

# Pavol Černý

*Curriculum Vitæ (November 25, 2018).*

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## Research Interests

Algorithmic and logical foundations for reliable software. Computer-aided verification. Program synthesis.

## Education

- 2009 **PhD in Computer Science**, *Computer and Information Science Department, University of Pennsylvania, Philadelphia, PA, USA.*  
Thesis: Software Model Checking for Confidentiality. Advisor: Rajeev Alur.
- 2003 **DEA diploma**, *École normale supérieure (ENS), Paris, France.*

## Employment

- 2013 onwards **Assistant Professor**, *Department of Electrical, Computer, and Energy Engineering (ECEE), University of Colorado Boulder, CO, USA.*
- 2009 - 2012 **Postdoctoral Researcher**, *IST Austria, Klosterneuburg, Austria; Group of Thomas A. Henzinger.*
- Summer 2007 **Research Intern**, *Microsoft Research India.*
- Summer 2005 **Research Intern**, *NEC Laboratories America.*

## Publications

The titles of the five most significant publications are typeset in bold.

### Selective conferences

- [1] Tianhan Lu, Pavol Černý, Bor-Yuh Evan Chang, and Ashutosh Trivedi. “Type-directed Bounding of Collections in Reactive Programs”. In: *20th Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI)*, 2019.
- [2] Arjun Radhakrishna, Nicholas Lewchenko, Shawn Meier, Sergio Mover, Krishna Chaitanya Sripada, Damien Zufferey, Bor-Yuh Evan Chang, and Pavol Černý. “DroidStar: Callback Typestates for Android Classes”. In: *40th International Conference on Software Engineering (ICSE)*, 2018.
- [3] Saeid Tizpaz-Niari, Pavol Černý, Bor-Yuh Evan Chang, and Ashutosh Trivedi. “Differential Performance Debugging with Discriminant Regression Trees”. In: *32nd AAAI Conference on Artificial Intelligence (AAAI)*, 2018.

- [4] Jedidiah McClurg, Hossein Hojjat, and Pavol Černý. “Synchronization Synthesis for Network Programs”. In: *29th Conference on Computer Aided Verification (CAV)*, 2017, pp. 301–321.
- [5] Saeid Tizpaz-Niari, Pavol Černý, Bor-Yuh Evan Chang, Sriram Sankaranarayanan, and Ashutosh Trivedi. “Discriminating Traces with Time”. In: *23rd Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, 2017, pp. 21–37.
- [6] Pavol Černý, Nate Foster, Nilesh Jagnik, and Jedidiah McClurg. “Optimal Consistent Network Updates in Polynomial Time”. In: *30th Conference on Distributed Computing (DISC)*, 2016, pp. 114–128.
- [7] Hossein Hojjat, Philipp Rümmer, Jedidiah McClurg, Pavol Černý, and Nate Foster. “Optimizing Horn solvers for network repair”. In: *16th Conference Formal Methods in Computer-Aided Design (FMCAD)*, 2016, pp. 73–80.
- [8] Jedidiah McClurg, Hossein Hojjat, Nate Foster, and Pavol Černý. “**Event-driven network programming**”. In: *37th Conference on Programming Language Design and Implementation (PLDI)*, 2016, pp. 369–385.
- [9] Rajeev Alur, Pavol Černý, and Arjun Radhakrishna. “Synthesis Through Unification”. In: *27th Conference on Computer Aided Verification (CAV)*, 2015, pp. 163–179.
- [10] Pavol Černý, Edmund M. Clarke, Thomas A. Henzinger, Arjun Radhakrishna, Leonid Ryzhyk, Roopsha Samanta, and Thorsten Tarrach. “From Non-preemptive to Preemptive Scheduling Using Synchronization Synthesis”. In: *37th Conference on Computer Aided Verification (CAV)*, 2015, pp. 180–197.
- [11] Pavol Černý, Thomas A. Henzinger, Laura Kovács, Arjun Radhakrishna, and Jakob Zwiirmayr. “Segment Abstraction for Worst-Case Execution Time Analysis”. In: *24th European Symposium on Programming (ESOP)*, 2015, pp. 105–131.
- [12] Jedidiah McClurg, Hossein Hojjat, Pavol Černý, and Nate Foster. “**Efficient synthesis of network updates**”. In: *36th Conference on Programming Language Design and Implementation (PLDI)*, 2015, pp. 196–207.
- [13] Pavol Černý, Thomas A. Henzinger, Arjun Radhakrishna, Leonid Ryzhyk, and Thorsten Tarrach. “Regression-Free Synthesis for Concurrency”. In: *26th Conference on Computer Aided Verification (CAV)*, 2014, pp. 568–584.
- [14] Pavol Černý, Thomas A. Henzinger, and Arjun Radhakrishna. “**Quantitative abstraction refinement**”. In: *40th Conference on Principles of Programming Languages (POPL)*, 2013, pp. 115–128.
- [15] Pavol Černý, Thomas A. Henzinger, Arjun Radhakrishna, Leonid Ryzhyk, and Thorsten Tarrach. “Efficient Synthesis for Concurrency by Semantics-Preserving Transformations”. In: *25th Conference on Computer Aided Verification (CAV)*, 2013, pp. 951–967.
- [16] Pavol Černý, Martin Chmelik, Thomas A. Henzinger, and Arjun Radhakrishna. “Interface Simulation Distances”. In: *3rd Symposium on Games, Automata, Logics and Formal Verification (GandALF)*, 2012, pp. 29–42.
- [17] Pavol Černý, Sivakanth Gopi, Thomas A. Henzinger, Arjun Radhakrishna, and Nishant Totla. “Synthesis from incompatible specifications”. In: *12th Conference on Embedded Software (EMSOFT)*, 2012, pp. 53–62.

- [18] Rajeev Alur and Pavol Černý. “**Streaming transducers for algorithmic verification of single-pass list-processing programs**”. In: *38th Conference on Principles of Programming Languages (POPL)*, 2011, pp. 599–610.
- [19] Pavol Černý, Krishnendu Chatterjee, and Thomas A. Henzinger. “The Complexity of Quantitative Information Flow Problems”. In: *24th Symposium on Computer Security Foundations (CSF)*, 2011, pp. 205–217.
- [20] Pavol Černý, Krishnendu Chatterjee, Thomas A. Henzinger, Arjun Radhakrishna, and Rohit Singh. “Quantitative Synthesis for Concurrent Programs”. In: *23rd Conference on Computer Aided Verification (CAV)*, 2011, pp. 243–259.
- [21] Pavol Černý, Thomas A. Henzinger, and Arjun Radhakrishna. “Simulation Distances”. In: *21st Conference on Concurrency Theory (CONCUR)*, 2010, pp. 253–268.
- [22] Pavol Černý, Arjun Radhakrishna, Damien Zufferey, Swarat Chaudhuri, and Rajeev Alur. “Model Checking of Linearizability of Concurrent List Implementations”. In: *22nd Conference on Computer Aided Verification (CAV)*, 2010, pp. 465–479.
- [23] Rajeev Alur, Pavol Černý, and Scott Weinstein. “Algorithmic Analysis of Array-Accessing Programs”. In: *18th Conference on Computer Science Logic (CSL)*, 2009, pp. 86–101.
- [24] Pavol Černý and Rajeev Alur. “Automated Analysis of Java Methods for Confidentiality”. In: *21st Conference on Computer Aided Verification (CAV)*, 2009, pp. 173–187.
- [25] Roberto Lubliner, Swarat Chaudhuri, and Pavol Černý. “Parallel programming with object assemblies”. In: *24th Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA)*, 2009, pp. 61–80.
- [26] Rajeev Alur, Pavol Černý, and Swarat Chaudhuri. “Model Checking on Trees with Path Equivalences”. In: *13th Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, 2007, pp. 664–678.
- [27] Rajeev Alur, Pavol Černý, and Steve Zdancewic. “Preserving Secrecy Under Refinement”. In: *33rd International Colloquium on Automata, Languages and Programming (ICALP)*, 2006, pp. 107–118.
- [28] Rajeev Alur, Pavol Černý, P. Madhusudan, and Wonhong Nam. “**Synthesis of interface specifications for Java classes**”. In: *32nd Conference on Principles of Programming Languages (POPL)*, 2005, pp. 98–109.

### Journals

- [29] Pavol Černý, Edmund M. Clarke, Thomas A. Henzinger, Arjun Radhakrishna, Leonid Ryzhyk, Roopsha Samanta, and Thorsten Tarrach. “From non-preemptive to preemptive scheduling using synchronization synthesis”. In: *Formal Methods in System Design* 50.2-3 (2017), pp. 97–139.
- [30] Pavol Černý, Martin Chmelik, Thomas A. Henzinger, and Arjun Radhakrishna. “Interface simulation distances”. In: *Theor. Comput. Sci.* 560 (2014), pp. 348–363.
- [31] Rajeev Alur, Pavol Černý, and Scott Weinstein. “Algorithmic analysis of array-accessing programs”. In: *ACM Trans. Comput. Log.* 13.3 (2012), 27:1–27:29.
- [32] Pavol Černý, Thomas A. Henzinger, and Arjun Radhakrishna. “Simulation distances”. In: *Theor. Comput. Sci.* 413.1 (2012), pp. 21–35.

### Workshops with proceedings

- [33] Youngsung Kim, Pavol Černý, and John M. Dennis. “Performance search engine driven by prior knowledge of optimization”. In: *2nd Workshop on Libraries, Languages, and Compilers for Array Programming, ARRAY@PLDI*, 2015, pp. 25–30.
- [34] Andrew Noyes, Todd Warszawski, Pavol Černý, and Nate Foster. “Toward Synthesis of Network Updates”. In: *2nd Workshop on Synthesis (SYNT)*, 2013, pp. 8–23.
- [35] Adam J. Aviv, Pavol Černý, Sandy Clark, Eric Cronin, Gaurav Shah, Micah Sherr, and Matt Blaze. “Security Evaluation of ES&S Voting Machines and Election Management System”. In: *3rd Electronic Voting Workshop (EVT)*, 2008.

### Edited proceedings

- [36] Pavol Černý, Viktor Kuncak, and Parthasarathy Madhusudan, eds. *Proceedings Fourth Workshop on Synthesis, SYNT 2015, San Francisco, CA, USA, 18th July 2015*. Vol. 202. EPTCS. 2016.

### Invited contributions

- [37] Pavol Černý and Thomas A. Henzinger. “From boolean to quantitative synthesis”. In: *11th Conference on Embedded Software (EMSOFT)*, 2011, pp. 149–154.
- [38] Rajeev Alur and Pavol Černý. “Expressiveness of streaming string transducers”. In: *30th Conference Foundations of Software Technology and Theoretical Computer Science (FSTTCS)*, 2010, pp. 1–12.
- [39] Pavol Černý, Thomas A. Henzinger, and Arjun Radhakrishna. “Quantitative Simulation Games”. In: *Time for Verification, Essays in Memory of Amir Pnueli*, 2010, pp. 42–60.

### Workshops without proceedings

- [40] Hossein Hojjat, Jedidiah McClurg, Pavol Černý, and Nate Foster. “Network Updates for the Impatient: Eliminating Unnecessary Waits”. In: *1st Workshop on Programming Languages and Verification Technology for Networking (PLVNET)*, 2015.
- [41] Pavol Černý, Thomas Henzinger, and Arjun Radhakrishna. “Quantitative Simulation Games”. In: *Workshop on Games and Probabilistic Models in Formal Verification (GPMFV)*, 2010.
- [42] Swarat Chaudhuri, Roberto Lublinerma, and Pavol Černý. “Assemblies of Objects”. In: *2nd Workshop on Exploiting Concurrency Efficiently and Correctly (EC2)*, 2009.

### Theses

- [43] Pavol Černý. “Software Model Checking for Confidentiality”. PhD thesis. Computer and Information Science department, University of Pennsylvania, Philadelphia, PA, USA, Aug. 2009.
- [44] Pavol Černý. “Verification by Abstract Interpretation of Parameterized Predicates”. MS thesis (DEA). École normale supérieure (ENS), Paris, France, Sept. 2003.

### Report

- [45] Patrick McDaniel (PI) and Team. *EVEREST: Evaluation and Validation of Election-Related Standards and Testing*. Dec. 2007. A study of electronic voting systems for the State of Ohio. Available on the website of the Ohio Secretary of State.

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## Teaching

### University of Colorado Boulder

- Spring 2019 ECEN 1310: Programming for Engineers.
- Fall 2018 ECEN 5139, CSCI 5135: Computer-Aided Verification.
- Spring 2018 ECEN 1310: Programming for Engineers.
- Fall 2017 ECEN 5139, CSCI 5135: Computer-Aided Verification.
- Spring 2017 ECEN 4313, CSCI 4830: Concurrent Programming.
- Fall 2016 ECEN 5033, CSCI 7000-005: Program Synthesis.
- Spring 2016 ECEN 4003, CSCI 4830: Concurrent Programming.
- Fall 2015 ECEN 5033, CSCI 7000-005: Program Synthesis.
- Spring 2015 ECEN 4003, CSCI 4830: Concurrent Programming.
- Fall 2014 ECEN 5139, CSCI 5135: Computer-Aided Verification.
- Spring 2014 ECEN 5033, CSCI 7000-007: Concurrent Programming.
- Fall 2013 ECEN 5139, CSCI 5135: Computer-Aided Verification.
- Spring 2013 ECEN 5033, CSCI 7000-007: Program Synthesis.

### Previous Courses

- Fall 2010 Programming Paradigms for Concurrency. IST Austria and TU Wien, co-instructor.
- Spring 2009, Spring 2006 CIS399 C/C++ programming. University of Pennsylvania, co-instructor in Spring 2006, instructor in Spring 2009.
- Spring 2009, Fall 2004, Fall 2005 Guest lectures in CIS640 Introduction to Multiprocessor Programming, CSE482 Logic in Computer Science. University of Pennsylvania.
- Spring 2005 Teaching Assistant, CIS511 Theory of Computation. University of Pennsylvania.
- Fall 2004 Teaching Assistant, CSE482 Logic in Computer Science. University of Pennsylvania.

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## Students

- Since Fall 2015 Tianhan Lu (PhD). Co-advised with Evan Chang.
- Since Fall 2015 Saeid Tizpaz Niari (PhD). Second prize, Microsoft Research Open Source Challenge. 2016. ECEE Departmental Gold Outstanding Research Award. 2018.
- Since Fall 2016 Nicholas Lewchenko (PhD).

### Alumni

- Jedidiah McClurg. PhD, Spring 2018. Thesis: Program Synthesis for Software-Defined Networks. Computer Science Departmental Outstanding Research Award, 2017. First employment: Tenure-track Assistant Professor, CS Department, University of New Mexico.
- Nilesh Jagnik. MS Spring 2016. Optimal Consistent Network Updates in Polynomial Time [6]. First employment: Google.
- Parker Evans. (Undergraduate) Discovery Learning Apprenticeship, 2013-14.
- Prabhash Krishnan (2015-16), Aniket Lata (2015-16), Krishna Sripada (2015-16), Vaibhav Singh (2014-15). (Graduate) Independent Study.
- Andrew Dudney (Fall 2016) (Undergraduate) Independent Study.

## Co-supervised Students at IST Austria

- 2009-14 Mentored Arjun Radhakrishna on model checking and synthesis for concurrent programs [22],[20],[15],[13] and on quantitative verification and synthesis [21],[32],[39],[16],[17],[14],[30],[11]. A.R. was a doctoral student of Thomas Henzinger.
- Fall 2012 Co-supervised Thorsten Tarrach's rotation on Efficient Synthesis for Concurrency using Semantics-Preserving Transformations [15].
- Spring 2012 Co-supervised Martin Chmelík's rotation on Interface Simulation Distances [16],[30].
- Summer 2011 Co-supervised Nishant Totla's and Sivakanth Gopi's internship on Synthesis from Incompatible Specifications [17].
- Summer 2010 Co-supervised Rohit Singh's internship on Quantitative Synthesis for Concurrent Programs [20].

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## Awards

- Microsoft Research Cambridge award for best paper co-authored by a student at TACAS 2007.
- Bourse du Gouvernement Français (French Government Stipend), 2000-2003.
- Winner (one of six) of Olympiad in Computer Science, national round, Slovakia, 1998.

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## Selected Research Projects

- 2017–present **ML+PL for Performance and Security.** Machine learning and programming languages methods for finding performance and security bugs. Work described in [5],[3].
- 2015–present **Event-Driven Network Programming.** Theory and algorithms for event-driven network programming. Work described in [8],[4].
- 2013–2015 **Synthesis for Network Updates.** A framework, algorithms, and tools for synthesis of safe updates of global network policies. Work described in [6],[7],[12],[40],[34].
- 2013–present **Synthesis for Concurrent Programs.** Algorithms for efficient synthesis of concurrent programs, with applications to device drivers. Work described in [15],[13],[10],[9].
- 2010–present **Quantitative Verification and Synthesis.** Algorithms and tools for verification and synthesis that take into account quantitative measures such as performance, fault tolerance, information flow, and resource consumption. Work described in [21],[32],[20],[19],[37],[39],[16],[17],[14],[30],[33],[11].
- 2010–2011 **Streaming Transducers for Program Verification.** A new, expressively robust, and analyzable transducer model with applications in verification of list-processing and string-processing programs. Work described in [18],[38].
- 2009 **Model Checking for Concurrent Data Structures.** Introduced techniques for model checking for concurrent data structures and developed CoLT, a tool for verifying their Java implementations. Work described in [22]. Project website: <http://www.ist.ac.at/~cernyp/colt>.
- 2008–2009 **Programming Abstractions for Data Parallel Programs.** A data-centric programming model called Chorus and a language and runtime system called JChorus for irregular data parallel applications based on the idea of spatial locality. Work described in [25].

- 2005–2009 **Software Model Checking for Confidentiality.** A specification framework for confidentiality, novel decision procedures for finite state systems and for classes of programs, and abstraction-based program analysis techniques. Implemented a tool ConAn (for CONFidentiality ANalysis) for checking confidentiality properties of midlets for mobile devices. Work described in [43],[23],[24],[26],[27].
- 2007 **Security Evaluation of ES&S Voting Machines and Election Management System.** Member of a team conducting security evaluation of voting machines and software in the project EVEREST, commissioned by the Ohio Secretary of State. I led the efforts in static analysis of the backend system. Work described in [45],[35].
- 2007 **Integrity Analysis for Windows Vista.** Methods for analysis of possible vulnerabilities in Vista access control system, which is based on integrity levels that can change over time. Supervisors: Sriram Rajamani, Prasad Naldurg. Microsoft Research India, May-August, 2007.
- 2003–2005 **JIST project.** Automatic synthesis of behavioral interfaces for Java classes using predicate abstraction, learning algorithm  $L^*$  and symbolic model checking. Work described in [28].
- 2003 **Verification by Abstract Interpretation of Parameterized Predicates.** DEA diploma thesis, 2003. Generalizes predicate abstraction in order to reason about programs on arrays (e.g. sorting programs). Supervisor: Patrick Cousot. ENS, Paris, France. Work described in [44].

## Selected Talks

### Invited Talks

- Synthesizing Event-driven Network Programs from Scenarios. 5<sup>th</sup> Workshop on Synthesis (SYNT), Toronto, Canada, 2016.
- Program Synthesis for Network Updates. 1<sup>st</sup> NetPL workshop on programming languages for networks, Prague, Czech Republic, 2015.
- Program Synthesis for Network Updates. 7<sup>th</sup> Interaction and Concurrency Experience (ICE) workshop, Berlin, Germany, 2014.
- Quantitative Abstraction Refinement. Rich Model Toolkit COST Action meeting, co-located with HVC 2012, Haifa, Israel, 2012.
- Quantitative Synthesis for Concurrent Programs. 4<sup>th</sup> Workshop on Games for Design, Verification and Synthesis (GASICS), Newcastle, UK, 2012.

### Invited Tutorial

- Program Synthesis for Networks. 16<sup>th</sup> Conference on Formal Methods in Computer-Aided Design, Mountain View, CA, USA, 2016.

### Seminar Talks

- Event-Driven Network Programming. IST Austria, 2016.
- Trace-based Synchronization Synthesis for Device Drivers. Intel Research, Hillsboro, OR, USA, 2016.
- From Non-preemptive to Preemptive Scheduling using Synchronization Synthesis. Intel Research, Hillsboro, OR, USA, 2015.
- Program Synthesis for Concurrency. Xilinx, Longmont, CO, USA 2014.
- Program Synthesis for Network Updates. Kempner Colloquium, joint Mathematics and Applied Mathematics departments colloquium, University of Colorado Boulder, 2014; CISL seminar, NCAR, Boulder, CO, USA 2014; Dagstuhl seminar 15071 on Formal Foundations on Networking, 2015; IST Austria, 2014.

- Regression-free Synthesis for Concurrency. Intel Research, Hillsboro, OR, USA, 2014.
- Toward Synthesis of Network Updates. IST Austria, 2013.
- Efficient Synthesis for Concurrency using Semantics-Preserving Transformations. Intel Research, Hillsboro, OR, USA, 2013.
- Quantitative Abstraction Refinement. Verimag, Grenoble, France, 2012. ERC meeting, Brussels, Belgium, 2012. Tel Aviv University, Tel Aviv, Israel, 2012.
- From Boolean to Quantitative Synthesis. University of Colorado, Boulder, CO, USA, 2012.
- Inductive Synthesis for Automata Education. Microsoft Research, Redmond, WA, USA, 2012.
- Quantitative Synthesis for Concurrent Programs. ERC meeting, Venice, Italy, 2011. Intel Research, Hillsboro, OR, USA, 2012.
- Algorithmic Software Verification for Data Structures. EPFL, Switzerland; Rice University, TX, USA; Leicester University, UK; Queen Mary, University of London, UK; University of Birmingham, UK; 2011.
- Streaming Transducers for Algorithmic Verification of Single-Pass List Processing Programs. Alpine Verification Meeting, Lausanne, Switzerland, 2010. RiSE seminar, TU Wien, Austria, 2010; Masaryk University, Brno, Czech Republic, 2011; Charles University, Prague, Czech Republic, 2011.
- Model Checking of Linearizability of Concurrent Data Structures. Univerite Paris VII, Paris, France; Graz University of Technology, Graz, Austria, 2010.
- Software Model Checking for Confidentiality. NASA Ames Research Center, CA, USA; INRIA Rennes, France; EPFL, Switzerland; Pennsylvania State University, PA, USA, 2009.
- A Unified Framework for Integrity Analysis in Windows Vista. Microsoft Research India, 2007.
- Algorithmic Verification of Secrecy. IBM Research, 2007.
- Model Checking on Trees with Path Equivalences. Penn Security Seminar.
- Preserving Secrecy under Refinement. Penn Programming Languages Club.
- Pointer analysis in FSoft. NEC Labs America, 2005.
- Verification by Abstract Interpretation of Parameterized Predicates. SAI seminar, ENS, Paris, France. 2003.
- Static Analyses for Efficient Execution of PVS. SRI, 2002.

## Professional Service

- Program committee co-chair of EC2 2016, PLVNET 2015, SYNT 2015.
- Program committee member for CAV 2019, ATVA 2018, CAV 2018, POPL 2018, CAV 2016, TACAS 2016, GandALF 2015, EC2 2015, CAV 2014, EMSOFT 2014, SYNT 2014, MEMICS 2011.
- External review committee (ERC) member for POPL 2016.
- Sponsorship chair for CAV 2016.
- Graduate Committee, ECEE, 2013-2017.
- PhD Thesis Committee for Ziad Hassan (ECEE, CU Boulder, 2014), Saqib Sohail (ECEE, CU Boulder, 2014), Arjun Radhakrishna (IST Austria, 2014), Thomas Nelson (ECEE, CU Boulder, 2015), Samuel Blackshear (CS, CU Boulder, 2015), Aleksandar Chakarov (proposal, CS, CU Boulder, 2015), Thorsten Tarrach (IST Austria, 2016), Jedidiah McClurg (proposal, CS, CU Boulder, 2017, advisor), Hadi Ravanbakhsh (ECEE, CU Boulder, 2018).



- PhD Preliminary Examination committee for Michael Dooley (ECEE, CU Boulder), Aleksandar Chakarov (CS, CU Boulder), Thorsten Tarrach (IST Austria), Michael Coughlin (ECEE, CU Boulder), Hadi Ravanbakhsh (ECEE, CU Boulder), Jedidiah McClurg (CS, CU Boulder, advisor), Saeid Tizpaz Niari (ECEE, CU Boulder, advisor), Shawn Meier (CS, CU Boulder), Souradeep Dutta (ECEE, CU Boulder).
- MS Thesis committee for Ali Ismail (ECEE, CU Boulder, 2015), Suhas Kumar (ECEE, CU Boulder, 2016), Nilesh Jagnik (CS, CU Boulder, 2016, advisor).
- Senior Thesis committee for Ross Holland (CS, CU Boulder), Nick Vanderweit (CS, CU Boulder), Evan Roncevich (CS, CU Boulder).
- Reviewer for conferences and workshops: POPL, CAV, LICS, PLDI, ESOP, ICALP, CSL, FOSSACS, FMCAD, APLAS, Usenix Security, TACAS, PLAN-X, Gandalf, MFCS, LPAR, CSF, FM, SAS.
- Reviewer for journals: Theoretical Computer Science, Communications of the ACM, Journal of Computer Security, IET Software journal, ACM Transactions on Embedded Computing Systems, IEEE Transactions on Software Engineering, Formal Methods in System Design, Acta Informatica, ACM Transactions on Computational Logic.
- Reviewer for Handbook of Model Checking, 2017.
- Panelist for National Science Foundation, two times (US).
- Reviewer for FWF Science Foundation (Austria).
- Reviewer for the Czech Science Foundation (Czech Republic).
- Joint IST Austria / TU Wien verification seminar, February 2010 - January 2011, organizer.
- NEVER 4-ever, 4th Northeastern Verification Workshop, 2007, Co-organizer.
- Research Forum at Penn Engineering 2007, Graduate Student Planning Committee member.

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## Software

- Liss. A tool for synchronization synthesis for concurrent programs [10]. Available at: <https://github.com/thorstent/Liss> .
- CoLT (Concurrency using Lockstep Tool). A tool for model checking of linearizability of concurrent data structures [22]. Tool web page: <http://www.ist.ac.at/~cernyp/coLt> .
- Chorus. A compiler and runtime for a programming model for data parallel programs [25].
- ConAn (CONFidentiality ANALysis). Verification of confidentiality properties of Java midlets for mobile devices [24].
- Jist (Java Interface Synthesis Tool). A tool for synthesis of behavioral interfaces for Java classes [28].

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## Funding

- CU ASIRT seed funding on Temporal-Logic Based Reinforcement Learning, co-PI. CU Boulder. \$15K.
- Travel and Registration Support for Computer Aided Verification 2016, PI. NSF. \$15K. Supports student participation at CAV 2016.
- Audit: Securing Space/Time Defenses in Java Bytecode. 2015-2019, PI. CU Boulder co-PIs: John Black, Bor-Yuh Evan Chang, Sriram Sankaranarayanan. Subcontracts: UT Austin (Isil Dillig (PI), Marijn Heule (co-PI)); Kestrel Technology (Henny Sipma (PI)). DARPA, STAC program. \$5.7M (\$2.8M for CU Boulder).

- Mining and Understanding Bug Fixes to Address Application-Framework Protocol Defects. 2014-2018, co-PI. PI: Bor-Yuh Evan Chang; other co-PIs: Kenneth Anderson, Sriram Sankaranarayanan, Tom Yeh. DARPA, MUSE program. \$1.6M.
- Practical Synthesis of Network Updates. 2014-2017, PI. Other PI: Nate Foster, Cornell. NSF. \$246K for CU Boulder.
- Automatic Synthesis of High-Assurance Device Drivers. PI. Other PIs: Leonid Ryzyk, Michael Stumm (University of Toronto), Gernot Heiser (NICTA), Alastair Donaldson (Imperial College London). Awarded, 2013. Gift from Intel Corporation to CU Boulder: \$300,000.
- Automated tutor for automata education, \$10,000. Co-author. PI: T. Henzinger. Grant from Microsoft Research, Awarded, December 2010.
- RiSE. Co-author. PIs: Thomas Henzinger and others. Austrian National Research Network on Rigorous Software Engineering. Awarded, 2010.
- Travel grants from Usenix Security Conference, 2008 and from Marktoberdorf Summer School, 2006.

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## Miscellaneous

- Citizenship: Slovak Republic. Permanent resident of the United States.
- “v sieti” column on everything Web related for the Slovak magazine Tyzden, 2004-2006.