



Semi Annual Progress Report for University Transportation Centers

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Project title: **Pacific Northwest Transportation Consortium (PacTrans): Providing Data-Driven Solutions for the Diverse Mobility Challenges of the Pacific Northwest**

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Report Term: Semi-Annual

Accomplishments

What are the major goals and objectives of the program?

Pacific Northwest Transportation Consortium (PacTrans) consists of institutions from all four states in our region with the University of Washington (UW) as the lead and Oregon State University (OSU), University of Alaska Fairbanks (UAF), University of Idaho (UI), and Washington State University (WSU) as research partners, as well as Boise State University (BSU) and Gonzaga University (GU) as education partners. PacTrans' theme centers on "Developing Data Driven Solutions for the Diverse Mobility Needs of People and Goods in the Pacific Northwest". PacTrans serves as a focal point within Region 10 to develop initiatives and facilitate collaborative activities with regional partners to maximize the effectiveness of their collective services and programs toward the U.S. Department of Transportation (USDOT) strategic goal of mobility. Major goals and objectives of PacTrans include:

Research – Serving as Region 10's research engine, PacTrans is committed to funding research in both the categories of advanced and, more importantly, applied research.

Technology Transfer – PacTrans strives to be an applied technology showcase, providing additional funds to projects that are deemed as "Success Stories" to ensure dissemination of results to policy makers, educators, practitioners, other transportation professionals, and the general public.

Education – As a consortium of seven prestigious universities, PacTrans is devoted to being an education leader. This involves continued evaluation and evolution of our transportation engineering programs as well as providing state-of-the-art research laboratories, student conferences and seminars, mentoring, and scholarship opportunities for our students and future workforce trainees.

Workforce Development – PacTrans endeavors to be a workforce development base: hosting activities that focus on the development of transportation professionals, building strong partnerships with transportation agencies and companies in our region, and designing training programs to address the workforce development needs, while connecting our students with quality jobs where they can implement the knowledge they gained through their education.

Outreach – Throughout all of these other goals and objectives, PacTrans seeks to be in a continual process of outreach: promoting and building the educational student base, making new industry and agency partners, attracting new research, and providing opportunities to share and learn about key outcomes and achievements that have been learned through research and education activities.

Collaboration – PacTrans desires to be a platform for participation and is always on the lookout for potential new partner and new opportunities with current partners to collaborate on transportation related endeavors.

What was accomplished under these goals?

During the period from April 1, 2023 – September 30, 2023, PacTrans was actively engaged in each goal and objective identified above. This was achieved through a breadth of activities that were conducted to ensure our transportation expertise contributes to the advancement of the region's transportation

research, technology transfer, education, workforce development, outreach, and collaboration.

Research

As Region 10's research engine, PacTrans has been actively engaged in two broader categories of research projects. We engage in multi-institutional research projects that require participation from at least two consortium universities, and typically have a larger budget. Such projects include multi-institutional general research projects, as well as a multi-institutional educational project, and a multi-institutional outreach project. We also engage in single institutional projects (referred to as small research projects) that only require participation from a single consortium university and typically have smaller budgets. Both categories of research are geared towards the goal of advancing the region's transportation mobility research.

As mentioned in previous Semi-Annual Progress Reports, PacTrans shifted our last two research performance periods forward on the calendar in an attempt to maximize the amount of time researchers have to conduct their work while still ensuring that all projects will be completed on time and technical reports will be submitted to the necessary repositories before the grant ends. Thus, all projects that will have been funded during the course of this grant were initiated before the end of two performance periods past. All projects have project profiles on our website, the ongoing projects have active profiles on the Research in Progress (RiP) database, and completed projects have all been submitted to TRiD, NTL, etc.

During this reporting period, we have completed the collection, peer reviewing, and finalization of all technical reports from Year 4 (2020 – 2022) projects, and have completed roughly 85% of Year 5 (2021 – 2022) projects and roughly 45% of Year 6 (2022 – 2023).

Finally, Washington State University Assistant Professor, and PacTrans PI, Jia Li, received an NSF early CAREER Award, and PacTrans PI from WSU, Adam Phillips, receives Junior Faculty Research Award his university.

Technology Transfer

During this past reporting period, PacTrans PIs and staff have finalized our four 2021 and five 2022 success story projects, and PIs are working to wrap up our six 2023 success story projects. These projects are extensions of research that merit additional funding for the creation of outputs specifically geared toward industry in an attempt to make implementation one step closer for meaningful research results.

The PacTrans-developed, Mobile Unit for Sensing Traffic (MUST) technology was implemented in Toppenish, WA, last year in a project with partners from the Confederated Tribes and Bands of the Yakama Nation and AIWaysion (the STAR Lab spin-off company). The work was is a pilot project deploying the MUST device at one of the most hazardous intersections in Toppenish. This project recently earned the prestigious 2023 Innovative Project Award and Best All Around Award from FHWA's Build a Better Mousetrap program.

PacTrans Director, Yinhai Wang, participated in the FHWA library week and presented on Artificial Intelligence.

PacTrans and its PIs engaged in a number of great conferences, workshops, and symposiums during this reporting period that offered a great platform for us to showcase our research to a broader audience.

Several students and faculty traveled to Austin, Texas in June to participate in the 2023 International Conference on Transportation and Development. PacTrans Assistant Director, Cole Kopca, served on the conference steering committee as its younger member representative and subsequently hosted a handful of conference related activities geared toward the younger member committee.

PacTrans also participated in the 2023 Summer CUTC meeting in Miami, FL, as well as the 2023 National Travel Monitoring Exposition and Conference where PacTrans was co-organizer, and PacTrans Associate Director, Ahmed Abdel Rahim, co-chaired the conference.

UW was honored to host the first Advanced Research Projects Agency–Infrastructure (ARPA-I) workshop where a joint team from USDOT and the Federation of American Scientists met with roughly one hundred professionals from around the region to discuss large transportation problems that the ARPA-I program could work to address.

Education

The UW Concrete Canoe team placed 8th overall at the 2023 ASCE Civil Engineering Student Championships in Platteville, Wisconsin, earlier this year. They placed 7th in the project proposal category, 6th in the technical presentation category, 13th in the final product prototype category, and 9th in the combined races.

OSU Student researcher, Amy Wyman, received her 3rd Dwight D Eisenhower fellowship and was honored with an outstanding mentor award from her university.

PacTrans PI from UI, Mike Lowry, received the outstanding professor award in the teaching category from the college of Engineering.

UW Student researcher, Peter Yu, was one of five UW Students named 2023 Goldwater Scholars.

Workforce Development

PacTrans hosted Randy McCourt, retired principal from DKS & Associates and former President of ITE International for a Quarterly Transportation Seminar titled, *Can AI Advance Transportation Engineering: Will Analysts Finally have Ubiquitous Access to the Best the Practice has to Offer?*. This seminar was also livestreamed to our PacTrans YouTube account.

Last summer PacTrans began a partnership with the UW Youth and Teen Program at our Continuum College to offer a middle school summer course called Intro to Autonomous Cars. The course was such a success that this year we were given the opportunity to offer the same course twice. So, during July, we offered two, two-week long middle school courses that sought to show students how exciting a future career in transportation could be while teaching them engineering/problem solving principal through robot design and programming.

This summer, PacTrans partners UW and WSU partnered with the Washington State Department of Transportation to offer two, week-long residential transportation camps, one on the UW campus and one

on the WSU campus. These courses each had 25 participants and they had the opportunity to learn about a variety of transportation principal in the classroom, through guest lectures, through field trips, and while working on their final projects. The feedback was incredibly positive so we are already working to offer this camp again next summer.

To inspire the next generation of transportation thought leaders, the 2023 Oregon State University National Summer Transportation Institute (OSU NSTI) was delivered in July. As part of the program, students visited the driving and bicycling simulator lab and the asphalt materials lab, learned how to fly drones and use total stations, toured ODOT bridge construction projects and experienced transportation planners' visions for the cities of Corvallis and Eugene. This program was a partnership between the College of Engineering – Oregon State University, the Oregon Department of Transportation, the Federal Highway Administration, and PacTrans.

What opportunities for training and professional development have the program provided?

Many of the specific details of these opportunities have been discussed above. More generally, PacTrans provides training and professional development opportunities through multiple channels:

Research: Through the lifespan of this grant, PacTrans annually selects research projects that offer faculty and student researchers funding to conduct cutting edge research in a variety of areas directly tied to the USDOT strategic goals.

Education: PacTrans consortium partners offer a variety of other on-campus and online courses designed for professional development in addition to the regular degree programs. The online programs, such as the online master's program of sustainable transportation, are particularly good for working professionals because of the flexibility in schedule and location. PacTrans also supports a wide variety of student activities geared toward enhancing their educations. Several examples include: supporting ITE student chapter activities, travel support for students to present accepted work at conferences, sponsorship of student competition teams, and so much more.

Outreach: PacTrans offers training and educational opportunities to K-12 students through its outreach activities. Two quick examples include: (1) the PacTrans partnership with the UW Teen and Youth Program to offer a course titled *Introduction to Autonomous Cars* that will be offered to sixth through eighth graders, and (2) the week-long high school residential transportation camp that was offered through partnership between UW, WSU, and WSDOT.

Funding assistance: PacTrans financially supports students through their participation in research activities, as well as fellowships. During this past reporting period, PacTrans welcomed three new graduate fellows. The Undergraduate Research Fellowship offers undergraduate students the opportunity to participate in research while receiving a stipend for things like conference travel, or research supplies. PacTrans also offered travel support to student competition teams (ITE student chapters, steel bridge, concrete canoe, etc.)

Seminars, workshops, and conferences: As outlined above, PacTrans offers many opportunities for

training and professional development through its webinar series and various workshops, such as the seven webinars we hosted during this reporting period. During this reporting period PacTrans provided travel support for students to present their work at the International Conference on Transportation and Development, as well as the National Traffic Monitoring Exposition and Conference.

Internships: PacTrans regularly posts internship opportunities on our website as a student resource. During this reporting period for example, PacTrans circulated thirteen separate announcements for internship opportunities. Further, we regularly work with our external partners to develop internship programs for our students. With the WSDOT for example, we have set up internship opportunities both with their traffic management center and their tolling operations group.

Partnerships: PacTrans has developed strong partnerships with many agencies, companies, and non-profit organizations. For example, PacTrans has developed strong partnerships with local ITE chapters in student mentoring and training. ITE Washington has a mentor program for university students. They offer student fellowships and also host events for student training. PacTrans is also in a strong partnership with American Society of Civil Engineers in organizing the upcoming International Conference on Transportation and Development.

How have the results been disseminated? If so, in what way/s?

PacTrans has a strong outreach program to local and state transportation agencies and private partners in the region, where PacTrans research outcomes are presented and demonstrated. Research outcomes are posted on the PacTrans website, distributed through our monthly newsletter and annual reports, and promoted through social media such as LinkedIn and Facebook and the University of Washington press media. We also disseminate news, events and results via our website at www.pactrans.org.

Another avenue for dissemination that PacTrans leans on heavily is presentations at conferences, workshops, and symposia. Each year we send roughly one hundred PIs and students (about 70 students) to the TRB annual meeting where we participate in over 120 committee meetings, poster presentations, workshops, and lecterns. Our annual conference each October also provides an invaluable platform for our researchers to present work either through presentation or poster.

As has been mentioned above, PacTrans also encourages new, innovative dissemination materials through the identification of success stories, where PacTrans offers limited additional funds to projects that have results with potentially strong impacts. These funds can then be used to explore new and innovative opportunities to get knowledge, methods, and products gained, into the hands of practitioners. This year these funds have been used to host workshops/training, produce informational videos, build online tools and procedure manuals, etc.

Finally, per our obligation as a UTC, research results are posted on our website and are disseminated to all of the required repositories that include, TRID, USDOT, Transportation Library, Volpe National Transportation Systems Center, Federal Highway Administration Research Library and the US Department of Commerce National Technical Information Service.

What do you plan to do during the next reporting period to accomplish the

goals and objectives?

PacTrans is working hard to wrap up this iteration of our Center. Below are the center's identified plans and strategies for accomplishing its goals and objectives over the next reporting period.

Research

During this next reporting period PacTrans will wrap up any outstanding year 4 (2020 – 2022), year 5 (2021 – 2022), and year 6 (2022 – 2023) funded projects. As project technical reports are submitted, we will send them out for peer review, and then to a technical editor before considering them complete. We will then post the reports on our website and send them to TRID and Research Hub.

Technology Transfer

PacTrans will work with currently funded success story project PIs to get all projects completed and deliverables submitted and posted to our website. These small projects do not require technical reports but instead they require whatever the medium was that was developed through the project (website, webtool, video, recorded training, digital materials, etc.)

Also, during this next reporting period, PacTrans has several great opportunities for technology transfer, including: the PacTrans Region 10 Transportation Conference, and the 2024 TRB Annual Meeting.

Education

To the extent that funds and time remain for this grant, PacTrans consortium partners will continue to support our students in the ways we have been over the past six years. Generally, those include:

1. We support professional organization student chapters, such as the Institute of Transportation Engineers, and student competition teams, such as UI's clean snowmobile team, and UW's Hyperloop team.
2. Some of these funds are historically used to support the travel of students to conferences such as the Region 10 Transportation Conference and 2024 TRB Annual Meeting to present their work.
3. We will offer the 2023 Region 10 Student Conference on the UW campus this October.

Finally, PacTrans will continue to operation of our quarterly Doctoral Webinar Series with a Fall and Winter installment of the series.

Workforce Development

PacTrans will continue our quarterly Regional Transportation Seminar where we invite top experts from agencies, industry, and academia to come to campus and present in-person to students, faculty, and local industry professions about their research. These seminars are also livestreamed via YouTube. This Fall PacTrans will host Kelvin Wang, Director of the Western Transportation Institute and Professor at Montana State University, to present at one such seminar.

In addition, PacTrans is currently working to hire a new Assistant Director of our Workforce Development Institute in an effort to expand our offerings and better leverage partnerships across the region to address the critical workforce shortages.

Participant and Collaborating Organizations: Who has been involved?

What individuals have worked on the program?

- PacTrans Director, **Yinhai Wang**, Ph.D., Professor of Civil and Environmental Engineering at the UW, devotes 50 percent of his time directing PacTrans. Dr. Wang has overall responsibility for program management, oversight of PacTrans operations, including the Research Committee, the Education and Workforce Development Committee, and the Outreach and Technology Transfer Committee, and Student Leadership Council. He is the regional and national leadership for PacTrans, and the contact person for management relationships with USDOT Research and Innovative Administration (RITA) and other USDOT organizations.
- PacTrans Associate Director in Research, **Jeff Ban**, Ph.D., Associate Professor of Transportation Engineering in Civil and Environmental Engineering at the UW spends 5 percent of her time managing the research program for PacTrans and coordinates the research collaboration across the five partner institutions.
- PacTrans Associate Director in Education and Workforce Development, **Anne Vernez-Moudon**, Dr. es SC, Professor of Architecture, Landscape Architecture, and Urban Design and Planning, Adjunct Professor of Epidemiology and in Civil and Environmental Engineering, devotes 5 percent of her time leading the Education and Workforce Development Committee. She is involved in curriculum changes, training program development, and educational enhancements among the partner institutions.
- PacTrans Associate Director in Oregon State University (OSU), **David Hurwitz**, Ph.D., Professor of Civil and Construction Engineering at OSU, devotes 5 percent of his time to managing and organizing the education, outreach, and research activities within OSU. He coordinates all results and outcomes with the UW on a regular basis.
- PacTrans Associate Director in the University of Alaska Fairbanks (UAF), **Billy Connor**, Director of the Alaska University Transportation Center (AUTC), devotes 5 percent of his time to managing and organizing the education, outreach, and research activities within UAF. He coordinates all results and outcomes with the UW on a regular basis.
- PacTrans Associate Director in University of Idaho (UI), **Ahmed Abdel-Rahim**, Ph.D., Associate Professor of Civil Engineering at UI, devotes 5 percent of his time to managing and organizing the education, outreach, and research activities within UI. He coordinates all results and outcomes with the UW on a regular basis.
- PacTrans Associate Director in Washington State University (WSU), **Eric Jessup**, Ph.D., Associate Professor and Transportation Economist in the School of Economic Sciences at Washington State University (WSU), devotes 5 percent of his time to managing and organizing the education, outreach, and research activities within WSU. He coordinates all results and outcomes with the UW on a regular basis.

- Assistant Director, **Cole Kopca**, devoted 75 percent of his time to the day-to-day operations in support of the PacTrans mission. His responsibilities include project management, grant management, events coordination and outreach, and managing the PacTrans operations team.
- PacTrans full-time Finance, Grants, and Research Manager, **Christina Yarbrough**, devoted 100 percent of her time to the Center’s budget, expenditure, and research management.
- PacTrans part-time Program Coordinator, **Melanie Paredes**, devoted 40 percent of her time to the Center’s fiscal matters, support with events coordination and outreach and day to day administration.
- PacTrans has 28 fulltime faculty at the UW engaged in transportation research. Our consortium partners (OSU, UI, WSU, UAF, GU, BSU) have 41 fulltime faculty directly involved in PacTrans research.

What other organizations have been involved as partners?

The following table highlights the institutions, organizations, agencies, and industry partners who have partnered with current PacTrans funded research projects to provide match, either cash or in-kind.

Partner	Type
Washington State Department of Transportation	Government
Alaska Department of Transportation and Public Facilities	Government
Idaho Transportation Department	Government
Capital City Development Corporation (CCDC)	Government

Further, PacTrans has continuing relationships with many partners that have been cultivated over the years. The table below highlights the many partnerships that PacTrans has built over the duration of the center:

Partner	Type
Alaska Department of Transportation and Public Facilities	Government
Idaho Transportation Department	Government
Oregon State Department of Transportation	Government
Washington State Department of Transportation	Government
City of Bellingham	Government
City of Seattle	Government
City of Lynnwood	Government
City of Bellevue	Government
City of Everett	Government
King County	Government
Snohomish County	Government
Pierce County	Government
Sound Transit	Government Agency
Washington Traffic Safety Commission	Government Agency
Washington State Transportation Insurance Pool	Government Agency
University of Alaska, Anchorage	Educational Institution
University of Washington Transportation Services	Educational Institution

Washington State Department of Ecology	Government
Puget Sound Regional Council	Government
Washington State Transportation Investment Board	Government Agency
American Society of Civil Engineers	Professional Association
Institute of Electrical and Electronics Engineers	Professional Association
Institute of Transportation Engineers	Professional Association
Yakama Nation	Federated Tribe
Northwestern Tribal Technical Assistance Program (NW TTAP) Center	University Center
ITS Washington	Professional Association
HDR Engineering	Private Industry
Port of Portland	Government
BMW Group	Private Industry
Western Trailers	Private Industry
Coral Sales Co.	Private Industry
National Institute for Transportation and Communities	University Transportation Center
Transportation for Livability by Integrating Vehicles and the Environment	University Transportation Center
Center for Environmentally Sustainable Transportation in Cold Climates	University Transportation Center
Aichele and Associates	Private Industry
Alstom Grid Inc.	Private Industry
Alta Planning and Design	Private Industry
Battelle	Private Industry
Cascade Bicycle Club	Non-profit/ Foundation
Feet First	Non-profit/ Foundation
DENSO	Private Industry
T Mobile	Private Industry
DKS Associates	Private Industry
Fehr and Peers	Private Industry
FLIR	Private Industry
Inrix Inc.	Private Industry
Wejo	Private Industry
AIWaysion	Private Industry
Tom Tom	Private Industry
Amazon	Private Industry
Nokia	Private Industry
Transpo Group	Private Industry
Intelligent Transportation Systems of Washington	Professional Association
Luum	Private Industry
Kittelson and Associates	Private Industry
Microsoft	Private Industry
BlackBerry	Private Industry
Verizon	Private Industry

Q-Free	Private Industry
PACCAR, Inc.	Private Industry
West Salem High School	Educational Institution
The Bush School	Educational Institution

Outputs

	Total	UW	WSU	UI	OSU	UAF	GU	BSU
Publications: peer reviewed journal articles	53	26	8	4	10	2	1	2
Publications: Book chapters and other edited manuscripts	14	2	1	11	0	0	0	0
Conference papers	63	25	3	5	27	2	1	0
Conference presentations	81	37	6	9	24	4	1	0
Lectures/Seminars /Workshops/ Invited Talks	45	18	6	3	16	1	0	1
Policy Papers	0	0	0	0	0	0	0	0
Websites or Other Internet Sites	4	3	1	0	0	0	0	0
New Methodologies, Technologies or Techniques	6	1	1	1	2	1	0	0
Inventions, patent applications, and/or licenses	0	0	0	0	0	0	0	0
Other products: data or databases, physical collections, audio or video products, software or NetWare, models, educational aids or curricula, instruments, or equipment	7	3	1	2	1	0	0	0

OUTPUTS: Technology Transfer Plan Output Metrics	Annual Targets	Numbers for Reporting Period
Number of publications, presentations, and posters made at conferences or workshops explaining or promoting the research outputs	200	242
Number of software tools and technologies made available to practitioners	10	6

Examples of peer reviewed journal articles

- Madkour, F.E., Lowry, M., Abdel-Rahim, A., Hammad, A., Vibhav, D., and Yu Paulo. (2023). "Analysis of Wind Force on Cyclists from Passing Vehicles." *Transportation Research Record* 03611981231159126.
- Wang, Y. and Shen, Q. (2023). "An Economic Analysis of Incorporating New Shared Mobility into Public Transportation Provision". *Transport Policy*. (Corresponding Author)
<https://doi.org/10.1016/j.tranpol.2023.07.025>
- Liu, C., Yang, H., Ke, R., Sun, W., Wang, J., & Wang, Y. (2023). "Cooperative and Comprehensive Multi-Task Surveillance Sensing and Interaction System Empowered by Edge Artificial Intelligence". *Transportation Research Record*, 03611981231160174.
- Ricord, S., Kopca, C., Yang, H. F., & Wang, Y. (2023). "Estimating a Demographic Profile for the Central Puget Sound Region Freeway Network". *Journal of Transportation Engineering, Part A: Systems*, 149(9), 04023087.
- Zheng, W., Yang, H. F., Cai, J., Wang, P., Jiang, X., Du, S. S., ... & Wang, Z. (2023). "Integrating the traffic science with representation learning for city-wide network congestion prediction". *Information Fusion*, 99, 101837.
- Young, R., Chang, K., Hurwitz, D., Campos, A., and Woodside, J. "Characterizations of Expert and Public Perception of Bicycle Rolling Stop Laws: Public Hazard or Practical Convenience?" *Transportation Research Record*. Recommended for Publication Consideration.
- Elshazli, M., Hussein, D., Bhat, G., Abdel-Rahim, A., and Ibrahim, A. "Machine Learning Prediction of Bridges' Load Ratings due to Truck Platooning". Submitted to the *ASCE Journal of Bridge Engineering*
- Xu, A., Yan, C., Goh, C.Y., and Jaillet, P., "A Locational Demand Model for Bike-Sharing, under major revision at *Manufacturing and Service Operations Management*".
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3311371

Examples of conference papers and presentations

- Peterson, Brian J. and Hess, Herbert L., "Comparison Between Finite Element Analysis and Winding Function Theory of a Field Regulated Reluctance Machine," *IEEE Industrial Electronics Society Global On Line Conference (ONCON) 2022*, December 2022, Mumbai, India.
- Garcia, Sebastian, Peterson, Brian J., and Hess, Herbert L., "Hardware Subsystem Development of Shaftless Flywheel Energy Storage," *US Department of Transportation PacTrans-CSET Region Ten Transportation Annual Conference*, October 2022, Seattle, Washington.
- Eberhard, M., "Identification of Critical Bridge Features for Performance Assessment of Regional Transportation Networks," *Pacific Earthquake Research Center Annual Meeting*, August 2023.
- Darrow, M. M., Herrman, D. H., Olsen, M. J., Leshchinsky, B. A., Berrett, B., Presler, P., Peethambaran, B., Wartman, J. (2022). "Generalizing the Rockfall Activity Index (RAI) for well-characterized slopes." *2022 Region 10 Transportation Conference*, Oct. 14, 2022.
- NFORMS Transportation Science and Logistics Society Triennial Conference, 07/2023
- INFORMS 18th Data Mining and Decision Analytics Workshop (best applied paper award finalist, result to be disclosed), 10/2023
- 2023 INFORMS Workshop on Data Science, 10/2023
- Toward Automation in Crack Detection and Measurements: Benchmarking of CNN-based Algorithms Donghoo Ji, Yelda Turkan and Paolo Calvi Pages 136-143 (2022 Proceedings of the 39th ISARC, Bogotá, Colombia, ISBN 978-952-69524-2-0, ISSN 2413-5844)
- Ashour, Lamis, et.al, Examining Commute Mode Choice of Essential Workers Before and During the COVID-19 Pandemic – A Case Study of the University of Washington

Example of lectures/seminars/workshops/invited talks

- Shen, Q. 2023. Supplementing Public Transit with On-demand Shared Mobility Services: An Economic Analysis. Lecture given at Peking University-Shenzhen Graduate School. Shenzhen, China, June 21.
- INFORMS 18th Data Mining and Decision Analytics Workshop (best applied paper award finalist, result to be disclosed), 10/2023

Examples of Website(s) or other Internet site(s)

Lidar-derived Rockfall Inventory - An Analysis of the Geomorphic Evolution of Rock Slopes and Modifying the Rockfall Activity Index (RAI)

<https://www.designsafe-ci.org/data/browser/public/designsafe.storage.published/PRJ-4018/#details-2473391058770399726-242ac117-0001-012>

<https://yanchiwei.github.io/hubway2017/index.html>

shelter-animals.herokuapp.com

<http://v2192.host.s.uw.edu>

Examples of New Methodologies, Technologies or Techniques

ADA compliance of curb ramps using lidar data Y. Turkan

We have started examining how our virtual vehicle simulation technology scales to other simulation engines, most recently in Godot. O. Lawlor

An efficient estimation algorithm to estimate free-floating vehicle demand based on only trip and vehicle availability data. The complete codebase and data set can be accessed here:

https://github.com/angxu1/bike_sharing

Shelter animal routing algorithm: shelter-animals.herokuapp.com/

Examples of Data/Database/Video/Software/Educational Aids/Curricula/Equipment

<https://doi.org/10.17603/ds2-zv25-jt06>

An efficient estimation algorithm to estimate free-floating vehicle demand based on only trip and vehicle availability data. The complete codebase and data set can be accessed here:

https://github.com/angxu1/bike_sharing

Regional shelter animal data: shelter-animals.herokuapp.com/

Automated Crack Assessment: An Application on Ultra-High-Performance Concrete (UHPC) Panels: The dataset supports report: LiDAR, Drones and BrIM for Rapid Bridge Inspection and Management, available at the URL <https://doi.org/10.7910/DVN/F1NAIY>

<https://github.com/jlouis2k4/cs46x-eth-smart-contracts-scaffolding>

Outcomes

OUTCOMES: Technology Transfer Plan Outcomes Metrics	Annual Targets	Numbers for Reporting Period
Number of early adopters of our research outputs	10	3
Changes made to the transportation system, or its regulatory, legislative, practice manuals, design standards, or policy frameworks	2	1

Over the years PacTrans research has been implemented into practice dozens of times. PacTrans PIs utilize research and/or technology transfer (Success Story) funds, and leverage match resources from external partners, to create new techniques and technologies that solve real world problems. A good example of this success from this performance period is as follows:

The rockfall multi-institutional research team from OSU, UW, and UAF, that we have written about many times in our semi-annual reporting, is currently working with Utah DOT to set up a new pilot project. This project will leverage EZDataMD (a web tool that was the product of a commercialization of PacTrans-development methods) and in partnership with Senceive and 5C Strategies. The culmination of this effort is that states are better equipped to predict rockfall danger adjacent to transportation infrastructure so that they can proactively control for it. This saves lives, money, and time for all road users.

Impact

IMPACTS: Technology Transfer Plan Impacts Metrics	Annual Targets	Numbers for Reporting Period
Number of research outputs that positively contribute to the reduced roadway vehicle to vehicle or vehicle to ped/bike crash rates	3	2
Number of research outputs that positively contribute to improving roadway travel reliability, efficiency, accessibility	7	5

What is the impact on the effectiveness of the transportation system?

Several years ago, PacTrans funded a University of Alaska, Fairbanks project lead by Svetlana Stuefer, titled, *River Ice Measurements for Transportation Safety in Rural Communities*. During Winter months, many normally-isolated communities in rural Alaska are blessed with new transportation infrastructure, the frozen rivers. Residents travel to adjacent communities using ATVs, etc. by driving on the ice. This obviously also creates many dangerous situations but the ice needs to be accurately measured to assess whether it can structurally support the weight. This project studied the relationship between the ice thickness and the load the ice could sustain before failure.

Since that project ended, the team from UAF has created a phone app, currently available in app stores, to incorporate the research results into a tool that can be utilized by rural Alaska residents. This app allows the user to either input (A) the ice thickness, or (B) the weight of their vehicle and immediately get (A) the weight threshold for that ice thickness, or (B) the thickness the ice must be to support the weight. This app is rapidly spreading among residents of these rural communities and enabling safer winter travel.

What is the impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company?

University of Washington, PacTrans PI, Anne Vernez Moudon, has been working with the Washington State Department of Transportation for many years now to better understand Active School Travel (AST) behavior of K-8 students in Washington State. Early in this grant, PacTrans funded a project where Prof. Moudon developed the Washington School Walk Score (similar to WalkScore) which uses a variety of data inputs to estimate the school-level rates of AST for more than 1,300 students. More recently, Prof. Moudon has developed a tool, The Children Walking to Health Tool, which is being used by WSDOT, that

utilizes the results of the Washington School Walk Score project, to estimate corresponding health and economic outcomes for those students. In a world where what gets measured gets managed, and where 17% of American youth are obese, this work is a large step toward better understanding how our transportation infrastructure adjacent to schools, can help to improve health and economic outcomes.

What is the impact on the body of scientific knowledge?

PacTrans extensive research portfolio contributes greatly to the scientific body of knowledge in the transportation field. Over the course of this six-year grant we have funded 110 research projects including eighteen (18) multi-institutional research projects, four (4) COVID-related projects, eighty-six (86) single-institution small projects, a multi-institutional outreach project, and a multi-institutional education project. Our portfolio over this time has significantly advance the scientific body of knowledge in many mobility related areas such as: urban goods delivery, connected technology, electrification, rock-slope management, artificial intelligence and machine learning, construction zone safety, safe routes to school, and many, many others.

What is the impact on transportation workforce development?

The research conducted by our PIs is then being implemented into course curriculums across the region so that our graduates have the cutting edge and up-to-date knowledge about their field when they leave school and enter the workforce. Several great examples of this from this performance period include:

- The rockfall multi-institutional research team that was discussed in the “Outcomes” section is incorporating their Rockfall Activity Index (RAI), as well as their RAMBO software (both developed using PacTrans funding) in their geotechnical courses.
- UAF PI Margaret Darrow has incorporated results of one of her PacTrans-funded research projects into her slope stability course.
- UAF PI Orion Lawlor has incorporated some of his PacTrans funded research results into his Robotics & 3D Printing course.
- UW PI Chiwei Yan has incorporated the method developed in his PacTrans-funded research project into the teaching of his graduate class on supply chain systems.

Changes/Problems

None.

Special Reporting Requirements

Research Project Requirements

Per our research update above, PacTrans is working diligently to wrap up all remaining ongoing research projects. Records of these projects have all been uploaded to RiP and put on our website. Further, PacTrans has begun include the requirement for an ORCID number from each PI before their project funds are released.

Submission of Final Research Reports

As final versions of technical project reports are completed and checked for ADA compliance, they are then uploaded to our repository and linked on the research project profiles on the PacTrans website. Then they are submitted to TRID and Research HUB as well. PacTrans staff is currently finishing the publication of Year 4, Year 5, and Year 6 technical reports.