

## Qixiu Cheng, PhD

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### Working Experience

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Research Assistant Professor, Department of Logistics & Maritime Studies, The Hong Kong Polytechnic University, Hong Kong, China, 04/2022 – Present

Postdoctoral Fellow, Department of Logistics & Maritime Studies, The Hong Kong Polytechnic University, Hong Kong, China, 05/2021 – 04/2022

### Educational Background

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PhD, Transportation Engineering, Southeast University (SEU), China, 02/2017 – 03/2021

- Thesis title: Dynamic Traffic Assignment and its Application in Congestion Pricing
- Thesis supervisor: Prof. Zhiyuan Liu

Visiting Student, Arizona State University, USA, 03/2019 – 04/2020

- Supervisor: Prof. Xuesong Zhou

MSc, Transportation Systems Engineering (Double Master Degree with SEU), Monash University, Australia, 03/2015 – 06/2017

MPhil, Transportation Engineering, Southeast University, China, 09/2014 – 12/2016

- Thesis title: The Optimal Toll Rate of Distance-Based Dynamic Congestion Pricing

BEng, Civil Engineering, Changsha University of Science & Technology, China, 09/2010 – 06/2014

### Research Interests

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Transportation Network Modelling and Optimization

- Dynamic network loading
- Dynamic traffic assignment
- Dynamic congestion pricing

Freeway Traffic Management and Control

- Freeway travel time reliability
- Traffic bottleneck analysis, management and control
- Traffic flow theory (macroscopic and microscopic)

Transportation Big Data Analytics and Urban Informatics

- Multi-source data-driven traffic flow model
- Data fusion technology for traffic state estimation and prediction
- Spatial big data analytics with deep learning

### Teaching Experience

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Graduate Teaching Assistant, Southeast University, China

- Course: Modelling transportation systems (Spring 2016, Spring 2017, Spring 2018)

### Journal Papers (\* Corresponding Author, in Reverse Chronological Order)

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1. **Cheng, Q.**, Liu, Z.\*, Guo, J., Wu, X., Pendyala, R., Belezamo, B., & Zhou, X.\* (2022). Estimating key traffic state parameters through parsimonious spatial queue models. *Transportation Research Part C*, 137, 103596.
2. **Cheng, Q.**\*, Chen, Y., & Liu, Z. (2022). A bi-level programming model for the optimal lane reservation problem. *Expert Systems with Applications*, 189, 116147.
3. Liu, Z.\*, Wang, Y., **Cheng, Q.**, & Yang, H. (2022). Analysis of the information entropy on traffic flows. Accepted by *IEEE Transactions on Intelligent Transportation Systems*.

4. Xing, J., Wu, W., **Cheng, Q.\***, & Liu, R. (2022). Traffic state estimation of urban road network by multi-source data fusion: Review and new insights. *Physica A*, 595, 127079.
5. Wang, Y., **Cheng, Q.**, Wang, M., & Liu, Z.\* (2022). Weibull-distribution-based neural network for capacity estimation. *ASCE Journal of Transportation Engineering, Part A*, 148(4), 04022009.
6. Zhou, X.\*, **Cheng, Q.**, Wu, X., Li, P., Belezamo, B., Lu, J., & Abbasi, M. (2022). A meso-to-macro cross-resolution approach for connecting polynomial arrival queue model to volume-delay function with inflow-demand-to-capacity ratio. Accepted by *Multimodal Transportation*.
7. Zhang, J., Wu, W., **Cheng, Q.\***, Tong, W.\*, Khadka, A., Fu, X., & Gu, Z. (2022). Extracting the complete travel trajectory of subway passengers based on mobile phone data. *Journal of Advanced Transportation*, 2022, 8151520.
8. **Cheng, Q.**, Liu, Z.\*, Lin, Y., & Zhou, X.\* (2021). An s-shaped three-parameter (S3) traffic stream model with consistent car following relationship. *Transportation Research Part B*, 153, 246-271.
9. **Cheng, Q.**, Chen, J.\*, Zhang, H., & Liu, Z. (2021). Optimal congestion pricing with day-to-day evolutionary flow dynamics: A mean-variance optimization approach. *Sustainability*, 13(9), 4931.
10. Liu, Z.\*, Wang, Z., **Cheng, Q.**, Yin, R., & Wang, M. (2021). Estimation of urban network capacity with second-best constraints for multimodal transport systems. *Transportation Research Part B*, 152, 276-294.
11. Chen, Y., Song, X., **Cheng, Q.\***, An, Q., & Zhang, Y. (2021). A cordon-based reservation system for urban traffic management. *Physica A*, 582, 126276.
12. Selmourne, A., **Cheng, Q.\***, Wang, L., & Liu, Z. (2020). Influencing factors in congestion pricing acceptability: A literature review. *Journal of Advanced Transportation*, 2020, 4242964.
13. Huang, K., Xu, L., Chen, Y., **Cheng, Q.\***, & An, K. (2020). Customized bus route optimization with the real-time data. *Journal of Advanced Transportation*, 2020, 8838994.
14. An, Q., Fu, X., Huang, D., **Cheng, Q.**, & Liu, Z.\* (2020). Analysis of adding-runs strategy for peak-hour regular bus services. *Transportation Research Part E*, 143, 102100.
15. **Cheng, Q.**, Wang, S., Liu, Z.\*, & Yuan, Y. (2019). Surrogate-based simulation optimization approach for day-to-day dynamics model calibration with real data. *Transportation Research Part C*, 105, 422-438.
16. Liu, Z.\*, Liu, Y., Meng, Q., & **Cheng, Q.** (2019). A tailored machine learning approach for urban transport network flow estimation. *Transportation Research Part C*, 108, 130-150.
17. **Cheng, Q.**, Liu, Z.\*, & Szeto, W. Y. (2019). A cell-based dynamic congestion pricing considering travel distance and congestion level. *Transportmetrica B*, 7(1), 1286-1304.
18. **Cheng, Q.**, Xing, J., Yi, W., Liu, Z.\*, & Fu, X. (2019). Distance-based congestion pricing with day-to-day dynamic traffic flow evolution process. *Discrete Dynamics in Nature and Society*, 2019, 7438147.
19. Fang, Z., **Cheng, Q.\***, Jia, R., & Liu, Z. (2019). Urban rail transit demand analysis and prediction: A review of recent studies. *Smart Innovation, Systems and Technologies*, 98, 300-309.
20. **Cheng, Q.**, Liu, Z.\*, & Selmourne, A. (2018). Nonlinear distance-based dynamic pricing considering congestion-level correction. *International Journal of Transportation*, 6(2), 1-8.
21. Gu, Z., Liu, Z.\*, **Cheng, Q.**, & Saberi, M. (2018). Congestion pricing practices and public acceptance: a review of evidence. *Case Studies on Transport Policy*, 6(1), 94-101.
22. Xia, Y., Yang, J., Wang, F., & **Cheng, Q.\*** (2018). Impact of battery size and energy cost on the market acceptance of blended plug-in hybrid electric vehicles. *Procedia Computer Science*, 131, 377-386.
23. **Cheng, Q.**, Liu, Z.\*, Liu, F., & Jia, R. (2017). Urban dynamic congestion pricing: An overview and emerging research needs. *International Journal of Urban Sciences*, 21(S1), 3-18.
24. Liu, Z.\*, Wang, S., Zhou, B., & **Cheng, Q.** (2017). Robust optimization of distance-based tolls in a network considering stochastic day to day dynamics. *Transportation Research Part C*, 79, 58-72.
25. Sun, X., Huang, D.\*, & **Cheng, Q.** (2016). Optimal nonlinear distance toll for cordon-based congestion pricing considering equity issue. *Journal of Harbin Institute of Technology*, 23(6), 73-79.

### Journal Papers Under Review (\* Corresponding Author)

26. **Cheng, Q.**, Liu, Z., Lin, Y., & Zhou, X. (2022). Stochastic fundamental diagram and freeway capacity: Model formulation, parameter calibration, and potential applications. Under review with *Transportation Research Part B*.

27. **Cheng, Q.**, Liu, Z., Lu, J., List, G., & Zhou, X. (2022). Travel time reliability on freeways: A frequency-domain approach. Under review with *Transportation Research Part B*.
28. Zhang, Y., **Cheng, Q.\***, Liu, Y., & Liu, Z. (2022). A Gaussian process-based model for transport network flow estimation. Under the 2<sup>nd</sup> round review with *Transportmetrica B*.
29. Zhang, K., Zhang, H., **Cheng, Q.**, Wang, Z., & Liu, Z. (2022). A customized two stage parallel algorithm for solving the combined modal split and traffic assignment problem. Submitted to *Computers & Operations Research*.
30. Wang, Z., Shi, Y., **Cheng, Q.**, Tong, W.\*, & Gu, Z. (2022). Car-following models for human-driven vehicles and autonomous vehicles: A systematic review. Under review with *European Transport Research Review*.
31. Li, L., Zhang, Y., Zhang, W., & **Cheng, Q.\*** (2022). GATC and DeepCut: Deep spatiotemporal feature extraction and clustering for large-scale transportation network partition. Under review with *Physica A*.
32. Xing, J., Liu, R., Zhang, Y., Choudhury, C.F., & **Cheng, Q.\*** (2022). Urban network-wide traffic volume estimation under sparse deployment of detectors. Under review with *Transportmetrica A*.

### Working Papers

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33. Traffic dynamics modeling with an extended S3 car following model. To be submitted to *Transportation Research Part B*.
34. A systematic review of traffic flow fundamental diagram and its application in mixed human-driven and autonomous vehicles. To be submitted to *Transportation Research Part C*.
35. Day-to-day Dynamic Traffic Flows with Mixed Autonomy: Modeling Framework and Properties Analysis. To be submitted to *Transportation Research Part C*.
36. On the instability of Gaussian process in solving bi-level models for transportation problems. To be submitted to *Transportation Science*.
37. An XGBoost-based model for vehicle lane change decision making on the expressway. To be submitted to *Transportmetrica A*.

### Conference Papers (\* Corresponding Author)

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1. **Cheng, Q.**, Liu, Z., Guo, J., Wu, X., & Zhou, X.\* (2020). A queueing-theoretic performance model for oversaturated traffic systems. *Proceedings of the 99th Annual Meeting of Transportation Research Board (No. 20-03048)*, Washington D.C., 01/2020.
2. Chen, Y., **Cheng, Q.\***, & Liu, Z. (2020). A bi-level programming model for the optimal lane reservation problem. *Proceedings of the 99th Annual Meeting of Transportation Research Board (No. 20-03266)*, Washington D.C., 01/2020.
3. Liu, Y., Lyu, C., **Cheng, Q.**, & Liu, Z.\* (2019). Exploring personalization in the application of intelligent transportation systems. *International Workshop on Ride-hailing Algorithms, Applications, and Systems (RAAS 2019) at the 27<sup>th</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, Chicago, 11/2019.
4. **Cheng, Q.**, Liu, Z., Guo, J., Wu, X., & Zhou, X. (2019). Fluid approximation for traffic system performance evaluation under oversaturated conditions: Model formulation, parameter calibration and applications. *2019 INFORMS Annual Meeting*, Seattle, Washington, 10/2019.
5. Fang, Z., **Cheng, Q.**, Liu, Z.\*, & Liu, Y. (2019). A deep learning approach for the traffic assignment problem. *Proceedings of the 98<sup>th</sup> Annual Meeting of Transportation Research Board (No. 19-01956)*, Washington D.C., 01/2019.
6. Selmoune, A., **Cheng, Q.**, & Liu, Z.\* (2018). Analysis of the influencing factors in the public acceptance of urban congestion pricing practices in Nanjing City. *Proceedings of the 23<sup>rd</sup> International Conference of Hong Kong Society for Transportation Studies (HKSTS)*, Hong Kong, 12/2018.
7. Xie, X., **Cheng, Q.\***, Selmoune, A., Lu, B., & Liu, Z. (2018). A Lagrangian-based approach for reliable user equilibrium considering link travel time variance. *CICTP 2018*, Beijing, 06/2018.
8. Zhou, D., **Cheng, Q.\***, An, Q., Lu, B., & Liu, Z. (2018). Link criticality analysis based on reliable shortest path in a network with correlated link travel times. *CICTP 2018*, Beijing, 06/2018.

9. **Cheng, Q.**, & Liu, Z.\* (2018). A cell-based dynamic congestion pricing considering travel distance and congestion level. *The 7th International Symposium on Dynamic Traffic Assignment*, Hong Kong, 06/2018.
10. **Cheng, Q.**, Xing, J., Selmourne, A., Fu, X., & Liu, Z.\* (2017). Day-to-day dynamics in urban railway networks based on smart card transaction data. *Proceedings of the 22<sup>nd</sup> International Conference of Hong Kong Society for Transportation Studies (HKSTS)*, Hong Kong, 12/2017.
11. **Cheng, Q.**, Liu, Z.\*, & Huang, D. (2016). Dynamic optimal toll with joint distance and congestion. *Proceedings of the 1<sup>st</sup> Transportation Research Congress (TRC)*, Beijing, 06/2016.

## Presentations

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1. Zhang, Y., **Cheng, Q.\***, Liu, Y., & Liu, Z. (2021). A Gaussian Process-based Model for Transport Network Flow Estimation. *The 4th International Symposium on Multimodal Transportation (ISMT 2021)*, Nanjing, 12/2021.
2. **Cheng, Q.**, Liu, Z., Guo, J., Wu, X., & Zhou, X.\* (2020). A Queueing-theoretic Performance Model for Oversaturated Traffic Systems. *The 99th Annual Meeting of Transportation Research Board*, Washington D.C., 01/2020.
3. Liu, Y., Lyu, C., **Cheng, Q.**, & Liu, Z.\* (2019). Exploring Personalization in the Application of Intelligent Transportation Systems. *International Workshop on Ride-hailing Algorithms, Applications, and Systems (RAAS 2019) at the 27<sup>th</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, Chicago, 11/2019.
4. Zhou, X.\*, **Cheng, Q.**, & Liu, Z. (2019). Data Driven Approach for Calibrating BPR Function as A Queueing Model. *INFORMS Annual Meeting 2019*, Seattle, Washington, 10/2019.
5. **Cheng, Q.**, & Liu, Z.\* (2018). A cell-based dynamic congestion pricing considering travel distance and congestion level. *The 7th International Symposium on Dynamic Traffic Assignment*, Hong Kong, 06/2018.
6. **Cheng, Q.**, Xing, J., Selmourne, A., Fu, X., & Liu, Z.\* (2017). Day-to-day Dynamics in Urban Railway Networks Based on Smart Card Transaction Data. *The 22<sup>nd</sup> International Conference of Hong Kong Society for Transportation Studies (HKSTS)*, Hong Kong, 12/2017.

## Authorized Patents (in Chinese)

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1. Liu, Z., **Cheng, Q.**, Bie, Y., Jing, W., Huang, D., & Huang, K. Congestion charging optimal toll rate determining method based on trial-and-error method and motor vehicle flow. *CN201510883352.0*.
2. Liu, Z., **Cheng, Q.**, Zhang, H., & Zhang, Q. A multiscale demand-and-supply modeling approach for oversaturated transportation systems based on queueing theory. *CN202110350726.8*.
3. Liu, Z., **Cheng, Q.**, Liu, Y., Wei, W., Yu, J., & Li, Z. A method for forecasting the day-to-day dynamic traffic demand based on the neural networks. *CN201810431068.3*.
4. Liu, Z., Wang, L., **Cheng, Q.**, & Yu, J. A method for calculating the optimal toll rate of dynamic congestion pricing based on the cell transmission model. *CN201810418436.0*.

## Member of Academic and Professional Organizations

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- TRB (Transportation Research Board)
- INFORMS (Institute for Operations Research and the Management Sciences)
- CHTS (China Highway and Transportation Society)

## Scientific Committee Member for International Conferences

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- The 4th International Symposium on Multimodal Transportation (ISMT), Nanjing, China.

## Referee for Academic Journals and Peer-reviewed Conferences

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- Annual Meeting of Transportation Research Board
- Annual Meeting of COTA International Conference of Transportation Professionals
- Annual Meeting of World Transport Convention
- Cleaner Logistics and Supply Chain

- Communications in Transportation Research
- Discrete Dynamics in Nature and Society
- IET Intelligent Transport Systems
- Journal of Advanced Transportation
- Journal of Intelligent Transportation Systems: Technology, Planning, and Operations
- Journal of Traffic and Transportation Engineering (English Edition)
- Journal of Transportation Engineering Part A: Systems
- KSCE Journal of Civil Engineering
- Multimodal Transportation
- Operational Research: An International Journal
- Physica A: Statistical Mechanics and its Applications
- Sustainability
- Transport Policy
- Transportation Letters: The International Journal of Transportation Research
- Transportation Research Part B: Methodological
- Transportation Research Part C: Emerging Technologies
- Transportation Research Part D: Transport and Environment
- Transportation Research Part E: Logistics and Transportation Review
- Transportation Research Record: Journal of the Transportation Research Board
- Transportation Science
- Transportmetrica B: Transport Dynamics
- Utilities Policy

## Research Grants

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- Graduate Scientific Research Innovation Project of Jiangsu Province. Principal Investigator. Project Title: Day-to-day Dynamic Flow Evolution Process for Multimodal Transport Network, Grant No.: KYCX17\_0142, 04/2017-12/2020. Award Amount: RMB ¥30k.
- Scientific Research Foundation of Graduate School of Southeast University. Principal Investigator. Project Title: Dynamic traffic assignment and its application in urban congestion pricing, Grant No.: YBPY1885, 10/2018-12/2020. Award Amount: RMB ¥42k.

## Honors & Awards

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- Outstanding Submittal Award of “TRB 2017 Transportation Data Analytics Contest”, Awarded by TRB Effects of Information and Communication Technologies on Travel Choices Committee, 2017
- Best Paper Award of the 2<sup>nd</sup> Transportation Research Congress, 2017
- Outstanding Student Scholarship, Southeast University, 2015~2020
- Excellent Graduate, Hunan Province, 2014
- Outstanding Volunteer, Hunan Province, 2013
- Outstanding Student Scholarship, Changsha University of Science & Technology, 2011~2014

## Technical Skills

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- Programming Language & Scientific Application: Python, Matlab, Cplex, Gurobi
- Simulation Software: Vissim, Visum, Cube, TransCAD

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