CURRICULUM VITAE

Songhua Hu
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EDUCATION

Ph.D. Transportation Engineering, 09/2019~03/2023
University of Maryland, College Park, MD, USA

GPA: 3.975/4.000

Dissertation: "A big-data-driven framework for spatiotemporal travel demand estimation and prediction"

M.S. Transportation Engineering, 09/2016~06/2019
Tongji University, Shanghai, China

GPA: 86.90/100.00

Thesis: "Promoting electric vehicle utilization in large-scale carsharing systems: Factors analysis and relocation simulation"

B.S. Transportation Engineering, 09/2012~06/2016
Huazhong University of Science & Technology, Wuhan, Hubei, China

GPA: 90.40/100.00

Thesis: "Simulation of pedestrian flow in metro systems: a dynamic floor-field cellular automata approach"

RESEARCH INTERESTS

- Ubiquitous and Mobile Computing
- Urban Computing and Human Mobility
- Spatiotemporal Network Modeling: Network science, Spatial AI, Time series analysis
- Computational Epidemiology and Health Geography
- Infrastructure Sustainability, Resilience, and Equity
- Mobility as a Service (MaaS) and Shared Mobility

RESEARCH EXPERIENCE

Postdoctoral Research Associate, 06/2023~Present
Massachusetts Institute of Technology (PI's: Carlo Ratti, Paolo Santi)

- GEMINI: DiGital twin for Emission MonItoring aNd predIction – Kista Case

Graduate Research Assistant, 09/2019~06/2023
University of Maryland, College Park (PI's: Paul Schonfeld, Lei Zhang, Chenfeng Xiong)

- INFORM AFRICA: Integrated Modeling of Mobility and Epidemiology in South Africa and Nigeria, 2021~2022 (NIH)
- Next Generation National Household Travel Survey Origin-Destination Data Program,

2021~2022 (FHWA)

- ATCMTD: Deployment of Personalized and Dynamic Travel Demand Management Technology in the Washington D.C.-Baltimore, MD-Richmond, VA Megaregion, 2020~Present (USDOT)
- University of Maryland COVID-19 Impact Analysis Platform (data.covid.umd.edu), 2020~2021 (USDOT, NSF)
- Evaluate the Impact of Express Toll Lanes in Maryland with Advanced Travel Demand and Dynamic Traffic Assignment Models, 2019~2020 (MDOT SHA)
- incenTrip APP: Personalized and Real-Time Traveler Incentives (incentrip.org), 2019~Present (USDOE, USDOT, MDOT)

Graduate Research Assistant, 09/2016~06/2019
Tongji University (PI's: Hangfei Lin, Xiaohong Chen, Peng Chen)

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

Research Assistant, 09/2015~06/2016
Huazhong University of Science & Technology (PI: Li Duan)

- Pedestrians Flow Simulation Based on the Floor Field Cellular Automata Model for Turnstiles Deployment Optimization in Subway Systems, 2015~2016

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 146 (2023): 103962.
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. **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.

6. **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.
7. **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.
8. **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.
9. **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.
10. 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.
11. 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.
12. 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.
13. **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.
14. **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.
15. 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.
16. **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. 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.
5. 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.
6. **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.
7. **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.
8. 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.
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 Board 100th Annual Meeting (2021), Washington DC.
10. 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.
11. 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.
12. **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.
13. **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.
14. 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.
15. **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).

16. **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 PAPERS/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. (Intended for 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. (Intended for 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 for 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 for Brain, Behavior, and Immunity)

TEACHING EXPERIENCE

Teaching Assistant

Tongji University, Shanghai, China

- Sustainable Transportation, Fall 2018, Graduate Course
- Travel Behavior Analysis and Discrete Choice Models, Spring 2019, Graduate Course

Teaching Assistant

University of Maryland, College Park, MD, USA

- Introduction to Transportation Engineering and Planning, Fall 2022, Undergraduate Course

SERVICE TO PROFESSION

Journal Article Reviewer (Selected)

- Accident Analysis and Prevention
- Cambridge Journal of Regions, Economy and Society
- Cities
- IEEE Access
- International Journal of Transportation Science and Technology
- Geo-spatial Information Science
- Journal of Planning Education and Research
- Journal of Transport Geography
- Journal of Transport and Land Use
- Journal of Advanced Transportation
- PLOS One
- Regional Studies

- Sustainable Cities and Society
- Scientific Reports
- Transportation Research Part B: Methodological
- Transportation Research Part D: Transport and Environment
- Transport Policy
- Traffic Injury Prevention
- Travel Behavior and Society
- Transportation Letters
- Transportation Research Record

Conference Proceeding Reviewer

- 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

ADDITIONAL EXPERIENCE

Research Scientist Intern, 09/2018 ~02/2019
Shanghai Electric Vehicle Public Data Collecting, Monitoring, and Research Center, Shanghai, China

Research Scientist Intern, 11/2017~06/2018
Evcard, Shanghai International Automobile City (Group) Co., Ltd., Shanghai, China

Traffic Engineer Intern, 08/2017~10/2017
Shenzhen Urban Transport Planning Center Co., Ltd., Shenzhen, China

Traffic Engineer Intern, 08/2017~10/2017
Wuhan Transport Planning&Design Co., Ltd., Wuhan, China

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

SKILLS

Programming:
Python (pandas, numpy, pytorch, sklearn), **R** (dplyr, ggplot2, car, lavaan, mgcv, spdep), **SQL** (MySQL, pgAdmin, Impala, Oracle), **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**

ML/DL/AI:

Machine learning (RF, XGBoost, LightGBM), **Explainable AI** (SHAP, PDP, ALE), **Deep learning** (FNN, CNN, (Attention) RNN, Transformer, (Temporal) Graph NN)

Spatial analysis:

ArcGIS, QGIS, Geopandas, NetworkX, igraph, OSMnx

Traffic simulation:

Vissim, AnyLogic, TransCAD, DTALite

Updated by 05/2023