

Tao Ma, Ph.D., P. Eng.

CURRENT POSITION

Senior Lecturer (full-time)

Daniel J. Epstein Department of Industrial and Systems Engineering

Viterbi School of Engineering

University of Southern California | 3715 McClintock Ave., | GER 216, Los Angeles, CA 90089

Email: ma.tao@usc.edu

NATIONALITY

Canadian Citizen

RESEARCH AREAS

- Statistics and Probability, Statistical & Machine Learning, Operations Research, Optimization, Predictive Analytics, Data Mining, Time Series Forecast, Functional Data Analysis
- Statistical Analysis of Network Data, Network-level Traffic State Prediction, Transportation Systems Modeling, Simulation, and Calibration, Traffic Flow Operations and Management, Demand Forecast

EDUCATION

University of Toronto, Canada

- Ph.D. in Transportation Engineering and Statistical Sciences, 9/2011 ~ 6/2016
- Master of Applied Science, Transportation Engineering, 9/1999 ~ 6/2001

Xi'an University of Architecture & Technology, China

- Bachelor of Engineering, Major in Transportation, 9/1987 ~ 7/1991

PROFESSIONAL EDUCATION PROGRAMS

Massachusetts Institute of Technology, Boston, USA

- Transportation Networks and Smart Mobility: Methods and Solutions, 8/2021
- Discrete Choice Analysis: Predicting Individual Behavior and Market Demand, 6/2018

Technical University of Crete, Chania, Greece

- Dynamic Traffic Flow Modelling and Control, 11/2018

Universität Stuttgart, TU Kaiserslautern, Germany

- Integrated Public Transport Planning, 7/2021

ACADEMIC EXPERIENCE

- **University of Southern California**, USA, Full-time Senior Lecturer, 8/2024 ~ present
- **Texas State University**, San Marcos, USA, Full-time Lecturer, 9/2022 ~ 6/2024
- **The University of Texas at Austin**, USA, Postdoctoral Research Fellow, 3/2022 ~ 7/2022
- **Technical University of Munich**, Germany, Full-time Postdoctoral Lecturer, 1/2018 ~ 3/2022
- **University of Toronto**, Canada, Research Fellow, 1/2017 ~ 12/2017

INDUSTRIAL EXPERIENCE

- HDR Corporation, Toronto, Canada, Project Manager, 10/2009 ~ 8/2011
- AECOM, Canada, Transportation Engineer, 10/2006 ~ 9/2009
- SNC Lavalin Engineers & Constructors, Toronto, Canada, Transportation Engineer, 5/2001 ~ 10/2006
- SAMI Engineering & Research Inst., Shenyang, China, Transportation Engineer (7/1996 ~ 8/1999), EIT (7/1991 ~ 6/1996)

PUBLICATIONS

JOURNAL ARTICLES

1. Tao Ma, Fang Yao, and Zhou Zhou (2024) Network-Level Traffic Flow Prediction: Functional Time Series vs. Functional Neural Network Approach. *The Annals of Applied Statistics*, Vol. 18 (1), 424–444. <https://doi.org/10.1214/23-AOAS1795>
2. Haoran Chen, Xuedong Yan, Xiaobing Liu & Tao Ma (2022) Exploring the operational performance discrepancies between online ridesplitting and carpooling transportation modes based on DiDi data, *Transportation*, Springer Nature. <https://doi.org/10.1007/s11116-022-10297-6>
3. Tao Ma, Kara Kockelman (2022) Optimization of TNC Parameters Using SPSA for Large-scale Agent-based Simulation of On-demand Ride-sourcing Service, (project working paper).
4. Meng Xie, Michael Winsor, Tao Ma, Andreas Rau, Fritz Busch, and Constantinos Antoniou (2021) Parameter Sensitivity Analysis of a Cooperative Dynamic Bus Lane System with Connected Vehicles, *Transportation Research Record* 1–13, <https://doi.org/10.1177/03611981211035758>
5. Yijiong Zhu, Moeid Qurashi, Tao Ma, Constantinos Antoniou (2021) Joint Calibration for DTA Model Using Islands-GA and PC-SPSA, *Transportation Research Procedia*, (52) 716-723 <https://doi.org/10.1016/j.trpro.2021.01.086>
6. Tao Ma, Constantinos Antoniou, Tomer Toledo (2020) Hybrid machine learning algorithm and statistical time series model for network-wide traffic forecast, *Transportation Research Part C: Emerging Technologies*, (111) 352–372, <https://doi.org/10.1016/j.trc.2019.12.022>
7. Moeid Qurashi, Tao Ma, Emmanouil Chaniotakis, and Constantinos Antoniou (2019) PC-SPSA: Employing Dimensionality Reduction to Limit SPSA Search Noise in DTA Model Calibration, *IEEE Transactions on Intelligent Transportation Systems*, ISSN: 1524-9050, 1-11 <https://doi.org/10.1109/TITS.2019.2915273>
8. Tao Ma, Zhou Zhou, Constantinos Antoniou (2018) Dynamic Factor Model for Network Traffic State Forecast, *Transportation Research Part B: Methodological*, (118), 281-317 <https://doi.org/10.1016/j.trb.2018.10.018>
9. Tao Ma, Zhou Zhou, Baher Abdulhai (2015) Nonlinear multivariate time–space threshold vector error correction model for short term traffic state prediction, *Transportation Research Part B Methodological*, (76), 27–47 <https://doi.org/10.1016/j.trb.2015.02.008>
10. Tao Ma, Baher Abdulhai (2002) Genetic Algorithm-Based Optimization Approach and Generic Tool for Calibrating Traffic Microscopic Simulation Parameters, *Transportation Research Record: Journal of the Transportation Research Board*, 1800, 6-15. <https://doi.org/10.3141/1800-02>

CONFERENCE PAPERS

11. Zihan Yang, Yijing Wang, Tao Ma (2025) Freight Volume Prediction with Deep Learning and Statistical Learning Hybrid Approaches, The 10th International Urban Freight Conference (I-NUF), 4.2025 Los Angeles
12. Meng Xie, Michael Winsor, Tao Ma, Andreas Rau, Fritz Busch, Constantinos Antoniou (2021) Parameter Sensitivity Analysis of A Cooperative Dynamic Bus Lane System with Connected Vehicles, the 100th Annual Conference of Transportation Research Board (TRB), Online Event, January 2021
13. Abdullahi Fatola, Tao Ma, Constantinos Antoniou (2021) Modeling and Forecasting Individual On-Demand Upcoming Trips, the 7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), <https://doi.org/10.1109/MT-ITS49943.2021.9529314>

14. Salma Y. Y. Hamad, Tao Ma, Constantinos Antoniou (2021) Analysis and Prediction of Bikesharing Traffic Flow – Citi Bike, New York, the 7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), <https://doi.org/10.1109/MT-ITS49943.2021.9529290>
15. Xiaolin Gong, Tao Ma, and Constantinos Antoniou (2021) Network Traffic Dynamics Prediction with a Hybrid Approach: Autoencoder-VAR, the 7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), <https://doi.org/10.1109/MT-ITS49943.2021.9529299>
16. Yijiong Zhu, Moeid Qurashi, Tao Ma, Constantinos Antoniou (2020) Joint Calibration for DTA Model Using Islands-GA and PC-SPSA, Presentation at the 23rd EURO Working Group on Transportation Meeting (EWGT), Paphos, Cyprus 2020
17. Tao Ma, Constantinos Antoniou, Tomer Toledo (2018) Combination of Neural Network and statistical model for network-wide traffic forecast. Presentation at Traffic Flow Theory and Characteristics Mid-year Meeting, Woods Hole, Massachusetts, USA, 7-9 August 2018
18. Moeid Qurashi, Tao Ma, Emmanouil Chaniotakis, Constantinos Antoniou (2018) An Alternate Online Calibration approach for O-D demand Calibration in Dynamic Traffic Assignment Systems, Proceedings of the 7th Symposium of the European Association for Research in Transportation (hEART), Athens, Greece, 5-7 September 2018. <https://transp-or.epfl.ch/heart/2018/abstracts/5521.pdf>
19. Moeid Qurashi, Tao Ma, Emmanouil Chaniotakis, Constantinos Antoniou (2018) PC-SPSA: Employing dimensionality reduction to limit SPSA noise in DTA model calibration, The 2nd Symposium on Management of Future motorway and urban Traffic Systems (MFTS), Ispra, Italy. <https://mediatum.ub.tum.de/doc/1464115/file.pdf#page=24>
20. Tao Ma, Khademul Haque, Sabyasachee Mishra, Mihalis Golias, Brad Freeze (2017) Nonlinear Multivariate Crash Prediction Model for Work Zones, Presentation at the Annual Conference of Transportation Research Board, Washington DC in January 2017
21. Tao Ma, Zhou Zhou, Baher Abdulhai (2016) Time Series Based Hourly Traffic Flow Prediction on The GTA Freeways Using TS-TVEC Model, Proceedings of Joint Annual Conference of Canadian Transportation Research Forum and US Transportation Research Forum (CTRF/TRF), Toronto, Canada, 1-4 May 2016.
22. Stephen Keen, Tao Ma, Stephen Sargeant (2008) Microscopic Simulation of a Roundabout, a Reality Test, Comparison of Simulation Results with Observed Traffic Behavior, Presentation at the TRB Roundabout Conference, Kansas City, USA
23. Tao Ma, Baher Abdulhai (2001) Genetic algorithm-based combinatorial parametric optimization for the calibration of microscopic traffic simulation models, Proceedings of IEEE Intelligent Transportation Systems Conference on August 25~29, 2001 Oakland, CA, USA

COURSES TAUGHT (AT GRADUATE & UNDERGRADUATE LEVEL)

University of Southern California, USA (8/2024 ~ present)

Graduate level courses

- Predictive Analytics (ISE529) 4 Units
- Data Mining (ISE535) 4 Units
- Time Series & Spatial Data Analytics (ISE599/541) 4 Units
- Foundations of Analytics (ISE556) 4 Units

Undergraduate level courses

- Solving Engineering Problems using Python (ISE150) 4 Units
- Database Systems: Storage and Retrieval using SQL (ISE382) 4 Units

Texas State University, USA (undergraduate level courses, 9/2022 – 6/2024)

- Operations Research (IE3340) 3 Units
- Engineering Statistics (IE3320) 3 Units
- Probabilistic Operations Research (IE4370) 3 Units
- Statistical Design of Experiments (IE4310) 3 Units

Technical University of Munich, Germany (graduate level courses, 1/2018 – 3/2022)

- Statistical Learning and Data Analytics (BGU4736)
- Applied Statistics (BGU0390)
- Discrete Choice Methods (BGU4329)
- Urban Operations Research (BGU4811)
- Optimization (BGU3721)
- ITS Architecture and Applications (BGU56034)
- Project Seminar

University of Toronto, Canada (undergraduate level courses, 09/2011 – 4/2016)

- Transport-II Performance (traffic engineering CIV332H1)
- Engineering Economics (CME368H1)
- Urban Operations Research (CIV355H1)
- Engineering Mathematics II (CME362H1)
- Transport-I Introduction to Urban Transportation Systems (CIV331H1)

MASTER'S THESIS CO-SUPERVISED (TECHNICAL UNIVERSITY OF MUNICH)

- An Image Fusion Framework for Deep Learning in Traffic Forecasting, (X. Li), 12/2020 ~ 06/2021
- Analyzing Mobility Behavior due to COVID-19 Impact Using Discrete Choice Models and Machine Learning, (S. Hamza), 09/2020 ~ 03/2021
- Bike Sharing Mobility Pattern Analysis Using Neural Network - Los Angeles, (T. E. Adesuyi), 10/2020 ~ 04/2021
- Analysis and Prediction of Bike Sharing Traffic Flow - Citi Bike, New York, (S. Y. Y. Hamad), 03/2020 ~ 09/2020
- Modeling and Forecasting Individual On-demand Upcoming Trips, (A. Fatola), 02/2020 ~ 08/2020
- Influence of Connected and Cooperative Vehicles on Virtual Right of Way Performance in Mixed Traffic, (M. Winsor), 11/2019 ~ 06/2020
- Analysis and Development of Car-Following Models Using xFCD, (M. Adil), 10/2019 ~ 03/2020
- Machine Learning Based Network-Wide Traffic Dynamics Prediction, (X. Gong), 06/2019 ~ 12/2019
- Simultaneous off-line demand supply calibration for simulation based dynamic traffic assignment models with PC-SPSA algorithm, (D. Bisas), 05/2019 ~ 11/2019
- DTA Model Calibration Using Islands-GA and PC-SPSA, (Y. Zhu), 04/2019 ~ 10/2019
- Deep learning techniques for short-term traffic forecasting, (A. Kholodkov), 04/2019 ~ 09/2019
- Data-driven time series demand forecast for car-sharing services, the case study by DriveNow in Munich, (S. H. Sohi), 07/2018 ~ 12/2018

FUNDED RESEARCH AND PROPOSALS

- NCHRP proposal: A Guide for the Development and Use of Truck Traffic Forecasts in Design (\$425,000, NCHRP 08-153 RFP, 4.2022, under review)
- Monitoring, Modeling and forecasting Mobility Patterns (MO3), IGSSE TUM – Deutsche Forschungsgemeinschaft (DFG Foundation), 1/2018 ~ 1/2021 (€110,000)
- Dynamic vanpool services: passenger preferences, operations modeling, and simulation-based quantification of impacts (D-Vanpool), Deutsche Forschungsgemeinschaft (DFG Foundation), 1/2018 ~ 1/2021 (€260,000)
- Imperial College London – Technical University of Munich Collaboration Fund 2021 (£8,000)
- Technical University of Munich (TUM) Global Incentive Fund 2021 (€12,000)

COMPUTATIONAL TOOLS

- *Programming*: Python, R, PostgreSQL, SQLite, HPC (high performance computing)
- *Transportation System Simulation*: VISSIM, SUMO, PARAMICS, Synchro/SimTraffic, MIT-SimMobility, POLARIS

SERVICE ACTIVITIES

Peer Reviewer for Journals and Conferences:

- Transportation Research Part B
- Transportation Research Part A
- IEEE Transactions on Intelligent Transportation Systems
- IEEE Intelligent Transportation Systems Magazine
- Expert Systems With Applications
- Sensors MDPI
- Springer Nature Scientific Report
- Springer Nature Transportation
- Transportation Science
- TRB Annual Conference (committee: AHB45, ADB30, ABE20, ADB20)
- Transportation Letters
- Transport: Proceedings of the Institution of Civil Engineers (ICE) Journal
- Transportation Research Procedia
- IET Intelligent Transport Systems
- Advances in Transportation Studies (ATS)
- International Journal of Modelling and Simulation
- Canadian Journal of Civil Engineering
- International Journal of Communication Systems

University of Southern California, USA

- ISE Undergraduate Curriculum Committee Member

Texas State University, San Marcos, USA

- Assist Ingram School of Engineering in preparing PhD program proposal, Summer 2023
- Help an undergraduate student receive Texas State's Osher Reentry Scholarship 2023
- Help two undergraduate students to receive NSF scholarships for attending the 3rd MIF UG workshop (INFORMS 2023)
- Supervise a senior student design team for an Electric Vehicle project.

Technical University of Munich, Germany

- Member of Admissions Committee, Master of Science in transportation systems, BGU-TUM, 2020/21
- Postdoctoral representative, International Graduate School of Science and Engineering (IGSSE), 1/2018 ~ 1/2021
- Invited talk: "Modeling complex systems: road traffic" at the Faculty of Mathematics, Informatics and Mechanics, the University of Warsaw, Poland, 1/2021

MEMBERSHIP OF PROFESSIONAL ORGANIZATIONS

Professional Engineers Ontario, Canada, Licensed Engineer, 2004 ~ present