

# Guosong Yang

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## RESEARCH INTERESTS

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

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## POSITIONS

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| <b>Rutgers, The State University of New Jersey</b> , Piscataway, NJ, USA             | Sep. 2022–present  |
| <i>Assistant Professor</i> , Department of Electrical and Computer Engineering       |                    |
| <b>University of Illinois at Urbana-Champaign</b> , Urbana, IL, USA                  | May 2022–Aug. 2022 |
| <i>Postdoctoral Research Associate</i> , Coordinated Science Laboratory              |                    |
| Advisor: Daniel Liberzon   |                    |
| <b>University of California, Santa Barbara</b> , Santa Barbara, CA, USA              | Aug. 2017–May 2022 |
| <i>Postdoctoral Scholar</i> , Center for Control, Dynamical Systems, and Computation |                    |
| Advisor: João P. Hespanha  |                    |

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## EDUCATION

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| <b>University of Illinois at Urbana-Champaign</b> , Urbana, IL, USA   | Oct. 2013–Jul. 2017 |
| <i>Doctor of Philosophy</i> 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  |                     |
| <b>University of Illinois at Urbana-Champaign</b> , Urbana, IL, USA   | Aug. 2011–Aug. 2013 |
| <i>Master of Science</i> in Electrical and Computer Engineering   |                     |
| Thesis: “A Lyapunov-based small-gain theorem for interconnected switched systems”   |                     |
| Advisor: Daniel Liberzon  |                     |
| <b>Hong Kong University of Science and Technology</b> , Kowloon, Hong Kong  | Sep. 2007–Jun. 2011 |
| <i>Bachelor of Engineering</i> in Electronic Engineering (First Class Honors), minor in Mathematics                                     |                     |
| Advisor: Zexiang Li   |                     |

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## AWARDS AND HONORS

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| 2019 | <i>ACM SIGBED HSCC Best Paper Award</i> , 22nd ACM International Conference on Hybrid Systems: Computation and Control, Montreal, Canada       |
| 2016 | <i>Best Poster Award</i> , 11th Coordinated Science Laboratory Student Conference, University of Illinois at Urbana-Champaign, Urbana, IL, USA |

**Working papers**

- [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**

- [J8] Raphael Chinchilla, Guosong Yang, and João P. Hespanha, “Newton and interior-point methods for (constrained) nonconvex–nonconcave minmax optimization with stability and instability guarantees,” *Mathematics of Control, Signals, and Systems*, vol. 36, no. 2, pp. 381–421, Jun. 2024
- [J7] Guosong Yang, Daniel Liberzon, and João P. Hespanha, “Topological entropy of switched nonlinear and interconnected systems,” *Mathematics of Control, Signals, and Systems*, vol. 35, no. 3, pp. 641–683, Sep. 2023
- [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] Kuniyoshi 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**

- [C15] Kyriakos G. Vamvoudakis, Filippos Fotiadis, João P. Hespanha, Raphael Chinchilla, Guosong Yang, Mushuang Liu, Jeff S. Shamma, and Lăcrășă Pavel, “Game theory for autonomy: From min-max optimization to equilibrium and bounded rationality learning,” in *2023 American Control Conference*, San Diego, CA, USA, Jun. 2023, pp. 4363–4380
- [C14] Sharad C. Shankar, Guosong Yang, and João P. Hespanha, “State estimation for asynchronously switched sampled-data systems,” in *61st IEEE Conference on Decision and Control*, Cancún, Mexico, Dec. 2022, pp. 1–7

- [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, Dec. 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, May 2021, pp. 1–11
- [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, Dec. 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, Apr. 2019, pp. 119–127 (24% acceptance rate, **Best Paper Award winner**)
- [C9] 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, Dec. 2018, pp. 5682–5687
- [C8] 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, Oct. 2018, pp. 429–436 (invited paper)
- [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, Jun. 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, May 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, Dec. 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*, Monterey, CA, USA, Aug. 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, Jul. 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, Dec. 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, Jul. 2014, pp. 1001–1008

## GRANT-APPLICATION EXPERIENCE

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

## PRESENTATIONS AND SEMINARS

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1. “On topological entropy of switched cascade systems,” in *60th Annual Allerton Conference on Communication, Control, and Computing*, Urbana, IL, USA, Sep. 2024 (invited talk)
2. “Adaptive learning in two-player Stackelberg games with application to network security,” in *2024 Joint Statistical Meetings*, Portland, OR, USA, Aug. 2024 (invited talk)
3. “Networked cyber-physical systems: Information and control,” in *e-TEC Talks @SNU Summer 2021*, Seoul National University, Aug. 2021 (invited virtual seminar)
4. “Topological entropy of switched nonlinear systems,” in *24th ACM International Conference on Hybrid Systems: Computation and Control*, May 2021 (virtual talk)
5. “Information and control in networked cyber-physical systems,” in *2020 Information Theory and Applications Workshop*, San Diego, CA, USA, Feb. 2020 (invited talk)
6. “Adaptive learning in two-player Stackelberg games with continuous action sets,” in *37th Southern California Control Workshop*, University of California, San Diego, San Diego, CA, USA, Jan. 2020
7. “On topological entropy and stability of switched linear systems,” in *22nd ACM International Conference on Hybrid Systems: Computation and Control*, Montreal, Canada, Apr. 2019
8. “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, Dec. 2018
9. “On topological entropy of switched linear systems,” in *35th Southern California Control Workshop*, University of California, Los Angeles, Los Angeles, CA, USA, Nov. 2018
10. “On topological entropy of switched linear systems with pairwise commuting matrices,” in *56th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, USA, Oct. 2018 (invited talk)
11. “Modeling and mitigating the Coremelt attack,” in *2018 American Control Conference*, Milwaukee, WI, USA, Jun. 2018
12. “Stabilization of interconnected switched control-affine systems via a Lyapunov-based small-gain approach,” in *2017 American Control Conference*, Seattle, WA, USA, May 2017
13. “Analysis of different Lyapunov function constructions for interconnected hybrid systems,” in *55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, Dec. 2016 (invited talk)
14. “Feedback stabilization of a switched linear system with unknown disturbance under data-rate constraints,” in *CCDC Seminar Series*, Center for Control, Dynamical Systems, and Computation, University of California, Santa Barbara, Santa Barbara, CA, USA, Nov. 2016 (invited seminar)
15. “Finite data-rate stabilization of a switched linear system with unknown disturbance,” in *10th IFAC Symposium on Nonlinear Control Systems*, Monterey, CA, USA, Aug. 2016

16. “Stabilizing a switched linear system with unknown disturbance by sampled and quantized state feedback,” in *11th Coordinated Science Laboratory Student Conference*, University of Illinois at Urbana-Champaign, Urbana, IL, USA, Feb. 2016 (poster presentation, **Best Poster Award winner**)
17. “Stabilizing a switched linear system with disturbance by sampled-data quantized feedback,” in *2015 American Control Conference*, Chicago, IL, USA, Jul. 2015
18. “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, Dec. 2014
19. “A Lyapunov-based small-gain theorem for interconnected switched systems,” in *2nd Midwest Workshop on Control and Game Theory*, University of Notre Dame, Notre Dame, IN, USA, Apr. 2013

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## TEACHING

**Rutgers, The State University of New Jersey**, Piscataway, NJ, USA

- 16:332:541 Stochastic Signals and Systems
- 16:332:512 Nonlinear and Adaptive Control
- 14:332:345 Linear Systems and Signals
- 14:332:226 Probability and Random Processes

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## SERVICE TO THE PROFESSION

### Journal review

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

### Conference review

- *American Control Conference*
- *IEEE Conference on Decision and Control*
- *IFAC World Congress*
- *IFAC Workshop on Distributed Estimation and Control in Networked Systems*
- *ACM International Conference on Hybrid Systems: Computation and Control*
- *IFAC Conference on Modelling, Identification and Control of Nonlinear Systems*

### **Conference organization**

- Program Committee for *28th ACM International Conference on Hybrid Systems: Computation and Control*, May 2025
- Repeatability Evaluation Program Committee for *26th ACM International Conference on Hybrid Systems: Computation and Control*, May 2023
- Repeatability Evaluation and Posters and Demos Program Committees for *25th ACM International Conference on Hybrid Systems: Computation and Control*, May 2022
- Repeatability Evaluation and Posters and Demos Program Committees for *24th ACM International Conference on Hybrid Systems: Computation and Control*, May 2021
- Session chair for “Switched Systems I” in *57th IEEE Conference on Decision and Control*, Miami Beach, FL, USA, Dec. 2018