

Zhe-wei (Jacky) LIU

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EDUCATION

Ph.D in Geographical Information Science, The Hong Kong Polytechnic University

Thesis Topic: Semantic, Spatial and Temporal Modelling of Geotagged Social Media Data for Desirable Region and Event Detection, 08.2016-09.2021
Supervised by Prof. Wenzhong Shi and Prof. Geoffery Shen

B.S. in Remote Sensing and Geographical Information Science, Wuhan University

GPA 3.65/4.0, Average Score 89.5/100, Ranking: 1/70 09.2011-06.2015

PROFESSIONAL APPOINTMENTS AND EXPERIENCES

Postdoctoral Researcher, Texas A&M University 12.2022-date

Research Associate, The Hong Kong Polytechnic University 01.2022-10.2022

Research Assistant, The Hong Kong Polytechnic University 02.2021-12.2021

RESEARCH INTEREST

GeoAI, environmental justice, urban resilience, human mobility, spatial big data analytics

COMPUTER SKILLS

Programming Languages: Python, SQL, Matlab, C/C++, C#, Javascript
Code Library: Pytorch, Keras, Scikit-learn, Numpy, Pandas, OpenCV, ArcObjects
Skills: machine learning, large-scale database, complex network analysis, Git

PUBLICATIONS

- Liu, Z.**, Liu, J., Huang, X., Zhang, E., & Chen, B. (2022). Measuring Chinese cities' economic development with mobile application usage. *Journal of Geographical Sciences*, 32(12), 2415-2429. <https://doi.org/10.1007/s11442-022-2054-x>
- Liu Z**, Shi W*, et al.. (2022) A LSTM-based approach for modelling the movement uncertainty of indoor trajectories with mobile sensing data. *International Journal of Applied Earth Observation and Geoinformation*, 108 <https://doi.org/10.1016/j.jag.2022.102758>
- Liu Z**, Wang A*, Chan Ed, et al. (2022) Categorisation of cultural tourism attractions by tourist preference using location-based social network data: The case of Central, Hong Kong. *Tourism Management*, 90. <https://doi.org/10.1016/j.tourman.2022.104488>
- Liu, Z.**, Shi, W., & Zhang, A. (2021). Detecting home countries of social media users with machine-learned ranking approach: A case study in Hong Kong. *Applied Geography*, 134, 102532. <https://doi.org/10.1016/j.apgeog.2021.102532>
- Liu, Z.**, Zhang, A., Yao, Y., Shi, W., Huang, X., & Shen, X. (2021). Analysis of the performance and robustness of methods to detect base locations of individuals with geo-tagged social media data. *International Journal of Geographical Information Science*, 35(3), 609-627. <https://doi.org/10.1080/13658816.2020.1847288>
- Shi, W., **Liu, Z***, An, Z., & Chen, P. (2021). RegNet: a neural network model for predicting regional desirability with VGI data. *International Journal of Geographical Information Science*, 35(1), 175-192. (**corresponding author**, with supervisor being first author). <https://doi.org/10.1080/13658816.2020.1768261>
- Liu, Z.**, Zhou, X., Shi, W., & Zhang, A. (2019). Recommending attractive thematic regions by semantic community detection with multi-sourced VGI data. *International Journal of Geographical Information Science*, 33(8), 1520-1544. <https://doi.org/10.1080/13658816.2018.1563298>
- Liu, Z.**, Zhou, X., Shi, W., & Zhang, A. (2018). Towards detecting social events by mining geographical patterns with VGI data. *ISPRS International Journal of Geo-Information*, 7(12), 481. <https://doi.org/10.3390/ijgi7120481>
- Shi, W., Yu, Y., **Liu, Z.**, Chen, R., & Chen, L. (2022). A deep-learning approach for modelling pedestrian movement uncertainty in large-scale indoor areas. *International Journal of Applied Earth Observation and Geoinformation*, 114, 103065. <https://doi.org/10.1016/j.jag.2022.103065>
- Huang, X., Wang, S., Zhang, M., Hu, T., Hohl, A., She, B., ... & **Li, Z.** (2022). Social media mining under the COVID-19 context: Progress, challenges, and opportunities. *International Journal of Applied Earth Observation and Geoinformation*, 113, 102967. <https://doi.org/10.1016/j.jag.2022.102967>

- Fu, W., Shao, P., Dong, T., & **Liu, Z.** (2022). Novel Higher-Order Clique Conditional Random Field to Unsupervised Change Detection for Remote Sensing Images. *Remote Sensing*, 14(15), 3651. <https://doi.org/10.3390/rs14153651>
- Shen, X., Shi, W., **Liu, Z.**, Zhang, A., Wang, L., & Zeng, F. (2022). Extracting Human Activity Areas from Large-Scale Spatial Data with Varying Densities. *ISPRS International Journal of Geo-Information*, 11(7), 397. <https://doi.org/10.3390/ijgi11070397>
- Shi, W. Z., Zeng, F., Zhang, A., Tong, C., Shen, X., **Liu, Z.**, & Shi, Z. (2022). Online public opinion during the first epidemic wave of COVID-19 in China based on Weibo data. *Humanities and Social Sciences Communications*, 9(1), 1-10. <https://www.nature.com/articles/s41599-022-01181-w>
- Zhang, A., Shi, W., Tong, C., Zhu, X., Liu, Y., **Liu, Z.**, ... & Shi, Z. (2022). The fine-scale associations between socioeconomic status, density, functionality, and spread of COVID-19 within a high-density city. *BMC Infectious Diseases*, 22(1), 1-22. <https://link.springer.com/article/10.1186/s12879-022-07274-w>
- Shen, X., Shi, W., Chen, P., **Liu, Z.**, Wang, L. (2022) Novel model for predicting individuals' movements in dynamic regions of interest. *GIScience & Remote Sensing* <https://doi.org/10.1080/15481603.2022.2026637>
- Zhan, Z., Shi, W., Zhang, M., **Liu, Z.**, Peng, L., Yu, Y., & Sun, Y. (2022). Landslide Trail Extraction Using Fire Extinguishing Model. *Remote Sensing*, 14(2), 308. <https://doi.org/10.3390/rs14020308>
- Shao, P., Yi, Y., **Liu, Z.**, Dong, T., Ren, D. (2022). Novel Multiscale Decision Fusion Approach to Unsupervised Change Detection for High-Resolution Images. *IEEE Geoscience and Remote Sensing Letters* <https://doi.org/10.1109/LGRS.2022.3140307>
- Shao, P., Shi, W., **Liu, Z.**, & Dong, T. (2021). Unsupervised Change Detection Using Fuzzy Topology-Based Majority Voting. *Remote Sensing*, 13(16), 3171 <https://doi.org/10.3390/rs13163171>
- Yao, Y., Shi, W., Zhang, A., **Liu, Z.**, & Luo, S. (2021). Examining the diffusion of coronavirus disease 2019 cases in a metropolis: a space syntax approach. *International Journal of Health Geographics*, 20(1), 1-14 <https://doi.org/10.1186/s12942-021-00270-4>
- Huang, X., Lu, J., Gao, S., Wang, S., **Liu, Z.**, & Wei, H. (2021). Staying at Home Is a Privilege: Evidence from Fine-Grained Mobile Phone Location Data in the United States during the COVID-19 Pandemic. *Annals of the American Association of Geographers*, 1-20. <https://doi.org/10.1080/24694452.2021.1904819>
- Wang, A., Zhang, A., Chan, E. H., Shi, W., Zhou, X., & **Liu, Z.** (2021). A review of human mobility research based on big data and its implication for smart city development. *ISPRS International Journal of Geo-Information*, 10(1), 13. <https://doi.org/10.3390/ijgi10010013>

Chen, P., Shi, W., Zhou, X., **Liu, Z.**, & Fu, X. (2019). STLP-GSM: a method to predict future locations of individuals based on geotagged social media data. *International Journal of Geographical Information Science*, 33(12), 2337-2362
<https://doi.org/10.1080/13658816.2019.1630630>

PAPERS UNDER REVIEW

Yu, Y., **Liu, Z.***, Chen, Rui. Towards Wide-area Indoor Positioning: An Enhanced Wi-Fi/BLE/QR/MEMS Sensors Integration Approach. *IEEE Transactions on Instrumentation & Measurement* (major revision) (corresponding author)

PATENTS

Shi W, **Liu Z.** Regional attraction assessment method and device. ZL 201910436416.0

Shi W, **Liu Z.** Method for predicting target area based on social media sign-in, terminal and storage medium. ZL 202011358914.7

Shi W, Wang M, **Liu Z.** Camera internal reference and camera relative laser radar external reference calibration method and electronic equipment. ZL 202110023285.0

Shi W, **Liu Z.** Regional attraction evaluation method and device. ZL 201910715730.2

GRANTS&FUNDINGS

External

Home country detection of social media users based on machine-learned ranking, Open Research Funding, LIESMARS, China, RMB 50,000, **PI**. 01.2022-12.2023

Convolutional Network Frameworks for Spatial Regression (*under review*), General Research Funding, University Grants Committee, Hong Kong, HKD 1,083,600, **Co-I and leading writer** 01.2023-12.2025

Internal

Postdoc Matching Fund (to support excellent Postdoc researcher with special University funding), The Hong Kong Polytechnic University, Hong Kong, China, HKD 364,054, **Funding Receiver**. 01.2022-12.2023

RESEARCH PROJECT

“Three-dimensional perception of urban agglomerations and data governance technology”, National Key R&D Program funded by Ministry of Science and Technology, P.R. China
2020- present

Core researcher and developer

- Model the patterns of human mobility and evaluate the results’ uncertainty using multi-sourced flow data, using Python libraries Scikit-learn, Numpy, Pandas.
- Data governance strategies are proposed to maintain the consistence and interoperability of heterogeneous data sources.

“Collaborative computation for multi-source geographic big flow data”, funded by Ministry of Science and Technology, P.R. China 2018-2020

Core researcher and developer

- Develop a series of novel indicators to quantify the irregular human movement, with Python and ArcGIS
- Detect events by investigating the irregular patterns of the tracked human mobility using the Extreme Studentized deviate (ESD) statistical test.

“Urban big data analytics for spatiotemporal human activity modeling and prediction”, funded by the Hong Kong Polytechnic University 2016-2018

Core researcher and developer

- A novel indicator is proposed to quantify the attractiveness of the urban regions with human mobility (location-based social network)
- A novel deep learning framework RegNet is proposed, using Python library Tensorflow, Keras, for predicting the attractiveness of the urban regions.

“Monitoring of the Evolution of Urbanization of Dongguan”, funded by Department of Land and Resources of Guangdong Province, P.R. China 2014-2015

Core researcher and developer

- Evaluate urbanization of Dongguan city and develop a comprehensive software by leveraging C#, ArcObjects, and Oracle, for urbanization monitoring with geospatial features.

TEACHING EXPERIENCE

Teaching Assistant, The Hong Kong Polytechnic University

Urban Informatics (LSGI545, 3 credits, 128 master students enrolled) 01.2022-03.2022

This course provides a hands-on introduction to the tools, technologies, and practical approaches used to organize and analyze urban data. It enables students to apply the theories and concepts of urban science to a variety of practical issues in urban planning and Smart City development; utilize their knowledge of the theories, methods, and tools of urban science and informatics better understand cities and inform Smart City planning and development. The Teaching Assistant are responsible for conducting tutorial, introducing the latest advancements of smart cities, and teaching the usage of agent-based-model software NetLogo.

Principles of GIS (LSGI521, 3 credits, 107 master students enrolled) 09.2021-11.2021

This subject is to provide students with an understanding of the theory embodied in spatial information systems in terms of spatial data modeling; spatial data structures; data analysis techniques; visualization and presentation, and an understanding of the flow of data and its various transformations from raw data collection to result presentation. The Teaching Assistants are responsible for conducting lecture and lab tutorial, introducing components of GIS, spatial data models, data management, spatial analysis, GIS applications, and hands-on experience on ArcGIS Pro.

Research Frontiers in Construction and Environment (CE603, 3 credits, 105 doctoral students enrolled) 11.2019

This subject is intended to provide students with: a good understanding of the research foci and achievements of the Faculty and its constituent departments; a broad perspective of key research issues in the broad field of construction and environment; general knowledge of the current status and future challenges of key research areas of FCE and their relationship with the student's own research. The Teaching Assistants are responsible for conducting lecture and lab tutorial, introducing geographic data capturing, management, visualization, processing and applications.

Hydrographic Surveying (LSGI3350A, 3 credits, 87 undergraduates enrolled) 12.2016

This subject introduces the technology of Hydrographic Surveying to students. Its purpose is to provide the necessary knowledge and practical instrument operational and data processing skills needed for them to confidently accomplish a bathymetric survey in the real world (at water area near Sai Kung, Hong Kong) during field camp at the conclusion of the course. This subject also aims to develop students' critical and creative thinking, as well as cooperative attitudes & behavior of working with others. The Teaching Assistants are responsible for conducting lab tutorial and field camp, teaching the use of total station, and CAD software.

INVITED TALKS&PRESENTATIONS

- **Liu Z.** Research Innovation on Human Mobility Modelling, Clemson University, Nov 2022, Online
- **Liu Z.** Human Mobility and Research Experience Sharing, Northwestern Polytechnical University, Nov 2022, Online
- **Liu Z.** Market Segmentation and Chinese Economy Forecasting with Spatial Big Data, Guangzhou University, May 2022, Online
- **Liu Z.** Attractive Region Detection and Recommendation with Geotagged Social Media Data, Wuhan University of Technology, April 2022, Online
- **Liu Z.** Artificial Intelligence on Geospatial Big Data Analytics, International Young Scholar Research Forum, Tongji University, March 2022, Online
- **Liu Z.** Spatial Big Data Analytics and Human Mobility Modelling, Hohai University, September 2021, Online
- **Liu Z.** Location Recommendation and Event Detection with Large-scale Human Mobility Data, China University of Geosciences (Wuhan), May 2021, Online

- **Liu Z.** Semantic, Spatial and Temporal Modelling with Multi-sourced Spatial Big Data, East China Normal University, April 2021, Online

AWARDS & HONORS

- Outstanding Graduates of Wuhan University, 2015 (10%)
- Annual Outstanding Students of Wuhan University, three times (2012, 2013, 2014) (10%)
- Second Honor Scholarship of Wuhan University, twice (2013, 2014) (10%)
- Xijie Special Scholarship, 2012
- First Honor Scholarship of Wuhan University, 2012 (2%)

LANGUAGES

Mandarin: Native

English: Professional Proficiency, **GRE:** 329/340

Cantonese: Elementary Proficiency

SERVICE

Co-founder/Coordinator of Taibai Reading Club, the Hong Kong Polytechnic University 2017-Present

Journal Reviewer:

- IEEE Transactions on Image Processing
- Frontiers in Public Health
- Environment and Planning B: Urban Analytics and City Science
- Computational Social Science
- Environment, Development and Sustainability
- Trends in Computer Science and Information Technology
- Forests
- Tropical Medicine and Infectious Disease
- Sustainability

Conference Reviewer:

- Geoinformatics 2022 (CPGIS 30th Anniversary) International Conference

Student SUPERVISION

Tyler Felton, Predicting urban fast flood risk with environmental Features, using boosted decision tree
10.2022-12.2022