

# SHUO YANG

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## EXPERTISE SUMMARY

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I have strong expertise in robotic, machine learning, algorithmic game theory, and control theory, with a particular application emphasis on safe and performant autonomous vehicles.

## EDUCATION

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### University of Pennsylvania

*Ph.D. in Electrical and Systems Engineering*

Safe Autonomous Systems Lab

Aug 2021 - present

Advisor: Prof. [Rahul Mangharam](#)

### Shanghai Jiao Tong University

*B.Eng. in Automation*

Cyber-Physical Systems Lab

Sept 2017 - June 2021

Advisor: Prof. [Xiang Yin](#)

## PROFESSIONAL EXPERIENCE

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### University of Pennsylvania

*Research Assistant*

Safe Autonomous Systems Lab

Aug 2021 - present

### Toyota Research Institute of North America

*Research Scientist Intern*

Future Mobility Research Department

May 2023 - Aug 2023

### Shanghai Jiao Tong University

*Research Assistant*

Cyber-Physical Systems Lab

Mar 2019 - June 2021

### Duke University

*Visiting Scholar*

June 2020 - Oct 2020

## SELECTED HONORS AND AWARDS

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| 1. Global Young PhD Fellow of Linear Capital                     | 2024       |
| 2. ACC Student Travel Grant                                      | 2023, 2024 |
| 3. The Dean's Fellowship from University of Pennsylvania         | 2021       |
| 4. Solomon M. Swaab Fellowship from University of Pennsylvania   | 2021       |
| 5. Outstanding Graduate of SJTU (top 1%)                         | 2021       |
| 6. Outstanding Bachelor Thesis Award of SJTU (top 1%)            | 2021       |
| 7. Person of the Year of SJTU (highest honor for SJTU students)  | 2020       |
| 8. COMAP Meritorious Winner in Mathematical Contest in Modelling | 2020       |
| 9. 3rd Prize of National College Student Physics Competition     | 2020       |
| 10. Excellent Academic Scholarship from SJTU                     | 2018, 2019 |
| 11. 3rd Prize of National High School Mathematics Competition    | 2016       |

## SOFTWARES

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- Safe Learning-based Certificates for Multi-Frictions Road Driving. [\[code\]](#) [\[paper\]](#)
- Adaptive Safe Reinforcement Learning. [\[code\]](#) [\[paper\]](#)
- Safe Multi-Frictions Road Driving. [\[code\]](#) [\[paper\]](#)
- Nash Equilibrium Solver for Two-Player Zero-Sum Games. [\[code\]](#)

## PUBLICATIONS

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(\* indicates equal contribution) [\[Google Scholar\]](#)

1. Tom Kuipers, Nandan Tumu, Shuo Yang, Milad Kazemi, Rahul Mangharam, Nicola Paoletti. “MA-COPP: Conformal Off-Policy Prediction for Multi-Agent Systems with Probabilistic Guarantees.” submitted, 2024.
2. Hongrui Zheng, Zhijun Zhuang, Stephanie Wu, Shuo Yang, Rahul Mangharam. ”Bridging the Gap between Discrete Agent Strategies in Game Theory and Continuous Motion Planning in Dynamic Environments.” submitted, 2024.
3. Shuo Yang, Yu Chen, Xiang Yin, Rahul Mangharam. “Learning Local Control Barrier Functions for Safety Control of Hybrid Systems.” submitted, 2024. [\[pdf\]](#) [\[code\]](#)
4. Jiangwei Wang, Shuo Yang, Ziyang An, Songyang Han, Zhili Zhang, Rahul Mangharam, Meiyi Ma, Fei Miao. “Multi-Agent Reinforcement Learning Guided by Signal Temporal Logic Specifications.” submitted, 2023. [\[pdf\]](#)
5. Xiatao Sun\*, Shuo Yang\*, Rahul Mangharam. “MEGA-Dagger: Imitation Learning with Multiple Imperfect Experts.” submitted, 2023. [\[pdf\]](#) [\[code\]](#)
6. Shuo Yang, Mitchell Black, Georgios Fainekos, Bardh Hoxha, Hideki Okamoto, Rahul Mangharam. “Safe Control Synthesis for Hybrid Systems through Local Control Barrier Functions.” *American Control Conference (ACC)*, 2024. [\[pdf\]](#) [\[code\]](#)
7. Luigi Berducci, Shuo Yang, Rahul Mangharam, Radu Grosu. “Learning Adaptive Safety for Multi-Agent Systems.” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024. [\[pdf\]](#) [\[code\]](#)
8. Shuo Yang, George J. Pappas, Rahul Mangharam, Lars Lindemann. “Safe Perception-Based Control under Stochastic Sensor Uncertainty using Conformal Prediction.” *IEEE Conference on Decision and Control (CDC)*, 2023. [\[pdf\]](#) [\[code\]](#)
9. Zhijie Qiao, Xiatao Sun, Shuo Yang, Helen Loeb, Rahul Mangharam. “Autonomous Vehicle Education Using a Virtual Reality Driving Simulator.” *CPS-IoT Week Humans in Cyber-Physical Systems Workshop*, 2023.
10. Yu Chen\*, Shuo Yang\*, Rahul Mangharam, Xiang Yin. “You Don’t Know When I Will Arrive: Unpredictable Controller Synthesis for Temporal Logic Tasks.” *22nd IFAC World Congress (IFAC WC)*, 2023. [\[pdf\]](#)
11. Hongrui Zheng\*, Zirui Zang\*, Shuo Yang\*, Rahul Mangharam. “Towards Explainability in Modular Autonomous Vehicle Software.” *IEEE Intelligent Vehicles Symposium (IV)*, 2023. [\[pdf\]](#)
12. Xiatao Sun, Mingyan Zhou, Zhijun Zhuang, Shuo Yang, Johannes Betz, Rahul Mangharam. “A Benchmark Comparison of Imitation Learning-based Control Policies for Autonomous Racing.” *IEEE Intelligent Vehicles Symposium (IV)*, 2023. [\[pdf\]](#)

13. Shuo Yang\*, Shaoru Chen\*, Victor M. Preciado, Rahul Mangharam. “Differentiable Safe Controller Design through Control Barrier Functions.” *IEEE Control Systems Letters (L-CSS)*, 2022. [\[pdf\]](#)[\[code\]](#)
14. Shuo Yang, Xiang Yin. “Secure Your Intention: On Notions of Pre-Opacity in Discrete-Event Systems.” (Full Paper), *IEEE Transactions on Automatic Control (TAC)*, 2022. [\[pdf\]](#)
15. Shuo Yang\*, Junyao Hou\*, Xiang Yin, Shaoyuan Li. “Opacity of Networked Supervisory Control Systems over Insecure Communication Channels.” *IEEE Transactions on Control of Network Systems (TCNS)*, 2021. [\[pdf\]](#)
16. Shuo Yang, Xiang Yin, Shaoyuan Li, Majid Zamani. “Secure-by-Construction Optimal Path Planning for Linear Temporal Logic Tasks.” *IEEE Conference on Decision and Control (CDC)*, 2020. [\[pdf\]](#)

## TALKS AND PRESENTATIONS

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1. Carnegie Mellon University (Intelligent Control Lab), Pittsburgh, Jan 2024  
**Safe Learning-Based Control for Hybrid Systems** (Host: Prof. Changliu Liu)
2. University of Pennsylvania (ASSET Seminar), Philadelphia, Sept 2023  
with Prof. Rahul Mangharam (Host: Prof. Rajeev Alur)  
**Safe and Performant Control for Learning-Enabled Autonomous Systems**
3. University of Pennsylvania (FM & ML Seminar), Philadelphia, Sept 2023 (Host: Prof. Eric Wong)  
**Safe Learning-Enabled Autonomous Systems**
4. University of Michigan, Ann Arbor, July 2023 (Host: Prof. Necmiye Ozay)  
**Safe Learning-Based Control for Autonomous Systems**
5. American Control Conference, San Diego, May 2023  
**Differentiable Safe Controller Design through Control Barrier Functions**
6. CPS-IoT Week Humans in CPS Workshop, San Antonio, May 2023  
**MEGA-Dagger: Imitation Learning with Multiple Imperfect Experts**
7. CPS-IoT Week Humans in CPS Workshop, San Antonio, May 2023  
**Autonomous Vehicle Education Using a Virtual Reality Driving Simulator**
8. RTSS Explainability Workshop, remote, Dec 2022  
**Towards Explainability in Modular Autonomous Vehicle Software**
9. 59<sup>th</sup> IEEE Conference on Decision and Control (CDC), remote, Dec 2020  
**Secure-by-Construction Optimal Path Planning for Linear Temporal Logic Tasks**

## TEACHING EXPERIENCES

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<b>Teaching Assitant</b>	<i>Fall 2023, UPenn</i>
<i>ESE 5000: Linear Systems Theory (Instructor: Prof. George J. Pappas)</i>	
<i>Responsibilities: teach 5 recitations, design assignments, hold office hours, etc.</i>	
<b>Teaching Assitant</b>	<i>Fall 2023, UPenn</i>
<i>ESE 5420: Statistics for Data Science (Instructor: Prof. Hamed Hassani)</i>	
<b>Teaching Assitant</b>	<i>Fall 2020, SJTU</i>
<i>MA 238: Discrete Mathematics (Instructor: Prof. Xiang Yin)</i>	
<b>Lecturer</b>	<i>Summer 2018, High School Affiliated to SJTU</i>
<i>Mathematics Competition</i>	

## STUDENT MENTORING

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**Xiatao Sun**, now Ph.D. student at Yale CS  
**Derek Zhou**, now Software Engineer at Plus.ai  
**Yu Chen**, now Ph.D. student at SJTU Automation  
**Shuqi Wang**, now Ph.D. student at SJTU Automation

## ACADEMIC SERVICES

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<b>Program Committee</b>	Tiny Papers @ ICLR 2023, 2024 (Area Chair) International Conference on Cyber-Physical Systems (ICCPS) 2023
<b>Reviewer</b>	American Control Conference (ACC) IEEE Conference on Decision and Control (CDC) International Conference on Learning Representations (ICLR) Advances in Neural Information Processing Systems (NeurIPS) AAAI Conference on Artificial Intelligence (AAAI) IEEE Transactions on Automatic Control (TAC) IEEE Transactions on Intelligent Vehicles (TIV) IEEE Robotics and Automation Letters (RA-L) IEEE Control Systems Letters (L-CSS) Nonlinear Analysis: Hybrid Systems (NAHS) International Conference on Robotics and Automation (ICRA) International Conference on Hybrid Systems: Computation and Control (HSCC) IROS 2023 Workshop on Multi-agent Dynamic Games (MAD-Games) NeurIPS 2023 AI for Science Workshop (AI4Science) etc.

## SELECTED ACTIVITY EXPERIENCES

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Global Education and Training at University of Illinois at Urbana-Champaign	2019
Volunteer of the Shanghai International Marathon	2018, 2019

## LANGUAGE, SKILLS AND INTERESTS

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<b>Language</b>	Chinese (native), English (fluent), French (basic)
<b>Programming</b>	Python, C++, R, MATLAB, $\text{\LaTeX}$
<b>Optimization</b>	Gurobi, CVX, CVXPY, CasADi
<b>Framework &amp; Toolkit</b>	NumPy, JAX, PyTorch, ROS, Docker, Git
<b>Interests</b>	Basketball, Literature, Music, Board Games, Video Games, etc.

*Last update: March 2024*