Guillaume Berger

https://guberger.github.io/

PhD in Mathematical Engineering
Postdoctoral Researcher at UCLouvain
FNRS Fellow

PROFESSIONAL APPOINTMENTS

Postdoctoral researcher at UCLouvain *Started October 2023*
Data-driven verification and control of cyber-physical systems
Advisor: Raphaël Jungers

Postdoctoral researcher at University of Colorado Boulder *2021 – 2023*
Verification and control of cyber-physical systems
Advisor: Sriram Sankaranarayanan

EDUCATION

PhD in mathematical engineering at UCLouvain *2017 – 2021*
Dominated splitting and quantization of hybrid systems
Supervisor: Raphaël Jungers

Master in mathematical engineering at UCLouvain *2015 – 2017*
Ranking: 1/248; *summa cum laude, with the congratulations of the jury*

TEACHING EXPERIENCE

Bachelor courses

Calculus I, UCLouvain, co-teacher, 200 students *2023*
Numerical analysis, UNamur, 15 students *2025*

Master Courses

Stochastic optimal control and reinforcement learning, UCLouvain, co-teacher, 10 students *2024, 2025*
Linear and integer programming, CU Boulder, 15 students *2023*
Numerical linear algebra, UNamur, 15 students *2025*

PUBLICATIONS

Preprints

- Léa Ninite, Adrien Banse, GB, Raphaël Jungers, **A path-complete approach for optimal control of switched systems**, submitted to *HSCC 2026*, November 2025. https://guberger.github.io/assets/papers/hscc-iccps26-paper143.pdf
- GB, **On the differentiability of the value function of switched linear systems under arbitrary and controlled switching**, submitted to *ECC 2026*, November 2025. https://arxiv.org/abs/2511.20037
- GB, Raphaël Jungers, **The internal growth function: a more general PAC framework for scenario decision making**, submitted to *Transactions on Machine Learning Research*, September 2025. https://openreview.net/forum?id=HqPKJSAkrp
- Lara Brudermüller, GB, Julius Jankowski, Raunak Bhattacharyya, Raphaël Jungers, Nick Hawes, **CC-VPSTO: Chance-Constrained Via-Point-based Stochastic Trajectory Optimisation for safe and efficient online robot motion planning**, submitted to *International Journal of Robotics Research*, August 2025. https://arxiv.org/abs/2402.01370
- GB, **Improved compression bounds for scenario decision making**, submitted to *IEEE Transactions on Automatic Control*, July 2025. https://arxiv.org/abs/2501.08884
- Sara Kamali, GB, Sriram Sankaranarayanan, **Synthesizing min-max control barrier functions for switched affine systems**, submitted to *Automatica*, June 2025. https://arxiv.org/abs/2506.10296

Journal papers

- GB, Raphaël Jungers, **PAC learnability of scenario decision-making algorithms: necessary conditions and sufficient conditions**, *IEEE Control Systems Letters*, vol. 9, no. 1, 2025.
- GB, Sriram Sankaranarayanan, **Template-based piecewise affine regression**, *Research Directions: Cyber-Physical Systems*, 2024.
- Zheming Wang, GB, Raphaël Jungers, **Data-driven control of unknown switched linear systems using scenario optimization**, *IEEE Transactions on Automatic Control*, 2024.

- GB, Sriram Sankaranarayanan, **Counterexample-guided computation of polyhedral Lyapunov functions for piecewise linear systems**, *Automatica*, vol. 155, 111165, 2023.
- GB, Raphaël Jungers, **Worst-case topological entropy and minimal data rate for state observation of switched linear systems**, *Communications of the ACM*, vol. 65, no. 2, 2022.
- GB, Zheming Wang, **Comments on "Data driven stability analysis of black-box switched linear systems"**, *Automatica*, vol. 142, 110412, 2022.
- GB, P.-A. Absil, Lieven De Lathauwer, Raphaël Jungers, Marc Van Barel, **Equivalent polyadic decompositions of matrix multiplication tensors**, *Journal of Computational and Applied Mathematics*, vol. 406, 113941, 2022.
- GB, Raphaël Jungers, **p-dominant switched linear systems**, *Automatica*, vol. 132, 109801, 2021.
- GB, Raphaël Jungers, **Quantized stabilization of continuous-time switched linear systems**, *IEEE Control Systems Letters*, vol. 5, no. 1, 2021.
- GB, P.-A. Absil, Raphaël Jungers, Yurii Nesterov, **On the quality of first-order approximation of functions with Hölder continuous gradient**, *Journal of Optimization Theory and Applications*, vol. 185, 2020.
- GB, Raphaël Jungers, **Formal methods for computing hyperbolic invariant sets for nonlinear systems**, *IEEE Control Systems Letters*, vol. 4, no. 1, 2020.

Conference papers

- Masoumeh Ghanbarpour, GB, Sriram Sankaranarayanan, **Controlled supermartingale functions for stochastic differential equations: inference and applications**, *CDC 2025*.
- Alexis Vuille, GB, Raphaël Jungers, **A stochastic-optimization-based adaptive-sampling scheme for data-driven stability analysis of switched linear systems**, *CDC 2025*.
- GB, Raphaël Jungers, **Online complexity estimation for repetitive scenario design**, *CDC 2025*.
- Sara Kamali, GB, Sriram Sankaranarayanan, **Polyhedral control Lyapunov functions for switched affine systems**, *HSCC 2025*, 2025.
- Alexis Vuille, GB, Raphaël Jungers, **Data-driven stability analysis of switched linear systems using adaptive sampling**, *ADHS 2024*, 2024.
- GB, Monal Narasimhamurthy, Sriram Sankaranarayanan, **Algorithms for identifying flagged and guarded linear systems**, *HSCC 2024*, 2024.
- GB, Masoumeh Ghanbarpour, Sriram Sankaranarayanan, **Cone-based abstract interpretation for nonlinear positive invariant synthesis**, *HSCC 2024*, 2024.
- GB, Sriram Sankaranarayanan, **Template-based piecewise affine regression**, *L4DC 2023*, 2023.
- Alec Reed, GB, Sriram Sankaranarayanan, Christoffer Heckman, **Verified path following using neural control Lyapunov functions**, *CoRL 2022*, 2022.
- GB, Monal Narasimhamurthy, Kandai Watanabe, Morteza Lahijanian, Sriram Sankaranarayanan, **An algorithm for learning switched linear dynamics from data**, *NeurIPS 2022*, 2022.
- GB, Sriram Sankaranarayanan, **Learning fixed-complexity polyhedral Lyapunov functions from counterexamples**, *CDC 2022*, 2022.
- GB, Raphaël Jungers, Zheming Wang, **Data-driven invariant subspace identification for black-box switched linear systems**, *CDC 2022*, 2022.
- GB, Raphaël Jungers, **Complexity of the LTI system trajectory boundedness problem**, *CDC 2021*, 2021.
- Zheming Wang, GB, Raphaël Jungers, **Data-driven feedback stabilization of switched linear systems with probabilistic stability guarantees**, *CDC 2021*, 2021.
- GB, Maben Rabi, **Bounds on set exit times of affine systems, using Linear Matrix Inequalities**, *ADHS 2021*, 2021.
- GB, Raphaël Jungers, Zheming Wang, **Chance-constrained quasi-convex optimization with application to data-driven switched systems control**, *L4DC 2021*, 2021. In the 14 out of 138 submissions accepted for oral presentation.
- GB, Raphaël Jungers, **Finite data-rate feedback stabilization of continuous-time switched linear systems with unknown switching signal**, *CDC 2020*, 2020.
- GB, Raphaël Jungers, **Topological entropy and minimal data rate for state observation of LTV systems**, *IFAC World Congress 2020*, 2020.
- GB, Raphaël Jungers, **Worst-case topological entropy and minimal data rate for state observation of switched linear systems**, *HSCC 2020*, 2020. HSCC 2020 Best Paper Award.
- GB, Raphaël Jungers, **A converse Lyapunov theorem for p-dominant switched linear systems**, *ECC 2019*, 2019.
- GB, Fulvio Forni, Raphaël Jungers, **Path-complete p-dominant switching linear systems**, *CDC 2018*, 2018.

SEMINARS

KU Leuven, 2018: *Equivalent polyadic decompositions of matrix multiplication tensors*

University of Cambridge, 2018: *Path-complete positivity of switched linear systems*
University of Illinois at Urbana–Champaign, 2019: *Path-complete p-dominance of switched linear systems*
University of Colorado Boulder, 2021: *Quantized control of switched linear systems: Theory and application*
École Polytechnique, Paris, 2023: *Counterexample-guided methods for verification of hybrid linear systems*
UCLouvain, 2024: *Safety in systems and control: From theory to implementation*
University of Colorado Boulder, 2025: *Data-driven methods in control*
UCLouvain, 2025: *Safety in the face of uncertainty: When is a scenario decision-making algorithm safe?*
University of Oxford, 2025: *Safety in the face of uncertainty: When is a scenario decision-making algorithm reliable?*

MAIN COLLABORATIONS

KU Leuven–SeLMA (Lieven De Lathauwer, Marc Van Barel), University of Cambridge (Fulvio Forni), University of Colorado Boulder (Chris Heckman, Morteza Lahijanian, Sriram Sankaranarayanan), UCLouvain (Pierre-Antoine Absil, Yurii Nesterov, Raphaël Jungers), University of Oxford (Nick Hawes), Zhejiang University (Zheming Wang)

PHD THESES SUPERVISION/MENTORING

Alexis Vuille, UCLouvain, *Data-driven control* — *Started September 2023*
Sara Kamali, CU Boulder, *Formal methods for hybrid systems* — *Started September 2023*
Monal Narasimhamurthy, CU Boulder, now at Google Research — *2021 – 2023*

FELLOWSHIPS AND GRANTS

Postdoctoral researcher fellowship (FNRS) — *2023 – 2026*
Postdoctoral research grant (WBI) — *2022 – 2023*
Postdoctoral researcher fellowship (BAEF) — *2021 – 2022*
PhD fellowship (FNRS–FRIA) — *2017 – 2021*

AWARDS AND DISTINCTIONS

Research Highlight in *Communications of the ACM* (CACM) — *2021*
Worst-case topological entropy and minimal data rate for state observation of switched linear systems
HSCC 2020 best paper award — *2020*
Worst-case topological entropy and minimal data rate for state observation of switched linear systems

RESEARCH VISITS

École Polytechnique, Paris, France; Éric Goubault and Sylvie Putot — *November 2022*
University of Illinois in Urbana–Champaign, USA; Daniel Liberzon — *April–May 2019*
University of Cambridge, UK; Fulvio Forni and Rodolphe Sepulchre — *February 2018*

SERVICES TO COMMUNITY

Conference organization committees: RP 2019 (Brussels), HSCC 2021 (virtual), ADHS 2021 (virtual)
Support of the general chair(s): managing bookings, website, communication with the different chairs and stakeholders, advertisement, etc.
Conference technical committees: HSCC 2021, HSCC 2023, HSCC 2025
Journal reviewer: Automatica, IEEE TAC, NAHS, IEEE L-CSS, SIOPT, SIMAX

MISCELLANEOUS

Member of UCLouvain IEEE Student Branch (https://sites.uclouvain.be/ieee/) — *2017 – 2021*
Organizing activities for researchers and engineering students, gathering industries and researchers together
Study exchange: Royal Institute of Technology (KTH), Stockholm — *2016 – 2017*
Hobbies: tennis, running, badminton, skiing

Last updated: November 30, 2025