

# Guillaume Berger

<https://guberger.github.io/>

PhD in Mathematical Engineering  
Postdoctoral Researcher at UCLouvain  
FNRS Fellow

## PROFESSIONAL APPOINTMENTS

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- Postdoctoral Researcher at UCLouvain** *Started October 2023*  
Data-Driven Verification and Control of Cyber-Physical Systems  
*Advisor:* Raphaël Jungers
- Postdoctoral Researcher at the University of Colorado Boulder** *2021 – 2023*  
Verification and Control of Cyber-Physical Systems  
*Advisor:* Sriram Sankaranarayanan

## EDUCATION

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- 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, congratulations of the jury

## TEACHING EXPERIENCE

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- Teacher at UCLouvain**  
Calculus (Bachelor in Computer Science, about 200 students) *Fall 2023*  
Stochastic Optimal Control and Reinforcement Learning (Master in Engineering Science, 10 students) *Fall 2024*
- Teacher at the University of Colorado Boulder**  
Linear and Integer Programming (Master in Engineering Science, 15 students) *Spring 2023*
- Teaching Assistant at UCLouvain**  
Advanced Linear Algebra, Discrete Mathematics, Functional Analysis, etc. *2017 – 2021*
- Master Theses Supervision at UCLouvain**  
Co-supervisor of 1 master thesis *2024–2025*

## PUBLICATIONS

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### Journal Papers

- 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

- 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. [Acceptance rate: 26 %]
- 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.

## Preprints

- Lara Bruder Müller, 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 *IEEE Transactions on Robotics*. <https://arxiv.org/abs/2402.01370>
- GB, **Improved compression bounds for scenario decision making**, submitted to *ECC 2025*. <https://arxiv.org/abs/2501.08884>
- Masoumeh Ghanbarpour, GB, Sriram Sankaranarayanan, **Vector supermartingales for proving properties of stochastic systems**, submitted to *ACC 2025*.
- Sara Kamali, GB, Sriram Sankaranarayanan, **Polyhedral control Lyapunov functions for switched affine systems.**, submitted to *HSCC 2025*.
- GB, Raphaël Jungers, **PAC learnability of scenario decision-making algorithms: necessary and sufficient conditions**, submitted to *L4DC 2025*. <https://arxiv.org/abs/2501.08887>

## FELLOWSHIPS AND GRANTS

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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

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Research Highlight in Communications of the ACM (CACM)	2021
<i>Worst-case topological entropy and minimal data rate for state observation of switched linear systems</i>	
HSCC 2020 Best Paper Award	2020
<i>Worst-case topological entropy and minimal data rate for state observation of switched linear systems</i>	

## RESEARCH VISITS

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École Polytechnique, Paris, France; Éric Goubault and Sylvie Putot

November 2022

University of Illinois in Urbana–Champaign, USA; Daniel Liberzon  
University of Cambridge, UK; Fulvio Forni and Rodolphe Sepulchre

*April–May 2019*

*February 2018*

## **SERVICES TO COMMUNITY**

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**Conference Organization Committee:** RP 2019 (Brussels), HSCC 2021 (virtual), ADHS 2021 (virtual)

*Support of the general chair(s): managing bookings, website, communications with the different chairs and stakeholders, advertisement, etc.*

**Conference Technical Committee:** HSCC 2025, HSCC 2023, HSCC 2021

**Journal Reviewer:** Automatica, IEEE TAC, NAHS, IEEE L-CSS, SIOPT, SIMAX

## **MISCELLANEOUS**

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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, Squash, Badminton, Skiing