



*Geography, Environment and Society
College of Liberal Art*

DI ZHU

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Education

Ph.D., Peking University . <i>Cartology and Geographic Information Science</i>	2020
Modelling and Analyzing Geospatial Distributions with Artificial Neural Networks	
B.S., Peking University . <i>Geographic Information Systems</i>	2014
An Incremental Map-Matching Method Based on Road Network Topology	
B.A., Peking University . <i>Economics</i>	2014

Positions/Employment

University of Minnesota, Twin Cities

<i>Assistant Professor</i> , Department of Geography, Environment and Society (GES) (Start date delayed to Sep. 1, 2021, due to the COVID-19 pandemic)	2020 - Present
<i>Faculty Member</i> , Minnesota Population Center	2021 - Present

University College London

<i>Visiting Lecturer</i> , SpaceTimeLab, Civil Environmental & Geomatic Engineering	2018 - 2019
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Peking University

<i>Research Assistant</i> , School of Earth and Space Sciences	2016 - 2020
<i>Research Assistant</i> , Geosoft Lab	2017 - 2018
<i>Teaching Assistant</i> , School of Earth and Space Sciences:	2015 - 2018
<i>Data Visualization Technician</i> , Geosoft Lab	2013 - 2013
<i>RS, GIS & GPS Practice Intern</i> , School of Earth and Space Sciences:	2012

Beijing GeekArt Technology Co. Ltd.

<i>Chief Product Officer</i>	2018- 2020
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Beijing LongRuan Technology Co. Ltd

<i>Software Engineer Intern</i>	2015
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RESEARCH, SCHOLARSHIP, AND CREATIVE WORK

Publications

Asterisk(*) - indicates the corresponding author

Sharp(#) - indicates co-senior author

Underline - indicates student author

Refereed Journal Articles

- Chen, T., **Zhu, D.**, Cheng, T., Gao, X., & Chen, H. (2023). Sensing dynamic human activity zones using geo-tagged big data in Greater London, UK during the COVID-19 pandemic. *PloS one*, 18(1), e0277913.
- Luo, P., Song, Y., **Zhu, D.**, Cheng, J., Meng, L. (2022). A Generalized Heterogeneity Model for Spatial Interpolation. *International Journal of Geographical Information Science*, 1-26.
- Chen, T., Bowers, K., **Zhu, D.***, Gao, X., Cheng, T. (2022). Spatio-temporal stratified associations between urban human activities and crime patterns: a case study in San Francisco around the COVID-19 stay-at-home mandate. *Computational Urban Science*, 2(1): 1-12.
- Zhang, Y., Yu, W., & **Zhu, D.** (2022). Terrain feature-aware deep learning network for digital elevation model superresolution. *ISPRS Journal of Photogrammetry and Remote Sensing*, 189, 143-162.
- Zhu, D.***, Liu, Y., Yao, X., & Fischer, M. M. (2021). Spatial regression graph convolutional neural networks: A deep learning paradigm for spatial multivariate distributions. *GeoInformatica*, 1--32.
- Huang, X., **Zhu, D.**, Zhang, F., Liu, T., Li, X., & Zou, L. (2021). Sensing population distribution from satellite imagery via deep learning: Model selection, neighboring effects, and systematic biases. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 14, 5137--5151.
- Zhu, D.***, Ye, X., & Manson, S. (2021). Revealing the spatial shifting pattern of COVID-19 pandemic in the United States. *Scientific reports*, 11(1), 8396.
- Xing, X., Huang, Z., Cheng, X., **Zhu, D.**, Kang, C., Zhang, F., & Liu, Y. (2020). Mapping human activity volumes through remote sensing imagery. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 13, 5652--5668.
- Sari Aslam, N., **Zhu, D.**, Cheng, T., Ibrahim, M. R., & Zhang, Y. (2020). Semantic enrichment of secondary activities using smart card data and point of interests: a case study in London. *Annals of GIS*, 27(1), 29--41.
- Yao, X., Gao, Y., **Zhu, D.**, Manley, E., Wang, J., & Liu, Y. (2020). Spatial origin-destination flow imputation using graph convolutional networks. *IEEE Transactions on Intelligent Transportation Systems*, 22(12), 7474--7484.
- Wang, Y., **Zhu, D.**, Yin, G., Huang, Z., & Liu, Y. (2020). A unified spatial multigraph analysis for public transport performance. *Scientific Reports*, 10(1), 1--9.
- Wu, L., Cheng, X., Kang, C., **Zhu, D.**, Huang, Z., & Liu, Y. (2020). A framework for mixed-use decomposition based on temporal activity signatures extracted from big geo-data. *International Journal of Digital Earth*, 13(6), 708--726.
- Zhang, F., Zu, J., Hu, M., **Zhu, D.**, Kang, Y., Gao, S., Zhang, Y., & Huang, Z. (2020). Uncovering inconspicuous places using social media check-ins and street view images. *Computers, Environment and Urban Systems*, 81, 101478.
- Zhu, D.**, Zhang, F., Wang, S., Wang, Y., Cheng, X., Huang, Z., & Liu, Y. (2020). Understanding

- place characteristics in geographic contexts through graph convolutional neural networks. *Annals of the American Association of Geographers*, 110(2), 408--420.
- Liu, Y., Yao, X., Gong, Y., Kang, C., Shi, X., Wang, F., ... **Zhu, D.**, & Zhu, X. (2020). Analytical methods and applications of spatial interactions in the era of big data. *Acta Geographica Sinica*, 75(7), 1523-1538.
- Chen, L., Gao, Y., **Zhu, D.**, Yuan, Y., & Liu, Y. (2019). Quantifying the scale effect in geospatial big data using semi-variograms. *PloS one*, 14(11), e0225139.
- Zhang, F., Wu, L., **Zhu, D.**, & Liu, Y. (2019). Social sensing from street-level imagery: A case study in learning spatio-temporal urban mobility patterns. *ISPRS Journal of Photogrammetry and Remote Sensing*, 153, 48--58.
- Zhu, D.**, Cheng, X., Zhang, F., Yao, X., Gao, Y., & Liu, Y. (2019). Spatial interpolation using conditional generative adversarial neural networks. *International Journal of Geographical Information Science*, 34(4), 735-758.
- Yao, X., Wu, L., **Zhu, D.**, Gao, Y., & Liu, Y. (2019). Visualizing spatial interaction characteristics with direction-based pattern maps. *Journal of Visualization*, 1--15.
- Zhang, S., **Zhu, D.***, Yao, X., Cheng, X., He, H., & Liu, Y. (2018). The scale effect on spatial interaction patterns: An empirical study using taxi OD data of Beijing and Shanghai. *IEEE Access*, 6, 51994--52003.
- Zhu, D.***, & Liu, Y. (2018). Modelling irregular spatial patterns using graph convolutional neural networks. *arXiv preprint arXiv:1808.09802*.
- Yao, X., **Zhu, D.**, Gao, Y., Wu, L., Zhang, P., & Liu, Y. (2018). A stepwise spatio-temporal flow clustering method for discovering mobility trends. *IEEE Access*, 6, 44666--44675.
- Zhu, D.**, Huang, Z., Shi, L., Wu, L., & Liu, Y. (2018). Inferring spatial interaction patterns from sequential snapshots of spatial distributions. *International Journal of Geographical Information Science*, 32(4), 783--805.
- Liu, Y., Zhan, Z., **Zhu, D.**, Chai, Y., Ma, X., & Wu, L. (2018). Incorporating Multi-source Big Geo-data to Sense Spatial Heterogeneity Patterns in Urban Space. *GEOMATICS AND INFORMATION SCIENCE OF WUHAN UNIVERS*, 43(3), 327--335.
- Zhu, D.**, Wang, N., Wu, L., & Liu, Y. (2017). Street as a big geo-data assembly and analysis unit in urban studies: A case study using Beijing taxi data. *Applied Geography*, 86, 152--164.
- Zhu, D.***, & Liu, Y. (2017). An incremental map-matching method based on road network topology. *GEOMATICS AND INFORMATION SCIENCE OF WUHAN UNIVERS*, 42(1), 77--83.

Conference Proceedings

- Zhu, D.***, Gao, S., Cao, G. (2022) Towards the Intelligent Era of Spatial Analysis and Modeling. (Proceedings of The 5th ACMSIGSPATIAL International Workshop on AI for Geographic Knowledge Discovery (GeoAI '22), Nov., Seattle, WA, United States)
- Luo, P., & **Zhu, D.*** (2022) Sensing overlapping geospatial communities from human movements using graph affiliation generation models. (Proceedings of The 5th ACMSIGSPATIAL International Workshop on AI for Geographic Knowledge Discovery (GeoAI '22), Nov., Seattle, WA, United States)
- Wang, Y., & **Zhu, D.*** (2022) SHGCN: A hypergraph-based deep learning model for spatiotemporal traffic flow prediction. (Proceedings of The 5th ACMSIGSPATIAL

- International Workshop on AI for Geographic Knowledge Discovery (GeoAI '22), Nov., Seattle, WA, United States)
- Zhang, W., Ma, Y., **Zhu, D.**, Dong, L., & Liu, Y. (2022) *MetroGAN: Simulating Urban Morphology with Generative Adversarial Network*. (Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 2022), Aug., Washington DC, United States)
- Zhu, D.***, Liu, Y., Yao, X., & Fischer, M.M. (2022). *Spatial Regression Graph Neural Networks*. (American Association of Geographers Annual Meeting 2022, Feb. 26, Virtual (AAG 2022))
- Chen, T., & **Zhu, D.*** (2021) *The Spatio-temporal stratified association between human activities and crime patterns during the COVID-19 stay-at-home mandate*. (Proceedings of the 2021 ACM SIGSPATIAL China Annual Conference on Space Intelligence (SpatialDI 2021), Apr., Hangzhou, China) [Accepted.:2021]
- Chen, T., Cheng, T., & **Zhu, D.** (2021). *The exploration of human activity zones using geo-tagged big data during the COVID-19 first lockdown in London, UK*. (Proceedings of the 29th Conference on GIS Research UK, Apr. 13-16 2021, Cardiff University, United Kingdom)
- Soundararaj, B., & **Zhu, D.** (2019) *Estimating pedestrian flow from footfall counts using Geo-propagation*. (2019 Annual Conference on Complex Systems (CCS 2019), Sep. 30 - Oct. 4, Singapore) [Accepted.:2019]
- Zhu, D.***, Zhang, F., Cheng, X., & Liu, Y. (2019). *Spatial interpolation based on conditional generative adversarial neural networks*. (American Association of Geographers Annual Meeting 2019, Apr. 3-7, Washington, DC, United States (AAG 2019))
- Wang, Y., **Zhu, D.**, Yin, G., Huang, Z., & Liu, Y. (2019). *Investigating local travel speed with spatial network structures and properties*. (Proceedings of the 2nd International Conference on Urban Informatics, June 24-26, Hong Kong, China (ICUI 2019))
- Zhu, D.***, Cheng, T., & Liu, Y. (2019). *Geo-propagation from Incomplete Spatial Distribution Data: A Case Study of House Price Estimation*. (Proceedings of the 27th Conference on GIS Research UK, Apr. 23-26, Newcastle upon Tyne, United Kingdom).
- Zhu, D.***, & Liu, Y. (2018). *Modelling spatial patterns using graph convolutional networks*. (Proceedings of the 10th International Conference on Geographic Information Science (GIScience 2018), Aug. 28-31, Melbourne, Australia)
- Xing, X., **Zhu, D.**, Cheng, X., & Liu, Y. (2018). *Population mapping based on deep features of remote sensing imagery*. (Proceedings of the 26th International Conference on Geoinformatics, June 28-30, Kunming, China)
- Chen, L., **Zhu, D.**, & Liu, Y. (2018). *Quantify the scale effect in geospatial big data using semi-variograms*. (Proceedings of the 26th International Conference on Geoinformatics, June 28-30, Kunming, China)
- Zhu, D.**, Shi, L., Wang, Y., Cheng, X., & Liu, Y. (2017). *Infer spatial interaction patterns from spatial distributions*. (Proceedings of the 25th International Conference on Geoinformatics, Aug. 2-4, Buffalo, United States)
- Zhu, D.**, Wang, N., & Liu, Y. (2016). *Street perspective: a novel spatial unit in urban social sensing*. (Proceedings of the 17th International Symposium on Spatial Data Handling (SDH), Aug. 18-20, Beijing, China)
- Zhu, D.**, & Liu, Y. (2016). *The distance effect in spatial interaction and spatial similarity: a big data view of Tobler's First Law*. (Proceedings of the 33rd International Geographical Congress (IGC 2016), Aug. 21-23, Beijing, China)

Books and Book Chapters

- Zhu, D.***, & Cao, G. (2023). Intelligent Spatial Prediction and Interpolation Methods. In Handbook of Geospatial Artificial Intelligence (GeoAI). CRC Press/Taylor & Francis Group (Forthcoming).
- Zhu, D.***, & Hu, Y. (2022). Artificial Intelligence. In Concise Encyclopedia of Human Geography. Edward Elgar Publishing. (<https://www.e-elgar.com/shop/usd/concise-encyclopedia-of-human-geography-9781800883482.html>)

Invited Presentations, Posters, and Exhibits

Underline - indicates advised student as the presenter

Keynote/Plenary Address

- Zhu, D.** "Intelligent spatial prediction: Rethinking geospatial modeling in the era of GeoAI," Annual Conference of Geomatics and GIScience Central South University, China. (December 26, 2020). *Invited*.

Guest Lecture

- Zhu, D.** "Inferring national migration flows from sequential population snapshots," Geospatial Seminar Department of Civil Environmental & Geomatic Engineering, University College London. (February 21, 2019). *Invited*.
- Zhu, D.** "Intelligent Sensing of Urban Space in Street Perspective," Intelligent Transportation Systems Course Institute of Remote Sensing and GIS, PKU. (October 17, 2017). *Invited*.

Invited Public Talk

- Zhu, D.** "Revealing the flow patterns underlying spatial distribution snapshots", Humanistic GIS Lab, Department of Geography, University of Washington, Seattle. (Oct 31, 2022). *Invited*.
- Zhu, D.** "Network-based GeoAI analytics," Research Seminar at the Chair of Cartography and Visual Analytics, School of Engineering and Design/Department of Aerospace and Geodesy, Technical University Munich. (July 21, 2022). *Invited*.
- Zhu, D.** "Intelligent spatial prediction in incomplete-data scenarios," GeoAI Research Seminar Discussion Knowledge Computing Lab, Department of Computer Science & Engineering, University of Minnesota. (December 16, 2021). *Invited*.
- Zhu, D.** "Inferring spatial interaction pattern from spatial distribution snapshots," China Data Lab 2021 Workflow Webinar Wuhan University & Harvard University. (June 18, 2021). *Invited*.
- Zhu, D.** "Intelligent spatial understanding: representation, modeling and prediction," CPGIS 2021 GeoAI Seminar Series China University of Geosciences. (May 9, 2021). *Invited*.
- Zhu, D.** "Linkages between Spatial Regression and Graph Neural Networks," The 5th GIScience Symposium Peking University, Beijing Normal University, and Chinese Academy of Science. (April 17, 2021). *Invited*.
- Zhu, D.** "Spatial prediction using black-box models," SpaceTimeLab Research Discussion SpaceTimeLab, University College London. (Oct 12, 2018). *Invited*.

Posters or Exhibitions

- Zhu, D.** "About spatial heterogeneity patterns," Poster Presentation in Academic Star Competition, School of Earth and Space Sciences, Peking University, Beijing, China. (Feb 26, 2017)
- Zhu, D.** "A map visualization of the air quality index in china," ChinaVis Data Challenge at the 3rd China Visualization and Visual Analytics Conference (ChinaVis 2016), Changsha, China

(July 23, 2016)

Grants, Awards, Gifts, or Endowment Earnings (Internal Sources)

Sensing Geospatial Communities in Mobility Networks: How Human Movements Drive Dynamic Community Structures within the Twin Cities Metro Area

PI, \$43,757; Faculty Interactive Research Program, Center for Urban & Regional Affairs (CURA)
July 1, 2022 – July 1, 2023

Intelligent Spatial Models and Analytical Methods

PI, \$100,000; Start-up Fund; College of Liberal Arts, University of Minnesota
September 1, 2021 – Present

Grants, Contract, Awards (External Sources)

National Spatiotemporal Population Research Infrastructure: 2R01HD057929-11

Collaborative Researcher; National Institutes of Health, Eunice Kennedy Shriver National Institute of Child Health and Human Development
September 9, 2020 – 2021

Modelling spatial heterogeneity and spatial interactions from the big geo-data perspective: 201806010077

PI, £16,200; China Scholarship Council (CSC) Funding
October 1, 2018 - October 1, 2019

Geo-spatial models and analytical methods: 41625003

Research Assistant; National Natural Science Fund for Distinguished Young Scholars
January 2017 - July 2020

Theoretical and analytical methods of spatial interaction networks in geospatial big data: 41830645

Research Assistant; The Major Program of the National Natural Science Foundation of China
January 2019 - January 2021

Multi-sensing of urban locations with big geo-data: 2017YFB0503602

Research Assistant; National Key Research and Development Program of China
July 2017 - July 2020

Investigating human mobility pattern based on massive spatio-temporal data: 41271386

Research Assistant; National Natural Science Foundation of China
January 2013 - December 2016

Honors and Scholarships

Distinction of Doctoral Thesis, Peking University 2020

Excellent Graduates, Peking University 2020

China National Scholarship, Ministry of Education, P. R. China 2019

Early Career Scholarship, GIS Research UK 2019

Travel Award AAG, Applied Geography Speciality Group 2019

Presidential Fellowship, Peking University 2018

Rising Star Award, College GIS Forum (CGF), China 2018

Tang Lixin Scholarship, Peking University 2017

Founder Scholarship, Peking University 2012

54 Scholarship, Peking University 2011

TEACHING AND CURRICULUM DEVELOPMENT

University of Minnesota

GEOG 3531/5531 Numerical Spatial Analysis	2021 - Present
<i>Chief Instructor</i>	
GEOG 8980 Topics: Geography - Seminar in Geospatial Artificial Intelligence	2022 - Present
<i>Chief Instructor</i>	
GIS 8990 Research Problems in GIS	2022 - Present
<i>Chief Instructor</i>	
GEOG 5900 Topics: Geography - Advanced Spatial Analysis	2024 - Present
<i>Chief Instructor</i>	

Peking University

04831410: Introduction to Computation	2016 - 2018
<i>Teaching Assistant</i>	
01213660: Intelligent Transportation Systems	2017
<i>Guest Lecturer</i>	
01213610: GIS Algorithms and Applications	2016 - 2017
<i>Teaching Assistant</i>	
01235080: Geo-mathematical Models	2015
<i>Teaching Assistant</i>	

University College London

CEGE 0097: Spatial Analysis and Geocomputation	2019
<i>Guest Lecturer, Tutor</i>	

ADVISING AND MENTORING

Graduate Student Activities

Zhongfu Ma, PhD	Advisor	2022 - Present
Gene (Ziying) Cheng, MGIS	Advisor	Graduated 2022
Xiaohuan Zeng, Geography MS	Committee member	2022 - Present
Tianyi Li, Civil, Environmental, and Geo- Engineering PhD	Committee member	2023 - Present
Zekun Li, Computer Science PhD	Committee member	2021 - Present
Mohsen Ahmadkhani, Geography PhD	Committee member	2021 - Present

SERVICE AND PUBLIC OUTREACH

Service to the Discipline/Profession/Interdisciplinary Area(s)

Editorship/Guest Editorship

Guest Editor	Frontiers in Environmental Science	2022
Guest Editor	Remote Sensing	2022

Journal Reviewing

Transactions in GIS	2022 - Present
Journal of Transport and Land Use	2022 - Present

IEEE Geoscience and Remote Sensing Letters	2022 - Present
Artificial Intelligence in Geosciences	2022 - Present
ISPRS Journal of Photogrammetry and Remote Sensing	2022 - Present
Cartography and Geographic Information Science	2021 - Present
CRC Press - Taylor & Francis Group	2021 - Present
Geomatics and Information Science of Wuhan University	2021 - Present
Humanities and Social Sciences Communications	2021 - Present
International Journal of Applied Earth Observation and Geoinformation	2021 - Present
International Journal of Digital Earth	2021 - Present
ISPRS International Journal of Geo-Information	2021 - Present
Journal of Planning Education and Research	2021 - Present
Stochastic Environmental Research and Risk Assessment	2021 - Present
Annals of the American Association of Geographers	2020 - Present
Cities	2020 - Present
Computational Urban Science	2020 - Present
Geo-spatial Information Science	2020 - Present
Nature Scientific Reports	2020 - Present
Transactions on Spatial Algorithms and Systems	2020 - Present
Applied Geography	2018 - Present
IEEE ACCESS	2018 - Present
IEEE Transactions on Industrial Informatics	2018 - Present
International Journal of Geographical Information Science	2018 - Present
PLOS ONE	2018 - Present
Acta Geodaetica et Cartographica Sinica	2017 - Present
Computers, Environment and Urban Systems	2017 - Present
Spatial Statistics	2016 - Present

Organization of Conferences, Workshops, Panels, Symposia

AAG 2023 Symposium on GeoAI and Deep Learning: Intelligent Geospatial Analytics	Session Chair	2023
AAG 2022 Symposium on Data-Intensive Geospatial Understanding the Era of AI and CyberGIS: GeoAI - Intelligent Geospatial Analytics	Session Chair	2022
The 28th Geographical Information Science Research UK Conference (GISRUK'20)	Session Chair	2020
The 5th International Workshop on AI for Geographic Knowledge Discovery (GeoAI'22)	Program Committee Member	2022
The 4th International Workshop on AI for Geographic Knowledge Discovery (GeoAI'21)	Program Committee Member	2021
The 3th International Workshop on AI for Geographic Knowledge Discovery (GeoAI'19)	Program Committee Member	2019

Service to the University/College/Department

Department

Member, Graduate Education Policy Committee, Department of GES, UMN	2022 - 2023
Member, Coffee Hour Committee, Department of GES, UMN	2022 - 2023
Member, Admissions Committee, Department of GES, UMN	2021 - 2023
Member, Awards Committee, Department of GES, UMN	2021 - 2022
Member, Undergraduate Education Policy Committee, Department of GES, UMN	2021 - 2022

University

Member, Executive Committee, Master of GIS (MGIS) Program, UMN	2022 - Present
Member, Minnesota Population Center (MPC), UMN	2021 - Present

Service to the Professional Organizations

Member, ACM Special Interest Group on Spatial Information (SIGSPATIAL)	2022 - Present
Member, Career Development Committee, International Association of Chinese Professionals in Geographic Information Sciences (CPGIS)	2022 - Present
Member, Association of American Geographers (AAG)	2019 - Present
Member, International Association of Chinese Professionals in Geographic Information Sciences (CPGIS)	2017 - Present