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.

Positions

Rutgers University–New Brunswick, Piscataway, NJ, USA Sep. 2022–present
Assistant Professor, Department of Electrical and Computer Engineering

University of Illinois at Urbana-Champaign, Urbana, IL, USA May 2022–Aug. 2022
Postdoctoral Research Associate, Coordinated Science Laboratory
Advisor: Daniel Liberzon

University of California, Santa Barbara, Santa Barbara, CA, USA Aug. 2017–May 2022
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–Jul. 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 (First Class Honors), 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

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] 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

[C15] Kyriakos G. Vamvoudakis, Filippos Fotiadis, João P. Hespanha, Raphael Chinchilla, Guosong Yang, Mushuang Liu, Jeff S. Shamma, and Lacra 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

- 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

1. "Networked cyber-physical systems: Information, uncertainty, and control," in *e-TEC Talks @SNU Summer 2021*, Seoul National University, Aug. 2021 (virtual seminar)
2. "Topological entropy of switched nonlinear systems," in *24th ACM International Conference on Hybrid Systems: Computation and Control*, may 2021 (virtual)
3. "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
4. "On topological entropy and stability of switched linear systems," in *22nd ACM International Conference on Hybrid Systems: Computation and Control*, Montreal, Canada, apr 2019
5. "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
6. "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
7. "Modeling and mitigating the Coremelt attack," in *2018 American Control Conference*, Milwaukee, WI, USA, jun 2018
8. "Stabilization of interconnected switched control-affine systems via a Lyapunov-based small-gain approach," in *2017 American Control Conference*, Seattle, WA, USA, may 2017
9. "Analysis of different Lyapunov function constructions for interconnected hybrid systems," in *55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, Dec. 2016
10. "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 (seminar)
11. "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
12. "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**)
13. "Stabilizing a switched linear system with disturbance by sampled-data quantized feedback," in *2015 American Control Conference*, Chicago, IL, USA, jul 2015
14. "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. 2015
15. "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

Teaching

Rutgers University–New Brunswick, Piscataway, NJ, USA

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

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 member for "Repeatability Evaluation," in *26th ACM International Conference on Hybrid Systems: Computation and Control*, May 2023
- Program committee member for "Repeatability Evaluation" and "Posters and Demos," in *25th ACM International Conference on Hybrid Systems: Computation and Control*, May 2022
- Program committee member for "Repeatability Evaluation" and "Posters and Demos," in *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