

SINONG(SIMON) ZHAN

Github◇ <http://simon-zhan.com/>◇ Google Scholar
L456 Sheridan Road, Evanston, IL
(+1)510-599-4662 ◇ SinongZhan2028@u.northwestern.edu

EDUCATION

Northwestern University

Sept 2023 - Now

PhD in Electrical and Computer Engineering advised by Prof. Qi Zhu

University of California, Berkeley

August 2018 - December 2022

Bachelor of Art in Computer Science and Applied Mathematics advised by Prof. Sanjit Seshia

ACADEMIC SERVICE

- **Conferences Review:** Neurips, ICML, ICLR, L4DC
- **Journals Review:** Machine Learning, IEEE Internet of Thing
- **Program Committee:** ICCPS Artifact Evaluation

RESEARCH EXPERIENCE

IDEAS Lab, Northwestern University

March 2022-Now

Research Assistant

Advised by Prof. Qi Zhu

- Developed safe RL with formal methods approaches to enhance safety and robustness in embodied AI applications for cyber-physical systems, with a focus on autonomous driving and safety-critical robotics.
- Developed reinforcement learning algorithms for real-time decision-making, focusing on data efficiency, robustness, and delay-aware optimization.
- Transferred inverse RL (IRL) and model-based RL problems into generative modelling (GAN, Score Matching, etc.) to improve stability and ensure constraint satisfaction in imitation learning.
- Explored neurosymbolic approaches to enable formal logic reasoning in ML systems, improving interpretability in LLM-aligned agents for autonomous applications.
- Applied transformer and diffusion-based models to reinforcement learning settings, enhancing generalization and robustness in vision-language navigation tasks.

University of California, Berkeley

Feb 2022-April 2023

Undergrad Researcher

Advised by Prof. Sanjit Seshia

- Worked on automated verification and control synthesis for complex robotics systems, particularly in path planning and trajectory optimization for underwater robots.
- Developed an SMT-based 3D bin-packing solver for efficient design model checking, contributing to structured design automation pipeline.

Human Computing Lab, ISCAS and XDiscovery Lab, Dartmouth

May 2019-Sep 2021

Research Assistant

Advised by Prof. Feng Tian & Prof. Teng Han & Prof. Xingdong Yang

- Researched human-computer interaction (HCI) techniques, developing VR-based interaction models with real-time feedback.
- Investigated novel fast-prototyping methods and materials for haptic interfaces and sensors fusion and leveraged self-supervised learning to improve robustness in multi-modal AI systems.

INDUSTRIAL EXPERIENCE

- Collected and Analyzed patients' and health people's performance data for product robustness testing.
- Participated in developing WeChat programs for both doctor and patient sides on test analysis.
- Pitched and Conducted live demos to various clients including top-tier hospitals and investors.

PUBLICATION(* STANDS FOR EQUAL CONTRIBUTION)

Model-Based Reward Shaping for Adversarial Inverse Reinforcement Learning in Stochastic Environments. Simon Sinong Zhan, Qingyuan Wu, Philip Wang, Yixuan Wang, Ruochen Jiao, Chao Huang, Qi Zhu. *In Submission*.

Inverse Delayed Reinforcement Learning. Simon Sinong Zhan*, Qingyuan Wu*, Aria Ruan, Frank Yang, Philip Wang, Yixuan Wang, Ruochen Jiao, Chao Huang, Qi Zhu. *In Submission*.

Directly Forecasting Belief for Reinforcement Learning with Delays. Qingyuan Wu*, Simon Sinong Zhan*, Yuhui Wang*, Yixuan Wang, Chung-Wei Lin, Chen Lv, Qi Zhu, Jurgen Schmidhuber, Chao Huang. *Forty-second International Conference on Machine Learning*.

Variational Delayed Policy Optimization. Qingyuan Wu*, Simon Sinong Zhan*, Yixuan Wang, Yuhui Wang, Chung-Wei Lin, Chen Lv, Qi Zhu, Chao Huang. *The Conference on Neural Information Processing Systems 2024 (Spotlight)*.

Switching Controller Synthesis for Hybrid Systems Against STL Formulas. Han Su, Shenghua Feng, Simon Sinong Zhan, Naijun Zhan. *The 26th International Symposium on Formal Methods*.

Case Study: Runtime Safety Verification of Neural Network Controlled System. Frank Yang, Simon Sinong Zhan, Yixuan Wang, Chao Huang, Qi Zhu. *The 24th International Conference on Runtime Verification*.

State-wise safe reinforcement learning with pixel observations. Simon Sinong Zhan, Yixuan Wang, Qingyuan Wu, Ruochen Jiao, Chao Huang, Qi Zhu. *6th Annual Learning for Dynamics and Control Conference*.

Boosting Reinforcement Learning with Strongly Delayed Feedback Through Auxiliary Short Delays. Qingyuan Wu, Simon Sinong Zhan, Yixuan Wang, Yuhui Wang, Chung-Wei Lin, Chen Lv, Qi Zhu, Jurgen Schmidhuber, Chao Huang. *Forty-first International Conference on Machine Learning*.

Empowering autonomous driving with large language models: A safety perspective. Yixuan Wang, Ruochen Jiao, Chengtian Lang, Simon Sinong Zhan, Chao Huang, Zhaoran Wang, Zhuoran Yang, Qi Zhu. *LLM@Agent@ICLR 2024*.

Kinematics-aware Trajectory Generation and Prediction with Latent Stochastic Differential Modeling. Ruochen Jiao*, Yixuan Wang*, Xiangguo Liu, Simon Sinong Zhan, Chao Huang, Qi Zhu. *IEEE/RSJ International Conference on Intelligent Robots and Systems 2023*.

Enforcing Hard Constraints with Soft Barriers: Safe Reinforcement Learning in Unknown Stochastic Environments. Yixuan Wang, Simon Sinong Zhan, Ruochen Jiao, Zhilu Wang, Wanxin Jin, Zhuoran Yang, Zhaoran Wang, Chao Huang, Qi Zhu. *The International Conference on Machine Learning 2023*.

Joint Differentiable Optimization and Verification for Certified Reinforcement Learning. Yixuan Wang*, Simon Sinong Zhan*, Zhilu Wang, Chao Huang, Zhaoran Wang, Zhuoran Yang, Qi Zhu. *14th International Conference on Cyber-Physical Systems (with CPS-IoT Week 2023)*.

MicroFluID - A Reconfigurable RFID Platform for Robust Interaction Sensing Based on Microfluidics. Wei Sun, Yuwen Chen, Yanjun Chen, **Simon Sinong Zhan**, Yixin Li, Jiecheng Wu, Teng Han, Feng Tian, Jingxian Wang, Haipeng Mi, Xing-Dong Yang. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 2022.

RElectrode: A Reconfigurable Electrode For Multi-Purpose Sensing Based on Microfluidics. Wei Sun, Yanjun Chen, **Simon Sinong Zhan**, Teng Han, Feng Tian, Hongan Wang, Xing-Dong Yang. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*.

COURSES

- TA for Math 128A Fall 2022 (UC Berkeley)

PATENT

No.CN201710953534.X **The Device generating control instruction for multi-targets based on EMG(electromyography) signal** Simon Zhan, Junjun Fan, Feng Tian, Wei Sun. *Protected by Patent Law of the People's Republic of China*

No.CN202110377915.4 **A complex microfluidic pipeline composite structure and microfluidic pattern deformation system based on microfluidic technology** Wei Sun, Yanjun Chen, Simon Zhan, Teng Han, Feng Tian, Hongan Wang, Xing-Dong Yang. *Protected by Patent Law of the People's Republic of China*

No.CN202110378536.7 **A fluid pattern re-configurable system based on microfluidic technology** Wei Sun, Yanjun Chen, Simon Zhan, Teng Han, Feng Tian, Hongan Wang, Xing-Dong Yang. *Protected by Patent Law of the People's Republic of China*

TECHNICAL STRENGTHS

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| Computer Languages | C/C++, CUDA, Python, Java, R, C#, MATLAB, Julia, PyTorch/JAX |
| Software & Tools | HTML, Gurobi/CVX, Excel, Mathematica, Unity3D, Simulink, L ^A T _E X |
| Language | Native in Chinese and English, Limited proficiency in German |