

CURRICULUM VITAE

Sergiy Bogomolov

1 CONTACT INFORMATION

Research School of Computer Science (RSCS)
College of Engineering & Computer Science (CECS)
The Australian National University
Australia

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2 RESEARCH INTERESTS

Cyber-physical systems, artificial intelligence, systems biology.

3 EDUCATION

Ph.D. in Computer Science

University of Freiburg, Germany, 2015

Thesis: Abstraction-based Analysis of Hybrid Automata (with distinction)

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

4 PROFESSIONAL EMPLOYMENT

October 2016 – Present: **Lecturer / Assistant Professor**

The 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

October 2012 – January 2013: **Intern**

NEC Laboratories America, Princeton, NJ, USA

March 2012 – April 2012: **Visiting Researcher**

Verimag, Grenoble, France

5 HONORS

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

Best Repeatability Evaluation Package Award at the 19th International Conference on Hybrid Systems: Computation and Control (HSCC), 2016

Best Tool Award at the 3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH), 2016

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

Best Paper Award at the 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

PEER-REVIEWED CONFERENCE PUBLICATIONS

- [1] Sergiy Bogomolov, Goran Frehse, Mirco Giacobbe, and Thomas A. Henzinger. Counterexample-guided refinement of template polyhedra. Accepted to *23rd International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2017)*.
- [2] Hui Kong, Sergiy Bogomolov, Christian Schilling, Yu Jiang, and Thomas Henzinger. Safety verification of nonlinear hybrid systems based on invariant clusters. Accepted to *20th International Conference on Hybrid Systems: Computation and Control (HSCC 2017)*.
- [3] 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.
- [4] 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. **Best Repeatability Evaluation Package Award**.
- [5] 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.
- [6] 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.
- [7] 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.
- [8] 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.
- [9] 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.

- [10] 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.
- [11] 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.
- [12] 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.
- [13] 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.
- [14] 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**.
- [15] 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.
- [16] 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.
- [17] 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.
- [18] 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.
- [19] 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

- [20] Christian Schilling, Sergiy Bogomolov, Thomas A. Henzinger, Andreas Podelski, and Jakob Ruess. Adaptive moment closure for parameter inference of biochemical reaction networks. Accepted to *Biosystems*, 2016.
- [21] 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*, pages 1–19, 2015.

EDITED WORKSHOP PROCEEDINGS

- [22] 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.
- [23] Sergiy Bogomolov and Erika Ábrahám, 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.

PEER-REVIEWED WORKSHOP PUBLICATIONS

- [24] 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, 2017. **Best Tool Award**.
- [25] 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, 2017.
- [26] 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, 2016.
- [27] 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.

6 INVITED TALKS

- *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*
 - 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

7 PROFESSIONAL ACTIVITIES

Program Chair/Organizer

- Repeatability Evaluation Chair, *20th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2017)*, Pittsburgh, PA, USA, April 2017
- Publicity Chair, *4rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH)* collocated with CPSWeek 2017, Pittsburgh, PA, USA, 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
- Program Chair and Organizer (jointly with Erika Ábrahám), *3rd International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR)* collocated with ETAPS 2017, Uppsala, Sweden, April 2016
- Registration Chair, *Cyber-Physical 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)* collocated with CPSWeek 2016, Vienna, Austria, April 2016
- Program Chair and Organizer (jointly with Matthieu Martel and Pavithra Prabhakar), *9th International Workshop on Numerical Software Verification (NSV)* collocated with CAV 2016, Toronto, Canada, July 2016
- Publicity Chair, *3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH)* collocated with CPSWeek 2016, Vienna, Austria, April 2016
- Program Chair and Organizer (jointly with Ashish Tiwari), *1st International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR)* collocated with CAV 2015, San Francisco, USA, July 2015
- Program Chair and Organizer (jointly with Daniele Magazzeni and Martin Wehrle), *Workshop Model Checking and Automated Planning (MOCHAP)* collocated with ICAPS 2015, Jerusalem, Israel, June 2015
- Program Chair and Organizer (jointly with Matthieu Martel), *8th International Workshop on Numerical Software Verification (NSV)* collocated with CPSWeek 2015, 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)* collocated with CPSWeek 2015, Seattle, USA, April 2015

Associate Editor

- ACM SIGBED Review, 2016 – present

Steering Committee Member

- International Workshop on Numerical Software Verification (NSV), 2017 – present

Program Committee Member

- 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
- 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 track, 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) collocated with CPSWeek 2016, Vienna, Austria, April 2016
- 30th AAAI Conference on Artificial Intelligence (AAAI) 2016, Student Abstract and Poster track, Phoenix, Arizona, USA, February 2016
- 4th International Workshop on Hybrid Systems Biology (HSB) 2015 collocated with Madrid Meet 2015, 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

Refereed for

- Journals: ACM Computing Reviews, Formal Methods in System Design (FMSD), ACM Transactions on Cyber-Physical Systems (TCPS), Information Systems Frontiers, Nonlinear Analysis: Hybrid Systems, Theoretical Computer Science (TCS), ACM Transactions on Software Engineering and Methodology (TOSEM)
- Conferences: International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), International Conference on Computer Aided Verification (CAV), International Conference on Hybrid Systems: Computation and Control (HSCC), International Symposium on Automated Technology for Verification and Analysis (ATVA), ACM SIGBED International Conference on Embedded Software (EMSOFT), International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI), International Conference on Quantitative Evaluation of Systems (QEST), International SPIN Symposium on Model Checking of Software (SPIN), International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS), International Workshop on Interactions between Computer Science and Biology (CS2Bio), NASA Formal Methods Symposium (NFM), International Workshop on Reachability Problems (RP), International Workshop-Conference on Tools & Methods of Program Analysis (TMPA).

8 TOOL DEVELOPMENT

1. **SpaceEx Bug Finder.** Tool based on the SpaceEx library. Finds bug in designs of cyber physical systems. Uses AI planning techniques. Related papers include [17, 16, 21].
Web: <http://swt.informatik.uni-freiburg.de/tool/spaceex/guided-search>
Development: 2012 – ongoing
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 [14].
Web: <http://swt.informatik.uni-freiburg.de/tool/spaceex/agar>
Development: 2013 – ongoing
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 [10].
Web: <http://verivital.com/hyst/>
Development: 2014 – ongoing

4. **Hydentify**. Tool for parameter identification of multiaffine hybrid automata. Employs hierarchical search in the space of parameter equivalence classes. Related papers include [8].
Web: <http://swt.informatik.uni-freiburg.de/tool/spaceex/hydentify/>
Development: 2014 – ongoing

9 TEACHING EXPERIENCE

Australian National University, Australia:

- Lecture Course: Foundations of Computing (COMP1600), Lecturer and Convenor, Second Semester 2017

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
- Seminar: Cyber-Physical Systems – Hybrid Models, Summer Term 2013
- Lecture Course: Hybrid Systems, Teaching Assistant, 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

Supervision of Master/Bachelor theses:

- Christopher Dillo, Modular Abstract Interpretation for Ultimate. Bachelor's thesis (2014)
- 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)
- Multiple student team projects (2011-2015)

10 PROFESSIONAL MEMBERSHIPS

- IEEE CSS Technical Committee on Hybrid Systems
- Association for Computing Machinery (ACM SIGBED, SIGLOG)