

Yukai Wang

PhD Candidate | KAIST
yukai@kaist.ac.kr | yukiiwong.github.io | GitHub

Education

- KAIST**, PhD Candidate 2023 - present
- Cho Chun Shik Graduate School of Mobility; **Advisor:** Prof. Tiantian Chen
- Southeast University**, Master's degree 2020 - 2023
- School of Transportation; **Advisor:** Prof. Zhiyuan Liu
- Southwest Jiaotong University**, Bachelor's degree 2016 - 2020
- Mao Yisheng Honors College
 - Honorable Student of Mao Yisheng Honors College

Research Interests

Traffic world models beyond ego-vehicle control: learning multi-agent dynamics from drone trajectories, evaluating their decision utility, and supporting site-level safety assessment and digital-twin validation.

Research Experience

Doctoral Research, KAIST 2023 - present

Traffic World Models and Evaluation

- **Traffic world models and digital twins.** Develop graph-conditioned latent dynamics with neural ODE decoding from inD, rounD, and highD trajectories; assess behavioral validity and cross-site transfer of learned models and calibrated simulators. (*Ongoing*)
- **Closed-loop diagnostics.** Design paired action/graph source-switch tests and temporal controls to isolate distribution shift and early error compounding. (*Under review, AAAI 2027*)
- **Missing-history evaluation.** Distinguish input-level missingness from latent-pathway interventions; compare forecasters under matched information conditions. (*Under review, AAAI 2027*)

Decision Utility and Traffic Safety

- **Decision utility and safety assessment.** Test whether prediction gains improve action ranking and forecast-based safety screening; develop recording-disjoint, leakage-controlled protocols with fixed candidate banks, conflict indicators, and tail-risk diagnostics. (*Ongoing*)
- **ProSafeAV.** Integrate world-model reinforcement learning, traffic-conflict indicators, and extreme value theory; evaluate policies in CARLA-based simulation. (*Under review, IEEE T-ITS*)

Graduate Research, Southeast University 2020 - 2023

- Conducted transportation research with Prof. Zhiyuan Liu; contributed to collaborative work on reinforcement learning for joint travel-mode and departure-time choice.

Industry Experience

Data Analyst Intern, Shokz April - July 2023

- North America Marketing Department

Publications and Manuscripts

Journal Article

1. Gu, Z., **Wang, Y.**, Ma, W., & Liu, Z. (2024). A joint travel mode and departure time choice model in dynamic multimodal transportation networks based on deep reinforcement learning. *Multimodal Transportation*, 3(3), 100137.
<https://doi.org/10.1016/j.multra.2024.100137>

Conference Contributions

1. **Wang, Y.**, Chen, T., & Chen, S. (2025). ProSafeAV: Enhancing Proactive Safety Performance of AVs using World Model-Based Reinforcement Learning and Extreme Value Theory. *TRB Annual Meeting 2025*. [Record]
2. **Wang, Y.**, Chen, T., & Jang, K. (2024). A Synergistic Approach to Real-Time Crash Risk Estimation at Signalized Intersections: Integrating Learning-Based Anomaly Detection with Extreme Value Theory. *Conference in Emerging Technologies in Transportation Systems (TRC-30)*, September 2-4, 2024. [Record]

Manuscripts Under Review

1. **Wang, Y.**, Chen, T., Ali, Y., & Jang, K. Crash risk estimation using auxiliary bivariate anomaly scoring and non-stationary bivariate peak over threshold modeling. *Analytic Methods in Accident Research (AMAR)*. (**Under review**).
2. **Wang, Y.**, Luo, Y., Ding, H., Jang, K., Chen, S., & Chen, T. Proactive Risk Modeling for Autonomous Driving with World Models and Extreme Value Theory. *IEEE Transactions on Intelligent Transportation Systems (T-ITS)*. (**Under review**).
3. Where Closed-Loop Traffic World Models Break and When Correction Pays. *AAAI 2027*. (**Under review**).
4. Missing-History Robustness Is Not a Single Number. *AAAI 2027*. (**Under review**).

Selected Honors and Awards

Top 20, AI Competition , RLChina Reinforcement Learning Summer School.	2021
National First Prize , 14th National Competition of Transport Science and Technology for Students.	2019
Honorable Mention , Interdisciplinary Contest in Modeling.	2019
National First Prize , China Undergraduate Mathematical Contest in Modeling.	2018
National First Prize , CSEE Cup National University Students Electrical Mathematical Modeling Competition.	2017

Technical Skills

Modeling: Graph neural networks; recurrent state-space models; neural ODEs; reinforcement learning.

Safety and evaluation: Surrogate safety measures; extreme value theory; bootstrap diagnostics; recording-disjoint evaluation.

Software: Python; PyTorch / PyTorch Lightning; CARLA; Git; LaTeX.