# 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* in 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* in 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* in Electronic Engineering, minor in Mathematics

Advisor: Zexiang Li

## Awards and honors

2019 *ACM SIGBED HSCC Best Paper Award*, 22nd ACM International Conference on Hybrid Systems: Computation and Control, Montreal, Canada

2016 *Best Poster Award*, 11th Coordinated Science Laboratory Student Conference, University of Illinois at Urbana-Champaign, Urbana, IL, USA

2016 *Graduate College Conference Travel Award*, University of Illinois at Urbana-Champaign, Urbana, IL, USA

2007–2011 *University Scholarship*, Hong Kong University of Science and Technology, Kowloon, Hong Kong

2007–2011 *School of Engineering Scholarship*, Hong Kong University of Science and Technology, Kowloon, Hong Kong,

2007–2011 *The Joseph Lau Luen Hung Charitable Trust Scholarship*, Hong Kong University of Science and Technology, Kowloon, Hong Kong

2007–2011 *ECE Outstanding Freshmen Scholarship*, Hong Kong University of Science and Technology, Kowloon, Hong Kong

2007–2009 *Dean's List*, Hong Kong University of Science and Technology, Kowloon, Hong Kong

2007 *Gold medal*, 8th Asian Physics Olympiad, Shanghai, China

## Publications

### Working papers

[W3] Henrique Ferraz, Guosong Yang, and João P. Hespanha, "Distributed leader-follower model predictive control," in preparation

[W2] Guosong Yang, Daniel Liberzon, and João P. Hespanha, "Topological entropy of nonlinear switched and time-varying systems," in preparation

[W1] Guosong Yang, Radha Poovendran, and João P. Hespanha, "Adaptive learning in two-player Stackelberg games with application to network security," submitted for journal publication

### Journals

[J6] João P. Hespanha, Raphael Chinchilla, Ramon R. Costa, Murat K. Erdal, and Guosong Yang, "Forecasting COVID-19 cases based on a parameter-varying stochastic SIR model," *Annual Reviews in Control*, vol. 51, pp. 460–476, Apr. 2021

[J5] 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

[J4] 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

[J3] 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

[J2] 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

[J1] 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

[Ch1] 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. Cham, Switzerland: Springer, 2021, pp. 433–463

**Conferences**

[C13] Raphael Chinchilla, Guosong Yang, Murat K. Erdal, Ramon R. Costa, and João P. Hespanha, "A tale of two doses: Model identification and optimal vaccination for COVID-19," in *60th IEEE Conference on Decision and Control*, Austin, TX, USA, 2021, pp. 3544–3550 (invited paper)

[C12] 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*, Nashville, TN, USA, 2021, 11 pages

[C11] 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*, Nice, France, 2019, pp. 6905–6911

[C10] 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*, Montreal, Canada, 2019, pp. 119–127 (24% acceptance rate, **Best Paper Award winner**)

[C9] 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*, Monticello, IL, USA, 2018, pp. 429–436 (invited paper)

[C8] 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*, Miami Beach, FL, USA, 2018, pp. 5682–5687

[C7] 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*, Milwaukee, WI, USA, 2018, pp. 3410–3416

[C6] 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*, Seattle, WA, USA, 2017, pp. 5182–5187

[C5] 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*, Las Vegas, NV, USA, 2016, pp. 465–470 (invited paper)

[C4] 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, Monterey, CA, USA, 2016, pp. 1085–1090

[C3] Guosong Yang and Daniel Liberzon, "Stabilizing a switched linear system with disturbance by sampled-data quantized feedback," in *2015 American Control Conference*, Chicago, IL, USA, 2015, pp. 2193–2198

[C2] 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*, Los Angeles, CA, USA, 2014, pp. 6240–6245

[C1] 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*, Groningen, Netherlands, 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, Jul. 2017–Jun. 2020, Award: $349,540

## Presentations and seminars

1. Seminar at the *e-TEC Talks @SNU Summer 2021*, Seoul National University, Seoul, Korea, Aug. 2021
2. Presentation at the *24th ACM International Conference on Hybrid Systems: Computation and Control*, Nashville, TN, USA, May 2021
3. Presentation at the *37th Southern California Control Workshop*, University of California, San Diego, San Diego, CA, USA, Jan. 2020
4. Presentation at the *22nd ACM International Conference on Hybrid Systems: Computation and Control*, Montreal, Canada, Apr. 2019 (24% acceptance rate, Best Paper Award winner)
5. Presentation at the *57th IEEE Conference on Decision and Control*, Miami Beach, FL, USA, Dec. 2018
6. Presentation at the *35th Southern California Control Workshop*, University of California, Los Angeles, Los Angeles, CA, USA, Nov. 2018
7. Invited presentation at the *56th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, USA, Oct. 2018
8. Presentation at the *2018 American Control Conference*, Milwaukee, WI, USA, Jun. 2018
9. Presentation at the *2017 American Control Conference*, Seattle, WA, USA, May 2017
10. Seminar at the *Multi-Agent Robotics Lab*, University of California, San Diego, San Diego, CA, USA, Mar. 2017 (Host: Jorge Cortés and Sonia Martínez)
11. Seminar at the *Arcak Lab*, University of California, Berkeley, Berkeley, CA, USA, Mar. 2017 (Host: Murat Arcak)
12. Seminar at the *Hybrid Systems Laboratory*, University of California, Santa Cruz, Santa Cruz, CA, USA, Feb. 2017 (Host: Ricardo G. Sanfelice)
13. Invited presentation at the *55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, Dec. 2016
14. Seminar at the *Center for Control, Dynamical Systems, and Computation*, University of California, Santa Barbara, Santa Barbara, CA, USA, Nov. 2016 (Host: Andrew R. Teel)
15. Seminar at the *Cyber-Physical Systems Laboratory*, University of California, Los Angeles, Los Angeles, CA, USA, Oct. 2016 (Host: Paulo Tabuada)
16. Presentation at the *10th IFAC Symposium on Nonlinear Control Systems*, Monterey, CA, USA, Aug. 2016
17. Poster presentation at the *11th Coordinated Science Laboratory Student Conference*, University of Illinois at Urbana-Champaign, Urbana, IL, USA, Feb. 2016 (Best Poster Award winner)
18. Presentation at the *2015 American Control Conference*, Chicago, IL, USA, Jul. 2015
19. Presentation at the *53rd IEEE Conference on Decision and Control*, Los Angeles, CA, USA, Dec. 2014

20. 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 review**

- *IEEE Transactions on Automatic Control* (8)
- *Automatica* (6)
- *System & Control Letters* (2)
- *Nonlinear Analysis: Hybrid Systems* (2)
- *IEEE Transactions on Control of Network Systems* (1)
- *IEEE Control Systems Letters* (1)
- *Communications in Nonlinear Science and Numerical Simulation* (1)
- *Mathematics of Control, Signals, and Systems* (1)

**Conference review**

- *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)
- *ACM International Conference on Hybrid Systems: Computation and Control* (2016 and 2017)
- *IFAC Conference on Modelling, Identification and Control of Nonlinear Systems* (2015)

**Conference organization**

- *Program committees* for "Repeatability Evaluation" and "Posters and Demos" at the *24th ACM International Conference on Hybrid Systems: Computation and Control*, May 2021
- *Session chair* for "Switched Systems I" at the *57th IEEE Conference on Decision and Control*, Miami Beach, FL, USA, Dec. 2018