Thom Badings

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thom-badings Google Scholar (h-index: 9; i10-index: 9) DBLP

Employment

Since Nov 2024 **Postdoctoral research associate,** University of Oxford, United Kingdom
- Member of the Oxford Control and Verification (OXCAV) group headed by Prof. Alessandro Abate
- Part of the Erlangen AI Hub on the mathematical foundations of decision-making in AI

Sep 2020 - Aug 2024 **PhD candidate,** Radboud University, The Netherlands
- Supervised by Prof. Nils Jansen and Prof. Mariëlle Stoelinga
- Part of the NWA-funded PrimaVera project on predictive maintenance

May 2019 - Aug 2020 **Graduate intern & consultant,** DNV GL, The Netherlands
- Graduation project at DNV GL Oil & Gas (Groningen), leading to a journal publication
- Continuation as a consultant at DNV GL Energy (Arnhem) in the power systems analysis group

Sep 2014 - May 2019 **Teaching assistant,** University of Groningen, The Netherlands
- Involved in developing new courses for the first year of the bachelor's programme

Qualifications

March 2025 **PhD in Computer Science *(cum laude)*,** Radboud University, The Netherlands
- The cum laude distinction is awarded to less than 5% of PhD candidates in the Netherlands
- Thesis on Robust Verification of Stochastic Systems: Guarantees in the Presence of Uncertainty

Oct 2019 **MSc in Industrial Engineering and Management *(cum laude)*,** University of Groningen, The Netherlands
- Average grade: 8.7/10
- Specialization: Smart Systems in Control and Automation
- Master's thesis led to one journal and two conference publications

July 2017 **Honours College Bachelor's Programme,** University of Groningen, The Netherlands
- Average grade: 8.4/10

July 2017 **BSc in Industrial Engineering and Management,** University of Groningen, The Netherlands
- Average grade: 7.8/10
- Double specialization: (1) Product and Process Technology; (2) Production Technology and Logistics

Awards and grants

2023 **Radboud University interdisciplinary research voucher**
- Voucher of €50,000 to work on the interdisciplinary research project ORLEANS: "Offline Reinforcement Learning for Sustainable Transportation at Sea"

2022 **AAAI distinguished paper award**
- For the paper "Sampling-Based Robust Control of Autonomous Systems with Non-Gaussian Noise" [C12]

Teaching experience

Certificates

2023 **University Teaching Qualification (UTQ/BKO)**, obtained at Radboud University

- "The University Teaching Qualification is evidence of the didactic competence of teachers in academic education, and is recognized by all 14 universities in the Netherlands"

Lecturer

2025 **System Verification**: Teaching in a course module of the AIMS centre for doctoral training at the University of Oxford

2022–2024 **Processors**: Co-coordinator and lecturer for this first-year bachelor's course at Radboud University for three consecutive academic years (around 200 registered students per year)

Guest lectures

2022–2024 Abstractions of dynamical systems using interval MDPs (Radboud University, Model Checking)

2022 Abstraction-based control of stochastic systems (UT Austin, Verification of Cyber-Physical Systems)

Committees

2015–2017 Evaluation committee of Industrial Engineering and Management, University of Groningen

2014–2016 Program committee of Industrial Engineering and Management, University of Groningen

Teaching assistant

2014–2019 Teaching assistant for several courses in Industrial Engineering and Management, University of Groningen

Organization of events

March 2026 EPSRC AI Hub, Postdoctoral Community Building Event, at the Isaac Newton Institute (Cambridge, UK)

July 2025 Verification Mentoring Workshop, at CAV 2025

March 2025 Symposium on Advances in Robust Verification of Stochastic Systems, organized for my PhD defence

Feb 2021 SEN Symposium, responsible for digital support

Reviewing activities

Program committees

2026 L4DC, FM (artifact evaluation)

2025 AAMAS, IJCAI, QEST+FORMATS (artifact evaluation), ECAI (main track and demo papers)

2024 AAAI, AAMAS

Journal reviewer

IEEE Transactions on Automatic Control (TAC), Automatica, Journal of AI Research (JAIR), IEEE Control Systems Letters (L-CSS), IEEE Transactions on Industrial Informatics (TII), IEEE Transactions on Control of Network Systems (TCNS)

External reviewer

AAAI, NeurIPS, AAMAS, ICML, ICAPS, ICRA, CDC, ECC, ACC, CAV, TACAS, CONCUR, QEST, ATVA, FASE, Formal Methods (FM), ADHS, L4DC, NeuS

Research stays

July 2024 **Stanford University (USA),** with Prof. Mykel Kochenderfer (Stanford Intelligent Systems Laboratory)

April 2022 **University of Texas at Austin (USA),** with Prof. Ufuk Topcu (Autonomous Systems Group)

Selected talks

Invited talks at workshops

2025 Annual Conference of the GT-Vérif Working Group, at Université Paris-Est (France)

Invited talks in research group

2025 **Oxford Robotics Institute** (GOALS), **Imperial College** (DynamIC)

2024 **TU Delft** (HERALD Lab), **Stanford University** (Stanford Intelligent Systems Laboratory)

2023 **University of Oxford** (OXCAV), **University of Texas at Austin** (Autonomous Systems Group), **TU Eindhoven** (OPAC Group), **TU Delft** (Algorithmics)

2022 **Saarland University** (Dependable Systems and Software)

2021 **TU Delft** (Algorithmics), **KTH Stockholm** (Robotics, Perception & Learning), **University of Oxford** (OXCAV)

Conference talks

2025 CAV, L4DC

2024 TACAS, ECC

2023 AAAI, CAV, BNAIC

2022 AAAI, CAV

2021 NASA Formal Methods (NFM)

Workshop participation

2025 Dagstuhl Seminar: Tools for Reachability Analysis of Stochastic Hybrid Systems (to take place)

ROCKS: Rigorous dependability analysis using model checking techniques for stochastic systems

2023 FMAS: Formal Methods for Autonomous Systems

Lorentz Center: Predictive Maintenance: Let Data Maintain the Model

ROCKS: Rigorous dependability analysis using model checking techniques for stochastic systems

2022 NeurIPS Robot Learning

AAAI Fall Symposium on AI for Predictive Maintenance

VeriProp (at CAV 2022)

Lorentz Center: Rigorous Automated Planning

ROCKS: Rigorous dependability analysis using model checking techniques for stochastic systems

2021 Robotics4People (at Robotics: Science and Systems)

SEN Symposium

Media appearances

July 2025	**TW.nl:** "Van chipmachine tot riool: zo voorkomt voorspellend onderhoud miljoenen aan schade"
March 2025	**BNR Nieuwradio:** Live interview in "Digitaal" podcast on Dutch national radio (about my PhD thesis)
March 2025	**Radboud University:** "This AI-model is more certain about uncertainty" (press item about my thesis)
Dec 2022	**PrimaVera project:** Predictive maintenance (promotion video for the PrimaVera project)
April 2022	**AI Hub:** Developing safe controllers for autonomous systems under uncertainty

Dissemination activities

Since 2024 **Erlangen AI Hub:** As a postdoctoral research associate, I contribute to organizing events within the hub:

- Organizing an event with two other AI Hubs for postdocs (taking place in March 2026)
- Organizing a series of tutorials for knowledge and skills transfer within the hub

2020–2024 **PrimaVera:** My PhD project was part of PrimaVera, for which I performed a range of dissemination tasks:

- Maintaining the website
- Producing a series of short dissemination videos
- Producing a booklet with fact sheets, as high-level summaries of research projects
- Co-organizing a recurring colloquium series

Language skills

Dutch	Native
English	Fluent (C2)
German	Basic

PhD thesis

[T1] **Thom Badings**. "Robust verification of stochastic systems: Guarantees in the presence of uncertainty". PhD thesis. Nijmegen: Radboud University Press, 2025. ***Cum Laude***.

Journal publications

[J1] Francisco Souza, **Thom Badings**, Geert Postma, and Jeroen Jansen. "Integrating expert and physics knowledge for modeling heat load in district heating systems". In: *IEEE Transactions on Industrial Informatics* 21.5 (2025), pp. 3955–3965. DOI: .

[J2] **Thom Badings**, Licio Romao, Alessandro Abate, David Parker, Hasan A. Poonawala, Mariëlle Stoelinga, and Nils Jansen. "Robust control for dynamical systems with non-Gaussian noise via formal abstractions". In: *J. Artif. Intell. Res.* 76 (2023), pp. 341–391. DOI: .

[J3] **Thom Badings**, Thiago D. Simão, Marnix Suilen, and Nils Jansen. "Decision-making under uncertainty: Beyond probabilities". In: *Int. J. Softw. Tools Technol. Transf.* 25.3 (2023), pp. 375–391. DOI: .

[J4] **Thom Badings**, Murat Cubuktepe, Nils Jansen, Sebastian Junges, Joost-Pieter Katoen, and Ufuk Topcu. "Scenario-based verification of uncertain parametric MDPs". In: *Int. J. Softw. Tools Technol. Transf.* 24.5 (2022), pp. 803–819. DOI: .

[J5] Vahab Rostampour, **Thom Badings**, and Jacquelien M. A. Scherpen. "Demand flexibility management for buildings-to-grid integration with uncertain generation". In: *ENERGIES* 13.24 (2020). DOI: .

[J6] **Thom Badings** and Dennis S. van Putten. "Data validation and reconciliation for error correction and gross error detection in multiphase allocation systems". In: *Journal of Petroleum Science and Engineering* 195 (2020), p. 107567. ISSN: 0920-4105. DOI: .

Conference publications

[C1] Mahdi Nazeri, **Thom Badings**, Anne-Kathrin Schmuck, Sadegh Soudjani, and Alessandro Abate. "Data-Driven Abstraction and Synthesis for Stochastic Systems with Unknown Dynamics". In: *CDC (accepted for presentation)*. 2025. DOI: .

[C2] Mahdi Nazeri, **Thom Badings**, Sadegh Soudjani, and Alessandro Abate. "Data-driven yet formal policy synthesis for stochastic nonlinear dynamical systems". In: *L4DC*. 2025. DOI: .

[C3] **Thom Badings** and Alessandro Abate. "Probabilistic Alternating Simulations for Policy Synthesis in Uncertain Stochastic Dynamical Systems". In: *CDC (accepted for presentation)*. 2025. DOI: .

[C4] **Thom Badings**, Wietze Koops, Sebastian Junges, and Nils Jansen. "Policy Verification in Stochastic Dynamical Systems Using Logarithmic Neural Certificates". In: *CAV (2)*. Vol. 15932. Lecture Notes in Computer Science. Springer, 2025, pp. 349–375. DOI: .

[C5] Marnix Suilen, **Thom Badings**, Eline M. Bovy, Parker David, and Nils Jansen. "Robust Markov decision processes: A place where AI and formal methods meet". In: *Principles of Verification: Cycling the Probabilistic Landscape : Essays Dedicated to Joost-Pieter Katoen on the Occasion of His 60th Birthday, Part III*. Springer Nature Switzerland, 2024, pp. 126–154. DOI: .

[C6] **Thom Badings**, Licio Romao, Alessandro Abate, and Nils Jansen. "A stability-based abstraction framework for reach-avoid control of stochastic dynamical systems with unknown noise distributions". In: *European Control Conference (ECC)*. 2024. DOI: .

[C7] **Thom Badings**, Matthias Volk, Sebastian Junges, Marielle Stoelinga, and Nils Jansen. "CTMCs with imprecisely timed observations". In: *TACAS (2)*. Vol. 14571. Lecture Notes in Computer Science. Springer, 2024, pp. 258–278. DOI: .

[C8] Luke Rickard, **Thom Badings**, Licio Romao, and Alessandro Abate. "Formal controller synthesis for Markov jump linear systems with uncertain dynamics". In: *QEST*. Vol. 14287. Lecture Notes in Computer Science. Springer, 2023, pp. 10–29. DOI: .

[C9] **Thom Badings**, Nils Jansen, Licio Romao, and Alessandro Abate. "Correct-by-construction control for stochastic and uncertain dynamical models via formal abstractions". In: *FMAS@iFM*. Vol. 395. EPTCS. 2023, pp. 144–152. DOI: .

[C10] **Thom Badings**, Sebastian Junges, Ahmadreza Marandi, Ufuk Topcu, and Nils Jansen. "Efficient sensitivity analysis for parametric robust Markov chains". In: *CAV (3)*. Vol. 13966. Lecture Notes in Computer Science. Springer, 2023, pp. 62–85. DOI: .

[C11] **Thom Badings**, Licio Romao, Alessandro Abate, and Nils Jansen. "Probabilities are not enough: Formal controller synthesis for stochastic dynamical models with epistemic uncertainty". In: *AAAI*. AAAI Press, 2023, pp. 14701–14710. DOI: .

[C12] **Thom Badings**, Alessandro Abate, Nils Jansen, David Parker, Hasan A. Poonawala, and Mariëlle Stoelinga. "Sampling-based robust control of autonomous systems with non-Gaussian noise". In: *AAAI*. AAAI Press, 2022, pp. 9669–9678. DOI: . ***Distinguished Paper Award***.

[C13] **Thom Badings**, Nils Jansen, Sebastian Junges, Mariëlle Stoelinga, and Matthias Volk. "Sampling-based verification of CTMCs with uncertain rates". In: *CAV (2)*. Vol. 13372. Lecture Notes in Computer Science. Springer, 2022, pp. 26–47. DOI: .

[C14] **Thom Badings**, Arnd Hartmanns, Nils Jansen, and Marnix Suilen. "Balancing wind and batteries: Towards predictive verification of smart grids". In: *NFM*. Vol. 12673. Lecture Notes in Computer Science. Springer, 2021, pp. 1–18. DOI: .

[C15] Vahab Rostampour, **Thom Badings**, and Jacquelien M. A. Scherpen. "Buildings-to-grid integration with high wind power penetration". In: *CDC*. IEEE, 2019, pp. 2976–2981. DOI: .

[C16] **Thom Badings**, Vahab Rostampour, and Jacquelien M.A. Scherpen. "Distributed building energy storage units for frequency control service in power systems". In: *IFAC-PapersOnLine* 52.4 (2019). IFAC Workshop on Control of Smart Grid and Renewable Energy Systems, pp. 228–233. DOI: .

Technical reports and preprints

[P1] Alessandro Abate, **Thom Badings**, Giuseppe De Giacomo, and Francesco Fabiano. "Best-Effort Policies for Robust Markov Decision Processes". In: *CoRR* abs/2508.07790 (2025). arXiv: 2508.07790 .

[P2] **Thom Badings**, Hasan A. Poonawala, Mariëlle Stoelinga, and Nils Jansen. “Correct-by-construction reach-avoid control of partially observable linear stochastic systems”. In: *CoRR* abs/2103.02398 (2023). arXiv: 2103.02398.