Gian Carlo Maffettone

Contact information
Scuola Superiore Meridionale
Largo san Marcellino 10, Naples, Italy, 80132
giancarlo.maffettone@unina.it
gc.maffettone@ssmeridionale.it
giancarlo.maffettone96@gmail.com

CURRENT POSITION

Postdoctoral Fellow 2025–present
Scuola Superiore Meridionale, Modeling and Engineering Risk and Complexity (MERC) Naples, Italy

EDUCATION

Ph.D. in Modeling and Engineering Risk and Complexity 2020–2024
Scuola Superiore Meridionale, Modeling and Engineering Risk and Complexity (MERC) Naples, Italy
Final grade: Excellent with honors (grading system: fair/good/excellent)
Advisors: prof. Mario di Bernardo, prof. Maurizio Porfiri
Thesis title: *Controlling the collective dynamics of large-scale multi-agent systems*

Master of Science in Automation Engineering 2018–2020
University of Naples Federico II Naples, Italy
Final grade: 110/110 summa cum laude
Advisors: prof. Mario di Bernardo, Dr. Davide Fire
Thesis title: *Analysis and Control of Pattern Formation in Large Scale Multi-agent Systems*

Bachelor of Science in Automation Engineering 2015–2018
University of Naples Federico II Naples, Italy
Final grade: 110/110 summa cum laude
Advisors: prof. Alberto Finzi
Thesis title: *RRT based multi-robot path-planning*

RESEARCH INTERESTS

Complex systems, Dynamical Systems, Control Theory, Network Theory, Data Science, Robotics, Fluid and Solid Mechanics

ACADEMIC EXPERIENCES

Visiting Ph.D. student May 2024 – July 2024
New York University, Center for Urban Science and Progress March 2023 – July 2023
Dynamical Systems Laboratory April 2022 – July 2022
Supervisor: prof. Maurizio Porfiri New York, NY, USA

Erasmus Master student January 2020 – June 2020
Royal Institute of Technology (Kungliga Tekniska högskolan – KTH) Stockholm, Sweden

Volunteer staff member July 2019
European Control Conference 2019 (ECC19) Naples, Italy

High-school summer intern June 2014 – August 2014
Stanford University, Fuller Research Group Palo Alto, CA, USA
Subject: Experiments on miscible liquid drops
Supervisors: Prof. Gerald Fuller, Dr. Daniel Walls

TEACHING EXPERIENCE

- **Fall 2021**, **Fall 2022**, **Fall 2023, Fall 2024, Fall 2025**: teaching assistant for the *Nonlinear Dynamics and Control* course offered by the M.Sc. program in Automation Engineering and Robotics at University of Naples Federico II, Naples, Italy.
  Supervisor: prof. Mario di Bernardo

- **Fall 2022**: teaching assistant for the *Mathematics and Data Modeling* course offered by the B.Sc. in Engineering at the Scuola Superiore Meridionale, Naples, Italy
  Supervisor: prof. Mario di Bernardo

- **Fall 2025**: *Mathematics and Data Modeling* course offered by the B.Sc. in Engineering at the Scuola Superiore Meridionale, Naples, Italy

HONORS, AWARDS

- Best Ph.D. thesis in automatic control from an Italian institution — September 2025
  premio SIDRA — Perugia, Italy

- Student travel grant for the 2023 American Control Conference — June 2023
  Awarded by the organizing committee — San Diego, CA, USA

- First ranked at Mathworks Minidrone Competition — June 2019
  IEEE International Workshop on Metrology for Industry 4.0 and IoT 2019 — Naples, Italy

- Merit scholarship, University of Naples Federico II — 2018
  Scholarship assigned to the best students in B.Sc. courses — Naples, Italy

AFFILIATIONS

Institute of Electrical and Electronics Engineers (IEEE): graduate student member — 2020 – present
Society of Industrial and Applied Mathematics (SIAM): student member — 2023 – present

RELEVANT COURSEWORK

Systems Theory[1], Signals Theory[1], Automatic Control[1], Nonlinear Dynamics and Control[1], Hybrid and Embedded Control Systems[2], Identification and Optimal Control[1], Robotics' Foundations[1], Optimization[1], Stochastic Differential Equations[3], Partial Differential Equations[3], Numerical Treatments of Partial Differential Equations[3], Numerical Methods for Complex Systems[3], Performance-Based Risk Analysis[3], Stochastic Modeling[3], Artificial Intelligence and Multiagent Systems[2]

[1] University of Naples Federico II, Naples, Italy
[2] Royal Institute of Technology (KTH), Stockholm, Sweden
[3] Scuola Superiore Meridionale, Naples, Italy

PUBLICATIONS

Journal Papers

1. **G.C. Maffettone**, Alain Boldini, Mario di Bernardo, Maurizio Porfiri, " Bio-inspired density control of multi-agent swarms via leader-follower plasticity", vol. 188, Automatica, 2025, .

2. Beniamino Di Lorenzo, **G.C. Maffettone**, Mario di Bernardo "A continuification-based control solution for large-scale shepherding", European Journal of Control, in press, (also accepted at European Control Conference 2025), 2025, arxiv.

3. Beniamino Di Lorenzo, **G.C. Maffettone**, Mario di Bernardo " Decentralized Continuification Control of Multi-Agent Systems via Distributed Density Estimation", IEEE Control Systems Letters, vol. 9, pp. 1580-1585, 2025.

4. **G.C. Maffettone**, A. Boldini, M. di Bernardo, M. Porfiri, "Leader-Follower Density Control of Spatial Dynamics in Large-Scale Multi-Agent Systems", IEEE Transactions on Automatic Control, in press, 2025.

5. **G.C. Maffettone**, L. Liguori, E. Palermo, M. di Bernardo, M. Porfiri, "Mixed Reality Environment and High-Dimensional Continuification Control For Swarm Robotics", IEEE Transactions on Control Systems Technology, vol. 32, no. 6, pp. 2484-2491.

6. **G.C. Maffettone**, M. Porfiri, M. di Bernardo, "Continuification control of large-scale multiagent systems under limited sensing and structural perturbations", IEEE Control Systems Letters, vol. 7, pp 2425-2430, 2023

7. **G.C. Maffettone**, A. Boldini, M. di Bernardo, M. Porfiri, "Continuification control of large-scale multia-

gent systems in a ring", IEEE Control Systems Letters, vol. 7, pp. 841-846, 2023

8. A. Giusti†, **G.C. Maffettone**†, D. Fiore, M. Coraggio, M. di Bernardo, "Distributed control for geometric pattern formation of large-scale multirobot systems", Frontiers in Robotics and Artificial Intelligence, 2023

Refereed Conference Papers

1. **G.C. Maffettone**, M. di Bernardo, M. Porfiri, "High-dimensional continuification control of large-scale multi-agent systems under limited sensing and perturbations", Accepted for pubblication in the proceedings of, and presentation at, the 63rd Conference on Decision and Control (Milan, December 2024), arxiv.

† authors contributed equally

CONFERENCE TALKS AND OTHER PRESENTATIONS

Talks

1. **G.C. Maffettone***, A.Boldini, M. Porfiri, M. di Bernardo, "Leader-Follower Density Control of Spatial Dynamics in Large-Scale Multi-Agent Systems", 2025 64th Conference on Decision and Control, December, 10 – 12, Rio de Janeiro, Brazil.

2. **G.C. Maffettone***, M. Porfiri, M. di Bernardo, "Controlling the collective dynamics of Large-Scale Multi-Agent Systems", Automatica.it SIDRA annual meeting, September, 3 – 5, Perugia, Italy.

3. **G.C. Maffettone***, A.Boldini, M. Porfiri, M. di Bernardo, "A Continuum Mixture of Leaders and Followers: Enhanced Flexibility and Robustness under Behavioral Plasticity Regimes", 2025 SIAM Conference on Applications of Dynamical Systems, May, 11 – 15, Denver, USA.

4. **G.C. Maffettone***, A.Boldini, M. Porfiri, M. di Bernardo, "Leader-Follower Density Control of Spatial Dynamics in Large-Scale Multi-Agent Systems", 2025 16th Conference on Dynamical Systems applied on Biology and Natural Sciences, January, 20 – 24, Naples, Italy.

5. **G.C. Maffettone***, M. di Bernardo, M. Porfiri, "High-dimensional continuification control of large-scale multi-agent systems under limited sensing and perturbations", 2024 63rd Conference on Decision and Control (CDC24), December 16 – 19, Milan, Italy.

6. **G.C. Maffettone***, M. di Bernardo, IEEE 63rd Conference on Decision and Control Workshop on Control and Optimization in the Probability Space, Controlling large-scale multiagent systems: a continuification-based approach, Milan, December 15, 2024.

7. **G.C. Maffettone***, "Complex systems across scales: a continuos mixture of leaders and followers", Workshop on Crowd Dynamics Modelling at Scuola Superiore Meridionale, April 12, 2024, Naples, Italy.

8. **G.C. Maffettone***, "Control Systems' Design Across Scales: The Leader-Follower Problem", Kickoff meeting for the research project MENTOR (Machine-learning based control of complex multi-agent systems for search and rescue operations in natural disasters) funded by the Italian Government, February 2, 2024, Naples.

9. **G.C. Maffettone***, M. di Bernardo, M. Porfiri, "Continuification control of large-scale multiagent systems under limited sensing and structural perturbations", 2023 62nd Conference on Decision and Control (CDC23), December 13 – 15, Singapore.

10. **G.C. Maffettone***, Mario di Bernardo, Maurizio Porfiri, "Continuification Control of Large-Scale Multi-agent Systems", Italian Regional Conference on Complex Systems (CCS/Italy 23), October 9 – 11, Naples, Italy

11. **G.C. Maffettone***, A. Boldini, M. di Bernardo, M. Porfiri, "Continuification control of large-scale multi-agent systems under limited sensing and structural perturbations", Dynamics Days Europe 2023 (DD23), September 3 – 8, Naples, Italy.

12. **G.C. Maffettone***, A. Boldini, M. di Bernardo, M. Porfiri, "Continuification control of large-scale multi-agent systems in a ring", 2023 American Control Conference (ACC23), May 31 – June 2, San Diego, CA, USA.

13. **G.C. Maffettone***, Alain Boldini, Mario di Bernardo, Maurizio Porfiri, "Continuification-Based Control Control of Large-Scale Multiagent Systems in a Ring", SIAM conference on Applications of Dynamical Systems (SIAM DS23), May 14 – 18, Portland, OR, USA.

* speaker

Posters

1. **G.C. Maffettone**, Mario di Bernardo, "Higher-dimensional continuification control for large-scale multi-agent systems: a mixed reality environment for swarm robotics experiments", Workshop on Modelling, Analysis and Control of Multi-Agent Systems Across Scales, January 22 – 26, 2024, Scuola Superiore Normale, Pisa, Italy.

ORGANIZATION AND MANAGEMENT

1. **Organizer** (with Alessandro della Pia, Vincenzo Amato, Giacomo Ascione and Francesco Bajardi) of the "Scientific Colloquia" seminar series, hosted by the Scuola Supeiore Meridionale from 2024.

2. **Organizer** (with Mario di Bernardo and Andrea Lama) of the two sessions Mini Symposium "Analysis and Control of Collective Behavior in Interacting Populations" at 2025 SIAM Conference on Applications of Dynamical Systems (SIAM DS25).

3. **Organizer** (with Andrea Lama, Hector Vargas Alvarez and Mario di Bernardo) of the Mini Symposium "Analysis and control of large-scale dynamical systems" at 2023 Dynamics Days Europe (DD23).

4. **Organizer** (with Mario di Bernardo and Andrea Lama) of the Mini Symposium "Analysis, Control and Applications of Large-Scale Complex Multiagent Systems" at 2023 SIAM Conference on Applications of Dynamical Systems (SIAM DS23).

5. **Organizer** (with Mario di Bernardo and Andrea Lama) of the Mini Symposium "Analysis and Control of Collective Behavior in Interacting Populations" at 2025 SIAM Conference on Applications of Dynamical Systems (SIAM DS25).

EDITORIAL AND REVIEWING ACTIVITY

Associate Editor 2026–present
European Control Conferece

Reviewer for the following journals and conferences: *IEEE Transactions on Network Science and Engineering*, *IEEE Control Systems Letters*, *American Control Conference 2024 (ACC24)*, *63rd Conference on Decision and Control (CDC24)*, *62nd Conference on Decision and Control (CDC23)*, *International Federation of Automatic Control (IFAC) World Congress 2023*, *Mathematics in Engineering*, 2025 SIAM Conference on Control and its Applications (SIAM CT25), *IEEE Transactions on Control Systems Technology*, Cognitive Computation, *IEEE Transactions on Automatic Control*, *IEEE Robotics and Automation Letters*, *Scientific Reports*, *European Journal of Control*.

MENTORING

Ph.D. co-advisor of:

- Beniamino Di Lorenzo, Modeling and Engineering Risk and Complexity, Scuola Superiore Meridionale (from November 2024 up to now).

Master thesis co-advisor of:

- Beniamino Di Lorenzo, Master student Automation Engineering and Robotics at University of Naples Federico II. Selected as one of the fifteen best master thesis in control theory in Italy, from the Italian chapter of the IEEE Control Systems Society, among the Road2CDC initiative.
- Konishjit Bedi, Master student in Mechatronics and Robotics at New York University, Tandon School of Engineering.

TECHNICAL SKILLS

- *Programming languages*: Matlab, C/C++, C#, Python.
- ROS, Unity
- *Text editing and presentation*: LaTeX, Office Suite (Word, Excel, PowerPoint).
- *CAD, 3D printing*: Catia.
- *Prototyping and data acquisition software*: Arduino IDE.

LANGUAGES

- English (fluent)
- Italian (mother tongue)