RAJAT VERMA

Lyles School of Civil and Construction Engineering Purdue University, West Lafayette, IN, USA

Section State State

EDUCATION

 Ph.D., Civil Engineering (Transportation) Purdue University, West Lafayette, IN, USA Advisor: Prof. <u>Satish V. Ukkusuri</u>; GPA: 4.0 Dissertation: <u>Advancing the quantitative assessment of transportation equity for planning</u> With <u>Graduate Certificate</u> in Teaching and Learning in Engineering 	2019 – 2024
Master of Science , Civil Engineering (Transportation) Michigan State University, East Lansing, MI, USA Advisor: Prof. <u>Timothy J. Gates</u> ; GPA: 4.0 Thesis: <u>Evaluation of a rear-end collision avoidance system on winter maintenance trucks</u>	2017 – 2019
Bachelor of Technology , Civil Engineering Indian Institute of Technology (IIT) Roorkee, Roorkee, Uttarakhand, India Academic advisor: Prof. <u>Indrajit Ghosh;</u> GPA: 8.636 / 10	2013 – 2017

RESEARCH EXPERIENCE

RESEARCH LAFERIENCE	
 Postdoctoral Researcher Purdue University, West Lafayette, IN, USA Advisor: Prof. Satish V. Ukkusuri Leading projects related to accessibility to electric vehicle infrastructure, transport investment screening tool, and workforce development. Developed the <u>Spatial Accessibility of America</u> repository of multiple spatial accessibility metrics for the 50 largest urban areas of the U.S. 	8/2024 – Present
 Research Assistant 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 <u>A-RESCUE 3.0</u> (a Java-based evacuation micro traffic simulator), mobilitit+ (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). 	8/2019 – 7/2023
Graduate Research Assistant	8/2017 –

Michigan State University, East Lansing, MI, USA Advisor: Prof. Timothy J. Gates 7/2019

- Assessed the performance and effectiveness of a pilot rear-facing collision avoidance system on snowplows as part of a <u>Michigan DOT project</u>.
- 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

Indian Institute of Science Bangalore, Karnataka, India Advisor: Prof. <u>Ashish Verma</u>

 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: <u>The Kumbh Mela</u> <u>Experiment</u>: Measuring and Understanding the Dynamics of Mankind's Largest Crowd, Ujjain, India.

TEACHING EXPERIENCE AND CREDENTIALS

Guest Lecturer Purdue University, West Lafayette, IN, USA - <u>CE569 (Smart Logistics)</u> - <u>CE614 (Statistical & Econometric Methods I)</u>	9/2024 – 11/2025
 Teaching and Learning in Engineering Graduate Certificate (certificate) Certificate program at Purdue University's School of Engineering Education (ENE), including: <u>ENE 506: Content, Assessment, and Pedagogy</u> <u>ENE 685: Engineering Education Methods</u> <u>ENE 687: Mentored Teaching in Engineering</u> <u>ENE 695: Succeeding as an Engineering Professor</u> 	5/2024
 Teaching Assistant Purdue University, West Lafayette, IN, USA Course <u>CE597 (Data Science for Smart Cities)</u>, 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.) 	8/2023 – 12/2023
 Volunteer Tutor <u>Algebra by 7th Grade</u> Program, Purdue University Assisted high-performing students of color of 5–7th grades with math and English 	1/2023
 Volunteer Tutor Briarwood & RichField Tutoring & Life Skills Program, Lafayette Area, IN Tutored students of color in grades 1–4 and assisted with their homework 	9/2021 – 12/2021

PUBLICATIONS

Peer-Reviewed Journals

1. **Verma, R.** & Ukkusuri, S.V. <u>What determines travel time and distance decay in spatial interaction and accessibility?</u> *Journal of Transport Geography*, 122(104061) (2025). doi: 10.1016/j.jtrangeo.2024.104061.

5/2016 – 6/2016

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

Conference Proceedings

 Verma, R., Lei, Z., Xue, J., Shen, J., Gehlot, H., Ukkusuri, S.V. & Murray-Tuite, P. <u>How information</u> <u>heterogeneity influences traffic congestion during hurricane evacuation</u>. *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. <u>Towards a generalized accessibility measure for</u> <u>transportation equity and efficiency</u>. Economics ArXiv (2024). doi: arXiv:2404.04985.
- 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. & Ukkusuri, S.V. Spatial Access of America: Multiple indicators of accessibility to opportunities. Under review in *Scientific Data* (2025).
- 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).
- 3. 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.**, Ukkusuri, S.V. & Gkritza, K. A compound disadvantage-based approach to interactive transportation equity screening: A case study of the Indiana Transport Equity Atlas.
- 2. Verma, R. & Ukkusuri, S.V. Vehicular emission equity estimation using mobile phone geolocation data.
- 3. 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. **Verma, R.** & Debnath, M. Transportation equity assessment in Indiana: Recent findings. *110th Purdue Road School Conference and Expo*, West Lafayette, IN (Mar 2024).
- 2. **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).
- 3. 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).
- 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).
- 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).
- 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 highresolution 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).
- 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

- Gkritza, K., Ukkusuri, S.V., Chen, X., Hamim, O.F., Moras, B.C.K., Verma, R., Burra, L.T. & Jayaram, S. <u>Simulating Current and Future EV Growth Scenarios in Indiana</u>. Sponsor: Indiana Department of Transportation (INDOT) through the Joint Transportation Research Program (JTRP) project #SPR 4811 Expansion (Oct 2025).
- Ukkusuri, S.V., Verma, R., Rao, R., Debnath, M., Holguin, D., Deodhar, S. & Gkritza, K. <u>Addressing</u> accessibility, equity, and environmental justice measures of infrastructure facilities in Indiana. Sponsor: INDOT through the JTRP project #SPR 4711 (2024).
- Siebeneck, L., Ukkusuri, S.V., Lei, Z., Verma, R., Sharma, P. & Osazuwa-Peters, P. <u>RAPID/Collaborative research: Examining household movements and evacuation decision-making in</u> <u>a compounding risk event</u>. Sponsor: National Science Foundation. Award #2153919 and #2153913 (2024). See <u>data description</u>.
- 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. <u>Forecasting shifts in Hoosiers'</u> <u>travel demand and behavior</u>. 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. <u>Hazards SEES: Bridging information, uncertainty, and decision-making</u>

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

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).

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2024 – Present
2024 – Present
2017 – Present
2018 –2024

Purdue Graduate Student Government, Purdue University	3/2020 – 4/2021
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3/4/2025

Civil Engineering Graduate Student Advisory Council , Purdue University Volunteer member 	9/2019 - 4/2022
 Graduate Employees Union, Michigan State University Chair of the Deferred Actions for Childhood Arrivals (DACA) Committee 	– 11/2018 5/2019
Civil Engineering Consortium , IIT Roorkee – Graphic design lead	2/2015 – 5/2017
 Information Management Group, IIT Roorkee Design & Creativity Head of the intranet web/app development portal of IIT Roorkee 	2/2015 – 5/2017
Awards and Honors	
Kinnier Travel Award For ASCE International Conference on Transportation & Development (\$530) Lyles School of Civil Engineering, Purdue University	6/2024
Outstanding Service in Graduate Education College of Engineering, Purdue University (\$2,000)	4/2024
Eldon J. Yoder Memorial Award Outstanding Graduate Student in Transportation Engineering (\$750) Lyles School of Civil Engineering, Purdue University	9/2023
 Best ITE Student Chapter Award 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) 	8/2023
Erin Flannigan Travel Award For the 102nd Transportation Research Board Annual Meeting (\$300) Lyles School of Civil Engineering, Purdue University	11/2022
M.S. Student of the Year Department of Civil Engineering, Michigan State University	5/2019
Annual ITE Scholarship Institute of Transportation Engineers - Michigan Chapter (\$3,000)	2/2019
Student Travel Award For the 2018 International Conference on Transport & Health (\$800) Department of Civil Engineering, Michigan State University	6/2018
Merit-cum-Means Scholarship Ministry of Minority Affairs, Government of India Received a lumpsum of INR 200,000 (≈ US\$ 2,300) over two years at IIT Roorkee	1/2014 – 4/2015

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 802-863: Data Science (Spring '18)
- 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

- 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 Udemy.com (<u>certificate</u>)	5/2021
Text Mining and Analytics Coursera.org – University of Illinois, Urbana-Champaign (<u>certificate</u>)	2/2020
Introduction to Graph Theory Coursera.org – University of California, San Diego (<u>certificate</u>)	7/2018
Bayesian Statistics Coursera.org – University of California, Santa Cruz (<u>certificate</u>)	5/2018

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:	<u>caret</u> , <u>SPSS</u> [*] , <u>statsmodels</u> [*]
-	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: <u>AutoCAD, Canva^{*}, Figma^{*}, Illustrator^{*}, Photoshop^{*}</u>

* Proficient

Last updated: March 9, 2025