Xuan (Sharon) Di

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Employment

Columbia University   2016-
  Assistant Professor, Department of Civil Engineering and Engineering Mechanics

University of Michigan, Ann Arbor   2014-2016
  Postdoctoral Researcher, University of Michigan Transportation Research Institute (UMTRI)

University of Minnesota, Twin Cities   2008-2014
  Research/Teaching Assistant, Department of Civil, Environmental, and Geo- Engineering

Education

University of Minnesota, Twin Cities
  Ph.D.in Transportation Engineering, Department of Civil, Environmental, and Geo- Engineering   2014
    Dissertation: Boundedly Rational User Equilibria: Theory and Applications
      Committee members: Gary Davis (Chair), Henry Liu (Advisor), David Levinson, Shuzhong Zhang

Tongji University, School of Traffic Engineering, P.R. China
  M.A. in Transportation Information & Control Engineering   2008
    Thesis: Traffic Simulation of Expressway Weaving Section and Optimization of Traffic Flow

  B.S. in Transportation Operation & Management, *summa cum laude, Rank: 1/108*   2005
    Project: High-speed Intercity Passenger Rail Network Design in the Yangtze River Delta

Academic Awards

1. Transportation Data Analytics Contest Winner, Transportation Research Board (TRB)   2017
2. Dafermos Best Paper Award Honorable Mention, TRB Network Modeling Committee   2017
3. Chan Wui & Yunyin Rising Star Workshop Fellowship for Early Career Professionals, TRB (*only 6 fellows were selected internationally*)   2016
4. Outstanding Reviewer of *Transportation Research Part C,* Elsevier   2015
5. Best Paper Award, North-Central Section ITE   2014
6. Graduate Student Scholarship, North-Central Section ITE   2012, 2013, 2014
7. ITS SIG Outstanding Presentation Award, INFORMS   2013
8. Matthew J. Huber Graduate Student Award, Center for Transportation Studies   2013
9. Helene M. Overly Memorial Scholarship, WTS Foundation   2013
10. Kasia Winiarczyk Scholarship award   , ITE Student Chapter of University of Minnesota   2013
11. Graduate Student Award, ITS MN   2009, 2012
12. Student Leadership Award, College of Science and Engineering, University of Minnesota   2012
13. Graduate Student Fellowship, Department of Civil Engineering, University of Minnesota 2008-2009
14. National Scholarship with Highest Honor, Ministry of Education of the People's Republic of China 2002
15. Outstanding Student Scholarship, Tongji University   2001, 2002, 2003

Research Interests

Cyber-Physical Transportation Systems	Travel Behavior Modeling
Smart City Applications	Infrastructure Network Optimization
Big Data Analytics	Sustainable System Modeling

Publications

Peer-reviewed Journal Papers

1. **Di, X.**[*], Fabusuyi, T., Simek, C., Chen, X., Hampshire, R., Switching Behavior in Response to Re-Entry of Uber and Lyft: A Revealed Study in Austin, TX, available at http://ssrn.com/abstract=3016561, *Transport Findings*.
2. Shou, Z.Y., **Di, X.**[*], 2018. Similarity Analysis of Frequent Sequential Activity Patterns Mining, *Transportation Research Part C*, 96: 122-143.
3. **Di, X.**, Zhao, Y., Huang, S.H., Liu, H.X., 2018. A Similitude Theory for Modeling Connected and Automated Vehicle Systems, *IEEE Transactions on Intelligent Transportation Systems*, DOI: 10.1109/TITS.2018.2837011, https://ieeexplore.ieee.org/document/8370840/.
4. **Di, X.**[*], Ma, R., Liu, H.X., Ban, X., 2018. A Link-Node Reformulation of Ridesharing User Equilibrium With Network Design, *Transportation Research Part B,* 112: 230-255.
5. **Di, X.**[*], Liu, H.X., Ban, X., Yang, H., 2017. Ridesharing User Equilibrium and Its Implications for High-Occupancy Toll Lane Pricing, *Transportation Research Record*, 2667: 39-50.
6. Danczyk, A., **Di, X.**, Liu, H.X., Levinson, D.M., 2017. Unexpected versus Expected Network Disruption: Effects on Travel Behavior, *Transport Policy*, 57: 68-78.
7. **Di, X.**, Liu, H.X., Zhu, S.J., Levinson, D.M, 2017. Indifference Bands for Boundedly Rational Route Switching, *Transportation*, 44(5): 1169-1194.
8. Danczyk, A., **Di, X.**, Liu, H.X., 2016. A Probabilistic Optimization Model for Allocating Freeway Sensors, *Transportation Research Part C*, 67, 378-398.
9. **Di, X.**, Liu, H.X., 2016. Boundedly Rational Travel Behavior: A Review of Models and Methodologies, *Transportation Research Part B*, 85: 142-179.
10. **Di, X.**, Liu, H.X., Ban, X., 2016. Second Best Toll Pricing Within the Framework of Bounded Rationality, *Transportation Research Part B*, 83: 74-90.
11. **Di, X.**, Liu, H.X., Ban, X., Yu, J.W., 2015. On the Stability of a Boundedly Rational Day-to-day Dynamic, *Networks and Spatial Economics*, 15 (3): 537-557.
12. **Di, X.**, Liu, H.X., Levinson, D.M., 2014. Multi-Agent Route Choice Game for Transportation Engineering, *Transportation Research Record*, 2480: 55-63.
13. **Di, X.**, Liu, H.X., He, X.Z., 2014. Braess Paradox under the Boundedly Rational User Equilibria, *Transportation Research Part B*, 67: 86–108.
14. **Di, X.**[*], Liu, H.X., Pang, J.S., Ban, X., 2013. Boundedly Rational User Equilibria (BRUE): Mathematical Formulation and Solution Sets, *Transportation Research Part B*, 57: 300–313.
15. **Di, X.**, Liu, H. X., Davis, G. A., 2010. Hybrid Extended Kalman Filtering Approach for Traffic Density Estimation Along Signalized Arterials. *Transportation Research Record*, 2188 (1), 165-173.
16. **Di, X.**, Zhang, X.N., Zhang, M.H., 2008. Cellular Automata based Expressway Weaving Section Modeling and Simulation (in Chinese), *Transportation and Computer*, 26 (2), 23-26.

Peer-Reviewed Proceedings

1. Luo, Q., Dou, X.C., **Di, X.**[*], Hampshire, R.C, 2018. Multimodal Connections between Dockless Bikesharing and Ride-Hailing: An Empirical Study in New York City, *the 21ˢᵗ IEEE International Conference on Intelligent Transportation Systems (ITSC),* available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3062381.
2. **Di, X.**[*], Liu, H.X., Pang, J.S., Ban, X., 2013, Boundedly Rational User Equilibria (BRUE): Mathematical Formulation and Solution Sets, *Proceedings of 20th International Symposium on Transportation and Traffic Theory*, 231-248.

Others

3. Liao, S.Y., Zhou, L.T., **Di, X.**, Yuan, B., Xiong, J.J., 2018. Large-scale Short-term Urban Taxi Demand Forecasting Using Deep Learning, invited paper at 2*3rd Asia and South Pacific Design Automation Conference (ASP-DAC)*, https://ieeexplore.ieee.org/document/8297361/.
4. Shen, S.Y., **Di, X.**, Liu, H.X., Misgen, S.. 2017, Estimation of Crossing Conflict at Signalized Intersection Using High-Resolution Traffic Data, *Proceedings of Transportation Research Board 96th Annual Meeting*, 17-06897.
5. Zhang, X.N., **Di, X.**, Zhang, M.H., Simulating Traffic Spillback of the Expressway Weaving Area Based on Cellular Automata, 2009, *Proceedings of the World Research Institutes (WRI) World Congress on Software Engineering (WCSE),* IEEE Computer Society, 2: 137 - 141.

Journal Papers Under Review

1. Huang, K., **Di, X.**[*], Du, Q., Chen, X., 2019. Stable Autonomous Driving Algorithm Development in the Mixed Autonomy, submitted to *the 22ⁿᵈ IEEE International Conference on Intelligent Transportation Systems (ITSC)*.

2. Luo, Q., Dou, X.C., **Di, X.**, Hampshire, R.C, 2019. Multimodal Connections between Micro-Mobility and Microtransit: Conceptual Foundations and Empirical Evidence, submitted to *IEEE Intelligent Transportation Systems Magazine*.
3. Fabusuyi, T., Simek, C., **Di, X.**, Chen, X., Hampshire, R.C., 2019. Analyzing the Suspension Effect of Uber and Lyft Ride-sourcing Services on Travel Behavior, submitted to *Transportation Research Part A,* available at http://ssrn.com/abstract=2977969.
4. Huang, K., **Di, X.**[*], Du, Q., Chen, X., 2019. A Game-Theoretic Framework for Autonomous Vehicles Velocity Control: Bridging Microscopic Differential Games and Macroscopic Mean Field Games, submitted to *Transportation Research Part B*.
5. Meinrenken, C.J., Shou, Z.Y., **Di, X.**[*], 2019. Using GPS-Based Trip Pattern Data to Determine Optimum Ranges for Electric Vehicles Geared at Different Driver Types: A Michigan Case Study, submitted to *Transportation Research Part D*.
6. Shou, Z.Y., **Di, X.**[*], 2018. Where to Find Next Passengers on E-hailing Platforms? - A Reinforcement Learning approach, submitted to *Transportation Research Part C* (under the 1st round revision).
7. **Di, X.**[*], Ban, X., 2018. A Mixed Link-Node and Path Formulation for Equilibrium of New Mobility Systems, submitted to *Transportation Research Part B* (under the 1st round revision).
8. Li, S.K., Luo, Q., **Di, X**., Hampshire, R.C, 2018. Design of a Hub-and-Spoke Multimodal Network for the On-Demand Mobility Ecosystem: Ride-Hailing, Microtransit, Dockless Bikesharing, and Electric Scooters, submitted to *IEEE Transactions on Intelligent Transportation Systems*.
9. Li, M., **Di, X.**[*], Liu, H.X., Huang, H-J., 2018. A Restricted Path-Based Ridesharing User Equilibrium, submitted to *Journal of Intelligent Transportation Systems* (under the 2st round review).

Working Papers
1. Chen, X., **Di, X.,** 2019. A Game-Theoretic Framework for Rear-Ending Crash with Liability Rules.
2. Gu, H., Chen, X., **Di, X.,** 2019. Are Autonomous Vehicles Safe? Analyzing People's Attitudinal Changes After Autonomous Vehicles Accidents Using Facebook Data.
3. Cao, Z.H., **Di, X.,** 2019. Understanding Travel Mode Switching Behavior In Response To Uber and Lyft Service Disruption in Austin, TX Using Social Media Data.

([*]: corresponding author; __: my (co)advised student)

Grant Activities

Funded:
1. SAFE2RIDE: Sustainable and Fair Ecosystem Towards Robotic-Human Vehicle Interactive Driving Equilibrium. *Provost's Grants Program for Junior Faculty*. PI (1/1/2018-12/31/2018, $25,000)
2. A Game-Theoretical Framework for Modeling Strategic Interactions Between Autonomous and Human-Driven Vehicles. *Data Science Institute Seed Funds*. PI (1/1/2018-12/31/2018, $100,000)
3. *USDOT The Region 2 University Transportation Research Center (UTRC)*. Subcontract PI (9/1/2018-8/31/2023, $75,000) (PI: Rutgers University).
4. First-Last Mile connections for Ridehailing Services and Bikeshare: A Multi-Modal Approach. *DidiChuxing*. Subcontract PI (9/1/2017-8/31/2018, $31,985)
5. RAPID/Collaborative Research: Measuring the Impact of the Re-entry of Ride Sourcing in Austin, Texas: A Natural Experiment. *NSF* #1745708. PI (8/1/2017-7/31/2018, $2,200) (https://www.nsf.gov/awardsearch/showAward?AWD_ID=1745708&HistoricalAwards=false).
6. RAPID/Collaborative Research: Measuring the Impact of An Unanticipated Disruption of On-Demand Ride Services in Austin, Texas. *NSF* #1647517. Co-PI (9/1/2016-8/31/2017, $2,200) (PI: Robert Hampshire) (https://nsf.gov/awardsearch/showAward?AWD_ID=1647517&HistoricalAwards=false).

Media Exposure
1. Artificial Intelligence for Good: Thoughts, Deeds and Words. *Panelist, Columbia University DSI- DiDi Labs*, 2019.
2. Where you go tells who you are - and vice versa, Nov 19, 2018. ScienceDaily: https://www.sciencedaily.com/releases/2018/11/181119155935.htm
3. RideAustin Battles to survive in space dominated by Uber, Lyft, May 2, 2018. 512tech: https://www.512tech.com/technology/rideaustin-battles-survive-space-dominated-uber-lyft/d8SrCuNB9af7V05RIYgvZP/

4. Columbia Researchers Studying How To Ensure Safety of Driverless Cars, Mar 23 2018, Columbia DSI: http://datascience.columbia.edu/columbia-researchers-studying-how-ensure-safety-driverless-cars
5. Five Research Teams From Across Columbia University Will Use Data Science to Solve Societal Problems, Jan 24 2018, Columbia DSI: http://datascience.columbia.edu/five-research-teams-across-columbia-university-will-use-data-science-solve-societal-problems
6. Is Uber Helping or Hurting Mass Transit? October 16, 2017, NYC Times: https://www.nytimes.com/2017/10/16/upshot/is-uber-helping-or-hurting-mass-transit.html
7. Smart Cities: Focus on Networks and Governance First, Devices and Apps Second, September 14, 2017, HP Enterprise: https://insights.hpe.com/content/hpe-nxt/en/articles/2017/09/smart-cities-focus-on-networks-and-governance-first-devices-and-apps-second.html
8. Ride-hailing nonprofit struggles to survive in Austin, June 21, 2017, The Texas Tribune: https://www.texastribune.org/2017/06/21/rideaustin/
9. Evidence that Uber, Lyft reduce car ownership, Aug 10, 2017, Michigan News: http://ns.umich.edu/new/releases/25008-evidence-that-uber-lyft-reduce-car-ownership
10. Uber and Lyft may lead to drops in personal car ownership, Aug 10, 2017, The Verge: https://www.theverge.com/2017/8/10/16125518/uber-lyft-personal-car-ownership-austin-study

Teaching Experience

Department of Civil Engineering and Engineering Mechanics, Columbia University

CEOR E4011 Civil Infrastructure Systems Optimization, Instructor	Fall Semester
CIEN E4011 Big Data Analytics in Transportation, Instructor	Spring Semester

Department of Civil and Environmental Engineering, University of Michigan

CEE 501 Infrastructure Systems Optimization, Co-Instructor   2015
- Assisted in designing syllabus, preparing lecture materials, and teaching classes.
- Instructed recitation lectures and designed home assignments.
- Held office hours to graduate students from diverse backgrounds including water resources and environmental engineering, structural engineering, and urban planning.

CEE 470 Transportation Systems Engineering, Co-Instructor   2015
- Assisted in designing syllabus, preparing lecture materials, and teaching classes.
- Led recitation and lab sessions and held office hours to undergraduate students.

Department of Civil Engineering, University of Minnesota, Twin Cities

CE 5214 Transportation Systems Analysis, Co-Instructor   2013
- Instructed recitation lectures and designed home assignments.
- Held office hours to senior undergraduate and graduate students.

CE 3201 Introduction to Transportation Engineering, Teaching Assistant   2012, 2014
- Led recitation and lab sessions and held office hours to 70+ undergraduate students.
- Developed "Multi-Agent Route Choice" (MARC) online game for learning traffic assignment model, User Equilibrium and Braess' Paradox concepts.

College of Science and Engineering, University of Minnesota, Twin Cities

Teaching and Language Kick-off Orientation, Resource Instructor   2011, 2012
- Provided first-year international graduate students with information about teaching practice and English language requirements as future teaching assistants.
- Instructed students in spoken English for U of M classroom teaching and interaction.
- Demonstrated discipline-specific teaching skills & departmental expectations, and how to be responsive to U of M student cultural expectations of teaching assistants.

Presentations

- SAFE2RIDE: Sustainable and Fair Ecosystem Towards Robotic-Human Vehicle Interactive Driving Equilibrium. *Applied Mathematics and Scientific Computing Seminar, Temple University*, 2019.

- Game-Theoretic Models for Human-Robotic Vehicle Interaction in the Mixed-Autonomy Transportation Ecosystem. *Goldman Sachs Engineering Insights* & Guest lecture for Spring '19: *IEOR4505 Operation Research in public policy*, 2019.
- Deep Learning in Transportation. *TRIPODS Deep Learning Workshop*, 2019.
- Where to find the next passenger on e-hailing platform? - A reinforcement learning approach: *IMA invited workshop on Forging a New Discipline: Data-driven Supply Chain Management* (*https://www.ima.umn.edu/2018-2019.1/W10.3-5.18/27500*), 2018 & *98th TRB Annual Meeting*, 2019.
- Multimodal Connections between Dockless Bikesharing and Ride-Hailing: An Empirical Study in New York City: *21st IEEE ITSC*, 2018.
- Similarity Analysis of Travel Activity Patterns Using Michigan Connected Vehicles Test Bed Data: *COTA 21st Annual Winter Symposium*, 2018.
- Measuring the Impact of an Unanticipated Suspension of On-Demand Ride Services in Austin, Texas: *97th TRB Annual Meeting*, 2018.
- A Restricted Path-Based Ridesharing User Equilibrium: *97th TRB Annual Meeting*, 2018.
- Connected and Automated Vehicles, Guest lecture for Fall '17: *EECS E4764 IoT – Intelligent and Connected Systems*, 2017.
- Ridesharing User Equilibrium and Its Implications for High-Occupancy Toll Lane Pricing: *96th TRB Annual Meeting*, 2016 & *Columbia University's Data Science Institute Data Science Day*, 2017.
- A Similitude Theory for Modeling Connected and Automated Vehicle Systems: *96th TRB Annual Meeting*, 2016.
- Estimation of Crossing Conflict at Signalized Intersection Using High-Resolution Traffic Data: *96th TRB Annual Meeting*, 2016.
- Activity-Based Travel Demand Analysis using Michigan Connected Vehicles Test Bed Data: invited talk, *Center for Urban Intelligent Transportation Systems, NYU Civil & Urban Engineering*, 2016.
- A Cooperative Active Collision Avoidance (CACA) Model for Connected Vehicles: *INFORMS Annual Meeting*, 2015.
- Indifference Band for Route Switching: *INFORMS Annual Meeting,* 2014 & *94th TRB Annual Meeting & Purdue Prospective Faculty Workshop,* 2015.
- Boundedly Rational Travel Behavior: A Review of Models and Methodologies: *94th TRB Annual Meeting*, 2015.
- Boundedly Rational User Equilibrium: Models and Applications: *Doctoral Seminar of the 93rd Transportation Research Board (TRB) Annual Meeting*, 2014.
- Second Best Toll Pricing Within the Framework of Bounded Rationality: *INFORMS Annual Meeting,* 2013 & *93rd TRB Annual Meeting*, 2014.
- Multi-Agent Route Choice Game for Transportation Engineering: *92nd TRB Annual Meeting*, 2013.
- Application of Pavement Marker to Avoid Queue-jumping and Traffic Spillback at Off-ramp of Expressways: *92nd TRB Annual Meeting*, 2013.
- The Asymptotic Stability of a Boundedly Rational Day-to-day Dynamic: *INFORMS Annual Meeting*, 2012 & *92nd TRB Annual Meeting*, 2013.
- Braess Paradox under Boundedly Rational User Equilibria: Properties on the Paradox Network: *INFORMS Annual Meeting,* 2012 & *92nd TRB Annual Meeting*, 2013.
- On the Stability of a Boundedly Rational Day-to-day Dynamic: *4th International Symposium on Dynamic Traffic Assignment* & *INFORMS Annual Meeting*, 2012.
- Boundedly Rational User Equilibria (BRUE): Mathematical Formulation and Solution Sets: *20th International Symposium on Transportation and Traffic Theory* & *INFORMS Annual Meeting,* 2011 & *91st TRB Annual Meeting*, 2012 & *NSF BECS Workshop*, 2011.
- A Hybrid Extended Kalman Filtering Approach for Traffic Density Estimation along Signalized Arterials Using GPS: *89th TRB Annual Meeting*, 2010.

Professional Activities & Service

Professional Membership

- Institute of Transportation Engineers (ITE)
- Institute for Operations Research and the Management Sciences (INFORMS)
- Women's Transportation Seminar (WTS)

Reviewer

- Transportation Science
- Transportation Research Part B/C/D
- European Journal of Operational Research
- Networks and Spatial Economics
- Transportation
- Transportmetrica A: Transport Science
- Journal of Intelligent Transport Systems (The Institution of Engineering and Technology)
- Computer-Aided Civil and Infrastructure Engineering
- Transportation Research Board Annual Meeting Proceedings
- COTA International Conference for Transportation Professionals (CICTP2013, CICTP2014, CICTP2015)
- IEEE Intelligent Transportation Systems Society Conference (ITSC 2014,2018)
- 11th International Conference of Chinese Transportation Professionals (ICCTP 2011)
- Springer Book Series in Reliability Engineering on "Game Theoretic Analysis of Congestion, Safety and Security"