Gianluca Bianchin

Postdoctoral Scholar
Department of Electrical, Computer, and Energy Eng.
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Current Position

Apr 20 - Present **Postdoctoral Scholar**, University of Colorado Boulder, USA
Advisor: Prof. Emiliano Dall'Anese

Education

Sep 15 - Mar 20 **Ph.D. in Mechanical Engineering**, University of California Riverside, USA
Dissertation: Control-Theoretic Methods for the Robustness of Network Systems: Application to Traffic Control and Cyber-Physical Security
Advisor: Prof. Fabio Pasqualetti

Oct 12 - Oct 14 **M.Sc. in Controls Engineering**, University of Padova, Italy
Thesis: Coordinated Control of Mixed Robot and Sensor Networks for Distributed Area Exploration
Advisor: Prof. Angelo Cenedese
Degree awarded Summa Cum Laude

Oct 09 - Jul 12 **B.Sc. in Information Engineering**, University of Padova, Italy
Thesis: Modeling and Optimization of Hybrid Vehicle Powertrains
Advisor: Prof. Luca Schenato

Research Interests

My research interests are in the modeling, analysis, and control of large-scale interconnected systems, with a focus on transportation networks. My research objectives articulate in two main directions: (i) robustness analysis, security, and control of cyber-physical systems, and (ii) adaptive and data-driven optimization for dynamical systems.

Research Experience

Sep 15 - Mar 20 **Graduate Student Researcher**, University of California Riverside, USA
Group: Cyber-Physical Systems and Distributed Computing Laboratory
Supervisor: Prof. Fabio Pasqualetti

Jun 19 - Sep 19 **Research Intern**, Robert Bosch LLC, Sunnyvale, USA
Development and implementation of dynamical models for PEM fuel cells
Supervisor: Dr. Maksim Subbotin

Jun 18 - Sep 18 **Graduate Student Intern**, Pacific Northwest National Laboratory, Richland, WA, USA
Group: Optimization and Controls
Project: Control of Complex Systems Initiative (CCSI)
Supervisor: Dr. Soumya Kundu

Jan 15 - Sep 15 **Visiting Scholar**, University of California Riverside, USA
Group: Cyber-Physical Systems and Distributed Computing Laboratory
Supervisor: Prof. Fabio Pasqualetti

Jan 14 - Oct 14 **Graduate Student Researcher**, University of Padova, Italy
Group: NAVLAB – Laboratory for Autonomous Navigation
Supervisor: Prof. Angelo Cenedese

Publications

Journal Articles (Under Review)

[R1] **G. Bianchin**, J. Cortés, J. Poveda, and E. Dall'Anese, "Time-varying optimization of LTI systems via projected primal-dual gradient flows," *IEEE Transactions on Control of Network Systems*, Jan. 2021, *arXiv:2101.01799*, (Under Review)

[R2] **G. Bianchin**, J. Poveda, and E. Dall'Anese, "Online optimization of switched LTI systems using continuous-time and hybrid accelerated gradient flows," *Automatica*, 2020, *arXiv:2008.03903*, (Under Review)

[R3] **G. Bianchin** and F. Pasqualetti, "Routing apps may deteriorate stability in traffic networks: Oscillating congestions and robust information design," *IEEE Transactions on Automatic Control*, 2020, *arXiv:2003.10018*, (Under Review)

Journal Articles (Published)

[J1] F. Galarza-Jimenez, J. Poveda, **G. Bianchin**, and E. Dall'Anese, "On the stability properties of extremum seeking dynamics under persistent gradient deception: A switching systems approach," *IEEE Control Systems Letters*, 2021, (In press)

[J2] Y.-C. Liu, **G. Bianchin**, and F. Pasqualetti, "Secure trajectory planning against undetectable spoofing attacks," *Automatica*, vol. 112, p. 108655, 2020

[J3] **G. Bianchin**, Y.-C. Liu, and F. Pasqualetti, "Secure navigation of robots in adversarial environments," *IEEE Control Systems Letters*, vol. 4, no. 1, pp. 1–6, 2020

[J4] **G. Bianchin** and F. Pasqualetti, "Gramian-based optimization for the analysis and control of traffic networks," *IEEE Transactions on Intelligent Transportation Systems*, vol. 21, no. 7, pp. 3013–3024, 2020

[J5] **G. Bianchin**, P. Frasca, A. Gasparri, and F. Pasqualetti, "The observability radius of networks," *IEEE Transactions on Automatic Control*, vol. 62, no. 6, pp. 3006–3013, 2017

Peer-reviewed Conference Articles

[C1] **G. Bianchin** and F. Pasqualetti, "Routing apps may cause oscillatory congestions in traffic networks," in *IEEE Conf. on Decision and Control*, Jeju Island, Republic of Korea, Dec. 2020, (To appear)

[C2] **G. Bianchin**, F. Pasqualetti, and S. Kundu, "Resilience of traffic networks with partially controlled routing," in *American Control Conference*, Philadelphia, PA, USA, Jul. 2019, pp. 2670–2675

[C3] **G. Bianchin** and F. Pasqualetti, "A network optimization framework for the analysis and control of traffic dynamics and intersection signaling," in *IEEE Conf. on Decision and Control*, Miami, FL, USA, Dec. 2018, pp. 1017–1022

[C4] T. Menara, **G. Bianchin**, M. Innocenti, and F. Pasqualetti, "On the number of strongly structurally controllable networks," in *American Control Conference*, Seattle, WA, USA, May 2017, pp. 340–345

[C5] **G. Bianchin**, P. Frasca, A. Gasparri, and F. Pasqualetti, "The observability radius of network systems," in *American Control Conference*, Boston, MA, USA, Jul. 2016, pp. 185–190

[C6] **G. Bianchin**, F. Pasqualetti, and S. Zampieri, "The role of diameter in the controllability of complex networks," in *IEEE Conf. on Decision and Control*, Osaka, Japan, Dec. 2015, pp. 980–985

[C7] **G. Bianchin**, A. Cenedese, M. Luvisotto, and G. Michieletto, "Distributed fault detection in sensor networks via clustering and consensus," in *IEEE Conf. on Decision and Control*, Osaka, Japan, Dec. 2015, pp. 3828–3833

Book Chapters and Code Releases

[M1] **G. Bianchin** and F. Pasqualetti, "Time-delay attacks in network systems," in *Cyber-Physical Systems Security*. Springer International Publishing, 2018, pp. 157–174

[M2] **G. Bianchin** and F. Pasqualetti, "SUMO toolbox for Gramian-based optimization," `https://github.com/gianlucaBi/Gramian-Based-Traffic-Optimization`, 2018, [Online; accessed 23-October-2020]

Theses

[T1] **G. Bianchin**, "Control-theoretic methods for the robustness of network systems: Application to traffic control and cyber-physical security," Ph.D. dissertation, University of California Riverside, 2020

[T2] **G. Bianchin**, "Coordinated control of mixed robot and sensor networks in distributed area exploration," Master's thesis, University of Padova, 2014

Honors & Awards

2019	**Dissertation Year Program Award**, University of California Riverside, USA (for outstanding research accomplishments in the area of mechanical engineering)
2017	**UC Riverside Green Grant** (G^3), University of California Riverside, USA (one of three campus-wide awards)
2015	**Dean's Distinguished Fellowship Award**, University of California Riverside, USA
2014	M.Sc. degree awarded with honor from the University of Padova

Proposal Writing Experience

I contributed to the writing of the following proposals:

2020	Closed-loop Online Optimization of Dynamical Systems under Information Streams Funding Agency: National Science Foundation (NSF) PI: Emiliano Dall'Anese, co-PI: Jorge Cortés
2020	Control-Theoretic Design of Data-Driven Policies for Containing Transmission of Infectious Diseases Funding Agency: AB Nexus, University of Colorado PI: Emiliano Dall'Anese, co-PIs: Andrea Buchwald, Jorge I. Poveda
2019	Leveraging Connected Automated Vehicles to Guide Human Behavior in Congestion Funding Agency: United States Department of Energy (DOE) PI: Fabio Pasqualetti, co-PIs: Guoyuan Wu, Soumya Kundu

Teaching Experience

Lecturer at University of Colorado Boulder:

Fall 2020	ECEN 5008 – Coordinated Control of Multi-Agent Systems (graduate class)

Teaching Assistant at University of California Riverside:

Spring 19	ME 223 – Secure and Reliable Control Systems (graduate class)
Winter 18	ME 133 – Mechatronics (undergraduate class)
Spring 17	ME 223 – Secure and Reliable Control Systems (graduate class)

Lecturer at GradQuant Center, University of California Riverside:

2018	Course: Data Processing in Matlab
2017	Course: Introduction to LaTeX

Student Mentoring Experience

2017	Yin-Cen Liu, University of California Riverside, USA Project: RSSI-Aided Trajectory Planning Against GNSS Spoofing
2016	Tommaso Menara, University of California Riverside, USA Project: Strong Structural Controllability: Sparsity Conditions and Control Paths

Professional Affiliations

2015 - Present	Institute for Electrical and Electronics Engineers (IEEE)
	IEEE Control Systems Society (IEEE CSS)
	Society for Industrial and Applied Mathematics (SIAM)

Talks, Seminars, and Presentations

Dec 2020	2020 IEEE Conference on Decision and Control, Jeju Island, Republic of Korea Title: *" Routing Apps May Cause Oscillatory Congestions in Traffic Networks"*
May 2020	Seminar, National Renewable Energy Laboratory (NREL) Title: *"Stability and Robustness of Traffic Networks with App-Informed Vehicle Routing"*
Dec 2019	2019 IEEE Conference on Decision and Control, Nice, France Title: *"Secure Navigation of Robots in Adversarial Environments"*

Sep 2019	GE Global Research, Niskayuna, NY, USA Title: *"Towards Dependable CPS: Network-Wide Optimization and Secure Control"*
Sep 2019	Battery Systems Group, Robert Bosch LLC, Sunnyvale, CA, USA Title: *"PEM Fuel Cell Modeling and State Observers: A Control-Systems Perspective"*
Jul 2019	American Control Conference, Philadelphia, PA, USA Title: *"Resilience of Traffic Networks With Partially Controlled Routing"*
Dec 2018	2018 IEEE Conference on Decision and Control, Miami Beach, FL, USA Title: *"A Network Optimization Framework for the Control of Traffic Dynamics and Intersection Signaling"*
Sep 2018	Optimization and Controls Group, Pacific Northwest National Laboratory Title: *"The Role of Partially Controlling Routing in Traffic Networks"*
May 2018	35$^{\text{th}}$ Southern California Control Workshop, University of California, Riverside Title: *"A Network Optimization Approach for the Optimization of Intersection Signaling"*
Jul 2016	American Control Conference, Boston, MA, USA Title: *"The Observability Radius of Networks"*
May 2015	28$^{\text{th}}$ Southern California Control Workshop, University of California, Los Angeles Title: *"The Role of the Diameter in the Controllability of Complex Networks"*

Professional Service

Technical Reviewer:

Journals:	IEEE Transactions on Automatic Control Automatica IEEE Transactions on Control of Network Systems IEEE Control Systems Letters IEEE Transactions on Control Systems Technology Systems & Control Letters SIAM Journal on Control and Optimization IEEE Transactions on Intelligent Transportation Systems Journal of Urban Technology IEEE Robotics and Automation Letters Journal of Selected Topics in Signal Processing IEEE Transactions on Smart Grid
Conferences:	IEEE Conference on Decision and Control American Control Conference European Control Conference IFAC World Congress IFAC Workshop on Distrib. Estimation and Control in Netw. Systems Conference on Automation Science and Engineering

Volunteering Activities:

2018	Co-organizer of the Mechanical Engineering Department Graduate Symposium
2017 - 2018	Vice President of the Mechanical Eng. Graduate Student Association, UC Riverside
2016	Volunteer, IEEE Conference on Decision and Control, Las Vegas, NV, USA

Conferences, Workshops, and Summer Schools Participation

Aug 2020	Autonomous Energy Systems Workshop, NREL
Jan 2020	37$^{\text{th}}$ Southern California Control Workshop, UC San Diego
May 2019	36$^{\text{th}}$ Southern California Control Workshop, University of Southern California
May 2018	35$^{\text{th}}$ Southern California Control Workshop, UC Riverside
Oct 2017	33$^{\text{rd}}$ Southern California Control Workshop, UC Santa Barbara
Oct 2016	31$^{\text{st}}$ Southern California Control Workshop, UC Irvine
Jul 2015	Games and Contracts for Cyber-Physical Security, Summer School, IPAM, UCLA
Jun 2015	Trustworthy Cyber Infrastructure for the Power Grid, Summer School, UIUC