

# Fabio Pasqualetti

## Curriculum Vitae

July 2017

Address: Department of Mechanical Engineering  
University of California at Riverside  
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### Current Position

Jul 13 - Present **Assistant Professor**  
Mechanical Engineering, University of California, Riverside

### Previous Positions

Oct 12 - Jun 13 **Postdoctoral Researcher**  
Mechanical Engineering, University of California, Santa Barbara

### Education and Qualifications

Sep 2012 **Ph.D.**  
Mechanical Engineering, University of California, Santa Barbara  
Advisor: Francesco Bullo  
Thesis: Secure Control Systems: A Control-Theoretic Approach to Cyber-Physical Security

Oct 2007 **Laurea Magistrale** (M.Sc. equivalent)  
Automation Engineering, University of Pisa, Pisa, Italy  
Advisor: Antonio Bicchi  
Thesis: Distributed Intrusion Detection for Secure Consensus Computations

Aug 2004 **Laurea** (B.Sc. equivalent)  
Computer Engineering, University of Pisa, Pisa, Italy

### Research Interests

My main thrust is on *security, reliability, and trust management in cyber-physical systems*, with an emphasis on distributed control and estimation of large-scale systems. A second research direction is in network science, and particularly in the intersection between control theory and network neuroscience. A third interest is in *mobile robotics, environmental patrolling, and persistent surveillance*, with an emphasis on combinatorial optimization, complexity theory, and network algorithms.

### Honors and Awards

Dec 2016 **IEEE Transactions on Control of Network Systems Outstanding Paper Award**  
For the paper "Controllability Metrics, Limitations and Algorithms for Complex Networks," IEEE Transactions on Control of Network Systems, 1(1), 40-52, 2014

July 2015 **ACC Best Student Paper Award Finalist**  
For the paper "Security in stochastic control systems: Fundamental limitations and performance bounds," American Control Conference, Chicago, IL, 195-200

May 2015 **Outstanding Research Award**  
Department of Mechanical Engineering, UCR, Riverside

June 2014 **Regents Fellowship**  
Department of Mechanical Engineering, UCR, Riverside

Mar 2013 **Best PhD Thesis Award**  
Department of Mechanical Engineering, UCSB, Santa Barbara

Jun 2012 **Excellence Fellowship**  
Department of Mechanical Engineering, UCSB, Santa Barbara

Dec 2009 **General Chairs' Recognition Award for Interactive Papers**  
Conference on Decision and Control, Shanghai, China

## Sponsored Projects

- “Control-Theoretic Defense Strategies for Cyber-Physical Systems”, NSF, PI, 9/1/14 - 8/31/17
- “Mapping and Control of Large - Scale Neural Dynamics”, NSF, co-PI, 9/1/14 - 8/31/17
- “Secure Cyber-Physical Systems Through Security Algorithm and Embedded Platform Co-design”, ONR, PI, 10/1/14 - 9/30/17
- “A Hierarchical Approach to Dynamic Big Data Analysis in Power Infrastructure Security”, co-PI, NSF, 9/1/15 - 8/31/17
- “A Mechanistic Model of Cognitive Control”, NSF, co-PI, 9/1/16 - 8/31/19
- “Securing the Timing of Cyber-Physical Systems”, NSF, co-PI, 9/1/16 - 8/31/19
- “Secure Algorithms for Cloud-Connected Autonomous Robots Interacting with Humans”, CITRIS, PI, 7/1/16 - 6/30/17

## Advising

### Current Graduate Students

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|---------------------|--|
| Rajasekhar Anguluri | Ph.D. student, Mechanical Engineering, UCR<br>Mentoring: Advisor and Chair of Doctoral Committee, Sep 14 - present |
| Gianluca Bianchin   | Ph.D. student, Mechanical Engineering, UCR<br>Mentoring: Advisor and Chair of Doctoral Committee, Sep 15 - present |
| Yin-Chen Liu        | M.S. student, Mechanical Engineering, UCR<br>Mentoring: Advisor and Chair of Doctoral Committee, Sep 15 - present  |
| Akila Ganlath       | Ph.D. student, Mechanical Engineering, UCR<br>Mentoring: Advisor and Chair of Doctoral Committee, Sep 16 - present |
| Tommaso Menara      | Ph.D. student, Mechanical Engineering, UCR<br>Mentoring: Advisor and Chair of Doctoral Committee, Sep 16 - present |

### Former M.S. Students

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|-------------|--|
| John Tran   | M.S., Mechanical Engineering, UCR<br>Mentoring: Advisor and Chair of M.S. Committee, Sep 13 - Jun 14 |
| Mikalie Lai | M.S., Bioengineering, UCR<br>Mentoring: Advisor and Chair of M.S. Committee, Sep 13 - Dec 15         |

## Teaching Activities

### Instructor

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| ME223(V) | <i>Secure and Reliable Control Systems</i> , UCR     |
| ME145    | <i>Robotic Planning and Kinematics</i> , UCR         |
| ME018    | <i>Introduction to Engineering Computation</i> , UCR |
| ME170A   | <i>Experimental Techniques</i> , UCR                 |
| ME133    | <i>Introduction to Mechatronics</i> , UCR            |

## Professional Service and Affiliations

### Invited Sessions, Workshops, and Tutorials Organized

May 2017	<b>Analysis and Control of Neural Systems</b> Conference: IEEE American Control Conference, Seattle, WA
Dec 2016	<b>IEEE Conference on Decision and Control</b> Las Vegas, NV, Role: Local arrangement chair
Jun 2015	<b>IFAC Symposium on Large Scale Complex Systems: Theory and Applications</b> Riverside, CA, Role: Vice-chair of symposium
Jun 2015	<b>Research Avenues in Network Neuroscience and Controls</b> Conference: IEEE American Control Conference, Chicago, IL
Dec 2012	<b>Security and Privacy in Cyber-Physical Systems</b> Conference: IEEE Conference on Decision and Control, Maui, HI
Dec 2011	<b>Workshop on Control Systems Security: Challenges and Directions</b> Conference: IEEE Conference on Decision and Control, Orlando, FL
Jun 2011	<b>The 2011 Santa Barbara Control Workshop: Decision, Dynamics and Control in Multi-Agent Systems</b> Santa Barbara, CA

### Technical Reviewer

NSF Panels	2014 (2), 2015 (1), 2016 (1), 2017 (2)
Arpa-E Panels	2015 (1)
Journals	Automatica ◦ IEEE Transactions on Automatic Control ◦ IEEE Transactions on Control of Network Systems ◦ IEEE Transactions on Robotics ◦ IEEE Transactions on Systems, Man, and Cybernetics, Part B ◦ International Journal of Robotics Research ◦ Transactions on Control Systems Technology ◦ Nature Communications ◦ Sensors ◦ Systems & Control Letters ◦ Nonlinearity ◦ IEEE Transactions on Industrial Informatics ◦ IEEE Computer ◦ IET Control Theory & Applications ◦ SIAM Journal on Control and Optimization ◦ IEEE Transactions on Network Science and Engineering ◦ Physical Review E ◦ Physical Review Letters
Conferences	IEEE American Control Conference ◦ IEEE Conference on Decision and Control ◦ IEEE International Conference on Robotics and Automation ◦ IFAC Workshop on Distributed Estimation and Control in Networked Systems ◦ IFAC World Congress

### Affiliations

Member	Institute for Electrical and Electronics Engineers (IEEE) IEEE Control Systems Society (IEEE CSS) Society for Industrial and Applied Mathematics (SIAM) SIAG on Control & Systems Theory
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## Selected Invited Talks

Jul 2017	A Systems and Control Perspective on Privacy, Safety, and Security in large-scale Cyber-Physical Systems, DISC Summer School, The Hague, The Netherlands
Jun 2017	Workshop on Brain Dynamics and Neurocontrol Engineering, Washington University in St. Louis, St. Louis
Apr 2015	Department of Electrical and Computer Engineering, University of California, San Diego
Feb 2015	Department of Mechanical and Aerospace Engineering, University of California, Irvine
Feb 2015	Department of Mechanical Engineering, University of California, Santa Barbara
Sep 2014	Department of Electrical Engineering, University of Notre Dame, Notre Dame
Apr 2013	Department of Mechanical Engineering, University of California, Riverside
Feb 2013	Department of Mechanical Engineering, University of California, Riverside
Oct 2012	INRIA Grenoble Rhone-Alpes, NeCS team, Grenoble
Oct 2012	Gipsa-Lab, Grenoble
Jul 2012	Siemens Corporate Technology, Munich
Feb 2012	Cyber-Physical Systems Laboratory, University of California, Los Angeles
Aug 2010	Interdepartmental Research Center E. Piaggio, University of Pisa, Pisa
Aug 2010	Department of Information Engineering, University of Padova, Padova

## Publications

### Journal Articles Under Review

1. S. Amini, F. Pasqualetti, M. Abbaszadeh, and H. Mohsenian-Rad. Hierarchical Location Identification of Destabilizing Faults and Attacks in Power Systems: A Frequency-Domain Approach. *IEEE Transactions on Smart Grid*, 2017, Submitted.
2. J. Kim, J. M. Soffer, A. E. Kahn, J. M. Vettel, F. Pasqualetti, and D. S. Bassett. Topological Principles of Control in Dynamical Network Systems. *Nature Physics*, 2017, Submitted.
3. J. D. Medaglia, S. Gu, F. Pasqualetti, R. L. Ashare, C. Lerman, J. Kable, and D. S. Bassett. Cognitive Control in the Controllable Connectome. *Journal of Neuroscience*, 2017, Submitted.
4. E. Nozari, F. Pasqualetti, and J. Cortés. Time-Varying Actuator Scheduling in Complex Networks. *IEEE Transactions on Control of Network Systems*, 2017, Submitted.
5. S. Gu, M. Cieslak, B. Baird, S. F. Muldoon, S. T. Grafton, F. Pasqualetti, and D. S. Bassett. The Energy Landscape of Neurophysiological Activity Implicit in Brain Network Structure. *PLOS Computational Biology*, 2016, Submitted.
6. S. Zhao and F. Pasqualetti. Network Design with Guaranteed Controllability and Robustness Performance. *IEEE Transactions on Control of Network Systems*, 2016, Submitted.

### Journal Articles

1. C-Z. Bai, F. Pasqualetti, and V. Gupta. Data-injection attacks in stochastic control systems: Detectability and performance tradeoffs. *Automatica*, **82**:251–260, 2017, To appear.
2. G. Bianchin, P. Frasca, A. Gasparri, and F. Pasqualetti. The Observability Radius of Networks. **62**(6):3006–3013, 2017.
3. V. Katewa, F. Pasqualetti, and V. Gupta. On Privacy vs Cooperation in Multi-agent Systems. *International Journal of Control*:1–15, 2017.
4. J. D. Medaglia, F. Pasqualetti, R. H. Hamilton, S. L. Thompson-Schill, and D. S. Bassett. Brain and cognitive reserve: Translation via network control theory. *Neuroscience and Biobehavioral Reviews*, **75**(2017):53–64, 2017.

5. L. Wiles, S. Gu, F. Pasqualetti, D. S Bassett, and D. F. Meaney. Autaptic Connections Shift Network Excitability and Bursting. *Scientific Reports*, 7(44006), 2017.
6. C-Z. Bai, V. Gupta, and F. Pasqualetti. On Kalman Filtering with Compromised Sensors: Attack Stealthiness and Performance Bounds. *IEEE Transactions on Automatic Control*, 2016, To appear.
7. R. F. Betzel, S. Gu, J. D. Medaglia, F. Pasqualetti, and D. S. Bassett. Optimally controlling the human connectome: the role of network topology. *Scientific Reports*, 6(30770), 2016.
8. S. F. Muldoon, F. Pasqualetti, S. Gu, M. Cieslak, S. T. Grafton, J. M. Vettel, and D. S. Bassett. Stimulation-based control of dynamic brain networks. *PLOS Computational Biology*, 12(9):e1005076, 2016.
9. B. Zheng, P. Deng, R. Anguluri, Q. Zhu, and F. Pasqualetti. Cross-Layer Codesign for Secure Cyber-Physical Systems. *IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems*, 35(5):699–711, 2016.
10. S. Amini, F. Pasqualetti, and H. Mohsenian-Rad. Dynamic Load Altering Attacks Against Power System Stability: Attack Models and Protection Designs. *IEEE Transactions on Smart Grid*:1–5, 2015.
11. D. Borra, F. Pasqualetti, and F. Bullo. Continuous Graph Partitioning for Camera Network Surveillance. *Automatica*, 52(1):227–231, 2015.
12. S. Gu, F. Pasqualetti, M. Cieslak, Q. K. Telesford, B. Y. Alfred, A. E. Kahn, J. D. Medaglia, J. M. Vettel, M. B. Miller, S. T. Grafton, and D. S. Bassett. Controllability of structural brain networks. *Nature Communications*, 6, 2015.
13. F. Pasqualetti, F. Dörfler, and F. Bullo. Control-Theoretic Methods for Cyberphysical Security: Geometric Principles for Optimal Cross-Layer Resilient Control Systems. *IEEE Control Systems Magazine*, 35(1):110–127, 2015.
14. F. Pasqualetti and Q. Zhu. Design and Operation of Secure Cyber-Physical Systems. *Embedded Systems Letters*, 7(1):3–6, 2015.
15. F. Pasqualetti, D. Borra, and F. Bullo. Consensus Networks over Finite Fields. *Automatica*, 50(2), Feb. 2014.
16. F. Pasqualetti, S. Zampieri, and F. Bullo. Controllability Metrics, Limitations and Algorithms for Complex Networks. *IEEE Transactions on Control of Network Systems*, 1(1):40–52, 2014, (2016 TCNS Outstanding Paper Award).
17. F. Pasqualetti, F. Zanella, J. R. Peters, M. Spindler, R. Carli, and F. Bullo. Camera Network Coordination for Intruder Detection. *IEEE Transactions on Control Systems Technology*, 22(5):1169–1683, 2014.
18. F. Dörfler, F. Pasqualetti, and F. Bullo. Continuous-Time Distributed Observers with Discrete Communication. *IEEE Journal of Selected Topics in Signal Processing*, 7(2):296–304, 2013.
19. F. Pasqualetti, F. Dörfler, and F. Bullo. Attack Detection and Identification in Cyber-Physical Systems. *IEEE Transactions on Automatic Control*, 58(11):2715–2729, 2013.
20. V. Srivastava, F. Pasqualetti, and F. Bullo. Stochastic Surveillance Strategies for Spatial Quickest Detection. *International Journal of Robotics Research*, 32(12):1438–1458, 2013.
21. F. Pasqualetti, R. Carli, and F. Bullo. Distributed Estimation via Iterative Projections with Application to Power Network Monitoring. *Automatica*, 48(5):747–758, 2012.
22. F. Pasqualetti, J. W. Durham, and F. Bullo. Cooperative Patrolling via Weighted Tours: Performance Analysis and Distributed Algorithms. *IEEE Transactions on Robotics*, 28(5):1181–1188, 2012.
23. F. Pasqualetti, A. Franchi, and F. Bullo. On Cooperative Patrolling: Optimal Trajectories, Complexity Analysis and Approximation Algorithms. *IEEE Transactions on Robotics*, 28(3):592–606, 2012.
24. F. Pasqualetti, A. Bicchi, and F. Bullo. Consensus Computation in Unreliable Networks: A System Theoretic Approach. *IEEE Transactions on Automatic Control*, 56(12), 2011.

### Conference Articles Under Review

1. S. Phillips, A. Duz, F. Pasqualetti, and R. G. Sanfelice. Recurrent Attacks in Cloud-Connected Cyber-Physical Systems: Hybrid-Control Framework for Modeling and Detection. In: *IEEE Conf. on Decision and Control*, Melbourne, Australia, 2017, Submitted.
2. L. Tiberi, C. Favaretto, M. Innocenti, and F. Pasqualetti. Synchronization Patterns in Networks of Kuramoto Oscillators: A Geometric Approach for Analysis and Control. In: *IEEE Conf. on Decision and Control*, Melbourne, Australia, 2017, Submitted.

### Conference Articles

1. C. Favaretto, D. S. Bassett, A. Cenedese, and F. Pasqualetti. Bode meets Kuramoto: Synchronized clusters in oscillatory networks. In: *American Control Conference*, Seattle, WA, pp. 2378–5861, May 2017.
2. A. Ganlath, R. Anguluri, V. Katewa, and F. Pasqualetti. Secure Reference-Tracking with Resource-Constrained UAVs. In: *Conference on Control Technology and Applications*, Kohala Coast, Hawaii, USA, 2017, Submitted.
3. S. Zhao and F. Pasqualetti. Discrete-Time Dynamical Networks with Diagonal Controllability Gramian. In: *IFAC World Congress*, Toulouse, France, 2017, To appear.
4. R. Anguluri, R. Dhal, S. Roy, and F. Pasqualetti. Network Invariants for Optimal Input Detection. In: *IEEE American Control Conference*, Boston, MA, USA, pp. 3776–3781, July 2016.
5. R. Anguluri, V. Gupta, and F. Pasqualetti. Periodic Coordinated Attacks Against Cyber-Physical Systems: Detectability and Performance Bounds. In: *IEEE Conference on Decision and Control*, Las Vegas, pp. 5079–5084, Dec. 2016.
6. G. Bianchin, P. Frasca, A. Gasparri, and F. Pasqualetti. The Observability Radius of Network Systems. In: *IEEE American Control Conference*, Boston, MA, USA, pp. 185–190, July 2016.
7. A. Gasparri, F. Pasqualetti, R. Santini, and S. Panzieri. Network Composition for Optimal Disturbance Rejection. In: *American Control Conference*, Boston, MA, USA, pp. 3764–3769, July 2016.
8. Y. Zhao, F. Pasqualetti, and J. Cortés. Scheduling of Control Nodes for Improved Network Controllability. In: *IEEE Conference on Decision and Control*, Las Vegas, NV, USA, pp. 1859–1864, Dec. 2016.
9. S. Amini, H. Mohsenian-Rad, and F. Pasqualetti. Dynamic Load Altering Attacks in Smart Grid. In: *IEEE PES Conf. on Innovative Smart Grid Technologies (ISGT)*, Washington, DC, Feb. 2015, To appear.
10. Cheng-Zong Bai, F. Pasqualetti, and V. Gupta. Security in stochastic control systems: Fundamental limitations and performance bounds. In: *American Control Conference*, Chicago, IL, pp. 195–200, July 2015, (**Best Student Paper Award Finalist**).
11. G. Bianchin, F. Pasqualetti, and S. Zampieri. The Role of Diameter in the Controllability of Complex Networks. In: *IEEE Conference on Decision and Control*, Osaka, Japan, pp. 980–985, 2015.
12. F. Pasqualetti, F. Dörfler, and F. Bullo. A Divide-and-Conquer Approach to Distributed Attack Identification. In: *IEEE Conference on Decision and Control*, Osaka, Japan, pp. 5801–5807, 2015.
13. F. Pasqualetti and S. Zampieri. On the Controllability of Isotropic and Anisotropic Networks. In: *IEEE Conf. on Decision and Control*, Los Angeles, CA, USA, pp. 607–612, Dec. 2014.
14. F. Pasqualetti, S. Zampieri, and F. Bullo. Controllability metrics and algorithms for complex networks. In: *American Control Conference*, Portland, OR, USA, June 2014.
15. F. Pasqualetti, D. Borra, and F. Bullo. Finite-Field Consensus. In: *IEEE Conf. on Decision and Control*, Florence, Italy, pp. 2629–2634, Dec. 2013.
16. D. Borra, F. Pasqualetti, and F. Bullo. Continuous graph partitioning for camera network surveillance. In: *IFAC Workshop on Distributed Estimation and Control in Networked Systems*, Santa Barbara, CA, USA, pp. 228–233, Sept. 2012.

17. F. Pasqualetti, F. Dörfler, and F. Bullo. Cyber-physical security via geometric control: Distributed monitoring and malicious attacks. In: *IEEE Conf. on Decision and Control*, Maui, HI, USA, pp. 3418–3425, Dec. 2012.
18. M. Spindler, F. Pasqualetti, and F. Bullo. Distributed multi-camera synchronization for smart-intruder detection. In: *American Control Conference*, Montreal, Canada, June 2012, Submitted.
19. F. Zanella, F. Pasqualetti, R. Carli, and F. Bullo. Simultaneous boundary partitioning and cameras synchronization for optimal video surveillance. In: *IFAC Workshop on Distributed Estimation and Control in Networked Systems*, Santa Barbara, CA, USA, pp. 1–6, Sept. 2012.
20. F. Dörfler, F. Pasqualetti, and F. Bullo. Distributed detection of cyber-physical attacks in power networks: A waveform relaxation approach. In: *Allerton Conf. on Communications, Control and Computing*, Sept. 2011.
21. F. Pasqualetti, A. Bicchi, and F. Bullo. A graph-theoretical characterization of power network vulnerabilities. In: *American Control Conference*, San Francisco, CA, USA, pp. 3918–3923, June 2011.
22. F. Pasqualetti, R. Carli, and F. Bullo. A distributed method for state estimation and false data detection in power networks. In: *IEEE International Conference on Smart Grid Communications*, Brussels, Belgium, Oct. 2011.
23. F. Pasqualetti, F. Dörfler, and F. Bullo. Cyber-physical attacks in power networks: Models, fundamental limitations and monitor design. In: *IEEE Conference on Decision and Control and European Control Conference*, Orlando, FL, USA, Dec. 2011.
24. F. Pasqualetti, R. Carli, A. Bicchi, and F. Bullo. Distributed estimation and detection under local information. In: *IFAC Workshop on Distributed Estimation and Control in Networked Systems*, Nancy, France, pp. 263–268, Sept. 2010.
25. F. Pasqualetti, R. Carli, A. Bicchi, and F. Bullo. Identifying cyber attacks under local model information. In: *IEEE Conference on Decision and Control*, Atlanta, GA, USA, pp. 5961–5966, Dec. 2010.
26. F. Pasqualetti, A. Franchi, and F. Bullo. On optimal cooperative patrolling. In: *IEEE Conference on Decision and Control*, Atlanta, GA, USA, pp. 7153–7158, Dec. 2010.
27. F. Pasqualetti, A. Bicchi, and F. Bullo. On the security of linear consensus networks. In: *IEEE Conference on Decision and Control and Chinese Control Conference*, Shanghai, China, pp. 4894–4901, Dec. 2009.
28. F. Pasqualetti, S. Martini, and A. Bicchi. Steering a Leader-Follower Team Via Linear Consensus. In: *Hybrid Systems: Computation and Control*, pp. 642–645, Apr. 2008.
29. F. Pasqualetti, A. Bicchi, and F. Bullo. Distributed intrusion detection for secure consensus computations. In: *IEEE Conference on Decision and Control*, New Orleans, LA, USA, pp. 5594–5599, Dec. 2007.