Harsh Anand, Ph.D.

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Employment History

Professional Experience

09/2024 – *Present* ▸ **Data Scientist (R&D) - Data and AI Program** - *Leidos Inc.*, McLean, VA
Principal investigator and lead for AI in transportation projects at Saxton Transportation Operations Laboratory, Federal Highway Administration, U.S. DOT.

06/2020 – 08/2020 ▸ **Data Science Intern** - *Swiss Re*, New York, NY, USA

01/2017 – 05/2021 ▸ **Senior Data Scientist** - *Kearney*, Mumbai, India
Worked as a consultant in Kearney's Analytics practice, leading data-driven strategy and implementing projects across telecommunications, IT, and government sectors in three continents, including engagements in Germany, the Netherlands, and Saudi Arabia.

08/2015 – 11/2016 ▸ **Machine Learning Engineer** - *A.I. Research Lab, TCS*, Kochi, India
Developed and deployed ML models and knowledge graphs for real-world applications across private equity and e-commerce, enhancing enterprise AI solutions.

01/2015 – 06/2015 ▸ **Data Science Intern, Semantic Search** - *DataWeave Inc.*, Bangalore, India

Research Experience

05/2021 – 08/2024 ▸ **Doctoral Researcher** – *University of Virginia*, VA, USA

11/2019 – 05/2021 ▸ **Graduate Researcher** – *Pennsylvania State University*, PA, USA

2013 – 2015 ▸ **Research Assistant** – *Dept. of Information Technology, MIT, Manipal*, India

Summer 2013 ▸ **Research Intern** – *Indian Institute of Technology (IIT), Guwahati*, India

Education

2021 – 2024 ▸ **Ph.D. Systems Engineering, University of Virginia**, GPA: **4/4**
(*Data Science and Operations Research concentration*)
Dissertation title: *Examination of Community Responses to Hurricane Evacuation Orders Using High-Fidelity Mobility Data.*
Committee: Negin Alemazkoor (Co-Advisor), Majid Shafiee-Jood (Co-Advisor), James H. Lambert (Chair), Samarth Swarup, Mani Rouhi Rad.

2019 – 2021 ▸ **M.Sc. Data Science and Analytics, Pennsylvania State University**, GPA: **4/4**
Thesis title: *Energy Infrastructure Resilience and Economic Impacts: Modeling, Data Analytics, and Metrics*.
Committee: Mohamad Darayi (Advisor), Colin J. Neill (Chair), Raghvinder S. Sangwan, Satish M. Srinivasan, and Ashkan Negahban.

2011 – 2015 ▸ **B.Sc. Information Technology, Manipal University**
(*Computer Science concentration*)

Research Interest

- **Methodological domains**: artificial intelligence, scientific machine learning, reinforcement learning, system modeling and simulation, data-driven decision making, mathematical modeling and optimization.
- **Application domains**: intelligent transportation systems, energy systems, interdependent infrastructure systems, healthcare, computational sustainability, climate change.

Technical Skills

Advanced Data Science	Scientific Machine Learning, Deep Learning, Reinforcement Learning, Uncertainty Quantification, Meta-Learning, Transfer Learning.
Data Analytics	Data Mining, Predictive and Prescriptive Modeling, Quantitative Analysis, Parametric & Non-Parametric Statistical Modeling, Causal and Bayesian methods, Time-series forecasting, Design of Experiments, A/B Testing, ANOVA, Bootstrapping, Data Structures and Algorithms.
Programming Languages	Python, R, SQL, Java.
Development	TensorFlow, PyTorch, Spark (PySpark, Spark SQL), Hadoop, MapReduce, Graph DB, HBase, Neo4j, CI/CD Jenkins.
Project Management	Project Planning, Agile Development, Leadership, Problem Solving.
Visualization/Others	Power BI, Tableau, Elastic Search, Excel (Advanced), AIIMS, Minitab, KNIME, Alteryx, AWS, IBM Bluemix, Palantir Foundry.

Research Publications

Journal Articles

[1] M. A. Hasnat, **H. Anand**, M. Tootkaboni, and N. Alemazkoor, "Spatio-temporal graph attention network-based detection of fdia from smart meter data at geographically hierarchical levels," *Electric Power Systems Research*, vol. 238, p. 111 149, 2025. DOI: 10.1016/j.epsr.2024.111149.

[2] **H. Anand**, N. Alemazkoor, and M. Shafiee-Jood, "Hevod: A database of hurricane evacuation orders in the united states," *Scientific data*, vol. 11, no. 1, p. 270, 2024. DOI: 10.1038/s41597-024-03100-x.

[3] **H. Anand**, S. Swarup, M. Shafiee-Jood, and N. Alemazkoor, "Understanding of income and race disparities in hurricane evacuation is contingent upon study case and design," *Scientific Reports*, vol. 14, no. 1, p. 28 829, 2024. DOI: 10.1038/s41598-024-79754-9.

[4] M. Gollapalli, **H. Anand**, and S. M. Srinivasan, "Characterizing diseases using genetic and clinical variables: A data analytics approach," *Quantitative Biology*, vol. 12, no. 3, pp. 271–285, 2024. DOI: 10.1002/qub2.46.

[5] **H. Anand**, R. Nateghi, and N. Alemazkoor, "Bottom-up forecasting: Applications and limitations in load forecasting using smart-meter data," *Data-Centric Engineering*, vol. 4, e14, 2023. DOI: 10.1017/dce.2023.10.

[6] X. Ma, E. Pierce, **H. Anand**, N. Aviles, P. Kunk, and N. Alemazkoor, "Early prediction of response to palliative chemotherapy in patients with stage-iv gastric and esophageal cancer," *Bmc Cancer*, vol. 23, no. 1, p. 910, 2023. DOI: 10.1186/s12885-023-11422-z.

[7] **H. Anand**, "Energy infrastructure resilience and economic impacts: Modeling, metrics, and data analytics," 2021. URL: https://etda.libraries.psu.edu/catalog/18967hpa5116.

[8] **H. Anand** and M. Darayi, "Power network component vulnerability analysis: A machine learning approach," *Procedia Computer Science*, vol. 185, pp. 73–80, 2021. DOI: 10.1016/j.procs.2021.05.008.

[9] D. P. Jaiswal, **H. Anand**, S. M. Srinivasan, and M. Darayi, "A data-driven model to generate disruptive scenarios for infrastructure resilience studies," *Procedia Computer Science*, vol. 185, pp. 248–255, 2021.

[10] R. Sharma, **H. Anand**, Y. Badr, and R. G. Qiu, "Time-to-event prediction using survival analysis methods for alzheimer's disease progression," *Alzheimer's & Dementia: Translational Research & Clinical Interventions*, vol. 7, no. 1, e12229, 2021. DOI: 10.1002/trc2.12229.

[11] A. Saxena, **H. Anand**, T. Pradhan, and S. R. Mishra, "A hybrid chaining model with avl and binary search tree to enhance search speed in hashing," *International Journal of Hybrid Information Technology*, vol. 8, no. 3, pp. 185–194, 2015.

[12] T. Pradhan, **H. Anand**, and A. Goyal, "Tha-a hybrid approach for rule induction system using rough set theory, genetic algorithm and boolean algebra," *Global Journal of Research and Engineering-GJRE-I*, vol. 14, no. 1, 2014.

Conference Proceedings

[1] **H. Anand**, M. Shafiee-Jood, and N. Alemazkoor, "Perspicuity of evacuation behavior in communities during hurricanes using large-scale mobility patterns and communal characteristics," in *2023 57th Annual Conference on Information Sciences and Systems (CISS)*, IEEE, 2023, pp. 1–6.

[2] **H. Anand** and M. Darayi, "A probabilistic approach to modeling power network component importance considering economic impacts," in *IIE Annual Conference. Proceedings*, Institute of Industrial and Systems Engineers (IISE), 2021, pp. 1010–1015.

Under Review Publications

Journal Articles

[1] **H. Anand** and M. Darayi, *Modeling and analyzing energy infrastructure resilience considering economic impact*, Under Revision Review at *PLOS One*, 2025.

[2] **H. Anand**, M. Rouhi Rad, N. Alemazkoor, and M. Shafiee-Jood, *Unveiling the truth: How effective are hurricane evacuation orders? insights from hurricane dorian in florida*, Under Review at *Bulletin of the American Meteorological Society*, 2025.

[3] K. Khayambashi, **H. Anand**, M. Taghizadeh, and N. Alemazkoor, *Data transmission and storage reduction in wireless sensor networks via local and global deep learning models*, Under Review at *Internet of Things and Cyber-Physical Systems*, 2024.

Books and Chapters

[1] **H. Anand**, K. Khayambashi, and N. Alemazkoor, *Long-term impact of climate change on power grids*, Under Review for Book Publishing at *IEEE and Wiley*, 2025.

In Preparation Publications

Journal Articles

[1] **H. Anand**, "Multi-fidelity deep q-learning with action probing," Experiments and draft in preparation, 2024.

[2] **H. Anand**, N. Alemazkoor, and M. Shafiee-Jood, "Evaluating evacuation effectiveness and community behavior in successive similar trajectory hurricanes via mobility data," Analysis and draft in preparation for submission to *Natural Hazards Review*, 2024.

[3] **H. Anand** and M. Darayi, "Infrastructure systems resilience using machine learning techniques: A literature review," Draft in preparation for submission to *Sustainability*, 2024.

[4] **H. Anand**, K. Khayambashi, M. Taghizadeh, M. Shafiee-Jood, M. A. Hasnat, and N. Alemazkoor, "Graph neural network applications in foundational physical infrastructure systems: A review," Analysis and draft in preparation for submission to *Nature Cities*, 2024.

[5] **H. Anand**, L. Liu, N. Alemazkoor, and M. Shafiee-Jood, "Residents' perception on the role of generative ai to inform personalized evacuation decisions during future hurricanes," Analysis and draft in preparation, 2024.

[6] **H. Anand**, W. Watson, and N. Alemazkoor, "Evaluating energy utilization patterns for policy development towards equity," Analysis and draft in preparation for submission to *Nature Communication*, 2024.

[7] E. Mohellebi, **H. Anand**, M. Darayi, and A. Negahban, "Developing and evaluating an integrated mobility and epidemic vulnerability index via network analysis," Draft in preparation for submission to *PLOS One*, 2024.

Presentations

Technical Presentation

[1] **H. Anand**, *Examination of community responses to hurricane evacuation orders using high-fidelity mobility data*, Technical Presentation, SERC Doctoral Student Forum, SERC 2024 Annual Meeting, Washington DC, November 2024, 2024.

[2] **H. Anand**, M. Shafiee-Jood, and N. Alemazkoor, *Evaluating the effectiveness of hurricane evacuation orders by leveraging large-scale human mobility patterns*, Technical Presentation, Response and Recovery to Disasters and Disruptions, INFORMS 2023 Annual Meeting, Phoenix, October 2023, 2023.

[3] **H. Anand**, M. Shafiee-Jood, and N. Alemazkoor, *Perspicacity of evacuation behavior in communities during hurricanes using large-scale mobility patterns and communal characteristics*, Technical Presentation, Applied Machine Learning, 2023 57th Annual Conference on Information Sciences and Systems (CISS), Baltimore, March 2023, 2023.

[4] **H. Anand**, M. Shafiee-Jood, M. Rouhi Rad, and N. Alemazkoor, *Evacuation order effectiveness and community behavior: Enabling strategic data-driven decision making through big data*, Technical Presentation, Machine Learning Applications and Data-centric AI, INFORMS 2022 Annual Meeting, Indianapolis, October 2022, 2022.

[5] **H. Anand** and M. Darayi, *A probabilistic approach to modeling power network component importance considering economic impacts*, Technical Presentation, Data and System Analytics Application II, IISE 2021 Annual Meeting, May 2021, 2021.

[6] **H. Anand** and M. Darayi, *A review on energy infrastructure resilience: Modeling, metrics and data analytics*, Technical Presentation, Energy Infrastructure Resilience and Economic Impacts, INFORMS 2021 Annual Meeting, October 2021, 2021.

[7] **H. Anand** and M. Darayi, *Modeling and analyzing energy infrastructure resilience considering economic impact*, Technical Presentation, Equilibrium Modeling of the Environmental and Institutional Aspects of Interregional Electricity Trade, INFORMS 2020 Annual Meeting, November 2020, 2020.

Poster Presentation

[1] **H. Anand**, M. Shafiee-Jood, and N. Alemazkoor, *Evacuation order effectiveness and community behavior: Enabling strategic data-driven decision making through big data*, Poster Presentation, U.S. Environmental Protection Agency International Decontamination Research and Development Conference, Charleston, December 2023 **(Best Poster Winner Award)**, 2023.

[2] **H. Anand** and N. Alemazkoor, *Enabling causal study of evacuation orders effectiveness through big data*, Poster Presentation, Link Lab - UVA Engineering Poster and Flash Talk, Charlottesville, February 2022, 2022.

[3] **H. Anand**, *Modeling and analyzing energy infrastructure resilience considering economic impact*, Poster Presentation, Penn State Poster Competition, Malvern, PA, 2020, 2020.

[4] **H. Anand**, R. Sharma, and A. Mungee, *Projecting patterns with causal influences in a dynamic ecosystem for retail sales forecasting*, Poster Presentation, Penn State Poster Competition, Malvern, PA **(Runners Up Award)**, 2020, 2020.

[5] A. Mani, **H. Anand**, and A. Venkata, *A qualitative study of multi-channel marketing campaigns using market mix modeling*, Poster Presentation, Penn State Poster Competition, Malvern, PA, 2020, 2020.

Invited Talks

[1] **H. Anand**, *Demands of good research and how has ai impacted research?* Invited Talk, Ramanujan Society of Research, Indian Institute of Technology Madras, Feb. 2025.

[2] **H. Anand**, *Pioneering transporation innovation through ai-driven solutions*, Invited Talk, Session: From Concept to Reality: Generative AI in the Transportation Industry, Gen AI in Transportation Workshop, ASCE AI in Transportation Committee, Maryland, Mar. 2025.

[3] **H. Anand**, *Enabling causal study of evacuation orders effectiveness through big data*, Invited Talk, Environmental Futures Forum, Energy Resilience Institute, Charlottesville, Oct. 2022.

Professional Engagement

03/2025 ▸ *Chair and Moderator*, Discussion – ASCE Gen AI in Transportation Workshop
Led group discussions with attendees from US DOT, State DOTs, academia, industry, and transportation agencies on AI research gaps and training needs in transportation.

01/2025 ▸ *Chair and Facilitator*, AI Standards Engagement Session – 2025 TRB Annual Meeting
Organized and led an invite-only session with stakeholders from State DOTs, academia, and transportation agencies to discuss challenges and opportunities in deploying AI systems in transportation.

Teaching Experience

University of Virginia

Spring 2024 ▸ *Co-instructor* – School of Data Science (*DS 4002: Data Science Projects*)
Fall 2023 ▸ *Co-instructor and TA* – School of Data Science (*DS 4002: Data Science Projects*)
Spring 2023 ▸ *Teaching Assistant* – School of Data Science (*DS 6030: Statistical Learning*)
Fall 2022 ▸ *Teaching Assistant* – School of Data Science (*DS 4002: Data Science Projects*)
Summer 2022 ▸ *Teaching Assistant* – School of Data Science (*DS 6030: Statistical Learning*)
Spring 2022 ▸ *Teaching Assistant* – School of Data Science (*DS 6030: Statistical Learning*)

Manipal University

Spring 2014 ▸ *Academic Assistant and Tutor* - Dept. of I&CT (*Data Structures and Algorithms*)

Awards & Fellowships

2024 ▸ Robert T. Ferguson III Memorial Award (*Outstanding academic performance*)
▸ Outstanding Graduate Teaching Assistant Award
▸ Raven Award (*Highest honor that the Raven Society can bestow*)
2023, 2024 ▸ Nominee (top 5% among 800+ TAs across UVA) for Graduate Teaching Award
2023 ▸ Olsen Graduate Fellowship (*Endowed Fellowship*)
▸ Louis T. Rader Outstanding Graduate Service Award
▸ Pete Cone Memorial Scholarship
2022 – 2023 ▸ International Student Citizen Leaders Fellowship
2022 ▸ Link Lab Flash Talk Award
2021, 2022 ▸ INFORMS ORMS Tomorrow Conference and Travel Award
2021 ▸ Outstanding Student Award in Data Analytics, Penn State University
▸ Penn State Valedictorian, Class of 2021
▸ The Web Conference 2021 Student Scholarship
2020 – 2021 ▸ Warren V. Musser Fellowship in Entrepreneurial Studies
2019 – 2020 ▸ Penn State Chancellor's Scholarship (*Merit Award*)
2011 – 2015 ▸ AICTE Scholarship (*Tuition Waiver*), Manipal University

Competitions

2023 ▸ *Winner* – Best Poster Award Competition @ 2023 U.S. EPA Decon Conference
2022 ▸ *Winner* – Freestyle O.R. Supreme Case Competition @ 2022 INFORMS
▸ *Finalist* – Duke-UNC-TMC Consulting Case Competition
2021 ▸ Winner – Freestyle O.R. Supreme Case Competition @ 2021 INFORMS
▸ *Finalist* – Mentor and Participant - 2021 Nittany AI Challenge
▸ *Third Place* – Innovation Design Competition @ 2021 IISE
2021, 2020 ▸ *Best Student Pitch* - Lion Cage: Annual competition for early-stage entrepreneurs

Competitions (continued)

- 2020 — *Winner* – Freestyle O.R. Supreme Case Competition @ 2020 INFORMS
- *Judge and Moderator* - Smart India Hackathon - Sentiment Analysis of Code-Mixed Languages
- Placed in *top 10%* for prototyping Video-To-Text Summarizer - 2020 Nittany AI Challenge
- *Runner's Up* - Penn State Poster Competition - Retail Sales Forecasting
- 2019 — *Winner of Wawa - HCL Hackathon*: Sales forecasting for Wawa using LSTM and Prophet
- 2010 — Ranked *top 1%* in 4th International Math Olympiad and 13th National Science Olympiad

Leadership

- 2023 – 2024 — *Chair* - Graduate Engineering Student Council, University of Virginia
- *Chair* - Systems Engineering Student Advocacy Committee, University of Virginia
- *Treasurer and Livability Chair* - Link Lab, University of Virginia
- *Selection Chair* - Engineering School, Raven Society
- *Senior Advisor* - Graduate Consulting Club, University of Virginia
- 2021 – 2023 — *VP of Projects* - Graduate Consulting Club, University of Virginia
- 2022 – 2023 — *Chair (Interim)* - Graduate Engineering Student Council, University of Virginia
- 2022 – 2022 — *Vice-Chair* - Graduate Engineering Student Council, University of Virginia
- 2022 – 2023 — *Livability Liaison* - Link Lab, University of Virginia
- 2021 – 2023 — *International Student Chair* (ESE Graduate Student Council), University of Virginia
- 2019 – 2021 — *Student Senator* - School of Graduate Professional Studies, Penn State University
- 2020 – 2021 — *Global Programs Senate Committee*, Penn State University
- 2012 – 2015 — *Student Council and Curriculum Change Committee*, Manipal University
- *Class Representative*, Manipal University
- 2009 – 2019 — *Educator for Non-profit*, Chala Janjatiya Vikas Sanstha

Professional Services

- 2024 — Technical Program Committee - *IEEE SIEDS Conference*
- 2022 – 2024 — Editorial Board Member - *OR/MS Tomorrow, INFORMS*
- 2023 — Program Committee Member and Reviewer - Manuscript and Posters, *US-RSE Conference*
- Professional Studies Advocacy (through promo videos) for US Dept. of State, *EducationUSA*
- 2022 — Writer, eNews Daily and OR/MS Today Coverage - *INFORMS 2022 Annual Meeting*
- 2021 – 2022 — Webmaster - *OR/MS Tomorrow, INFORMS*
- 2021 — Facilitator, Energy & Infrastructure - *INFORMS 2021 Annual Meeting*

Reviewer

- *Social Network Analysis and Mining, Springer Nature*
- *PLOS One*
- *International Journal of Medical Informatics*
- *IEEE International Conference on Systems, Man, and Cybernetics (SMC)*
- *Transportation Research Board (TRB)*
- *Digital Transformation and Society*
- *US Research Software Engineer Association*
- *IEEE Intelligent Transportation Systems Society*

Professional Services (continued)

Session Chair

05/2024 — *Systems and Information Engineering Design Symposium (SIEDS)*
Sessions Chairing Chair: Leading and overseeing all session chairs

10/2023 — *2023 INFORMS Annual Conference*
TA16. Response and Recovery to Disasters and Disruptions

2021 — *2021 Complex Adaptive Systems Conference*
Session 4: System Analysis
Session 7: Applications of AI
Session 11: Data Science and Analytics

Judge

2024 — *HooHacks* - University of Virginia Computer Science Hackathon

2020 — *Smart India Hackathon* - Sentiment Analysis of Code-Mixed Languages

Miscellaneous Services

University of Virginia

2023 – 2024 — Core Member - Student Health Advisory Committee, University of Virginia

2023 — Waste Action Planning Committee, University of Virginia

2022 — Honor and Academic Integrity Committee, University of Virginia

Faculty Search Committee, ESE Dept., University of Virginia

Summer 2022 — K-12 Outreach - *Starr Hill Pathways Program*, UVA Equity Center

Media & News Coverage

- Featured in *UVA Today* – How Hurricanes in the Gulf Trigger Storms in VA and NC
- Featured in *WVTF* – UVA Hopes to Improve Hurricane Evacuation Orders
- Research Featured in *EurekAlert!* – First-Ever Hurricane Evacuation Order Database May Hold Keys to Future Readiness
- Research Featured in *29News* – First-Ever Hurricane Evacuation Order Database Created by UVA
- Research Featured in *Virginia Public Radio* – UVA Hopes to Improve Hurricane Evacuation Order
- Research Featured in *Phys.org* – Q&A with the Creators of the Hurricane Evacuation Database
- Featured in *UVA Engineering News* – First-Ever Hurricane Evacuation Order Database May Hold Keys to Future Readiness
- Featured in *UVA Engineering News* – Why Gulf Hurricanes Threaten Virginia & the Southeast
- Featured in *UVA Engineering News* – Engineering Grad Students Shine in Teaching Excellence Awards, Claiming UVA's Top Honors
- Featured in *UVA Data Science News* – School of Data Science Celebrates Graduate Teaching Stars
- Featured in *Penn State News* – Great Valley Data Analytics Students Win Wawa-HCL Hackathon

Affiliations & Memberships

- The Intelligent Transportation Society of America (ITS America)
- American Society of Civil Engineers (ASCE)
- Transportation Research Board (TRB)
- Institute for Operations Research and the Management Sciences (INFORMS)
- Institute of Industrial and Systems Engineers (IISE)
- The Honor Society of Phi Kappa Phi

Affiliations & Memberships (continued)

- Complex Adaptive Systems Conference
- The Raven Society - *The oldest and most prestigious honorary society at UVA*
- Sigma Xi, The Scientific Research Honor Society - *Intl. honor society of science and engineering*

References

- **Dr. Negin Alemazkoor**
  Assistant Professor, Civil and Environmental Engineering
  University of Virginia
  E-mail: na7fp@virginia.edu
- **Dr. Majid Shafiee-Jood**
  Research Assistant Professor, Civil and Environmental Engineering
  University of Virginia
  E-mail: ms2dm@virginia.edu
- **Dr. Mohamad Darayi**
  Associate Professor, Systems Engineering
  Pennsylvania State University
  E-mail: mud415@psu.edu

- Industry references are available upon request.