

XIMENG CHENG

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RESEARCH INTERESTS

GIScience, spatio-temporal data mining, explainable artificial intelligence (XAI), GeoAI, social sensing, machine learning, time-series analysis, urban studies, remote sensing, transportation, disaster assessment, forestry.

SKILLS

Programming Related	Python, Jupyter, PyTorch, TensorFlow, C#, SQL, C/C++, Matlab
GIS Related	ArcGIS, QGIS, PostGIS, ENVI, GDAL, OpenStreetMap
Languages	Chinese, English

EDUCATION

Doctor of Natural Science Cartology and GIS, Peking University (PKU) Advisors: Prof. Yu Liu, Prof. Lun Wu	<i>September 2016 - August 2020</i>
Master of Engineering Cartography and Geographic Information Engineering, China University of Geosciences, Beijing (CUGB) Advisor: Prof. Tingyan Xing	<i>September 2013 - June 2016</i>
Bachelor of Science Geographic Information System, China University of Geosciences, Beijing (CUGB)	<i>September 2009 - June 2013</i> GPA: 3.65/4

RESEARCH EXPERIENCE

Postdoc Researcher Applied Machine Learning Group, Artificial Intelligence Department, Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute (HHI)	<i>November 2021 - Present</i>
Parental Leave	<i>December 2023 - May 2024</i>
Postdoc Researcher High Performance Computing (HPC) Group, Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen (GWDG)	<i>August 2021 - October 2021</i>
Research Assistant Institute of Remote Sensing and Geographical Information Systems, Peking University (PKU)	<i>September 2016 - April 2021</i>
Visiting Scholar CyberGIS Center for Advanced Digital and Spatial Studies, Department of Geography and Geographic Information Science, University of Illinois at Urbana-Champaign (UIUC) Advisor: Prof. Shaowen Wang	<i>April 2019 - August 2019</i>
Visiting Graduate Student Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences (CAS) Advisor: Prof. Zhanfeng Shen, Prof. Jiancheng Luo	<i>November 2014 - January 2016</i>

PUBLICATIONS AND PATENTS

Publications (* for corresponding author)

Spatio-temporal data mining & social sensing

1. **Ximeng Cheng***, and Jackie Ma. Global or local modeling for XGBoost in geospatial studies upon simulated data and German COVID-19 infection forecasting. *Scientific Reports*, 15, 8858, 2025.
<https://doi.org/10.1038/s41598-025-92995-6>
2. Jintong Tang, **Ximeng Cheng***, Aihan Liu, Qian Huang, Yinsheng Zhou, Zhou Huang, Yu Liu, and Liyan Xu*. Inferring “high-frequent” mixed urban functions from telecom traffic. *Environment and Planning B: Urban Analytics and City Science*, 23998083231221867, 2023.
<https://doi.org/10.1177/23998083231221867>
3. **Ximeng Cheng***, Zhiqian Wang, Xuexi Yang, Liyan Xu, and Yu Liu. Multi-scale detection and interpretation of spatio-temporal anomalies of human activities represented by time-series. *Computers, Environment and Urban Systems*, 88:101627, 2021.
<https://doi.org/10.1016/j.compenvurbsys.2021.101627>
4. Lun Wu, **Ximeng Cheng**, Chaogui Kang, Di Zhu, Zhou Huang, and Yu Liu*. 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, 2020.
<https://doi.org/10.1080/17538947.2018.1556353>

Explainable artificial intelligence (XAI)

1. **Ximeng Cheng***, Tianqi Wang, Di Zhu, and Jackie Ma. Uncertainty explanation of artificial intelligence models by SHAP. *Knowledge-Based Systems*, under review.
2. **Ximeng Cheng***. Explainable AI applications in GIS. *The Geographic Information Science & Technology Body of Knowledge*, accept.
3. **Ximeng Cheng***, Marc Vischer, Zachary Schellin, Leila Arras, Monique M. Kuglitsch, Wojciech Samek, and Jackie Ma. Explainability in GeoAI. *Handbook of Geospatial Artificial Intelligence*, CRC Press, 177-200, 2024.
<https://doi.org/10.1201/9781003308423-9>
4. **Ximeng Cheng***, Ali Doosthosseini, and Julian Kunkel. Improve the deep learning models in forestry based on explanations and expertise. *Frontiers in Plant Science*, 13:902105, 2022.
<https://doi.org/10.3389/fpls.2022.902105>
5. **Ximeng Cheng**, Jianying Wang, Haifeng Li, Yi Zhang, Lun Wu, and Yu Liu*. A method to evaluate task-specific importance of spatio-temporal units based on explainable artificial intelligence. *International Journal of Geographical Information Science*, 35(10):2002-2025, 2021.
<https://doi.org/10.1080/13658816.2020.1805116>
6. Jesper Sören Dramsch*, Monique M. Kuglitsch, Miguel-Ángel Fernández-Torres, Andrea Toreti, Rustem Arif Albayrak, Lorenzo Nava, Saman Ghaffarian, **Ximeng Cheng**, Jackie Ma, Wojciech Samek, Rudy Venguswamy, Anirudh Koul, Raghavan Muthuregunathan, and Arthur Hraest Essensfelder. Explainability can foster trust in artificial intelligence in geoscience. *Nature Geoscience*, 18:112-114, 2025.
<https://doi.org/10.1038/s41561-025-01639-x>

Other

1. Fan Xia, **Ximeng Cheng**, Zhen Lei*, Jintao Xu, Yu Liu, Yingxin Zhang, and Qinghong Zhang. Heterogeneous impacts of local traffic congestion on local air pollution within a city: Utilizing taxi

- trajectory data. *Journal of Environmental Economics and Management*, 122:102896, 2023.
<https://doi.org/10.1016/j.jeem.2023.102896>
2. Di Zhu, **Ximeng Cheng**, Fan Zhang, Xin Yao, Yong Gao, and Yu Liu*. Spatial interpolation using conditional generative adversarial neural networks. *International Journal of Geographical Information Science*, 34(4):735-758, 2020.
<https://doi.org/10.1080/13658816.2019.1599122>
 3. Xiaoyue Xing, Zhou Huang*, **Ximeng Cheng**, Di Zhu, Chaogui Kang, Fan Zhang, and Yu Liu. Mapping human activity volumes through remote sensing imagery. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 13:5652-5668, 2020.
<https://doi.org/10.1109/JSTARS.2020.3023730>
 4. Di Zhu, Fan Zhang, Shengyin Wang, Yaoli Wang, **Ximeng Cheng**, Zhou Huang, and Yu Liu. Understanding place characteristics in geographic contexts through graph convolutional neural networks. *Annals of the American Association of Geographers*, 110(2):408-420, 2020.
<https://doi.org/10.1080/24694452.2019.1694403>
 5. Jianying Wang, Lei Dong, **Ximeng Cheng**, Weijun Yang, and Yu Liu*. An extended exploration and preferential return model for human mobility simulation at individual and collective levels. *Physica A: Statistical Mechanics and its Applications*, 534:121921, 2019.
<https://doi.org/10.1016/j.physa.2019.121921>
 6. Shiliang Zhang, Di Zhu*, Xin Yao, **Ximeng Cheng**, Huagui He, and Yu Liu. The scale effect on spatial interaction patterns: an empirical study using taxi O-D data of Beijing and Shanghai. *IEEE Access*, 6:51994-52003, 2018.
<https://doi.org/10.1109/ACCESS.2018.2869378>
 7. **Ximeng Cheng***, Zhanfeng Shen, Tingyan Xing, and Wen Dong. Damaged building extraction and rapid assessment for earthquake disasters based on high-resolution remote sensing images. *Journal of Natural Disasters*, 25(3):22-31, 2016. (In Chinese)
<https://doi.org/10.13577/j.jnd.2016.0303>
 8. **Ximeng Cheng**, Zhanfeng Shen*, Tingyan Xing, Liegang Xia, and Tianjun Wu. Efficiency and accuracy analysis of multispectral image classification based on mRMR feature selection method. *Journal of Geo-information Science*, 18(6):815-823, 2016. (In Chinese)
<http://www.dqxxkx.cn/CN/10.3724/SP.J.1047.2016.00815>
 9. Wen Dong*, Zhanfeng Shen, and **Ximeng Cheng**. The rapid assessment method of earthquake disaster based on high-resolution remote sensing target feature library. *Journal of Geo-information Science*, 18(5):699-707, 2016. (In Chinese)
<http://www.dqxxkx.cn/CN/10.3724/SP.J.1047.2016.00699>

Patents

1. Lingling Li, Zhanfeng Shen, Yida Fan, Tong Tang, Qi Wen, Wei Wang, Ping Wang, Wen Dong, Wei Zhang, Yueguan Lin, Yan Cui, He Huang, and **Ximeng Cheng**. Building vector boundary simplification method. Chinese patent: CN105787977A, 20/07/2016.
2. Zhanfeng Shen, **Ximeng Cheng**, Jiancheng Luo, and Liegang Xia. Remote sensing character optimization algorithm for improving mRMR (min-redundancy max-relevance) algorithm. Chinese patent: CN104794496A, 22/07/2015.
3. Tingyan Xing, Chunmei Zheng, Junbao Xia, Xiao Nie, Hongliang Xing, Junbao Cheng, Hao Hou, Haizhi Zhang, Fang Yuan, Linqi Wu, and **Ximeng Cheng**. Data configuration based oil and gas resource data integration method and integration platform. Chinese patent: CN104008161A, 27/08/2014.

CONFERENCES

1. **Ximeng Cheng**, Jost Arndt, Emilia Marquez, and Jackie Ma. Decomposition learning based on spatial heterogeneity: A case study of COVID-19 infection forecasting in Germany. *2023 European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 2023*. (PICO presentation)
2. **Ximeng Cheng**, and Yu Liu. Evaluation of spatio-temporal tensor data based on the explainable artificial intelligence methods. *2019 Chinese Geography Information Science Theories and Methods Annual Conference, Shanghai, China, October 2019*. (Oral presentation)
3. Di Zhu, **Ximeng Cheng**, Fan Zhang, Yong Gao, and Yu Liu. Spatial interpolation based on conditional generative adversarial neural network. *2019 American Association of Geographers (AAG) Annual Meeting, Washington D.C., United States, April 2019*.
4. Zhiqian Wang, **Ximeng Cheng**, and Yu Liu. Study on the precipitation weather influence on taxi behaviors based on the Fourier transform. *2018 Chinese Geography Information Science Theories and Methods Annual Conference, Taiyuan, China, November 2018*.
5. Xiaoyue Xing, Di Zhu, **Ximeng Cheng**, and Yu Liu. Population mapping based on deep features of remote sensing imagery. *The 26th International Conference on Geoinformatics, Kunming, China, June 2018*.
6. **Ximeng Cheng**, and Yu Liu. Urban mixed-use decomposition based on the temporal activity signatures. *2017 Chinese Geography Information Science Theories and Methods Annual Conference, Changsha, China, November 2017*. (Oral presentation)
7. *Spatio-temporal Patterns and Geographical Analysis, GIScience Symposium Series No.2, Beijing, China, October 2017*. (Conference organizer)
8. Di Zhu, Li Shi, Yuxia Wang, **Ximeng Cheng**, and Yu Liu. Infer spatial interaction patterns from spatial distributions. *The 25th International Conference on Geoinformatics, Buffalo, United States, August 2017*.

ADVISING OF THESES

1. Emilia Marquez. Spatiotemporal analysis of remote sensing nightlight data in Germany using geographically weighted regression (GWR). Master in Remote Sensing, geoInformation and Visualization, University of Potsdam, 2024.

PROJECTS

1. **2021.12-2024.11**, DAKI-FWS, Data- and AI- supported early warning system, Federal Ministry for Economic Affairs and Climate Action (BMWK), Germany (No.01MK21009A)
2. **2021.04-2023.03**, FORESTCARE, Single tree-based, satellite-supported forest ecosystem monitoring using auto-adaptive hyperdimension geodata analysis, Federal Ministry of Education and Research (BMBF), Germany (No.02WDG014E)
3. **2019.04-2019.08**, Doctoral student short-term aboard study project supported by Graduate School of Peking University (No.7101702197)
4. **2019.01-2023.12**, Towards theories and methods for spatial interaction networks derived from big geo-data, National Natural Science Foundation of China (No.41830645)
5. **2017.07-2021.07**, Big geo-data mining and spatio-temporal pattern discovery, National Key Research and Development Program of China (No.2017YFB0503600)
6. **2017.01-2021.12**, Methods for geo-spatial modeling and analyzing, National Natural Science Foundation of China (No.41625003)

PEER REVIEWS

2025 - Present	<i>Information Fusion</i>
2025 - Present	<i>Habitat International</i>
2024 - Present	<i>Geoscience Data Journal</i>
2024 - Present	<i>Computational Urban Science</i>
2023 - Present	<i>Computers, Environment and Urban Systems</i>
2023 - Present	<i>International Journal of Digital Earth</i>
2023 - Present	<i>Annals of GIS</i>
2023 - Present	<i>Information Processing and Management</i>
2023 - Present	<i>Pest Management Science</i>
2023 - Present	<i>Journal of Agricultural, Biological, and Environmental Statistics</i>
2022 - Present	<i>Transactions in GIS</i>
2022 - Present	<i>International Journal of Environmental Research and Public Health</i>
2022 - Present	<i>Sustainability</i>
2021 - Present	<i>Electronics</i>
2021 - Present	<i>Scientific Programming</i>
2021 - Present	<i>Sensors</i>
2019 - Present	<i>IEEE Access</i>
2018 - Present	<i>International Journal of Geographical Information Science</i>

AWARDS AND HONORS

2020	Excellent Graduate	Peking University
2019	Merit Student	Peking University
2019	Special Academic Scholarship	Peking University
2018	Special Academic Scholarship	Peking University
2017	Special Academic Scholarship	Peking University
2016	Excellent Graduate	Beijing Municipal Education Commission
2016	Excellent Graduate	China University of Geosciences, Beijing
2014	Merit Student	China University of Geosciences, Beijing
2013	Excellent Graduate	China University of Geosciences, Beijing
2012	Professional Scholarship	China University of Geosciences, Beijing
2011	Excellent Student Cadre	China University of Geosciences, Beijing
2011	Professional Scholarship	China University of Geosciences, Beijing
2010	Merit Student	China University of Geosciences, Beijing
2010	Outstanding Volunteer	China University of Geosciences, Beijing
2010	Professional Scholarship	China University of Geosciences, Beijing

COMPETITIONS

2015	Semi-final	Beauty of Programming, Microsoft (China)
2014	First Prize	International Underwater Robot Competition (URC)
2012	Second Prize	Lan Qiao Cup Collegiate Programming Contest, China
2012	First Prize	Lan Qiao Cup Collegiate Programming Contest, Beijing
2012	Third Prize	Peking University Programming Contest (Guest)
2011	Second Prize	The Electrician Mathematical Contest in Modeling, China
2010	Gold Medal	Campus Programming Contest, China University of Geosciences, Beijing

SERVICES AND ACTIVITIES

- 2017-2019** **Leader of the spatio-temporal analysis group**
 Spatio-temporal big data and social sensing laboratory, Peking University
- 2014** **Member of University Robot Team**, China University of Geosciences, Beijing
- 2013** **Volunteer** of 9th China (Beijing) International Garden Expo
- 2013** **Volunteer** of Beijing Marathon
- 2012** **Volunteer** organizer of sixty university anniversary, CUGB
- 2012** **Volunteer** of Esri (China) User Conference, Beijing
- 2012** **Volunteer** of 3rd Beijing Olympic City Sports & Culture Festival
- 2012** **Volunteer** of Beijing Marathon
- 2012** **Volunteer** of 2nd National Undergraduate Geological Skills Competition, China
- 2011-2012** **Council member of Youth Volunteers Association**, CUGB
- 2011-2012** **President of Youth Volunteers Association**
 School of Information Engineering, China University of Geosciences, Beijing
- 2010-2012** **Member of University ACM/ICPC Team**, China University of Geosciences, Beijing
- 2010** **Volunteer** of 1st Beijing Olympic City Sports & Culture Festival

REFERENCES

Yu Liu

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 Heinrich Hertz Institute, HHI
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