

## 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*.
- Currently, my work centers on **Empirical Dynamic Modeling (EDM)** framework for modeling *dynamic system* and **Difference-in-Differences (DID)** methods for *event studies*. I am particularly interested in leveraging these approaches to address critical challenges in *urban sustainability, climate change mitigation*, and broader global issues.
- I possess expertise in *data analysis, statistical modeling*, and the development of *R packages* and open-source analytical tools utilizing **R**, **C++**, and **Python**.
- I have contributed to the **development** and **maintenance** of several open-source spatial analysis tools within the R community and remain dedicated to **advancing open-source geospatial analysis software**.

## Education

2021-2025 **BSc In Geographic Information Science**, *Shaanxi Normal University*, Xi'an, Shaanxi.

## 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. 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>

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5. 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>

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## 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.

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## Unpublished

- First Author Measuring causal associations by geographical cross mapping cardinality, *Submitted to IJGIS, currently under review.*
- Third Author Agricultural policies reshape cropland patterns with varying impacts - a case of soybeans from Heilongjiang Province, *Submitted to Land Use Policy, currently under review.*
- First Author Decomposing spatial causality through mutual information, *Plan.*
- First Author On the role of explicit spatial information in stratified heterogeneity, *Plan.*

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## Developed Spatial Analysis Toolkit

- **spEDM**  
Inferring causation from spatial cross-sectional data through empirical dynamic modeling (EDM), with methodological extensions including geographical convergent cross mapping, geographical cross mapping cardinality and spatially convergent partial cross mapping, as well as the spatial granger causality. Data I/O is handled at the **R** level, while the rest is fully implemented using **modern C++**.
- **gdverse**  
Detecting spatial associations via spatial stratified heterogeneity, accounting for spatial dependencies, interpretability, complex interactions, and robust stratification. In addition, it supports the spatial stratified heterogeneity family described in Lv et al. (2025) [doi: 10.1111/tgis.70032](#). Developed using **R**, **C++**, and **Python**.
- **seesp**  
Implements the *Spatially Explicit Stratified Power* model, a robust framework for spatial analysis combining stratification and statistical power. Written in **R** and **C++**.
- **geocomplexity**  
Focuses on mitigating spatial biases by leveraging geographical complexity. Combines computational efficiency with flexibility, developed in **C++**, **R**, and **C**.
- **cisp**  
Introduces a novel *Correlation Indicator Based on Spatial Patterns* for measuring spatial correlations with high precision. Written in **R**.
- **geosimilarity**  
Provides methods for calculating *Geographically Optimal Similarity*, enabling better spatial predict. Developed in **R**.
- **GD**  
Implements *Geographical Detectors*, a toolkit for assessing spatial factors influencing heterogeneity. Fully developed in **R**.
- **sdsfun**  
Adds complementary features for *Spatial Data Science*, providing user-friendly functionalities for geospatial research. Developed using **C++** and **R**.
- **geocn**  
Simplifies the process of loading and managing spatial datasets of China, supporting research with localized datasets. Developed in **R**.
- **qgisprocess**  
Offers an **R** interface to *QGIS processing algorithms*, enabling seamless integration of QGIS functionalities into R workflows.
- **spEcula**  
Provides advanced methods for *Spatial Prediction* in **R**, supporting applications ranging from environmental modeling to spatial econometrics.
- **tidyrgeoda**  
Offers a tidy interface for *rgeoda*, bridging geospatial analysis and tidyverse workflows to streamline data handling and modeling in **R**.

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