

# Toru Seo

## Curriculum Vitae, as of February 14, 2019

### Personal Information

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Name: Toru SEO

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### Affiliation

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Assistant Professor, *Regional Planning and Information Lab., Department of Civil Engineering, The University of Tokyo, Japan*

### Contact and Personal Links

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ResearchGate: [https://www.researchgate.net/profile/Toru\\_Seo2](https://www.researchgate.net/profile/Toru_Seo2)

Google Scholar: <https://scholar.google.com/citations?user=CAxkSpwAAAAJ>

### Degree

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[Sep. 25, 2015] Doctor of Engineering, *Department of Civil Engineering, Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan*

### Working Experience

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[Jun. 2018–] Assistant Professor, *The University of Tokyo, Japan*

- Traffic state estimation
- Traffic flow theory
- Mobile sensing
- Remote sensing
- Congestion pricing

[Apr. 2016–May 2018] Research Staff, *Tokyo Institute of Technology, Japan*

- Traffic state estimation
- Traffic flow theory
- Behavioral data collection
- Social adaptation of emerging mobility systems

[Aug. 2017–May 2018] Research Associate, *University of Michigan, The United States*

- Departure time choice equilibrium
- Static network traffic equilibrium
- Congestion pricing
- Connected vehicle data

[Jun. 2017–Aug. 2017] Visiting Scholar, *University of Michigan, The United States*

- Something interesting

[Oct. 2015–Mar. 2016] Research Fellow (PD), *Japan Society for the Promotion of Science, Japan*

- Traffic state estimation
- Traffic flow theory
- Mobile sensing

[Apr. 2014–Sep. 2015] Research Fellow (DC2), *Japan Society for the Promotion of Science, Japan*  
 - Traffic state estimation  
 - Mobile sensing

## Education

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[Sep. 2015] Dr.Eng., *Department of Civil Engineering, Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan*  
 Doctoral dissertation: Traffic estimation with vehicles observing other vehicles  
 Supervisor: Prof. Yasuo Asakura

[Mar. 2013] M.Eng., *Department of Civil Engineering, Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan*  
 Master thesis: Traffic state estimation with Lagrangian observation (in Japanese)  
 Supervisors: Prof. Yasuo Asakura and Dr. Daisuke Fukuda

[Mar. 2011] B.Eng., *Department of Civil and Environmental Engineering, School of Engineering, Tokyo Institute of Technology, Japan*  
 Graduation thesis: Pedestrian behavior modeling in a train station based on the concept of “Plan-Action” (in Japanese)  
 Supervisor: Dr. Daisuke Fukuda

## Honors and Awards

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[Nov. 4, 2017] Outstanding Paper Award, *Committee of Infrastructure Planning and Management, Japan Society of Civil Engineers*

[Jul. 2017] TRC Best Paper Award, *Transportation Research Part C: Emerging Technologies*

[Nov. 25, 2016] Kometani–Sasaki Prize (for Dissertation), *Institute of Systems Science Research*

[Jun. 20, 2016] The 30th Japan Society of Traffic Engineers Paper Award, *Japan Society of Traffic Engineers*

[Sep. 16, 2015] Best Paper Award, *IEEE 18th International Conference on Intelligent Transportation Systems*

[Aug. 8, 2014] Research Encouragement Award, *The 34th Conference of Japan Society of Traffic Engineers*

[Dec. 5, 2013] Outstanding Paper Award, *The 30th Japan Road Conference*

## Competitive Research Funding

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### Ongoing

[Apr. 2018–Mar. 2021] Research Fund by Committee on Advanced Road Technology, Ministry of Land, Infrastructure, Transport and Tourism, Japan, *Tourism Congestion Management using Learning-based Monitoring and Prediction of Traffic*, PI: Takashi Fuse.

[Apr. 2017–Mar. 2019] KAKENHI Grant-in-Aid for Challenging Research (Exploratory), Japan Society for the Promotion of Science, *Market diffusion and social influences of automated cars: Integrated approach from traffic engineering and transport economics*, PI: Daisuke Fukuda.

[Apr. 2017–Mar. 2021] KAKENHI Grant-in-Aid for Scientific Research (A), Japan Society for the Promotion of Science, *Research on mathematical models for management of large-scale transportation network under mega disaster*, PI: Yasuo Asakura.

[Apr. 2017–Mar. 2020] KAKENHI Grant-in-Aid for Scientific Research (B), Japan Society for the Promotion of Science, *Integrated Analytical Modeling of Urban Rail Transit System with High-Frequent Operations*, PI: Daisuke Fukuda.

[Apr. 2016–Mar. 2020] KAKENHI Grant-in-Aid for Young Scientists (B), Japan Society for the Promotion of Science, *Development and verification of model describing spatiotemporal dynamics of traffic flow consists of heterogeneous vehicles*, PI: Toru Seo.

**Completed**.....  
[Apr. 2014–Mar. 2016] KAKENHI Grant-in-Aid for JSPS Fellows, Japan Society for the Promotion of Science,  
*Road network traffic state estimation using information from cameras on probe vehicles*, PI: Toru Seo.

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## Affiliated Societies

IEEE, IEEE Intelligent Transportation Systems Society  
Japan Society of Civil Engineers  
Japan Society of Traffic Engineers  
Information Processing Society of Japan  
The Japan Statistical Society

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## Academic Services

**Editor**.....  
[2017] JSTE Traffic Engineering, Vol.52, No.4 (Guest editor),

**Journal reviewer**.....  
Transportation Research Part A: Policy and Practice  
Transportation Research Part B: Methodological  
Transportation Research Part C: Emerging Technologies  
IEEE Transactions on Intelligent Transportation Systems  
IEEE Intelligent Transportation Systems Magazine  
Journal of Japan Society of Civil Engineers, Ser. D3  
JSTE Journal of Traffic Engineering

**Conference session chair**.....  
[2018] JSCE Infrastructure Planning and Management Conference,  
[2017] IEEE International Conference on Intelligent Transportation Systems,

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## Teaching Experience

**Classes**.....  
[2018] Applied Project III (partial), *The University of Tokyo*  
[2018] Fieldwork Exercise (partial), *The University of Tokyo*  
[2018] Fieldwork in Spatial Information Engineering (partial), *The University of Tokyo*  
[2011] Infrastructure Planning and Design (teaching assistant), *Tokyo Institute of Technology*

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## Publications

**Refereed International Journal Articles**.....  
10. Seo, T., Kawasaki, Y., Kusakabe, T., and Asakura, Y. Fundamental diagram estimation by using trajectories of probe vehicles. *Transportation Research Part B: Methodological*, Vol. 122, pp. 40–56, 2019  
9. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. Evolution of a dynamic ridesharing system based on rational behaviour of users. *International Journal of Sustainable Transportation*, 2018, in press  
8. Seo, T., Kusakabe, T., Gotoh, H., and Asakura, Y. Interactive online machine learning approach for activity-travel survey. *Transportation Research Part B: Methodological*, 2017, in press (Selected paper from IATBR2015)  
7. Lykov, S., Seo, T., and Asakura, Y. Analysis of spatiotemporal dependencies in two-dimensional traffic flow in large-scale urban area with probe vehicle data. *Journal of the Eastern Asia Society for Transportation Studies*, Vol. 12, pp. 1676–1696, 2017

6. Seo, T., Bayen, A. M., Kusakabe, T., and Asakura, Y. Traffic state estimation on highway: A comprehensive survey. *Annual Reviews in Control*, Vol. 43, pp. 128–151, 2017
5. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. A passengers matching problem in ridesharing systems by considering user preference. *Journal of the Eastern Asia Society for Transportation Studies*, Vol. 11, pp. 1416–1432, 2015
4. Seo, T. and Kusakabe, T. Probe vehicle-based traffic state estimation method with spacing information and conservation law. *Transportation Research Part C: Emerging Technologies*, Vol. 59, pp. 391–403, 2015 (Selected paper from ISTTT21)
3. Seo, T., Kusakabe, T., and Asakura, Y. Estimation of flow and density using probe vehicles with spacing measurement equipment. *Transportation Research Part C: Emerging Technologies*, Vol. 53, pp. 134–150, 2015 [Best Paper Award]
2. Fukuda, D., Seo, T., Yamada, K., Yaginuma, H., and Matsuyama, N. An econometric-based model of pedestrian walking behavior implicitly considering strategic or tactical decisions. In Weidmann, U., Kirsch, U., and Schreckenberg, M. (Eds.), *Pedestrian and Evacuation Dynamics 2012*, pp. 615–624. Springer International Publishing, 2014
1. Narioka, N., Seo, T., Kusakabe, T., and Asakura, Y. Incident detection method using longitudinal occupancy time-series data. *Journal of the Eastern Asia Society for Transportation Studies*, Vol. 10, pp. 1720–1733, 2013

#### Refereed Japanese Journal Articles.....

13. Seo, T. and Kusakabe, T. Traffic state estimation using satellite remote sensing and probe vehicles. *JSTE Journal of Traffic Engineering*, Vol. 5, No. 2, pp. A\_1–A\_10, 2019. (in Japanese)
12. Aiko, S., Thaithatkul, P., Seo, T., and Asakura, Y. Optimum routing of ride share vehicles for given activity patterns. *Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)*, Vol. 73, No. 5, pp. I\_1233–I\_1242, 2017. (in Japanese)
11. Wada, K., Seo, T., Nakanishi, W., Satsukawa, K., and Yanagihara, M. Recent advances in kinematic wave theory of traffic flows: variational formulation and network extension. *Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)*, Vol. 73, No. 5, pp. I\_1139–I\_1158, 2017. (in Japanese)
10. Fukuda, D., Mizuguchi, M., Seo, T., Kusakabe, T., and Asakura, Y. Evaluation of area level travel time reliability using large-scale probe vehicle trajectories recorded for a long period. *Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)*, Vol. 73, No. 5, pp. I\_1105–I\_1118, 2017. (in Japanese)
9. Seo, T., Kusakabe, T., and Asakura, Y. Trip purpose estimation method for probe person survey using sequential learning. *Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)*, Vol. 73, No. 5, pp. I\_517–I\_526, 2017. (in Japanese) [Outstanding Paper Award]
8. Kawasaki, Y., Seo, T., Kusakabe, T., and Asakura, Y. Estimation of fundamental diagram using probe vehicle trajectories: EM-algorithm-based method and field validation. In *Proceedings of the 36th Japan Society of Traffic Engineers Conference*, 2016. (in Japanese)
7. Seo, T., Kusakabe, T., and Asakura, Y. Methodology for calibration of fundamental diagram based on trajectories of sampled vehicles: Concept and numerical experiment. *JSTE Journal of Traffic Engineering*, Vol. 2, No. 2, pp. A\_1–A\_10, 2016. (in Japanese)
6. Narioka, N., Seo, T., Kusakabe, T., and Asakura, Y. A method for detecting incidents from traffic detector data based on the non-parametric statistics. *JSTE Journal of Traffic Engineering*, Vol. 1, No. 1, pp. 11–20, 2015. (in Japanese) [JSTE Paper Award]
5. Yanagihara, M., Kusakabe, T., Seo, T., and Asakura, Y. An estimation method for cyclic period of vehicle speed during car-following situation using probe vehicle data. In *Peer Review Proceedings of the 12th ITS Symposium 2014*, 2014. (in Japanese)
4. Seo, T., Kusakabe, T., and Asakura, Y. Field experiment of traffic flow observation by using probe vehicles with spacing measuring equipment. In *Proceedings of the 34th Japan Society of Traffic Engineers Conference*, pp. 277–283, 2014. (in Japanese) [Research Encouragement Award]

3. Seo, T., Kusakabe, T., and Asakura, Y. Estimation of traffic state using probe vehicles that equipped with spacing measurement devices. *Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)*, Vol. 69, No. 5, pp. I\_809–I\_818, 2013. (in Japanese)
2. Narioka, N., Seo, T., Kusakabe, T., and Asakura, Y. Incident detection by nonparametric model using traffic detectors' long term observation data. In *Proceedings of the 33rd Japan Society of Traffic Engineers Conference*, 2013. (in Japanese)
1. Seo, T., Yaginuma, H., and Fukuda, D. Modeling pedestrian behavior based on the concept of “Plan-Action” structure: An application in a train station. *Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)*, Vol. 68, No. 5, pp. I\_679–I\_690, 2012. (in Japanese)

#### Refereed International Conference Presentations.....

32. Seo, T. and Yin, Y. Optimal pricing for departure time choice problems with unknown preference and demand: Trial-and-error approach. In *Transportation Research Board 98th Annual Meeting*, 2019
31. Seo, T. and Kusakabe, T. Use of small satellites and connected vehicles for large-scale traffic monitoring in road network. In *IEEE 21st International Conference on Intelligent Transportation Systems*, pp. 2805–2810, Maui, The United States, 2018
30. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. Adoption of dynamic ridesharing system under influence of information on social network. In *Transportation Research Procedia*, Vol. 37, pp. 401–408, 2019. (The 21st EURO Working Group on Transportation Meeting, 17-19 September 2018, Braunschweig, Germany)
29. Seo, T. and Kusakabe, T. Traffic state estimation using small imaging satellites and connected vehicles. *Transportation Research Procedia*, Vol. 34, pp. 4–11, 2018. (ISTS and IWTDSCS 2018, 4–6 August 2018, Matsuyama, Japan)
28. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. User equilibrium model of ridesharing transport with high-occupancy vehicles lane. In *Proceedings of the 14th International Conference on Advanced Systems in Public Transport*, Brisbane, Australia, 2018
27. Kusakabe, T., Seo, T., Nakanishi, W., and Asakura, Y. Implementation of interactive online machine learning approach for smart phone based activity-travel survey. In *The 15th International Conference on Travel Behaviour Research*, Santa Barbara, The United States, 2018
26. Seo, T. and Yin, Y. Estimating individual congestion externality using connected vehicle data. In *2018 Global Symposium for Connected and Automated Vehicles and Infrastructure*, Ann Arbor, The United States, 2018
25. Seo, T. and Bayen, A. M. Traffic state estimation method with efficient data fusion based on the Aw–Rasclé–Zhang model. In *IEEE 20th International Conference on Intelligent Transportation Systems*, Yokohama, Japan, 2017
24. Kawasaki, Y., Seo, T., Kusakabe, T., and Asakura, Y. Fundamental diagram estimation using GPS trajectories of probe vehicles. In *IEEE 20th International Conference on Intelligent Transportation Systems*, Yokohama, Japan, 2017
23. Lykov, S., Seo, T., and Asakura, Y. Analysis of spatiotemporal dependencies in two-dimensional traffic flow in large-scale urban area with probe vehicle data. In *The 12th International Conference of Eastern Asia Society for Transportation Studies*, Ho Chi Minh City, Vietnam, 2017
22. Aiko, S., Itabashi, R., Seo, T., Kusakabe, T., and Asakura, Y. Social benefit of optimal ride-share transport with given travelers' activity patterns. *Transportation Research Procedia*, Vol. 27, pp. 261–269, 2017. (20th EURO Working Group on Transportation Meeting, EWGT 2017, 4-6 September 2017, Budapest, Hungary)
21. Seo, T. and Asakura, Y. Endogenous market penetration dynamics of automated and connected vehicles: Transport-oriented model and its paradox. *Transportation Research Procedia*, Vol. 27, pp. 238–245, 2017. (20th EURO Working Group on Transportation Meeting, EWGT 2017, 4-6 September 2017, Budapest, Hungary)
20. Seo, T., Wada, K., and Fukuda, D. A macroscopic and dynamic model of urban rail transit with delay and congestion. In *Transportation Research Board 96th Annual Meeting*, Washington DC, The United States,

2017

19. Seo, T., Tchakian, T. T., Zhuk, S., and Bayen, A. M. Filter comparison for estimation on discretized PDEs modeling traffic: Ensemble Kalman filter and Minimax filter. In *IEEE 55th Conference on Decision and Control*, pp. 3979–3984, Las Vegas, The United States, 2016
18. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. Field experiment on traveler's behavior in smart ridesharing system. In *The 21st International Conference of Hong Kong Society for Transportation Studies*, Hong Kong, 2016
17. Seo, T., Wada, K., and Fukuda, D. A simplified model of urban railway system for dynamic traffic assignment. In *Proceedings of the 21st International Conference of Hong Kong Society for Transportation Studies*, pp. 357–364, Hong Kong, 2016
16. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. User equilibria for ridesharing transportation. In *The 5th symposium arranged by European Association for Research in Transportation*, Delft, The Netherlands, 2016
15. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. Simulation approach for investigating dynamics of passenger matching problem in smart ridesharing system. *Transportation Research Procedia*, Vol. 21, pp. 29–41, 2017. (Selected paper from ISTS&IWTDCS, Jeju, Korea, July 7–8, 2016)
14. Seo, T., Kusakabe, T., and Asakura, Y. Calibration of fundamental diagram using trajectories of probe vehicles: Basic formulation and heuristic algorithm. *Transportation Research Procedia*, Vol. 21, pp. 6–17, 2017. (Selected paper from ISTS&IWTDCS, Jeju, Korea, July 7–8, 2016)
13. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. Day-to-day dynamics of passenger matching problem in smart ridesharing systems. In *Proceedings of the 20th International Conference of Hong Kong Society for Transportation Studies*, pp. 449–456, Hong Kong, 2015
12. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. A numerical study on the effect of variety of user preference to ridesharing system's performance. In *The 7th Regional Symposium on Infrastructure Development*, Bangkok, Thailand, 2015 [Best Presentation Award]
11. Ozaki, N., Ueno, H., Sato, T., Wada, S., Ooba, Y., Suzuki, Y., Takahashi, Y., Sakai, H., Warita, H., Matsushita, M., Seo, T., Kusakabe, T., and Asakura, Y. Image recognition based OBU probe system for traffic monitoring. In *Proceedings of the 22nd ITS World Congress*, Bordeaux, France, 2015
10. Seo, T., Kusakabe, T., and Asakura, Y. Traffic state estimation with the advanced probe vehicles using data assimilation. In *IEEE 18th International Conference on Intelligent Transportation Systems*, pp. 824–830, Gran Canaria, Spain, 2015 [Best Paper Award]
9. Thaithatkul, P., Seo, T., Kusakabe, T., and Asakura, Y. A passengers matching problem in ridesharing systems by considering user preference. In *Proceedings of the 11th International Conference of Eastern Asia Society for Transportation Studies*, Cebu, Philippines, 2015 [Outstanding Poster Presentation Award]
8. Seo, T. and Kusakabe, T. Probe vehicle-based traffic flow estimation method without fundamental diagram. *Transportation Research Procedia*, Vol. 9, pp. 149–163, 2015. (Selected paper from ISTTT21 Poster Session, Kobe, Japan, August 5–7, 2015)
7. Kusakabe, T., Seo, T., Goto, H., and Asakura, Y. Interactive online machine learning approach for activity-travel survey. In *Proceedings of the 14th International Conference on Travel Behaviour Research*, Windsor, The United Kingdom, 2015
6. Kusakabe, T., Seo, T., Goto, H., and Asakura, Y. Improving activity-travel survey using on-line machine learning and smartphone-based interactive system. In *International Workshop on Activity-Travel Behavior Analysis and Multi-State Supernetwork Modeling*, Hong Kong, 2014
5. Nguyen, L. X., Seo, T., Van, H. T., Kusakabe, T., and Asakura, Y. Mixed flow observation using video cameras on probe vehicles: A case study in Ho Chi Minh City. In *Proceedings of the 19th International Conference of Hong Kong Society for Transportation Studies*, pp. 374–381, Hong Kong, 2014
4. Narioka, N., Seo, T., Kusakabe, T., and Asakura, Y. Incident detection method using longitudinal occupancy time-series data. In *Proceedings of the 10th International Conference of Eastern Asia Society for Transportation Studies*, Taipei, Taiwan, 2013
3. Seo, T., Kusakabe, T., and Asakura, Y. Traffic flow monitoring utilizing on-vehicle devices of spacing

measurement. In *The 2nd Symposium of the European Association for Research in Transportation*, Stockholm, Sweden, 2013

2. Seo, T., Kusakabe, T., and Asakura, Y. Traffic state estimation method using probe vehicles equipped with spacing measurement system. In *Proceedings of International Symposium on Recent Advances in Transport Modelling*, Kings Cliff, Australia, 2013
1. Fukuda, D., Seo, T., Yamada, K., Yaginuma, H., and Matsuyama, N. An econometric based pedestrian walking behaviour model implicitly considering strategic or tactical decisions. In *Proceedings of the 6th International Conference on Pedestrian and Evacuation Dynamics*, Zürich, Switzerland, 2012

#### **Others.....**

5. Seo, T., Kawasaki, Y., Kusakabe, T., and Asakura, Y. Fundamental diagram estimation by using trajectories of probe vehicles. *arXiv preprint arXiv: 1804.05927*, 2018, Published at arXiv
4. Seo, T. and Yanagihara, M. Multi-class multi-lane traffic flow models. In *Traffic Engineering*, Vol. 52, No. 4, pp. 30–36. Japan Society of Traffic Engineers, 2017. (in Japanese)
3. Seo, T. Kinematic wave theory is a car-following model. In *Traffic Engineering*, Vol. 52, No. 3, pp. 18–24. Japan Society of Traffic Engineers, 2017. (in Japanese)
2. Seo, T., Wada, K., and Fukuda, D. Fundamental diagram of rail transit and its application to dynamic assignment. *arXiv preprint arXiv: 1708.02147*, 2017, Published at arXiv
1. Seo, T. *Traffic Estimation with Vehicles Observing Other Vehicles*. PhD thesis, Tokyo Institute of Technology, 2015