

Dr. Pieter Collins — Curriculum vitae

Name: Pieter John Collins

Nationalities: Dutch (NL) and British (UK)

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Maastricht University, Postbus 616, 6200 MD MAASTRICHT, The Netherlands

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Work Experience

January 2011-: Assistant professor.

Institution: Department of Data Science and Knowledge Engineering,
Maastricht University, The Netherlands

Appointment: 0.9 FTE. Permanent since April 2014.

Courses: Mathematical Optimization, Software & Systems Verification, Topics in Scientific Computing, Numerical Mathematics.

Supervision: 1 Ph.D. student, 9 Master students, 17 Bachelor students.

Leadership: Team Co-Leader Explainable and Reliable Artificial Intelligence (2018-2021)

Administration: Chair DKE Board of Admissions

November 2010-December 2010: Scientific researcher

Institution: Dipartimento di Informatica, Università degli Studi di Verona, Italy

Group: Formal methods for discrete and hybrid systems, Prof. Tiziano Villa

April 2005—March 2010: Scientific researcher

Institution: Centrum Wiskunde en Informatica, Amsterdam, The Netherlands

Grant: NWO Vernieuwingsimpuls Vidi grant 639.032.408 (€600 000)

Project: “Topological Methods for Systems and Control”

January—March 2005: Visiting Research Fellow

Host: Research Institute for Mathematical Sciences, Kyoto, Japan

Group: Dynamical Systems group of Hiroshi Kokubu

April 2003—December 2004: Postdoctoral researcher

Institution: Centrum Wiskunde en Informatica, Amsterdam, The Netherlands

Project: “Control and Computation”

January—June 2002: Lecturer

Institution: Department of Mathematical Sciences, University of Liverpool, U.K.

Courses: Methods of Applied Mathematics, Engineering Mathematics

January 2000—December 2002: Research Fellow

Institution: Department of Mathematical Sciences, University of Liverpool, U.K.

Grant: Leverhulme Special Research Fellowship SRF/4/9900172

Project: “Periodic orbits of chaotic systems”

August 1995—June 1999 Graduate Student Instructor

Employer: University of California, Berkeley, U.S.A.

Courses: Calculus, Multivariable Calculus, Differential Equations.

July 1994—August 1994: Software developer

Employer: Cosmic Solutions, Oakham, Leicestershire, U.K.

Education

Aug 1995–Dec 1999: University of California, Berkeley, U.S.A.

Degree: Ph.D. in Applied Mathematics

Supervisor: Prof. Morris Hirsch

Thesis: “Surface diffeomorphisms with homoclinic and heteroclinic tangles”

Oct 1991–Jun 1995: Jesus College, University of Cambridge, U.K.

Degrees: Mathematics Tripos, Part III, Distinction (1995)

B.A. Hons (1st Class) in Mathematics (1994)

Prizes: (Awarded by Jesus College.) Senior Keller Prize for overall achievement, Spencer Jones and Ware Prizes for mathematics.

Students Supervision

Ph.D. Theses (2)

L. Sella, *Computation of Symbolic Dynamics of Low-Dimensional Maps* (Vrije Universiteit, Amsterdam, 2009; Promotor J.H. van Schuppen)

M. Clerx, *Multi-Scale Modeling and Variability in Cardiac Cellular Electrophysiology* (Universiteit Maastricht, 2017; Promotors R. Peeters & P. Volders)

Master Theses & Internships (9) Including “Model-Checking Markov Chains using Interval Arithmetic”, “Implementation of a Polymorphic Function Calculus in C++”, “Building an Understandable Explanation System for Machine Learning Models in the Production Domain”, “Proportionality-based Occlusion Grid contextual explanation for semantic segmentation”, “Proving Correctness of Compositional Systems Analysis using Coq” (in progress), “Hybrid Helmholtz machine: A gate-based quantum circuit implementation”.

Bachelor Theses & Internships (11) Including “Elliptic curve hash algorithms and random number generation”, “An Adaptation of Counterexample-Guided Abstraction Refinement”, “Brain-Inspired Algorithms for Computational Auditory Scene Analysis”, “Formal Verification of Deep Neural Networks for Sentiment Classification”, “Applications in the Axiom of Choice and Tychonoff’s theorem”, “Rigorous Solution for Discrete Algebraic Riccati Equations”, “Rigorous Computation of Eigenvalues / Eigenvectors and Graphical User Interface for Ariadne”, “Querying Grey-Box Models for Explanations”, “Development of web application for automation of access codes distribution and management (Medtronic)”. “Collision Attacks against Elliptic Curve Only Hash”.

Master Group Projects Including “Explainable Artificial Intelligence”, “Verification of Machine Learning”, “Making Rigorous Function Calculus Easy”.

Teaching:

Qualifications: Basic Educational Qualification (Basis Kwalificatie Onderwijs; BKO) 2014.

Courses Mathematical Optimization, Software & Systems Verification, Numerical Mathematics, Topics in Scientific Computing, Chaos & Fractals, Heart-Brain Connection, Calculus.

Administration Member of Startup Committee for Master Programme in Systems Biology (2014-15) and Programme Committee for Master Programme in Systems Biology (2015-16)

Development Redesigned mathematics curriculum for Maastricht Science Programme (2017)

Organisation:

Admissions Chair, DKE Board of Admissions (2014-22)

Leadership Faculty Representative, Studium Generale (2011-14)

Founder and co-leader of research team on Explainable and Reliable Artificial Intelligence (2018-21)

Editorial Associate Editor, Journal Mathematics of Control, Signals & Systems (2011-) Editor, MCSS Special Issue on Control, Communication, and Complexity (2013) Editor, Postproceedings of Workshop on Computability, Constructivity: From Logic to Algorithms (CCC 2017) for Logical Methods in Computer Science.

Conferences Organiser, Workshop on Computable Analysis and Rigorous Numerics (CARN), Maastricht, 2013.

Programme Committee for the workshops Applied Verification and Reachability of Continuous and Hybrid Systems (ARCH 2014,15,18), Continuity, Computability, Constructivity (CCC 2017,18), and Hybrid Systems Biology (HSB 2016).

Key Publications:

- [1] Pieter Collins, Milad Niqui, and Nathalie Revol. A validated real function calculus. *Math. Comput. Sci.*, 5:437–467, 2011. <https://doi.org/10.1007/s11786-011-0102-5>.
- [2] Pieter Collins. Semantics and computability of the evolution of hybrid systems. *SIAM J. Control Optim.*, 49(2):890–925, 2011. <https://doi.org/10.1137/080716955>.
- [3] Pieter Collins. Computable analysis with applications to dynamic systems. *Mathematical Structures in Computer Science*, 30(2):173-233, 2020. <https://doi.org/10.1017/S096012952000002X>
- [4] Pieter Collins, Luca Geretti, Sanja Gonzalez Zivanovic, Davide Bresolin, and Tiziano Villa. Rigorous function calculi in Ariadne. Technical report, 2023. arXiv:2306.17541.
- [5] Pieter Collins, Bastiaan Laarakker, and Sasha Sindorf. Verification of compositional frameworks in Coq. In *Proceedings of the 26th International Symposium on Mathematical Theory of Networks and Systems, Cambridge, United Kingdom*, 2024.
- [6] Davide Bresolin, Pieter Collins, Luca Geretti, Roberto Segala, Tiziano Villa, and Sanja Živanović Gonzalez. A computable and compositional semantics for hybrid systems. *Information and Computation*, 300:105189, 2024.

Third-Party Funding

April 2017-March 2023

EU-RISE-731143 “Computing with Infinite Data”.
Marie Curie Research and Innovation Staff Exchange.
Total cost €1458900; EU contribution €958 500; net €18 000 to U. Maastricht.
Contributed to Work Package 2 “Exact Computations in Real Analysis”.
Funding for 4 one-month Secondments.

May 2008-August 2011

EU-FP7-ICT-223844 “Control for Coordination of Distributed Systems (C4C)”.
Total budget €3994585; EU contribution €2900000; net €364920 to CWI.
Contributed to Work Package 10 on “Tools”.

April 2005-March 2010

NWO Vidi 639.032.408 “Computational Topology for Systems and Control”.
Netherlands Organisation for Scientific Research (NWO).
Personal grant of total value €600000.
Held at Centre for Mathematics and Computer Science (CWI), Amsterdam.

January 2000-December 2001

SRF/4/9900172 on “Periodic orbits of chaotic systems”.
Leverhulme Special Research Fellowship.
Held at the Department of Mathematics, Liverpool University.

Refereed Publications in Primary Journals

- [1] Pieter Collins. Relative periodic point theory. *Topology Appl.*, 115(1):97–114, 2001.
- [2] Pieter Collins. Symbolic dynamics from homoclinic tangles. *Internat. J. Bifur. Chaos Appl. Sci. Engrg.*, 12(3):605–617, 2002.
- [3] Pieter Collins and Bernd Krauskopf. Entropy and bifurcations in a chaotic laser. *Phys. Rev. E*, 66(5):056201, 2002.
- [4] Pieter Collins. Dynamics of surface diffeomorphisms relative to homoclinic and heteroclinic orbits. *Dyn. Syst.*, 19(1):1–39, 2004.
- [5] Pieter Collins. Forcing relations for homoclinic orbits of the Smale horseshoe map. *Experiment. Math.*, 14(1):75–86, 2005.
- [6] Pieter Collins. Continuity and computability of reachable sets. *Theor. Comput. Sci.*, 341:162–195, 2005.
- [7] Pieter Collins. Entropy-minimising models of surface diffeomorphisms relative to homoclinic and heteroclinic orbits. *Dyn. Syst.*, 20(4):369–400, 2005.
- [8] Luc C.G.J.M. Habets, Pieter J. Collins, and Jan H. van Schuppen. Reachability and control synthesis for piecewise-affine hybrid systems on simplices. *IEEE Trans. Automat. Control*, 51(6):938–948, 2006.
- [9] Pieter Collins. Universal trellises. *J. Knot Theory Ramifications*, 16(4):471–487, 2007.
- [10] Pieter Collins. Optimal semicomputable approximations to reachable and invariant sets. *Theory Comput. Syst.*, 41(1):33–48, 2007.
- [11] Clare M. Lee, Pieter J. Collins, Bernd Krauskopf, and Hinke M. Osinga. Tangency bifurcations of global Poincaré maps. *SIAM J. Appl. Dyn. Syst.*, 7(3):712–754, 2008.
- [12] Pieter Collins and Daniel Graça. Effective computability of solutions of differential inclusions – the ten thousand monkeys approach. *J. Univ. Comput. Sci.*, 15(6):1162–1185, 2009.
- [13] Lorenzo Sella and Pieter Collins. Computation of symbolic dynamics for one-dimensional maps. *J. Comput. Applied Math.*, 234:418–436, 2010.
- [14] Pieter Collins, Milad Niqui, and Nathalie Revol. A validated real function calculus. *Math. Comput. Sci.*, 5:437–467, 2011.
- [15] Alexandre Goldsztejn, Wayne Hayes, and Pieter Collins. Tinkerbell is chaotic. *SIAM J. Appl. Dynam. Sys.*, 10(4):1480–1501, 2011.
- [16] Pieter Collins. Semantics and computability of the evolution of hybrid systems. *SIAM J. Control Optim.*, 49(2):890–925, 2011.
- [17] Lorenzo Sella and Pieter Collins. Computation of symbolic dynamics for two-dimensional piecewise-affine maps. *Discrete Contin. Dyn. S. (B)*, 15(3):739–767, 2011.
- [18] Pieter Collins and Ivan S. Zapreev. Computable semantics for CTL* on discrete-time and continuous-space dynamic systems. *Int. J. Found. Comput. Sci.*, 22(4):801–821, 2011.
- [19] Luc C.G.J.M. Habets, Pieter J. Collins, and Jan H. van Schuppen. Control to facet by piecewise-affine output feedback. *IEEE Trans. Automatic Control*, 57(11):2831–2843, 2012.
- [20] Luca Benvenuti, Davide Bresolin, Pieter Collins, Alberto Ferrari, Luca Geretti, and Tiziano Villa. Assume-guarantee verification of nonlinear hybrid systems with Ariadne. *Int. J. Robust Nonlinear Control*, 24(4):699–724, 2014.
- [21] Michael Clerx, Pieter Collins, Enno de Lange, and Paul G.A. Volders. Myokit: A simple interface to cardiac cellular electrophysiology. *Progress in Biophysics and Molecular Biology*, 120(1-3):100–114, 2016.
- [22] Michael Clerx, Jordi Heijman, Pieter Collins, and Paul G. A. Volders. Predicting changes to INa from missense mutations in human SCN5A. *Scientific Reports*, 8(1), 2018.
- [23] Pieter Collins and Kevin A Mitchell. Graph duality in surface dynamics. *Journal of Nonlinear Science*, 29(5):2103–2135, 2019.
- [24] Firat Ismailoglu, Rachel Cavill, Evgueni Smirnov, Shuang Zhou, Pieter Collins, and Ralf Peeters. Heterogeneous domain adaptation for IHC classification of breast cancer subtype. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 17(1):347–353, 2020.
- [25] Pieter Collins. Computable analysis with applications to dynamic systems. *Mathematical Structures in Computer Science*, 30(2):173–233, 2020.
- [26] Sanja Zivanovic Gonzalez, Luca Geretti, Davide Bresolin, Tiziano Villa, and Pieter Collins. A higher order method for input-affine uncertain systems. *Nonlinear Analysis: Hybrid Systems*, 47:101266, 2023.
- [27] Sewon Park, Franz Brauße, Pieter Collins, Sun Young Kim, Michal Konečný, Gyesik Lee, Norbert Müller, Eike Neumann, Norbert Preining, and Martin Ziegler. Semantics, specification logic, and Hoare logic of exact real computation. *Logical Methods in Computer Science*, 20(2), 2024.

- [28] Davide Bresolin, Pieter Collins, Luca Geretti, Roberto Segala, Tiziano Villa, and Sanja Živanović Gonzalez. A computable and compositional semantics for hybrid systems. *Information and Computation*, 300:105189, 2024.
- [29] Luca Geretti, Pieter Collins, Pierluigi Nuzzo, and Tiziano Villa. Constraint-driven nonlinear reachability analysis with automated tuning of tool properties. *Nonlinear Analysis: Hybrid Systems*, 54:101532, 2024.

Conference Publications

- [30] Pieter Collins. Dynamics forced by surface trellises. In *Geometry and topology in dynamics (Winston-Salem, NC, 1998/San Antonio, TX, 1999)*, volume 246 of *Contemp. Math.*, pages 65–86. Amer. Math. Soc., Providence, RI, 1999.
- [31] Pieter Collins. A trajectory-space approach to hybrid systems. In *Proceedings of the 16th International Symposium on Mathematical Theory of Networks and Systems, Katholiek Universiteit Leuven, Belgium, July 5-9, 2004*, 2004.
- [32] Pieter Collins and Jan H. van Schuppen. Observability of piecewise-affine hybrid systems. In *Hybrid Systems: Computation and Control*, number 2993 in *Lecture Notes in Computer Science*, pages 265–279, Berlin Heidelberg New York, 2004. Springer-Verlag.
- [33] Pieter Collins and Jan H. van Schuppen. Observability of hybrid systems and Turing machines. In *Proceedings of the 43rd IEEE Conference on Decision and Control*, New York, 2004. IEEE Press.
- [34] Pieter Collins and Bernd Krauskopf. Chaotic lasers: manifolds, bifurcations and symbolic dynamics. In *Proceedings of Equadiff 2003*, Singapore, 2005. World Scientific.
- [35] Eugene Asarin and Pieter Collins. Noisy turing machines. In *Proceedings of the 32nd International Colloquium on Automata, Languages and Programming*, pages 1031–1042, 2005.
- [36] Pieter Collins. On the computability of reachable and invariant sets. In *Proceedings of the 44th IEEE Conference on Decision and Control, and the European Control Conference 2005*, pages 4187–4192, New York, 2005. IEEE Press.
- [37] Pieter Collins and John Lygeros. Computability of finite-time reachable sets for hybrid systems. In *Proceedings of the 44th IEEE Conference on Decision and Control, and the European Control Conference 2005*, pages 4688–4693, New York, 2005. IEEE Press.
- [38] Andrea Balluchi, Alberto Casagrande, Pieter Collins, Alberto Ferrari, Tiziano Villa, and Alberto L. Sangiovanni-Vincentelli. Ariadne: a framework for reachability analysis of hybrid automata. In *Proceedings of the 17th International Symposium on Mathematical Theory of Networks and Systems, Kyoto, Japan, July 24-28, 2006*, pages 1269–1267, 2006.
- [39] Pieter Collins. Generalised hybrid trajectory spaces. In *Proceedings of the 17th International Symposium on Mathematical Theory of Networks and Systems, Kyoto, Japan, July 24-28, 2006*, pages 2101–2109, 2006.
- [40] Pieter Collins, Luc Habets, Anton Kuut, Margreet Nool, Mihaly Petreczky, and Jan H. van Schuppen. ConPAHS - a software package for control of piecewise-affine hybrid systems. In *Proceedings of the 2006 IEEE Conference on Computer Aided Control Systems Design, Munich, Germany, October 4-6, 2006*, pages 76–81, 2006.
- [41] Pieter Collins. Effective computation for nonlinear systems. In S. Barry Cooper, Benedikt Löwe, and Andrea Sorbi, editors, *Computation and Logic in the Real World, Proceedings of the Third Conference on Computability in Europe, Siena, Italy, June 18-23, 2007*, volume 4497 of *Lecture Notes in Computer Science*, pages 169–178. Springer, 2007.
- [42] Lorenzo Sella and Pieter Collins. Stability analysis of switched-linear hybrid systems. In *Proceedings of the European Control Conference 2007, Kos, Greece, 2-5 July 2007*, 2007.
- [43] Lorenzo Sella and Pieter Collins. Discrete dynamics of two-dimensional nonlinear hybrid automata. In Magnus Egerstedt and Bud Mishra, editors, *Proceedings of the 11th International Workshop on Hybrid Systems: Computation and Control (HSCC 200), St. Louis, MO, USA, April 22-24 2008*, volume 4981 of *Lecture Notes in Computer Science*, pages 486–499. Springer, 2008.
- [44] Luca Benvenuti, Davide Bresolin, Alberto Casagrande, Pieter Collins, Alberto Ferrari, Emanuele Mazzi, Alberto Sangiovanni-Vincentelli, and Tiziano Villa. Reachability computation for hybrid systems with Ariadne. In *Proceedings of the 17th IFAC World Congress*, 2008.
- [45] Pieter Collins, Luc Habets, and Jan H. van Schuppen. Control-to-facet by piecewise-affine output feedback. In *Proceedings of the 18th International Symposium on Mathematical Theory of Networks and Systems, Blacksburg, Virginia*, 2008.
- [46] Pieter Collins. Computability of controllers for discrete-time semicontinuous systems. In *Proceedings of the 18th International Symposium on Mathematical Theory of Networks and Systems, Blacksburg, Virginia*, 2008.

- [47] Lorenzo Sella and Pieter Collins. Symbolic dynamics for a piecewise-affine system with hysteresis. In *Proceedings of the 18th International Symposium on Mathematical Theory of Networks and Systems, Blacksburg, Virginia*, 2008.
- [48] Pieter Collins and Daniel Graça. Effective computability of solutions of ordinary differential equations – the thousand monkeys approach. In Vasco Brattka and Klaus Weihrauch, editors, *Proceedings of the 5th International Conference on Computability and Complexity in Analysis (CCA'08)*, Electronic Notes in Theoretical Computer Science, pages 53–64. Elsevier, Amsterdam, The Netherlands, 2008.
- [49] Pieter Collins. Computability and representations of the zero set. In Vasco Brattka and Klaus Weihrauch, editors, *Proceedings of the 5th International Conference on Computability and Complexity in Analysis (CCA'08)*, Electronic Notes in Theoretical Computer Science, pages 45–51. Elsevier, Amsterdam, The Netherlands, 2008.
- [50] Pieter Collins and Alexandre Goldsztejn. The reach-and-evolve algorithm for reachability analysis of nonlinear dynamical systems. In Vesa Halava and Igor Potapov, editors, *Proceedings of the Workshop on Reachability Problems (RP'08), Liverpool, UK, September 15-17, 2008*, Electronic Notes in Theoretical Computer Science, pages 83–97, 2008.
- [51] Pieter Collins and Ivan S. Zapreev. Computable CTL for discrete-time and continuous-space dynamic systems. In *Proceedings of the Fifth Conference on Computability in Europe*, 2009.
- [52] Pieter Collins. Computable types for dynamic systems. In *Proceedings of the Fifth Conference on Computability in Europe*, 2009.
- [53] Pieter Collins. Controllability and falsification of hybrid systems. In *Proceedings of the European Control Conference 2009*, 2009.
- [54] Pieter Collins. Computability of homology for compact absolute neighbourhood retracts. In *Proceedings of the Sixth International Conference on Computability and Complexity in Analysis*, 2009.
- [55] Pieter Collins and Ivan Zapreev. Computable CTL* for discrete-time and continuous-space dynamic systems. In Oliver Bournez and Igor Potapov, editors, *Reachability Problems*, volume 5797 of *Lecture Notes in Computer Science*, pages 107–119. Springer, 2009.
- [56] Pieter Collins. A computable type theory for control systems. In *Proceedings of the 48th IEEE Conference on Decision and Control*, 2009.
- [57] D.A. van Beek, P. Collins, D.E. Ndales Agut, J.E. Rooda, and R.R.H. Schiffelers. New concepts in the abstract format of the Compositional Interchange Format. In A. Giua, C. Mahulea, M. Silva, and J. Zaytoon, editors, *3rd IFAC Conference on Analysis and Design of Hybrid Systems*, 2009.
- [58] Mihaly Petreczky, Dirk A. van Beek, Jacobus E. Rooda, Pieter Collins, and Jan H. van Schuppen. Sampled-data control of hybrid systems with discrete inputs and outputs. In A. Giua, C. Mahulea, M. Silva, and J. Zaytoon, editors, *3rd IFAC Conference on Analysis and Design of Hybrid Systems*, pages 334–339, 2009.
- [59] Pieter J. Collins, Luc C.G.J.M. Habets, Mihály Petreczky, and Jan H. van Schuppen. Control of piecewise-affine hybrid systems - Extended abstract. In A. Giua, C. Mahulea, M. Silva, and J. Zaytoon, editors, *3rd IFAC Conference on Analysis and Design of Hybrid Systems*, pages 234–237, 2009.
- [60] Pieter J. Collins, Milad Niqui, and Nathalie Revol. A Taylor function calculus for hybrid system analysis: Validation in Coq (extended abstract). In *Third International Workshop on Numerical Software Verification*, 2010.
- [61] Sanja Živanović and Pieter Collins. Numerical solutions to noisy systems. In *Proceedings of the 49th IEEE Conference on Decision and Control*, pages 798–803, 2010.
- [62] Pieter Collins, Luc C.G.J.M. Habets, Jan H. van Schuppen, Ivana Cerna, Jana Fabrikova, and David Safranek. Abstraction of biochemical reaction systems on polytopes. In *Proceedings of the 18th IFAC World Congress*, 2011.
- [63] Pieter Collins. Computable probability theory and stochastic processes. In *Proceedings of the Ninth International Conference on Computability and Complexity in Analysis*, 2012.
- [64] Philippe Uyttendaele, Frank Thuijsman, Pieter Collins, Ralf Peeters, Gijs Schoenmakers, and Ronald Westra. Evolutionary games and periodic fitness. In *Proceedings of the Fifteenth International Symposium on Dynamic Games and Applications*, 2012.
- [65] Luca Benvenuti, Davide Bresolin, Pieter Collins, Alberto Ferrari, Luca Geretti, and Tiziano Villa. Ariadne: Dominance checking of nonlinear hybrid automata using reachability analysis. In *Proceedings of the 6th International Workshop on Reachability Problems*, volume 7550 of *Lecture Notes in Computer Science*, pages 79–91, 2012.
- [66] Pieter Collins, Davide Bresolin, Luca Geretti, and Tiziano Villa. Computing the evolution of hybrid systems using rigorous function calculus. In *Proceedings of the 4th IFAC Conference on Analysis and Design of Hybrid Systems*, volume 45 of *IFAC Proceedings Volumes*, pages 284–290, 2012.

- [67] Milahi Marin, Andrea Benigni, Hakima Lakhdar, Antonello Monti, and Pieter Collins. Towards the implementation of a parallel real-time simulator for DSP cluster. In *Proceedings of the 2012 International Simulation Multi-Conference*, 2012.
- [68] Johanna Nellen, Erika Ábrahám, Xin Chen, and Pieter Collins. Counterexample generation for hybrid automata. In Cyrille Artho and Csaba Peter Ölveczky, editors, *Proceedings of the Second International Workshop on Formal Techniques for Safety-Critical Systems*, pages 88–106. Springer, 2014.
- [69] Pieter Collins. Model-checking in systems biology-from micro to macro. In *Proceedings of the First International Conference on Formal Methods in Macro-Biology*, volume 8738 of *Lecture Notes in Computer Science*, pages 1–22. Springer, 2014.
- [70] Michael Clerx and Pieter Collins. Reducing run-times of excitable cell models by replacing computationally expensive functions with splines. In *Proceedings of the 21st International Symposium on Mathematical Theory of Networks and Systems*, 2014.
- [71] Pieter Collins. Input-output representations for verifying safety properties. In *Proceedings of the International Symposium on Mathematical Theory of Networks and Systems*, 2014.
- [72] Michael Clerx, Pieter Collins, and Paul Volders. Applying novel identification protocols to Markov models of I_{Na} . In *Proceedings of the 42nd Annual Conference on Computing in Cardiology*, 2015.
- [73] Luca Geretti, Davide Bresolin, Pieter Collins, Sanja Živanović Gonzalez, and Tiziano Villa. Ongoing work on automated verification of noisy nonlinear systems with Ariadne. In Nina Yevtushenko, Ana Rosa Cavalli, and Hüsnü Yenigün, editors, *Testing Software and Systems*, pages 313–319. Springer, 2017.
- [74] David Roschewitz, Kurt Driessens, and Pieter Collins. Simultaneous ensemble generation and hyperparameter optimization for regression. In Bart Verheij and Marco Wiering, editors, *Artificial Intelligence*, pages 116–130, Cham, 2018. Springer.
- [75] Firat Ismailoglu, Evgueni Smirnov, Ralf Peeters, Shuang Zhou, and Pieter Collins. Heterogeneous domain adaptation based on class decomposition schemes. In Dinh Phung, Vincent S. Tseng, Geoffrey I. Webb, Bao Ho, Mohadeseh Ganji, and Lida Rashidi, editors, *Advances in Knowledge Discovery and Data Mining*, pages 169–182, Cham, 2018. Springer.
- [76] Luca Geretti, Sanja Gonzalez Živanović, Pieter Collins, Davide Bresolin, and Tiziano Villa. Rigorous continuous evolution of uncertain systems. In *Proceedings of the International Workshop on Numerical Software Verification*, pages 60–75, 2019.
- [77] Luca Geretti, Julien Alexandre dit Sandretto, Matthias Althoff, Luis Benet, Alexandre Chapoutot, Xin Chen, Pieter Collins, Marcelo Forets, Daniel Freire, Fabian Immler, Niklas Kochdumper, David P. Sanders, and Schilling Christian. ARCH-COMP20 category report: Continuous and hybrid systems with nonlinear dynamics. In Goran Frehse and Matthias Althoff, editors, *7th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH20)*, volume 74 of *EPiC Series in Computing*, pages 49–75, 2020.
- [78] Davide Bresolin, Pieter Collins, Luca Geretti, Roberto Segala, Tiziano Villa, and Sanja Živanović Gonzalez. A computable and compositional semantics for hybrid automata. In *Proceedings of the 23rd International Conference on Hybrid Systems: Computation and Control*, pages 1–11, 2020.
- [79] Luca Geretti, Julien Alexandre dit Sandretto, Matthias Althoff, Luis Benet, Alexandre Chapoutot, Pieter Collins, Parasara Sridhar Duggirala, Marcelo Forets, Edward Kim, Uziel Linares, David P. Sanders, Christian Schilling, and Mark Wetzlinger. ARCH-COMP21 category report: Continuous and hybrid systems with nonlinear dynamics. In Goran Frehse and Matthias Althoff, editors, *Proceedings of the 8th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH21)*, volume 80 of *EPiC Series in Computing*, pages 32–54, 2021.
- [80] Jonas Bei, David Pomeranke, Lukas Schreiner, Sepideh Sharbaf, Pieter Collins, and Nico Roos. Explainable AI through the learning of arguments. In Luis A. Leiva, Cédric Pruski, Réka Markovich, Amro Najjar, and Christoph Schommer, editors, *Artificial Intelligence and Machine Learning. Proceedings of the 33rd Benelux Conference on Artificial Intelligence, BNAIC/Benelearn*, volume 80 of *Communications in Computer and Information Science*, pages 241–255, 2021.
- [81] Pieter Collins and Michal Konecny. Computability of the behaviour of impacting systems beyond Zeno times. In *Proceedings of the 25th International Symposium on Mathematical Theory of Networks and Systems, Bayreuth, Germany*, 2022.
- [82] Pieter Collins. Monadic systems. In *Proceedings of the 25th International Symposium on Mathematical Theory of Networks and Systems, Bayreuth, Germany*, 2022.
- [83] Franz Brauße, Pieter Collins, and Martin Ziegler. Computer science for continuous data. In François Boulier, Matthew England, Timur M. Sadykov, and Evgenii V. Vorozhtsov, editors, *Computer Algebra in Scientific Computing*, pages 62–82. Springer, 2022.
- [84] Luca Geretti, Pieter Collins, Davide Bresolin, and Tiziano Villa. Automating numerical parameters along the evolution of a nonlinear system. In Thao Dang and Volker Stolz, editors, *Runtime Verification*, pages 336–345. Springer, 2022.

- [85] Luca Geretti, Julien Alexandre dit Sandretto, Matthias Althoff, Luis Benet, Pieter Collins, Parasara Duggirala, Marcelo Forets, Edward Kim, Stefan Mitsch, Christian Schilling, and Mark Wetzlinger. ARCH-COMP22 category report: Continuous and hybrid systems with nonlinear dynamics. In Goran Frehse, Matthias Althoff, Erwin Schoitsch, and Jeremie Guiochet, editors, *Proceedings of 9th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH22)*, volume 90 of *EPiC Series in Computing*, pages 86–112. EasyChair, 2022.
- [86] Luca Geretti, Julien Alexandre dit Sandretto, Matthias Althoff, Luis Benet, Pieter Collins, Marcelo Forets, Stefan Mitsch, Christian Schilling, Joris Tillet, and Mark Wetzlinger. Arch-comp24 category report: Continuous and hybrid systems with nonlinear dynamics. In Goran Frehse and Matthias Althoff, editors, *Proceedings of 11th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH24)*, volume 103 of *EPiC Series in Computing*, pages 39–63. EasyChair, 2024.
- [87] Pieter Collins, Bastiaan Laarakker, and Sasha Sindorf. Verification of compositional frameworks in Coq. In *Proceedings of the 26th International Symposium on Mathematical Theory of Networks and Systems, Cambridge, United Kingdom, 2024*.

Contributions to Books

- [88] Davide Bresolin, Luca Geretti, Tiziano Villa, and Pieter Collins. An introduction to the verification of hybrid systems using ARIADNE. In van Schuppen and Villa [91], pages 339–346.
- [89] Sanja Živanović Gonzalez and Pieter Collins. Computing reachable sets of differential inclusions. In van Schuppen and Villa [91], pages 357–365.
- [90] Pieter Collins, Simcha van Helvoort, Giorgi Khimshiasvili, Antonio Marsella, Jaap Molenaar, and Lense Swaenen. Prediction of print success for concrete 3d printing. In Jaap Molenaar and Hans Stigter, editors, *Proceedings of the 148th European Study Group Mathematics with Industry*. 2019.
- [91] Jan H. van Schuppen and Tiziano Villa, editors. *Coordination Control of Distributed Systems*, volume 456 of *Lecture Notes in Control and Information Sciences*. Springer, 2015.

Survey and Expository Articles

- [92] Pieter Collins. Chaotic dynamics in hybrid systems. *Nonlinear Dyn. Syst. Theory*, 8(2):169–194, 2008.

Software

- [93] Pieter Collins, Davide Bresolin, Alberto Casagrande, Luca Geretti, Ivan Zapreev, and Sanja Živanović Gonzalez. ARIADNE – a C++/Python library for formal verification of cyber-physical systems, using reachability analysis and rigorous numerics on nonlinear hybrid automata. (Release 2.4.1 August 2021.) <http://www.ariadne-cps.org/>.

Theses, Technical Reports and Preprints

- [94] Pieter Collins. *Surface Diffeomorphisms with Homoclinic and Heteroclinic Tangles*. PhD thesis, University of California, Berkeley, 1999.
- [95] S. Živanović and P. J. Collins. Higher Order Methods for Differential Inclusions. Technical Report MAC-1007, Centrum Wiskunde en Informatica, November 2010.
- [96] Pieter Collins. Computable stochastic processes. Technical report, 2014. arXiv:1409.4667.
- [97] Pieter Collins. Computable random variables and conditioning. Technical report, 2020. arXiv:2101.00956.
- [98] Pieter Collins, Luca Geretti, Sanja Gonzalez Zivanovic, Davide Bresolin, and Tiziano Villa. Rigorous function calculi in Ariadne. Technical report, 2023. arXiv:2306.17541.