Curriculum Vitae – Sergiy Bogomolov

1 Contact Information

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Newcastle University
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2 Research Interests

Cyber-physical systems and artificial intelligence.

3 Brief Biography

Sergiy Bogomolov is a Reader / Associate Professor in Cyber-Physical Systems at Newcastle University (UK). Sergiy joined Newcastle University from Australian National University (Australia) in September 2019. Prior to being a faculty member at ANU, Sergiy was a postdoctoral researcher at the Institute of Science and Technology Austria (IST Austria). His research focuses on the development of algorithms and tools to model and analyze complex concurrent and distributed systems. In particular, Sergiy aims at providing scalable solutions for automatic analysis of cyber-physical systems using the techniques on the interface of the areas of verification, control and artificial intelligence. Sergiy has over 40 publications in top hybrid systems, verification and AI venues, such as EMSOFT, HSCC, TACAS, AAAI, IJCAI and ICAPS targeting multiple applications domains such as autonomous systems, systems biology and operations research. He has co-chaired several events (HSCC'21, ADHS RE'21, SNR'15-17, NSV'15-16, MOCHAP'15), served on the program committees of around 50 conferences and workshops; he was also ACM SIGBED Review Editor in 2017-2019. Sergiy's work has won several awards such as Best Repeatability Evaluation Package Award at HSCC'16, Best Tool Award at ARCH'16 and Best Paper Award at HVC'14. He started the International Workshop on Symbolic-Numeric Methods for Reasoning about CPS and IoT in 2015 (collocated with CAV, Cyber-Physical Systems Week and ETAPS in different years). In order to ensure his research has a lasting impact in the community, Sergiy actively pursues research collaborations and has been supported by a number of agencies and companies. These include US Air Force Office of Scientific Research, Defence Science and Technology Group (Australia) and Toyota (USA). His Ph.D. and M.Sc. degrees are from the University of Freiburg (Germany).

4 Education

Ph.D. in Computer Science (with distinction)
University of Freiburg, Germany, 2015
Thesis: Abstraction-based Analysis of Hybrid Automata
Advisor: Prof. Dr. Andreas Podelski

M.Sc. in Applied Computer Science
University of Freiburg, Germany, 2009

B.Sc. in Applied Mathematics
V. Karazin Kharkiv National University, Ukraine, 2007

5 Professional Employment

Since December 2020: **Reader / Associate Professor in Cyber-Physical Systems**, Newcastle University, UK

August 2020 – November 2020: **Senior Lecturer / Associate Professor**, Newcastle University, UK

September 2019 – July 2020: **Lecturer / Assistant Professor**, Newcastle University, UK

October 2016 – August 2019: **Lecturer / Assistant Professor**, Australian National University, Australia

January 2015 – September 2016: **Postdoctoral Researcher**, Institute of Science and Technology Austria, Austria

October 2009 – December 2014: **Research and Teaching Assistant**, University of Freiburg, Germany

March – April 2012 and June – July 2016: **Visiting Researcher**, Verimag, Grenoble, France

October 2012 – January 2013: **Intern**, NEC Laboratories America, Princeton, NJ, USA

6 Honors

Invited to participate as a Young Scientist at the **Annual Meeting of the New Champions**, World Economic Forum, 2017 and 2019

Best Repeatability Evaluation Package Award, 19th International Conference on Hybrid Systems: Computation and Control, 2016

Best Tool Award, 3rd International Workshop on Applied Verification for Continuous and Hybrid Systems, 2016

Selected to participate in the **3rd Heidelberg Laureate Forum**, 2015

Best Paper Award, 10th Haifa Verification Conference (HVC), 2014

Scholarship of the DAAD (German Academic Exchange Service), 2007 – 2009

Scholarship of the President of Ukraine, 2005 – 2007

First place in All-Ukrainian Collegiate Programming Olympiad, 2006

7 Publications

Peer-Reviewed Conference Publications

[1] Stanley Bak, Sergiy Bogomolov, Parasara Sridhar Duggirala, Adam Gerlach, and Kostiantyn Potomkin. Reachability of black-box nonlinear systems after Koopman operator linearization. Accepted to *7th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS 2021)*.

[2] Dongxu Li, Stanley Bak, and Sergiy Bogomolov. Reachability analysis of nonlinear systems using hybridization and dynamics scaling. In *18th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS 2020)*, volume 12288 of *LNCS*, pages 265–282. Springer, 2020.

[3] Petro Feketa, Sergiy Bogomolov, and Thomas Meurer. Safety verification for impulsive systems. Accepted to *21st IFAC World Congress*, 2020.

[4] Sergiy Bogomolov, Marcelo Forets, and Kostiantyn Potomkin. Case study: Reachability and scalability in a unified combat-command-and-control model. In *14th International Conference on Reachability Problems (RP 2020)*, volume 12448 of *LNCS*, pages 52–66. Springer, 2020.

[5] Sergiy Bogomolov, Goran Frehse, Amit Gurung, Dongxu Li, Georg Martius, and Rajarshi Ray. Falsification of hybrid systems using symbolic reachability and trajectory splicing. In *22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2019)*, pages 1–10. ACM, 2019.

[6] Sergiy Bogomolov, Marcelo Forets, Goran Frehse, Kostiantyn Potomkin, and Christian Schilling. JuliaReach: a toolbox for set-based reachability. In *22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2019)*, pages 39–44. ACM, 2019.

[7] Alexander Heinz, Martin Wehrle, Sergiy Bogomolov, Daniele Magazzeni, Marius Greitschus, and Andreas Podelski. Temporal planning as refinement-based model checking. In *29th International Conference on Automated Planning and Scheduling (ICAPS 2019)*, pages 195–199. AAAI Press, 2019.

[8] Sergiy Bogomolov, Marcelo Forets, Goran Frehse, Andreas Podelski, Christian Schilling, and Frédéric Viry. Reach Set Approximation through Decomposition with Low-dimensional Sets and High-dimensional Matrices. In *21th International Conference on Hybrid Systems: Computation and Control (HSCC 2018)*, pages 41–50. ACM, 2018.

[9] Dongxu Li, Enrico Scala, Patrik Haslum, and Sergiy Bogomolov. Effect-abstraction based relaxation for linear numeric planning. In *27th International Joint Conference on Artificial Intelligence (IJCAI 2018)*, pages 4787–4793. International Joint Conferences on Artificial Intelligence Organization, 2018.

[10] Stanley Bak, Sergiy Bogomolov, and Matthias Althoff. Time-triggered conversion of guards for reachability analysis of hybrid automata. In *15th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS 2017)*, volume 10419 of *LNCS*, pages 133–150. Springer, 2017.

[11] Sergiy Bogomolov, Mirco Giacobbe, Thomas A. Henzinger, and Hui Kong. Conic abstractions for hybrid systems. In *15th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS 2017)*, volume 10419 of *LNCS*, pages 116–132. Springer, 2017.

[12] Sergiy Bogomolov, Goran Frehse, Mirco Giacobbe, and Thomas A. Henzinger. Counterexample-guided refinement of template polyhedra. In *23rd International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2017)*, volume 10205 of *LNCS*, pages 589–606. Springer, 2017.

[13] Hui Kong, Sergiy Bogomolov, Christian Schilling, Yu Jiang, and Thomas Henzinger. Safety verification of nonlinear hybrid systems based on invariant clusters. In *20th International Conference on Hybrid Systems: Computation and Control (HSCC 2017)*, pages 163–172. ACM, 2017.

[14] Amit Gurung, Arup Kumar Deka, Ezio Bartocci, Sergiy Bogomolov, Radu Grosu, and Rajarshi Ray. Parallel reachability analysis for hybrid systems. In *14th ACM-IEEE International Conference on Formal Methods and Models for System Design (MEMOCODE 2016)*, pages 12–22. ACM-IEEE, 2016.

[15] Stanley Bak, Sergiy Bogomolov, Thomas A. Henzinger, Taylor T. Johnson, and Pradyot Prakash. Scalable static hybridization methods for analysis of nonlinear systems. In *19th International Conference on Hybrid Systems: Computation and Control (HSCC 2016)*, pages 155–164. ACM, 2016. **Best Repeatability Evaluation Package Award**.

[16] Sergiy Bogomolov, Daniele Magazzeni, Stefano Minopoli, and Martin Wehrle. PDDL+ Planning with Hybrid Automata: Foundations of Translating Must Behavior. In *25th International Conference on Automated Planning and Scheduling (ICAPS 2015)*, pages 42–46. AAAI Press, 2015.

[17] Sergiy Bogomolov, Thomas A. Henzinger, Andreas Podelski, Jakob Ruess, and Christian Schilling. Adaptive moment closure for parameter inference of biochemical reaction networks. In *13th International Conference on Computational Methods in Systems Biology (CMSB 2015)*, volume 9308 of *LNCS*, pages 77–89. Springer, 2015.

[18] Rajarshi Ray, Amit Gurung, Binayak Das, Ezio Bartocci, Sergiy Bogomolov, and Radu Grosu. XSpeed: Accelerating reachability analysis on multi-core processors. In *11th International Haifa Verification Conference (HVC 2015)*, volume 9434 of *LNCS*, pages 3–18. Springer, 2015.

[19] Sergiy Bogomolov, Christian Schilling, Ezio Bartocci, Grégory Batt, Hui Kong, and Radu Grosu. Abstraction-based parameter synthesis for multiaffine systems. In *11th International Haifa Verification Conference (HVC 2015)*, volume 9434 of *LNCS*, pages 19–35. Springer, 2015.

[20] Sergiy Bogomolov, Marius Greitschus, Peter G. Jensen, Kim G. Larsen, Marius Mikucionis, Thomas Strump, and Stavros Tripakis. Co-simulation of hybrid systems with SpaceEx and Uppaal. In *11th International Modelica Conference (Modelica 2015)*, Linköping Electronic Conference Proceedings, pages 159–169. Linköping University Electronic Press, Linköpings universitet, 2015.

[21] Stanley Bak, Sergiy Bogomolov, and Taylor T. Johnson. HYST: a source transformation and translation tool for hybrid automaton models. In *18th International Conference on Hybrid Systems: Computation and Control (HSCC 2015)*, pages 128–133. ACM, 2015.

[22] Goran Frehse, Sergiy Bogomolov, Marius Greitschus, Thomas Strump, and Andreas Podelski. Eliminating spurious transitions in reachability with support functions. In *18th International Conference on Hybrid Systems: Computation and Control (HSCC 2015)*, pages 149–158. ACM, 2015.

[23] Luan Viet Nguyen, Christian Schilling, Sergiy Bogomolov, and Taylor T. Johnson. Runtime verification for hybrid analysis tools. In *6th International Conference on Runtime Verification (RV 2015)*, volume 9333 of *LNCS*, pages 281–286. Springer, 2015.

[24] Sergiy Bogomolov, Daniele Magazzeni, Andreas Podelski, and Martin Wehrle. Planning as Model Checking in Hybrid Domains. In *AAAI Conference on Artificial Intelligence (AAAI 2014)*, pages 2228–2234. AAAI Press, 2014.

[25] Sergiy Bogomolov, Goran Frehse, Marius Greitschus, Radu Grosu, Corina S. Pasareanu, Andreas Podelski, and Thomas Strump. Assume-guarantee abstraction refinement meets hybrid systems. In *Haifa Verification Conference (HVC 2014)*, volume 8855 of *LNCS*, pages 116–131. Springer, 2014. **Best Paper Award**.

[26] Sergiy Bogomolov, Christian Herrera, Marco Muñiz, Bernd Westphal, and Andreas Podelski. Quasi-dependent variables in hybrid automata. In *17th International Conference on Hybrid Systems: Computation and Control (HSCC 2014)*, pages 93–102. ACM, 2014.

[27] Sergiy Bogomolov, Alexandre Donzé, Goran Frehse, Radu Grosu, Taylor T. Johnson, Hamed Ladan, Andreas Podelski, and Martin Wehrle. Abstraction-based guided search for hybrid systems. In *Model Checking Software (SPIN 2013)*, volume 7976 of *LNCS*, pages 117–134. Springer, 2013.

[28] Sergiy Bogomolov, Goran Frehse, Radu Grosu, Hamed Ladan, Andreas Podelski, and Martin Wehrle. A box-based distance between regions for guiding the reachability analysis of SpaceEx. In *Computer Aided Verification (CAV 2012)*, volume 7358 of *LNCS*, pages 479–494. Springer, 2012.

[29] Sergiy Bogomolov, Corina Mitrohin, and Andreas Podelski. Composing reachability analyses of hybrid systems for safety and stability. In *8th International Symposium on Automated Technology for Verification and Analysis (ATVA 2010)*, volume 6252 of *LNCS*, pages 67–81. Springer, 2010.

[30] Sergiy Bogomolov, Martin Mann, Björn Voß, Andreas Podelski, and Rolf Backofen. Shape-based barrier estimation for RNAs. In *German Conference on Bioinformatics (GCB 2010)*, volume 173 of *LNI*, pages 41–50. GI, 2010.

Peer-Reviewed Journal Publications

[31] Sergiy Bogomolov, Marcelo Forets, Goran Frehse, Kostiantyn Potomkin, and Christian Schilling. Reachability analysis of linear hybrid systems via block decomposition. *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, 39(11):4018–4029, 2020. Special Issue from EMSOFT 2020.

[32] Bai Xue, Martin Fränzle, Naijun Zhan, Sergiy Bogomolov, and Bican Xia. Safety verification for random ordinary differential equations. *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, 39(11):4090–4101, 2020. Special Issue from EMSOFT 2020.

[33] Amit Gurung, Rajarshi Ray, Ezio Bartocci, Sergiy Bogomolov, and Radu Grosu. Parallel reachability analysis of hybrid systems in XSpeed. *International Journal on Software Tools for Technology Transfer (STTT)*, pages 1–23, 2018.

[34] Stanley Bak, Omar Ali Beg, Sergiy Bogomolov, Taylor T. Johnson, Luan Viet Nguyen, and Christian Schilling. Hybrid automata: From verification to implementation. *International Journal on Software Tools for Technology Transfer (STTT)*, pages 1–18, 2017.

[35] Christian Schilling, Sergiy Bogomolov, Thomas A. Henzinger, Andreas Podelski, and Jakob Ruess. Adaptive moment closure for parameter inference of biochemical reaction networks. *Biosystems*, 149:15 – 25, 2016.

[36] Sergiy Bogomolov, Alexandre Donzé, Goran Frehse, Radu Grosu, Taylor T. Johnson, Hamed Ladan, Andreas Podelski, and Martin Wehrle. Guided search for hybrid systems based on coarse-grained space abstractions. *International Journal on Software Tools for Technology Transfer (STTT)*, pages 1–19, 2015.

Edited Workshop Proceedings

[37] Erika Ábrahám and Sergiy Bogomolov, editors. *3st International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2017), Uppsala, Sweden, April 22, 2017 (collocated with ETAPS 2017)*, EPTCS, 2017.

[38] Sergiy Bogomolov, Matthieu Martel, and Pavithra Prabhakar, editors. *9th International Workshop on Numerical Software Verification (NSV 2016), Toronto, ON, Canada, July 17-18, 2016 (collocated with CAV 2016), Revised Selected Papers*, volume 10152 of *Lecture Notes in Computer Science*. Springer, 2017.

[39] Erika Ábrahám and Sergiy Bogomolov, editors. *2nd International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2016), Vienna, Austria, April 11, 2016 (collocated with CPSWeek 2016)*. IEEE, 2016.

[40] Sergiy Bogomolov and Matthieu Martel, editors. *The Seventh and Eighth International Workshops on Numerical Software Verification (NSV 2014-15)*, volume 317. Elsevier, 2015.

[41] Sergiy Bogomolov and Ashish Tiwari, editors. *1st International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2015), San Francisco, CA, USA, July 19, 2015 (collocated with CAV 2015)*, EPiC Series in Computing. EasyChair, 2015.

Peer-Reviewed Workshop Publications

[42] Sergiy Bogomolov, John Fitzgerald, Frederik Foldager, Peter Gorm Larsen, Ken Pierce, Paulius Stankaitis, and Ben Wooding. Tuning Robotti: the machine-assisted exploration of parameter spaces in multi-models of a cyber-physical system. Accepted to *18th Overture Workshop*, 2020.

[43] Stanley Bak, Sergiy Bogomolov, Thomas A. Henzinger, and Aviral Kumar. Challenges and tool implementation of hybrid rapidly-exploring random trees. In *10th International Workshop on Numerical Software Verification (NSV 2017)*, volume 10381 of *LNCS*, pages 83–89. Springer, 2017.

[44] Stanley Bak, Sergiy Bogomolov, and Christian Schilling. High-level hybrid systems analysis with hypy. In Goran Frehse and Matthias Althoff, editors, *3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2016)*, volume 43 of *EPiC Series in Computing*, pages 80–90. EasyChair, 2016. **Best Tool Award**.

[45] Sergiy Bogomolov, Christian Herrera, and Wilfried Steiner. Verification of fault-tolerant clock synchronization algorithms. In *3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2016)*, volume 43 of *EPiC Series in Computing*, pages 36–41. EasyChair, 2016.

[46] Hui Kong, Ezio Bartocci, Sergiy Bogomolov, Radu Grosu, Thomas A. Henzinger, Yu Jiang, and Christian Schilling. Discrete abstraction of multiaffine systems. In *5th International Workshop on Hybrid Systems Biology (HSB 2016)*, volume 9957 of *LNCS*, pages 128–144. Springer, 2016.

[47] Stanley Bak, Sergiy Bogomolov, Marius Greitschus, and Taylor T Johnson. Benchmark generator for stratified controllers of tank networks. In *1st and 2nd International Workshop on Applied veRification for Continuous and Hybrid Systems (ARCH 2014-15)*, volume 34 of *EPiC Series in Computer Science*, pages 73–79. EasyChair, 2015.

8 Team

Newcastle University, UK:

- Paulius Stankaitis, postdoctoral researcher, since April 2020
- Kostiantyn Potomkin, PhD student, since November 2017, Topic: Verification of Autonomous Systems
- Abdelrahman Hekal, PhD student, since September 2020, Topic: Verification of Hybrid Automata and Machine learning for Cyber-Physical Systems
- Tom Helyer, PhD student (co-supervised with John Fitzgerald and Peter Gorm Larsen), since September 2020, Topic: From Co-Simulation to Co-Verification – Advancing Analytic Techniques for the Design of Cyber-Physical Systems

Australian National University, Australia:

- Dongxu Li, PhD student, 2018-2019, Topic: Verification of Nonlinear Hybrid Systems
- Haodong Yao, PhD student, 2018-2019, Topic: Compositional Analysis of Cyber-Physical Systems

9 Research Grants

- Principal Investigator, Asian Office of Aerospace Research and Development, US Air Force Office of Scientific Research, *Compositional Analysis of Autonomous Systems*, 2017-2021.
- Principal Investigator, Toyota Research Institute of North America, *Towards Trusted Autonomy via Reachability Analysis*, 2020-2021.
- Principal Investigator, EPSRC IAA, *Prediction Algorithms for Autonomous Systems*, 2020-2021.
- Principal Investigator, Foretellix, *Automated Testing of Autonomous Vehicles*, 2021.
- Principal Investigator, Defence Science and Technology Group, Australia, Modelling Complex Warfighting Strategic Research Investment, *Hybrid Automata for Complex Combats*, 2019.
- Principal Investigator, Defence Science and Technology Group, Australia, Competitive Evaluation Research Agreement (CERA) Program, *Safety for Autonomous Systems in Uncertain Environments*, 2017-2018.
- Principal Investigator, AAS-ANU European COST Travel Grant, *EU ICT COST Action IC1402 "Runtime Verification beyond Monitoring (ARVI)"*, 2017-2018.
- Principal Investigator, ANU Early Career Researchers Travel Grant, 2017.

10 Invited Talks

- *Trusted Autonomous Systems: Verification Meets Falsification*
  - University of Liverpool, UK, February 2020
  - University of York, UK, January 2020
  - Dagstuhl Seminar "Analysis of Autonomous Mobile Collectives in Complex Physical Environments", Germany, October 2019
- *Hybrid Automata in Generalised Combat Models*
  - Defence Science and Technology Laboratory, UK, January 2020
- *Trustworthy Cyber-Physical Systems: Dream or Reality?*
  - United Technologies Research Center, Italy, February 2020
  - Institute of Software, Chinese Academy of Sciences, China, July 2019
  - National Institute of Informatics, Japan, June 2019
  - DENSO Corporation, Japan, June 2019
  - Northeastern University, USA, April 2019
  - Galois, USA, April 2019
- *Time-Triggered Conversion of Guards for Reachability Analysis of Hybrid Automata*
  - Verimag, France, April 2018
  - Institute of Science and Technology Austria, Austria, April 2018
  - Technical University of Vienna, Austria, April 2018
- *Verification and AI Planning for Robotics*, Australian Centre for Robotic Vision, Australia, October 2017
- *Towards Scalable Verification of Cyber-Physical Systems*
  - University of Luxembourg, Luxembourg, April 2018
  - STELaRLab, Lockheed Martin Australia, Australia, December 2017
  - United Technologies Research Center, USA, September 2017
  - Toyota InfoTechnology Center, USA, September 2017
  - Nanjing University, China, June 2017
- *Scalable Static Hybridization Methods for Analysis of Nonlinear Systems*
  - University of Pennsylvania, USA, April 2017
  - Stony Brook University, USA, April 2017

  - Technical University of Munich, Germany, January 2017
  - University of Oldenburg, Germany, December 2016
  - Dagstuhl Seminar "Symbolic-Numeric Methods for Reliable and Trustworthy Problem Solving in Cyber-Physical Domains", December 2016
- *Cyber-Physical Systems: Challenges and Opportunities*
  - CyberCardia Project Meeting, University of Pennsylvania, USA, April 2017
  - Technical University of Kaiserslautern, Germany, December 2016
  - Taras Shevchenko National University of Kyiv, Ukraine, December 2016
  - Igor Sikorsky Kyiv Polytechnic Institute, Ukraine, December 2016
  - Siemens, Vienna, Austria, June 2016
- *Abstraction-based Parameter Synthesis for Multiaffine Systems*, UC Berkeley, USA, July 2015
- *Hybrid Systems: Guided Search, Abstractions, and Beyond*, 2nd Workshop on Model-Checking and Automated Planning (MOCHAP) collocated with ICAPS 2015, Israel, June 2015
- *Guided Search for Hybrid Systems*, Dagstuhl Seminar "Automated Planning and Model Checking", Germany, November 2014

11 Professional Activities

Program Chair/Organizer

- Repeatability Evaluation Chair (jointly with Aditya Zutshi), *7th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS 2021)*, Brussels, Belgium, July 2021
- Program Chair (jointly with Raphaël Jungers), *24th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2021)*, Nashville, Tennessee, USA, May 2021
- General Chair, *1st International Workshop on Verification of Autonomous and Robotic Systems (VARS)*, collocated with CPS-IoT Week 2021, Nashville, Tennessee, USA, May 2021
- Repeatability Evaluation Chair, *ACM International Conference on Hybrid Systems: Computation and Control (HSCC)*, 2017-2020
- Publicity Chair, *International Workshop on Applied Verification for Continuous and Hybrid Systems* (ARCH), 2016-2021
- Program Chair and Organizer (jointly with Erika Ábrahám), *3nd International Workshop on Symbolic and Numerical Methods for Reachability Analysis* (SNR 2017) collocated with ETAPS, Uppsala, Sweden, April 2017
- Organizer (jointly with Martin Fränzle, Kyoko Makino and Nacim Ramdani), *Dagstuhl Seminar 16491 on Symbolic-Numeric Methods for Reliable and Trustworthy Problem Solving in Cyber-Physical Domains*, Wadern, Germany, December 2016
- Registration Chair, *Cyber-Physical Systems Week 2016*, Vienna, Austria, April 2016
- Program Chair and Organizer (jointly with Erika Ábrahám), *2nd International Workshop on Symbolic and Numerical Methods for Reachability Analysis* (SNR 2016) collocated with CPSWeek, Vienna, Austria, April 2016
- Program Chair and Organizer (jointly with Matthieu Martel and Pavithra Prabhakar), *9th International Workshop on Numerical Software Verification* (NSV 2016) collocated with CAV, Toronto, Canada, July 2016
- Program Chair and Organizer (jointly with Ashish Tiwari), *1st International Workshop on Symbolic and Numerical Methods for Reachability Analysis* (SNR) collocated with CAV, San Francisco, USA, July 2015
- Program Chair and Organizer (jointly with Daniele Magazzeni and Martin Wehrle), *Workshop Model Checking and Automated Planning* (MOCHAP 2015) collocated with ICAPS, Jerusalem, Israel, June 2015
- Program Chair and Organizer (jointly with Matthieu Martel), *8th International Workshop on Numerical Software Verification* (NSV 2015) collocated with CPSWeek, Seattle, USA, April 2015
- Experiment and Evaluation Chair (jointly with Taylor T. Johnson), *2nd International Workshop on Applied Verification for Continuous and Hybrid Systems* (ARCH 2015) collocated with CPSWeek, Seattle, USA, April 2015

Editor

- ACM SIGBED Review, 2017 – 2019

Associate Editor

- ACM SIGBED Review, 2016 – 2017

Steering Committee Member

- International Workshop on Numerical Software Verification (NSV), 2017 – present
- International Workshop on Symbolic-Numeric methods for Reasoning about CPS and IoT (SNR), 2017 – present

Repeatability Evaluation Advisory Committee Member

- ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2020 – present

Program Committee Member

- 14th International Conference on Advanced Engineering Computing and Applications in Sciences (ADVCOMP 2021), Barcelona, Spain, October 2021
- 7th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS 2021), Brussels, Belgium, July 2021
- 1st International Workshop on Software Engineering for Industrial Cyber-Physical Systems (SE4ICPS 2021) collocated with COMPSAC, Madrid, Spain, July 2021
- 35th AAAI Conference on Artificial Intelligence (AAAI 2021), Main PC + Student Abstract and Poster Program + Doctoral Consortium, virtual conference due to COVID-19, February 2021
- 25rd International Conference on Engineering of Complex Computer Systems (ICECCS 2020), Singapore, October 2020
- 14th International Conference on Reachability Problems (RP 2020), Paris, France, October 2020
- ACM/IEEE International Conference on Embedded Software (EMSOFT 2020), Hamburg, Germany, September 2020
- 6th International Workshop on Symbolic-Numeric methods for Reasoning about CPS and IoT (SNR 2020), Vienna, Austria, August 2020
- Summer Simulation Conference (SummerSim 2020), Madrid, Spain, July 2020
- 23th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2020), Sydney, Australia, April 2020
- 11th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2020), Sydney, Australia, April 2020
- 7th International Workshop on Hybrid Systems Biology (HSB 2020), Vienna, Austria, April 2020
- 34th AAAI Conference on Artificial Intelligence (AAAI 2020), Main PC + Student Abstract and Poster Program, New York, USA, February 2020
- 32nd Australasian Joint Conference on Artificial Intelligence (AI 2019), Adelaide, Australia, December 2019
- 24rd International Conference on Engineering of Complex Computer Systems (ICECCS 2019), Hong Kong, China, November 2019
- ACM/IEEE International Conference on Embedded Software (EMSOFT 2019), New York City, USA, October 2019
- 9th Workshop on Model-Based Design of Cyber Physical Systems (CyPhy 2019) collocated with EMSOFT, New York City, USA, October 2019
- 23rd International Symposium on Formal Methods (FM 2019), Porto, Portugal, October 2019
- 17th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS 2019), Amsterdam, Netherlands, August 2019
- 22st Euromicro Conference on Digital System Design (DSD 2019), Special Session on Cyber-Physical Systems, Chalkidiki, Greece, August 2019
- 22th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2019), Montreal, Canada, April 2019
- 6th International Workshop on Hybrid Systems Biology (HSB 2019), Prague, Czech Republic, April 2019
- 5th International Workshop on Symbolic-Numeric Methods for Reasoning about CPS and IoT (SNR 2019), Montreal, Canada, April 2019

- 33nd AAAI Conference on Artificial Intelligence (AAAI 2019), Main PC + Student Abstract and Poster Program, Honolulu, Hawaii, USA, February 2019
- 23rd International Conference on Engineering of Complex Computer Systems (ICECCS 2018), Melbourne, Australia, December 2018
- ACM International Conference on Embedded Software (EMSOFT 2018), Turin, Italy, October 2018
- 8th Workshop on Model-Based Design of Cyber Physical Systems (CyPhy 2018) collocated with EMSOFT, Turin, Italy, October 2018
- 10th International Conference on Advances in System Testing and Validation Lifecycle (VALID 2018), Nice, France, October 2018
- 16th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS 2018), Beijing, China, September 2018
- 15th International Conference on Quantitative Evaluation of Systems (QEST 2018), Beijing, China, September 2018
- 21st Euromicro Conference on Digital System Design (DSD 2018), Special Session on Cyber-Physical Systems, Prague, Czech Republic, August 2018
- 6th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS 2018), Oxford, UK, July 2018
- Artefact Evaluation for the 30th International Conference on Computer Aided Verification (CAV 2018), Oxford, UK, July 2018
- 21th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2018), Porto, Portugal, April 2018
- 4th International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2018), Thessaloniki, Greece, April 2018
- 32nd AAAI Conference on Artificial Intelligence (AAAI 2018), Main PC + Student Abstract and Poster Program, New Orleans, Louisiana, USA, February 2018
- ACM International Conference on Embedded Software (EMSOFT 2017), Seoul, South Korea, October 2017
- 15th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS 2017), Berlin, Germany, September 2017
- 29th International Conference on Computer-Aided Verification (CAV 2017), Heidelberg, Germany, July 2017
- 10th International Workshop on Numerical Software Verification (NSV 2017), Heidelberg, Germany, July 2017
- 20th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2017), Pittsburgh, PA, USA, April 2017
- 31th AAAI Conference on Artificial Intelligence (AAAI 2017), Student Abstract and Poster Program, San Francisco, CA, USA, February 2017
- 13th International Conference on Formal Aspects of Component Software (FACS 2016), Besançon, France, October 2016
- 4th IEEE International Conference on Cyber-Physical Systems, Networks, and Applications (CPSNA 2016), Nagoya, Japan, October 2016
- 5th International Workshop on Hybrid Systems Biology (HSB 2016), Grenoble, France, October 2016
- Repeatability Evaluation for the 19th ACM International Conference on Hybrid Systems Computation and Control (HSCC 2016), Vienna, Austria, April 2016
- 1st International Workshop on Monitoring and Testing of Cyber-Physical Systems (MT-CPS 2016) collocated with CPSWeek, Vienna, Austria, April 2016
- 30th AAAI Conference on Artificial Intelligence (AAAI) 2016, Student Abstract and Poster Program, Phoenix, Arizona, USA, February 2016
- 4th International Workshop on Hybrid Systems Biology (HSB 2015) collocated with Madrid Meet, Madrid, Spain, September 2015
- Artefact Evaluation for the 27th International Conference on Computer Aided Verification (CAV 2015), San Francisco, USA, July 2015

- Repeatability Evaluation for the 17th International Conference on Hybrid Systems Computation and Control (HSCC 2014), Berlin, Germany, April 2014

Journal Reviewer

- Formal Methods in System Design (FMSD), Formal Aspects of Computing, Automatica, Journal of Logical and Algebraic Methods in Programming (JLAMP), Information and Computation , Discrete Event Dynamic Systems, ACM Transactions on Cyber-Physical Systems (TCPS), ACM Transactions on Computer Systems (TOCS), Information Systems Frontiers, Nonlinear Analysis: Hybrid Systems, Theoretical Computer Science (TCS), ACM Transactions on Software Engineering and Methodology (TOSEM), Journal of Aerospace Information Systems, Information and Computation, ACM Transactions on Computer Systems (TOCS)

12 Tool Development

1. **SpaceEx Bug Finder**. Tool based on SpaceEx library. Finds bug in designs of cyber physical systems. Uses AI planning techniques. Related papers include [28, 27, 36].
   Web: `http://swt.informatik.uni-freiburg.de/tool/spaceex/guided-search`

2. **SpaceEx AGAR**. Tool based on SpaceEx library. Derives quality assurance guarantees for designs of cyber physical systems. Uses new technique of Assume Guarantee Abstraction Refinement. Related papers include [25].
   Web: `http://swt.informatik.uni-freiburg.de/tool/spaceex/agar`

3. **HyST**. Tool provides an automatic translation of SpaceEx models to Flow*, dReach, HyCreate and MathWorks Simulink/Stateflow, which enables efficient model analysis by different tools. Related papers include [21, 34, 44].
   Web: `http://verivital.com/hyst/`

4. **Hydentify**. Tool for parameter identification of multiaffine hybrid automata. Employs hierarchical search in the space of parameter equivalence classes. Related papers include [19].
   Web: `http://swt.informatik.uni-freiburg.de/tool/spaceex/hydentify/`

5. **JuliaReach**. Tool for reachability analysis and verification of dynamical systems. Related papers include [6, 8, 31].
   Web: `http://juliareach.com/`

13 Teaching Experience

Newcastle University, UK:

- CSC1035 “Programming Portfolio 2” (Semester 2 2019/2020, 2020/2021)
- CSC3095 “Project and Dissertation in Computing Science” (Semester 2 2020/2021)
- CSC8208 “Research Methods and Group Project in Security and Resilience” (Semester 2 2020/2021)

Australian National University, Australia:

- Principles of Programming Languages (Semester 2 2017, 2018)

University of Freiburg, Germany:

- Lecture Course: Software Engineering, Teaching Assistant, Summer Term 2014
- Seminar: Design and Analysis of Cyber-Physical Systems, Winter Term 2013/14
- Lecture Course: Cyber-Physical Systems – Hybrid Models, Teaching Assistant, Summer Term 2013
- Seminar: Hybrid Systems, Summer Term 2013
- Seminar: Cyber-Physical Systems, Summer Term 2011
- Lecture Course: Model Checking, Teaching Assistant, Summer Term 2011
- Seminar: Design and Analysis of Embedded Systems, Winter Term 2010/11
- Lecture Course: Theoretical Computer Science II, Teaching Assistant, Winter Term 2010/11

- Lecture Course: Informatik III – Theoretische Informatik, Teaching Assistant, Winter Term 2010/11
- Seminar: Abstraction Techniques for Hybrid Systems, Summer Term 2010
- Seminar: Design and Analysis of Cyber-Physical Systems, Winter Term 2009/2010
- Lecture Course: Model Checking, Teaching Assistant, Summer Term 2009

14 Supervision of Student Projects

Newcastle University, UK:

- Kacper W. Florianski, Model-predictive Control for F1/10 Cars, Bachelor's thesis (2021)
- Rory J.T. Baker, Planning Algorithms for F/10 Racing, Bachelor's thesis (2021)
- Adanna V. Obibuaku, Simulation of Dynamical Systems via Neural Networks, Bachelor's thesis (2021)
- Rajan N.S. Gill, Cyber-Physical Systems: Modelling and Visualisation, Bachelor's thesis (2021)
- Abdelrahman Waleed, Verification of Learning-enabled Systems using Hybrid Automata, Master's thesis (2020)
- Benjamin C. Ball, Neural Networks for Analysis of Dynamical Systems, Master's thesis (2020)
- Bingqing Lin, Visualisation of Sorting Algorithms, Master's thesis (2020)
- Sebastian Nixon, Visualisation of Hybrid Systems Analysis Algorithms, Bachelor's thesis (2020)
- Nicholas Ng, Analysis and Comparison of Heuristic Algorithms in Chess Endgames, Bachelor's thesis (2020)

Australian National University, Australia:

- Dongxu Li, Abstraction-based Heuristics for Numeric Planning, Bachelor's thesis (2017)

Institute of Science and Technology Austria, Austria:

- Aviral Kumar, Hybrid Rapidly-exploring Random Trees, Intern project (2016)
- Pradyot Prakash, Verification of Nonlinear Systems, Intern project (2015)

University of Freiburg, Germany:

- Alexander Heinz, CEGAR and SMT for Planning, Master's thesis (2018)
- Thomas Stump, Analysis Framework for Heterogeneous Dynamic Systems, Master's thesis (2015)
- Alexander Heinz, Extending Non-linear Decision Procedures to Automata Networks, Bachelor's thesis (2015)
- Christopher Dillo, Modular Abstract Interpretation for Ultimate. Bachelor's thesis (2014)
- Multiple student team projects (2011-2015)

15 Professional Memberships

- IEEE CSS Technical Committee on Hybrid Systems
- IFAC TC 1.3 Discrete Event and Hybrid Systems
- Association for Computing Machinery (ACM SIGBED, SIGLOG)