

# Yang Zheng

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## Research Overview

My research interests broadly include topics in learning, optimization, and control of network systems, with applications to cyber-physical systems, autonomous vehicles, and smart cities. I am leading the Scalable Optimization and Control (SOC) Lab at UC San Diego.

Our SOC lab develops theory and algorithms for scalable convex and nonconvex optimization (particularly around semidefinite and polynomial optimization), data-driven and learning-based control, and sustainable urban mobility.

## Appointments

- 07/2021 - present Assistant Professor, Department of Electrical and Computer Engineering  
University of California San Diego
- 09/2020 - 06/2021 Research associate, Department of Computing, Imperial College London  
Advisor: Prof. Alessio R. Lomuscio.
- 03/2019 - 08/2020 Postdoctoral fellow, School of Engineering and Applied Sciences,  
Harvard Center for Green Buildings and Cities, Harvard University  
Advisors: Prof. Na Li and Prof. Ali Malkawi.

## Education

- 09/2015 - 03/2019 DPhil (Ph.D.) in Engineering Science, University of Oxford  
Thesis: Chordal sparsity in control and optimization of large-scale systems  
Advisor: Prof. Antonis Papachristodoulou
- 09/2013 - 07/2015 M.E. in Mechanical Engineering, Tsinghua University
- 09/2010 - 07/2013 B.A. in Economics (double degree), Tsinghua University
- 09/2009 - 07/2013 B.E. in Automotive Engineering, Tsinghua University

## Teaching Experience

### At UCSD

- Winter 2024 Instructor, *ECE 285 - Semidefinite and Sum-of-squares Optimization*
- Spring 2023 Instructor, *ECE 171A - Linear Control System Theory* (100% recommendation rate)
- Winter 2023 Instructor, *ECE 285 - Semidefinite and Sum-of-squares Optimization*
- Spring 2022 Instructor, *ECE 171A - Linear Control System Theory* (100% recommendation rate)
- Winter 2022 Instructor, *ECE 285 - Semidefinite and Sum-of-squares Optimization*

### Before UCSD

- Fall 2019 Lead Teaching Fellow, *ES 155 - Systems and Control*, School of Engineering and Applied Sciences, Harvard University. (**Award of Distinction in Teaching**)
- 2016 – 2018 Teaching Assistant, *B15 Control Systems*, Department of Engineering Science, University of Oxford.
- Spring 2017 Lab Demonstrator, *Control Coursework Module*, Department of Engineering Science, University of Oxford.
- Spring 2016 Lab Demonstrator, *2<sup>nd</sup> Year Helicopter Control Lab*, Department of Engineering Science, University of Oxford.

## Student Advising

### Current SOC members

- 09/2023 – present Feng-Yi Liao (Ph.D.; MS from 2021 - 2023)

09/2023 – present Xu Shang (Ph.D.)  
 09/2022 – present Hesam Mojtahedi (Ph.D.)  
 09/2022 – present Xixin Zhang (Ph.D.; co-advised with Prof. Junfei Xie)  
 09/2021 – present Chih-Fan (Rich) Pai (Ph.D., joined the SOC lab since summer 2023)  
 06/2023 – present Guanbo Shao (MS)  
 02/2023 – present Yunzhou Yan (MS)  
 06/2023 – present Pranav Reddy (UG)  
 06/2023 – present Yue (Melody) Yin (UG)  
 02/2023 – present Meihui Liu (UG), SRIP program 2023

#### SOC Group Alumni

02/2023 – 08/2023 Haoxing Du (MS), SRIP program 2023  
 Spring 2023 Mingqing Xu (MS)  
 Fall 2022 Elham Abolfazli (Ph.D., academic visitor from Aalto University, Finland)  
 Summer 2022 Jonathan Mi (UG → Ph.D. at UMich; 2023 NSF GRFP awardee)  
 Summer 2022 Yichen Yang (UG → MS at UCLA)  
 Summer 2022 Chenhao (Jason) Zhu (UG → MS at UC Berkeley)  
 Summer 2022 Xiao Ding (MS)  
 07/2022 – 12/2022 Laiwei Wei (MS)  
 02/2022 – 08/2022 Yanzhi Yao (MS), SRIP program 2022  
 02/2022 – 08/2022 Anish Kulkarni (UG), SRIP program 2022  
 02/2021 – 08/2021 Stuart Boynton (UG), SRIP program 2021  
 02/2021 – 08/2021 Haozhe Liu (UG), SRIP program 2021

#### Students at **Harvard** (co-advised with Prof. Na Li)

02/2019 – 06/2019 Aldis Elfarsdottir (UG); **Dean's Award** for her senior thesis

#### Students at **Oxford** (co-advised with Prof. Antonis Papachristodoulou)

05/2019 – 09/2019 Matthew Newton (AIMS CDT student)  
 05/2019 – 09/2019 Adrian Radu (UG)  
 10/2018 – 02/2019 Jonathan Pease (UG)

#### Students at **Tsinghua** (co-advised with Prof. Keqiang Li)

04/2018 – 07/2021 Jiawei Wang (Ph.D.); **Outstanding Undergraduate Thesis Award; Excellent Doctoral Dissertation Award**  
 05/2017 – 07/2019 Yougang Bian (Ph.D.)  
 10/2017 – 07/2019 Zhitao Wang (MS)

#### Selected Honors & Awards

01/2024 NSF CAREER Award  
 12/2023 Jacobs School of Engineering Early Career Faculty Development Award, UC San Diego  
 10/2023 Best Graduate Teacher Award, ECE UC San Diego  
 06/2023 IEEE Intelligent Transportation Systems Magazine 2017-2020 Outstanding Survey Paper Award  
 12/2022 IEEE Transactions on Control of Network Systems Best Paper Award  
 07/2020 European PhD Award on Control for Complex and Heterogeneous Systems  
 04/2020 Award of Distinction in Teaching, Harvard University  
 06/2019 Best Student Paper Award finalist (18<sup>th</sup> European Control Conference)  
 03/2019 Chinese Government Award for Outstanding Self-financed Students Abroad  
 09/2018 Outstanding contribution in reviewing, Journal of the Franklin Institute  
 09/2015 Clarendon Scholarship at the University of Oxford  
 07/2015 Excellent Graduate of Beijing  
 04/2015 Best Paper Award (14<sup>th</sup> Intelligent Transportation Systems Asia-Pacific Forum)  
 10/2014 Best Student Paper Award (IEEE 17<sup>th</sup> Conference on Intelligent Transportation Systems)

10/2014	National Scholarship for graduates
07/2013	Excellent Graduate at Tsinghua University
09/2012	Tsinghua Kaifeng Scholarship
09/2011	Comprehensive Scholarship
09/2010	National Scholarship for undergraduates
05/2010	2 <sup>nd</sup> prize, 4 <sup>th</sup> Smart Car Design Competition at Tsinghua University
02/2009	1 <sup>st</sup> Prize, National Chemistry Olympiad Competition, Guangxi, China
11/2008	1 <sup>st</sup> Prize, National Physical Olympiad Competition, Guangxi, China
10/2008	1 <sup>st</sup> Prize, National Mathematics Olympiad Competition, Guangxi, China

## Selected Student Honors & Awards

2023	Mr. Feng-Yi Liao (PhD student) won the <i>Poster Presentation Award</i> in Operations Research and Optimization Methodologies at 2023 INFORMS Annual Conference, for his poster “ <i>Spectral Bundle Methods for Primal and Dual Semidefinite Programs</i> ”.
2023	Mr. Jonathan Mi (UG) won the NSF Graduate Research Fellowship. He is currently a PhD student at UMich.
2019	Ms. Aldis Elfarsdottir (UG) received the Dean’s Design Award for her senior thesis at Harvard: “ <i>Thermal Dynamic Model Development and Model Predictive Building Control Using an Extensive Sensor Network</i> ”.

## Current Funded Projects

05/2024 - 04/2029	“CAREER: Interplay between Convex and Nonconvex Optimization for Control”, National Science Foundation, Single PI, \$550,000.
01/2024 - 06/2024	“Principled Data-driven Control for Societal Nonlinear Systems via Koopman Operator and Behavioral Theory”, JOSE Early Career Faculty Development Award, UC San Diego, Lead PI, approx. \$100,000 (my share \$50,000; Collaborative Research with Prof. Jorge Cortes).
09/2023 - 08/2026	“Collaborative Research: Scalable Data-Enabled Predictive Control for Heterogeneous Mixed Traffic Systems”, National Science Foundation, Lead PI, \$405,000 (my share \$203,000; Collaborative Research with Michigan State University, PI: Zhaojian Li).
08/2022 - 07/2025	“Matrix Decomposition for Scalable Conic Optimization with Applications to Distributed Control and Machine Learning”, National Science Foundation, Single PI, \$350,000.

## Open-source Packages

See our group Github page for a list of the packages developed at the SOC lab.

1. CDCS: Cone Decomposition Conic Solver.  
An open-source first-order solver for sparse conic optimization by exploiting chordal sparsity.  
<https://github.com/oxfordcontrol/CDCS>
2. SOSADMM.  
An open-source first-order MATLAB solver for conic programs with row sparsity.  
<https://github.com/oxfordcontrol/SOSADMM>
3. Mixed-traffic.  
Open-source modeling, control, and demos of mixed traffic flow.  
<https://github.com/soc-ucsd/mixed-traffic>
4. DeeP-LCC.  
Open-source demos for Data-Enabled Predictive Leading Cruise Control (DeeP-LCC).  
<https://github.com/soc-ucsd/DeeP-LCC>

## Publications

Citations: 5400+; h-index: 35; i-10 index: 59 (Data from Google Scholar, Feb 2024)

## Preprint

- P1 X. Shang, J. Wang, and Y. Zheng. Decentralized robust data-driven predictive control for smoothing mixed traffic flow. *arXiv preprint arXiv:2401.15826*, 2024
- P2 F.-Y. Liao, L. Ding, and Y. Zheng. Error bounds, PL condition, and quadratic growth for weakly convex functions, and linear convergences of proximal point methods. *arXiv preprint arXiv:2312.16775*, 2023
- P3 X. Shang and Y. Zheng. Convex approximations for a bi-level formulation of data-enabled predictive control. *arXiv preprint arXiv:2312.15431*, 2023
- P4 Y. Zheng, C.-f. Pai, and Y. Tang. Benign nonconvex landscapes in optimal and robust control, part i: Global optimality. *arXiv preprint arXiv:2312.15332*, 2023
- P5 X. Shang, J. Wang, and **Y. Zheng**. Smoothing mixed traffic with robust data-driven predictive control for connected and autonomous vehicles. *arXiv preprint arXiv:2310.00509*, 2023
- P6 F.-Y. Liao, L. Ding, and Y. Zheng. An overview and comparison of spectral bundle methods for primal and dual semidefinite programs. *arXiv preprint arXiv:2307.07651*, 2023
- P7 Z. Ren, Y. Zheng, M. Fazel, and N. Li. On controller reduction in linear quadratic gaussian control with performance bounds, 2022

## Journal

- J1 J. Wang, **Y. Zheng**, J. Dong, C. Chen, M. Cai, K. Li, and Q. Xu. Implementation and experimental validation of data-driven predictive control for dissipating stop-and-go waves in mixed traffic. *IEEE Internet of Things Journal*, 11(3):4570–4585, 2024
- J2 J. Duan, W. Cao, **Y. Zheng**, and L. Zhao. On the optimization landscape of dynamic output feedback linear quadratic control. *IEEE Transactions on Automatic Control*, 69(2):920–935, 2024
- J3 K. Zhang, K. Chen, Z. Li, J. Chen, and **Y. Zheng**. Privacy-preserving data-enabled predictive leading cruise control in mixed traffic. *IEEE Transactions on Intelligent Transportation Systems*, pages 1–16, 2023
- J4 K. Zhang, **Y. Zheng**, C. Shang, and Z. Li. Dimension reduction for efficient data-enabled predictive control. *IEEE Control Systems Letters*, 7:3277–3282, 2023
- J5 Y. Bian, N. Zheng, **Y. Zheng**, B. Xu, and Y. Shi. Predicting strategic energy storage behaviors. *IEEE Transactions on Smart Grid*, pages 1–11, 2023
- J6 J. Wang, **Y. Zheng**, K. Li, and Q. Xu. DeeP-LCC: Data-enabled predictive leading cruise control in mixed traffic flow. *IEEE Transactions on Control Systems Technology*, 31(6):2760–2776, 2023
- J7 **Y. Zheng** and G. Fantuzzi. Sum-of-squares chordal decomposition of polynomial matrix inequalities. *Mathematical Programming*, 197(1):71–108, 2023
- J8 **Y. Zheng**, A. Sootla, and A. Papachristodoulou. Block factor-width-two matrices and their applications to semidefinite and sum-of-squares optimization. *IEEE Transactions on Automatic Control*, 68(2):943–958, 2023
- J9 Y. Tang, **Y. Zheng**, and N. Li. Analysis of the optimization landscape of Linear Quadratic Gaussian (LQG) control. *Mathematical Programming*, pages 399–444, 2023
- J10 B. Hu and **Y. Zheng**. Connectivity of the feasible and sublevel sets of dynamic output feedback control with robustness constraints. *IEEE Control Systems Letters*, 7:442–447, 2022
- J11 **Y. Zheng**, L. Furieri, M. Kamgarpour, and N. Li. System-level, input–output and new parameterizations of stabilizing controllers, and their numerical computation. *Automatica*, 140:110211, 2022 [PDF]
- J12 J. Miller, **Y. Zheng**, M. Sznaier, and A. Papachristodoulou. Decomposed structured subsets for semidefinite and sum-of-squares optimization. *Automatica*, 137:110125, 2022
- J13 K. Li, J. Wang, and **Y. Zheng**. Cooperative formation of autonomous vehicles in mixed traffic flow: Beyond platooning. *IEEE Transactions on Intelligent Transportation Systems*, 23(9):15951–15966, 2022
- J14 J. Wang, **Y. Zheng**, C. Chen, Q. Xu, and K. Li. Leading cruise control in mixed traffic flow: System modeling, controllability, and string stability. *IEEE Transactions on Intelligent Transportation Systems*, 23(8):12861–12876, 2022
- J15 **Y. Zheng**, G. Fantuzzi, and A. Papachristodoulou. Chordal and factor-width decompositions for scalable semidefinite and polynomial optimization. *Annual Reviews in Control*, 52:243–279, 2021

- J16 J. Wang, **Y. Zheng**, Q. Xu, J. Wang, and K. Li. Controllability analysis and optimal control of mixed traffic flow with human-driven and autonomous vehicles. *IEEE Transactions on Intelligent Transportation Systems*, 22(12):7445–7459, 2021 [PDF]
- J17 **Y. Zheng**, Y. Bian, S. Li, and S. E. Li. Cooperative control of heterogeneous connected vehicles with directed acyclic interactions. *IEEE Intelligent Transportation Systems Magazine*, 13(2):127–141, 2021 [PDF]
- J18 Y. Li, **Y. Zheng**, B. Morys, S. Pan, J. Wang, and K. Li. Threat assessment techniques in intelligent vehicles: A comparative survey. *IEEE Intelligent Transportation Systems Magazine*, 13(4):71–91, 2021 [PDF]
- J19 **Y. Zheng** and N. Li. Non-asymptotic identification of linear dynamical systems using multiple trajectories. *IEEE Control Systems Letters*, 5(5):1693–1698, 2021 [PDF]
- J20 **Y. Zheng**, L. Furieri, A. Papachristodoulou, N. Li, and M. Kamgarpour. On the equivalence of youla, system-level, and input–output parameterizations. *IEEE Transactions on Automatic Control*, 66(1):413–420, 2020 [PDF]
- J21 Y. Chen, Z. Tong, **Y. Zheng**, H. Samuelson, and L. Norford. Transfer learning with deep neural networks for model predictive control of HVAC and natural ventilation in smart buildings. *Journal of Cleaner Production*, 254:119866, 2020 [PDF]
- J22 S. E. Li, Z. Wang, **Y. Zheng**, Q. Sun, J. Gao, F. Ma, and K. Li. Synchronous and asynchronous parallel computation for large-scale optimal control of connected vehicles. *Transportation research part C: emerging technologies*, 121:102842, 2020 [PDF]
- J23 L. Furieri, **Y. Zheng**, A. Papachristodoulou, and M. Kamgarpour. Sparsity invariance for convex design of distributed controllers. *IEEE Transactions on Control of Network Systems*, 7(4):1836–1847, 2020 [PDF]. **Best Paper Award**
- J24 **Y. Zheng**, G. Fantuzzi, A. Papachristodoulou, P. Goulart, and A. Wynn. Chordal decomposition in operator-splitting methods for sparse semidefinite programs. *Mathematical Programming*, 180(1):489–532, 2020 [PDF]
- J25 **Y. Zheng**, J. Wang, and K. Li. Smoothing traffic flow via control of autonomous vehicles. *IEEE Internet of Things Journal*, 7(5):3882–3896, 2020 [PDF]
- J26 **Y. Zheng**, M. Kamgarpour, A. Sootla, and A. Papachristodoulou. Distributed design for decentralized control using chordal decomposition and ADMM. *IEEE Transactions on Control of Network Systems*, 7(2):614–626, 2020 [PDF]
- J27 A. Sootla, **Y. Zheng**, and A. Papachristodoulou. On the existence of block-diagonal solutions to Lyapunov and  $\mathcal{H}_\infty$  riccati inequalities. *IEEE Transactions on Automatic Control*, 65(7):3170–3175, 2019 [PDF]
- J28 **Y. Zheng**, G. Fantuzzi, and A. Papachristodoulou. Fast ADMM for sum-of-squares programs using partial orthogonality. *IEEE Transactions on Automatic Control*, 64(9):3869–3876, Sep. 2019 [PDF]
- J29 L. Furieri, **Y. Zheng**, A. Papachristodoulou, and M. Kamgarpour. An input-output parametrization of stabilizing controllers: Amidst youla and system level synthesis. *IEEE Control Systems Letters*, 3(4):1014–1019, Oct 2019 [PDF]
- J30 Y. Bian, **Y. Zheng**, W. Ren, S. E. Li, J. Wang, and K. Li. Reducing time headway for platooning of connected vehicles via V2V communication. *Transportation Research Part C: Emerging Technologies*, 102:87–105, 2019 [PDF]
- J31 **Y. Zheng**, R. P. Mason, and A. Papachristodoulou. Scalable design of structured controllers using chordal decomposition. *IEEE Transactions on Automatic Control*, 63(3):752–767, 2018 [PDF]
- J32 **Y. Zheng**, S. E. Li, K. Li, and W. Ren. Platooning of connected vehicles with undirected topologies: Robustness analysis and distributed h-infinity controller synthesis. *IEEE Transactions on Intelligent Transportation Systems*, 19(5):1353–1364, 2018 [PDF]
- J33 **Y. Zheng**, G. Fantuzzi, and A. Papachristodoulou. Exploiting sparsity in the coefficient matching conditions in Sum-of-Squares programming using ADMM. *IEEE Control Systems Letters*, 1(1):80–85, 2017 [PDF]
- J34 **Y. Zheng**, S. E. Li, K. Li, F. Borrelli, and J. K. Hedrick. Distributed model predictive control for heterogeneous vehicle platoons under unidirectional topologies. *IEEE Transactions on Control Systems Technology*, 25(3), 2017 [PDF]

- J35 S. E. Li, **Y. Zheng**, K. Li, Y. Wu, J. K. Hedrick, F. Gao, and H. Zhang. Dynamical modeling and distributed control of connected and automated vehicles: Challenges and opportunities. *IEEE Intelligent Transportation Systems Magazine*, 9(3):46–58, 2017 [PDF]. **2017-2020 Outstanding survey paper award**
- J36 Y. Li, **Y. Zheng**, J. Wang, K. Kodaka, and K. Li. Crash probability estimation via quantifying driver hazard perception. *Accident Analysis & Prevention*, 2017 [PDF]
- J37 S. E. Li, X. Qin, **Y. Zheng**, J. Wang, K. Li, and H. Zhang. Distributed platoon control under topologies with complex eigenvalues: stability analysis and controller synthesis. *IEEE Transactions on Control Systems Technology*, 27(1):206–220, 2017 [PDF]
- J38 **Y. Zheng**, S. E. Li, K. Li, and L.-Y. Wang. Stability margin improvement of vehicular platoon considering undirected topology and asymmetric control. *IEEE Transactions on Control Systems Technology*, 24(4):1253–1265, 2016 [PDF]
- J39 **Y. Zheng**, S. E. Li, J. Wang, D. Cao, and K. Li. Stability and scalability of homogeneous vehicular platoon: Study on the influence of information flow topologies. *IEEE Transactions on Intelligent Transportation Systems*, 17(1):14–26, 2016 [PDF]
- J40 F. Gao, S. E. Li, **Y. Zheng**, and D. Kum. Robust control of heterogeneous vehicular platoon with uncertain dynamics and communication delay. *IET Intelligent Transport Systems*, 10(7):503–513, 2016 [PDF]
- J41 J. Wang, **Y. Zheng**, X. Li, C. Yu, K. Kodaka, and K. Li. Driving risk assessment using near-crash database through data mining of tree-based model. *Accident Analysis & Prevention*, 84:54–64, 2015
- J42 J.-Q. Wang, S. E. Li, **Y. Zheng**, and X.-Y. Lu. Longitudinal collision mitigation via coordinated braking of multiple vehicles using model predictive control. *Integrated Computer-Aided Engineering*, 22(2):171–185, 2015 [PDF]
- J43 S. E. Li, K. Deng, **Y. Zheng**, and H. Peng. Effect of pulse-and-glide strategy on traffic flow for a platoon of mixed automated and manually driven vehicles. *Computer-Aided Civil and Infrastructure Engineering*, 30(11):892–905, 2015 [PDF]

#### Book chapter & Tutorial paper

1. **Y. Zheng**, G. Fantuzzi, and A. Papachristodoulou. Decomposition methods for large-scale semidefinite programs with chordal aggregate sparsity and partial orthogonality. In *Large-Scale and Distributed Optimization*, pages 33–55. Springer, 2018 [PDF]
2. A. A. Ahmadi, G. Hall, A. Papachristodoulou, J. Saunderson, and **Y. Zheng**. Improving efficiency and scalability of sum of squares optimization: Recent advances and limitations. In *Proc. 56th IEEE Conf. Decis. Control*, pages 453–462, Dec 2017 [PDF] **Tutorial paper**

#### Refereed Conference papers

- C1 Y. Tang and **Y. Zheng**. On the global optimality of direct policy search for nonsmooth  $\mathcal{H}_\infty$  output-feedback control. In *2023 62nd IEEE Conference on Decision and Control (CDC)*, pages 6148–6153, 2023
- C2 H. Mojtahedi, F.-Y. Liao, and **Y. Zheng**. A spectral bundle method for sparse semidefinite programs. In *2023 62nd IEEE Conference on Decision and Control (CDC)*, pages 8254–8259, 2023
- C3 Z. Ren, **Y. Zheng**, M. Fazel, and N. Li. On controller reduction in linear quadratic gaussian control with performance bounds. In *Learning for Dynamics and Control Conference*, pages 1008–1019. PMLR, 2023
- C4 J. Lan, **Y. Zheng**, and A. Lomuscio. Iteratively enhanced semidefinite relaxations for efficient neural network verification. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 37, pages 14937–14945, 2023
- C5 F.-Y. Liao and **Y. Zheng**. Iterative inner/outer approximations for scalable semidefinite programs using block factor-width-two matrices. In *2022 IEEE 61st Conference on Decision and Control (CDC)*, pages 7591–7597. IEEE, 2022
- C6 J. Duan, W. Cao, **Y. Zheng**, and L. Zhao. On the optimization landscape of dynamic output feedback: A case study for linear quadratic regulator. In *2022 IEEE 61st Conference on Decision and Control (CDC)*, pages 4040–4045. IEEE, 2022

- C7 **Y. Zheng**, Y. Sun, M. Fazel, and N. Li. Escaping high-order saddles in policy optimization for linear quadratic gaussian (lqg) control. In *2022 IEEE 61st Conference on Decision and Control (CDC)*, pages 5329–5334. IEEE, 2022
- C8 M. C. de Oliveira and **Y. Zheng**. Convex parameterization of stabilizing controllers and its lmi-based computation via filtering. In *2022 IEEE 61st Conference on Decision and Control (CDC)*, pages 5498–5504. IEEE, 2022
- C9 J. Lan, **Y. Zheng**, and A. Lomuscio. Tight neural network verification via semidefinite relaxations and linear reformulations. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 36, pages 7272–7280, 2022
- C10 Y. Bian, N. Zheng, **Y. Zheng**, B. Xu, and Y. Shi. Demand response model identification and behavior forecast with optnet: A gradient-based approach. New York, NY, USA, 2022. Association for Computing Machinery (ACM)
- C11 P. Kouvaros, T. Kyono, F. Leofante, A. Lomuscio, D. Margineantu, D. Osipychyev, and **Y. Zheng**. Formal analysis of neural network-based systems in the aircraft domain. In *International Symposium on Formal Methods*, pages 730–740. Springer, 2021
- C12 Y. Tang, **Y. Zheng**, and N. Li. Analysis of the optimization landscape of linear quadratic gaussian (lqg) control. In *Learning for Dynamics and Control*, pages 599–610. PMLR, 2021
- C13 **Y. Zheng**, L. Furieri, M. Kamgarpour, and N. Li. Sample complexity of linear quadratic gaussian (lqg) control for output feedback systems. In *Learning for Dynamics and Control*, pages 559–570. PMLR, 2021
- C14 B. Batten, P. Kouvaros, A. Lomuscio, and **Y. Zheng**. Efficient neural network verification via layer-based semidefinite relaxations and linear cuts. In *International Joint Conference on Artificial Intelligence (IJCAI21)*, pages 2184–2190, 2021
- C15 R. Drummond and **Y. Zheng**. Impact of disturbances on mixed traffic control with autonomous vehicles. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 220–225. IEEE, 2020
- C16 J. Wang, **Y. Zheng**, C. Chen, Q. Xu, and K. Li. Leading cruise control in mixed traffic flow. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 226–232. IEEE, 2020
- C17 L. Furieri, **Y. Zheng**, and M. Kamgarpour. Learning the globally optimal distributed LQ regulator. In *Learning for Dynamics and Control*, pages 287–297. PMLR, 2020 [PDF]
- C18 **Y. Zheng**, G. Fantuzzi, and A. Papachristodoulou. Sparse sum-of-squares (SOS) optimization: A bridge between DSOS/SDSOS and SOS optimization for sparse polynomials. In *2019 American Control Conference (ACC)*, pages 5513–5518. IEEE, 2019 [PDF]
- C19 J. Miller, **Y. Zheng**, B. Roig-Solvas, M. Sznaier, and A. Papachristodoulou. Chordal decomposition in rank minimized semidefinite programs with applications to subspace clustering. In *2019 IEEE 58th conference on decision and control (CDC)*, pages 4916–4921. IEEE, 2019
- C20 J. Wang, **Y. Zheng**, Q. Xu, J. Wang, and K. Li. Controllability analysis and optimal controller synthesis of mixed traffic systems. In *2019 IEEE Intelligent Vehicles Symposium (IV)*, pages 1041–1047. IEEE, 2019
- C21 L. Furieri, **Y. Zheng**, A. Papachristodoulou, and M. Kamgarpour. On separable quadratic lyapunov functions for convex design of distributed controllers. In *2019 18th European Control Conference (ECC)*, pages 42–49, June 2019 [PDF]. **Best Student Paper Award finalist**
- C22 A. Sootla, **Y. Zheng**, and A. Papachristodoulou. Block factor-width-two matrices in semidefinite programming. In *2019 18th European Control Conference (ECC)*, pages 1981–1986, June 2019 [PDF]
- C23 Y. Bian, **Y. Zheng**, S. E. Li, Z. Wang, Q. Xu, J. Wang, and K. Li. Reducing time headway for platoons of connected vehicles via multiple-predecessor following. In *21st International Conference on Intelligent Transportation Systems (ITSC)*, pages 1240–1245. IEEE, 2018 [PDF]
- C24 Z. Wang, **Y. Zheng**, S. Li, K. You, and K. Li. Parallel optimal control for cooperative automation of large-scale connected vehicles via admm. In *21st International Conference on Intelligent Transportation Systems (ITSC)*, pages 1633–1639. IEEE, 2018 [PDF]
- C25 **Y. Zheng**, G. Fantuzzi, and A. Papachristodoulou. Decomposition and completion of sum-of-squares matrices. In *2018 IEEE Conference on Decision and Control (CDC)*, pages 4026–4031. IEEE, 2018 [PDF]

- C26 **Y. Zheng**, M. Kamgarpour, A. Sootla, and A. Papachristodoulou. Scalable analysis of linear networked systems via chordal decomposition. In *17th European Control Conference*, pages 2260–2265, 2018 [PDF].
- C27 **Y. Zheng**, G. Fantuzzi, A. Papachristodoulou, P. Goulart, and A. Wynn. Fast ADMM for semidefinite programs with chordal sparsity. In *American Control Conference (ACC)*, pages 3335–3340, 2017 [PDF]
- C28 **Y. Zheng**, G. Fantuzzi, A. Papachristodoulou, P. Goulart, and A. Wynn. Fast ADMM for homogeneous self-dual embedding of sparse SDPs. *IFAC-PapersOnLine*, 50(1):8411–8416, 2017 [PDF]
- C29 A. Sootla, **Y. Zheng**, and A. Papachristodoulou. Block-diagonal solutions to Lyapunov inequalities and generalisations of diagonal dominance. In *2017 IEEE 56th Annual Conference on Decision and Control (CDC)*, pages 6561–6566. IEEE, 2017 [PDF]
- C30 **Y. Zheng**, R. P. Mason, and A. Papachristodoulou. A chordal decomposition approach to scalable design of structured feedback gains over directed graphs. In *IEEE 55th Conference on Decision and Control (CDC)*, pages 6909–6914. IEEE, 2016 [PDF]
- C31 Y. Wu, S. E. Li, **Y. Zheng**, and J. K. Hedrick. Distributed sliding mode control for multi-vehicle systems with positive definite topologies. In *IEEE 55th Conference on Decision and Control (CDC)*, pages 5213–5219, 2016 [PDF]
- C32 Y. Li, **Y. Zheng**, J. Wang, L. Wang, K. Kodaka, and K. Li. Evaluation of forward collision avoidance system using driver’s hazard perception. In *Intelligent Transportation Systems (ITSC), 19th International Conference on*, pages 2273–2278. IEEE, 2016 [PDF]
- C33 **Y. Zheng**, S. E. Li, B. Xu, K. Li, and J. Wang. Complexity analysis of green light optimal velocity problem: An NP-complete result for binary speed choices. In *14th Intelligent Transportation Systems Asia Pacific Forum*, 2015. **Best Paper Award**
- C34 S. E. Li, **Y. Zheng**, K. Li, and J. Wang. An overview of vehicular platoon control under the four-component framework. In *Intelligent Vehicles Symposium (IV)*, pages 286–291. IEEE, 2015 [PDF]
- C35 S. E. Li, **Y. Zheng**, K. Li, and J. Wang. Scalability limitation of homogeneous vehicular platoon under undirected information flow topology and constant spacing policy. In *Control Conference (CCC), 34th Chinese*, pages 8039–8045. IEEE, 2015
- C36 **Y. Zheng**, S. E. Li, J. Wang, L. Y. Wang, and K. Li. Influence of information flow topology on closed-loop stability of vehicle platoon with rigid formation. In *Intelligent Transportation Systems (ITSC), 17<sup>th</sup> IEEE International Conference on*, pages 2094–2100. IEEE, 2014. **Best Student Paper Award**
- C37 **Y. Zheng**, J. Wang, X. Li, C. Yu, K. Kodaka, and K. Li. Driving risk assessment using cluster analysis based on naturalistic driving data. In *Intelligent Transportation Systems (ITSC), 17<sup>th</sup> IEEE International Conference on*, pages 2584–2589. IEEE, 2014 [PDF]

### Invited Talks (excluding conference presentations)

- 12/2023 *Nonconvex Optimization for Linear Quadratic Gaussian (LQG) Control*  
ECE Department at the National University of Singapore; hosted by Prof. Lin ZHAO.
- 10/2023 *Chordal Graphs, Semidefinite Optimization, and Sum-of-squares Matrices*  
MAE Department, Arizona State University; hosted by Prof. Matthew Peet.
- 11/2022 *Scalable Learning, Optimization, and Control for Autonomous Systems*  
Tsinghua Berkeley Shenzhen Institute; hosted by Prof. Xuan Zhang.
- 09/2022 *Nonconvex Optimization for Linear Quadratic Gaussian (LQG) Control*  
TILOS talk at UCSD; hosted by Prof. Sicun Gao.
- 03/2022 *Scalable Semidefinite and Polynomial Optimization via Matrix Decomposition*  
LANS seminars series at Argonne National Lab; hosted by Dr. Prasanna Balaprakash
- 03/2022 *Analysis of the Optimization Landscape of Linear Quadratic Gaussian (LQG) Control*  
Control Seminars, University of Michigan; hosted by Prof. Peter Seiler
- 03/2022 *Analysis of the Optimization Landscape of Linear Quadratic Gaussian (LQG) Control*  
ISE Graduate Seminar Series, UIUC; hosted by Prof. Rasoul Etesami
- 12/2021 *Landscape Analysis and Sample Complexity of Linear Quadratic Gaussian Control*  
Northeastern University; hosted by Prof. Tao Yang



- 11/2021 *Integrating Autonomy into Traffic Systems: Scalable Control and Optimization*  
INTR 6800 Seminar, Hong Kong University of Science and Technology; hosted by Prof. Huan Yu
- 10/2021 *Chordal Graphs, Semidefinite Optimization, and Sum-of-squares Matrices*  
Optimization and Data Science Seminar, UCSD; hosted by Prof. Jiawang Nie
- 10/2021 *Landscape Analysis and Sample Complexity of Linear Quadratic Gaussian Control*  
Department of Automation, Tsinghua University; hosted by Prof Keyou You
- 01/2021 *Distributed control and scalable optimization for large-scale autonomy*  
EECI Annual Seminar/EECI Annual General Assembly
- 10/2020 *Integrating Autonomy into Traffic Systems: Scalable Control and Optimization*  
IEEE IV 2020 Workshop on IoT in ITS: Opportunities and Challenges
- 02/2020 *Distributed control and scalable optimization for large-scale autonomy*  
Department of Mechanical and Industrial Engineering, Northeastern University.
- 02/2020 *Distributed control and scalable optimization for large-scale autonomy*  
Department of Electrical and Computer Engineering, UC San Diego.
- 02/2020 *Distributed control and scalable optimization for large-scale autonomy*  
AE Chair's Distinguished Seminar Series, University of Michigan, Ann Arbor.
- 02/2020 *Integrating Autonomy into Traffic Systems: Scalable Control and Optimization*  
ENAC Seminar Series, EPFL.
- 12/2019 *Scalable Semidefinite and Sum-of-square Optimization via Matrix Decomposition*  
School of EECS, KTH Royal Institute of Technology; hosted by Prof. Karl H. Johansson.
- 12/2019 *Smoothing traffic flow via control of autonomous vehicles*  
Center of Innovation Automation at Volkswagen, Wolfsburg.
- 11/2018 *Chordal decomposition in sparse semidefinite optimization and sum-of-squares optimization*  
Institute for Computational Engineering and Sciences, UT Austin; hosted by Prof. Ufuk Topcu.
- 07/2018 *Chordal decomposition in sparse semidefinite optimization and sum-of-squares optimization*  
LIDS seminar, MIT; hosted by Prof. Pablo Parrilo.
- 07/2018 *Chordal decomposition in sparse semidefinite optimization and sum-of-squares optimization*  
ECE Department, Northeastern University; hosted by Prof. Mario Sznajder.
- 07/2018 *Chordal decomposition in sparse semidefinite optimization and sum-of-squares optimization*  
School of Engineering and Applied Sciences, Harvard University; hosted by Prof. Na Li.
- 06/2017 *Fast ADMM for semidefinite programs (SDPs) with chordal sparsity*  
LCCC workshop on Large-Scale and Distributed Optimization, Lund University.
- 05/2017 *Distributed control of connected vehicles and fast ADMM for sparse SDPs*  
Advanced Vehicle Engineering Centre, Cranfield University; hosted by Prof. Dongpu Cao.
- 02/2017 *Fast ADMM for semidefinite programs (SDPs) with chordal sparsity*  
School of Mathematics, University of Birmingham; hosted by Prof. Michal Kovara.

## Professional Services

### Ph.D. Committees

1. Chinmay Talegaonkar, ECE PhD Preliminary Exam (Nov. 2023), UCSD
2. Yuexin Bian, ECE Ph.D. Preliminary Exam (Jun. 2023), UCSD
3. Zhirui Dai, ECE Ph.D. Preliminary Exam (Jun. 2023), UCSD
4. Daniel Ochoa Tamayo, ECE Ph.D. Qualifying Exam (Jun. 2023), UCSD
5. Xiaomeng Hu, Math Ph.D. Qualifying Exam (May. 2023), UCSD
6. Yan Yan, Doctor of Philosophy thesis examination (Mar. 2023), the University of Wollongong
7. Ashwin Verma, ECE Ph.D. Qualifying Exam (Jun. 2022), UCSD
8. Zhichao Li, ECE Ph.D. Qualifying Exam (Nov. 2021), and Thesis Defense (Nov. 2023) UCSD

### Conference committees & organization

- 2023 Co-organizing the invited session “Learning and Control” at the 2023 Information Theory and Applications Workshop, February 12-17. Wyndham Bayside, San Diego
- 2019 Technical program committee of the ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2020).
- 2017 Co-organizing the tutorial session “Improving Efficiency and Scalability of Sum of Squares Optimization: Recent Advances and Limitations” at the 56th IEEE Conference on Decision and Control, Melbourne, Australia, December 12-15, 2017

**Reviewer for Journals**

ACM Transactions on Cyber-Physical Systems · Accident Analysis & Prevention · Ad Hoc Networks · Annual Reviews in Control · Automatica · Control & Systems Letter · Computational Optimization and Applications · IEEE Control Systems Letters · IEEE Internet of Things Journal · IEEE Intelligent Transportation Systems Magazine · IEEE Transactions on Automatic Control · IEEE Transactions on Control Systems Technology · IEEE Transactions on Industrial Electronics · IEEE Transactions on Industrial Informatics · IEEE Transactions on Intelligent Transportation Systems · IEEE Transactions on Control of Network Systems · IEEE Transactions on Mobile Computing · IEEE Transactions on Vehicular Technology · IET Intelligent Transport Systems · International Journal of Control · Journal of Global Optimization · Journal of The Franklin Institute · Mathematical Programming · SIAM Control & Optimization · Transportation Research Part B: Methodological · Transportation Research Part C: Emerging Technologies

**Reviewer for Conferences**

Annual Conference on Neural Information Processing Systems (2021,2022) · American Control Conference (2017, 2018, 2020, 2021, 2022) · European Control Conference (2017-2019, 2021) · Learning for Dynamics and Control (2020,2021, 2022) · IEEE Conference on Decision and Control (2017–2023) · IEEE Conference on Control Technology and Applications (2017, 2020) · IEEE Conference on Intelligent Transportation Systems (2018, 2023) · IEEE Conference on Vehicular Electronics and Safety (2017) · IEEE Intelligent Vehicles Symposium (2015 – 2020) · IFAC World Congress (2021, 2023) · International Conference on Machine Learning (2022) · International Symposium on Advanced Vehicle Control (2018) · International Symposium on Symbolic and Algebraic Computation (2019)