Xianyuan **Zhan**

Curriculum Vitae

Urban Computing Business Unit & JD Intelligent City Research, JD Digits
12/F, Block A, No. 18 Kechuang 11 Street, Beijing, China

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Research Interests

Deep Reinforcement Learning, Complex System Optimization, Urban Computing, Big data Analytics in Transportation, Intelligent Transportation Systems, Complex Networks

Education

Doctor of Philosophy *Jan. 2013 - Aug. 2017*
Purdue University
Transportation Systems, Civil Engineering. Advisor: Dr. Satish V. Ukkusuri

Master of Science *Jan. 2014 - Dec. 2016*
Purdue University
Computer Science

Master of Science in Engineering *Aug. 2011 - Dec. 2012*
Purdue University
Transportation Systems, Civil Engineering

Bachelor of Engineering *Aug. 2007 - Jul. 2011*
Tsinghua University *Beijing, China*
Civil Engineering

Professional Experience

Data Scientist, Senior Researcher *Jan. 2018 - Present*
JD Digits *Beijing, China*
JD Urban Computing Business Unit, JD Intelligent City Research

Research Associate *Aug. 2017 - Jan. 2018*
Microsoft Research Asia *Beijing, China*
Urban Computing Group

Research Assistant *Aug. 2011 - Aug. 2017*
Purdue University *West Lafayette, US*
Lyles School of Civil Engineering

Teaching Assistant *SPRING 2013, FALL 2015*
Purdue University *West Lafayette, US*
Lyles School of Civil Engineering

Visiting Research Fellow *May. - Aug. 2015*
Microsoft Research Asia *Beijing, China*
Mentor: Dr. Yu Zheng

Research Assistant *Jun. 2009 - Jan. 2011*
Tsinghua University *Beijing, China*
3S (GNSS/RS/GIS) Research Center

Assistant Engineer *Jun. - Sep. 2010*

Beijing Construction Engineering Group, Co., Ltd. *Beijing, China*

Intern

Honors & Awards

2020	2019 Synced Machine Intelligence Awards: 30 Best AI Use Cases of the Year	*SYNCED*
2018	Artificial Intelligence Innovation Award	*CAIS 2018*
2018	Committee Member of Technical Committee on Artificial Intelligence & Pattern Recognition of China Computer Federation (CCF-AI)	*CCF*
2016	James S. McDonnell Foundation (JSMF) Postdoctoral Fellowship Award in Studying Complex Systems	*James S. McDonnell Foundation*
2014	Pai Tao Yeh Fellowship	*Purdue University*
2013	Pai Tao Yeh Fellowship	*Purdue University*
2010	2nd Prize of Fifth National Competition of Transport Science and Technology	*China*
2010	Gammon Scholarship	*Tsinghua University*
2009	Zheng Ge Ru Scholarship	*Tsinghua University*
2008	Gammon Scholarship	*Tsinghua University*

Publications

Journal Publications

1. **Zhan, X.**, Li, R., and Ukkusuri, S. V., 2020. Link-based Traffic State Estimation and Prediction for Arterial Networks Using License-plate Recognition Data. *Transportation Research Part C: Emerging Technologies*, 117, 102660.
2. Yang, C., Zhang, Y., **Zhan, X.**, Ukkusuri, S. V. and Chen, Y., 2020. Fusing Mobile Phone and Travel Survey Data to Model Urban Activity Dynamics. Accepted in *Journal of Advanced Transportation*.
3. **Zhan, X.**, and Ukkusuri, S. V., 2019. Spatial Dependency of Urban Sprawl and the Underlying Road Network Structure. *Journal of Urban Planning and Development*, 145(4), 04019014.
4. Zischg, J., Klinkhamer, C., **Zhan, X.**, Rao, S. C., and Sitzenfrei, R., 2019. A Century of Topological Co-Evolution of Complex Infrastructure Networks in an Alpine City. *Complexity*, 2019, 2096749.
5. Gehlot, H., **Zhan, X.**, Qian, X., Thompson, C., Kulkarni, M. and Ukkusuri, S. V., 2018. A-Rescue 2.0: A High Fidelity, Parallel, Agent-based Evacuation Simulator. *Journal of Computing in Civil Engineering*, 33(2), 04018059.
6. **Zhan, X.**, Ukkusuri, S. V., and Rao, S. C., 2017. Dynamics of Functional Failures and Recovery in Complex Road Networks. *Physical Review E*, 96(5), 052301.
7. **Zhan, X.**, and Ukkusuri, S. V., 2017. Multiclass, Simultaneous Route and Departure Time Choice Dynamic Traffic Assignment with an Embedded Spatial Queuing Model. *Transportmetrica B: Transport Dynamics*, doi: 10.1080/21680566.2017.1354738.
8. Mo, B., Li, R., **Zhan, X.**, 2017. Speed Profile Estimation Using License Plate Recognition Data. *Transportation Research Part C: Emerging Technology*, 82, 358–378.
9. Kreuger, E., Klinkhamer, C., Urich C., **Zhan, X.**, and Rao, S. C., 2017. Generic Patterns in the Evolution of Urban Water Networks: Evidence from a Large Asian City. *Physical Review E*, 95(3), 032312.
10. Li, R. Ye, Z., Li. B. and **Zhan, X.**, 2017. Simulation of Hard Shoulder Running Combined with Queue Warning During Traffic Accident with CTM model. *IET Intelligent Transport Systems*, 11(9), 553-560.
11. **Zhan, X.**, Zheng, Y., Yi, X., and Ukkusuri, S. V., 2016. Citywide Traffic Volume Estimation Using Trajectory Data. *IEEE Transactions on Knowledge and Data Engineering (TKDE)*, 29(2), 272-285.
12. **Zhan, X.**, Qian, X., Ukkusuri, S. V., 2016. A Graph Based Approach to Measure the Efficiency of Urban Taxi Service System. *IEEE Transactions on Intelligent Transportation Systems*, 17(9), 2479-2489.
13. **Zhan, X.**, Ukkusuri, S., V., Yang, C., 2016. A Bayesian Mixture Model for Short-term Average Link Travel Time Estimation Using Large-scale Limited Information Trip-based Data. *Automation in Construction*, 72(3), 237-246.
14. Mesa-Arango, R., **Zhan, X.**, Ukkusuri, S. V., Mitra, A., 2016. Direct Transportation Economic Impacts of Highway

Networks Disruptions Using Public Data from United States. *Journal of Transportation Safety & Security*, 8(1), 36-55.

15. Hasan, S., Ukkusuri, S., **Zhan, X.**, 2016. Understanding Social Influence in Activity-Location Choice and Life-Style Patterns Using Geo-location Data from Social Media. *Frontiers in ICT*, 3:10, doi: 10.3389/fict.2016.00010.
16. Aziz, H. M., Ukkusuri, S., **Zhan, X.**, 2016. Determining the Impact of Personal Mobility Carbon Allowance Schemes in Transportation Networks. *Network and Spatial Economics*, 17(2), 505-545.
17. Ukkusuri, S., Hasan, S., Doan, K., Luong, B., **Zhan, X.**, Murray-Tuite, P., Yin, W., 2016. A-RESCUE: An Agent-based Regional Evacuation Simulator Coupled with User Enriched Behavior. *Network and Spatial Economics*, 17(1), 197-223.
18. **Zhan, X.**, Aziz, H. M., Ukkusuri, S. V., 2015. An Efficient Parallel Sampling Technique for Multivariate Poisson-Lognormal Model: Analysis with Two Crash Count Datasets. *Analytic Methods in Accident Research*, 8, 45-60.
19. **Zhan, X.**, Li, R., Ukkusuri, S. V., 2015. Lane-based Real Time Queue Length Estimation Using License Plate Recognition Data. *Transportation Research Part C: Emerging Technology*, 57, 85-102.
20. **Zhan, X.**, Ukkusuri, S., V., Zhu, F., 2014. Inferring Urban Land Use Using Large-Scale Social Media Check-in Data. *Network and Spatial Economics*, 14, 647-667.
21. **Zhan, X.**, Hasan, S., Ukkusuri, S. V., Kamga, C., 2013. Urban Link Travel Time Estimation Using Large-scale Taxi Data with Partial Information. *Transportation Research Part C: Emerging Technologies*, 33, 37-49.
22. Ukkusuri, S., **Zhan, X.**, Sadri A., Ye, Q., 2013. Exploring Crisis Informatics Using Social Media Data: A Study on 2013 Oklahoma Tornado. *Transportation Research Record*, 2459, 110-118.

Peer Reviewed Book Chapter

1. Qian, X, **Zhan, X.**, Ukkusuri, S. V. Characterizing Urban Dynamics Using Large Scale Taxicab Data. Engineering and Applied Sciences Optimization: Vol. 38, 17-32, Springer International Publishing, 2015.
2. Ukkusuri, S. V., Hasan, S., and **Zhan, X.** Checking the Urban Pulse: Social Media Data Analytics for Transportation Applications. Best Practices for Transportation Agency Use of Social Media Data. Taylor and Francis/CRC Press, 2013.

Conference Proceedings

1. Qin, H., **Zhan, X.**, Ke, S., Yang, X., Xu, H., and Zheng, Y. Robust Spatio-Temporal Purchase Prediction via Deep Meta Learning. In *Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI2021)*.
2. Yang, C., Zhang, Y., **Zhan, X.**, Ukkusuri, S. V., and Qiu, W. Activity Chain Inference Using Travel Survey and Mobile Phone data. In *Proceedings of Transportation Research Board Meeting*, Washington D.C., January 2017.
3. Zischg, J., Klinkhamer, C., **Zhan, X.**, Krueger, E., Ukkusuri, S., Rao, P. S. C., Rauch, W. and Sitzenfrei, R. Evolution of Complex Network Topologies in Urban Water Infrastructure. In *World Environmental and Water Resources Congress 2017*, Sacramento, May 2017.
4. **Zhan, X.**, Ukkusuri, S. V. A Probabilistic Urban Link Travel Time Estimation Model Using Large-scale Taxi Trip Data. In *Proceedings of 94th Transportation Research Board Meeting*, Washington D.C., January 2015.
5. **Zhan, X.**, Qian, X., Ukkusuri, S. V. Measuring the Efficiency of Urban Taxi Service System. In *Proceedings of the 3rd ACM SIGKDD International Workshop on Urban Computing*, New York, August 2014.
6. Qian, X., **Zhan, X.**, Ukkusuri, S. Characterizing Urban Dynamics Using Large Scale Taxicab Data. In *Proceedings of 93nd Transportation Research Board Meeting*, Washington D.C., January 2014.
7. **Zhan, X.**, Ukkusuri, S. V.. Multi-User Class, Simultaneous Route and Departure Time Choice Dynamic Traffic Assignment with an Embedded Spatial Queuing Model. *5th International Symposium on Dynamic Traffic Assignment*. Salerno, Italy, June, 2014.
8. Hasan, S., **Zhan, X.**, and Ukkusuri, S. V. Understanding Urban Human Activity and Mobility Patterns Using Large-scale Location-based Data from Online Social Media. *Proceedings of the 2nd ACM SIGKDD International Workshop on Urban Computing*, 2013.

ArXiv Preprints

1. **Zhan, X.**, Xu, H., Zhang, Y., Huo, Y., Zhu, X., Yin, H., and Zheng, Y., 2021. DeepThermal: Combustion Optimization for Thermal Power Generating Units Using Offline Reinforcement Learning. *arXiv preprint* arXiv:2102.11492.
2. Klinkhamer, C., Kreuger, E., **Zhan, X.**, Blumesaat, F., Ukkusuri, S. V., and Rao, S. C. Functionally Fractal Urban Networks: Geospatial Co-location and Homogeneity of Infrastructure. *arXiv preprint* arXiv:1712.03883.

Theses

1. Novel Approaches to Model Congestion Evolution and Dependencies in Complex Road Networks. Ph.D. Dissertation, Purdue University, 2017.
2. Understanding the Aggregate Level Urban Activity Patterns Using Large-Scale Geo-Location Data. MS Thesis, Purdue University, 2012.
3. A Cellular Automaton Based Microscopic Traffic Flow Simulation Model for Abnormal Traffic Flow. Undergraduate Thesis, Tsinghua University, 2011.

Papers Under Review

1. Qin, H., **Zhan, X.**, Zheng, Y. CSCAD: Correlation Structure-based Collective Anomaly Detection in Complex System. Submitted to *IEEE Transactions on Knowledge and Data Engineering (TKDE)*.
2. **Zhan, X.**, Zhu, X., Xu, H., Zhang, Y., Zheng, Y. Model-Based Offline Planning with Trajectory Pruning. Submitted to *The 30th International Joint Conference on Artificial Intelligence (IJCAI-21)* .
3. Xu, H., **Zhan, X.**, Zhang, Y., Yin, H., Zhu, X., Huo, Y., Zheng, Y. and Li, C. Constraints Penalized Q-Learning for Safe Offline Reinforcement Learning. Submitted to *The 30th International Joint Conference on Artificial Intelligence (IJCAI-21)* .
4. Xu, H., **Zhan, X.**, Zhang, Y., Yin, H., Zhu, X., Huo, Y., Zheng, Y. and Duan, Z. Soft Behavior-constrained Q-Learning for Offline Reinforcement Learning. Submitted to *The 30th International Joint Conference on Artificial Intelligence (IJCAI-21)* .
5. **Zhan, X.**, Zhang, Y., Xu, H., Huo, Y., Zhu, X., Yin, H., and Zheng, Y. DeepThermal: Combustion Optimization for Thermal Power Generating Units Using Offline Reinforcement Learning. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD-21)* .
6. Qin, H., **Zhan, X.**, Li, Y., Yang, X. and Zheng, Y. Network-Wide Traffic States Imputation Using Self-interested Coalitional Learning. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD-21)* .

Talks & Presentations

1. Application of Deep Reinforcement Learning in Control Optimization of Thermal Power Plants. *IEEE Services - Industry Symposium*. October 2020.
2. Urban Computing: Building Intelligent Cities with Big Data and AI. Invited talk at Tsinghua University. November 2019, Beijing, China.
3. Data-driven Methods in Urban Applications: New Problems, New Directions and New Approaches. Invited talk at Tsinghua University. December 2018, Beijing, China.
4. Spatio-Temporal Deep Learning in Intelligent Cities. *Smart Cities and Urban Computing Forum, China National Computer Congress (CNCC 2018)*. October 2018, Hangzhou.
5. Data-driven Optimization Models for Logistics in Urban Applications. *3rd Workshop on Applications of the Mathematical Modeling in Enterprises*. July 2018, University of Chinese Academy of Sciences, Beijing.
6. Data-driven Methods in Urban Transportation Applications. Invited talk at Tsinghua University. September 2017, Beijing, China.
7. A Vertex Split-Recovery Model for Congestion Evolution Process on Road Networks. *INFORMS 2016*. November 2016, Nashville.
8. Traffic State Estimation for Arterial Networks Using License-plate Recognition Data. *INFORMS 2016*. November 2016, Nashville.
9. A Node Split-Recovery Model for Congestion Evolution Process on Road Networks. *Resilience Week 2016*. August 2016, Chicago.
10. A Node Splitting-Recovery Model for Congestion Evolution Process on Road Networks. *4th International Symposium on Water, Feedbacks, and Complexity*. March 2016, Purdue University.
11. A Bayesian Mixture Model for Short-term Average Link Travel Time Estimation Using Large-scale Limited Information Trip-based Data. *INFORMS 2015*, November 2015, Philadelphia.
12. A Graph-based Approach to Measure the Efficiency of Urban Taxi Service System. *INFORMS 2015*, November 2015, Philadelphia.
13. Measuring the Efficiency of Urban Taxi Service System. *KDD 2014 International Workshop on Urban Computing*,

August 2014, New York.

14. Urban Link Travel Time Estimation Using Large-scale Taxi Data with Partial Information. *MPE 2013+ Workshop on Sustainable Human Environments*. April 2014, Rutgers University.
15. Multiclass Dynamic User Equilibrium with a Path Based Cell Transmission Model for General Traffic Networks. *INFORMS 2013*, October 2013, Minneapolis.
16. Real Time Link Travel Time Estimation Using License-plate Recognition Data. *INFORMS 2013*, October 2013, Minneapolis.

Collaborative Research Activities

Traffic Signal Optimization: A Data-driven and Deep Reinforcement Learning Approach *2017 - 2018*

Collaborated with Didi Chuxing

1 patent granted.

Citywide Traffic Volume Estimation Using Large-scale Trajectory Data *2015 - 2016*

Collaborated with Microsoft Research Asia (MSRA)

1 paper published in IEEE Transactions on Knowledge and Data Engineering (TKDE).

Real Time Queue Length Estimation Using License-plate Recognition Data *2014 - 2015*

Collaborated with Tsinghua University, China

1 paper published in Transportation Research Part C.

The Use of Large-scale Dataset for Understanding Network State *2013*

Collaborated with The City University of New York (CUNY)

1 paper published in Transportation Research Part C.

Research Projects

Artificial Intelligence-based Optimization System for Thermal Power Generating Units. *2018*

Funded by CNH Energy and JD Intelligent City Research

Research project manager for developing a deep reinforcement learning model and system to optimize power generation efficiency for thermal power generating units in power plants. This research has already finished software productization and been deployed in three power plants in China.

Collective Anomaly Detection for Large-Scale Complex Sensory Systems. *2018*

Funded by CNH Energy and JD Intelligent City Research

Research project manager for developing a collective anomaly detection algorithm for very high dimensional sensory data in complex systems.

Bridging Information, Uncertainty and Decision-Making in Hurricanes Using an Interdisciplinary Perspective *2015 - 2017*

Funded by National Science Foundation (NSF)

Project leader for developing parallelized large-scale agent-based traffic simulator for hurricane evacuation in urban road networks.

Incorporating Household Decision Making with Dynamic Transportation Modeling in Hurricane Evacuation *2012 - 2015*

Funded by National Science Foundation (NSF)

Participated in coding a Java-based large-scale agent-based traffic simulator for hurricane evacuation (A-RESCUE). A research paper is published in Network and Spatial Economics.

The Use of Large Scale Datasets for Understand Traffic Network State *2012 - 2013*

Sponsor: University Transportation Research Center - Region 2

Developed a real-time link travel time estimation model using large-scale taxi trip data from New York City. Published in Transportation Research Part C.

Professional Activities

Member of Editorial Board

- Frontiers in Built Environment - Transportation and Transit Systems: *Review Editor*

Reviewer of Journals

- PLOS ONE
- ACM Transactions on Intelligent Systems and Technology
- IEEE Transactions on Knowledge and Data Engineering (TKDE)
- IEEE Transactions on Big Data (TBD)
- IEEE Transactions on Knowledge Discovery from Data (TKDD)
- IEEE Transactions on Intelligent Transportation Systems (ITS)
- IEEE Access
- Expert Systems With Applications
- Transportation Research Part B: Methodological
- Transportation Research Part C: Emerging Technologies
- Transportation Research Part D: Transport and Environment
- Transportmetrica B: Transport Dynamics
- European Journal of Operational Research
- Network and Spatial Economics
- Transportation
- Journal of Advanced Transportation
- Environment and Planning B: Urban Analytics and City Science
- IET Intelligent Transport Systems
- Journal of Physics: Complexity

Reviewer of Conferences

- AAAI Conference on Artificial Intelligence
- IEEE Conference on Decision and Control
- Transportation Research Board Annual Meeting
- China Conference on Data Mining (CCDM)

Chair of Conference Sessions

- **Session Chair**: Innovative Data Sources in Transportation. *INFORMS 2015*, November, Philadelphia.
- **Session Chair**: Advances in Transportation Network Modeling. *INFORMS 2015*, November, Philadelphia.

Teaching Experience

Courses as Teaching Assistant

Lyles School of Civil Engineering, Purdue University

- **CE 597** (Fall 2015): The Science and Business of Logistics Systems
- **CE 398** (Spring 2013): Introduction to Civil Engineering System Design

Co-Instructor of a Summer Course *Jun 2016*

School of Transportation Engineering, Tongji University, China

- **Summer Course**: Big Data Transportation Analytics

Instructor at Workshop *Jun. - Jul. 2015*

Korea University, Seoul, South Korea

Synthesis Workshop on "Dynamics of Structure and Functions of Complex Networks"

Supervised Exchange Undergraduate Students at Purdue *2015*

Lyles School of Civil Engineering, Purdue University

- Jingxing Wang (Jan. - Feb. 2015), from Tsinghua University, China
- Xiaodong Qian (Jun. - Sep. 2015), from Tsinghua University, China
- Victorial Mutran (Jul. - Aug. 2015), from Universidade do Estado do Pará, Brazil

Supervised Interns *2017*

Microsoft Research Asia

- Huilin Qin (2017-2018), PhD student at Xidian University, China

Supervised Interns *2018 - Present*

JD Intelligent City Research

- Yixian Li (2018), Master student at Northeastern University, China
- Huilin Qin (2018-2020), PhD student at Xidian University, China
- Haoran Xu (2018-2020), Master student at Xidian University, China
- Chunyang Li (2018-2020), Master student at Xidian University, China

Membership & Affiliations

Committee Member *2018 - Present*

Technical Committee on Artificial Intelligence & Pattern Recognition of China Computer Federation (CCF-AI)

Member *2018 - Present*

China Computer Federation (CCF)

Member *2011 - 2017*

Purdue Institute of Transportation Engineers (ITE)

Member *2013 - 2017*

INFORMS Chapter at Purdue University

Co-chair *2012 - 2014*

Tsinghua University Alumni Association of Purdue University