RAJAT **VERMA**

Department of Transport & Planning
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EDUCATION

Ph.D., Civil Engineering (Transportation) 2019 – 2024
Purdue University, West Lafayette, IN, USA
Advisor: Prof. Satish V. Ukkusuri; GPA: 4.0
Dissertation: Advancing the quantitative assessment of transportation equity for planning
With Graduate Certificate in Teaching and Learning in Engineering

Master of Science, Civil Engineering (Transportation) 2017 – 2019
Michigan State University, East Lansing, MI, USA
Advisor: Prof. Timothy J. Gates; GPA: 4.0
Thesis: Evaluation of a rear-end collision avoidance system on winter maintenance trucks

Bachelor of Technology, Civil Engineering 2013 – 2017
Indian Institute of Technology (IIT) Roorkee, Roorkee, Uttarakhand, India
Academic advisor: Prof. Indrajit Ghosh; GPA: 8.636 / 10

RESEARCH EXPERIENCE

Postdoctoral Researcher 7/2025 – Present
Delft University of Technology (TU Delft), Delft, The Netherlands
Advisor: Prof. Oded Cats

- Working on the project titled "Multi-modal and Multi-class Air and Rail Systems (3MARS)" to study the dynamics of long-distance passenger transport systems, sponsored by the European Research Council Consolidator Grant.

Postdoctoral Researcher 8/2024 – 7/2025
Purdue University, West Lafayette, IN, USA
Advisor: Prof. Satish V. Ukkusuri

- Projects related to accessibility to electric vehicle infrastructure, transport investment screening tool, and workforce development for cybersecurity in transportation.
- Developed the Spatial Accessibility of America data repository of multiple spatial accessibility metrics for the 50 most populous urban areas of the U.S.

Research Assistant 8/2019 – 7/2023
Purdue University, West Lafayette, IN, USA
Advisor: Prof. Satish V. Ukkusuri

- Worked on a collection of projects to assess human mobility patterns at scale and their applications in travel demand forecasting, transport equity assessment, and evacuation

modeling. Projects sponsored by the National Science Foundation (NSF) and the Indiana Department of Transportation (INDOT).
- Major outcomes/contributions include A-RESCUE 3.0 (a Java-based evacuation micro traffic simulator), mobilkit+ (a Spark-based Python toolkit for processing high-volume passively collected smartphone GPS data), and Indiana Transportation Equity Atlas (an equity screening tool developed in collaboration with INDOT).

Graduate Research Assistant 8/2017 – 7/2019
Michigan State University, East Lansing, MI, USA
Advisor: Prof. Timothy J. Gates
- Assessed the performance and effectiveness of a pilot rear-facing collision avoidance system on snowplows as part of a Michigan DOT project.
- 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.

Research Intern 5/2016 – 6/2016
Indian Institute of Science Bangalore, Karnataka, India
Advisor: Prof. Ashish Verma
- Studied pedestrian traffic flow theory and the social force method to study the basic forms of interaction among pedestrian groups as part of the project: *The Kumbh Mela Experiment: Measuring and Understanding the Dynamics of Mankind's Largest Crowd*, Ujjain, India.

TEACHING EXPERIENCE AND CREDENTIALS

Guest Lecturer 9/2024 – 11/2025
Purdue University, West Lafayette, IN, USA
- CE569 (*Smart Logistics*)
- CE614 (*Statistical & Econometric Methods I*)

Teaching and Learning in Engineering Graduate Certificate (certificate) 5/2024
Certificate program at Purdue University's School of Engineering Education (ENE), including:
- ENE 506: Content, Assessment, and Pedagogy
- ENE 685: Engineering Education Methods
- ENE 687: Mentored Teaching in Engineering
- ENE 695: Succeeding as an Engineering Professor

Teaching Assistant 8/2023 – 12/2023
Purdue University, West Lafayette, IN, USA
- Course CE597 (*Data Science for Smart Cities*), instructed by Dr. Satish V. Ukkusuri.
- Development and instruction of 6 introductory tutorial sessions for using Python for data analytics in Jupyter Lab in addition to other duties (office hours, grading, etc.)

Volunteer Tutor 1/2023
Algebra by 7th Grade Program, Purdue University
- Assisted high-performing students of color of 5–7th grades with math and English

Volunteer Tutor 9/2021 – 12/2021
Briarwood & RichField Tutoring & Life Skills Program, Lafayette Area, IN
- Tutored students of color in grades 1–4 and assisted with their homework

PUBLICATIONS

Peer-Reviewed Journals

1. **Verma, R.**, Mittal, S. & Ukkusuri, S.V. Spatial Access of America: Multiple indicators of accessibility to opportunities. *Scientific Data*, 12(1223) (2025). doi: 10.1038/s41597-025-05440-8.
2. **Verma, R.** & Ukkusuri, S.V. What determines travel time and distance decay in spatial interaction and accessibility? *Journal of Transport Geography*, 122(104061) (2025). doi: 10.1016/j.jtrangeo.2024.104061.
3. Lei, Z., **Verma, R.**, Siebeneck, L. & Ukkusuri, S.V. Modeling hurricane evacuation/return under compounding risks – Evidence from Hurricane Ida. *International Journal of Disaster Risk Reduction*, 114(104977) (2024). doi: 10.1016/j.ijdrr.2024.104977.
4. Siebeneck, L., Lei, Z., Sharma, P., **Verma, R.**, Osazuwa-Peters, P. & Ukkusuri, S.V. Household evacuation decision-making during simultaneous disasters: Hurricane Ida and the COVID-19 pandemic. *International Journal of Disaster Risk Reduction*, 114(104914) (2024). doi: 10.1016/j.ijdrr.2024.104914.
5. **Verma, R.**, Mittal, S., Lei, Z., Chen, X. & Ukkusuri, S.V. Comparison of home detection algorithms using smartphone GPS data. *EPJ Data Science*, 13(6) (2024). doi: 10.1140/epjds/s13688-023-00447-w.
6. **Verma, R.** & Ukkusuri, S.V. Crosswalk detection from satellite imagery for pedestrian network completion. *Transportation Research Record*, 2678(7), 845–856 (2023). doi: 10.1177/03611981231210545. Special coverage in *The Washington Post*.
7. **Verma, R.** & Ukkusuri, S.V. A link criticality approach for pedestrian network design to promote walking. *npj Urban Sustainability*, 3(48) (2023). doi: 10.1038/s42949-023-00114-z.
8. **Verma, R.**, Shen, J., Benedict, B.C., Murray-Tuite, P., Lee, S. & Ukkusuri, S.V. Progression of hurricane evacuation-related dynamic decision-making with information processing. *Transportation Research Part D: Transport and Environment*, 108(103323) (2022). doi: 10.1016/j.trd.2022.103323.
9. **Verma, R.**, Yabe, T. & Ukkusuri, S.V. Spatiotemporal contact density explains the disparity of COVID-19 spread in urban neighborhoods. *Scientific Reports*, 11(10952) (2021). doi: 10.1038/s41598-021-90483-1.
10. Saedi, R., **Verma, R.**, Zockaei, A., Ghamami, M. & Gates, T.J. Comparison of support vector and non-linear regression models for estimating large-scale vehicular emissions, incorporating network-wide fundamental diagram for heterogeneous vehicles. *Transportation Research Record*, 2674(5), 70–84 (2020). doi: 10.1177/0361198120914304.
11. **Verma, R.**, Saedi, R., Zockaie, A. & Gates, T.J. Behavioral analysis of drivers following winter maintenance trucks enabled with collision avoidance system. *Transportation Research Record*, 2673(10), 394–404 (2019). doi: 10.1177/0361198119850131.
12. Saedi, R., **Verma, R.**, Zockaei, A., Ghamami, M. & Gates, T.J. A framework for incorporating the network fundamental diagram into large-scale emission estimation. *Journal of Transport & Health*, 9, S54–S55 (2018). doi: 10.1016/j.jth.2018.05.041.

Conference Proceedings

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

ArXiv

1. **Verma, R.**, Debnath, M., Mittal, S. & Ukkusuri, S.V. Towards a generalized accessibility measure for transportation equity and efficiency. Economics ArXiv (2024). doi: arXiv:2404.04985.
2. **Verma, R.**, Ka, E. & Ukkusuri, S.V. Long-term forecasts of statewide travel demand patterns using large-scale mobile phone GPS data: A case study of Indiana. Economics ArXiv (2024). doi: arXiv:2404.13211.

Under Review

1. **Verma, R.**, Mittal, S., Debnath, M. Ukkusuri, S.V. & Gkritza, K. Modal accessibility differences using cross-modal floating catchment area. Under review in *Environment and Planning – Part B: Urban Analytics and City Science* (2024).
2. Siebeneck, L., Lei, Z., Sharma, P., **Verma, R.**, Osazuwa-Peters, P. & Ukkusuri, S.V. After Hurricane Ida: Evacuation decisions post-disaster. Under review in *Journal of Homeland Security and Emergency Management* (2024).

In Preparation

1. **Verma, R.**, Mittal, S. & Ukkusuri, S.V. Urban landscape representation via accessibility to determine socioeconomic performance and inequality.
2. **Verma, R.**, Ukkusuri, S.V. & Gkritza, K. A compound disadvantage-based approach to interactive transportation equity screening: A case study of the Indiana Transport Equity Atlas.
3. **Verma, R.** & Ukkusuri, S.V. Vehicular emission equity estimation using mobile phone geolocation data.
4. Tumula, R., **Verma, R.**, Gkritza, K. & Ukkusuri, S.V. Breathing in the burden: Health inequity due to traffic-related air pollution.

PRESENTATIONS

Invited Talks

1. "Beyond traffic: How integrated transport systems can transform cities", as part of the biweekly seminar series "Civil Engineering for the Future" hosted by Dr. Nitin Tiwari at the School of Civil, Environmental, and Infrastructure Engineering, Southern Illinois University, Carbondale (YouTube link).

Oral/Lectern

1. Mittal, S., **Verma, R.** & Ukkusuri, S.V. Understanding income-based inequalities in public transit in data-poor environments. Accepted for oral presentation at the *16th International Conference on Advanced Systems in Public Transport* (CASPT2025) and the *10th International Workshop and Symposium on Research and Applications on the Use of Passive Data from Public Transport* (TRANSIT DATA), Kyoto, Japan (Jul 2025).
2. **Verma, R.** & Debnath, M. Transportation equity assessment in Indiana: Recent findings. *110th Purdue Road School Conference and Expo*, West Lafayette, IN (Mar 2024).
3. **Verma, R.** & Ukkusuri, S.V. Crosswalk detection from satellite imagery for pedestrian network completion. *Transportation Research Board 102nd Annual Meeting*, Washington D.C. (Jan 2023).
4. **Verma, R.**, Shen, J., Murray-Tuite, P., Lee, S., Ge, Y. Ukkusuri, S.V. How hurricane evacuation dynamic decision-making progresses with information-seeking behavior. *INFORMS: Mini-conference on Decision Making for Emerging Risks*, online (Jun 2021).
5. **Verma, R.**, Saedi, R., Zockaie, A. Gates, T.J. Behavioral analysis of drivers following winter maintenance trucks enabled with collision avoidance system. *Transportation Research Board 98th Annual Meeting*, Washington D.C. (Jan 2019).

Research Posters

1. **Verma, R.**, Mittal, S., Debnath, M. & Ukkusuri, S.V. Gkritza, K. Modal accessibility differences using cross-modal floating catchment area. *Transportation Research Board 104th Annual Meeting*, Washington D.C. (Jan 2025).
2. **Verma, R.** & Ukkusuri, S.V. What determines travel time and distance decay in spatial interaction and accessibility? *Transportation Research Board 104th Annual Meeting*, Washington D.C. (Jan 2025).
3. Tumula, R., **Verma, R.**, Gkritza, K. & Ukkusuri, S.V. Breathing in the burden: Health inequity due to traffic-related air pollution. *Transportation Research Board 104th Annual Meeting*, Washington D.C. (Jan 2025).
4. **Verma, R.**, Holguin, D., Debnath, M., Ukkusuri, S.V. & Gkritza, K. Assessing Indiana's transportation and environmental equity using large-scale data. *ASCE International Conference on Transportation Development*, Atlanta (Jun 2024).
5. **Verma, R.**, Debnath, M., Mittal, S. & Ukkusuri, S.V. Towards a generalized accessibility measure for transportation equity and efficiency. *Joint Transportation Research Program Poster Session*, Indianapolis (Feb 2024).
6. **Verma, R.** & Ukkusuri, S.V. What determines distance decay? Understanding impedance decay in spatial interaction and accessibility. *Joint Transportation Research Program Poster Session*, Indianapolis (Feb 2024).
7. **Verma, R.**, Mittal, S., Lei, Z., Chen, X. & Ukkusuri, S.V. Comparison of home detection algorithms using smartphone GPS data. *Transportation Research Board 103rd Annual Meeting*, Washington D.C. (Jan 2024).
8. **Verma, R.** & Ukkusuri, S.V. Leveraging large-scale cell phone geolocation data to inform high-resolution transportation planning in Indiana. *109th Purdue Road School Conference and Expo*, West Lafayette, IN (Mar 2023).
9. **Verma, R.**, Deodhar, S., Ukkusuri, S.V. Gkritza, N. Measuring Indiana's transportation equity using large-scale data. *109th Purdue Road School Conference and Expo*, West Lafayette, IN (Mar 2023).
10. **Verma, R.**, Shen, J., Murray-Tuite, P., Lee, S., Ge, Y. Ukkusuri, S.V. How hurricane evacuation dynamic decision-making progresses with information-seeking behavior. *Transportation Research Board 100th Annual Meeting*, Washington D.C. (Jan 2022).
11. Paul, M., **Verma, R.** & Ghosh, I. An efficient calibration methodology of microsimulation model for signalized intersections under heterogeneous and indisciplined traffic environment. *Transportation Research Board 98th Annual Meeting*, Washington D.C. (Jan 2019).
12. Saedi, R., **Verma, R.**, Zockaie, A. Ghamami, M. Large-scale emission estimation framework by incorporating the network-wide fundamental diagram: Introduction to network-wide emission diagram. *International Conference on Transportation Health*, Mackinac Island, MI (Jun 2018).

Funded Research Projects

1. Gkritza, K., Ukkusuri, S.V., Chen, X., Hamim, O.F., Moras, B.C.K., **Verma, R.**, Burra, L.T. & Jayaram, S. Simulating Current and Future EV Growth Scenarios in Indiana. Sponsor: Indiana Department of Transportation (INDOT) through the Joint Transportation Research Program (JTRP) project #SPR 4811 Expansion (Oct 2025).
2. Ukkusuri, S.V., **Verma, R.**, Rao, R., Debnath, M., Holguin, D., Deodhar, S. & Gkritza, K. Addressing accessibility, equity, and environmental justice measures of infrastructure facilities in Indiana. Sponsor: INDOT through the JTRP project #SPR 4711 (2024).

3. Siebeneck, L., Ukkusuri, S.V., Lei, Z., **Verma, R.**, Sharma, P. & Osazuwa-Peters, P. RAPID/Collaborative research: Examining household movements and evacuation decision-making in a compounding risk event. Sponsor: National Science Foundation. Award #2153919 and #2153913 (2024). See data description.
4. **Verma, R.**, Luo, H., Deodhar, S., Ka, E., Chahine, R., Natu, P., Malhotra, H., Polisetty, V., Thakkar, D. J., Ukkusuri, S. V., Cai, H., Dunlop, S. R., Iyer, A. V., & Gkritza, K. Forecasting shifts in Hoosiers' travel demand and behavior. Sponsor: INDOT through the JTRP project # SPR 4608. Publication No. FHWA/IN/JTRP-2023/28 (2023).
5. 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. Hazards SEES: Bridging information, uncertainty, and decision-making in hurricanes using an interdisciplinary perspective. Sponsor: National Science Foundation. Award #1520338 (2021).
6. Zockaie, 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. Evaluation of a collision avoidance and mitigation system (CAMS) on winter maintenance trucks. Sponsor: Michigan Department of Transportation Research Administration. Publication #OR 17-103 (2018).

MEMBERSHIPS AND SERVICE

Article Reviewer

- Data Science for Transportation (ISSN: 2948-135X)
- IEEE International Conference on Intelligent Transportation Systems (ISSN: 2153-0009)
- Journal of Big Data Analytics in Transportation (Springer Nature)
- Journal of Transportation Engineering, Part A: Systems (ISSN: 0733-947X)
- Natural Hazards Review (ISSN: 1527-6988)
- Transport Policy (ISSN: 1879-310X)
- Transportation Research Record: Journal of the Transportation Research Board (ISSN: 0361-1981)

Service

MALTA Workshop at AAAI Conference 2025 3/4/2025

- Helped organize a one-day workshop with Dr. Vaneet Aggarwal titled "Multi-Agent reinforcement Learning for Transportation Autonomy" (MALTA) at the AAAI Conference on Artificial Intelligence 2025 in Philadelphia, USA, organized by the Association for the Advancement of Artificial Intelligence (AAAI).

Professional Organizations/Committees

Transportation Research Board: Friend Member of **Standing Committees** 2024 – Present

- AME50: Accessible Transportation and Mobility
- AME40: Transportation in the Developing Countries
- AME10: Equity in Transportation
- AEP50: Transportation Demand Forecasting
- AEP30: Traveler Behavior and Values
- AED80: Visualization in Transportation
- AED40: Geographic Information Science
- AED20: Urban Transportation Data and Information Systems
- ACH20: Bicycle Transportation

National Collaboration on Bicycle, Pedestrian & Accessibility Infrastructure Data 2024 – Present

- Volunteer member

Institute of Transportation Engineers 2017 – Present
- Served in Purdue Chapter as president (2022–23), vice-president (2021–22), and treasurer (2020–21)

American Society of Civil Engineers 2018 –2024
- Student member

Student Bodies

Purdue Graduate Student Government, Purdue University 3/2020 – 4/2021

Civil Engineering Graduate Student Advisory Council, Purdue University 9/2019 – 4/2022
- Vice-president (2020–21), secretary of the Professional Development Committee (2019–20), volunteer member (2021–22).

Graduate Employees Union, Michigan State University 11/2018 – 5/2019
- Chair of the Deferred Actions for Childhood Arrivals (DACA) Committee

Civil Engineering Consortium, IIT Roorkee 2/2015 – 5/2017
- Graphic design lead

Information Management Group, IIT Roorkee 2/2015 – 5/2017
- Design & Creativity Head of the intranet web/app development portal of IIT Roorkee

AWARDS AND HONORS

Kinnier Travel Award 6/2024
For ASCE International Conference on Transportation & Development ($530)
Lyles School of Civil Engineering, Purdue University

Outstanding Service in Graduate Education 4/2024
College of Engineering, Purdue University ($2,000)

Eldon J. Yoder Memorial Award 9/2023
Outstanding Graduate Student in Transportation Engineering ($750)
Lyles School of Civil Engineering, Purdue University

Best ITE Student Chapter Award 8/2023
Received as outgoing president, ITE Purdue University Chapter
- For the Great Lakes ITE District Annual Meeting, Grand Rapids, MI ($500)
- For ITE International and West District Annual Meeting, Portland, OR ($1,000)

Erin Flannigan Travel Award 11/2022
For the 102nd Transportation Research Board Annual Meeting ($300)
Lyles School of Civil Engineering, Purdue University

M.S. Student of the Year 5/2019
Department of Civil Engineering, Michigan State University

Annual ITE Scholarship 2/2019
Institute of Transportation Engineers - Michigan Chapter ($3,000)

Student Travel Award 6/2018
For the 2018 International Conference on Transport & Health ($800)
Department of Civil Engineering, Michigan State University

Merit-cum-Means Scholarship 1/2014 – 4/2015
Ministry of Minority Affairs, Government of India
Received a lumpsum of INR 200,000 (≈ US$ 2,300) over two years at IIT Roorkee

Relevant Coursework

Graduate Degree Courses

Transportation Engineering

- CE 449: Highway Design (Fall '17)
- CE 847: Traffic Analysis and Control (Fall '17)
- CE 851: Transportation and Environment (Fall '17)
- CE 448: Transportation Planning (Spring '18)
- CE 850: Intelligent Transportation Systems (Spring '18)
- CE 841: Traffic Flow Theory (Fall '18)
- CE 844: Traffic and Highway Safety (Spring '19)
- CE 597: Network Models for Connected and Autonomous Vehicles (Fall '19)

Mathematics, Optimization, and Statistics

- ECE 695: Structure and Dynamics of Large-Scale Networks (Fall '19)
- IE 561: Introduction to Convex Optimization (Fall '19)
- IE 690: Game Theory and Uncertainty (Spring '20)
- STAT 517: Inferential Statistics (Fall '20)
- IE 633: Dynamic Programming (Spring '21)

Data Science and Machine Learning

- ECE 802-863: Data Science (Spring '18)
- CS 590: Graphs in Machine Learning (Spring '20)
- CE 597: Data Science for Smart Cities (Fall '20)
- BME 695: Deep Learning (Spring '21)

Massive Open Online Courses

Complete Guide to TensorFlow for Deep Learning with Python 5/2021
Udemy.com (certificate)

Text Mining and Analytics 2/2020
Coursera.org – University of Illinois, Urbana-Champaign (certificate)

Introduction to Graph Theory 7/2018
Coursera.org – University of California, San Diego (certificate)

Bayesian Statistics 5/2018
Coursera.org – University of California, Santa Cruz (certificate)

Technical Strengths

Programming and Data Science

- General programming: Bash*, Git*, Java*, Julia, Jupyter*, Linux*, MATLAB, Python*, R*
- Data manipulation: Dask, dplyr*, Excel*, NumPy*, pandas*, pySpark*, SciPy*
- Data visualization: D3.js, Gephi, ggplot2, Leaflet, Matplotlib*, Plotly*, Shiny, Tableau*
- Geospatial analysis: ArcGIS Pro*, GeoDa, geopandas*, OSRM*, pyrosm*, QGIS*
- Simulation: A-RESCUE*, VISSIM, Simulink, SUMO
- Statistical analysis: caret, SPSS*, statsmodels*
- Machine learning: PyTorch*, scikit-learn*, TensorFlow
- Web development: Dash*, HTML/CSS*, JavaScript (jQuery, React)

Communication and Creative

- Languages: English*, Hindi/Hinglish* (native), Spanish (elementary)
- Graphic/UI designing: AutoCAD, Canva*, Figma*, Illustrator*, Photoshop*

* Proficient

Last updated: July 30, 2025

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