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: 3.72/4.0

Hunan University — *Changsha, China*

Bachelor in Urban and Rural Planning, School of Architecture and Planning — *Sep. 2017 - June. 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: 3.47/4.0 (**Ranking 3/25**)

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.***

[J5] 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).***

[J6] 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).***

[J7] 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. (Minor Revision)***

Selected Honors

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

Teaching Assistant

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

Skills

Coding Python, Sql, LaTeX
Software SPSS, GIS (ArcGIS, QGIS), Adobe (PS, AI, AU), Modeling (CAD, Sketch Up, Unity)
Language Chinese (Native), English (TOEFL: 97)

Activities

Academic Department Minister of the College of Architecture and Landscape — *Peking University*
Organized 5 academic lectures and 2 PhD experience sharing lectures. — *Sep. 2023 - Sep. 2024*

Rural Revitalization Workshop Organizer — *Peking University*
Led 19 members from 9 universities to conduct field research and public welfare construction in rural. — *Aug. 2022*

Debate Team Leader of the School of Architecture and Planning — *Hunan University*
Won the Individual Best Debater twice and Group Runner-up once. — *Sep. 2018 - Jul. 2020*

References

- **Dean and Advisor:** **Kongjian Yu**, Professor, Dean, Peking University,
- **Master's Advisor:** **Liyan Xu**, Associate Professor, Peking University.
- **Project Advisor:** **Yu Liu**, Professor, Peking University.