KEXIN WANG

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RESEARCH INTERESTS

Multi-Agent Learning, Game Theory, and LLM-based Decision Making for Cyber-Physical Systems; Applications in Autonomous Mobility and Intelligent Transportation Systems

EDUCATION

University of Southern California — Los Angeles, CA
PhD. in Civil Engineering; **GPA:** 4.0/4.0 — 08/2025 - Present

University of Southern California — Los Angeles, CA
M.S. in Computer Science; **GPA:** 3.72/4.0 — 08/2024 - Present

Cornell University — Ithaca, NY
M.Eng in Civil Engineering; **GPA:** 3.83/4.0 — 08/2021 - 12/2022

Nanjing Forestry University — Nanjing, China
B.S. in Civil Engineering (Top 5%); **GPA:** 3.80/4.0; — 09/2016 - 06/2021

University of Minnesota, Twin Cities — Minneapolis, MN
Exchange Student; **GPA:** 3.77/4.0 — 08/2019 - 07/2020

RESEARCH EXPERIENCE

Bounded LLM Mediation for Cyber-Physical Control — Los Angeles, CA
Research Assistant, Advisor: Prof. Ruolin Li — 04/2026 - Present

- Proposed a bounded LLM mediation framework for cyber-physical control, enabling system-level coordination while preserving safety under unreliable LLM outputs.
- Designed a dual-agent architecture for macro–micro coordination in mixed-autonomy traffic systems.
- Established theoretical guarantees and demonstrated robust performance under adversarial and out-of-distribution settings.

Defensive PSRO for Competitive Autonomous Ride-Hailing — Los Angeles, CA
Research Assistant, Advisor: Prof. Ruolin Li, Prof. Yue Zhao & Prof. Xiyang Hu — 12/2025 - Present

- Studied competitive ride-hailing with mixed AV/HV fleets at street-level, where fine-grained spatial interactions induce non-transitive strategies.
- Proposed a macro–micro learning framework integrating structured priors with per-vehicle reinforcement learning for spatially-aware decision-making.
- Developed a robust population-based learning approach (DF-PSRO) to handle adversarial and off-equilibrium competitor behaviors.

Macro–Micro Pigouvian Lane Control for Mixed-Autonomy Traffic Efficiency — Los Angeles, CA
Research Assistant, Advisor: Prof. Ruolin Li & Prof. Jiachen Li — 12/2025 - Present

- Developed a closed-loop macro–micro control framework for mixed-autonomy traffic, where lane-level Pigouvian price signals are derived from macroscopic states and guide decentralized CAV decision-making.
- Formulated the induced interaction among CAVs as an ε-approximate potential game, establishing theoretical alignment between individual incentives and system-level congestion minimization.
- Integrated the pricing mechanism into multi-agent reinforcement learning as reward shaping, and demonstrated consistent performance improvements across diverse traffic scenarios through SUMO simulations.
- *Manuscript submitted to IEEE Conference on Decision and Control (CDC 2026).*

Equilibrium in Mixed-Autonomy Ride-Hailing Networks — Los Angeles, CA
Research Assistant, Advisor: Prof. Jong-shi Pang & Prof. Ruolin Li — 01/2025 - 12/2025

- Developed a network equilibrium framework that integrates ride-hailing company profit maximization with HV/AV fleet operations, traffic congestion dynamics, and traveler choice behavior.

- Formulated and solved the model as a Mathematical Program with Complementarity Constraints (MCP) in GAMS using the PATH solver.
- Conducted numerical experiments to assess how AV penetration rate and relaxation parameters influence company performance, traveler welfare, and overall network efficiency.
- *Manuscript under review at Transportation Research Part B.*

Game-Theoretic Framework for Mixed Autonomy at Highway Weaving Ramps Los Angeles, CA
Research Assistant, Advisor: Prof. Ruolin Li 01/2025 - 12/2025

- Formulated a Wardrop-equilibrium based model to capture the aggregate, strategic lane-choice behavior of human-driven vehicles (HDVs) at highway weaving ramps, and established the existence and uniqueness of the resulting equilibrium.
- Proposed two integrated control frameworks for connected and autonomous vehicles (CAVs): (i) a bilevel Stackelberg–Wardrop formulation for dedicated altruistic CAVs, and (ii) a Wardrop extension incorporating Social Value Orientation (SVO) to model relaxed altruistic CAVs.
- Analytically characterized CAVs influences by deriving threshold penetration rates required to shift HDV equilibrium behavior, and further examined how CAV strategy configurations affect system efficiency.
- *Manuscript under review at Transportation Science.*

TEACHING & MENTORING EXPERIENCE

USC CURVE Program Los Angeles, CA
PhD Mentor 08/2025 - Present

- Mentored 7 undergraduate students across Computer Science, Electrical Engineering, and Civil Engineering on independent research projects in intelligent transportation systems.
- Provided guidance on academic writing, literature review, and experiment design.

USC Civil and Environmental Engineering Department Los Angeles, CA
Teaching Assistant for Prof. Audrey Olivier 08/2025 - 12/2025

- Assisted in course administration for CE-119 *Statistical Data Analysis in Engineering*, including assignment design, grading, and student performance evaluation.
- Guided students in data exploration and visualization during office hours.

Cornell Civil and Environmental Engineering Department Ithaca, NY
Academic Assistant for Prof. Matthew Reiter 08/2022 - 12/2022

- Assisted in course management and student evaluation for *Masonry Design* and *Metal Structure* courses.
- Provided detailed feedback on design projects and assignments using professional structural analysis software such as SAP2000.

PUBLICATIONS

Wang, K., Guan, Y., & Li, R. (2026). *Out of the Loop: Bounded LLM Mediation for Cyber-Physical Control.* Submitted to *The Fortieth Annual Conference on Neural Information Processing Systems (NeurIPS 2026).*

Wang, K., Huang, G., Wang, Z., Li, J., & Li, R. (2026). *Macro–Micro Pigouvian Multi-Agent Reinforcement Learning for Mixed-Autonomy Lane Control.* Submitted to *IEEE Conference on Decision and Control (CDC 2026).*

Paul, S., Williams, S., **Wang, K.**, Qin, X., Li, R., & Deshmukh, J. (2026). *Topology-Aware Congestion Pricing: Demand-Robust Routing using the Forman–Ricci Curvature.* Submitted to *IEEE Conference on Decision and Control (CDC 2026).*

Wang, K., He, H., & Li, R. (2026). *When Altruism Meets Autonomy: Managing Weaving Ramp Congestion with Strategic AVs.* Under review at *Transportation Science.*

Hou, J., **Wang, K.**, Li, R., & Pang, J. (2026). *Traffic Equilibrium in Mixed-Autonomy Network with Capped Customer Waiting.* Under review at *Transportation Research Part B.*

He, H., **Wang, K.**, & Li, R. (2025). *To Stay or to Bypass: Unraveling Mainline Vehicles' Aggregate Strategic Decision–Making in Weaving Ramps. IEEE Intelligent Transportation Systems Conference (ITSC 2025).*

PRESENTATIONS

INFORMS Annual Meeting Oral Presentation, San Francisco, USA 10/2026

INFORMS Transportation Science and Logistics Conference (TSL) Presentation, MA, USA 07/2026

SoCal CEE Research Symposium Presentation, Los Angeles, USA 04/2026

Transportation Research Board (TRB) Annual Meeting Presentation, Washington D.C., USA 01/2026

INFORMS Annual Meeting Oral Presentation, Atlanta, USA 10/2025

USC Center for Autonomy & AI Workshop Poster Presentation, Los Angeles, USA 9/2025

USC STEM Bytes Seminar Oral Presentation, Los Angeles, USA 7/2025

SoCal CEE Research Symposium Presentation, Irvine, USA 04/2025

PAPER REVIEWS

Reviewer, *Bridging Transport Researchers Conference (BTR)* 2026

Reviewer, *IEEE Conference on Decision and Control (CDC)* 2025/2026

Reviewer, *IEEE Intelligent Transportation Systems Conference (ITSC)* 2026

Reviewer, *IEEE Intelligent Vehicles Symposium (IV)* 2026

Reviewer, *IEEE International Conference on Robotics and Automation (ICRA)* 2026

Reviewer, *Transportation Research Board (TRB) Annual Meeting* 2025

AWARDS AND HONORS

USC CURVE fellowship (University of Southern California) 2025/2026

Das Family Travel Award (University of Southern California) 2025/2026

Second Place in Garmezy Concrete Competition (Cornell University) 2022

Outstanding Graduate Award (Nanjing Forestry University) 2021

Undergraduate Research Scholarship (University of Minnesota, Twin Cities) 2020

First Class Scholarship (Nanjing Forestry University) 2017/2018/2019

KLAUSNER Scholarship (Nanjing Forestry University) 2019

Germany LEITZ Scholarship (Nanjing Forestry University) 2018

PROFESSIONAL AND ACADEMIC SERVICE

Organizer, *2026 Conference on Robot Learning (CoRL).*

Student Volunteer, *2026 NASA Formal Methods Symposium (NFM).*

Website Designer, *2026 IFAC Workshop on Cyber-Physical Human Systems (CPHS).*

SKILLS

Programming Skills: Python, Java, C++, R, MATLAB

Software and Tools: SUMO, GAMS, AutoCAD, OpenSees, Revit, SAP2000, Sketchup, 3Dmax

Language: Mandarin (Native); English (Proficient)