

# Keyi Liu

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## Education

### Peking University

Beijing, China

Master in Landscape Architecture, College of Architecture and Landscape

Sep. 2022 - Jul. 2025 (Expected)

- Research Field: Spatial-temporal geographic analysis, modeling and simulation
- Advisor: **Liyan Xu**, Tenured Associate Professor, College of Architecture and Landscape, Peking University.
- GPA: 3.7/4.0

### Hunan University

Changsha, China

Bachelor in Urban and Rural Planning, School of Architecture and Planning

Sep. 2017 - Jul. 2022

- Graduation Design: Flood Resilient Park Planning and Design Based on Sponge City Principles
- Advisor: **Ran Jing**, Tenured Associate Professor, School of Architecture and Planning, Hunan University.
- GPA: 3.5/4.0 (Ranking 2/25)

## Research Experience

### Automated Generation and Multi-objective Optimization of Land-Use Planning

Beijing, China

Thesis, advised by Professor Liyan Xu

Jan. 2024 - Now

- Conceptualize a novel land-use planning strategy that combines *reinforcement learning and multi-objective optimization*.
- Enhance the Proximal Policy Optimization (PPO)-based reinforcement learning model for *provincial-scale applicability*.
- Incorporate Pareto multi-objective optimization to maximize both *economic land rent and ecological service value* in land-use.

### AI-Human Collaboration in Urban Design: An AIGC Tool for Streetscape Imagery

Beijing, China

Core Researcher, advised by Professor Liyan Xu

Jan. 2024 - Now

- Fine-tune *a LoRA model tailored for street garden scenes*, enabling Stable Diffusion to generate 4 design concepts within 1 minute.
- Design an experiment that varies user control over *redesign areas and prompt words* to model 4 levels of designer collaboration.
- *Recruit 160 participants* and analyze the *aesthetic and compatibility scores* of design outputs under different collaboration levels.

### Simulation of Ecological Policy: Balancing Development and Conservation

Beijing, China

Core Researcher, advised by Professor Liyan Xu

May. 2023 - Now

- Enhance the *policy evaluation sub-module* of an Agent-Based Model to simulate 15-year socio-ecological impacts of the *Grain-to-Green (G2G) and Firewood-to-Electricity (F2E)* programs in *Wolong National Reserve*.
- Simulate agent policy responses based on *microeconomics and individual behavioral patterns*, such as their *decision-making regarding participation* in G2G programs, and the impact of the F2E program on *firewood collection behaviors*.
- Evaluate the *cost-efficiency* of G2G and F2E programs across various subsidy levels, identifying *18 optimal combinations* that balance *panda habitat, carbon emissions, and economic benefits*.

### Inference of user attributes based on geographic trajectory data

Beijing, China

Team member, advised by Professor Liyan Xu

Sep. 2022 - June. 2023

- Explore a strategy to extract *multi-dimensional high-order mobility features* for user profiling from trajectory data.
- Extract *4 mobility spatiotemporal features* and vectorize *3 location semantic features* of 501,158 users' trajectory data.
- Identify *4 levels, 7 user clusters* with different lifestyle profiles by adopting a multi-view k-means cluster method.

### Interactions and behavioral preferences among road-user groups

Beijing, China

Team member, advised by Professor Liyan Xu

Nov. 2022 - June. 2023

- Apply YOLO and ByteTrack for *video target recognition and trajectory extraction*, and compute road users' kinematic features.
- Analyze the *behavioral choice differences* of 3 groups of road users (vehicle & pedestrian, vehicle & e-bike, e-bike & pedestrian) at crossroads conflict scenarios by using the *Quantal Response Equilibrium model*.

### The Color Analysis of Ancient Architecture

Changsha, China

Core Researcher, won the 1st prize of National College Student Innovation Training Program

Sep. 2019 - May. 2021

- Collect 1,341 color samples encompassing *the entire range of ancient architectures* at Yuelu Academy.
- Propose a systematic and scientific working model for *the data collection and correction* of ancient architectural colors.
- Utilize the Nippon Color & Design (NCD) color system for the analysis of *ancient architectural color imagery*, exploring the *protection and revitalization* of ancient buildings from a human-centric perspective.

## Publications (\*Corresponding Author)

[J1] **K. Liu**, Y. Chen, L. Xu\*, X. Zhang, Z. Wang, H. Li\*, et al., "Reconciling Human Development and Giant Panda Protection Goals: Cost-Effectiveness of Farmland Reversion and Energy Substitution Programs in Wolong National Reserve." *Submitted to Ecological Modelling on Nov, 2024. (Under Review)*

[J2] **K. Liu**, J. Tang, H. Yin, S. Li, L. Xu\*, "Development of an Automated Land-Use Planning Framework Utilizing Multi-Objective Reinforcement Learning for Enhanced Spatial Allocation and Decision-Making." *(In Preparation. Expected Feb, 2025)*

[C1] **K. Liu**, S. Ge, X. Wu, D. Li\*, "Evaluation of Oasis Habitat Stability in Arid Regions Based on the PPSD Model: A Case Study of Wensu County, Xinjiang." *2024 International Association for China Planning. (Oral Presentation)*

[C2] D. Mo, **K. Liu**, Q. Tian, D. Li, L. Xu\*, "The Role of Urban Designers in the Era of AIGC: An Experimental Study Based on Public Participation." *Submitted to 39th AAAI-2024 Workshop on AI for Urban Planning on Nov, 2024. (Under Review)*

[J3] Q. Huang, **K. Liu\***, J. Gu, et al., "Enhancing Preservation of Ancient Buildings through Color Imagery Analysis and Activation: Take Yuelu Academy as an Example." *Submitted to Journal of Asia Architecture and Building Environment on Sep, 2023. (In Press)*

[J4] Q. Huang, **K. Liu\***, Y. He, Z. Yang, J. Gu, Y. Zhao, "Research on the Application of Color Acquisition Method and Process Design in the Protection of Ancient Buildings—A Case Study of Yuelu Academy." *Furniture & Interior Design, 2024, 31(02): 116-121.*

[C3] S. Ye, G. Zhang, **K. Liu**, J. Tang, L. Xu\*, "A Framework for Mining Lifestyle Profiles Through Multi-Dimensional and High-Order Mobility Feature Clustering." *arXiv:2312.00411 (2023).*

[J5] G. Zhang, S. Ye, **K. Liu**, Y. Wang, D. Li, L. Xu\*, "Vehicles, Pedestrians, and E-bikes: A Three-Party Game at Right-Turn-on-Red Crossroads Revealing the Dual and Irrational Role of E-bikes that Risks Traffic Safety." *arXiv:2411.02183 (2023).*

[J6] J. Tang, H. Yu, D. He, T. Li, W. Xiao, X. Zheng, **K. Liu**, Y. Li, L. Xu\*, "A Dataset of Multi-level Street-block Divisions of 985 Cities Worldwide." *Submitted to Scientific Data on May 14, 2024. (Under Review)*

## Selected Honors

2024	<b>Outstanding Scientific Research Award (1 TOP-Student Each Year)</b>	Peking University
2023	<b>Merit Student (3 Students Each Year)</b>	Peking University
2023	<b>Scientific Innovation Award Scholarship (3 Students Each Year)</b>	Peking University
2023	<b>1st Prize (TOP 1%) of International Innovation Design &amp; Science for SDGs Innovation Contest</b>	China
2020	<b>1st Prize (TOP 1%) of National College Student Innovation Training Program</b>	China
2018-2021	<b>Outstanding Undergraduate Researcher Scholarship (3 Consecutive Years )</b>	Hunan University
2018	<b>Excellent Student Cadre</b>	Hunan University
2017	<b>Undergraduate Comprehensive Scholarship</b>	Hunan University

## Teaching Assistant

2023	<b>History of Chinese and Foreign Cities</b> Compulsory, 32 class periods, 150 students	Peking University
2023	<b>Smart City Planning and Design</b> Elective, 32 class periods, 20 students	Peking University
2020	<b>Administration and Law of Urban Planning</b> Compulsory, 32 class periods, 180 students	Hunan University

## Skills

<b>Coding</b>	Python, Sql, $\LaTeX$
<b>Software</b>	SPSS, GIS (ArcGIS, QGIS), Adobe (PS, AI, AU), modeling (CAD, Sketchup, Unity)
<b>Language</b>	Chinese (Native), English (TOEFL: 101)

## Activities

<b>Academic Department Minister of the College of Architecture and Landscape</b> <i>Organized 5 academic lectures and 2 PhD experience sharing lectures.</i>	Peking University Sep. 2023 - Sep. 2024
<b>Rural Revitalization Workshop Organizer</b> <i>Led 50 members from 23 universities to conduct field research and public welfare construction in rural.</i>	Peking University July. 2023
<b>Debate Team Leader of the School of Architecture and Planning</b> <i>Won the Individual Best Debater twice and Group Runner-up once.</i>	Hunan University Sep. 2018 - Jul. 2020

## References

- **Master's Supervisor:** **Liyan Xu**, Associate Professor, Peking University.
- **Course Supervisor:** **Dihua Li**, Associate Professor, Deputy Dean, Peking University.
- **Undergraduate Supervisor:** **Yao Shen**, Professor, Deputy Dean, Hunan University.