

# Wenbo Lv

B.Sc. Graduate

## Curriculum Vitae

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## Some stuff about me

- My research interests lie in **advancing methodologies in spatial causal inference** and **developing high-performance computational tools**, with a primary focus on *R packages*.
- I specialize in *data analysis*, *statistical modeling*, and developing open-source analytical tools, including *R packages*, using **R**, **C++**, and **Python**, with a strong focus on *spatial analysis*. I actively contribute to the R geospatial community and am dedicated to advancing open-source geospatial software.
- Currently, my work centers on **Empirical Dynamic Modeling (EDM)** framework for modeling *dynamic system*, **information theory** for quantifying *information flow* and *causal interdependence*, **ordinary differential equations (ODEs)** for characterizing *spatiotemporal processes* and *system evolution*, as well as **counterfactual** and **potential outcomes** framework for estimating *causal effects*. I am particularly interested in leveraging these approaches to address critical challenges in *urban sustainability*, *climate change mitigation*, and broader global issues.

## Education

2021.8-2025.6    **B.Sc. In Geographic Information Science**    Shaanxi Normal University  
Xi'an, Shaanxi

## Research Experience

2025.9-2026.2    **Research Assistant**    Eastern Institute of Technology, Ningbo  
Ningbo, Zhejiang

2024.8-2025.8    **Research Intern**    The Hong Kong University of Science and Technology (Guangzhou)  
Guangzhou, Guangdong

## Publications

1. Lv, W., Lei, Y., Liu, F., Yan, J., Song, Y., & Zhao, W. (2025). gdverse: An R package for spatial stratified heterogeneity family. *Transactions in GIS*, 29(2), 29:e70032. <https://doi.org/10.1111/tgis.70032>
2. Lv, W., Liu, F., Cai, K., Cao, Y., Deng, M., Liang, W., Yan, J., & Wang, G. (2024). Distinguishing the impacts and gradient effects of climate change and human activities on vegetation cover in the weihe river basin, china. *Journal of Geophysical Research: Biogeosciences*, 129(10). <https://doi.org/10.1029/2024jg008297>
3. Chen, C., Song, Y., Lv, W., Shemery, A., Hampson, K., Yi, W., Zhong, Y., & Wu, P. (2025). Predicting pavement cracking performance using laser scanning and geocomplexity-enhanced machine learning. *Computer-Aided Civil and Infrastructure Engineering*. <https://doi.org/10.1111/mice.13489>
4. Xiao, Y., Yang, Y., Zhao, T., Wang, W., Lv, W., & Zhao, W. (2026). Contrasting causal pathways of vegetation greening between economically strong and weak towns in china's greater bay area. *GIScience & Remote Sensing*, 63(1). <https://doi.org/10.1080/15481603.2026.2623327>
5. Xiao, Y., Lv, W., & Zhao, W. (2025). Exploring multiscale variations in greenspace exposure drivers: A perspective on the modifiable areal unit problem. *IGARSS 2025 - 2025 IEEE International Geoscience and Remote Sensing Symposium*, 1094–1098. <https://doi.org/10.1109/igarss55030.2025.11243018>
6. Song, Z., Liu, F., Lv, W., & Yan, J. (2023). Classification of urban agricultural functional regions and their carbon effects at the county level in the pearl river delta, china. *Agriculture*, 13(9). <https://doi.org/10.3390/agriculture13091734>
7. Song, Z., Liu, F., & Lv, W. (2023). *Spatiotemporal characteristics and optimization strategies of urban-rural development disparities in china's urban agglomerations(in chinese)* (pp. 1418–1429). People's Cities, Empowered by Planning - Proceedings of the 2023 China Urban Planning Annual Conference (14 Regional Planning; Urban Economy). <https://link.cnki.net/doi/10.26914/c.cnkihy.2023.061565>

## Honor

2024.12    **Longi Non-Education Major Scholarship**

2024.11    **First Prize in the 13th National University Student GIS Application Skills Competition**

2024.06	<b>National University Student Innovation and Entrepreneurship Training Program Qualified Completion</b>
2023.12	<b>Grand Prize in the 12th National University Student GIS Application Skills Competition</b>
2023.11	<b>First Prize in the Second National University Student Ecological Environment Management Research Innovation Competition</b>
2023.12	<b>Second Prize of the 5th 'Guodi Cup' National College Student Natural Resource Science and Technology Competition, China Society of Natural Resources</b>
2021.10	<b>Outstanding Individual in Military Training Publicity for College Students, Shaanxi Normal University</b>

## Unpublished

First Author	<b>Measuring causal strengths from spatial cross-sectional data with geographical cross mapping cardinality</b> Submitted to IJGIS, currently second-round review	
First Author	<b>Causal discovery in urban data with temporal empirical dynamic modeling: The R package tEDM</b> Submitted to CEUS, currently second-round review	
First Author	<b>Spatially convergent partial cross mapping for identifying direct causal influence in cross-sectional data</b> Submitted to NatComms, currently under consideration	
Co-First Author	<b>Spatial Pattern Entropy: A Symbolic Measure for Continuous Spatial Data</b>	Plan
Co-First Author	<b>Convergence-Diagnostic Geographical Pattern Causality for Robust Spatial Causal Discovery</b>	Plan
First Author	<b>Quantifying Information Flows in Spatial Processes</b>	Plan
First Author	<b>gobi: General ODE-Based Causal Inference in R</b>	Plan

## Developed Spatial Analysis Toolkit

Package	Description	Language
spEDM	Spatial Empirical Dynamic Modeling	C++, R
tEDM	Temporal Empirical Dynamic Modeling	C++, R
infocausality	Information-Theoretic Measure of Causality	C++, Python, R
gobi	General ODE-Based Causal Inference	C++, R
gdverse	Analysis of Spatial Stratified Heterogeneity	R, C++, Python
sdsfun	Spatial Data Science Complementary Features	R, C++
geocomplexity	Mitigate Spatial Bias Through Geographical Complexity	C++, R, C
HSAR	Hierarchical Spatial Autoregressive Model	C++, R
GD	Geographical Detectors for Assessing Spatial Factors	R
geosimilarity	Geographically Optimal Similarity	R