SHAORU CHEN

Senior Software Engineer, Machine Learning at LinkedIn
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SUMMARY

Senior Machine Learning Engineer at LinkedIn, leading integration of generative AI in ads campaign design and recommendations. Published 20+ papers in top machine learning, robotics, and control theory conferences. Passionate about productionizing generative AI.

EDUCATION

University of Pennsylvania *Philadelphia, PA*
Ph.D. in Electrical and Systems Engineering *Aug. 2017 - Dec. 2022*
Advised by: Prof. Victor M. Preciado. GPA: 3.96/4.00.

Zhejiang University *Hangzhou, China*
B.E. in Electrical Engineering *Aug. 2013 - Jun. 2017*
Chu Kochen Honors College, Advisor: Prof. Jian Chen. GPA: 90.8/100.

EXPERIENCE

LinkedIn Aug. 2024 - Present
Senior Software Engineer, Machine Learning *Mountain View, CA*

· Utilizing generative AI tools for ads campaign design and ads recommendation.

Microsoft Research, NYC Jan. 2023 - Jun. 2024
Postdoctoral Researcher *New York City, NY*

· Representation learning for goal-conditioned planning through high-dimensional observation.

- Designed and learned the latent state representation that maintains the geometry of the environment in the latent space for vision-based planning and policy learning.
- Developed a hierarchical motion planning method using latent representation that outperforms strong deep reinforcement learning baselines.

· Safety-assured control of neural network systems through online convex optimization.

- Filtered unsafe control inputs for neural network systems using neural network verification bounds and robust model predictive control.
- Relaxed the complex, nonconvex predictive control problem of neural network systems into a convex quadratic program with interpretable numerical results.

· Verification-aided learning of formal safety certificates for learning-enabled systems.

- Proposed a novel fine-tuning method based on convex optimization for learning neural network safety certificates. Boosted the success rate by 5x times and significantly reduced the algorithm runtime through the principled fine-tuning method.

University of Pennsylvania Aug. 2017 - Dec. 2022
Graduate Research Assistant *Philadelphia, PA*

· Scalable neural network verification through operator splitting.

- Proposed DeepSplit, a neural network verification algorithm that is scalable, parallelizable, and enjoys fast theoretical convergence guarantees.
- Achieved 7x speedup in certifying robustness of deep NN image classifiers compared with commercial solvers, and 10x tighter bounds in dynamical system reachable set approximation compared with equally scalable NN verification baselines.

· Boosting tightness of robust model predictive control for uncertain systems.

- Proposed a novel robust MPC method that jointly searches for robust feedback policies and uncertainty over-approximations through a numerically efficient convex quadratic program.
- Achieved significant and consistent tightness improvement over all existing robust MPC methods in comprehensive numerical experiments.

Harvard University Nov. 2016 - May 2017
Research Intern *Cambridge, MA*

· Brain-network reconstruction using molecular imaging. Mentor: Prof. Quanzheng Li.

- Applied graph theory and machine learning to integrate the analysis of different types of brain molecular images for brain-network reconstruction and diagnosis of Alzheimer's disease.

University of California, Davis Jul. 2016 - Sept. 2016
Research Intern *Davis, CA*

· Fault-tolerant control of distributed energy resources. Mentor: Prof. Nael El-Farra.

- Developed sensor fault accommodation methods for control systems subject to improper sensor reading and sensor sampling rate drift.
- Examined stability and performance of a multi-rate sampled-data solid oxide fuel cell system.

SKILLS

Programming Languages	Python, Scala, SQL, Matlab
Tools	PyTorch, TensorFlow, Spark, Gurobi, Git, LaTeX

HONORS AND AWARDS

Chu Kochen Honors College Research Fellowship, Zhejiang University	2017
Chunhui Scholarship (highest honor in College of Control Science and Engineering, ZJU)	2017
First-Class Scholarship for Outstanding Students of Zhejiang University (top 3%)	2014, 2015
Outstanding Student Leader Awards, Zhejiang University	2014
First Prize of Chinese Physics Olympiad (Top 55 in Jiangsu Province, China)	2012

LEADERSHIP AND PROFESSIONAL SERVICE

Publicity Co-Chair of the Control Systems Society (CSS) NextCom – A committee established in December 2023 aiming to support students and early career researchers from the control community.

Teaching assistant for four courses (Learning for Dynamics and Control, Model Predictive Control, Modern Convex Optimization, Introduction to Optimization Theory) at the University of Pennsylvania.

Journal Reviewer IEEE Transactions on Automatic Control (TAC), Automatica, IEEE Open Journal of Control Systems (OJCSYS), IEEE Control Systems Letters (L-CSS), IEEE Transactions on Vehicular Technology (TVT), IEEE Robotics and Automation Letters (RA-L).

Conference Reviewer IEEE Conference on Decision and Control (CDC), IEEE International Conference on Robotics and Automation (ICRA), American Control Conference (ACC), IFAC World Congress,

Annual Learning for Dynamics and Control Conference (L4DC), ACM International Conference on Hybrid Systems: Computation and Control (HSCC), IFAC Symposium on System Identification (SYSID).

PUBLICATIONS

Journal Publications(* indicates equal contribution)

1. **Shaoru Chen**, Victor M. Preciado, Manfred Morari, and Nikolai Matni. Robust model predictive control with polytopic model uncertainty through System Level Synthesis. Automatica, 2023.
2. Shuo Yang*, **Shaoru Chen***, Victor M. Preciado, and Rahul Mangharam. Differentiable Safe Controller Design through Control Barrier Functions. IEEE Control Systems Letters, 2022.
3. **Shaoru Chen***, Eric Wong*, J. Zico Kolter, and Mahyar Fazlyab. DeepSplit: Scalable Verification of Deep Neural Networks via Operator Splitting. IEEE Open Journal of Control Systems (OJCSYS), 2022.
4. James T. Allen, **Shaoru Chen**, and Nael H. El-Farra. Model-based Strategies for Sensor Fault Accommodation in Uncertain Dynamic Processes with Multi-rate Sampled Measurements. Chemical Engineering Research and Design, 2019.

Conference Publications

1. Lakshmideepakreddy Manda, **Shaoru Chen**, Mahyar Fazlyab. Learning Performance-Oriented Control Barrier Functions under Complex Safety Constraints and Limited Actuation. Conference on Robot Learning (CoRL), 2024.
2. Lakshmideepakreddy Manda, **Shaoru Chen**, Mahyar Fazlyab. Domain Adaptive Safety Filters via Deep Operator Learning. IEEE Conference on Decision and Control (CDC), 2024.
3. Lekan Molu, **Shaoru Chen**. Structural Properties and Control of Soft Robots Modeled as Discrete Cosserat Rods. IEEE Conference on Decision and Control (CDC), 2024.
4. Anurag Koul, Shivakanth Sujit, **Shaoru Chen**, Ben Evans, Lili Wu, Byron Xu, Rajan Chari, Riashat Islam, Raihan Seraj, Yonathan Efroni, Lekan Molu, Miro Dudik, John Langford, Alex Lamb. PcLast: Discovering Plannable Continuous Latent States. International Conference on Machine Learning (ICML), 2024.
5. **Shaoru Chen**, Lekan Molu, Mahyar Fazlyab. Verification-Aided Learning of Neural Network Barrier Functions with Termination Guarantees. American Control Conference (ACC), 2024.
6. **Shaoru Chen***, Kong Yao Chee*, Nikolai Matni, M. Ani Hsieh, George J. Pappas. Safety Filter Design for Neural Network Systems via Convex Optimization. IEEE Conference on Decision and Control (CDC), 2023.
7. **Shaoru Chen**, Victor M. Preciado, and Mahyar Fazlyab. One-shot reachability analysis of neural network dynamical systems. International Conference on Robotics and Automation (ICRA), 2023.
8. **Shaoru Chen**, Ning-Yuan Li, Victor M. Preciado, and Nikolai Matni. Robust Model Predictive Control of Time-Delay Systems through System Level Synthesis. IEEE Conference on Decision and Control (CDC), 2022.
9. **Shaoru Chen**, Mahyar Fazlyab, Manfred Morari, George J. Pappas, and Victor M. Preciado. Learning Rregion of Attraction for Nonlinear Systems. IEEE Conference on Decision and Control (CDC), 2021.
10. **Shaoru Chen**, Mahyar Fazlyab, Manfred Morari, George J. Pappas, and Victor M. Preciado. Learning Lyapunov Functions for Hybrid Systems. International Conference on Hybrid Systems: Computation and Control (HSCC), 2021.

11. **Shaoru Chen**, Han Wang, Manfred Morari, Victor M. Preciado, and Nikolai Matni. Robust Closed-loop Model Predictive Control via System Level Synthesis. IEEE Conference on Decision and Control (CDC), 2020.

12. Ximing Chen, **Shaoru Chen**, and Victor M. Preciado. Safety Verification of Nonlinear Polynomial System via Occupation Measures. IEEE Conference on Decision and Control (CDC), 2019.

13. Han Wang, Mahyar Fazlyab, **Shaoru Chen**, and Victor M. Preciado. Robust Convergence Analysis of Three-Operator Splitting. Annual Allerton Conference on Communication, Control, and Computing (Allerton), 2019.

14. **Shaoru Chen**, James T. Allen, and Nael H. El-Farra. Stability and Performance-Based Strategies for Sensor Fault Accommodation in Multi-rate Sampled-data Processes. 20th World Congress of the International Federation of Automatic Control (IFAC), 2017.

15. Zhiyang Liu, Jian Chen, **Shaoru Chen**, Lianghui Huang, and Zhigang Shao. Modeling and Control of Cathode Air Humidity for PEM Fuel Cell Systems. 20th World Congress of the International Federation of Automatic Control (IFAC), 2017.