

# 杨国松

Center for Control, Dynamical Systems, and Computation  
University of California, Santa Barbara

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## 科研方向

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申请人的科研方向主要集中在信息物理系统的网络化控制，包括：

- 以切换和混杂系统为模型，实现信息物理系统中计算、网络与物理环境的无缝集成
- 以拓扑熵为工具，判断切换系统网络化控制的信息需求，并设计通信与控制一体化算法
- 利用小增益原理，为可容错混杂系统网络建立稳定性条件
- 将博弈论与自适应控制及机器学习相结合，解决网络安全中攻防两方信息不对称的问题

## 工作经历

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加利福尼亚大学圣巴巴拉分校，美国

2017/08 至现在

博士后，控制、动态系统与运算中心

导师：João P. Hespanha

## 教育背景

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伊利诺伊大学厄巴纳-尚佩恩分校，美国

2013/10 至 2017/08

博士（电子与计算机工程）

毕业论文：“Switched and hybrid systems with inputs: Small-gain theorems, control with limited information, and topological entropy”

导师：Daniel Liberzon

伊利诺伊大学厄巴纳-尚佩恩分校，美国

2011/08 至 2013/08

硕士（电子与计算机工程）

毕业论文：“A Lyapunov-based small-gain theorem for interconnected switched systems”

导师：Daniel Liberzon

香港科技大学，中国香港

2007/09 至 2011/06

学士（电子工程，辅修数学）

导师：李泽湘

## 奖项与荣誉

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2019 最佳论文奖：ACM SIGBED HSCC Best Paper Award，第 22 届 ACM International Conference on Hybrid Systems: Computation and Control，加拿大

2016 最佳海报奖：Best Poster Award，第 11 届 Coordinated Science Laboratory Student Conference，伊利诺伊大学厄巴纳-尚佩恩分校，美国

2016 Graduate College Conference Travel Award，伊利诺伊大学厄巴纳-尚佩恩分校，美国

2007 至 2011 *University Scholarship*, 香港科技大学, 中国香港  
2007 至 2011 *School of Engineering Scholarship*, 香港科技大学, 中国香港  
2007 至 2011 *The Joseph Lau Luen Hung Charitable Trust Scholarship*, 香港科技大学, 中国香港  
2007 至 2011 *ECE Outstanding Freshmen Scholarship*, 香港科技大学, 中国香港  
2007 至 2009 *Dean's List*, 香港科技大学, 中国香港  
2007 金牌, 第 8 届亚洲物理奥林匹克竞赛, 上海

## 学术成果

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### 工作论文

- [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

### 期刊论文

- [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

### 书籍章节

- [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

## 会议论文

- [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 (特邀论文)
- [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 (会议录用率 24%, 最佳论文奖)
- [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 (特邀论文)
- [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 (特邀论文)
- [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

## 科研项目申请经历

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1. 项目申请撰稿人: National Science Foundation grant CMMI-1662708: “Switched Control Systems with Limited Information: An Entropy Approach to Stabilization and Disturbance Attenuation” (Program: Dynamics, Control and Systems Diagnostics), PI: Daniel Liberzon, Jul. 2017–Jun. 2021, Award: \$349,540 (依托单位: 伊利诺伊大学厄巴纳-尚佩恩分校)

## 科研项目参与经历

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1. National Science Foundation grant ECCS-2029985: “RAPID: Informed Decision Making for Pandemic Management” (Program: COVID-19 Research), PI: João P. Hespanha, May 2020–Apr. 2022, Award: \$146,274 (依托单位: 加利福尼亚大学圣巴巴拉分校)
2. National Science Foundation grant EPCN-1608880: “Online Optimization for the Control of Small Autonomous Vehicles” (Program: Energy, Power, Control, and Networks), PI: João P. Hespanha, Sep. 2016–Aug. 2021, Award: \$359,838 (依托单位: 加利福尼亚大学圣巴巴拉分校)
3. Office of Naval Research grant N00014-16-1-2710: “ADAPT: Analytical Framework for Actionable Defense against Advanced Persistent Threats” (Program: Multidisciplinary University Research Initiative), Leading PI: Radha Poovendran, PI: João P. Hespanha, 2016–2021 (依托单位: 加利福尼亚大学圣巴巴拉分校)
4. National Science Foundation grant CNS-1329650: “ROSELIN: Enabling Robust, Secure, and Efficient Knowledge of Time Across the System Stack” (Program: Cyber-Physical Systems), PI: João P. Hespanha, Jun. 2014–May 2020, Award: \$544,726 (依托单位: 加利福尼亚大学圣巴巴拉分校)
5. National Science Foundation grant ECCS-1231196: “Hybrid Small-Gain Theorems for Nonlinear Networked and Quantized Control Systems” (Program: Energy, Power, Control, and Networks), PI: Daniel Liberzon, Sep. 2012–Aug. 2016, Award: \$240,000 (依托单位: 伊利诺伊大学厄巴纳-尚佩恩分校)
6. National Science Foundation grant CNS-1217811: “Limited-Information Control of Hybrid Systems via Reachable Set Propagation” (Program: Computer Systems Research), PI: Daniel Liberzon, Sep. 2012–Aug. 2016, Award: \$280,000 (依托单位: 伊利诺伊大学厄巴纳-尚佩恩分校)

## 会议与学术报告

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### 特邀报告

1. *56th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, USA, Oct. 2018
2. *55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, Dec. 2016

### 会议报告

1. *24th ACM International Conference on Hybrid Systems: Computation and Control*, Nashville, TN, USA, May 2021
2. *37th Southern California Control Workshop*, University of California, San Diego, San Diego, CA, USA, Jan. 2020

3. *22nd ACM International Conference on Hybrid Systems: Computation and Control*, Montreal, Canada, Apr. 2019 (会议录用率 24%, 最佳论文奖)
4. *57th IEEE Conference on Decision and Control*, Miami Beach, FL, USA, Dec. 2018
5. *35th Southern California Control Workshop*, University of California, Los Angeles, Los Angeles, CA, USA, Nov. 2018
6. *2018 American Control Conference*, Milwaukee, WI, USA, Jun. 2018
7. *2017 American Control Conference*, Seattle, WA, USA, May 2017
8. *10th IFAC Symposium on Nonlinear Control Systems*, Monterey, CA, USA, Aug. 2016
9. *11th Coordinated Science Laboratory Student Conference*, University of Illinois at Urbana-Champaign, Urbana, IL, USA, Feb. 2016 (最佳海报奖)
10. *2015 American Control Conference*, Chicago, IL, USA, Jul. 2015
11. *53rd IEEE Conference on Decision and Control*, Los Angeles, CA, USA, Dec. 2014
12. *2nd Midwest Workshop on Control and Game Theory*, University of Notre Dame, Notre Dame, IN, USA, Apr. 2013

### 学术报告

1. *e-TEC Talks @SNU Summer 2021*, Seoul National University, Seoul, Korea, Aug. 2021
2. *Multi-Agent Robotics Lab*, University of California, San Diego, San Diego, CA, USA, Mar. 2017 (Host: Jorge Cortés and Sonia Martínez)
3. *Arcak Lab*, University of California, Berkeley, Berkeley, CA, USA, Mar. 2017 (Host: Murat Arcak)
4. *Hybrid Systems Laboratory*, University of California, Santa Cruz, Santa Cruz, CA, USA, Feb. 2017 (Host: Ricardo G. Sanfelice)
5. *Center for Control, Dynamical Systems, and Computation*, University of California, Santa Barbara, Santa Barbara, CA, USA, Nov. 2016 (Host: Andrew R. Teel)
6. *Cyber-Physical Systems Laboratory*, University of California, Los Angeles, Los Angeles, CA, USA, Oct. 2016 (Host: Paulo Tabuada)

### 教学与学生指导

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#### 加利福尼亚大学圣巴巴拉分校, 美国

- 本科生科研项目导师: “Remote Tracking of Unmanned Ground Vehicles”
- 高中生科研项目导师: “Motion Planning for Unmanned Ground Vehicles”

#### 伊利诺伊大学厄巴纳-尚佩恩分校, 美国

- 研究生课程助教: “ECE517 Nonlinear and Adaptive Control” (非线性与自适应控制)
- 研究生课程助教: “ECE528 Analysis of Nonlinear Systems” (非线性系统分析)

### 期刊审稿人

- *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)

### 会议审稿人

- *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)

### 会议组织者

- 会议项目委员会成员: “Repeatability Evaluation” and “Posters and Demos” at the *24th ACM International Conference on Hybrid Systems: Computation and Control*, May 2021
- 会议分会主席: “Switched Systems I” at the *57th IEEE Conference on Decision and Control*, Miami Beach, FL, USA, Dec. 2018