

SZE ZHENG YONG, PH.D.

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RESEARCH INTERESTS

Computational set-theoretic methods for estimation, control, learning and autonomy; uncertain non-linear and hybrid inclusion systems; intention-aware multi-agent systems; safety and security of cyber-physical systems; optimization-based and data-driven decision-making; robust and adaptive control

CURRENT POSITION

Assistant Professor, Mechanical and Aerospace Engineering Jan 2017 to present
School for Engineering of Matter, Transport & Energy
Arizona State University, Tempe, AZ

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

Ph.D., Mechanical Engineering, Feb 2016, GPA: 5.0/5.0

- Thesis: *Control and estimation of hidden mode hybrid systems with applications to autonomous systems*
- Committee: Emilio Frazzoli (advisor), Jean-Jacques Slotine, Domitilla Del Vecchio

M.S., Mechanical Engineering, Jun 2010, GPA: 4.9/5.0

- Thesis: *Multiphase models of slag layer built-up in solid fuel gasification and combustion*
- Advisor: Ahmed Ghoniem

Esslingen University of Applied Sciences, Esslingen, Germany

Dipl.-Ing.(FH), Automotive Engineering—Mechatronics, Jul 2008, Grade: 1,2 (equiv. GPA: 4.8/5.0)

- Thesis: *Fault-tolerant control of a diesel engine air system* (in German; in collaboration with Robert Bosch GmbH, Germany; Behr Award nominee)
- Advisors: Rainer Nitsche, Matthias Oberhauser

Kettering University, Flint, MI

Foreign Student Exchange Program, Spring 2007, GPA: 4.0/4.0

MARA University of Technology, Shah Alam, Malaysia

Advanced Level–London Examinations General Certificate of Education, Jun 2003, Grade: 99/100

AWARDS AND HONORS

- Nominated for 2022 Sloan Research Fellowship (under consideration) 2021
- National Aeronautics and Space Administration (NASA) Early Career Faculty Award 2020
- National Science Foundation Faculty Early Career Development Program (CAREER) Award 2020
- Defense Advanced Research Projects Agency (DARPA) Young Faculty Award 2018
- Top 5% Teaching Award in Ira A. Fulton Schools of Engineering 2018
- Travel award to CPSWeek, International Conference on Hybrid Systems: Computation and Control, Berlin, Germany 2014
- NSF Early Career Professionals Workshop on Exploring New Frontiers in Cyber-Physical Systems, Washington, DC, **Best poster** 2014
- Nominated for Behr Award (Undergraduate thesis) 2008
- Malaysian Public Service Department Scholarship 2001–2008
- ‘All Round Excellence’ Award (High School), Sitiawan, Malaysia 2000

RESEARCH EXPERIENCE**Postdoctoral Fellow**

July 2016 to Dec 2016

*Department of Electrical Engineering and Computer Science,
University of Michigan, Ann Arbor, MI*

Advisor: Necmiye Ozay, Sponsoring Agency: Defense Advanced Research Projects Agency

- Developed discrete state estimation methods for system diagnosis with persistent sensor faults.
- Designed tractable optimization-based passive and active model discrimination algorithms with applications to intention-aware vehicles and fraud detection.

Postdoctoral Associate & Graduate Student Research Assistant

Jan 2011 to Jun 2016

*Laboratory for Information and Decision Systems,
Massachusetts Institute of Technology, Cambridge, MA*

Advisor: Emilio Frazzoli, Collaborator: Aurora Flight Sciences Corporation

Sponsoring Agencies: Office of Naval Research, National Science Foundation

- Developed control and estimation algorithms for hybrid systems (i.e., systems with discrete and continuous states and dynamics).
- Designed hidden mode tracking control of uncertain systems with input amplitude and rate constraints, applied to autonomous helicopter landing; experimentally verified the feasibility of dynamic landing of a quadrotor using a precision motion capture system.
- Developed provably optimal and stable state and input estimators and established connection with strong detectability of linear systems.
- Devised a consistent multiple model estimator for stochastic hidden mode hybrid systems with unknown inputs, applied to intention inference of other drivers at road intersections and resilience of power distribution against switching and data injection attacks.
- Also designed optimal control for Dubins vehicle on heterogeneous terrains, causal flatness-based tracking control and anytime algorithms for ordered differential games.

Graduate Student Research Assistant

Sep 2008 to Dec 2010

*Reacting Gas Dynamics Laboratory,
Massachusetts Institute of Technology, Cambridge, MA*

Advisor: Ahmed Ghoniem, Industrial sponsor: Enel S.p.A., Rome, Italy

- Modeled the flow and heat transfer characteristics of the slag layer that builds up on coal combustor walls.
- Incorporated submodels for ash particle capture (formation of slag layer) and the inhibited burning of particles with combustibles into a Computational Fluid Dynamics software.

Undergraduate Thesis Researcher

Feb 2008 to Jun 2008

*Control Theory Group,
Robert Bosch GmbH (multinational automotive supplier), Stuttgart, Germany*

Supervisor: Rainer Nitsche

- Developed a real-time fault diagnosis tool for a jammed/stuck exhaust gas recirculation valve and a jam position estimator.
- Designed a fault-tolerant control that prevents engine power loss and retains low NO_x and fine particle emission levels using redundant actuators.

Research Intern

Sep 2006 to Mar 2007

*Group Research and Advanced Engineering Powertrain,
Daimler AG (parent company of Mercedes-Benz), Stuttgart, Germany*

Supervisor: Pedro Macri-Lassus

- Implemented a real-time estimator of pressure in an engine combustion chamber.

- Matthew Cavorsi (Ph.D., Mechanical Engineering, co-advised, transferred to Harvard University) Fall 2019 to Spring 2020
- Kevin Julius (Bachelor’s & Master’s, Mechanical Engineering) Fall 2019 to Spring 2020
- Qiang Shen (Postdoctoral Associate) Spring 2018 to Fall 2019
 - Currently an Associate Professor in the School of Aeronautics and Astronautics at Shanghai Jiao Tong University, Shanghai, China
- Kanishka Singh (Master’s, Mechanical Engineering) Summer 2017 to Summer 2018

FUNDING

9. **National Institute of Health (R01)** Sep 2021 to Sep 2025
“Smart User-Effective Data-Enabled (SUEDE) Shoe for Ankle Injury Prevention” (Total: \$1.125m; My share: \$258k; My role: Co-I)
8. **NASA Small Business Technology Transfer (STTR)** May 2021 to Jun 2022
“Communicationless Coordination via Intent Estimation and Intent-Expressive Motion Planning in Multiagent Exploration” (Total: \$125k; My share: \$69.5k; My role: PI)
7. **NASA Early Career Faculty Award** Oct 2020 to Oct 2023
“Coordinated Multi-Robot-Chain for Terrain Estimation and Exploration” (Total: \$600k; My share: \$600k; My role: Sole PI)
6. **NSF Cyber-Physical Systems (CPS)** Jun 2020 to May 2025
“CAREER: Towards Non-Conservative Learning-Aided Robustness for Cyber-Physical Safety and Security” (Total: \$501.8k; My share: \$501.8k; My role: Sole PI)
5. **NSF Cyber-Physical Systems (CPS)** Jan 2020 to Dec 2022
“Data-Driven Modeling and Preview-Based Control for Cyber-Physical System Safety” (Total: \$1.2m; My share: \$290k; My role: ASU PI)
4. **NSF National Robotics Initiative (NRI)** Jan 2020 to Dec 2022
“User-Adaptive and Safe Control of a Wearable Upper-Extremity Exoskeleton Robot” (Total: \$750k; My share: \$375k; My role: Co-PI)
3. **Toyota Research Institute** May 2019 to Dec 2019
“Control and Estimation for Provably Safe Interactive Driver Assistance (Extended Scope)” (Total: \$165k; My share: \$49.5k, including cost share; My role: ASU PI)
2. **DARPA Young Faculty Award** Jul 2018 to Jun 2020
“Identification and Estimation of Swarm Intent via Partitions of System Dynamics” (Total: \$500k; My share: \$500k; My role: Sole PI)
1. **Toyota Research Institute** Jan 2017 to Apr 2019
“Control and Estimation for Provably Safe Interactive Driver Assistance” (Total: \$603k; My share: \$211k, including cost share; My role: ASU PI)

PUBLICATIONS

Google Scholar Bibliometrics¹ – Citations: 3097, h-index: 15, i10-index: 21

Book Chapter

2. Khajenejad, M. and **Yong, S.Z.** “Resilient State Estimation and Attack Mitigation in Cyber-Physical Systems.” *Security and Resilience in Cyber-Physical Systems: Detection, Estimation and Control*, Springer, 2021, accepted.
1. Harirchi, F., **Yong, S.Z.** and Ozay, N. “Passive diagnosis of hidden-mode switched affine models with detection guarantees via model invalidation.” *Diagnosis and Diagnosability of Hybrid Dynamic Systems: Challenges, Methods and Applications*, Springer, 2018.

Journal Publications

26. Khajenejad, M., Shoaib, F. and **Yong, S.Z.** “Interval Observer Synthesis for Locally Lipschitz Nonlinear Dynamical Systems via Mixed-Monotone Decompositions.” *IEEE Control Systems Letters*, 2021, under review.
25. Khajenejad, M., Shoaib, F. and **Yong, S.Z.** “Guaranteed State Estimation via Direct Polytopic Set Computation for Nonlinear Discrete-Time Systems.” *IEEE Control Systems Letters*, 2021, under review.
24. Liu, C., Shen, Q., Niu, R. and **Yong, S.Z.** “Integrated Passive-Active Model Identification with Tunable Model Discrimination for Affine Discrete-Time Systems.” *IEEE Control Systems Letters*, 2021, under review.
23. Khajenejad, M. and **Yong, S.Z.** “Simultaneous State and Unknown Input Set-Valued Observers for Some Classes of Nonlinear Dynamical Systems.” *International Journal of Robust and Nonlinear Control*, 2021, under review.
22. Khajenejad, M. and **Yong, S.Z.** “Tight Remainder-Form Decomposition Functions with Applications to Constrained Reachability and Interval Observer Design.” *IEEE Transactions on Automatic Control*, 2021, under review.
21. Khajenejad, M. and **Yong, S.Z.** “Simultaneous Mode, State and Input Set-Valued Observers for Switched Nonlinear Systems.” *Nonlinear Analysis: Hybrid Systems*, 2021, under review.
20. Shen, Q., Niu, R. and **Yong, S.Z.** “Tractable Model Discrimination for Safety-Critical Systems with Disjunctive and Coupled Constraints.” *Nonlinear Analysis: Hybrid Systems*, 2021, under review.
19. Khajenejad, M., Jin, Z. and **Yong, S.Z.** “State and Unknown Terrain Estimation for Planetary Rovers via Interval Observers.” *Advanced Intelligent Systems*, 2100040, 2021 (Invited Paper).
18. Huang, Y., **Yong, S.Z.** and Chen, Y. “Safety Control of Autonomous Ground Vehicles Using Control-Dependent Barrier Functions.” *IEEE Transactions on Intelligent Vehicles*, 2021.
17. Niu, R., Hassaan, S.M., Yang, L., Jin, Z. and **Yong, S.Z.** “Model Discrimination of Switched Nonlinear Systems with Temporal Logic-Constrained Switching.” *IEEE Control Systems Letters*, vol. 6, pp. 151-156, 2022.

¹Accessed 11/24/2021 from <http://scholar.google.com/citations?user=Y5uZtkcAAAAJ&hl=en>.

16. Hassaan, S.M., Shen, Q., and **Yong, S.Z.** “Equalized Recovery State Estimators for Linear Systems with Delayed and Missing Observations.” *IEEE Control Systems Letters*, vol. 6, pp. 85-90, 2022.
15. Jin, Z., Shen, Q., and **Yong, S.Z.** “Mesh-Based Piecewise Affine Abstraction with Polytopic Partitions for Nonlinear Systems.” *IEEE Control Systems Letters*, vol. 5, no. 5, pp. 1543–1548, 2021.
14. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous Mode, Input and State Estimation for Switched Linear Stochastic Systems with Unknown Inputs.” *International Journal of Robust and Nonlinear Control*, 31:640–661, 2021.
13. Hassaan, S.M., Khajenejad, M., Jensen, S., Shen, Q., and **Yong, S.Z.** “Incremental Affine Abstraction of Nonlinear Systems.” *IEEE Control Systems Letters*, Vol. 5, No. 2, pp. 653-658, 2021.
12. Rutledge, K., **Yong, S.Z.** and Ozay, N. “Finite Horizon Constrained Control and Bounded-error Estimation in the Presence of Missing Data.” *Nonlinear Analysis: Hybrid Systems*, Vol. 36, pp. 100854, 2020.
11. Singh, P., **Yong, S.Z.**, and Frazzoli, E. “Regulation of Linear Systems using Event-Based Detection Sensors.” *IEEE Transactions on Automatic Control*, vol. 64, no. 1, pp. 373-380, 2019.
10. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Switching and data injection attacks on stochastic cyber-physical systems: Modeling, resilient estimation and attack mitigation.” *ACM Transactions on Cyber-Physical Systems*, Vol. 2, No. 2, Article 9, 2018.
9. Singh, P., **Yong, S.Z.**, and Frazzoli, E. “Supermodular batch state estimation in optimal sensor scheduling.” *IEEE Control Systems Letters*, 2017.
8. Paden, B., Cap, M., **Yong, S.Z.**, Yershov, D., Frazzoli, E. “A survey of motion planning and control techniques for self-driving urban vehicles.” *IEEE Transactions on Intelligent Vehicles*, vol. 1, no. 1, pp. 33–55, 2016.
7. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous input and state estimation for linear time-varying continuous-time stochastic systems.” *Transactions on Automatic Control*, 2016 (**Impact factor:** 2.779).
6. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “A unified filter for simultaneous input and state estimation for linear discrete-time stochastic systems.” *Automatica*, 63:321–329, 2016. Extended version available from: <http://arxiv.org/abs/1309.6627> (**Impact factor:** 3.020).
5. Sanfelice, R.G., **Yong, S.Z.**, and Frazzoli, E. “On minimum-time paths of bounded curvature with position-dependent constraints.” *Automatica*, 50(2):537–546,2014 (**Impact factor:** 3.020).
4. Chen, L., **Yong, S.Z.**, and Ghoniem, A.F. “Modeling the slag behavior in three dimensional CFD simulation of a vertically-oriented oxy-coal combustor.” *Fuel Processing Technology*, 112:106–117, 2013 (**Impact factor:** 3.352).
3. **Yong, S.Z.**, Gazzino, M., and Ghoniem, A.F. “Modeling the slag layer in solid fuel gasification and combustion—Two-way coupling with CFD.” *Fuel*, 97:457–466,2012 (**Impact factor:** 3.520).
2. Chen, L., **Yong, S.Z.**, and Ghoniem, A.F. “Oxy-fuel combustion of pulverized coal: Characterization, fundamentals, stabilization and CFD modeling.” *Progress in Energy and Combustion Science*, 38(2):156–214, 2012 (**Impact factor:** 19.220; Top 25 Most Cited Paper since 2009).

1. **Yong, S.Z.**, Gazzino, M., and Ghoniem, A.F. “Modeling the slag layer in solid fuel gasification and combustion—Formulation and sensitivity analysis.” *Fuel*, 92(1):162–170, 2012 (**Impact factor:** 3.520).

Conference Publications

52. Jin, Z., Khajenejad, M., and **Yong, S.Z.** “Data-Driven Model Invalidation for Unknown Bounded Jacobian Systems via Abstraction.” *European Control Conference*, 2022, under review.
51. Hassaan, S.M., Jin, Z., and **Yong, S.Z.** “Multi-Model Affine Abstraction of Nonlinear Systems with Model Discrimination Guarantees.” *European Control Conference*, 2022, under review.
50. Pati, T. and **Yong, S.Z.** “Robust Control Barrier Functions for Uncertain Control Affine Systems.” *European Control Conference*, 2022, under review.
49. Khajenejad, M., Jin, Z., and **Yong, S.Z.** “Resilient Interval Observer for Simultaneous Estimation of States, Modes and Attack Policies.” *American Control Conference*, 2022, under review.
48. Niu, R., Hassaan, S.M., and **Yong, S.Z.** “A Multi-Parametric Method for Active Model Discrimination of Nonlinear Systems with Temporal Logic-Constrained Switching.” *American Control Conference*, 2022, under review.
47. Bhagwat, M., Jin, Z. and **Yong, S.Z.** “Computation-Aware Data-Driven Model Discrimination with Application to Driver Intent Identification.” *IEEE Conference on Decision and Control*, 2021, accepted.
46. Khajenejad, M., Shoaib, F. and **Yong, S.Z.** “Guaranteed State Estimation via Remainder-Form Decomposition Function-Based Set Inclusion for Nonlinear Discrete-Time Systems.” *IEEE Conference on Decision and Control*, 2021, accepted.
45. Hassaan, S., Pati, T., Shen, Q., **Yong, S.Z.** “Time-Varying Tube-Based Output Feedback MPC for Constrained Linear Systems with Intermittently Delayed Data.” *IFAC Conference on Analysis and Design of Hybrid Systems*, Brussels, Belgium (Virtual), 2021.
44. Khajenejad, M., **Yong, S.Z.** “Simultaneous Input and State Interval Observers for Nonlinear Systems with Rank-Deficient Direct Feedthrough.” *European Control Conference*, Rotterdam, The Netherlands (Virtual), pp. 2303–2308, 2021.
43. Khajenejad, M., Cavorsi, M., Niu, R., Shen, Q., **Yong, S.Z.** “Tractable Compositions of Discrete-Time Control Barrier Functions with Application to Driving Safety Control.” *European Control Conference*, Rotterdam, The Netherlands (Virtual), pp. 1298–1304, 2021.
42. Khajenejad, M., Jin, Z., and **Yong, S.Z.** “Interval Observers for Simultaneous State and Model Estimation of Partially Known Nonlinear Systems.” *American Control Conference*, New Orleans, LA (Virtual), pp. 2842–2848, 2021.
41. Hassaan, S.M., Shen, Q. and **Yong, S.Z.** “Path-Dependent Controller and Estimator Synthesis with Robustness to Delayed and Missing Data.” *International Conference on Hybrid Systems: Computation and Control*, Nashville, TN (Virtual), vol. 22, pp. 1-11, 2021.
40. Khajenejad, M., **Yong, S.Z.** “Simultaneous Input and State Interval Observers for Nonlinear Systems with Full-Rank Direct Feedthrough.” *IEEE Conference on Decision and Control*, Jeju Island, South Korea (Virtual), pp. 5443–5448, 2020.

39. Jin, Z., Khajenejad, M., **Yong, S.Z.** “Data-Driven Model Invalidation for Unknown Lipschitz Continuous Systems via Abstraction.” *American Control Conference*, Denver, CO (Virtual), pp. 2975–2980, 2020.
38. Shen, Q., **Yong, S.Z.** “Active Model Discrimination using Partition-Based Output Feedback Input Design.” *European Control Conference*, Saint Petersburg, Russia (Virtual), pp. 712–717, 2020.
37. Jin, Z., Shen Q., **Yong, S.Z.** “Optimization-Based Approaches for Affine Abstraction and Model Discrimination of Uncertain Nonlinear Systems.” *IEEE Conference on Decision and Control*, Nice, France, pp. 7976–7981, 2019.
36. Khajenejad, M., **Yong, S.Z.** “Simultaneous Mode, Input and State Set-Valued Observers with Applications to Resilient Estimation against Sparse Attacks.” *IEEE Conference on Decision and Control*, Nice, France, pp. 1544–1550, 2019.
35. Sahin, Y.E., Liu, Z., Rutledge, K., Panagou, D., **Yong, S.Z.**, Ozay, N. “Intention-Aware Supervisory Control with Driving Safety Applications.” *IEEE Conference on Control Technology and Applications*, pp. 1-8, 2019.
34. Shen, Q., **Yong, S.Z.** “Robust Optimization-Based Affine Abstractions for Uncertain Affine Dynamics.” *American Control Conference*, Philadelphia, PA, pp. 2452–2457, 2019.
33. Khajenejad, M., **Yong, S.Z.** “Simultaneous Input and State Set-Valued \mathcal{H}_∞ -Observers For Linear Parameter-Varying Systems.” *American Control Conference*, Philadelphia, PA, pp. 4521–4526, 2019.
32. Hassaan, S.M., Shen, Q., **Yong, S.Z.** “Bounded-Error Estimator Design with Missing Data Patterns via State Augmentation.” *American Control Conference*, Philadelphia, PA, pp. 447–452, 2019.
31. Rutledge, K., **Yong, S.Z.**, Ozay, N. “Prefix-based Bounded-error Estimation with Intermittent Observations.” *American Control Conference*, Philadelphia, PA, pp. 4320–4325, 2019.
30. Huang, Y., **Yong, S.Z.**, Chen, Y. “Guaranteed Vehicle Safety Control Using Control-Dependent Barrier Functions.” *American Control Conference*, Philadelphia, PA, pp. 983–988, 2019.
29. Niu, R., Shen, Q., **Yong, S.Z.** “Partition-Based Parametric Active Model Discrimination Design with Applications to Driver Intention Estimation.” *European Control Conference*, Naples, Italy, pp. 3880–3885, 2019.
28. Chipade, V.S., Shen, Q., Huang, L., Ozay, N., **Yong, S.Z.**, Panagou, D. “Safe Autonomous Overtaking with Intention Estimation.” *European Control Conference*, Naples, Italy, pp. 2050–2057, 2019.
27. Rutledge, K., **Yong, S.Z.**, and Ozay, N. “Equalized recovery: Weakening invariance for control and estimation.” *ACM International Conference on Hybrid Systems: Computation and Control*, Montreal, Canada, pp. 276–277, 2019 (abstract).
26. Singh, K., Shen, Q., **Yong, S.Z.** “Mesh-based affine abstraction of nonlinear systems with tighter bounds.” *IEEE Conference on Decision and Control*, Miami, FL, pp. 3056–3061, 2018.
25. Singh, K., Ding, Y., Ozay, N., **Yong, S.Z.** “Input design for nonlinear model discrimination via affine abstraction.” *IFAC-PapersOnLine*, Oxford, UK, 51(16), pp.175–180, 2018.

24. Rutledge, K., **Yong, S.Z.**, Ozay, N. “Optimization-based design of bounded-error estimators robust to missing data.” *IFAC-PapersOnLine*, Oxford, UK, 51(16), pp.157–162, 2018.
23. Ding, Y., Harirchi, F., **Yong, S.Z.**, Jacobsen, E. and Ozay, N. “Optimal input design for affine model discrimination with applications in intention-aware vehicles.” *ACM/IEEE International Conference on Cyber-Physical Systems*, Porto, Portugal, pp. 297–307, 2018.
22. **Yong, S.Z.** and Ozay, N. “Discrete state estimation with persistent sensor faults and non-persistent noise via noisy Bayesian active diagnosis.” *American Control Conference*, Milwaukee, WI, pp. 313–320, 2018.
21. **Yong, S.Z.** “Simultaneous input and state set-valued observers with applications to attack-resilient estimation.” *American Control Conference*, Milwaukee, WI, pp. 5167–5174, 2018.
20. Harirchi, F., **Yong, S.Z.** and Ozay, N. “Guaranteed fault detection and isolation for switched affine models.” *IEEE Conference on Decision and Control*, Melbourne, Australia, pp. 5161–5167, 2017.
19. Harirchi, F., **Yong, S.Z.**, Jacobsen, E. and Ozay, N. “Active model discrimination with applications to fraud detection in smart buildings.” *IFAC-PapersOnLine*, Toulouse, France, 50(1), pp. 9527–9534, 2017.
18. **Yong, S.Z.**, Gao, L. and Ozay, N. “Weak adaptive submodularity and group-based active diagnosis with applications to state estimation with persistent sensor faults.” *American Control Conference*, Seattle, WA, pp. 2574–2581, 2017.
17. Singh, P., **Yong, S.Z.**, and Frazzoli, E. “Stabilization of stochastic linear continuous-time systems using noisy neuromorphic vision sensors.” *American Control Conference*, Seattle, WA, pp. 535–541, 2017.
16. **Yong, S.Z.**, and Frazzoli, E. “Adaptive hidden mode tracking control with input constraints and bounded disturbances.” *IEEE Conference on Decision and Control*, Las Vegas, NV, pp. 1235–1242, Dec 2016.
15. Singh, P., **Yong, S.Z.**, Gregoire, J., Censi, A., and Frazzoli, E. “Stabilization of linear continuous-time systems using neuromorphic vision sensors.” *IEEE Conference on Decision and Control*, Las Vegas, NV, pp. 3030–3036, Dec 2016.
14. **Yong, S.Z.**, Foo, M.Q., and Frazzoli, E. “Robust and resilient estimation for cyber-physical systems under adversarial attacks.” *American Control Conference*, Boston, MA, pp. 308–315, Jul 2016.
13. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous input and state estimation of linear discrete-time stochastic systems with input aggregate information.” *IEEE Conference on Decision and Control*, Osaka, Japan, pp. 461–467, Dec 2015.
12. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous input and state estimation with a delay.” *IEEE Conference on Decision and Control*, Osaka, Japan, pp. 468–475, Dec 2015.
11. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Resilient state estimation against switching attacks on stochastic cyber-physical systems.” *IEEE Conference on Decision and Control*, Osaka, Japan, pp. 5162–5169, Dec 2015.

10. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous input and state estimation for linear time-invariant continuous-time stochastic systems with unknown inputs.” *American Control Conference*, Chicago, IL, pp. 2511–2518, Jul 2015.
9. **Yong, S.Z.**, Paden, B., and Frazzoli, E. “Computational methods for MIMO flat linear systems: flat output characterization, test and tracking control.” *American Control Conference*, Chicago, IL, pp. 3898–3904, Jul 2015.
8. Paden, B., **Yong, S.Z.**, and Frazzoli, E. “Asymptotically reachable states and related symmetry in systems theory.” *American Control Conference*, Chicago, IL, pp. 2856–2861, Jul 2015.
7. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Generalized innovation and inference algorithms for hidden mode switched linear stochastic systems with unknown inputs.” *IEEE Conference on Decision and Control*, Los Angeles, CA, pp. 3388–3394, Dec 2014.
6. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous input and state smoothing for linear discrete-time stochastic systems with unknown inputs.” *IEEE Conference on Decision and Control*, Los Angeles, CA, pp. 4204–4209, Dec 2014.
5. **Yong, S.Z.**, and Frazzoli, E. “Asymptotic adaptive tracking with input amplitude and rate constraints and bounded disturbances.” *IEEE Conference on Decision and Control*, Los Angeles, CA, pp. 1256–1263, Dec 2014.
4. **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Simultaneous input and state estimation for linear discrete-time stochastic systems with direct feedthrough.” *IEEE Conference on Decision and Control*, Florence, Italy, pp. 7034–7039, Dec 2013.
3. Mueller, E., **Yong, S.Z.**, Zhu, M., and Frazzoli, E. “Anytime computation algorithms for stochastically parametric approach-evasion differential games.” *IEEE /RSJ International Conference on Intelligent Robots and Systems*, Tokyo, Japan, pp. 3816–3821, Nov 2013.
2. **Yong, S.Z.**, and Frazzoli, E. “Hidden mode tracking control for a class of hybrid systems.” *American Control Conference*, Washington, DC, pp. 5735–5741, Jun 2013.
1. **Yong, S.Z.**, Gazzino, M., and Ghoniem, A.F. “Multiphase models of slag layer built-up in solid fuel gasification and combustion.” *International Technical Conference on Clean Coal and Fuel Systems*, Clearwater, FL, No. 35 PT 1-2 2010; 2; 1208–1218, Jun 2010.

Patents

6. Shen, Q. and **Yong, S.Z.** “Robust Optimization-Based Affine Abstractions for Uncertain Affine Dynamics.” US 2021/0009167 A1, Jan. 14, 2021.
5. Hassaan, S.M., Shen, Q. and **Yong, S.Z.** “Bounded-Error Estimator Design with Missing Data Patterns via State Augmentation.” US 2021/0012593 A1, Jan. 14, 2021.
4. Niu, R., Shen, Q. and **Yong, S.Z.** “Partition-Based Parametric Active Model Discrimination Design with Applications to Driver Intention Estimation.” US 2020/0401161 A1, Dec. 24, 2020.
3. Rutledge, K., **Yong, S.Z.** and Ozay, N. “Prefix-based Bounded-error Estimation with Intermittent Observations.” US 2020/0238987 A1, Jul. 30, 2020.
2. Sahin, Y.E., Liu, Z., Rutledge, K., Panagou, D., **Yong, S.Z.** and Ozay, N. “Intention-Aware Supervisory Control with Driving Safety Applications.” US 2020/0339123 A1, Oct. 29, 2020.
1. Chipade, V.S., Shen, Q., Huang, L., Ozay, N., **Yong, S.Z.** and Panagou, D. “Safe Autonomous Overtaking with Intention Estimation.” US 2020/0298859 A1, Sep. 24, 2020.

POSTERS/TALKS

- Yong, S.Z. Robotics Seminar, NASA Ames Research Center, Mountain View, CA Nov 2021
(Invited Talk)
“Coordinated Multi-Robot-Chain for Terrain Estimation and Exploration”
- Yong, S.Z. Controls Seminar, University of California, San Diego, CA Nov 2021
(Invited Talk)
“Set-Theoretic Methods for Estimation and Control of Safety-Critical Cyber-Physical Systems”
- IFAC Conference on Analysis and Design of Hybrid Systems, Brussels, Belgium Jul 2021
(Virtual Talk)
“Time-Varying Tube-Based Output Feedback MPC for Constrained Linear Systems with Intermittently Delayed Data”
- European Control Conference, Rotterdam, The Netherlands (Virtual Talk) Jun 2021
“Tractable Compositions of Discrete-Time Control Barrier Functions with Application to Driving Safety Control” & *“Simultaneous Input and State Interval Observers for Nonlinear Systems with Rank-Deficient Direct Feedthrough”*
- SJTU-SAA International Seminar, Shanghai Jiao Tong University, Shanghai, China Jun 2021
(Invited Talk)
“Set-Theoretic Methods for Estimation and Control of Safety-Critical Systems”
- American Control Conference, New Orleans, LA (Virtual Talk) May 2021
“Interval Observers for Simultaneous State and Model Estimation of Partially Known Nonlinear Systems” & *“Mesh-Based Piecewise Affine Abstraction with Polytopic Partitions for Nonlinear Systems”* & *“Equalized Recovery State Estimators for Linear Systems with Delayed and Missing Observations”*
- International Conference on Hybrid Systems: Computation and Control, Nashville, TN (Virtual Talk) May 2021
“Path-Dependent Controller and Estimator Synthesis with Robustness to Delayed and Missing Data”
- Robotics Center Seminar, University of Delaware, Newark, DE (Invited Talk) May 2021
“Set-Theoretic Methods for Estimation and Control of Safety-Critical Cyber-Physical Systems”
- Seminar Webinar, Singapore University of Technology and Design, Singapore Apr 2021
(Invited Talk)
“Resilience of Cyber-Physical Systems”
- Electrical Engineering Colloquia, Pennsylvania State University, University Park, PA Mar 2021
(Invited Talk)
“Set-Theoretic Estimation and Control for Safety-Critical Cyber-Physical Systems”
- IEEE Conference on Decision and Control, Jeju Island, South Korea (Virtual Talk) Dec 2020
“Incremental Affine Abstraction of Nonlinear Systems” & *“Simultaneous Input and State Interval Observers for Nonlinear Systems with Full-Rank Direct Feedthrough”*
- American Control Conference, Denver, CO (Virtual Talk) Jul 2020
“Data-Driven Model Invalidation for Unknown Lipschitz Continuous Systems via Abstraction”
- European Control Conference, Saint Petersburg, Russia (Virtual Talk) May 2020
“Active Model Discrimination using Partition-Based Output Feedback Input Design”
- IEEE Conference on Decision and Control, Nice, France (Talks) Dec 2019
“Optimization-based approaches for affine abstraction and model discrimination of uncertain nonlinear systems” & *“Simultaneous mode, input and state set-valued*

- observers with applications to resilient estimation against sparse attacks*
- American Control Conference, Philadelphia, PA (Talks) Jul 2019
“Bounded-error estimator design with missing data patterns via state augmentation”
 & *“Simultaneous input and state set-valued \mathcal{H}_∞ -observers for linear parameter-varying systems”*
 - European Control Conference, Naples, Italy (Talk) Jun 2019
“Partition-based parametric active model discrimination design with applications to driver intention estimation”
 - International Conference on Hybrid Systems: Computation and Control, Montreal, Canada (Poster) Apr 2019
“Equalized Recovery: Weakening invariance for control and estimation”
 - ASU Southwest Robotics Symposium (Poster) Jan 2019
“Identification and estimation of swarm intent via partitions of system dynamics”
 - IEEE Conference on Decision and Control, Miami, FL (Talk) Dec 2018
“Mesh-based affine abstraction of nonlinear systems with tighter bounds”
 - IFAC Conference on Analysis and Design of Hybrid Systems, Oxford, UK (Talk) Jul 2018
“Input design for nonlinear model discrimination via affine abstraction”
 - American Control Conference, Milwaukee, WI (Talk) Jun 2018
“Discrete state estimation with persistent sensor faults and non-persistent noise via noisy Bayesian active diagnosis” & *“Simultaneous input and state set-valued observers with applications to attack-resilient estimation”*
 - IEEE Conference on Decision and Control, Melbourne, Australia (Talk) Dec 2017
“Supermodular batch state estimation in optimal sensor scheduling”
 - American Control Conference, Seattle, WA (Talk) May 2017
“Weak adaptive submodularity and group-based active diagnosis with applications to state estimation with persistent sensor faults”
 - IEEE Conference on Decision and Control, Las Vegas, NV (Talks) Dec 2016
“Adaptive hidden mode tracking control with input constraints and bounded disturbances”
 & *“Stabilization of linear continuous-time systems using neuromorphic vision sensors”*
 - American Control Conference, Boston, MA (Talk) Jul 2016
“Robust and resilient estimation for cyber-physical systems under adversarial attacks”
 - EECS Seminar, University of Michigan, Ann Arbor, MI (Talk) Mar 2016
“Toward intention-aware and resilient systems using a hidden mode hybrid system”
 - MAE Research Seminar, Arizona State University, Tempe, AZ (Talk) Mar 2016
“Toward intention-aware and resilient systems using a hidden mode hybrid system”
 - IEEE Conference on Decision and Control, Osaka, Japan (Talks) Dec 2015
“Simultaneous input and state estimation of linear discrete-time stochastic systems with input aggregate information”, “Simultaneous input and state estimation with a delay” & *“Resilient state estimation against switching attacks on stochastic cyber-physical systems”*
 - EECS Seminar, University of California, Berkeley, CA (Talk) Sept 2015
“Estimation of hidden mode hybrid systems with applications to intention-aware vehicles and resilient state estimation”
 - American Control Conference, Chicago, IL (Talks) Jul 2015
“Computational methods for MIMO flat linear systems: flat output characterization, test and tracking control” & *“Simultaneous input and state filtering for linear continuous-time stochastic systems with unknown inputs”*
 - GRASP Special Seminar, University of Pennsylvania, Philadelphia, PA (Talk) May 2015
“Estimation of hidden mode hybrid systems with applications to autonomous

systems and resilient estimation”

- IEEE Conference on Decision and Control, Los Angeles, CA (Talks) Dec 2014
“Generalized innovation and inference algorithms for hidden mode switched linear stochastic systems with unknown inputs”, “Simultaneous input and state smoothing for linear discrete-time stochastic systems with unknown inputs” & “Asymptotic adaptive tracking with input amplitude and rate constraints and bounded disturbances”
- NSF Early Career Professionals Workshop on Exploring New Frontiers in Mar, Apr 2014
 Cyber-Physical Systems, Washington, DC, & CPSWeek, International Conference on Hybrid Systems: Computation and Control, Berlin, Germany (Poster)
*“Safety hybrid control with intention inference for semi-autonomous cyber-physical transportation systems”, **Best poster***
- IEEE Conference on Decision and Control, Florence, Italy (Talk) Dec 2013
“A unified filter for simultaneous input and state estimation for linear discrete-time stochastic systems”
- American Control Conference, Washington, DC (Talk) Jun 2013
“Hidden mode tracking control for a class of hybrid systems”
- International Technical Conf. on Clean Coal & Fuel Systems, Clearwater, FL (Talk) Jun 2010
“Multiphase models of slag layer built-up in solid fuel gasification and combustion”

ACADEMIC SERVICE

- Topic Editor for Research Topic *“Estimation and Control-Based Set-Valued Methods of Uncertain Systems”*, Frontiers in Control Engineering
- Associate Editor of Invited Sessions for American Control Conference
- Member of IEEE Control Systems Society’s Technical Committee on Hybrid Systems
- Panel reviewer for National Science Foundation (NSF)
- Member of ASU Space Grant Steering Committee
- Member of ASU New Faculty Advisory Council
- Member of SEMTE Robotics and Autonomous Systems Graduate Program Committee
- Moderator for the Transportation and Energy breakout session at NSF Early Career Professionals Workshop on Exploring New Cyber-Physical Systems
- Reviewer for IEEE Transactions on Automatic Control, Automatica, IEEE Control Systems Letters, IFAC Nonlinear Analysis: Hybrid Systems, IEEE Transactions on Control of Network Systems, Systems & Control Letters, International Journal of Adaptive Control and Signal Processing, IEEE Transactions on Cybernetics, AIAA Journal of Guidance, Control and Dynamics, Transactions of Cyber-Physical Systems, Control Engineering Practice, IMA Journal of Mathematical Control and Information, Optimal Control, Applications and Methods, International Journal of Advanced Robotic Systems, IEEE/CAA Journal of Automatica Sinica, International Journal of Robust and Nonlinear Control, IEEE Systems Journal, American Control Conference, IEEE Conference for Decision and Control, ACM/IEEE International Conference on Cyber-Physical Systems, IEEE International Conference on Robotics and Automation, SIAM Conference on Control and its Applications

PROFESSIONAL EXPERIENCE

- MAHLE Powertrain LLC. (Design/Testing Intern)** Jun 2007 to Aug 2007
 Connecting Rod and Piston R&D, Farmington Hills, MI
- Robert Bosch GmbH (Student Trainee)** May 2006 to Oct 2006
 Catalog Parts Design Department, Stuttgart, Germany

Host Broadcast Services (Commentary Assistant) 2006 FIFA World Cup, Stuttgart, Germany	Jun 2006 to Jul 2006
Robert Bosch GmbH (Design Intern) Mechanical Design Department, Stuttgart, Germany	Mar 2005 to Sep 2005

STUDENT LEADERSHIP AND EXTRA-CURRICULARS

MIT Graduate Christian Fellowship , Co-President and Treasurer • Oversaw the leadership restructuring for better transparency and efficiency.	2010–2013
The Veritas Forum at MIT , Finance Director • Raised funds and managed finances for a campus-wide forum.	2010–2011
MIT Graduate Student Council (GSC) , Council Representative • Organized a mixer event for incoming international students and MIT alumni.	2009–2011
MIT Malaysian Student Association , Treasurer	2009–2010
MIT Table Tennis Team • U1200 Champion of 2010 New England Open Table Tennis Tournament.	2009–2010, 2013–2015

LANGUAGE SKILLS

English, German, Malay (Fluent); Chinese Mandarin (Fluent, oral); Spanish (Beginner)