

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

## 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