

Fabio Pasqualetti

Curriculum Vitae

September 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.

Sponsored Projects

“Design and Operation of Secure Multi-Agent Networks”, ARO YIP, PI, 09/22/17 - 09/21/20.

“Secure Algorithms for Cloud-Connected Autonomous Robots Interacting with Humans”, CITRIS, PI, 7/1/16 - 6/30/17.

“Securing the Timing of Cyber-Physical Systems”, NSF, co-PI, 9/1/16 - 8/31/19.

“A Mechanistic Model of Cognitive Control”, NSF, co-PI, 9/1/16 - 8/31/19.

“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.

Honors and Awards

Sep 2017	ARO Young Investigator Program Award For the proposal "Design and Operation of Secure Multi-Agent Networks"
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

Advising

Current Graduate Students

Rajasekhar Anguluri	Ph.D. student, Mechanical Engineering, UCR Mentoring: Advisor and Chair of Doctoral Committee, Sep 14 - present
Gianluca Bianchin	Ph.D. student, Mechanical Engineering, UCR Mentoring: Advisor and Chair of Doctoral Committee, Sep 15 - present
Akila Ganlath	Ph.D. student, Mechanical Engineering, UCR Mentoring: Advisor and Chair of Doctoral Committee, Sep 16 - present
Tommaso Menara	Ph.D. student, Mechanical Engineering, UCR Mentoring: Advisor and Chair of Doctoral Committee, Sep 16 - present

Former Graduate Students

Yin-Chen Liu	M.S. student, Mechanical Engineering, UCR Mentoring: Advisor and Chair of Doctoral Committee, Sep 15 - present
John Tran	M.S., Mechanical Engineering, UCR Mentoring: Advisor and Chair of M.S. Committee, Sep 13 - Jun 14
Mikalie Lai	M.S., Bioengineering, UCR Mentoring: Advisor and Chair of M.S. Committee, Sep 13 - Dec 15

Current Postdocs

Vaibhav Katewa

Former Postdocs

Shiyu Zhao; Sofia Karamintziou

Teaching Activities

Instructor

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

Professional Service and Affiliations

Invited Sessions, Workshops, and Tutorials Organized

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

Editorial board and program committee

IEEE American Control Conference, 2018
 IEEE Conference on Decision and Control, 2017
 IEEE Consumer Communications & Networking Conference, 2017
 Cyber-Physical Security Education Workshop, 2017

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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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

Selected Invited Talks

Aug. 2017	ICTALS2017: Designing the next generation of closed loop seizure control, University of Minnesota, Minneapolis
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. 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.
3. E. Nozari, F. Pasqualetti, and J. Cortés. Time-Varying Actuator Scheduling in Complex Networks. *IEEE Transactions on Control of Network Systems*, 2017, Submitted.

4. 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.
5. 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. S. Gu, R. F. Betzel, M. G. Mattar, M. Cieslak, P. R. Delio, S. T. Grafton, F. Pasqualetti, and D. S. Bassett. Optimal trajectories of brain state transitions. *NeuroImage*, **148**:305–317, Mar. 2017.
4. V. Katewa, F. Pasqualetti, and V. Gupta. On Privacy vs Cooperation in Multi-agent Systems. *International Journal of Control*:1–15, 2017.
5. J. Kim, J. M. Soffer, A. E. Kahn, J. M. Vettel, F. Pasqualetti, and D. S. Bassett. Control in Dynamical Networks: Role of Graph Architecture and Applications to Neural Systems. *Nature Physics*, 2017, To appear.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. D. Borra, F. Pasqualetti, and F. Bullo. Continuous Graph Partitioning for Camera Network Surveillance. *Automatica*, **52**(1):227–231, 2015.
14. 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.
15. 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.
16. F. Pasqualetti and Q. Zhu. Design and Operation of Secure Cyber-Physical Systems. *Embedded Systems Letters*, **7**(1):3–6, 2015.
17. F. Pasqualetti, D. Borra, and F. Bullo. Consensus Networks over Finite Fields. *Automatica*, **50**(2), Feb. 2014.
18. 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.

19. 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.
20. 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.
21. 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.
22. V. Srivastava, F. Pasqualetti, and F. Bullo. Stochastic Surveillance Strategies for Spatial Quickest Detection. *International Journal of Robotics Research*, 32(12):1438–1458, 2013.
23. F. Pasqualetti, R. Carli, and F. Bullo. Distributed Estimation via Iterative Projections with Application to Power Network Monitoring. *Automatica*, 48(5):747–758, 2012.
24. 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.
25. 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.
26. 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. A. Duz, S. Phillips, A. Fagiolini, R. G. Sanfelice, and F. Pasqualetti. Stealthy Attacks in Cloud-Connected (Linear-Impulsive) Systems. In: *American Control Conference*, Milwaukee, WI, USA, June 2018, Submitted.
2. T. Menara, V. Katewa, D. S. Bassett, and F. Pasqualetti. The Structured Controllability Radius of Symmetric (Brain) Networks. In: *American Control Conference*, Milwaukee, WI, USA, June 2018, Submitted.
3. F. Pasqualetti, C. Favaretto, S. Zhao, and S. Zampieri. Fragility and Controllability Tradeoff in Complex Networks. In: *American Control Conference*, Milwaukee, WI, USA, June 2018, Submitted.

Conference Articles

1. C. Favaretto, D. S. Bassett, A. Cenedese, and F. Pasqualetti. Bode meets Kuramoto: Synchronized Clusters in Oscillatory Networks. In: *IEEE American Control Conference*, Seattle, WA, USA, pp. 2799–2804, May 2017.
2. C. Favaretto, A. Cenedese, and F. Pasqualetti. Cluster Synchronization in Networks of Kuramoto Oscillators. In: *IFAC World Congress*, 2017, To Appear.
3. 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, To appear.
4. T. Menara, G. Bianchin, M. Innocenti, and F. Pasqualetti. On the Number of Strongly Structurally Controllable Networks. In: *IEEE American Control Conference*, Seattle, WA, USA, pp. 340–345, 2017.
5. E. Nozari, F. Pasqualetti, and J. Cortés. Time-Varying Actuator Scheduling in Complex Networks. In: *IEEE American Control Conference*, Seattle, WA, USA, pp. 4995–5000, May 2017.
6. 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, To appear.
7. S. Zhao and F. Pasqualetti. Discrete-Time Dynamical Networks with Diagonal Controllability Gramian. In: *IFAC World Congress*, Toulouse, France, 2017, To appear.
8. 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.

9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. F. Pasqualetti, S. Zampieri, and F. Bullo. Controllability metrics and algorithms for complex networks. In: *American Control Conference*, Portland, OR, USA, June 2014.
19. F. Pasqualetti, D. Borra, and F. Bullo. Finite-Field Consensus. In: *IEEE Conf. on Decision and Control*, Florence, Italy, pp. 2629–2634, Dec. 2013.
20. 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.
21. 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.
22. M. Spindler, F. Pasqualetti, and F. Bullo. Distributed multi-camera synchronization for smart-intruder detection. In: *American Control Conference*, Montreal, Canada, June 2012, Submitted.
23. 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.
24. 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.
25. 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.
26. 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.
27. 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.

28. 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*, Annecy, France, pp. 263–268, Sept. 2010.
29. 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.
30. 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.
31. 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.
32. 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.
33. 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.