ZHAOBIN MO

(+1)347-535-4735 | Email: zm2302@columbia.edu | google scholar | New York, NY, 10027

EDUCATION

Columbia University — New York, NY
Ph.D. Candidate in Civil Engineering (Advisor: Xuan Di) — Aug. 2018 – Nov. 2023
GPA: 3.96/4.00
Dissertation: "Physics-informed Deep Learning: Applications to Transportation"

Tsinghua University — Beijing, China
B.E. in Automotive Engineering (Advisor: Diange Yang) — Aug. 2013 – Jul. 2017
GPA: 87/100

RESEARCH INTERESTS

My research focuses on physics-informed deep learning that facilitates the integration of domain knowledge and deep learning models. I am passionate about exploring how prior knowledge can foster safe, robust, and explainable AI. I am also interested in other topics like reinforcement learning, graph neural networks, and probabilistic graphical models.

EMPLOYMENT

Siemens — June. 2022 – Aug. 2022
Research intern in Autonomous System and Control team. Mentor: Xiaofan Wu — Princeton, NJ

DiDi AI Labs — Mar. 2018 – Jul. 2018
Algorithm engineer intern. Mentor: Jieping Ye — Beijing, China

Tsinghua University — Dec. 2017 – Jul. 2018
Full-time research assistant in Laboratory of Automated Vehicles. Mentor: Diange Yang — Beijing, China

HONORS AND AWARDS

Mindlin Scholar in Civil Engineering, Columbia University	2023
Best Paper Award, KDD'22 urban computing workshop	2022
Teaching Assistant Excellence Award, Columbia University	2021
Presidential Fellowship, Columbia University	2018-2022
Tsinghua's Friend Mingwei Zhang Scholarship, Tsinghua University	2016
2^{nd} prize in Theoretical Mechanics Competition, Tsinghua University	2015
Tsinghua's Friend Geru Zhen Scholarship, Tsinghua University	2014, 2015

PUBLICATION

Journal Publications

1. [ALG'23] Xuan Di, Rongye Shi, **Zhaobin Mo**, and Yongjie Fu. "Physics-Informed Deep Learning For Traffic State Estimation: A Survey and the Outlook", *Algorithms*, 2023. [link]
2. [GAMES'23] **Zhaobin Mo**, Rongye Shi, and Xuan Di. "Robust Data Sampling in Machine Learning: A Game-Theoretic Framework for Training and Validation Data Selection", *Games*, 2023. [link]
3. [AS'23] Rolando Bautista-Montesano, Renato Galluzzi, **Zhaobin Mo**, Yongjie Fu, Rogelio Bustamante-Bello, and Xuan Di. "Longitudinal Control Strategy for Connected Electric Vehicle with Regenerative Braking in Eco-Approach and Departure", *Applied Science*, 2023. [link]

4. [AIM'23] Xuan Di, Yiqiao Yin, Yongjie Fu, **Zhaobin Mo**, Shaw-Hwa Lo, Carolyn DiGuiseppi, David W. Eby, Linda L. Hill, Thelma J. Mielenz, David Strogatz, Minjae Kim, and Guohua Li. "Detecting Mild Cognitive Impairment and Dementia in Older Adults Using Naturalistic Driving Data and Interaction-Based Classification From Influence Score". *Artificial Intelligence in Medicine*, 2023. [link]

5. [CRPS'22] Zhe Li, Anhao Zuo, **Zhaobin Mo**, Mu Lin, Chengyu Wang, Jianbo Zhang, Markus H. Hofmann, and Andreas Jossen. "Demonstrating stability within parallel connection as a basis for building large-scale battery systems", *Cell Reports Physical Science*, 2022. [link]

6. [TRC'21] **Zhaobin Mo**, Rongye Shi, and Xuan Di. "A Physics-informed Deep Learning Paradigm for Car-following Models", *Transportation Research Part C: Emerging Technologies*, 2021.[link]

7. [TRC'21] **Zhaobin Mo**, Wangzhi Li, Yongjie Fu, Kangrui Yuan, and Xuan Di. "CVLight: Decentralized Learning for Adaptive Traffic Signal Control with Connected Vehicles", *Transportation Research Part C: Emerging Technologies*, 2021. [link]

8. [TITS'21] Rongye Shi, **Zhaobin Mo**, Kuang Huang, Xuan Di, and Qiang Du. "A physics-informed deep learning paradigm for traffic state and fundamental diagram estimation", *IEEE Transactions on Intelligent Transportation Systems*, 2021. [link]

Peer-reviewed Proceedings

9. [KDD'22] **Zhaobin Mo** and Xuan Di. "Uncertainty Quantification of Car-following Behaviors: Physics-Informed Generative Adversarial Networks", the *28th ACM SIGKDD in conjunction with the 11th International Workshop on Urban Computing (UrbComp2022)* (**best paper award**). [link]

10. [ECML-PKDD'22] **Zhaobin Mo**, Yongjie Fu, Daran Xu, and Xuan Di. "TrafficFlowGAN: Physics-informed Flow based Generative Adversarial Network for Uncertainty Quantification", *Joint European Conference on Machine Learning and Knowledge Discovery in Database (ECML&PKDD)*, 2022. [link]

11. [ITSC'22] **Zhaobin Mo**, Yongjie Fu, and Xuan Di. "Quantifying Uncertainty In Traffic State Estimation Using Generative Adversarial Networks", *IEEE 25th International Conference on Intelligent Transportation Systems (ITSC)*, 2022. [link]

12. [AAAI'21] Rongye Shi, **Zhaobin Mo**, and Xuan Di."Physics-informed Deep Learning for Traffic State Estimation: A Hybrid Paradigm Informed by Second-order Traffic Models", *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, 2021. [link]

13. [KDD'19] **Zhaobin Mo** and Xuan Di."AI-Guided Virtual Lab for Autonomous Vehicle Test: Self-Play Reinforcement Learning Based Two-Player-Game." the *25th ACM SIGKDD Social Impact Workshop*, 2019. [link]

14. [AVEC'18] **Zhaobin Mo**, Sisi Li, Diange Yang and Ding Zhao, "Extraction of V2V Encountering Scenarios from Naturalistic Driving Database", *14th International Symposium on Advanced Vehicle Control (AVEC)*, 2018. [link]

15. [ICMEW'18] Zhongyang Xiao, **Zhaobin Mo**, Kun Jiang, and Diange Yang."Multimedia fusion at semantic level in vehicle cooperative perception", *2018 IEEE International Conference on Multimedia & Expo Workshops (ICMEW)*, 2018. [link]

16. [IV'18] Sisi Li, Wenshuo Wang, **Zhaobin Mo**, and Ding Zhao."Cluster naturalistic driving encounters using deep unsupervised learning", *2018 IEEE Intelligent Vehicles Symposium (IV)*, 2018. [link]

Under Review & Preprints

17. [CIKM'23] **Zhaobin Mo**, Yongjie Fu, and Xuan Di. "PI-NeuGODE: Physics-Informed Graph Neural Ordinary Differential Equations for Spatiotemporal Trajectory Prediction". *The 32nd ACM International Conference on Information and Knowledge Management*, 2023. Under review.

18. [TSAS'23] **Zhaobin Mo**, Haotian Xiang, Cheng-Chun Chang, and Xuan Di. "Cross- and Context-Aware Attention Based Spatial-Temporal Graph Convolutional Networks for Human Mobility Prediction", *ACM Transactions on Spatial Algorithms and Systems*, 2023. Under review.
19. [ISTTT'25] Xuan Di, Elisa Iacomini, Chiara Segala, Michael Herty, **Zhaobin Mo**, Xu Chen, Mathieu Lauriere. "A Mean Field Game-Theoretic Framework for Generic Second Order Traffic Flow Models". *The 25th International Symposium on Transportation and Traffic Theory*, 2023. Under review.
20. Huajing Zhao, **Zhaobin Mo**, Macheng Shen, Jing Sun, and Ding Zhao. "Interpenetrating Cooperative Localization in Dynamic Connected Vehicle Networks". *arXiv preprint,* 2018. [link]

Teaching

Teaching assistant at Columbia University:

- CIEN E4011: Big Data Analytics in Transportation. Spring 2019, Spring 2020, Spring 2021, Spring 2023.
- CEOR E4011: Civil Infrastructure Systems Optimization. Fall 2020, Summer 2021.
- CIEN E4131: Principle of Construction Techniques. Spring 2021.

Teaching assistant at Tsinghua University:

- Competition: Cooperative Driving at Nonsignalized Intersections. Spring, 2018. [link]

Presentations

- Physics-informed Flow based Generative Adversarial Network for Uncertainty Quantification. *INFORMS Annual Meeting,* 2022. [link]
- Physics Informed Machine Learning Techniques for Traffic State Estimation. *INFORMS Annual Meeting,* 2021.
- Physics-Informed Deep Learning for Traffic State Estimation and Fundamental Diagram Discovery. *New York Scientific Data Summit,* 2021. [link]
- A Physics-informed Deep Learning Paradigm For Car-following Models. *INFORMS Annual Meeting,* 2019; *Columbia University's Data Science Institute Data Science Day,* 2021. [link]
- AI-Guided Data Selection for Deep Learning Tasks: A Reinforcement Learning Based Approach. *Columbia University's Data Science Institute Data Science Day,* 2020.
- A Game-theoretic Framework for Autonomous Vehicle Velocity Control. *INFORMS Annual Meeting,* 2019.
- Where to Find Next Passengers on E-hailing Platforms? – A Markov Decision Process Approach. *Columbia University's Data Science Institute Data Science Day,* 2019.
- Multi-Driver Repositioning via Incentive Design: A Mean Field Multi-Agent Reinforcement Learning Approach. 99^{th} *Transportation Research Board Annual Meeting,* 2019.

Media Exposure

- International Workshop on Urban Computing 2022 Best Paper Award won by Professor Sharon Di. *Columbia Civil Engineering and Engineering Mechanics News*, 2022. [link]
- Where you go tells who you are - and vice versa. *Columbia Engineering*, 2018. [link]

Academic Service

- **Journal Reviewer**: Transportation Research Part C, IEEE Transaction on Intelligent Transportation Systems.
- **Conference Reviewer**: KDD 2022, ECML-PKDD 2021.
- **Mentor**: 2023 Columbia University Center for Smart Streetscapes Summer Program

Advising and Mentorship

- Daran Xu, MS at Statistics, Columbia University // Next: Ph.D. at Applied Math, University of Washington.
- Wangzhi Li, MS at Data Science Institute, Columbia University // Next: Ph.D. at Civil, Purdue University.
- Lilian Zha, BS at CS, Columbia University // Next: SWE at Capital One.
- Emily Hao, BS at CS, Columbia University // Next: SWE at American Express.
- Chuyun Liu, BS at CS, Columbia University.
- Bader Alaskar, MS at IEOR, Columbia University.
- Eric Chang, MS at EE, Columbia University.
- Ruiqi Wang, MS at Statistics, Columbia University.
- Xuan Lian, MS at Statistics, Columbia University.
- Jiaxi Liu, MS at Automotive, Tsinghua University.
- Haotian Xiang, MS at EE, Columbia University.
- Lindong Liu, MS at Statistics, Columbia University.
- Yue Wang, MS at Statistics, Columbia University.
- Wencheng Bao, MS at Applied Math, Columbia University.
- Hanrui Liu, MS at Statistics, Columbia University.
- Thomas Chen, BS at CS, Columbia University.
- Siyi Hong, MS at CS, Columbia University.
- Susan Cao, NYC Lab High School.
- Joel Lazcano, Regis High School.