# Guosong Yang

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## Research Interests

Switched and hybrid systems, networked control systems, learning in games, and their applications to cyber-physical systems (CPS) and network security.

## Academic Appointment

**University of California, Santa Barbara**, Santa Barbara, CA, USA Aug. 2017–present

*Postdoctoral Scholar*, Center for Control, Dynamical Systems, and Computation

Advisor: João P. Hespanha

## Education

**University of Illinois at Urbana-Champaign**, Urbana, IL, USA Oct. 2013–Aug. 2017

*Doctor of Philosophy*, Electrical and Computer Engineering

Dissertation: "Switched and hybrid systems with inputs: Small-gain theorems, control with limited information, and topological entropy"

Advisor: Daniel Liberzon

**University of Illinois at Urbana-Champaign**, Urbana, IL, USA Aug. 2011–Aug. 2013

*Master of Science*, Electrical and Computer Engineering

Thesis: "A Lyapunov-based small-gain theorem for interconnected switched systems"

Advisor: Daniel Liberzon

**Hong Kong University of Science and Technology**, Kowloon, Hong Kong Sep. 2007–Jun. 2011

*Bachelor of Engineering*, Electronic Engineering, minor in Mathematics

Advisor: Zexiang Li

## Awards and Honors

- *ACM SIGBED HSCC Best Paper Award*, 22nd ACM International Conference on Hybrid Systems: Computation and Control, 2019
- *Best Poster Award*, 11th Coordinated Science Laboratory Student Conference, University of Illinois at Urbana-Champaign, 2016
- *Graduate College Conference Travel Award*, University of Illinois at Urbana-Champaign, 2016
- *University Scholarship*, *School of Engineering Scholarship*, *ECE Outstanding Freshmen Scholarship*, *The Joseph Lau Luen Hung Charitable Trust Scholarship*, Hong Kong University of Science and Technology, 2007–2011
- *Gold medal*, 8th Asian Physics Olympiad, 2007

## PUBLICATIONS

### Working papers (preprints available)

1. Henrique Ferraz, Guosong Yang, and João P. Hespanha, "Distributed leader-follower model predictive control."
2. Guosong Yang, Daniel Liberzon, and João P. Hespanha, "Topological entropy of nonlinear switched and time-varying systems."
3. Guosong Yang, Radha Poovendran, and João P. Hespanha, "Adaptive learning in two-player Stackelberg games with application to network security."

### Journals

1. Guosong Yang, A. James Schmidt, Daniel Liberzon, and João P. Hespanha, "Topological entropy of switched linear systems: General matrices and matrices with commutation relations," *Mathematics of Control, Signals, and Systems*, vol. 32, no. 3, pp. 411–453, Sep. 2020
2. Guosong Yang and Daniel Liberzon, "Feedback stabilization of switched linear systems with unknown disturbances under data-rate constraints," *IEEE Transactions on Automatic Control*, vol. 63, no. 7, pp. 2107–2122, Jul. 2018
3. Kunihisa Okano, Masashi Wakaiki, Guosong Yang, and João P. Hespanha, "Stabilization of networked control systems under clock offsets and quantization," *IEEE Transactions on Automatic Control*, vol. 63, no. 6, pp. 1708–1723, Jun. 2018
4. Andrii Mironchenko, Guosong Yang, and Daniel Liberzon, "Lyapunov small-gain theorems for networks of not necessarily ISS hybrid systems," *Automatica*, vol. 88, pp. 10–20, Feb. 2018
5. Guosong Yang and Daniel Liberzon, "A Lyapunov-based small-gain theorem for interconnected switched systems," *Systems & Control Letters*, vol. 78, pp. 47–54, Apr. 2015

### Book chapter

1. Guosong Yang and João P. Hespanha, "Modeling and mitigating link-flooding distributed denial-of-service attacks via learning in Stackelberg games," in *Handbook of Reinforcement Learning and Control*, Kyriakos G. Vamvoudakis, Yan Wan, Frank L. Lewis, and Derya Cansever, Eds. Springer, to be published

### Conferences

1. Guosong Yang, Daniel Liberzon, and João P. Hespanha, "Topological entropy of switched nonlinear systems," in *24th ACM International Conference on Hybrid Systems: Computation and Control*, 2021, to be published
2. Guosong Yang, Radha Poovendran, and João P. Hespanha, "Adaptive learning in two-player Stackelberg games with continuous action sets," in *58th IEEE Conference on Decision and Control*, 2019, pp. 6905–6911
3. Guosong Yang, João P. Hespanha, and Daniel Liberzon, "On topological entropy and stability of switched linear systems," in *22nd ACM International Conference on Hybrid Systems: Computation and Control*, 2019, pp. 119–127 **(Best Paper Award winner)**

4. Guosong Yang and João P. Hespanha, "On topological entropy of switched linear systems with pairwise commuting matrices," in *56th Annual Allerton Conference on Communication, Control, and Computing*, 2018, pp. 429–436 (invited paper)
5. Guosong Yang, A. James Schmidt, and Daniel Liberzon, "On topological entropy of switched linear systems with diagonal, triangular, and general matrices," in *57th IEEE Conference on Decision and Control*, 2018, pp. 5682–5687
6. Guosong Yang, Hossein Hosseini, Dinuka Sahabandu, Andrew Clark, João P. Hespanha, and Radha Poovendran, "Modeling and mitigating the Coremelt attack," in *2018 American Control Conference*, 2018, pp. 3410–3416
7. Guosong Yang, Daniel Liberzon, and Zhong-Ping Jiang, "Stabilization of interconnected switched control-affine systems via a Lyapunov-based small-gain approach," in *2017 American Control Conference*, 2017, pp. 5182–5187
8. Guosong Yang, Daniel Liberzon, and Andrii Mironchenko, "Analysis of different Lyapunov function constructions for interconnected hybrid systems," in *55th IEEE Conference on Decision and Control*, 2016, pp. 465–470 (invited paper)
9. Guosong Yang and Daniel Liberzon, "Finite data-rate stabilization of a switched linear system with unknown disturbance," in *10th IFAC Symposium on Nonlinear Control Systems*, vol. 49, no. 18, 2016, pp. 1085–1090
10. Guosong Yang and Daniel Liberzon, "Stabilizing a switched linear system with disturbance by sampled-data quantized feedback," in *2015 American Control Conference*, 2015, pp. 2193–2198
11. Guosong Yang and Daniel Liberzon, "Input-to-state stability for switched systems with unstable subsystems: A hybrid Lyapunov construction," in *53rd IEEE Conference on Decision and Control*, 2014, pp. 6240–6245
12. Andrii Mironchenko, Guosong Yang, and Daniel Liberzon, "Lyapunov small-gain theorems for not necessarily ISS hybrid systems," in *21st International Symposium on Mathematical Theory of Networks and Systems*, 2014, pp. 1001–1008

## Grant-Application Experience

- Coauthor of the National Science Foundation grant CMMI-1662708: "Switched control systems with limited information: An entropy approach to stabilization and disturbance attenuation," PI: Daniel Liberzon, 2017–2020, Award: $349,540

## Presentations and Seminars

- Presentation at the *37th Southern California Control Workshop*, University of California, San Diego, CA, USA, Jan. 2020
- Presentation at the *22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2019)*, Montreal, Canada, Apr. 2019 (Best Paper Award winner)
- Presentation at the *57th IEEE Conference on Decision and Control (CDC 2018)*, Miami Beach, FL, USA, Dec. 2018
- Presentation at the *35th Southern California Control Workshop*, University of California, Los Angeles, CA, USA, Nov. 2018

- Invited presentation at the *56th Annual Allerton Conference on Communication, Control, and Computing (Allerton 2018)*, Monticello, IL, USA, Oct. 2018
- Presentation at the *2018 American Control Conference (ACC 2018)*, Milwaukee, WI, USA, Jun. 2018
- Presentation at the *2017 American Control Conference (ACC 2017)*, Seattle, WA, USA, May 2017
- Seminar at the *Multi-Agent Robotics Lab*, University of California, San Diego, CA, USA, Mar. 2017 (Host: Jorge Cortés and Sonia Martínez)
- Seminar at the *Hybrid Systems Laboratory*, University of California, Santa Cruz, CA, USA, Feb. 2017 (Host: Ricardo G. Sanfelice)
- Invited presentation at the *55th IEEE Conference on Decision and Control (CDC 2016)*, Las Vegas, NV, USA, Dec. 2016
- Seminar at the *Center for Control, Dynamical Systems, and Computation*, University of California, Santa Barbara, CA, USA, Nov. 2016 (Host: Andrew R. Teel)
- Seminar at the *Cyber-Physical Systems Laboratory*, University of California, Los Angeles, CA, USA, Oct. 2016 (Host: Paulo Tabuada)
- Presentation at the *10th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2016)*, Monterey, CA, USA, Aug. 2016
- Poster presentation at the *11th Coordinated Science Laboratory Student Conference (CSLSC 2016)*, Urbana, IL, USA, Feb. 2016 (Best Poster Award winner)
- Presentation at the *2015 American Control Conference (ACC 2015)*, Chicago, IL, USA, Jul. 2015
- Presentation at the *53rd IEEE Conference on Decision and Control (CDC 2014)*, Los Angeles, CA, USA, Dec. 2014
- Presentation at the *2nd Midwest Workshop on Control and Game Theory*, University of Notre Dame, Notre Dame, IN, USA, Apr. 2013

## Teaching and Mentoring

**University of California, Santa Barbara**, Santa Barbara, CA, USA

- Mentor for undergraduate student internship: "Remote Tracking of Unmanned Ground Vehicles"
- Mentor for high school student internship: "Motion Planning for Unmanned Ground Vehicles"

**University of Illinois at Urbana-Champaign**, Urbana, IL, USA

- Teaching assistant for graduate course: "ECE517 Nonlinear and Adaptive Control"
- Teaching assistant for graduate course: "ECE528 Analysis of Nonlinear Systems"

## Service to the Profession

**Journal reviewer**

- *IEEE Transactions on Automatic Control*
- *IFAC Automatica*
- *System & Control Letters*

- *Mathematics of Control, Signals, and Systems*
- *Nonlinear Analysis: Hybrid Systems*
- *IEEE Control Systems Letters*
- *Communications in Nonlinear Science and Numerical Simulation*

**Conference reviewer**

- *ACM International Conference on Hybrid Systems: Computation and Control* (2016, 2017, and 2021)
- *American Control Conference* (2017, 2018, and 2021)
- *IEEE Conference on Decision and Control* (2019 and 2020)
- *IFAC World Congress* (2020)
- *IFAC Workshop on Distributed Estimation and Control in Networked Systems* (2019)
- *IFAC Conference on Modelling, Identification and Control of Nonlinear Systems* (2015)

**Conference organization**

- Chair for session: "Switched Systems I" at the *57th IEEE Conference on Decision and Control*, Miami Beach, FL, USA, Dec. 2018