

Aleksandar Chakarov

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EDUCATION	University of Colorado Boulder , Boulder, CO PhD in Computer Science Dissertation: <i>Deductive Verification of Infinite State Stochastic Systems with Martingales</i>	August 2010 – August 2016
	University of Colorado Boulder , Boulder, CO MS in Computer Science	August 2010 – December 2012
	Bard College , Annandale-on-Hudson, NY BA in Mathematics and Computer Science	August 2006 – May 2010
PROFESSIONAL SKILLS	Program Analysis, Static Analysis, Formal Methods and Verification, Probabilistic Models	
PROGRAMMING SKILLS	Python, OCaml, Java, Scala, C#, C/C++/Boost, Matlab, Mathematica, HTML, CSS, JavaScript, XML, PHP, L ^A T _E X	
PROFESSIONAL ACTIVITIES	SAS 2017 Program Committee Member PLDI 2017 External Review Committee Member POPL 2016 Artifact Evaluation Committee Member	
RELEVANT GRADUATE COURSES	Algorithms Ethical Hacking Program Analysis (course and practicum) Computer Performance Modeling Non-Linear Dynamics Cyber Physical Systems Applied Probabilistic and Stochastic Methods	Compiler Construction Program Synthesis (course and seminar) Verification of VLSI (Computer Aided Verification) Computational Complexity Programming Languages Closed Loop Medical Devices (seminar)
PROFESSIONAL EXPERIENCE	Department of Electrical, Computer and Energy Engineering , Boulder, CO. <i>Post Doctoral Researcher</i> My work with professors Pavol Černý, Ashutosh Trivedi and Sriram Sankaranarayanan focuses on applying program analysis, machine learning and probabilistic reasoning techniques to detect and quantify information leaks in target applications. Another project focuses on applying context-free grammar (CFG) reasoning and evolutionary algorithms (CMA-ES) to construct CPU exhaustion attack inputs. Finally, I work on a novel bit-scaling algorithm for solving UTVPI constraints that has applications to program analysis.	September 2016 – present
	Department of Computer Science , Boulder, CO. <i>Research Assistant</i> My work with professor Sriram Sankaranarayanan focuses on verification of reachability and repeated reachability properties of probabilistic systems using martingales. Past work has also focused on verification of timed automata and hybrid systems, learning User Interfaces, security and privacy, specification mining for Android applications. For my research, I used OCaml, Matlab, Python, Satisfiability Modulo Theory solvers, semidefinite and linear programming techniques (and solvers). I have presented joint work at conferences and co-authored a number of papers (listed below).	August 2010 – August 2016
	Department of Computer Science , Boulder, CO. <i>Co-Instructor</i> I was a co-instructor for CSCI 3155: Principles of Programming Languages. The course taught the principles of programming languages with an emphasis on hands-on bi-weekly project assignments that familiarized students with git, sbt, Scala, CI and unit testing within Eclipse.	January 2016 – May 2016

Microsoft Research India, Bangalore, India.

Research Associate

June 2014 – August 2014

During this summer internship, I had the opportunity to work with Dr. Aditya Nori and Dr. Sriram Rajamani on applying a combination of program analysis and machine learning techniques to automatically infer the root causes of bugs in machine learning tasks. We developed black box probabilistic programming models for state of the art machine learning algorithms applied in industry to infer the reasons (explanations) for misclassifications (Cf. arXiv paper below).

SRI International, Menlo Park, CA.

Student Associate

May 2013 – August 2013

During this summer internship, I had the opportunity to work under the mentorship of Dr. Ashish Tiwari on the analysis of simple cryptographic protocols. We applied program analysis techniques to round-based encryption schemes that incorporate probabilistic choices.

Department of Computer Science, Boulder, CO.

Teaching Assistant

January 2012 – May 2012

I was a teaching assistant for professor Bor-Yu Evan Chang's undergraduate level Principles of Programming Languages course.

Department of Computer Science, University of North Carolina Greensboro, Greensboro, NC

REU Summer Research Assistant

June 2010 – July 2010

As a research assistant to professor Blanchet-Sadri, I helped organize and lead 11 undergraduate students in their summer research at UNCG. In addition to conducting research closely with an undergraduate student and providing guidance to the other participants, I organized various events and managed the webpage of the program.

Bard Academic Resource Center (BARC), Bard College, Annandale-on-Hudson, NY

Mathematics, physics and computer science tutor

January 2007 – January 2010

I worked individually with peer students and as a dedicated tutor for classes.

ASC Laboratory, Bard College, Annandale-on-Hudson, NY

Researcher

February 2008 – May 2010

I designed and implemented C/C++ and Mathematica programs used in our lab's research. In addition, I designed and coded an interface between Mathematica and the MACE4 model theorem prover, as well as a Mathematica package providing various functions for knot computation. I also helped present our work at conferences.

PUBLICATIONS

Aleksandar Chakarov, Yuen-Lam Voronin, Sriram Sankaranarayanan, *Deductive Proofs of Almost Sure Persistence and Recurrence Properties*. International Conference on Tools and Algorithms for the Construction and Analysis of Systems. Springer Berlin Heidelberg, 2016.

Olivier Bouissou, Eric Goubault, Sylvie Putot, Aleksandar Chakarov and Sriram Sankaranarayanan, *Uncertainty Propagation using Probabilistic Affine Forms and Concentration of Measure Inequalities*. International Conference on Tools and Algorithms for the Construction and Analysis of Systems. Springer Berlin Heidelberg, 2016.

Aleksandar Chakarov, Aditya Nori, Sriram Rajamani, Shayak Sen, Deepak Vijaykeerthy, *Debugging Machine Learning Tasks*. arXiv preprint arXiv:1603.07292 (2016).

Aleksandar Chakarov, Sriram Sankaranarayanan, *Expectation Invariants for Probabilistic Program Loops as Fixed Points*. 21st International Static Analysis Symposium (SAS) 2014: 85-100. **Radhia Cousot Young Researcher Best Paper Award**.

Aleksandar Chakarov, Sriram Sankaranarayanan, *Probabilistic Program Analysis with Martingales*. International Conference on Computer Aided Verification. Springer Berlin Heidelberg, CAV 2013: 511-526.

Sriram Sankaranarayanan, Aleksandar Chakarov, and Sumit Gulwani, *Static Analysis for Probabilistic Programs: Inferring Whole Program Properties from Finitely Many Paths*. PLDI 2013: 447-458. **Distinguished Paper Award**.

Paul Givens, Aleksandar Chakarov, Sriram Sankaranarayanan, Tom Yeh, *Exploring the internal state of user interfaces by combining computer vision techniques with grammatical inference*. ICSE 2013: 1165-1168

F. Blanchet-Sadri, Aleksandar Chakarov, Lucas Manuelli, Jarett Schwartz, and Slater Stich, *Constructing Partial Words with Subword Complexities not Achievable by Full Words*. Theoretical Computer Science, Volume 432, 11 May 2012, Pages 2127, <http://dx.doi.org/10.1016/j.tcs.2012.01.039>

Aleksandar Chakarov, Sriram Sankaranarayanan, Georgios Fainekos, *Combining Time and Frequency Domain Specifications For Periodic Signals*. In the Proceedings of Runtime Verification, San Francisco, California, Sep. 2011

F. Blanchet-Sadri, Aleksandar Chakarov, Lucas Manuelli, Jarett Schwartz, and Slater Stich, *Recurrent Partial Words*. WORDS 2011: 71–82

F. Blanchet-Sadri, Bob Chen and Aleksandar Chakarov, *Minimum Number of Holes in Unavoidable Sets of Partial Words of Size Three*. in C. S. Iliopoulos and W. F. Smyth (Eds.), IWOCA 2010, 21st International Workshop on Combinatorial Algorithms, July 26-28, 2010, London, United Kingdom, Lecture Notes in Computer Science, Vol. 6460, Springer-Verlag, Berlin, Heidelberg, 2011, 43–55.

Peter Golbus, Robert W. McGrail, Tomasz Przytycki, Mary Sharac and Aleksandar Chakarov, *Tricolorable Torus Knots are NP-Complete*. Proceedings of the 47th ACM Southeast Conference (ACMSE 200), Clemson, South Carolina, March 2009.

HONORS AND AWARDS

The Radhia Cousot Young Researcher Best Paper Award of 2014 at 21st International Static Analysis Symposium (SAS), 2014

Distinguished Paper Award at Programming Languages, Design and Implementation (PLDI), 2013

Ralph J. Slutz Student Excellence Award, University of Colorado Boulder, Fall 2013

Dean's Outstanding Merit Fellowship, University of Colorado Boulder, 2010-2011

Distinguished Scientists Scholarship, Bard College, 2006-2010

Distinguished Scientists Scholar's Summer Research Stipend, Bard College, 2008, 2009

TEACHING EXPERIENCE

CSCI 3434: Theory of Computation, Fall 2016. Guest Lecturer.

CSCI 7000: Program Synthesis, Fall 2016. Guest Lecturer.

CSCI 3155: Principles of Programming Languages, Spring '16,'12. Co-Instructor, Teaching Assistant.

CSCI 5444: Theory of Computation, Fall 2015. Guest Lecturer.

CSCI 7000: Verification and Control of Cyber-Physical Systems, Fall 2014. Guest Lecturer.

OTHER RELEVANT EXPERIENCE

22nd International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS' 2016), **April 2016**
Eindhoven, The Netherlands.
Conference Presentations

Dagstuhl Seminar: Challenges and Trends in Probabilistic Programming, **April 2015**
Dagstuhl, Germany.
Seminar Participant

21th International Static Analysis Symposium (SAS' 2014), **September 2014**
Munich, Germany.
Conference Presentation

Microsoft Research India, **June – September 2014**
Bangalore, India.
Summer Internship

25th International Conference on Computer Aided Verification (CAV' 2013), **July 2013**
Saint Petersburg, Russia.
Conference Presentation

Programming Languages, Design, Implementation Conference (PLDI' 2013), June 2011
Seattle, Washington.

Poster Presentation

SRI International,
Menlo Park, California.
Summer Internship

May – August 2013

ExCAPE Summer School on Synthesis,
Berkeley, California.
Summer School Participant

June 12-15 2013

Third Summer School on Formal Techniques,
Atherton, California.
Summer School Participant

May 20-24 2013

2nd International Conference on Runtime Verification (RV' 2011),
San Francisco, California.
Conference Presentation

September 2011

NSV Workshop at CAV' 2011,
Snowbird, Utah.
Workshop Presentation

July 2011

Department of Computer Science, University of North Carolina Greensboro, NC.
REU Participant

June 2009 – July 2009

47th ACM Southeast Conference, Clemson, South Carolina.
Conference Presentation

March 2009