

YUXUAN CAI

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 Department of City and Regional Planning, UNC Chapel Hill

RESEARCH INTERESTS

AI applications in urban planning, including vision-language models for environmental perception, LLM-based multi-agent simulation for planning decision-making, and mechanistic interpretability of AI systems. Interdisciplinary research connecting computational methods with urban health, environmental justice, and transportation.

EDUCATION

University of North Carolina at Chapel Hill 2025 – Present
 Ph.D., City and Regional Planning | Advisor: Prof. Nikhil Kaza | Doctoral Merit Fellowship
University of Chicago 2023 – 2025
 M.A., Computational Social Science | Thesis Nominated Outstanding Thesis Award
 University Scholarship (\$30,600); Phoenix Research & Merit Scholarship (\$22,000)
University of California, Berkeley 2022 – 2023
 M.Arch (transferred to academic track) | Karren Architecture Fellowship (\$20,000)
Wuhan Polytechnic University 2017 – 2021
 B.A., Environmental Design | University Scholarship

SELECTED PUBLICATIONS

(* = corresponding author)

- [1] Cai, Y., Huang, Y., Chen, A., et al. (2025). Subjective Perception or Physical Environment: Which Matters More? *Urban Forestry & Urban Greening*. doi.org/10.1016/j.ufug.2025.128835
- [2] Cai, Y., Song, Q., et al. (2025). Desirable Bikeshare Routes: Nonlinear Impact of Micro-Level Street Environment. *Transportation Research Part A*.
<https://doi.org/10.1016/j.tra.2026.104962>
- [3] Chen, M., Cai, Y., et al. (2024). Implied Urban Nature Vitality in San Francisco. *Urban Forestry & Urban Greening*. doi.org/10.1016/j.ufug.2024.128289 (cited 50+)
- [4] Burrows, K., Luo, J., Cai, Y., & Aschebrook-Kilfoy, B. (2025). Disparate Impacts of Air Pollution on Depression and Anxiety. *Environmental Research*.
 doi.org/10.1016/j.envres.2025.122691
- [5] Hu, Y., Chen, M., & Cai, Y. (2025). Greenery Inequalities in New York and London. *Urban Forestry & Urban Greening*. doi.org/10.1016/j.ufug.2025.128939
- [6] Shen, X., Sun, Q., Mosey, G., Cai, Y., & Cheng, W. (2025). Enhancing Sustainable Indoor Air Environment: Assessing Potted Plants and Machine Learning Models for VOCs Mitigation. | *Urban Climate* | <https://doi.org/10.1016/j.uclim.2025.102497>
- [7] Huang, Y., Du, J., Chen, M., et al. & Cai, Y. (2025). Spatial-Temporal Impact of Urban Nature on Urban Vitality. *Land Use Policy*. doi.org/10.1016/j.landusepol.2025.107824
- [8] Li, H., Cai, Y.*, Yang, Y., & Cai, X. (2025). Urban Scene Characteristics and Urban Heat Island. *Urban Climate*. doi.org/10.1016/j.uclim.2025.102542
- [9] Chen, M., Yu, J., Mao, Q., Cai, Y., Ma, C., & Yang, J. Yan, H. (2026). How Park and Non-Park Urban Nature Shape Urban Vitality. *Landscape and Urban Planning* (Major Revision)

[10] Chen, M., Huang, Y., Zheng, Y., Du, J., & Cai, Y. (2025). Defining Urban Vitality Using Image-based, Text-based, and GPS Data. *npj Urban Sustainability* (Under Review)

RESEARCH EXPERIENCE

AI for Urban Perception & Planning Cognition (UNC Chapel Hill) 2025 – Present

Probing VLM/CLIP internal representations of urban perception; developing LLM multi-agent simulation for planning decision-making; identified Consistency-Misalignment issue.

Urban Scenes Theory & LLM (with Prof. Terry N. Clark, UChicago) 2024 – Present

Applying scene theory to cross-cultural urban analysis using Google Reviews and Dianping data from U.S. and Chinese cities; integrating LLM-based simulation to model cultural amenity dynamics and neighborhood characterization

Urban Cycling & Environmental Perception (with HKU) 2024 – Present

Analyzing cycling trajectories across major U.S. cities; examining perception-driven route decisions

Large-Scale Building Material Detection (with Univ. of Washington) 2024 – Present

Computational methods for large-scale detection and classification of urban building materials

Research Assistant, Inst. for Population and Precision Health, UChicago 2024 – 2025

Analyzing longitudinal health records to assess disparate impacts of PM2.5 and other exposure on mental health issues across demographic groups

Transit Perception (MIT Mobility Lab & Chicago Transit Authority) 2024 – 2025

LLM/NLP dynamic topic models on 1M+ transit feedback records and news data to quantify multi-domain public transit perceptions across official and public areas.

Research Assistant, Knowledge Lab, UChicago 2024 – 2025

Fine-tuning LLMs for cross-disciplinary knowledge boundary identification

TEACHING

Teaching Assistant, Urban Policy Analysis (SOCI 20120), UChicago, Autumn 2024

Teaching Assistant, Global-Local Politics (SOCI 20116), UChicago, Prof. Terry N. Clark

Grader, Perspectives on Computational Analysis / AI, Innovation & Growth, UChicago, 2024

CONFERENCES & SERVICE

2025 TRB Annual Meeting – Paper poster.

2023 AESOP 35th Congress – Full paper oral

Peer Reviewer: Nature Cities; Urban Forestry & Urban Greening; Sustainable Cities and Society; American Journal of Public Health; Scientific Reports; Humanities and Social Sciences Communications; 2024 National Communication Association Annual Convention; CELA 2025

Technical: Python, R, Machine Learning, Deep Learning, NLP/LLMs, GIS, MATLAB

Languages: Chinese, English, Japanese (JLPT N2)

AWARD

World Landscape Architecture Awards-Merit Award, 2023, 2020

ASLA Student Honor Award, Communications Category, 2021

Shanghai Jiao Tong University Exhibition Fellowship, 2021

iF Design Talent Award, 2020