RAJAT VERMA

Lyles School of Civil and Construction Engineering
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EDUCATION

Purdue University *West Lafayette, IN*
Ph.D., Civil Engineering. GPA: 4.0. 8/2019 – 7/2024
Advisor: Dr. Satish V. Ukkusuri
Dissertation: *Advancing the quantitative assessment of transportation equity for planning* (link).

Michigan State University *East Lansing, MI*
Master of Science, Civil Engineering. GPA: 4.0 8/2017 – 7/2019
Advisor: Dr. Timothy J. Gates
Thesis: *Evaluation of a rear-end collision avoidance system on winter maintenance trucks* (link).

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

WORK EXPERIENCE

Post-Doctoral Research Assistant 8/2024 – Present
Purdue University *West Lafayette, IN*

- Leading a project on equity investment potential analysis in Indiana led by Dr. Satish V. Ukkusuri.

Teaching Assistant 8/2023 – 12/2023
Purdue University *West Lafayette, IN*

- Course *CE 597: 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.).

Graduate Research Assistant 8/2019 – 7/2024
Purdue University *West Lafayette, IN*

- Worked on a collection of projects to assess human mobility patterns at scale and their relation with inequitable distribution of accessibility to jobs, transit, and places of interest as well as environmental inequity. Projects sponsored by the National Science Foundation and Indiana Department of Transportation (DOT).
- Major outcomes/contributions include A-RESCUE 3.0, a hurricane evacuation micro traffic simulator, mobilkit, a Spark-based Python toolkit for processing high-volume passively collected smartphone GPS data, and Spatial Accessibility of America, a repository of spatial accessibility metrics developed for the 50 largest urban areas of the U.S.

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

- Assessed the performance and effectiveness of a pilot rear-facing collision avoidance system on snowplows. Project sponsored by the Michigan DOT.
- 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 *Bengaluru, India*
Supervisor: Dr. Ashish Verma

- Worked on the 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

Articles in Peer Reviewed Journals and Conferences

13. Tumula, R., **Verma, R.**, Gkritza, K. & Ukkusuri, S.V. Breathing in the burden: Health inequity due to traffic-related air pollution. Under review in *Transportation Research Record* (2024).

12. Lei, Z., **Verma, R.**, Siebeneck, L. & Ukkusuri, S.V. Modeling hurricane evacuation/return under compounding risks – Evidence from Hurricane Ida. Under review (round 2) in *International Journal of Disaster Risk Reduction* (2024).

11. **Verma, R.** & Ukkusuri, S.V. What determines travel time and distance decay in spatial interaction and accessibility? Under review (round 2) in *Journal of Transport Geography* (2024).

10. 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. Under review (round 2) in *International Journal of Disaster Risk Reduction* (2024).

9. **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

8. **Verma, R.** & Ukkusuri, S. V. Crosswalk detection from satellite imagery for pedestrian network completion. *Transportation Research Record*, 0(0) (2023). doi: 10.1177/03611981231210545.
Special coverage in a news article in The Washington Post (link).

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

6. **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

5. **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

4. **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. *2021 IEEE International Intelligent Transportation Systems Conference (ITSC)*, 1833-1838 (2021). doi: 10.1109/ITSC48978.2021.9564797

3. 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

2. **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

1. 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

Articles in Preparation

5. **Verma, R.**, Mittal, S., Debnath, M. & Ukkusuri, S.V. & Gkritza, K. Modal accessibility differences using cross-modal floating catchment area.

4. **Verma, R.**, Ukkusuri, S.V. & Gkritza, K. A compound disadvantage-based approach to interactive equity screening.

3. **Verma, R.** & Ukkusuri, S.V. Vehicular emission equity estimation using mobile phone geolocation data.

2. **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

1. **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

PRESENTATIONS

12. **Verma, R.** Assessing Indiana's transportation and environmental equity using large-scale data. *ASCE International Conference on Transportation & Development*, Atlanta (Jun 2024). Research poster.

11. **Verma, R.** & Debnath, M. Transportation equity assessment in Indiana: Recent findings. *110th Purdue Road School Conference and Expo*, West Lafayette, IN (Mar 2024). Oral presentation.

10. **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). Research poster.

9. **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). Research poster.

8. **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). Research poster.

7. **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). Research poster.

6. **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). Research poster.

5. **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). Oral presentation.

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) (Oral presentation) and *Transportation Research Board 100th Annual Meeting*, Washington D.C. (Jan 2022) (Research poster).

3. 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). Research poster.

2. **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). Oral presentation.

1. 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). Research poster.

RESEARCH PROJECTS

5. Ukkusuri, S.V., Gkritza, K., **Verma, R.**, Rao, R., Debnath, M., Holguin, D. & Deodhar, S. Addressing accessibility, equity, and environmental justice measures of infrastructure facilities in Indiana. *Joint Transportation Research Program* project # SPR 4711 (expected Oct 2024).

4. RAPID/Collaborative research: Examining household movements and evacuation decision-making in a compounding risk event. *National Science Foundation*, Award #2153919 and #2153913 (submitted Apr 2024).

3. **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. *Joint Transportation Research Program*,

West Lafayette, Purdue University. Publication No. FHWA/IN/JTRP-2023/28 (Nov 2023). doi: 10.5703/1288284317685

2. 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. *National Science Foundation*, Award #1520338 (Oct 2021).

1. 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. *Michigan Department of Transportation Research Administration*, OR 17-103 (Sep 2018).

MEMBERSHIPS AND SERVICE

Article Reviewer in Journals & Conferences

- Data Science for Transportation
- IEEE International Conference on Intelligent Transportation Systems
- Journal of Big Data Analytics in Transportation
- Journal of Transportation Engineering
- Natural Hazards Review
- Transport Policy
- Transportation Research Record: Journal of the Transportation Research Board

Professional Organizations & Committees

- National Collaboration on Bicycle, Pedestrian & Accessibility Infrastructure Data (Volunteer member) — 4/2024 – Present
- Institute of Transportation Engineers — 12/2017 – Present
  (Served in Purdue Chapter as president (2022–23), vice-president (2021–22) & treasurer (2020–21))
- American Society of Civil Engineers — 3/2018 – Present
  (Student member)

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 students of color in grades 1–4 and assisted with their homework)
- National Service Scheme, *I.I.T. Roorkee* — 8/2013 – 7/2014
  (Conducted several awareness activities as part of the *Environment* section)

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 2020–21)

- 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)

CERTIFICATIONS

Teaching and Learning in Engineering Graduate Certificate (link) 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

Complete Guide to Tensorflow for Deep Learning with Python 5/2021
(Udemy)

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)

AWARDS & 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 Eningeering ($750)
Lyles School of Civil Engineering, Purdue University

Best ITE Student Chapter Award 8/2023
(Received as outgoing chapter president)
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

Best Poster in Civil Engineering (Transportation) 3/2018
2018 Engineering Graduate Research Symposium, Michigan State University

Merit-cum-Means Scholarship 1/2014 - 4/2015
Indian Institute of Technology Roorkee, INR 200,000 (≈$2,600) over 2 years

TECHNICAL STRENGTHS

Languages: Python*, R*, SQL*, Java, C^{++}, MATLAB, Julia, HTML/CSS, JavaScript, Bash*

Frameworks: Pyspark*, Pytorch, Tensorflow, Dash/Plotly*, Jupyter*, LaTeX*, jQuery

Software: QGIS*, ArcGIS, Tableau*, SPSS, Excel*, VISSIM, Gephi, AutoCAD

Creative: Figma*, Photoshop*, Illustrator*, Canva*

* Proficient

REFERENCES

Dr. **Satish V. Ukkusuri**
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Purdue University
Lyles School of Civil and Construction Engineering
550 West Stadium Avenue, West Lafayette, IN 47907
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Dr. **Takahiro Yabe**
Assistant Professor
New York University
Tandon School of Engineering

Department of Technology Management and Innovation (TMI) &
Center for Urban Science and Progress (CUSP)
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Dr. **Konstantina 'Nadia' Gkritza**
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Purdue University
Lyles School of Civil and Construction Engineering
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Dr. **Indrajit Ghosh**
Associate Professor of Civil Engineering
Indian Institute of Technology Roorkee
Roorkee - Haridwar Highway, Roorkee, Uttarakhand 247667, India
Email: indrajit.ghosh@ce.iitr.ac.in