

TRANSPORTATION RESEARCH AND EDUCATION CENTER

2023

ANNUAL REPORT

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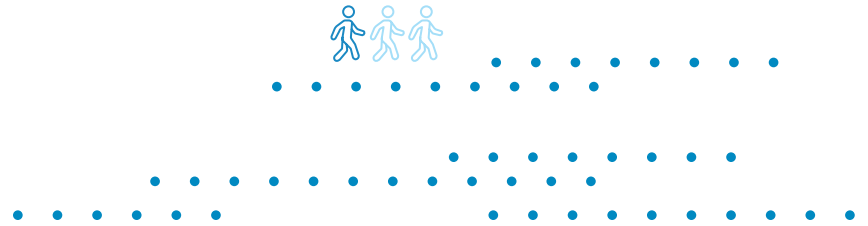
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TREC By The Numbers



TREC plays a vital role in PSU's mission as an urban serving research university. We are producing innovative research that makes a difference in practice and policy, supporting and engaging undergraduate and graduate students, and providing lifelong learning opportunities for K-12 students through to professionals of all ages.

Throughout 2023, TREC continued to build on the work we've been doing since our center's inception in 2006 as OTREC. The year was also marked by expanding partnerships and national impact. PSU is now a partner in PacTrans, the federally-funded regional university transportation center for the Pacific Northwest. Led by University of Washington, PacTrans will provide research and education funding to PSU over the five years of the Bipartisan Infrastructure Law.

Our data programs continue to grow and support research and practice. In 2023, TREC competed for and received five years of support for PORTAL, the official transportation data lake for the Portland, OR-Vancouver, WA metropolitan region. The \$1.6 million in funding will allow for the development of new and improved applications related to the region's transportation data needs; educational programming; and developing a community based advisory committee to provide guidance on how PORTAL can be transformed into a tool for understanding transportation related equity issues. BikePed Portal is a

comprehensive non-motorized data management system for manual and automated non-vehicular multi-modal counts housed at TREC. In 2023, we continued our work with the National Park Service, University of North Carolina, and other DC, Maryland, and Virginia agencies to archive and display active transportation data from the Washington DC region.

This report highlights a few examples of this work from 2023 – work that would not be possible without the stellar TREC team, colleagues across campus, and our many community partners. I'm looking forward to our continued collaboration!

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TREC's offices are located in the Fourth
Avenue Building at PSU: 1900 SW
Fourth Ave, Suite 175.



TREC BY THE NUMBERS



10,705

people who attended TREC's professional development and student group events

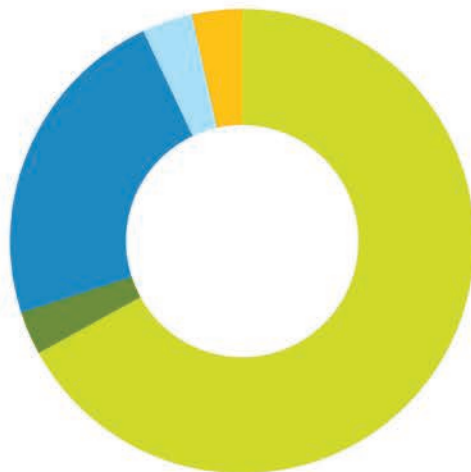
\$1.85M

in transportation research projects awarded to PSU principal investigators in 2023

\$56,000

in PSU scholarships to students studying transportation

Sources of funding over the past 10 years:



- U.S. DOT
- State Government
- Other Federal Agencies
- Local Government
- Nonprofit

235

students enrolled in courses focused on transportation

1,075

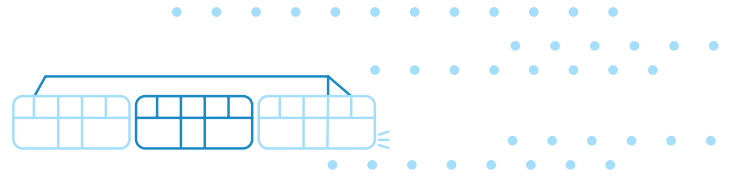
students enrolled in courses with transportation components

Over 28,000

research reports downloaded in 2023



PROGRAM HIGHLIGHTS



INITIATIVE FOR BICYCLE AND PEDESTRIAN INNOVATION COMPREHENSIVE BIKEWAY DESIGN WORKSHOP

Our flagship workshop, “Comprehensive Bikeway Design,” has been hosted at PSU for over a decade, training nearly 300 professionals from 34 states and 5 countries. This year’s course included participants from state DOTs, cities, consultancies, and advocacy groups.

“As Active Transportation Liaison for ODOT Region 3, I’m using my course knowledge to guide bikeway design within regional transportation projects. The course helped expose me to the latest concepts in bikeway design and experience those concepts in the field,” said 2023 attendee John Lazur.

“I have utilized the class strategies in local planning out in East County (Troutdale). I am currently serving on the Gresham Planning Commission and working on an updated city transportation plan where the class has

provided me with a variety of tools,” said 2023 attendee Frank Stevens.

WSDOT WORKSHOP: A FIRST IN 2023

For the first time this year, TREC hosted a two-day training workshop on sustainable mobility and transportation operations for about 100 Washington State DOT employees. Held September 26-28 at PSU, the workshop covered topics like Transportation System Management, Safety, and Innovative Transportation Solutions.

Presentations were given by WSDOT professionals, including Pam Vasudeva and Dongho Chang, along with local speakers like Peter Koonce (City of Portland) and Jingtao Ma (Traffic Technology Services). Field tours focused on bike signals, suburban bikeways, and intersections, while walking tours highlighted downtown Portland’s protected bike lanes and SE Powell Boulevard’s Complete Streets retrofit.



SUSTAINABLE TRANSPORTATION STUDY ABROAD

Since 2011, PSU and the Initiative for Bicycle and Pedestrian Innovation (IBPI) have offered a study abroad course introducing participants to cities with strong bike cultures. Past classes visited the Netherlands, but this year, 14 students, led by Professor John MacArthur and funded by the Scan Design Foundation, explored Denmark. Students met with Danish transportation professionals to learn about their work. Elizabeth Yates, a Masters in Civil Engineering student, quoted Niels Hoé, the founder of HOE360 Consulting: “Copenhageners cycle because it is the fastest and most convenient way to travel!”

“I am incredibly excited for the ways this time abroad will serve as a source of inspiration and contribute to an ethos that will guide my future career as a planner,” said MURP student Tyler Smith.

HIGH SCHOOL

SUMMER TRANSPORTATION CAMP

Since 2016, we have hosted a free transportation summer camp for high school students. Isa Swain, now a civil engineering sophomore at PSU, credits her attendance at the summer camp in 2020 with kickstarting her interest in the profession. She served as a camp counselor this year.

“My participation in the camp when I was a high school student opened up my eyes to social justice and equity issues within transportation systems in my own neighborhood.” Swain said. For students’ final projects this year, they were asked to evaluate their own daily commute from home to school and identify potential improvements.

PSU STUDENTS USE THEIR SKILLS TO HELP THE COMMUNITY

Maseeh College of Engineering & Computer Science Capstone projects give students community-based learning experience working with real-world clients. This year, one civil engineering capstone group did a Multimodal Intersection Design, and another created a “Living Streets Downtown” design for Portland. Two computer science groups worked on improving TREC’s transportation data programs, PORTAL and BikePed Portal.

Master of Urban & Regional Planning (MURP) workshop projects also let students work with real-world clients. Four MURP groups developed transportation plans to improve local communities: Nixyáawii Watikš, Gorge and Mount Hood Regional Park & Ride, Tree Canopy Development in the 82nd Avenue Corridor, and the Fremont Bridgehead Reclamation project saw planning students engage with communities to meet their mobility needs.

Through **The Better Block PSU Program**, Portland’s Old Town neighborhood is getting a new skatepark, and a team of PSU transportation students helped bring the project from idea to reality. Given the task of activating a vacant lot on the west side of the Steel Bridge, students in the Spring 2023 bike-pedestrian planning class created a set of design options, a weighted decision matrix, and a memorandum of existing conditions for the site.

A Transportation Equity Book Club held by PSU’s Institute of Transportation Engineers (ITE) student chapter, Students in Transportation Engineering and Planning (ITE-STEP), reads a different on equitable mobility topics each year. The 2023 book was *Roadways for People: Rethinking Transportation Planning and Engineering*, by Lynn Peterson. Peterson also delivered the annual Ann Niles Active Transportation Lecture at PSU on May 24, to an audience of practitioners, students and local transportation advocates.

UNIVERSITY

PROFESSIONAL

LIFELONG LEARNING AT PSU

Two summer Initiative for Bicycle and Pedestrian Innovation (IBPI) workshops taught 26 professionals key concepts and strategies for improving active transportation in their communities. Thirty-one webinars and seminars offered a broad menu of online learning options for practitioners this year.

2023



PSU joins PacTrans—the Pacific Northwest Transportation Consortium—a U.S. DOT-funded Regional University Transportation Center supporting research at PSU at ~\$400,000 per year.



After PSU faculty and students attend the annual meeting of the Transportation Research Board (TRB), PSU students share their research with members of ITE-STEP and YPT Portland in a “TRB Aftershock” event held on the Portland State University campus.



PSU students Cameron Bennett, Owen Christofferson, Emily D’Antonio and Aidan Simpson created a “Downtown Portland Living Streets Plan” for client Cathy Tuttle, planning consultant of BikeLoud PDX.



A team led by Marisa Zapata is awarded \$350,000 by the National Cooperative Highway Research Program to create a “Guide for Addressing Encampments on State Transportation Rights-of-Way.”

JAN

MAR

MAY

FEB

APR

JUN

Two MURP students, Jamie Arnau and Dawn Walter, win WTS Transportation scholarships. Jamie Arnau receives the Helene M Overly Scholarship and Dawn Water receives the Leadership Legacy Scholarship.



The Division Street Transit Project kicked off, led by TREC researcher Nathan McNeil. The project assesses conflicts between users of the new shared bicycle & transit stations along the high-capacity bus service corridor on SE Division in Portland, with a particular focus on conflicts between people on foot (or wheelchair/mobility devices) who are waiting for a bus, and people on bicycles riding in the bike lanes. *Photo by TriMet.*



Kelly Rodgers graduates with a PhD in Urban Studies, publishing her dissertation on “The use and influence of health indicators in transportation decision-making.” She is currently working for ODOT as a Senior Transportation Planner, as well as doing independent consulting.



YEAR IN REVIEW



Researchers Joe Broach, Sirisha Kothuri and Nathan McNeil publish "Evaluating the Potential of Crowdsourced Data to Estimate Network-Wide Bicycle Volumes" in the July 2023 issue of *Transportation Research Record*.



Tanmoy Bhowmik joins the Maseeh College of Engineering and Computer Science as an assistant professor in civil and environmental engineering. His research focuses on transportation with Connected and Automated Vehicles (CAV).



A team of Students in Transportation Engineering and Planning (ITE-STEP) students take first place in the 32nd annual Bill Kloos Traffic Bowl Competition held by Oregon ITE. Phil Armand, Elias Peters, Isa Swain, Elizabeth Yates and Moe Tahaw win a \$600 cash prize to support STEP activities.

JUL

SEP

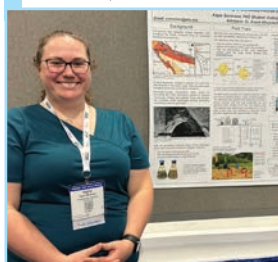
NOV

AUG

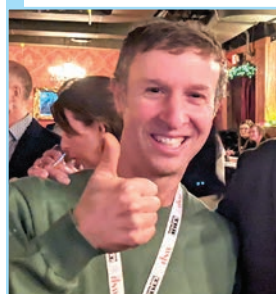
OCT

DEC

Civil & Environmental Engineering PhD student Kayla Sorenson is awarded the 2023 Dwight David Eisenhower Transportation Fellowship presented by the U.S. Department of Transportation.



A team led by Aaron Golub of Urban Studies and Planning receives \$250,000 from the National Cooperative Highway Research Program to create a "Research Roadmap for Institutionalizing Transportation Equity."



Nathan McNeil wins the Charley V. Wootan Award for outstanding papers in policy and organization, as lead author on "Transportation Academies as Catalysts for Civic Engagement in Transportation Decision-making."



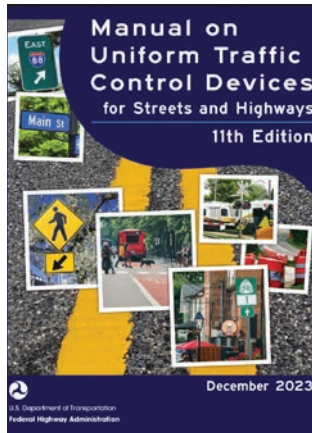
A MURP team wins the first-ever Graduate-Level Student Group Award from the Council of University Transportation Centers, for their project "Nixyáawii Watikš" on the Umatilla Indian Reservation.





RESEARCH

TREC Contributions to the 2023 Manual on Uniform Traffic Control Devices (MUTCD)



The [11th edition of the MUTCD](#) is out, and includes guidance which draws on TREC research in several key areas. Guidelines on bike-specific traffic signals come from [a project by Chris Monsere and Miguel Figliozzi](#), granted as an interim approval back in 2017 and now officially codified. Monsere and Sirisha Kothuri also led a [project](#)

[which helped standardize bike signal faces](#), working with Oregon State University and Toole Design Group. In 2010, Jennifer Dill worked with Monsere on the [first study in the United States on green bike boxes](#), which were pioneered in Portland and are now formalized in the MUTCD as Two-Stage Bicycle Turn Boxes.

Marginalized Populations' Access to Transit

Low-income individuals who also identify as racial, ethnic, and gender minorities are more likely to be dependent on public transportation. PSU researchers Miriam Abelson, Amy Lubitow, Marisa Zapata and PhD student Nicholas Puczkowskyj published research exploring how people with intersecting marginal identities experience social exclusion as they travel via mass transit.

Pedestrian Behavior Study to Advance Pedestrian Safety in Smart Transportation Systems Using Innovative LIDAR Sensors

Sirisha Kothuri worked with researchers from the University of Utah on a project funded by the National Institute for Transportation and Communities (NITC) to develop a system for collecting pedestrian behavior data using LiDAR sensors. The software they created can reliably observe pedestrians and reduce conflicts between pedestrians and vehicles at signalized intersections. The Utah Department of Transportation (UDOT) is working on implementing this new system to improve data collection at intersections. The new sensor system offers important functionality with its improved bicycle and pedestrian detection.

“With this LiDAR system, you’re able to look at things like red light running and near misses for pedestrians and vehicles, and you’re able to see a lot more information that the traditional detector is not able to provide you with.”

Mark Taylor, Traffic Signal Operations Engineer, Utah Department of Transportation

National Guidance to Help Transportation Agencies Respond to Homelessness

In recent years, unsheltered homelessness has increased in the U.S. TREC collaborated with PSU's Homelessness Research and Action Collaborative (HRAC) on two major research projects funded by the Transit Cooperative Research Program (TCRP) and Airport Cooperative Research Program (ACRP) to create national homelessness guidance.

The first, "Homelessness: A Guide for Public Transportation," helps transit agencies support people experiencing homelessness while minimizing impacts on services. It highlights ways agencies can collaborate with local partners to assist individuals in need. While transit agencies cannot address the underlying causes of homelessness, there are opportunities to work with local partners to help individuals in need, while providing a safe, reliable, and customer-friendly experience for all riders.

The second, "Strategies to Address Homelessness at Airports," developed guidance for airports to support people experiencing homelessness, while maintaining safety. After investigating the demographics of people experiencing homelessness at airports, how airport facilities were being used, and contextual factors like airport size, transit access, local climate, and existing outreach programs, researchers established a set of guiding principles for responding to this complex issue.

IMPACTS



Active Transportation Counts from Existing On-Street Signal and Detection Infrastructure

In a data project funded by the Oregon Department of Transportation (ODOT), Sirisha Kothuri is working to integrate pedestrian volume estimates into BikePed Portal. Data from existing traffic signal infrastructure were used to estimate pedestrian volumes. Using such pedestrian volume estimates can lead to improvements in pedestrian traffic monitoring, safety assessments of exposure, and equity and health analyses.

“Without a systematic way of counting people walking and rolling, much of this system use is invisible to transportation authorities like Oregon DOT. Enhancing BikePed Portal’s pedestrian volume estimation capabilities will help ODOT build and maintain quality pedestrian infrastructure.

Josh Roll, Research Analyst & Data Scientist, Oregon Department of Transportation

Tracking and Evaluating E-Bike Incentive Programs to Help Drive Adoption

TREC researcher John MacArthur leads research around electric bicycles (e-bikes), which offer greenhouse gas and traffic reductions, health benefits, increased mobility, affordability, and safety. The latest study, published in *Transportation Research Part D*, investigates the effectiveness of several types of e-bike purchase incentives.

The study found that incentives do spur extra e-bike purchases, but at a relatively high cost compared with narrowly defined climate benefits. Nonetheless, e-bikes provide many other benefits: They make mobility easier and more affordable for many people,

including older adults and people with disabilities; They bolster the case for investing in bike paths and infrastructure; and they boost health by promoting exercise. The researchers recommend that cities and

Unequal Realities, Racialized Geographies: Men Of Color Biking In Portland

Sociology professor Amy Lubitow published a study in the *Journal of Race, Ethnicity and the City* drawing from 25 interviews with men of color bicyclists in Portland, Oregon. Findings show that men of color experience public cycling spaces as exclusionary, and that racialized geographies generate a sense of “out of place-ness” for bicyclists of color. This paper is the first to elucidate the qualitative experiences of men of color bicyclists.

The Rose Lanes Project: Partnering with TriMet to Evaluate the new Red-Painted Bus Lanes in Portland, Oregon

As part of the City of Portland Enhanced Transit Corridors Plan, the Portland Bureau of Transportation (PBOT) worked with TriMet to implement red colored transit priority lanes at key locations in Portland. PSU researcher Nathan McNeil evaluated non-transit drivers’ comprehension of, and compliance with, the red lane markings.

He used two complementary research methods: 1) an online survey of drivers’ comprehension of red colored pavement markings, and 2) evaluation of before-and-after video. Comprehension of the pavement marking was higher for respondents who had seen the red lanes while driving, indicating that comprehension could improve over time and with wider application across a city.



STUDENT SPOTLIGHTS

Students who worked on TREC projects or were supported by TREC in 2023



Jamie Arnau
MURP, WTS Portland Scholar, Helene M Overly Scholar



Cameron Bennett
MSCE, Eisenhower Fellow, GRA, NITC Scholar, STEP Pres.



Darshan Chauhan
Ph.D. Civil Engineering, NITC scholar



Chris Corral
MPH & MURP, Oregon-ITE Scholar, STEP Pres.



Peter Domine
MURP, Walter H. Kramer Fellow



Lise Ferguson
MURP, Walter H. Kramer Fellow



Christian Galiza
BSCE, NITC scholar



Cole Grisham
PhD in Public Affairs, NITC scholar



Asif Haque
MURP, NITC scholar



Evan Howington
MURP, GRA



Kyu Ri Kim
PhD Urban Studies, GRA, Alta Planning + Design Scholar



Jacqueline Krantz
MA in English, Communications GRA



Julay Leatherman-Brooks
MS in Computer Science, GRA



Jiahui Ma
PhD Urban Planning, GRA



Prabhu Marappan
MS in Computer Science, GRA



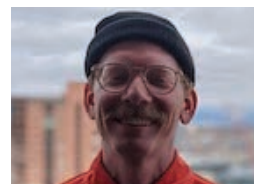
Nick Meusch
MURP, NITC scholar



Laurel Priest
MURP, NITC Scholar



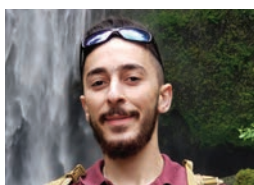
Gabriel Quiñones-Zambrana
PhD Urban Studies, GRA



Caleb Susuras
MURP, GRA



Isa Swain
BCSE, Bill Kloos Scholar, STEP officer



Mouhamad Taha
BSCE, NITC scholar, Oregon ITE scholar



Huijun Tan
PhD in Urban Studies, NITC scholar



Valeria Tapia
MURP, IBPI Innovation in Active Transportation Endowed Scholarship



Dawn Walter
MURP, WTS Portland Leadership Legacy Scholar, STEP officer

BSCE Bachelors in Civil Engineering
MSCE Masters in Civil Engineering
MURP Master of Urban and Regional Planning
MUS Master of Urban Studies
GRA Graduate Research Assistant

ABOUT TREC

THE TRANSPORTATION RESEARCH AND EDUCATION CENTER (TREC) AT PORTLAND STATE UNIVERSITY

TREC is an interdisciplinary center that elevates the voices and expertise of a wide range of backgrounds to provide transportation insights for vibrant communities. We support collaborative research and education programs for our faculty, partners, community members, and students. TREC is home to the USDOT-funded National Institute for Transportation and Communities (NITC), the Initiative for Bicycle and Pedestrian Innovation (IBPI), the Portland, Oregon Regional Transportation Archive Listing (PORTAL), BikePed Portal, and other transportation grants and programs. We produce impactful research for transportation decision makers, expand the diversity and capacity of the workforce, and engage students and professionals through education and participation in research.



THE PEOPLE

TREC STAFF MEMBERS

Jennifer Dill, Director
 Becca Bornstein, Events & Office Coordinator
 Basem Elazzabi, Senior Research Associate
 Lacey Friedly, Communications Coordinator
 Tammy Lee, Transportation Data Program Administrator
 John MacArthur, Sustainable Transportation Program Manager
 Nathan McNeil, Research Associate
 Joe Broach, Research Associate

PORTLAND STATE UNIVERSITY RESEARCHERS

Jason Anderson	John MacArthur
Tanmoy Bhowmik	Nathan McNeil
Joe Broach	Chris Monsere
Jennifer Dill	Randy Morris
Peter Dusicka	Diane Moug
Miguel Figliozzi	Amy Parker
Aaron Golub	Thomas Schumacher
Arash Khosravifar	Liming Wang
Sirisha Kothuri	David Yang
Jenny Liu	Marisa Zapata
Amy Lubitow	



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2023 PUBLICATIONS

- User Comprehension Of Bicycle Signal Countdown Timers: DP Cobb, C Monsere, DS Hurwitz, S Kothuri, H Jashami *Transportation Research Record* 2677 (6), 129-141
- Unequal Realities And Racialized Geographies: Men Of Color Biking In Portland: A Lubitow, E Johnson, VV Pierce Jr *Journal of Race, Ethnicity and the City*, 1-16
- Understanding The Factors Affecting Airport Level Demand (Arrivals And Departures) Using A Novel Modeling Approach: SD Tirtha, T Bhowmik, N Eluru *Journal of Air Transport Management* 106
- Transportation Academies as Catalysts for Civic Engagement in Transportation Decision-Making: N McNeil, K Bartholomew, M Ryan *Transportation Research Record* 2677 (10), 849-862
- Transit and Active Transportation Use for Non-Commute Travel Among Portland Transit-Oriented Development Residents: J Dill, N McNeil *Transportation Research Record* 2677 (1), 151-168
- Strategies to Address Homelessness at Airports: D Fordham, J Urrego, M Stephens, C Miller, B Smith, M Zapata, J MacArthur, A Rockhill, J Greene, S Batko, L Bond, A Williams, M Crosby, D Culhane, *Airport Cooperative Research Program (ACRP)*
- Safest Placement for Crosswalks at Intersections: D Hurwitz, E Chai, H Jashami, CM Monsere, S Kothuri, FB Appiah *Oregon. Dept. of Transportation. Research Section*
- Robust Multi-Period Maximum Coverage Drone Facility Location Problem Considering Coverage Reliability: D Rajesh Chauhan, A Unnikrishnan, MA Figliozzi, SD Boyles *Transportation Research Record* 2677 (2), 98-114
- Perspectives On E-Scooters Use: A Multi-Year Cross-Sectional Approach To Understanding E-Scooter Travel Behavior In Portland, Oregon: M Kim, N Puczkowskyj, J MacArthur, J Dill *Transportation Research Part A: Policy And Practice* 178, 103866
- Pedestrian Behavior Study to Advance Pedestrian Safety in Smart Transportation Systems Using Innovative LiDAR Sensors: T Li, SM Kothuri, KL Keeling, XT Yang, FR Chowdhury, *National Institute for Transportation and Communities (NITC)*
- Oregon Transportation Financial Analysis: J Liu *Northwest Economic Research Center Reports*
- Numerical Modeling Of A Pile-Supported Wharf Subjected To Liquefaction-Induced Lateral Ground Deformations: M Souri, A Khosravifar, S Dickenson, N McCullough, S Schlechter *Computers and Geotechnics* 154, 105117
- Multicopter Drone Mass Distribution Impacts On Viability, Performance, And Sustainability: M Figliozzi *Transportation Research Part D: Transport and Environment* 121, 103830
- Microbial Desaturation for Liquefaction Mitigation: A Khosravifar, D Moug *GeoStrata Magazine Archive* 27 (4), 23-29
- Marginalized Populations' Access to Transit: Journeys from Home and Work to Transit: M Abelson, I Garcia, S Khan, A Lubitow, N Puczkowskyj, M Zapata, *National Institute for Transportation and Communities (NITC)*
- Joint Econometric Model Framework for Transportation Network Company Users' Trip Fare and Destination Choice Analysis: DA Parvez, SD Tirtha, T Bhowmik, N Eluru *Transportation Research Record* 2677 (7), 545-557
- Impact Of Covid-19 On Traffic Signal Systems: Survey Of Agency Interventions And Observed Changes In Pedestrian Activity: PA Singleton, M Taylor, C Day, S Poddar, S Kothuri, A Sharma *Transportation Research Record* 2677 (4), 192-203
- How Low-Income Riders Are Affected by Low-Cost Transit Fare Programs: LQ Yang, L Wang, A Golub *National Institute for Transportation and Communities (NITC)*
- Flight-Level Analysis Of Departure Delay And Arrival Delay Using Copula-Based Joint Framework: SD Tirtha, T Bhowmik, N Eluru *Transportation Research Record* 2677 (5), 229-246
- Exploring The Temporal Variability Of The Factors Affecting Driver Injury Severity By Body Region Employing A Hybrid Econometric Approach: A Kabli, T Bhowmik, N Eluru *Analytic Methods In Accident Research* 37, 100246
- Examination of Cone Penetration in Non-Plastic Silt with a Direct Cone Penetration Model: DM Moug, AB Price *Geo-Congress* 2023, 373-384
- Evaluation of Site Effects Utilizing Cascadia Subduction Zone Ground Motions: A Khosravifar, P Dusicka, N Villeneuve, M O'Tousa *Oregon. Dept. of Transportation. Research Section*
- Evaluation of Freeway Demand in Florida during the COVID-19 Pandemic from a Spatiotemporal Perspective: MI Jahan, T Bhowmik, N Eluru *Journal of Transportation Engineering, Part A: Systems* 149 (8), 04023071
- Evaluation of Driver Comprehension and Compliance of Red-Colored Pavement Markings for Transit Lanes in Portland, Oregon: N McNeil, C Monsere, J Dill *Transportation Research Record*, 03611981231194347
- Effects Of Data Aggregation (Buffer) Techniques On Bicycle Volume Estimation: MM Miah, SP Mattingly, KK Hyun, J Broach, N McNeil, S Kothuri *Transportation*, 1-44
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- Development and Application of Crash Severity Models for Highway Safety: User Guidelines: JN Ivan, S Zhao, K Wang, J Hossain, N Eluru, M Abdel-Aty, T Bhowmik, *NCHRP Research Report*
- Damage Detection in Reinforced Concrete Member Using Local Time-Frequency Transform Applied to Vibration Measurements: L Ning, T Schumacher, Y Li, L Xu, B Wang *Buildings* 13 (1), 148
- Closure to "Axisymmetric Simulations of Cone Penetration in Biocemented Sands": M El Kortbawi, DM Moug, K Ziotopoulou, JT DeJong, RW Boulanger *Journal of Geotechnical and Geoenvironmental Engineering* 149 (11), 07023015
- Automatic and High-Precision Acoustic Emission-Based Structural Health Monitoring of Concrete Structures: S Momeni, T Schumacher, L Linzer, B Lecampion, *Structural Health Monitoring*
- Assessing The Impact Of Three Intersection Treatments On Bicyclist Safety Using A Bicycling Simulator: L Scott-Deeter, D Hurwitz, B Russo, E Smaglik, S Kothuri *Accident Analysis & Prevention* 179, 106877
- Analyzing The Impacts Of Intersection Treatments And Traffic Characteristics On Bicyclist Safety: Development Of Data-Driven Guidance On The Application Of Bike Boxes, Mixing: B Russo, S Kothuri, E Smaglik, D Hurwitz *Transportation Research Record* 2677 (12), 187-200
- An Econometric Framework For Integrating Aggregate And Disaggregate Level Crash Analysis: S Pervaz, T Bhowmik, N Eluru *Analytic Methods In Accident Research* 39, 100280