CURRICULUM VITAE

Songhua Hu
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EDUCATION

- Ph.D. candidate, Transportation Engineering, University of Maryland, College Park, MD, USA, 09/2019~02/2023 (expected) [**GPA**: 3.95/4.00][**Dissertation**: A big-data-driven framework for spatiotemporal travel demand estimation and prediction]
- Master of Engineering, Transportation Engineering, Tongji University, Shanghai, China, 09/2016~06/2019 [**GPA**: 86.90/100.00][**Thesis**: Promoting electric vehicle utilization in large-scale carsharing systems: Factors analysis and relocation simulation]
- Bachelor of Engineering, Transportation Engineering, Huazhong University of Science & Technology, Wuhan, Hubei, China, 09/2012~06/2016 [**GPA**: 90.40/100.00][**Thesis**: Simulation of pedestrian flow in metro systems: a floor-field cellular automata approach]

RESEARCH INTERESTS

- Urban Computing and Human Mobility
- Spatiotemporal Modeling and Temporal Graph Neural Network
- Mobility as a Service (MaaS) and Shared Mobility
- Transport Equity and Health Disparities
- Infrastructure Sustainability and Resilience
- Explainable AI and Nonlinearity
- Cloud Computing and Large-scale Simulation

AWARDS AND HONORS

- University of Maryland, College Park: Outstanding Graduate Assistant (top 2%), 2021
- University of Maryland, College Park: CEE Summer Research Fellowship, 2020
- University of Maryland, College Park: The Graduate School's Dean's Fellowship, 2019
- The Second Price in China Big Data Innovation Competition, 2017
- Tongji University: Runner-Up Student Scholarship, 2016~2019
- Social Responsibility Award in BMW Next Mobility Youth Camp, 2016
- Huazhong University of Science & Technology: Outstanding Graduates, 2016
- Huazhong University of Science & Technology: Pacemaker to Merit Student, 2015
- Huazhong University of Science & Technology: National Scholarship, 2013~2015

SELECTED JOURNAL PUBLICATIONS (*corresponding author)

1. **Hu, Songhua**, Chenfeng Xiong. "High-dimensional population flow time series forecasting via an interpretable hierarchical transformer." Transportation Research Part

C: Emerging Technologies (2022). (In press)

2. **Hu, Songhua**, Chenfeng Xiong, Qingchen Li, Zitong Wang, and Yuan Jiang. "COVID-19 vaccine hesitancy cannot fully explain disparities in vaccination coverage across the contiguous United States." Vaccine 40, no. 37 (2022): 5471-5482.

3. **Hu, Songhua**, Mingyang Chen, Yuan Jiang, Wei Sun, and Chenfeng Xiong. "Examining factors associated with bike-and-ride (BnR) activities around metro stations in large-scale dockless bikesharing systems." Journal of Transport Geography 98 (2022): 103271.

4. **Hu, Songhua**, Chenfeng Xiong, Hannah Younes, Mofeng Yang, Aref Darzi, and Zhiyu Catherine Jin. "Examining spatiotemporal evolution of racial/ethnic disparities in human mobility and COVID-19 health outcomes: Evidence from the contiguous United States." Sustainable Cities and Society 76 (2022): 103506.

5. Sun, Qianqian, Weiyi Zhou, Aliakbar Kabiri, Aref Darzi, **Songhua Hu**, Hannah Younes, and Lei Zhang. " COVID-19 and income profile: How people in different income groups responded to disease outbreak, case study of the United States." Regional Science Policy & Practice (2022).

6. **Hu, Songhua**, Weiyu Luo, Aref Darzi, Yixuan Pan, Guangchen Zhao, Yuxuan Liu, and Chenfeng Xiong. "Do racial and ethnic disparities in following stay-at-home orders influence COVID-19 health outcomes? A mediation analysis approach." PloS one 16, no. 11 (2021): e0259803.

7. **Hu, Songhua**, Peng Chen, and Xiaohong Chen. "Do personalized economic incentives work in promoting shared mobility? Examining customer churn using a time-varying Cox model." Transportation Research Part C: Emerging Technologies 128 (2021): 103224.

8. **Hu, Songhua**, Chenfeng Xiong, Zhanqin Liu, and Lei Zhang. "Examining spatiotemporal changing patterns of bike-sharing usage during COVID-19 pandemic." Journal of Transport Geography 91 (2021): 102997.

9. **Hu, Songhua**, Chenfeng Xiong, Mofeng Yang, Hannah Younes, Weiyu Luo, and Lei Zhang. "A big-data driven approach to analyzing and modeling human mobility trend under non-pharmaceutical interventions during COVID-19 pandemic." Transportation Research Part C: Emerging Technologies 124 (2021): 102955.

10. **Hu, Songhua**, and Peng Chen. "Who left riding transit? Examining socioeconomic disparities in the impact of COVID-19 on ridership." Transportation Research Part D: Transport and Environment 90 (2021): 102654.

11. Luo, Weiyu, Wei Guo, **Songhua Hu**, Mofeng Yang, Xinyuan Hu, and Chenfeng Xiong. "Flatten the curve: Empirical evidence on how non-pharmaceutical interventions substituted pharmaceutical treatments during COVID-19 pandemic." Plos one 16, no. 10 (2021): e0258379.

12. Xiong, Chenfeng, **Songhua Hu**, Mofeng Yang, Weiyu Luo, and Lei Zhang. "Mobile device data reveal the dynamics in a positive relationship between human mobility and COVID-19 infections." Proceedings of the National Academy of Sciences 117, no. 44 (2020): 27087-27089.

13. Xiong, Chenfeng, **Songhua Hu**, Mofeng Yang, Hannah Younes, Weiyu Luo, Sepehr Ghader, and Lei Zhang. "Mobile device location data reveal human mobility response to state-level stay-at-home orders during the COVID-19 pandemic in the USA." Journal of

the Royal Society Interface 17, no. 173 (2020): 20200344.

14. Zhang, Lei, Aref Darzi, Sepehr Ghader, Michael L. Pack, Chenfeng Xiong, Mofeng Yang, Qianqian Sun, AliAkbar Kabiri, and **Songhua Hu**. "Interactive covid-19 mobility impact and social distancing analysis platform." Transportation Research Record (2020): 03611981211043813.

15. Wang, Tao, **Songhua Hu ***, and Yuan Jiang. "Predicting shared-car use and examining nonlinear effects using gradient boosting regression trees." International Journal of Sustainable Transportation 15, no. 12 (2020): 893-907.

16. **Hu, Songhua**, Kun Xie, Xiaonian Shan, Hangfei Lin, and Xiaohong Chen. "Modeling usage frequencies and vehicle preferences in a large-scale electric vehicle sharing system." IEEE Intelligent Transportation Systems Magazine (2020): 1-10.

17. **Hu, Songhua**, Peng Chen, Feifei Xin, and Chi Xie. "Exploring the effect of battery capacity on electric vehicle sharing programs using a simulation approach." Transportation Research Part D: Transport and Environment 77 (2019): 164-177.

18. Chen, Peng, **Songhua Hu ***, Qing Shen, Hangfei Lin, and Chi Xie. "Estimating traffic volume for local streets with imbalanced data." Transportation Research Record 2673, no. 3 (2019): 598-610.

19. **Hu, Songhua**, Peng Chen, Hangfei Lin, Chi Xie, and Xiaohong Chen. "Promoting carsharing attractiveness and efficiency: An exploratory analysis." Transportation Research Part D: Transport and Environment 65 (2018): 229-243.

SELECTED PRESENTATIONS/POSTERS

1. **Hu, Songhua**, Chenfeng Xiong. High-dimensional population flow time series forecasting via an interpretable hierarchical transformer, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

2. **Hu, Songhua**, Chenfeng Xiong, Peng Chen, and Paul Schonfeld. Revisiting travel demand using big data: an empirical comparison of explainable machine learning models, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

3. **Hu, Songhua**, Chenfeng Xiong, Xin Yuan, and Xuqiu Wang. Vaccination, Mobility, and COVID-19 Health Outcomes: Empirical Comparison Before and During the Outbreak of SARS-Cov-2 B.1.1.529 (Omicron) Variant, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

4. Zhao, Guangchen, Chenfeng Xiong, **Songhua Hu**, Mofeng Yang, Aliakbar Kabiri, Aref Darzi, and Yixuan Pan. A novel measurement of job accessibility based on mobile device location data, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

5. Chen, Peng, Xiankui Yang, Yu Zhang, and **Songhua Hu**. The Renaissance of Transit and Ridesharing: From Pandemic Towards the New Normal, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

6. Sun, Qianqian, Yixuan Pan, Weiyi Zhou, Aliakbar Kabiri, Mofeng Yang, Guangchen Zhao, **Songhua Hu**, Mohammad Ashoori, Saeed Saleh Namadi, and Aref Darzi. National truck travel demand estimation using GPS data, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

7. Yang, Mofeng, Weiyu Luo, Mohammad Ashoori, Jina Mahmoudi, Chenfeng Xiong,

Jiawei Lu, Guangchen Zhao, Saeed Saleh Namadi, **Songhua Hu**, and Aliakbar Kabiri, A big-data driven framework to estimating vehicle volume based on mobile device location data, Transportation Research Board 102th Annual Meeting (2023), Washington DC.

8. **Hu, Songhua**, Weiyu Luo, Aref Darzi, Yixuan Pan, Guangchen Zhao, Yuxuan Liu, and Chenfeng Xiong. Do Racial and Ethnic Disparities in Maintaining Social distancing Influence COVID-19 Health Outcomes? A Mediation Analysis Approach, Transportation Research Board 101st Annual Meeting (2022), Washington DC.

9. **Hu, Songhua**, Chenfeng Xiong, Hannah Younes, Mofeng Yang, Aref Darzi, and Zhiyu Catherine Jin. Examining spatiotemporal evolution of racial/ethnic disparities in human mobility and COVID-19 health outcomes: Evidence from the contiguous United States, Transportation Research Board 101st Annual Meeting (2022), Washington DC.

10. Xiong, Chenfeng, **Songhua Hu**, Mofeng Yang, Hannah Younes, Weiyu Luo, Sepehr Ghader, and Lei Zhang. Mobile device location data reveal human mobility response to state-level stay-at-home orders during the COVID-19 pandemic in the USA, Transportation Research Board 100th Annual Meeting (2021), Washington DC.

11. **Hu, Songhua**, Chenfeng Xiong, Mofeng Yang, Hannah Younes, Weiyu Luo, and Lei Zhang. A big-data driven approach to analyzing and modeling human mobility trend under non-pharmaceutical interventions during COVID-19 pandemic, Transportation Research Board 100th Annual Meeting (2021), Washington DC.

12. Jing, Yi, **Songhua Hu**, and Hangfei Lin. Estimating Traffic Volume with Limited Observations: A Combination of Sampling Expansion and Geographically Weighted Poisson Regression, Transportation Research Board 100th Annual Meeting (2021), Washington DC.

13. Jing, Yi, **Songhua Hu**, and Hangfei Lin. Joint Analysis of Scooter Sharing and Bikesharing Usage: A Structural Equation Modeling Approach, Transportation Research Board 100th Annual Meeting (2021), Washington DC.

14. **Hu, Songhua**, Peng Chen, and Xiaohong Chen. Do Personalized Economic Incentives Work in Promoting Shared Mobility? Examining Customer Churn Using a Time-Varying Cox Model, Transportation Research Board 99th Annual Meeting (2020), Washington DC.

15. **Hu, Songhua**, Peng Chen, Feifei Xin, and Chi Xie. Exploring the effect of battery capacity on electric vehicle sharing programs using a simulation approach, Transportation Research Board 99th Annual Meeting (2020), Washington DC.

16. Chen, Peng, **Songhua Hu**, Qing Shen, Hangfei Lin, and Chi Xie. Estimating traffic volume for local streets with imbalanced data, Transportation Research Board 98th Annual Meeting (2019), Washington DC.

17. **Hu, Songhua,** Hangfei Lin, Kun Xie, Xiaohong Chen, and Hongjie Shi. Modeling users' vehicles selection behavior in urban carsharing program, 21st IEEE International Conference on Intelligent Transportation Systems (2018).

18. **Hu, Songhua**, Hangfei Lin, Kun Xie, Jianjun Dai, and Jiandong Qui. Impacts of rain and waterlogging on traffic speed and volume on urban roads, 21st IEEE International Conference on Intelligent Transportation Systems (2018).

WORKING PAPER/UNDER REVIEW

1. Multi-ATGCN: A multi-graph multi-head adaptive temporal graph convolutional network for multivariable crowd inflow forecasting. **Hu, Songhua**, Yiqun Xie, Chenfeng Xiong, Paul Schonfeld, 2022. (Intend to submit to KDD 2023)
2. Nationwide spatiotemporal population flow forecasting via temporal fusion graph convolutional neural network: a comparative analysis. **Hu, Songhua**, Yiqun Xie, Peng Chen, Paul Schonfeld, 2022. (Intend to submit to IEEE Transactions on Intelligent Transportation Systems)
3. Revisiting travel demand using big data: an empirical comparison of explainable machine learning models. **Hu, Songhua**, Chenfeng Xiong, Peng Chen, Paul Schonfeld, 2022. (First-round Review at Transportation Research Part A: Policy and Practice)
4. Vaccination, Mobility, and COVID-19 Health Outcomes: Empirical Comparison Before and During the Outbreak of SARS-Cov-2 B.1.1.529 (Omicron) Variant. **Hu, Songhua**, Chenfeng Xiong, Xin Yuan, Xuqiu Wang, 2022. (Second-round Review at Brain, Behavior, and Immunity)
5. Complementary or Competing? Studying the Relationship Between E-Scooter Sharing and Bikesharing. Chen, Peng and **Hu, Songhua**, 2019. (Fourth-round Review at Journal of Planning Education and Research)

RESEARCH EXPERIENCE

Graduate Research Assistant (PI: Paul Schonfeld, Lei Zhang, Chenfeng Xiong)

1. INFORM AFRICA: Integrated Modeling of Mobility and Epidemiology in South Africa and Nigeria, 2021~ 2022 (NIH)
2. Next Generation National Household Travel Survey Origin-Destination Data Program, 2021~Present (FHWA)
3. ATCMTD: Deployment of Personalized and Dynamic Travel Demand Management Technology in the Washington D.C.-Baltimore, MD-Richmond, VA Megaregion, 2020~ Present (USDOT)
4. University of Maryland COVID-19 Impact Analysis Platform (data.covid.umd.edu), 2020~2021 (USDOT, NSF)
5. Evaluate the Impact of Express Toll Lanes in Maryland with Advanced Travel Demand and Dynamic Traffic Assignment Models, 2019~2020 (MDOT SHA)
6. incenTrip APP: Personalized and Real-Time Traveler Incentives (incentrip.org), 2019~Present (USDOE, USDOT)

Research Assistant (PI: Hangfei Lin, Xiaohong Chen, Peng Chen)

1. A Data-Driven Framework for Station Site Selection, Fleet Management, and Operation Optimization in Large-Scale Electric Carsharing Systems (Evcard), 2018~2019
2. Shenzhen Waterlogging Detection Platform Using Traffic Flow Information, 2018
3. Agent-based Pedestrians Flow Simulation in Subway Systems, 2017
4. Shanghai Intelligent Transportation Information Platform, 2017
5. Bus Lane Performance Evaluation Using Micro Traffic Simulation, 2016~2017

Research Assistant (PI: Li Duan)

1. Pedestrians Flow Simulation Based on the Floor Field Cellular Automata Model for

Turnstiles Deployment Optimization in Subway Systems, 2015~2016

SERVICE TO PROFESSION

<u>Journal Article Reviewer (Selected)</u>

1. Accident Analysis and Prevention
2. Cambridge Journal of Regions, Economy and Society
3. Cities
4. IEEE Access
5. International Journal of Transportation Science and Technology
6. Geo-spatial Information Science
7. Journal of Planning Education and Research
8. Journal of Transport Geography
9. Journal of Transport and Land Use
10. Journal of Advanced Transportation
11. PLOS One
12. Regional Studies
13. Sustainable Cities and Society
14. Scientific Reports
15. Transportation Research Part B: Methodological
16. Transportation Research Part D: Transport and Environment
17. Transport Policy
18. Traffic Injury Prevention
19. Travel Behavior and Society
20. Transportation Letters
21. Transportation Research Record

<u>Conference Proceeding Reviewer</u>

- TRB Transportation Research Board Annual Meeting
- COTA International Conference of Transportation Professionals
- IACP International Association of China Planning
- IEEE Intelligent Transportation Systems Society Conference Management System

SKILLS

- **Programming**: Python, R, SQL, Matlab, Git, Java
- **Cloud computing**: AWS (S3, EMR, EC2), PySpark
- **Statistics (Causal inference):** DID, 2SLS, SEM (Mediation analysis, Path analysis), Bayesian structural time series, Survival analysis, Regression (Generalized linear models, Generialzied additive (mixed) models, Partial least squares), Spatial econometrics.
- **AI**: Machine learning (RF, XGBoost, LightGBM), Explainable AI (SHAP, PDP, ALE), Deep learning (FNN, CNN, (Attention) RNN, Transformer, (Temporal) Graph NN)
- **Others**: Spatial analysis (ArcGIS, GeoPandas, NetworkX, QGIS), Traffic simulation (Vissim, AnyLogic, TransCAD, DTALite)

Updated by 11/2022