alcohol Impaired	25	2.54
Failed to Maintain Lane	23	2.34
Speed Too Fast For Condit	20	2.03
Drove Left of Center	17	1.73
Distracted IN or ON Vehicle	14	1.42

Time Of The Day	Hours	Total Crashes	Percent Crashes
Early afternoon	1 pm to 3 pm	190	23.69
Late morning	9 am to 12 pm	183	22.82
Evening	6 pm to 9 pm	161	20.07
Late afternoon	4 pm to 5 pm	143	17.83
Early morning	5 am to 8 am	70	8.73
Night	10 pm to 4 am	55	6.86

City	Population	Total Crashes	Fatal crashes and A Injuries	Crash Rate (Total Crashes)	Crash Rate (Fatal crashes and A Injuries)
Garden City	10,972	24	13	2.19	1.18
Blackfoot	11,899	25	7	2.10	0.59
Idaho Falls	56,813	163	17	2.87	0.30
Moscow	23,800	11	6	0.46	0.25
Meridian	75,092	78	15	1.04	0.20
Eminett	6,557	10	1	1.53	0.15
Roxburg	25,484	49	3	1.92	0.12
Burley	10,345	34	1	3.29	0.10
Twin Falls	44,125	37	4	0.84	0.09
Coeur D'Alene	44,137	76	4	1.72	0.09
Nampa	81,557	66	5	0.81	0.06
Boise	205,671	302	8	1.47	0.04
Ammon	13,816	7	0	0.51	0.00
Caldwell	46,237	26	0	0.56	0.00
Chubbuck	13,922	19	0	1.36	0.00
Eagle	19,908	11	0	0.55	0.00
Hayden	13,294	26	0	1.96	0.00
Jarome	10,890	6	0	0.55	0.00
Ketchum	2,689	5	0	1.86	0.00
Lewiston	31,894	24	0	0.75	0.00
Pocatello	54,255	110	0	2.03	0.00
Ponderay	1,137	9	0	7.92	0.00
Post Falls	27,574	22	0	0.80	0.00
Sandpoint	7,365	6	0	0.81	0.00

- Only 2.54% of the crashes involved alcohol impairment. This, again, can be attributed to the lower percentages of left-turn crashes during night time.
- Inclement weather was a factor in less than 8% of the left-turn crashes that occurred at signalized intersection approaches, meaning that the use of a weather responsive traffic signal system that eliminates the permissive left-turn period during inclement weather can reduce left-turn crashes at signalized intersections in Idaho by up to 8%.
- Drivers under 19 years of age have the highest relative signalized intersection left-turn crash involvement rate, followed by drivers 75 or older.
- 265 intersections in different cities in Idaho were selected for in-depth analysis in order to investigate the impact of the left-turn operation modes and signal display on crash rate. The analysis showed that intersections that run protected-only left-turn operations showed significantly lower left-turn related crashes.

The study results suggest that there is a need for greater emphasis on left-turn permitted operations at signalized intersections in teen driver education programs, as teen drivers represent the most vulnerable group. For route and neighborhoods with high mature driver populations, protected-only left-turn operations at signalized intersections can eliminate a significant portion of mature drivers left-turn related crashes.

An Airborne Lidar Scanning and Deep Learning System for Real-time Event Extraction and Control Policies in Urban Transportation Networks

Principal Investigators: Sameh Sorour (UI), Ahmed Abdel-Rahim (UI), Chris Parish (OSU), and David Hurwitz (OSU)

Funding Agency: The Pacific Northwest Transportation Consortium (PacTrans) -Federal Region 10 University Transportation Center

This project aims to design and optimize the operation of unmanned aircraft systems (UAS) for monitoring and detection of special features in transportation networks using on-board 3D light detection and ranging (lidar) systems, direct georeferencing technology, and deep learning techniques. It is envisaged that in the future, a fleet of lidar-equipped UAS will be deployed to obliquely scan transportation networks from a range of viewing geometries.

Deep learning can then be employed to process the resulting point clouds from the scans and to extract features of interest (e.g., emergency response, clearance, congestion, accidents, fire, parking utilization, multimodal transportation activities etc.). If the feature extraction can be accomplished in real time, the learnt results can then be cooperatively reported to the traffic network controller through dedicated anchor points within the area of interest. The controller can then perform further processing, informing corresponding actions.

This study pairs Oregon State University's expertise in UAS operations, direct georeferencing and lidar technology with the University of Idaho's expertise in the application of deep learning for the purpose of extracting decision relevant information from large data sets. Each institution has an established track-record of research in their area. By bringing the two institutions together, and combining their UAV platforms, sensor technology, computer software and algorithms, the potential for using UAV mounted lidar for developing real-time decision making support to transportation agencies can be examined in a way that would be impossible without this unique collaboration. Typically, these fields are studied in isolation, preventing the advancement of this technical solution to a viable state for transportation agencies.

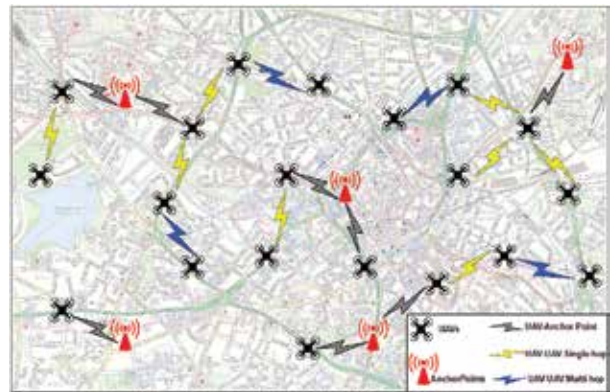


Fig. 1: An Example of UAV Distribution and Communication





Objectives

This project aims to fulfill three main objectives:

- Design and train deep and/or convolutional neural networks to extract specific traffic features from georeferenced lidar point clouds. This process will include both the determination of the extractable features of interest from lidar point cloud analysis, and the designing/training of DNNs/CNN to extract them.
- Investigate UAS flight and sensor parameters for optimal 3D laser scanning of a traffic network, using pre-planned trajectories and downlink capabilities, so as to both guarantee the required scan coverage of the entire area and deliver the maximum amount of extracted features to the controller's wireless anchor points with minimum delay.
- Develop guidelines for state DOTs and other transportation agencies on the technical and operational requirements for UAS-based lidar data integration.

Tasks

The aforementioned objectives are broken down into smaller tasks:

Task 1.1: Develop optimal UAS-based lidar acquisition methodologies (payloads, sensor settings, and processing strategies) for transportation network scanning.

Task 1.2: Design, implement, and train a DNN/CNN that can extract features from the real-time lidar scan on-board of the UAS.

Task 2.1: Determine the number of UAS and their trajectories so as to complete a full scan cycle within a system-mandated time constraint.

Task 2.2: Investigate guidance, navigation and control (GNC) strategies that will ensure that UAS are able to approach (within a defined proximity threshold) and transmit data to the network controller's anchor points.

Task 2.3: Design an optimal trajectory-aware single and/or multi-hop communication schedules of information from non-conveying UAS to conveying UAS in every DRI.

Task 3.1: Develop guidelines for state DOTs and other transportation agencies on the technical and operational requirements for UAS-based lidar data integration.

Region-Wide Technology

State DOTs throughout the nation are considering these technologies as promising tools to increase the efficiency of the transportation system operations and the productivity of their staff. The extended transportation networks in the Pacific Northwest makes these technologies of a greater value for the states of Alaska, Idaho, Oregon, and Washington. In Idaho, the University of Idaho, two Idaho industry partners and Idaho National Laboratory (INL) are joining forces to advance the state's UAS capabilities. Oregon State University is one of the core universities in the FAA's Center of Excellence for UAS Research (ASSURE) and maintains an active autonomous systems research group (ASRG) supporting UAS research and maintaining regulatory compliance. The OSU PIs are currently conducting research on UAS-based bridge inspection in support of the Oregon Department of Transportation (ODOT) and are collaborating closely with the ODOT Geometronics Unit. The OSU project team currently operates four multi-rotor UAS under an FAA Certificate of Authorization (COA).



Rural Bridge Safety: Evaluation of Atypically Large Farm Vehicles

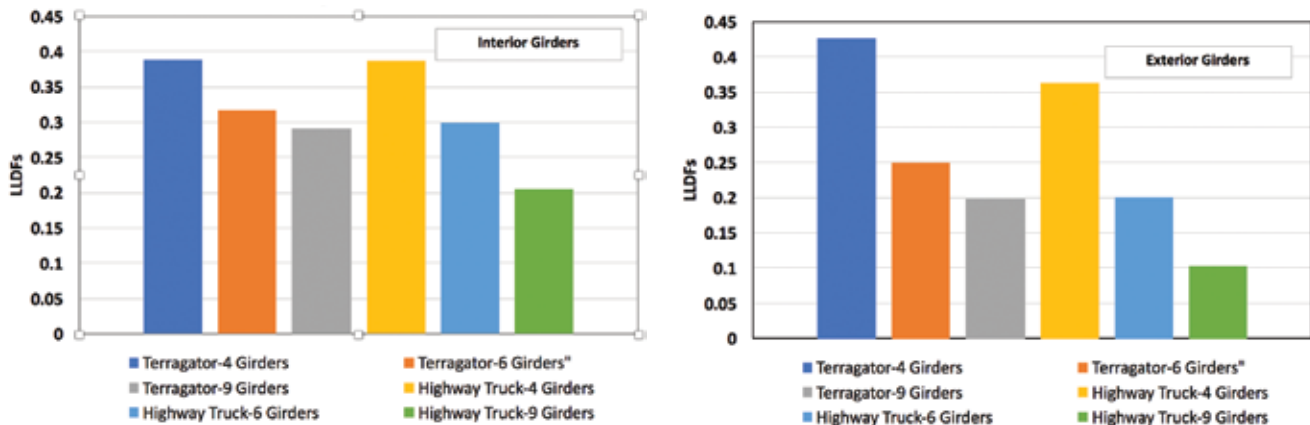
Principal Investigators: Ahmed Ibrahim

Funding Agency: The Pacific Northwest Transportation Consortium (PacTrans) -Federal Region 10 University Transportation Center

The Pacific Northwest region has no data on the assessment and recommendations on the design of rural bridges' safety subjected to Farm Vehicle (FV) loading. Bridges are usually designed and evaluated using live load distribution factors (LLDFs), which are defined as the ratio of the effect of maximum live load in a bridge girder to the effect of the maximum live load in the whole bridge girders when the truck is located at certain location along the bridge. The American Association of State Highway and Transportation Officials (AASHTO) has provided methods to determine LLDFs of different types of bridges. Agricultural vehicles, however, can have vastly different wheel spacings, footprints, and axle weights than other vehicles. Because of this, they very likely cause different effects on bridges than the vehicles designed for using the AASHTO LRFD (Load and Resistance Factor Design) manual.

This study uses computer simulation (the finite element method) to determine how different types of FVs with different characteristics distribute their loads on rural steel-concrete bridge superstructures. Load distribution factors due to shear and moments for interior and exterior girders under the critical loading conditions were determined for selected bridges that were representative of rural bridges with FV traffic in the PNW region. The computer models used in the study were verified using field data in order to explore a broad number of bridges under various FVs and key param-





eters. Five vehicle types were used in the analysis: a Terragator, a tractor with a grain wagon, a tractor with one manure applicator tank, a tractor with two manure applicator tanks, and a standard highway vehicle. The spacing of the girders, number of girders, and speed of the vehicles were considered key factors under the aforementioned vehicle types.

Key Findings

- For most of the girder spacings and vehicle types, the analytical LLDFs values were lower than the AASHTO design values.
- The Terragator created higher (4%) LLDF on the middle girder when the girder spacing was 1.64 ft., compared to the values obtained from the AASHTO code.
- At girder spacing of 4.10 ft. and 4.92 ft., the LLDFs created by the Terragator were less than the AASHTO values by 57% and 56%, respectively. For all other vehicles, the LLDFs were less than compared to the AASHTO values.
- The LLDFs of the exterior and interior girders due to Terragator (girder spacing= 1.64 ft.) were higher than the highway standard truck by 88%, and 62%, respectively.
- It is observed that the shear LLDFs for the exterior and interior girders due to Terragator (girder spacing= 1.64 ft.) were higher than the highway standard truck by 27%, and 9%, respectively.
- Terragator showed higher shear LLDFs for the exterior girders (27%, 237%, and 267%) for bridges with 4, 6, and 9 girders, respectively.
- The speed of the vehicles had no significant impact on the shear of the moment LLDFs of the bridges.

It is recommended that the farming states should pay attention to the increase in FV loads and bridge weight limits especially under such loading or to generate specific farming vehicles' posts to ensure the safety of rural bridges. It is also recommended to consider the effect of FVs on the live load distribution factors for rural bridges to be addressed in AASHTO. The authors also suggest that the DOT and local jurisdictions to consider special signage for rural bridges that are used by FVs. In the future, it is important to perform field tests to investigate the effect of agricultural vehicles on the various bridges in Idaho under multiple key parameters such as girder material types (timber, concrete, etc.), girder spacing, and configurations.

NIATT Safety Art Project

Principal Investigators: Ahmed Abdel-Rahim and Brooke Lowry

Funding Agency: Idaho Transportation Department and the Pacific Northwest Transportation Consortium (PacTrans) - Federal Region 10 University Transportation Center

In the fall of 2017, NIATT funded educator Brooke Lowry to go into twelve classrooms (grades 1st-8th) to teach about traffic safety. Each lesson consisted of 15 minutes of traffic safety education and discussion, followed by 20 minutes allotted to art creation. Elementary grades used pastels for their art, while middle school students used ink and traced their hand as they pledged to be more aware and put down their devices anytime they are in the street.



All the student's art focused on the various modes of transportation (cars, buses, bikes, pedestrians), the infrastructure that helps us stay safe (sidewalks, crosswalks, signs and traffic lights), and ways we can stay safe (not being a distracted walker, safe biking and safe crossing techniques). The course material was adjusted to be age-specific for each grade.

"When children walk and bike, they get a sense of what it's like to be around cars," she said. "So when they start driving, it breeds compassion and awareness for pedestrians. If the drivers know what it's like to be a pedestrian, they can take note of how to drive safely with them around."

Key ideas & easy-to-remember phrases were taught in each class. Phrases such as "Stop, Look and Listen," "Look Left, Right, Left Again" "Be Safe, Be Seen" "It Can Wait!" (the AT&T slogan to encourage people to stop texting while driving) were taught





We found that the students internalized the instruction in a more in-depth way when they were asked to create art about the topic. To help students engage we did age-appropriate things like: asked open-ended questions, read a book was read or did team quizzes to review material taught

“For the little kids, I found that pastels work well for them to use when doing their art activity,” Lowry said. “Many of them draw their renditions of common road signs, whereas the older students tend to draw bicycles or traffic scenes from a bird’s eye view.”

Over 200 pieces of student art was created and then displayed in NIATT hallways. Leaders from the University, City and Schools were invited to attend the reception in February to celebrate and high-light the student’s work. Approximately 45 people attended the reception (19 students, 24 adults). 15 students were chosen by NIATT students for exceptional art that portrayed clearly the aspects of safety that were taught during in-classroom instruction.

Ahmed Abdel-Rahim (Director of NIATT) had a mosaic created in the shape of an I (for UI) from the scanned artwork. At the reception, we gave these finished pieces to the teachers and schools who participated in this project.

All participating classes were also invited to come during school hours to do a field-trip in NIATT to view their art and see what it looks like to be an Engineering student at the University of Idaho. This project was meant to strengthen the relationships between Moscow School District and NIATT and help the schools identify NIATT as a resource for transportation safety in the community.

NIATT Staff Pick: A blind student in 4th grade created a car with styrofoam stickers for her art piece. Her classmates learned from her as she told them how she uses her ears only to cross the street safely by herself.



USDOT SHARP2 Education: National Traffic Incident Management Responder Training (TIM) Program

Principal Investigators: Kevin Chang

Funding Agency: U.S. Department of Transportation - Second Strategic Highway Research Program (SHRP 2)

The second Strategic Highway Research Program (SHRP2) focuses on over one hundred research projects to address critical state and local infrastructure, congestion, and safety challenges. SHRP2 concentrates its resources into four broad focus areas – renewal, reliability, capacity, and safety – which were identified as being critical to the health, safety, economy, and quality of life of these United States. One additional target audience that will benefit from increased exposure to SHRP2 products is the college student studying civil and environmental engineering, urban planning, transportation engineering, or another closely-affiliated discipline.



In response to this need, the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) launched the SHRP2 Education Connection in 2015. This program brought SHRP2 products into the classroom through cooperative agreements and ten universities, including the University of Idaho, received \$10,000 awards to integrate specific SHRP2 Solutions into existing curriculum. In 2017, a second round of SHRP2 Education Connection funding was awarded. The University of Idaho was once again selected to lead efforts to bring "state of the art to state of the practice" in the focus areas of Renewal, Capacity, and Reliability, joining four other national award recipients.

Led by principal investigator Kevin Chang, Ph.D., P.E., the incorporation of SHRP2 materials into college-level coursework will help to familiarize the next generation of engineers and transportation professionals with these resources. Over time, students will ideally increase utilization of these SHRP2 tools, processes, and innovations when addressing emerging transportation issues and challenges. Connecting students with these types of activities is a particularly good way to engage them and help them understand how classroom methods and techniques are applied on a real-world stage after they graduate and enter the workforce.

For this project, the University of Idaho will:

- 1) identify and review SHRP2 resources in the focus areas of capacity and reliability for inclusion as part of university transportation coursework.
- 2) develop, test, and revise new curricula to address gaps in current coursework materials.
- 3) assess student learning and comprehension needs with regard to these SHRP2 materials.

The University of Idaho will utilize its expertise in developing and administering content at the university and college curricula level for this project by fostering innovative and creative ways to engage students in SHRP2 materials. The methods used will include, but not be limited to: classroom lectures, assigned study exercises, student evaluation rubrics, and instructor notes to maximize opportunities for transferability across instructors and institutions.



New Research Area: Modeling Tire-Pavement Noise Measurements in Idaho

Principal Investigators: Emad Kassem

Funding Agency: NIATT

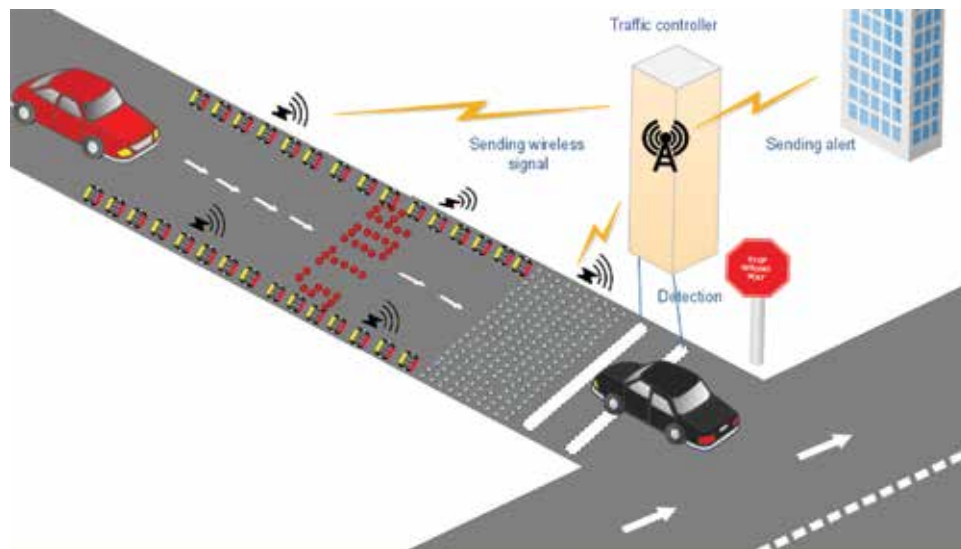
Noise pollution due to highway traffic is a major issue all over the world. Noise pollution adversely affects the quality of the quality of life of residents who live nearby major transportation corridors. There are three main sources of vehicle noise: propulsion, tire-pavement interaction, and aerodynamics. Tire-pavement noise is the dominant source at speeds over 30 mph. There is an increasing demand for quieter pavement especially where transportation corridors are close to residential zones. In the United States, the Federal Highway Administration (FHWA) Noise Abatement Criteria states that the A-weighted sound pressure level must not exceed 67 dBA for residential areas. Typically, noise barriers (walls or berms) are used to abate the noise. The noise barrier walls are costly and not effective all the times. Reducing the tire-pavement noise at the source is a viable alternative to cut down the noise level. Many states are examining the use of quieter pavement in conjunction with noise barriers.

The objective of this study is to examine the factors that affect tire-pavement noise so we can develop and design proper pavement surfaces (e.g., mix design for flexible pavements and texture [diamond grinding, longitudinal grooving, etc.] of concrete pavements) to reduce the noise level. This project will make use of an available tire-pavement noise measurement system at the University of Idaho to collect noise measurements on highways of interest to ITD.

This field investigation shall assist ITD with the following:

- Document typical noise levels on highways and roads in the state.
- Measure the noise level on asphalt pavements with different mix design and rigid pavement with different texture patterns to identify pavement surfaces that generate low noise level.
- Provide color-coded noise maps of examined roads that help in pavement management to identify segments of roads that exceed the permissible noise threshold.
- Construct quieter pavement to reduce the need for costly noise barriers

NIATT Student Teams



TRB Traffic Control Device Challenge: A Smart Wrong-Way Real-Time Active Warning System

Student Teams: Sherif Hussein, Syrine Belakaria, Fatma Maktour

In the United States, about 355 people are killed each year in crashes caused by drivers headed in the wrong direction on the highway. This project consisted of a pilot study on the feasibility of a wrong-way detection and warning system that utilized the current wireless sensing technology. A novel self-sustained warning system to detect wrong-way drivers and notify them instantaneously of their fault was proposed. As most wrong way drivers are unconscious of their fault at the time they are doing it, the novel system consists of a wireless component to warn both right way and wrong way drivers with visual, audible and physical warnings minimize the chance of wrong way crashes. For our prototype, low cost and low power components were used that gave efficient results. The proposed design would integrate readily available technologies with the existing freeway management system (FMS) infrastructure.

Detection and transmission by the traffic controller:

- Two detection loops installed under the pavement in order to be able to detection any driver.
- The microprocessor analyzes the time stamp of the activation of the first and the second detection loops.

- The microprocessor is related to an antenna able to send a wireless message in case of wrong way detection

Reception and warning:

- A wired message is sent to a wired motor that will lift up a pavement sheet containing semi spherical markers.
- The wireless message received by: (1) solar paneled powered pavement markers with microprocessors flashing red for the wrong way driver and yellow for the right way driver, (2) "STOP" shape flashing red activated with another microprocessor (3) the traffic management center, who will be informed of the wrong way entry.

Detection subsystem: Legacy detection box, two induction loops that may be replaced by:

- Two SOFT POTENTIOMETER sensing the load of the vehicle.
- Infrared sensor with two transmitters and two receivers.
- One passive Infrared sensor for heat motion detection.
- One Sharp Infrared distance sensor including both the transmitter and the receiver.
- Ultrasonic distance Sensor including both the transmitter and the receiver Microprocessor analyzing vehicle motion and including wireless transmission capability.

Warning subsystem:

- Microprocessors including wireless reception capability.
- Red and Yellow flashing pavement markers.
- Motorized pavement markers.

TRB Traffic Control Device Challenge

NIATT's Sherif Hussein, Syrine Belakaria and Fatma Makdour presented this research at the Transportation Research Board's (TRB) and American Traffic Safety Services Association's (ATSSA) Traffic Control Device Challenge. NIATT's researchers traveled and presented alongside researchers from all over the country to promote innovation and stimulate ideas in the traffic control devices area with a goal to improve operations and safety.





Clean Snowmobile Challenge

Every year, the Society of Automobile Engineers (SAE) hosts the Clean Snowmobile Challenge, a national engineering design competition for undergraduate and graduate students. The competition, which takes place in Michigan Technological University's Keweenaw Research Center, challenges students to reengineer a stock snowmobile in order to decrease noise and emissions.

The University of Idaho (U of I) Clean Snowmobile Challenge team started participating in SAE's competition in 2001, and has received first place overall three times since then, emerging as the only team from a school on the western side of the country. Then National Institute of Advanced Transportation Technology (NIATT) and the university's department of mechanical engineering are the team's biggest sponsors.

The competition's objectives is for the snowmobile (also referred to as a sled) to pass the United States National Park Service (NPS) noise standard, which gauges how disruptive it could be to its surroundings. Each of the event categories evaluates a specific aspect of the sled, including noise, emissions, design, and handling, acceleration, and fuel economy. Modified sleds are supposed to be cleaner, quieter, and more fuel efficient. Tailpipe emissions and noise output are the primary factors that weigh into our score.

In the 2018 competition last March, the U of I team placed first in several events, including best acceleration, best objective and subjective handling, best technical paper, and best technical presentation, in addition to passing the NPS noise standard. The team also received the Best Value award and the E-Controls award.



Student Highlights

Skye Swoboda-Colberg graduated with a B.A. in Spanish and Geography from the University of Wyoming in 2015. This summer, he worked as a Geographic Information System (GIS) technician assisting Dr. Ahmed Abdel Rahim on a project to develop a novel approach for collecting traffic-related data from Tweets related to traffic hazards in Idaho. In the future, Skye wants to learn more about search and rescue theory and using GIS to improve search and rescue operations.



Sam Fereidooni is a sophomore studying computer science and psychology at Yale University. During his summer NIATT Research Assistantship, he assisted in the development of a Python-based program which analyzed the sentiment of tweets regarding the state's roads and highways. Throughout the experience, he learned about implementing data analytics techniques on social media datasets while learning how to use new tools and libraries.



Sabreena Nasrin, originally from Bangladesh, is currently working on a gravel road project sponsored by Center for Safety Equity in Transportation (CSET) which aims to use the Idaho highway database to identify unpaved, gravel roads in Idaho that are critical for access to rural communities. Once identified, information regarding their existing conditions (i.e. geometric alignment, width including the shoulders, unpaved surface condition) will be used for assessing their vulnerability to structural failures and Geo-hazards.

Her engineering interests outside of this project are bridge engineering and design, which are the focus of her PhD. She is working on developing a numerical model of Ultra-High Performance Concrete (UHPC) connected bridge deck connections which can be used for predicting the performance of this kind of connections. Part of her project involves using locally available materials to reduce the excessive cost needed for Ultra-High Performance Concrete.

Outside of the classroom, she is a student member of American Society of Civil Engineers (ASCE) and American Concrete Institute (ACI). She also served the Graduate and Professional Students' Association (GPSA) of U of I for the year 2017-2018 as a Senator at Large, and currently she is the President of the Bangladesh Association of Students and Scholars (BASS). In her spare time, she enjoys gardening and painting.



Alex Kiss - Reducing Sound in Clean Snowmobiles

Alex Kiss is a returning undergraduate student going into his third year of Mechanical Engineering at the University of Idaho. Outside of the classroom, he is one of the captains of the University of Idaho Clean Snowmobile Challenge team and has been contributing to the team for the last two years. University teams participating in the Clean Snowmobile Challenge compete to make a stock snowmobile cleaner, quieter, and more fuel efficient.

"The competition has encouraged innovation that helps preserve land access in environmentally sensitive areas like the national parks. At the U of I, we take on the additional challenge of using a two-stroke engine to achieve a powerful, sporty platform that people still love to ride."



Some members of the team specialize in engine calibration, catalysis, and electrical systems, to name a few areas. In his first year on the sled team, Alex was assigned to a project to reduce noise using resonators which began his interest in acoustics.

In his latest research, Alex worked specifically on noise and vibration testing on snowmobiles via a test called order analysis. To do this, a noise frequency spectrum is plotted alongside the changing speed of the snowmobile's track or engine. Then, the dominant noise frequencies can be related to the rotational frequency over time by a constant multiple, which can be used to identify secondary noise sources, such as a gear reduction, in the drivetrain. The most recent competition for the University of Idaho Clean Snowmobile Challenge was in 2018 at Michigan Technological University:

"At the 2018 competition, our team had a dominant performance in most of the events, but struggled in the emissions event because the external fuel pressure regulator we used performed differently from our testing setup back in Idaho. With this learning, as well as one year of experience under our belts on the new chassis, we have a great shot at bringing home first place in 2019."

After graduation, Alex wants to work in the automotive industry, specifically in noise, vibration, and harshness. In his spare time, he enjoys cooking, playing ping pong, and running long distances.

Angel Gonzalez - Analyzing Traffic Safety Using Statistics

Angel Gonzalez began working in the geotechnical engineering industry after completing his undergraduate degree in Civil Engineering at the University of Idaho. Two years later, in the fall of 2017, he decided to come back to the University of Idaho as a graduate student to focus on his true passion – transportation engineering.

“Traffic safety is part of keeping people safe and making sure people don’t get injured or worse. Creating and developing ways of keeping people safe is what is important about transportation and traffic engineering.”

Since returning to NIATT, Angel has published a statistical analysis on left-turning traffic in Idaho and has begun working on his Master’s thesis, which studies the relationship between how unsafe unpaved rural low-volume roads are in Idaho and how many fatalities and incapacitating injuries come from those areas. Born in California, he hopes to apply the skills he learns at NIATT to procure a position in transportation safety in the North California area while working toward earning a professional engineering license in the state of California.

Aside from his graduate studies, Angel is involved with the ITE (Institute of Transportation Engineers) student chapter and enjoys fishing, weightlifting, and bike riding in Moscow and the surrounding areas.



Chowdhury S M Robinur Mohshin - From Construction to Materials

After his undergraduate studies at the Bangladesh University of Engineering and Technology, Chowdhury worked in the construction field for 4 years. While working in construction projects, such as the rehabilitation of an existing airport runway, he became interested in pavement materials and pavement construction industries.

Chowdhury is now a Masters student at the University of Idaho focusing on pavement materials engineering. His Masters project, sponsored by Idaho Transportation Department, involves unbound material characterization for Idaho pavements. Outside of the classroom, he is a member of the Institute of Transportation Engineers, and the general secretary of the Bangladesh Association of Students and Scholars.



Eventually, Chowdhury wants to pursue a PhD in pavement engineering and hopes to go back to his home country of Bangladesh and work in transportation engineering, as he mentioned the advancement in pavement engineering seen in the US is not common in Bangladesh. In his spare time, one of his favorite things to do is watch sci-fi movies.

Maged Miloud Mohamed - Making Marks in Traffic Engineering

Maged first became interested in traffic safety engineering when he noticed the difference between the U.S. and Europe road design on his first visit to the United States. Since then, he has completed his Masters at the University of Idaho and is currently enrolled as a doctorate working towards in traffic engineering.

His most recent research involves pavement markings, developing methods to evaluate the safety of pavement markings for the Idaho Transportation Department. In his spare time, Maged enjoys spending time with his family in the nature surrounding Moscow, especially with his son. After finishing his PhD, he plans on working in the engineering field rather than in academia.



Colin Parke - Clutching for the Clean Snowmobile Team

Colin Parke is an undergraduate student going into his third year at the University of Idaho. After joining the robotics team in high school, he realized that he enjoyed working on projects with his hands and became interested in engineering.

On top of his studies, Colin is now part of the clean snowmobile challenge team at the University of Idaho. The clean snowmobile challenge consists of taking a stock snowmobile and trying to get it to run cleaner, quieter, and more fuel efficient. Last year, University of Idaho's team placed 7th in the national competition which took place in Michigan. Each person on the team has a different focus – he works on improving clutching. As a whole, the team also works on outreach:

“Part of being on the team is to bring in more members and get people interested in what we’re doing.”

Aside from being a part of the clean snowmobile challenge team, Colin has also presented on their behalf at EXPO 2017. In the near future, he will begin his senior design project which will consist of redesigning the transmission for the clean snowmobiles. Colin loves doing stuff outdoors, such as mountain biking, hiking, and backpacking.



Paul Bomber - Researching Civil Engineering as an Undergraduate

Paul Bomber has been interested in civil engineering for most of his life. Ever since he was young, he enjoyed watching cars, how traffic signals work, and studying maps. Originally from Corvallis, Oregon, Paul decided to begin his engineering journey at the University of Idaho due to the transportation engineering opportunities and the change of scenery.

This summer, Paul is helping with Dr. Chang on doing research to help the Nez Perce tribe with some transportation issues. His involvement with the research has consisted of writing a literature review on the Nez Perce tribe, regarding sensitivity issues, questions, and previous data about the reservation.

Aside from his involvement in research, Paul helped improve the canoe program as the Concrete Canoe Captain for the American Society of Civil Engineers' National Concrete Canoe Competition in 2017. Looking to the future, he wants to use the experience doing research that he gathered at NIATT to start a career in transportation engineering. In his spare time, Paul enjoys cross-country skiing, running, hiking, kayaking and spending time with his family.



Mumtahir Hasnat - Sensing the Pavement

Once graduating from the Islamic University of Technology in his home country of Bangladesh, Mumtahir Hasnat wanted to continue his studies in the field of pavement engineering. Having heard of the pavement engineering research going on at the University of Idaho from one of his advisors, he decided to attend and started his Master's in Pavement Engineering at the University of Idaho in Fall 2017.

Mumtahir's research project focuses on pavement and materials engineering, specifically developing local calibration factors for the performance models in the AASHTOWare Pavement ME Design Software for PCC (rigid) pavements. Part of the process requires calibrating those calibration factors to specific local conditions, such as traffic and weather. The calibration factors developed in his research will be an important step in the full implementation of the new design software for Idaho

Now every time he drives, Mumtahir subconsciously focuses on cracks and the quality of the pavement – sensing and analyzing every bump. He hopes to continue gaining theoretical knowledge along with field experience through his research.

After finishing his Master's degree, he hopes to remain in academia and eventually become a person that is important to the field of transportation engineering. In his spare time, Mumtahir is an avid player of cricket.



Preyusha Aryal - Exploring Engineering in Different Terms

Growing up, Preyusha loved playing with electrical circuits and lights. Eventually, this led to her discovering computer engineering. The first time she remembers coding something was in 10th grade back in her home country of Nepal, where she first used Qbasic:

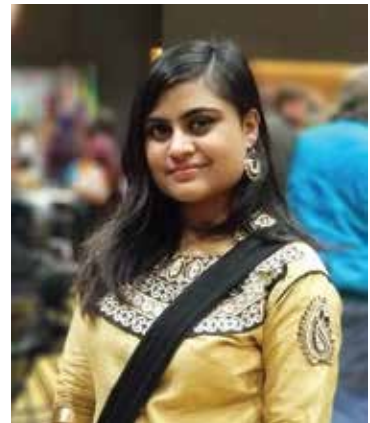
“You are writing a code and you are getting a specific output. I loved doing it.”

Preyusha’s passion for computer engineering brought her to the University of Idaho, where she enrolled as a Computer Engineering undergraduate student. The research opportunities available for undergraduate students to participate in graduate-level research and the welcoming international community led her to choose the University of Idaho over other schools. Currently, she is working on a project with graduate students to find the range that Road Side Units and On Board Units can effectively communicate in the field. This network provides communication between vehicles and traffic to relay information about safety messages, traffic condition, and so on.

Preyusha loves the outdoors, where she enjoys activities from camping, hiking, bungee jumping, and as of recently, skydiving. Traveling is also a big part of her life and ties into her future career goals:

“I personally want to travel and explore engineering in different terms - making engineering accessible to people in places where there aren’t many opportunities.”

Looking to someday work with different international non-governmental organizations and perhaps running her own, Preyusha wants to bring engineering to a broader community. On top of teaching, she has the goal of giving people from all around the world who are interested in engineering access to educational opportunities.





Mohammad and Simpson - Paving the Way to Safety

Mohammad Al Assi and Simpson Lamichhane collaborated in pavement materials and design research at the University of Idaho in Summer of 2018. The focus of their research is to evaluate the skid resistance in U.S. Interstate, and state highways in the state of Idaho at different testing speeds ranging from 20 to 60 mph. Typically, skid resistance is measured by Idaho Department of Transportation (ITD) at 40 mph. The research team measured skid resistance in the field and developed skid prediction models to evaluate the skid performance of highway pavements at any desired speed, which will enable ITD to perform their annual evaluation of the highway network safely and more efficiently.

Through this project, Simpson learned that pavement friction is an important factor in road safety especially in wet conditions. Mohammad hopes that the outcomes of their research will provide the Idaho Department of Transportation with the necessary tools to evaluate the roadway network for skid resistance (friction) safely and more efficiently in the future.

As international students, Mohammad (from Jordan) and Simpson (from Nepal) both were drawn to the University of Idaho because it offered the opportunity to work in their field of pavement development. Aside from academic opportunities, the cost of living and the location made them decide to begin their international research journey with NIATT at the University of Idaho.

In his spare time, Mohammed is an avid ultimate frisbee player. After graduating with his PhD, he wants to continue getting experience in the field of pavement engineering with more of a focus on pavement mix and design. Simpson hopes to gain some experience of the field before pursuing a career in pavement engineering as a research consultant.

Faculty and Student Awards

University of Idaho NIATT Graduate Student Wins first prize at National Conference

Hossein Sadeghi, a University of Idaho Engineering graduate student, wins first place in the 23rd National Conference on Rural Public and Intercity Bus Transportation Research Paper Competition.

Hossein has a MS in Water Resources Engineering from Isfahan University of Technology (Isfahan, Iran) and is currently pursuing a Master of Science degree in Civil Engineering with a minor in Transportation Engineering here at the University of Idaho.

After taking a class in Spring 18 from his advisor Dr. Kevin Chang on Civil and Environmental Engineering on Public Transportation, Hossein became interested in transportation. In the class, he studied the Transit Capacity and Quality of Service Manual (TCQSM), which resulted in a class project to come up with a more efficient transit signal algorithm.

Hossein is currently doing a summer internship in Lewiston, ID with the Idaho Transportation Department (ITD) where he is working on several projects including bridge design and repair in the state of Idaho. He is also helping ITD staff by preparing final reports for their projects.

His long term goal is to procure a position with a Transportation company where he could apply his education and experiences in all aspects of transportation engineering. Hossein said "I am very interested in developing mathematical algorithms that would be useful in Transportation Engineering. Transit Signal Priority (TSP) systems are a good example for this area."

This fall Hossein will do an oral presentation at the National conference in Breckenridge, CO and present his award winning research paper, which focuses on a Transit Signal Priority system that facilitates the efficient movement of buses through signalized intersections by providing extra green time or reducing red time for buses and allowing them to pass the intersection without stopping for red signals.

He said "I am very excited to represent the University of Idaho and the NIATT (National Institute of Advanced Transportation Technology) Program."



Outstanding Early Career Faculty Award 2018

Ahmed Ibrahim

Ahmed Ibrahim joined the Department of Civil and Environmental Engineering (CEE) as an assistant professor in fall 2015 after more than 15 years in industry and academia. He received his doctorate in civil engineering from the University of Missouri. His research expertise is in concrete durability and experimental testing and numerical analysis of structural concrete elements. His research has been funded from Idaho Transportation department, the US DOT and from the industry. He has published more than 60 peer-reviewed journal articles and conference proceedings. Since coming to the University of Idaho, he has developed three new courses, which have attracted practicing engineers and graduate students from other universities. Ibrahim is involved in many service activities at the department and college levels; he currently serves on the CEE Curriculum Committee and chairs the CEE Infrastructure Committee. He is very active in the professional community at the national level where he chairs the Bridge Design Committee of the American Concrete Institute and is a voting member on several committees for the Transportation Research Board and the American Society of Civil Engineers. He is the academic advisor for U of I's student chapter of the National Society of Black Engineers and mentors the ASCE Steel Bridge team each year. Ibrahim is a registered professional engineer in Idaho and Michigan and is planning to take the structural engineering exam.



Outstanding Young Faculty Award 2017

Kevin Chang, Assistant Professor of Civil & Environmental Engineering

Kevin Chang, Ph.D., P.E. joined the University of Idaho in 2013. Prior to his current position, he was a traffic engineer with the King County Department of Transportation in Seattle, Wash. where he managed the day-to-day operations of the King County Traffic Management Center and supervised the School Safety Program. Chang obtained his undergraduate and graduate degrees in civil engineering, with an emphasis in transportation engineering, from the University of Washington.



His research areas focus on traffic safety and operations, transportation security and transportation education, outreach and workforce development. Chang has secured over \$2 million in research funding for the university and has graduated four master's degree students. Chang is a member of the Transportation Research Board's (TRB) Safety Management Committee, chair of the TRB School Transportation Subcommittee and past chair of the Institute of Transportation Engineers' (ITE) Transportation Education Committee. He has served as conference chair for the American Society of Civil Engineers' (ASCE) Regional Student Conference, the University of Idaho's Cyber Security Symposium and the PacTrans Regional Transportation Conference. Chang has extensive experience in workforce development and has led multiple national transportation engineering webinars for ASCE.

A two-time University of Idaho Alumni Awards for Excellence recipient, Chang is the faculty advisor for the University of Idaho's ASCE and Institute of Transportation Engineers (ITE) student chapters. He was awarded the Outstanding Educator Award by the ITE's Western District in 2016. Outside of work, Chang serves on the board of directors for the Washington State Golf Association.



Mustafa Ammous - 2017 NIATT Student of the Year

The 2017 NIATT Student of the Year is Mustafa Ammous. Mustafa, originally from Jordan, started his Master's at the University of Idaho in the Spring of 2017. His research interests focus on mathematical modeling for transportation systems using mathematical and numerical tools to test different algorithms. He seeks to develop new algorithms for the autonomous mobility-on-demand systems which are expected to dominate the future of transportation in smart cities.

Since he began his studies at the University of Idaho, Mustafa has published 5 conference papers, represented the university in 3 different international conferences, and published 3 journal papers. He received also several travel grants including the Graduate and Professional Student (GPSA) travel award and the IEEE ICC'18 travel award. His involvement with the program also includes mentoring undergraduate students doing research with NIATT. Mustafa received an invitation to join the nation's oldest honor society, Phi Kappa Phi, for his excellent performance in both academic and research fields. By the end of Spring 2018, Mustafa was awarded the Outstanding Bhanoji Rao Award in Electrical Engineering at the College of Engineering annual ceremony.

Mustafa will be starting at the University of Toronto in September 2018 for his doctorate in electrical engineering with a focus on machine learning and hopes to continue conducting research with the goal of becoming a professor. In his spare time, he enjoys watching movies, traveling, and reading.

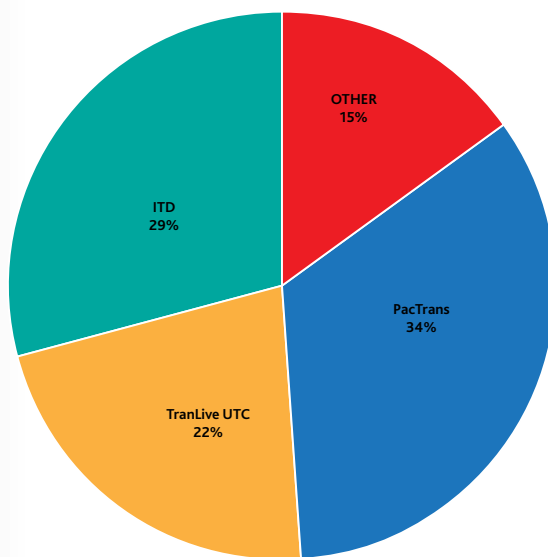
Outstanding Senior - Rafael Akio Alves Watanabe

Born and raised in the capital of Brazil, Rafael Akio Alves Watanabe never thought he would be graduating from the University of Idaho. From a young age, Watanabe displayed an interest for mathematics and physics but had not considered engineering before coming to U of I. During the last four years, Watanabe has managed to complete his electrical engineering and mathematics majors, incorporate some graduate courses in his academic schedule and maintain a continuous membership to the Honors Program. Because of his interest in electronics, Watanabe has assisted with the ECE 310 class, has attended the International Solid State Circuit Conference (ISSCC) and has worked on a Fast Acting Hardware Trojan circuit for his senior project. After getting married this coming summer, Watanabe will start his master's degree in electrical engineering at U of I in the fall.

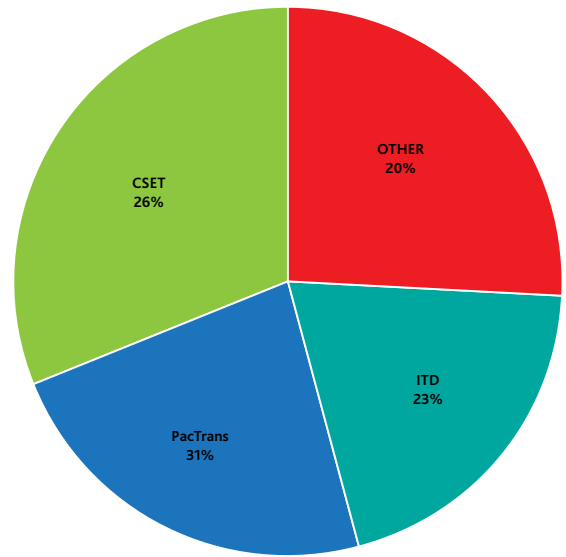


Financial Report

NIATT Funding Sources for Expenditures - FY2017-FY2018



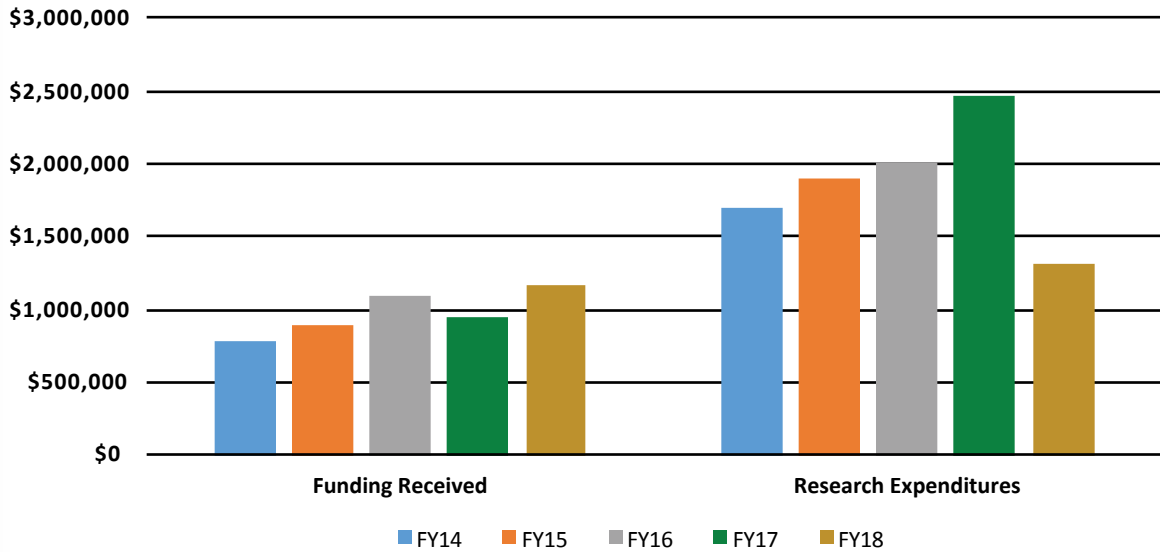
NIATT FUNDING SOURCES FOR EXPENDITURES - FY 2017



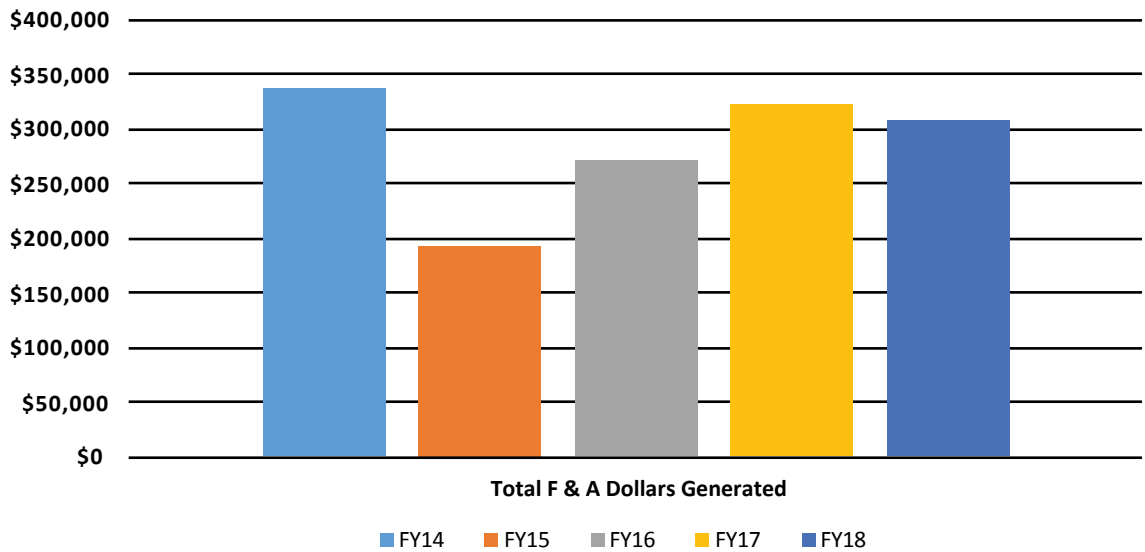
NIATT FUNDING SOURCES FOR EXPENDITURES - FY 2018

NIATT Funding and Expenses

The charts below shows the growth trends, in funding received and research expenditures.



Note: The reduction in FY18 Expenditures is due to the end of the TranLIVE UTC center



List of All Projects

NIATT Growth Trends FY2017 - FY2018

The chart below shows the growth trends, in funding received and research expenditures, from fiscal year 2017 to fiscal year 2018.

Projects Begun in FY2017

Nez Perce Tribe HMEP Hazmat Planning and Training

PI: Haifeng Liao

Funding Agency: Nez Perce Tribe

Portland Cement Concrete Material Characterization for Pavement ME Design

PI: Ahmed Ibrahim

Funding Agency: Washington State University

Concrete Performance in Aggressive Salt Environments

PI: Ahmed Ibrahim

Funding Agency: Idaho Transportation Department

Development and Evaluation of Performance Measures to Augment Asphalt Mix Design in Idaho

PI: Emad Kassem

Funding Agency: Idaho Transportation Department

Unbound Material Characterization of Pavement ME Implementation in Idaho

PI: Emad Kassem

Funding Agency: Boise State University

Evaluation of Skid Resistance Pavement at Different Speeds

PI: Emad Kassem

Funding Agency: Idaho Transportation Department

Administration

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Safety Data Management and Analysis: Addressing the Continuing Education Needs for the Pacific Northwest

PI: Kevin Chang

Funding Agency: University of Washington

Mitigation of Lane Departure Crashes in the Pacific Northwest Through Coordinated Outreach

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Safety of Idaho Rural Highways under 129K Trucks

PI: Ahmed Ibrahim

Funding Agency: University of Washington

Rural Bridge Safety: Evaluation of Atypical Large Farm Vehicles

PI: Ahmed Ibrahim

Funding Agency: University of Washington

Intersection Safety

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Streamlining the Crash Reporting Process in the Pacific Northwest

PI: Kevin Chang

Funding Agency: University of Washington

Aerogel Insulation System: An Insulation Energy Efficient Thermal Wall

PI: Ahmed Ibrahim

Funding Agency: Avista

COMPLETED PROJECTS FY2017

SHRP2 Education Connection

PI: Kevin Chang

Funding Agency: Federal Highway Administration

Passing Zone Behavior and Sight Distance on Rural Highways

PI: Kevin Chang

Funding Agency: University of Fairbanks, Alaska

Fiber Asphalt Pavements Phase 1

PI: Fouad Bayomy

Funding Agency: Idaho Transportation Department

Detection Field Testing

PI: Ahmed Abdel-Rahim

Funding Agency: Idaho Transportation Department

Bicycle and Pedestrian Facility Inventory Database

PI: Michael Lowry

Funding Agency: Idaho Transportation Department

Guidance to Assist Local Highway Jurisdictions in Evaluating 129,000 Pound Route Requests

PI: Ahmed Ibrahim

Funding Agency: Idaho Transportation of Idaho

Evaluation of Ultra-wideband Radio for Improved Pedestrian Safety at Signalized Intersections

PI: Jim Frenzel

Funding Agency: University of Washington

Modeling Passing Behavior on Two-Lane Rural Highways: Evaluating Crash Risk Under Different Geometric Conditions

PI: Kevin Chang

Funding Agency: University of Washington

Crowdsourcing Bicycle Travel Data to Estimate Risk Exposure and Create Safety Performance Functions

PI: Michael Lowry

Funding Agency: University of Washington

Mixed Use Safety on Rural Facilities in the Pacific Northwest

PI: Kevin Chang

Funding Agency: University of Washington

Aerodynamic Effects on Two-Lane Rural Highway Safety

PI: Tao Xing

Funding Agency: University of Washington

Spatial Analysis of Bicycle and Pedestrian Data

PI: Michael Lowry

Funding Agency: University of Washington

Tran LIVE Transportation for Livability by Integrating Vehicles and the Environment

PI: Ahmed Abdel-Rahim

Funding Agency: United States Department of Transportation - University Transportation Center

Operation, Analysis, and Design of Signalized Intersections: A module for the Introductory Course in Transportation Engineering

PI: Michael Kyte

Funding Agency: United States Department of Transportation – University Transportation Center

Calibration of Multi-scale Energy and Emission Models

PI: Ahmed Abdel-Rahim

Funding Agency: United States Department of Transportation - University Transportation Center

Eco-Driving Modeling Environment

PI: Ahmed Abdel-Rahim

Funding Agency: United States Department of Transportation – University Transportation Center

Field Implementation and Testing Eco-Traffic Signal System Applications

PI: Ahmed Abdel-Rahim

Funding Agency: United States Department of Transportation – University Transportation Center

CONTINUING PROJECTS THROUGH FY2017

Smart Raised Pavement Marking Integration with Traffic Control Systems

PI: Ahmed Abdel-Rahim

Funding Agency: Idaho Commerce, Idaho Global Entrepreneurial Mission

Safety Impacts Using Wider Pavement Marking in Two-Lane Rural Highways in Idaho

PI: Ahmed Abdel-Rahim

Funding Agency: Idaho Transportation Department

Calibration of the AASHTOWARE Pavement ME Design Performance Models for Flexible Pavements in Idaho

PI: Fouad Bayomy

Funding Agency: Idaho Transportation Department

Evaluation, Comparison, and Correlation Between the Idaho IT-144 and AASHTO T-84 Methods for Determining the Specific Gravity and Absorption Properties of Fine Aggregate

PI: Sunil Sharma

Funding Agency: Idaho Transportation Department

Safety Analysis of School Zones along Two-Way, Two-Lane Highways

PI: Kevin Chang

Funding Agency: Idaho Transportation Department

Educating Teenage Drivers of the Dangers of Distracted Driving

PI: Ahmed Abdel-Rahim

Funding Agency: Idaho Transportation Department

PROJECTS BEGUN IN FY2018

Safety Applications of Real-Time Responsive On-Pavement Warning Systems

PI: Ahmed Abdel-Rahim

Funding Agency: Evolutionary Markings, INC.

Idaho IT-144 & AASHTO T-84

PI: Sunil Sharma

Funding Agency: Idaho Transportation Department

AASHTOWare Pavement ME Design

PI: Fouad Bayomy

Funding Agency: Idaho Transportation Department

Development of an Inventory and Inspection Database Framework for Asset Management of MSE Walls

PI: Sunil Sharma

Funding Agency: Idaho Transportation Department

Implementing AASHTO TP 110 for Alkali-Silica Reaction Potential Evaluation of Idaho Aggregates

PI: Emad Kassem

Funding Agency: Boise State University

SHRP2 Education Connection

PI: Kevin Chang

Funding Agency: United States Department of Transportation

Decentralized Autonomous Electric Mobility-on-Demand Services for Individuals with Physical and Cognitive Disabilities

PI: Sameh Sorour

Funding Agency: University of Washington

High Energy Efficient Aerogel-Glazing Coupled with Aerogel-Insulated Walls in Residential Building: Phase II

PI: Ahmed Ibrahim

Funding Agency: Avista

Safety Data Management and Analysis: Addressing the Continuing Education Needs for the Pacific Northwest

PI: Kevin Chang

Funding Agency: University of Washington

Administration

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Outreach Characterization of Underserved Population Perceptions and Mobility Needs in Connected-Vehicle and Smarter City Environments

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Education

PI: Kevin Chang

Funding Agency: University of Washington

Education Development of PacTrans Workforce Development Institute

PI: Kevin Chang

Funding Agency: University of Washington

LIDAR An Airborne Lidar Scanning and Deep Learning System for Realtime Event Extraction and Control Policies in Urban Transportation Networks

PI: Sameh Sorour

Funding Agency: University of Washington

Mobility Implications of School Crossing Guard Programs and School Walking Route Maps

PI: Kevin Chang

Funding Agency: University of Washington

V21 Ada County Field Evaluation of V21 Connected Vehicle Deployment in Ada County, Idaho

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Administration and General Outreach and Education

PI: Kevin Chang

Funding Agency: University of Alaska, Fairbanks

Collaboration RAR Safety Equity and Transportation in Tribal Communities – Navigating Collaborative Approaches and Indigenous Partnerships

PI: Kevin Chang

Funding Agency: University of Alaska Fairbanks

Traffic Documenting the Characteristics of Traffic Crashes for RITI Communities in Idaho

PI: Abdel Abdel-Rahim

Funding Agency: University of Alaska Fairbanks

Connector Vehicle Transportation Equity for RITI Communities in an Autonomous and Connected Vehicle Environment: Opportunities and Barriers

PI: Sameh Sorour

Funding Agency: University of Alaska Fairbanks

Gravel Roads AI Operational Safety of Gravel Roads in Rural and Tribal Communities: Vulnerability to Structural Failures and Geohazards

PI: Ahmed Ibrahim

Funding Agency: University of Alaska Fairbanks

COMPLETED PROJECTS FY2018

Using Wider Pavement Markers

PI: Ahmed Abdel-Rahim

Funding Agency: Idaho Transportation Department

Safety of Idaho Rural Highways under 129K Trucks

PI: Ahmed Ibrahim

Funding Agency: University of Washington

CONTINUING PROJECTS THROUGH FY2018

Concrete Performance in Aggressive Salt Environments

PI: Ahmed Ibrahim

Funding Agency: Idaho Transportation Department

Development and Evaluation of Performance Measures to Augment Asphalt Mix Design in Idaho

PI: Emad Kassem

Funding Agency: Idaho Transportation Department

Unbound Material Characterization of Pavement ME Implementation in Idaho

PI: Emad Kassem

Funding Agency: Boise State University

Evaluation of Skid Resistance of Pavements at Different Speeds

PI: Emad Kassem

Funding Agency: Idaho Transportation Department

Avista-Aerogel Insulation System: An Insulation Energy Efficient Thermal Wall

PI: Ahmed Ibrahim

Funding Agency: Avista

Mitigation of Lane Departure Crashes in the Pacific Northwest Through Coordinated Outreach

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Rural Bridge Safety: Evaluation of Atypical Large Farm Vehicles

PI: Ahmed Ibrahim

Funding Agency: University of Washington

Intersection Safety

PI: Ahmed Abdel-Rahim

Funding Agency: University of Washington

Streamlining the Crash Reporting Process in the Pacific Northwest

PI: Kevin Chang

Funding Agency: University of Washington



**National Institute for Advanced
Transportation Technology**

University of Idaho
Engineering Physics Building 115
875 Perimeter Drive MS 0901
Moscow, ID 83844-0901

Telephone: (208) 885-0576

Fax: (208) 885-2877

<http://www.niatt.org>