Gianluca Bianchin

Postdoctoral Scholar
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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-Sensor Networks for Distributed 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, control, and online optimization of large-scale interconnected systems, with an application focus to transportation systems. My research objectives articulate in two main directions: (i) to design data-driven controllers for dynamical systems that are inspired from optimization algorithms, and (ii) to devise cyber-physical systems that can operate in a robust and secure fashion despite unmodeled disturbances or malicious attacks.

Research Experience

Apr 20 - Present **Post-Doctoral Researcher**, University of Colorado Boulder, USA
Supervisor: Prof. Emiliano Dall'Anese

Sep 15 - Mar 20 **Graduate Student Researcher**, University of California Riverside, USA
Supervisor: Prof. Fabio Pasqualetti

Jun 19 - Sep 19 **Research Intern**, Robert Bosch LLC, Sunnyvale, USA
Project: 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
Project: Study and characterization of network resilience in traffic systems
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/In Preparation)

[R1] **G. Bianchin**, M. Vaquero, J. Cortés, and E. Dall'Anese, "Data-driven synthesis of stochastic online optimization controllers for unknown linear systems," *IEEE Transactions on Automatic Control*, Aug. 2021, (Submitted)

[R2] K. Wood, **G. Bianchin**, and E. Dall'Anese, "Online projected gradient descent for stochastic optimization with decision-dependent distributions," *IEEE Control Systems Letters*, Jul. 2021, arXiv:2107.09721, (Submitted)

[R3] **G. Bianchin**, E. Dall'Anese, J. I. Poveda, and A. Buchwald, "Planning a return to normal after the COVID-19 pandemic: Identifying safe contact levels via online optimization," *Scientific Reports*, 2021, medRxiv:2021.04.20.21255350, (Submitted)

[R4] **G. Bianchin**, J. Cortés, J. I. Poveda, and E. Dall'Anese, "Time-varying optimization of LTI systems via projected primal-dual gradient flows," *IEEE Transactions on Control of Network Systems*, 2021, arXiv:2101.01799, (Accepted)

[R5] F. Galarza-Jimenez, **G. Bianchin**, J. I. Poveda, and E. Dall'Anese, "Online optimization of LTI systems under persistent attacks: Stability, tracking, and robustness," *Nonlinear Analysis: Hybrid Systems*, 2021, arXiv:2102.09356, (Accepted)

[R6] **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)

[R7] **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**, M. Vaquero, J. Cortés, and E. Dall'Anese, "Data-driven synthesis of optimization-based controllers for regulation of unknown linear systems," in *IEEE Conf. on Decision and Control*, Austin, TX, Dec. 2021, arXiv:2103.16067, (Accepted)

[C2] **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, pp. 253–260

[C3] **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

[C4] **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

[C5] 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

[C6] **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

[C7] **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

[C8] **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-Oct-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

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 G. Buchwald, Jorge I. Poveda
2019	Leveraging Connected Automated Vehicles to Guide Humans in Traffic Congestion Funding Agency: United States Department of Energy (DOE) PI: Fabio Pasqualetti, co-PIs: Guoyuan Wu, Soumya Kundu

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

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

2021	Killian Wood, University of Colorado Boulder, USA Project: Stochastic optimization with decision-dependent distributions
2020	Felipe Galarza-Jimenez, University of Colorado Boulder, USA Project: Hybrid methods in online optimization
2017	Yin-Cen Liu, University of California Riverside, USA Project: RSSI-Aided Trajectory Planning Against GPS Spoofing
2016	Tommaso Menara, University of California Riverside, USA Project: Strong Structural Controllability: Sparsity Conditions and Control Paths

Talks, Seminars, and Presentations

Apr 2021	Colorado COVID-19 Modeling Group, University of Colorado Title: *"When can we safely return to normal? A novel method for identifying safe levels of NPIs in the context of COVID-19 vaccinations"*
Apr 2021	Seminar, GIPSA-lab, CNRS, Grenoble Title: *"Analysis and Design of Robust Traffic Networks: from Static to Dynamic Schemes"*
Dec 2020	2020 IEEE Conference on Decision and Control, Jeju Island, Republic of Korea Title: *"Routing Apps May Cause Oscillatory Congestion 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	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"*
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	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 Affiliations

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

Professional Service

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

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

Conferences, Workshops, and Summer Schools Participation

Aug 2020	Autonomous Energy Systems Workshop, NREL
Jan 2020	37^{th} Southern California Control Workshop, UC San Diego
May 2019	36^{th} Southern California Control Workshop, University of Southern California
Aug 2018	Workshop on Control of Complex Systems, Pacific Northwest National Laboratory
May 2018	35^{th} Southern California Control Workshop, UC Riverside
Oct 2017	33^{rd} Southern California Control Workshop, UC Santa Barbara
Oct 2016	31^{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