

RAJAT VERMA

Lyles School of Civil Engineering
Purdue University, West Lafayette IN 47907
+1(517)481-0901 • verma99@purdue.edu

RESEARCH INTERESTS

Transportation equity, data-driven mobility modeling, urban planning, big data analytics, geospatial analysis.

EDUCATION

Purdue University *West Lafayette, IN*
Ph.D., Civil Engineering 8/2019 – Present. Current GPA: 4.0
Advisor: [Dr. Satish V. Ukkusuri](#)
Thesis: *Advancing the assesment of transportation equity using large-scale mobility data.*

Michigan State University *East Lansing, MI*
Master of Science, Civil Engineering. GPA: 4.0 8/2017 – 5/2019
Advisor: [Dr. Timothy J. Gates](#)
Thesis: *Evaluation of a rear-end collision avoidance system on winter maintenance trucks.*

Indian Institute of Technology Roorkee *Roorkee, India*
Bachelor of Technology, Civil Engineering. GPA: 8.64/10 7/2013 – 5/2017
Major project: *Design of sustainable drainage and rainwater harvesting for IIT Roorkee campus.*

RESEARCH EXPERIENCE

Purdue University *West Lafayette, IN*
Graduate Research Assistant 8/2019 - Present

- Working on a collection of projects involving processing passively collected GPS data from mobile devices and geospatial analysis to assess human mobility patterns and their relation with inequitable distribution of accessibility to jobs, transit, and places of interest as well as environmental inequity.
- Developing a Spark-based Python toolkit ([‘mobilkkit’](#)) for processing high-volume passively collected GPS data.

Michigan State University *East Lansing, MI*
Graduate Research Assistant 8/2017 - 7/2019

- Assessed the performance and effectiveness of a pilot rear-facing collision avoidance system on snowplows. Project sponsored by the Michigan Department of Transportation.
- Analyzed the effects of the 2017 speed limit change in Michigan on operating speeds based on three data sources.
- Developed OMR recognition system to automate processing of the annual state-wise safety belt survey data.

- Worked on the sub-project “Spatial Analysis of Pedestrian Crowds” of the main project “*The Kumbh Mela Experiment: Measuring and Understanding the Dynamics of Mankind’s Largest Crowd*”, Ujjain, India.
- Studied pedestrian traffic flow theory and the social force method to study the basic forms of interaction among pedestrian groups.

PUBLICATIONS & PRESENTATIONS

Articles in Peer Reviewed Journals

4. Progression of hurricane evacuation-related dynamic decision-making with information processing.
Verma, R., Shen, J., Benedict, B. C., Murray-Tuite, P., Lee, S., and Ukkusuri, S. V.
Transportation Research Part D: Transport and Environment, 108, 103323 (2021).
doi: [10.1016/j.trd.2022.103323](https://doi.org/10.1016/j.trd.2022.103323)
3. Spatiotemporal contact density explains the disparity of COVID-19 spread in urban neighborhoods.
Verma, R., Yabe, T., Ukkusuri, S.V.
Scientific Reports, 11, 10952 (2021). doi: [10.1038/s41598-021-90483-1](https://doi.org/10.1038/s41598-021-90483-1)
2. Comparison of support vector and non-linear regression models for estimating large-scale vehicular emissions, incorporating network-wide fundamental diagram for heterogeneous vehicles.
Saedi, R., **Verma, R.**, Zockaei, A., Ghamami, M., Gates, T.J.
Transportation Research Record, 2674(5), 70–84, (2020). doi: [10.1177/0361198120914304](https://doi.org/10.1177/0361198120914304)
1. Behavioral analysis of drivers following winter maintenance trucks enabled with collision avoidance system.
Verma, R., Saedi, R., Zockaei, A., Gates, T.J.
Transportation Research Record, 2673(10), 394–404 (2019). doi: [10.1177/0361198119850131](https://doi.org/10.1177/0361198119850131)

Articles in Preparation and Review

3. (In preparation) Comparison of home detection algorithms using smartphone GPS data.
Verma, R., Mittal, S., Lei, Z., Chen, X., and Ukkusuri, S.V. (2023).
To be submitted to *EPJ Data Science*
2. (Under review) A link criticality approach for pedestrian network design to promote walking.
Verma, R. and Ukkusuri, S. V.
Submitted to *npj Urban Sustainability* (2023)
1. (Under review) Crosswalk detection from satellite imagery for pedestrian network completion.
Verma, R. and Ukkusuri, S. V.
Submitted to *Transportation Research Record* (2022)

Articles in Conference Proceedings

2. How information heterogeneity influences traffic congestion during hurricane evacuation.
Verma, R., Lei, Z., Xue, J., Shen, J., Gehlot, H., Ukkusuri, S.V., Murray-Tuite, P.
2021 IEEE International Intelligent Transportation Systems Conference (ITSC), 1833–1838 (2021).
doi: [10.1109/ITSC48978.2021.9564797](https://doi.org/10.1109/ITSC48978.2021.9564797)

1. A framework for incorporating the network fundamental diagram into large-scale emission estimation.
Saedi, R., **Verma, R.**, Zockaei, A., Ghamami, M., Gates, T.J.
Journal of Transport & Health 9, S54-S55 (**2018**). doi: [10.1016/j.jth.2018.05.041](https://doi.org/10.1016/j.jth.2018.05.041)

Conference Presentations

7. Leveraging large-scale cell phone geolocation data to inform high-resolution transportation planning in Indiana.
Verma, R. and Ukkusuri, S.V.
109th Purdue Road School Conference and Expo, 2023 (poster)
6. Measuring Indiana's transportation equity using large-scale data.
Verma, R., Deodhar, S., Ukkusuri, S.V., and Gkritza, N.
109th Purdue Road School Conference and Expo, 2023 (poster)
5. Crosswalk detection from satellite imagery for pedestrian network completion.
Verma, R. and Ukkusuri, S.V.
Transportation Research Board 102nd Annual Meeting, Washington D.C., 2023 (lectern)
4. How hurricane evacuation dynamic decision-making progresses with information-seeking behavior.
Verma, R., Shen, J., Murray-Tuite, P., Lee, S., Ge, Y., Ukkusuri, S.V.
Transportation Research Board 100th Annual Meeting, Washington D.C., 2021 (poster)
3. An efficient calibration methodology of microsimulation model for signalized intersections under heterogeneous and indisciplined traffic environment.
Paul, M., **Verma, R.**, Ghosh, I.
Transportation Research Board 98th Annual Meeting, Washington D.C., 2019 (poster)
2. Behavioral analysis of drivers following winter maintenance trucks enabled with collision avoidance system.
Verma, R., Saedi, R., Zockaei, A., Gates, T.J.
Transportation Research Board 98th Annual Meeting, Washington D.C., 2019 (lectern)
1. Large-scale emission estimation framework by incorporating the network-wide fundamental diagram: Introduction to network-wide emission diagram.
Saedi, R., **Verma, R.**, Zockaei, A., and Ghamami, M.
International Conference on Transportation & Health, Mackinac Island, MI, 2018 (poster)

RESEARCH PROJECTS

Official Reports

2. Hazards SEES: Bridging information, uncertainty, and decision-making in hurricanes using an interdisciplinary perspective.
Ukkusuri, S.V., Murray-Tuite, P., Lee, S., Ge, Y., Lei, Z., **Verma, R.**, Gehlot, H., Xue, J., Shen, J., Zhan, X., Qian, X., Le, T., et al.
National Science Foundation, Award [#1520338](#) (Oct 7, 2021)
1. Evaluation of a collision avoidance and mitigation system (CAMS) on winter maintenance trucks.
Zockaei, A., Saedi, R., Gates, T.J., Savolainen, P.T., Schneider, B., Ghamami, M., **Verma, R.**, Fakhrmoosavi, F., Kavianipour, M., Shojaie, M., Singh, H., Zhou, C.
Michigan Department of Transportation Research Administration, [OR 17-103](#) (Sep 18, 2018)

Ongoing projects

3. Addressing accessibility, equity, and environmental justice measures of infrastructure facilities in Indiana.
Joint Transportation Research Program project SPR 4711 with the Indiana Department of Transportation (INDOT) (approved **2022**).
2. Forecasting shifts in Hoosiers' travel demand and behavior.
Joint Transportation Research Program project SPR 4608 with INDOT (approved **2021**).
1. RAPID proposal: Collaborative proposal: Examining household movements and decision-making in a compounding risk event.
National Science Foundation, Award #2153919 and #2153913 (approved **2021**).

AWARDS & SCHOLARSHIPS

Erin Flannigan Travel Award 102nd Transportation Research Board Annual Meeting, \$300	11/2022
M.S. Student of the Year Department of Civil Engineering, Michigan State University, \$200	5/2019
Annual ITE Scholarship Institute of Transportation Engineers - Michigan Chapter, \$3,000	2/2019
Student Travel Award 2018 International Conference on Transport & Health, \$800	6/2018
Best Poster in Civil Engineering (Transportation) 2018 Engineering Graduate Research Symposium, Michigan State University	3/2018
Merit-cum-Means Scholarship Indian Institute of Technology Roorkee, INR 200,000 (\approx \$2,600) over 2 years	1/2014 - 4/2015

EXTRACURRICULAR COURSEWORK

Teaching and Learning in Engineering Graduate Certificate 4-course program at Purdue University's School of Engineering Education, including: <ul style="list-style-type: none">– ENE 506: Content, Assessment, and Pedagogy– ENE 685: Engineering Education Methods– ENE 687: Mentored Teaching in Engineering– ENE 695: Succeeding as an Engineering Professor	5/2023
Complete Guide to Tensorflow for Deep Learning with Python (Udemy)	5/2021
Text Mining and Analytics	2/2020

University of Illinois, Urbana-Champaign ([Coursera](#))

Introduction to Graph Theory 7/2018
University of California, San Diego ([Coursera](#))

Bayesian Statistics 5/2018
University of California, Santa Cruz ([Coursera](#))

MEMBERSHIPS AND SERVICE

Professional Organizations

- American Society of Civil Engineers 3/2018 – 3/2019
(Student member)
- Institute of Transportation Engineers 12/2017 – Present
(Served in Purdue Chapter as president (2022–23), vice-president (2021–22) & treasurer (2020–21))

Student Bodies

- Purdue Graduate Student Government, *Purdue University* 3/2020 – 4/2021
- Civil Engineering Graduate Student Advisory Council, *Purdue University* 9/2019 – Present
(Served as vice-president during 2019–20)
- Graduate Employees Union, *Michigan State University* 11/2018 – 5/2019
(Chair of the *Deferred Actions for Childhood Arrivals* (DACA) Committee)
- Civil Engineering Consortium, *I.I.T. Roorkee* 7/2016 – 12/2016
(Graphic design lead)
- Information Management Group, *I.I.T. Roorkee* 2/2015 – 5/2017
(Design and Creativity Head)

Volunteer Service

- Purdue’s Algebra by 7th Grade 1/2023
(Assisted high-performing students of color of 7th grade with math and English)
- Briarwood & RichField Tutoring & Life Skills Program 9/2021 – 12/2021
(Tutored and assisted in homework kids of color in grades 1–4)
- National Service Scheme, *I.I.T. Roorkee* 8/2013 – 7/2014
(Conducted several awareness activities as part of the *Environment* section)

SKILLS

Programming **Proficient in:** Python, R, Julia
 Other languages: Bash, Java, JavaScript, MATLAB, HTML, CSS
 Tools: Jupyter, MySQL
 Frameworks: (py)spark (proficient), (py)torch, tensorflow, react.js

Software **Analysis:** VISSIM, QGIS, Tableau, Gephi, SPSS
 Design: AutoCAD, Photoshop, Illustrator, InDesign, CorelDRAW

Languages	English (proficient), Hindi (native), Spanish (basic)
-----------	---

Updated May 15, 2023