Emilio Benenati | CV

benenati@kth.se | bemilio.github.io

About me

I am a Postdoc in the Division of decision and control systems at KTH, Stockholm. My research lies at the intersection between multi-agent MPC and game theory, focusing on stability guarantees, design principles, and numerical methods.

Education and research experience

2025 - Now KTH Stockholm Sweden	**Post-doc** Topic: Multi-agent model predictive control Advisor: Prof. G. Belgioioso
2020 - 2025 TU Delft the Netherlands	**Ph.D.** in Systems and Control "Optimal selection and control in monotone and dynamic games" Advisor: Prof. S. Grammatico
2024 UC Santa Barbara USA	**Research visit** Topic: Contraction theory for time-scale separated systems Advisor: Prof. F. Bullo
2019 - 2020 Italian Inst. of Tech. Genova, Italy	**Research fellow** Topic: Control of jet-propelled aerial humanoid robots Advisor: Dr. D. Pucci
2018-2019 CU Boulder USA	**Research visit** Topic: Real-time power flow optimization for electric grids Advisor: Prof. E. Dall' Anese, Dr. M. Colombino
2016 - 2019 ETH Zürich Switzerland	**M.Sc.** in Robotics, Systems and Control Thesis: "Optimal Control of Electric Loads Using MDPs" Advisor: Prof. F. Dörfler
2013 - 2016 Univ. of Catania Italy	**B.Sc.** in Electrical Engineering (with honors) Thesis: "Control of a self-built robot arm using computer vision" Advisor: Prof. G. Muscato

Teaching and work experience

2021 - 2026 TU Delft, KTH Stockholm	**Teaching** *Model Predictive Control* (M.Sc. course); *Game Theory in Control* (Ph.D. course) Invited lecturer, exercise sessions, evaluation of projects, oral examinations
2021 - Now TU Delft, KTH Stockholm	**M.Sc. student advisor** Proposed and led several research projects in model predictive control and optimization, including applications to autonomous driving, energy distribution networks, and underwater robotics
2017 - 2018 ABB Baden Switzerland	**R&D Intern** Internship on automatic fault detection for electric drives using signal analysis and machine learning

Honors and Other Activities

- **Winner**, Autotrac 2020 competition in vehicle fleet coordination, European Commission JRC
- **Finalist**, IFAC Young Author Theory Paper Prize, 2026
- **Developer** of DyNECT, an open-source package for game-theoretic predictive control
- **Invited speaker** at international workshops: *Game Theory meets MPC* (Rio de Janeiro, 2025) and *Game Theory in the Era of AI* (Birmingham, 2026)
- **Organizer** of *Game On!*, a seminar series on control applications of game theory, featuring 20 invited talks from leading experts (available online)
- **Organizer** of *Game Theory in Action*, a workshop on computational game theory and multi-agent systems (upcoming in Honolulu, 2026)

Selected Publications

Full list of publications available on bemilio.github.io/pub.

[A] "Linear-quadratic dynamic games as receding-horizon variational inequalities"
IEEE Transactions on Automatic Control, 2025 DOI: 10.1109/TAC.2025.3632150

Game-theoretic predictive control enables autonomous systems to predict and account for external influences from rational agents. We develop a design principle that guarantees infinite-horizon optimality and stability, as well as connections with the variational inequality problem that enable computational tractability.

[B] "Optimal selection and tracking of generalized Nash equilibria in monotone games"
IEEE Transactions on Automatic Control, 2023 DOI: 10.1109/TAC.2023.3288372

Generalized Nash equilibrium problems admit multiple solutions, which can cause jittering of the control action when implementing a game-theoretic controller. We develop the first algorithms that compute and select the optimal solution, among potentially infinitely many.

[C] "Probabilistic game-theoretic traffic routing"
IEEE Transactions on Intelligent Transportation Systems, 2024 DOI: 10.1109/TITS.2024.3399112

This work validates our design principles and numerical algorithms for game-theoretic MPC on the routing problem for vehicle fleets on a road network. We design a controller that provably guides the vehicles to their destinations, and we demonstrate reduced congestion with respect to a greedy strategy.

[D] "The explicit game-theoretic linear quadratic regulator for constrained multi-agent systems"
Submitted to *IEEE Transactions on Automatic Control* in 2025 DOI: 10.48550/arXiv.2512.07749

Iterative solvers may be too slow at computing the input of a game-theoretic controller on some applications. For games with linear dynamics and quadratic objectives, we circumvent this limitation by computing the state-to-input map offline. We demonstrate superior performance in terms of online computation time and solution precision compared to state-of-the-art algorithms.

[E] "A Douglas-Rachford splitting for solving monotone affine variational inequalities in linear-quadratic dynamic games"
IFAC World Congress, 2026 (to appear) DOI: 10.48550/arXiv.2504.05757

🏆 *Finalist, IFAC Young Author Theory Paper Prize.*
Solving the variational inequality that defines a game-theoretic controller in real time is challenging within a limited sampling interval. We tailor a Douglas-Rachford splitting to the affine structure of linear-quadratic games, proving linear convergence and demonstrating faster, more stable convergence than state-of-the-art solvers on an automated driving benchmark.

Languages

Italian	Native
English	Proficient - certified level C2
German	Basic
Polish, Dutch	Elementary

Interests

Guitar, music collection and production, hobby electronics, cooking, learning languages