

Sriram Sankaranarayanan

Contact

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Employment

Aug. 2021 - Present	(Full) Professor, Department of Computer Science, S. J. Archuleta Endowed Professor Courtesy appointment in Electrical, Computer and Energy Engineering (ECEE) Affiliate Professor of Applied Mathematics. University of Colorado, Boulder, CO, USA.
Aug. 2015 - Jul. 2021	Associate Professor, Department of Computer Science,
Aug. 2009 - Jul. 2015	Assistant Professor, Department of Computer Science, University of Colorado, Boulder, CO, USA.
Oct. 2005 - Aug. 2009	Research Staff Member NEC Laboratories America, Princeton, NJ 8540, USA.

Education

Aug. 2005 Dissertation: Advisors: Awards:	PhD in Computer Science , Stanford University, Stanford, CA. Mathematical Analysis of Programs. Prof. Zohar Manna and Dr. Henny Sipma. Siebel Scholar (2005)
Sep. 2002	M.S. in Computer Science , Stanford University, Stanford, CA.
July 2000: Awards:	B. Tech (HONS) in Computer Science and Engg. Indian Institute of Technology, Kharagpur. President of India Gold Medal.

Research Interests

Cyber-Physical Systems: Modeling, Verification and Synthesis.

Program Analysis, Model Checking and Automated Reasoning.

Symbolic Logic, Theory of Computation and Computational Complexity.

Optimization and constraint solving.

Control and Dynamical Systems Theory.

Awards and Honours

May 2022	Coursera Outstanding Innovation Award.
Jul. 2019	S. J. Archuleta Endowed Professorship
Jul. 2016	Roubos Faculty Fellowship
Sep. 2014	Provost Award for Outstanding Research
Sep. 2014	Dean's Award for Outstanding Teaching
June 2014	Certificate of Recognition from the President of University of Colorado for "contribution to University of Colorado's Massive Open Online Courses".
Sep. 2012	Dean's Award for Outstanding Junior Faculty (2012). Awarded to one junior faculty in the college of engineering each academic year.
Mar. 2010	NSF Career Award "Automatic Analysis of Cyber-Physical Systems"
Aug. 2007	NEC Technology Commercialization Award. Successful technology transfer from research to a commercial product VARVEL
2004-2005	Siebel Scholarship, Stanford University.
July 2000	President of India Gold Medal, Indian Inst. of Technology, Kharagpur, class of 2000. Highest GPA in graduating class.
Award Papers:	Neurips 2022 Robot Learning workshop best paper award HSCC 2019 best demo/poster award IEEE TCSE Distinguished Paper Award (2018) EMSOFT 2017 best paper nomination HSCC 2016 best student paper EMSOFT 2014 best paper SAS 2014 Radhia Cousot best student paper award ECOOP 2013 Distinguished artifact award. PLDI 2013 distinguished paper award ASE 2009 distinguished paper award.

Ongoing Projects

Artificial Pancreas (2014 - present): Originally a framework for performing semiformal, leading to fully formal verification of artificial pancreas controllers in collaboration with a team of control designers from RPI who specialize in building control systems and clinicians from the Barbara Davis Center for childhood Diabetes at the University of Colorado medical school. Recently our work in this project has moved towards modeling blood glucose level and predicting likely future user behaviors to support longer term control.

Current Funding: NIH R01: Striking a Balance: Trust and Privacy in Using Adolescents' Data for Diabetes Self-Management (2022 - 2025).

Probabilistic Program Analysis (2013 - present): A framework for reasoning about probabilistic programs which manipulate random variables. The project combines basic ideas from probability theory (eg., Martingale theory, Concentration of Measure Inequalities), statistical hypothesis testing (eg., Sequential Hypothesis testing, Wald's ratio test, Bayes factors) and traditional program analysis techniques. The overall goal is to build program analysis tools capable of reasoning about the probabilities of assertions in probabilistic programs.

Current Funding: NSF Award #1815983 (2018-2023) (PI: Sankaranarayanan).

Verification of Neural Networks (2018 - present): A framework for verifying properties of neural networks used in controllers as well as rigorous approaches for checking whether neural network models of physical processes conform to the basic scientific laws underlying the process.

Current funding: NSF Award # 1932189 (2019-2023) (PI: Sankaranarayanan).

Cognitive Autonomous Systems (2019 - present): Reasoning about human operators in autonomous systems using logic-based techniques and building techniques for predictive runtime monitoring. This is part of a larger collaboration with human factors and control systems researchers led by the University of New Mexico.

Current funding: NSF Award # 1836900 (2019 - 2024) (PI: Meeko Oishi at University of New Mexico).

Completed Projects

Space and Time Resource Exhaustion Vulnerabilities (2015-present): Tools for inferring the absence of timing and resource exhaustion attacks in software systems that can violate privacy and security through long running loops and imbalance in resource usages in secure systems. My group is developing probabilistic analysis for inferring absence of leaks and vulnerabilities by combining static and dynamic analyses.

Funding: DARPA under STAC program (PI: Pavol Cerny, Colorado Co-PIs: Chang, Trivedi, Sankaranarayanan)

Simulation-Based Falsification of Cyber-Physical Systems (2013-2017): A framework for testing and predicting extremal properties of control software combining ideas from rare-event simulations, local/global trajectory optimization and AI search techniques. The project has resulted in tools such as S-Taliro for falsifying temporal properties of Simulink/Stateflow diagrams used by control designers. S-Taliro was named a Industry-Nominated **Technological Breakthrough** by NSF in 2012 for its potential to make control software more reliable and cost-effective. It is currently being evaluated by control engineers in Toyota Motors, USA and Japan.

Funding: NSF CNS Award # 1319457, 10/1/13-9/30/16, NSF CNS Award #1016994, 8/1/2010-7/31/2013 (PI: Sankaranarayanan and Prof. Fainekos, Arizona State University), Sponsored Research Contract From Toyota Motors, 2/1/13-2/1/15.

Mining Software Repositories (2015-2019): A framework for mining and learning information from large public software repositories to infer common usage and error patterns among developers. My group is working on fast approximate graph isomorphism solvers for understanding how parts of one code fragment embed into others.

Funding: DARPA under MUSE project (PI: Bor-Yuh Evan Chang, Co-PIs: Anderson, Cerny, Sankaranarayanan, Yeh).

Symbolic Verification of Cyber-Physical Systems (2010-2017): A programming framework for modeling and verification of numerical properties of control software. It integrates analysis at the source code level with reasoning over models of physical sub-systems expressed as switched Ordinary Differential Equations.

Funding: NSF CAREER Award: 3/1/10 - 2/28/16 (PI: Sankaranarayanan).

Infusion Pump Interaction Analysis (2011- 2014): A framework for reasoning about human interactions with complex cyber-physical systems (CPS). We are focusing on the analysis of drug infusion pump and insulin infusion pump usage. The goal is to develop mathematical models of human-machine interactions and use existing verification tools to prove properties about them.

Funding: NSF CPS Award #1035845, 9/1/2010-8/31/2013. (PI: Sankaranarayanan, Co-PI: Lewis).

Verifying Reconfigurable Power Systems: Application of stochastic sampling and rare-event simulations for reconfigurable “smart-grid” power systems.

Funding: Joint Institute for Strategic Energy Analysis (NREL), 9/1/2010-6/30/2011 (PI: Prof. Suryanarayanan, Colorado State Univ., Co-PIs: Chang, Grunwald and Sankaranarayanan.)

F-Soft/Varvel (2005-2009): A static program analysis framework for finding bugs in programs by combining abstract interpretation and model checking. Currently F-Soft tool and the underlying technologies are being productized by NEC Japan under the name VARVEL(tm).

CoBE (2006-2009): CoBE (Concurrency Bug Eliminator) is a visual and interactive static analysis toolkit for debugging, visualization and comprehension of concurrent multithreaded programs.

TeSSA (2008-2009): Analysis of embedded controller software focussing on automotive control software. Currently developing analyses on *Simulink/Stateflow*(TM) models, especially using symbolic execution and static analysis.

SpecTackle (2007-2009): Property inference using both static analysis and dynamic testing along with statistical techniques such as machine learning. Currently under evaluation as a companion to the VARVEL product.

TimePass (2006-2009): Verification of hybrid control systems using time trajectory approximations for ordinary differential equations through positive invariant computation as well as guaranteed set-valued integration techniques over polyhedra.

StInG/LPInv(2003-2005): Academic toolkit for automatic synthesis of invariants. Based on ideas from my dissertation work at Stanford University.

Teaching

Massively Open Online Courses (MOOC): Data Science Foundations: Data-Structures and Algorithms (online on Coursera.org, May 2021 - Present.).

- Three course specialization covering cs foundations for data science students.
- Total Enrollment: ~9,000 students, ~12% completion rate.
- Rated 4.7 out of 5.0 on [coursera.org](https://www.coursera.org).

Massively Open Online Courses (MOOC): Linear and Integer Programming on Coursera. September - November 2013 and October-December, 2014.

- Total Enrollment: 36,000 (2013) and 12,000 (2014), # watching at least one video: 14,000 (2013), and 8000 (2014).
- # Course Completion: 1,200 (2013) and 600 (2014), # Distinction Certificate Winners: 625 (2013) and 330 (2014).
- Rated 4.8 out of 5.0 on [coursetalk.org](https://www.coursetalk.org).

Instructor: Courses taught at CU Boulder.

- Principles of Programming Languages (CSCI 3155), Fall 2018, Spring 2019, Spring 2020, Fall 2020, Spring 2021 and Spring 2022.
 - Post-Baccalaurate Course Design, CSPB 3155 (2020).
- Algorithms (CSCI 3104), Spring 2015, 2016 and Fall 2016.
 - Post-Baccalaurate Course Design, CSPB 3104 (2016).

- Seminar on Closed Loop Medical Devices (CSCI 7000-13), Spring 2015.
- Discrete Structures (CSCI 2824), Spring 2011-14. Post-Baccalaureate Course Design (2016).
- Linear Programming (CSCI 5654), Fall 2009, 2011, 2013, 2016, 2020.
- Graduate Algorithms (CSCI 5454), Fall 2018 and Spring 2019.
- Complexity of Computations (CSCI 7154), Fall 2010.
- Automata For Cyber-Physical Systems (CSCI 4830/7000), Spring 2010, Fall 2012, 2014, Spring 2017.

Mentoring

Post-doctoral Students: Dr. Guillaume Berger (Oct. 2021 - Present), Dr. Xin Chen (Sept. 2015 - Mar 2018), Dr. Mohamed Amin Ben Sassi (Jan 2014 - March 2016), Dr. Yuen-Lam Vris Voronin (Oct. 2014 - July 2017).

PhD Students (Completed)

- Yan Zhang, PhD (ECEE), CU Boulder, July, 2014.
 - **Thesis Title:** Statistically Sound Verification and Optimization of Black-Box Systems.
 - Co-advised with Prof. Fabio Somenzi (ECEE).
- Arlen Cox, PhD (ECEE), CU Boulder, December, 2014.
 - **Thesis Title:** Parametric Heap Abstraction for Dynamic Language Libraries.
 - Co-advised with Prof. Bor-Yuh Evan Chang (ECEE).
 - **Awards:** Chateaubriand fellowship grant from the French embassy in the USA to conduct part of his research in France. Best artifact award at ECOOP 2013.
- Aleksandar Chakarov, CSCI, CU Boulder, July 2016.
 - **Thesis Title:** Probabilistic Program Verification using Martingale Theory.
 - **Awards:** Distinguished paper award at PLDI 2013, Radhia Cousot outstanding young researcher paper award.
- Aditya Zutshi, ECEE, CU Boulder, July 2016.
 - **Thesis Title:** Falsification of Cyber-Physical Systems.
 - **Awards:** Best paper award EMSOFT 2014, best student paper award HSCC 2016.
- Hadi Ravanbakhsh, CSCI, CU Boulder, July 2018.
 - **Thesis Title:** Inductive Certificate Synthesis for Control Design.
 - **Awards:** Award paper at RSS 2018 (invited to Autonomous Robots Journal).
- Souradeep Dutta, ECEE, CU Boulder, June 2020.
 - **Thesis Title:** Verification of Neural Networks.
 - **Awards:** Best demo/poster award at HSCC 2019.
- Taisa Kushner, CSCI and IQ Biology Program, CU Boulder, July 2020.
 - **Thesis Title:** Data-Driven Modeling and Verification for Artificial Pancreas Systems.
 - **Awards:** NSF Computing Innovation Fellow (2020).
- Yi Chou, CSCI, CU Boulder, July 2021.
 - **Thesis Title:** Bayesian parameter estimation for nonlinear dynamics.
- Hansol Yoon, CSCI, CU Boulder, June 2022.
 - **Thesis Title:** Predictive Runtime Monitoring for Safe Autonomy.

PhD Students (Current at CU Boulder)

- Emily Jensen, CSCI and Cognitive Science (Joint with Prof. Brad Hayes).
 - Research on human-robot interactions and cognitive autonomy project.
- Monal Narasimhamurthy, CSCI.
 - Research on learning data-driven models of controllers and dynamics with formal guarantees.
- Shadi Tashdighi-Kalat, CSCI (Joint with Prof. Ashutosh Trivedi).
 - Research on game theoretic learning for Cyber-Physical Systems.
- Kandai Watanabe, CSCI (Joint with Prof. Morteza Lahijanian).
 - Research on learning formal specifications and control strategies from demonstrations.

Undergraduate Research Students

- Serra Dane (Major: CSCI, 2022 - Present).
 - Modeling patient behavior in type-1 diabetes.
- Michael Dresser (Major: CSCI, 2019),
 - Research on probabilistic programming. Working towards thesis that performs Rao Blackwellization of probabilistic programs using affine form calculus.
- Rhys Braginton Pettie-Olsen (Major: CSCI, 2017-2019).
 - Research on mining API usage protocols from android software on github. Winner of IEEE TCSE distinguished paper award.
- Alexandra Okeson (Major: CSCI, 2013 - 2017).
 - Discovery Learning Apprentice (DLA) funded in part by College of Engineering and by NSF REU. Worked on data-driven modeling of insulin glucose regulation using time series methods. Winner of outstanding graduate award from college of engineering.
- Paul Givens (Major: CSCI, 2012-2013).
 - REU in NSF funded project for analyzing user interfaces. Paul interfaced Sikuli script tool with a novel exploration framework for systematic GUI exploration. Co-authored an ICSE NIER paper in 2013 and presented the paper at the conference.
- Nathan Lapinski (Major: CSCI, 2012-2013).
 - Discovery Learning Apprentice (DLA) funded in part by College of Engineering and by NSF REU. Worked on robustness analysis of medical decision making systems. Presented a poster at SIGCSE student research competition.
- Christopher Miller (Major: Mech. Engg, 2012-2014).
 - Discovery Learning Apprentice (DLA) funded in part by College of Engineering and by NSF REU. Worked on synthesizing insulin infusion pump usage parameters for patients with T1D using simulation. Co-author on Allerton 2012 paper and winner of best poster presentation award at DLA symposium 2013 for computer science.

MS Research Students (Completed)

- Patrick Cooper (MS in CSCI, CU Boulder, 2022 - Present).
- Chinmay Agarwal (MS in CSCI, 2022).
 - **Project:** Modeling eating patterns and analyzing correlations in type-1 diabetes data.
- Nagarajan Shanmughanathan (MS in CSCI, CU Boulder, June 2020).
 - **Project:** Predictive runtime monitoring of actions for UAVs (September 2019 - June 2020).

- Suhas Akshar Kumar (MS in ECEE, CU Boulder, July 2016).
 - **Project:** Suhas worked on data oriented modeling techniques for human insulin-glucose regulation (Jan 2015 - July 2016).
 - **MS Thesis:** Formal Verification of Artificial Pancreas, 2016.
- Huxley Bennett (MS in CSCI, CU Boulder, May 2012).
 - **Project:** Huxley worked on efficient solution counting methods for the satisfiability problem and on phase transition behavior for instances of counting and Quantified Boolean Satisfiability problems (September 2010 - May 2012).
 - **MS Thesis:** Results on the extension of the Satisfiability Problem, 2012.
- Sidartha Sam Flavio Gracias (MS in CSCI, CU Boulder, Dec. 2011).
 - **Project:** Modeling interfaces for commercial drug infusion pumps and simulating the effects of common user errors (Jan 2011 - Dec 2011).
- Hadjar Homaei (MS in CSCI, CU Boulder, Aug. 2011).
 - **Project:** Modeling user interactions with interfaces, including the effects of common user errors (August 2009 - August 2011).

Thesis Committees, Jury and Reviewer (External)

- Sophie Neubauer, TU Vienna, PhD 2022.
- Guillaume Berger, Catholic University Leuven, Belgium, PhD 2021.
- Nicholas Mazzocchi, University Libre Brussels, Belgium, PhD 2020.
- Ramin Hasani, TU-Wien, Austria, PhD 2020.
- Mahdi Yousefi, University of British Columbia, PhD 2018.
- Alexandre Marechal, University of Grenoble, France, PhD 2017.
- Nikolas Stott, Ecolé Polytechnique, France, PhD 2017.
- Friedrich Gretz, RWTH, Aachen, Germany, PhD 2015.
- Guillame Iooss, Colorado State University and ENS Lyon (France), PhD 2016.
- Tomasso Dreossi, University of Grenoble, France, PhD 2016.
- Xin Chen, RWTH, Aachen, Germany, PhD 2015..
- Dieky Adzikya, TU Delft, Netherlands, PhD 2014.
- Saqib Bin Sohail, University of Colorado, Boulder, PhD 2014.
- Yassamine Seladji, Ecole Polytechnique (France), PhD 2012.
- Khalil Ghorbal, Ecole Polytechnique (France), PhD 2011.
- Olivier Boissiou, Ecole Polytechnique (France), PhD, 2008.

Professional Service

Editorial Board: Logical Methods in Computer Science (Oct 2014 - Present), ACM Transactions on Embedded Computing Systems (July 2020 - Present).

Guest Editor: Guest editor for special issues:

- ACM Trans. on Embedded Computing Systems Special Issue on Verification of Cyber-Physical Systems (2010-11).
- Formal Methods in Systems Design, special issue on Numerical Software Verification, 2010.

Proposal Reviews and Panels.

- Service on various NSF panels (approx. 2 per year) including NSF panels for large, “expeditions” and “frontier” proposals, (2010 - Present).
- Ad-hoc reviewer for NSF proposals, DOE early career award proposal and Air Force Office of Scientific Research (AFOSR) Proposals, (2010 - Present).
- Ad-hoc proposal review for international funding agencies including Austrian Science Foundation (FWF, 2017, 2018), and Israel Science Foundation (ISF, 2020).
- Invited Speaker and Panelist for “Global Summit of Scientists of Indian Origin” organized by Dept. of Science and Technology, Govt. of India (2020).
- INRIA (French National Lab for Research in Computer Science and Automation) evaluation panelist: invited to review the work done by 11 Inria research teams (originally in person March 2020, rescheduled for March 2021).
- Invited Panelist for Medical Cyber-Physical Systems (CPS) as part of NSF CPS PI Meeting, (2019).
- Speaker at the S5 workshop on Safe & Secure Systems and Software Symposium organized by the US Air Force Research Labs (AFRL), (2016, 2018).
- Speaker (by invitation) at the AFRL organized Collaborative R&D for Innovative Airforce Leadership (CRDInAL) technical interchange meetings (2017 - 2019).
- Invited Speaker and Panelist for NSF organized workshop on writing proposals for the CPS program, (2015).
- Local organization support and registered participant at the Department of Homeland Security (DHS) national conversation — A Trusted Cyber Future discussion on August 21, 2015 in Boulder, CO.

Conference Organization

- PC Chair, European Conference on Tools and Algorithms for Construction and Analysis of Systems (TACAS 2023), Paris, France (to be held in March 2023).
- Lead PC Chair, ACM/IEEE Conference on Embedded Software (EMSOFT 2019), New York, USA (Joint with Timothy Bourke).
- Joint PC Chair, ACM/IEEE Conference on Embedded Software (EMSOFT 2018), Torino, Italy (Joint with Bjorn Brandenburg).
- Joint PC Chair Formal Methods Analysis of Timed Systems (FORMATS 2015), Madrid, Spain (Joint with Prof. Enrico Vicario).
- Joint PC Chair Hybrid Systems: Computation and Control (HSCC 2015), Seattle, WA (Joint with Prof. Antoine Girard).
- Publicity Chair for HSCC 2012-14.
- Publications Chair, CPSWeek 2013, Philadelphia, PA.

Technical Program Committees (Selected)

- 2022: Hybrid Systems: Computation and Control (HSCC) and Verification, Model Checking and Abstract Interpretation (VMCAI).
- 2020: Computer-Aided Verification (CAV) and ACM Principles of Programming Languages (POPL).
- 2019: CAV, Static Analysis Symposium (SAS) and Hybrid Systems: Computation and Control (HSCC).
- 2018: CAV and SAS.

- 2017: Verification, Model-Checking and Abstract Interpretation (VMCAI), ACM/IEEE conference on Embedded Software (EMSOFT), HSCC and NASA Formal Methods (NFM).
- 2016: CAV, EMSOFT and HSCC.
- 2015: CAV, VMCAI, and Tools and Algorithms for Construction and Analysis of Systems (TACAS).
- 2014: VMCAI, TACAS, HSCC, and SAS.
- 2013: HSCC and NFM.
- 2012: VMCAI, HSCC, CAV, and SAS.
- 2011: CAV, and VMCAI.
- 2010: HSCC, and Intl. Conference on Software engineering (ICSE New Ideas Track).
- 2009: HSCC.

Workshop Organization

- Workshop on Symbolic/Numeric Reachability (SNR 2019).
- Workshop on Numerical Verification of Cyber-Physical Software (July 2012, Berkeley, CA; July 2011, Snowbird, UT; March 2009, San Francisco, CA; and July 2008, Princeton, NJ).
- Third North Eastern Verification Seminar (NEVER), May 2007.

Referee: Non-Linear Analysis: Hybrid Systems, Automatica, Constraints, Formal Methods in Systems Design, Logical Methods in Computer Science, J. Symbolic Computation, J. Theoretical Comp. Sci, J. Satisfiability, IEEE Trans. on Automatic Control, ACM Trans. on Design of Electronic Systems, J. Symbolic Computation, POPL, PLDI, HSCC, CAV, TACAS, LICS, VMCAI, SAS and *many others*.

University Service

Department: Associate Chair and Co-director of CS undergraduate program (2019 - present), Associate Chair and Co-director of CS graduate admissions committee (2015-2019), Member of the CS Graduate Admissions Committee (2009-2010, 2012 - 2015), CS Executive Committee (2010-2012).

College: Dissertation Awards Committee (2010), Applied Mathematics Course Review Committee (2011), Engineering Massively Open Online Course (MOOC) Faculty Panelist (2013), College of Engineering Bioengineering Minor Task Force (2014), CAREER proposal review committee (2020).

University: MS in Data Science curriculum design (2018 - present), Panelist for FTEP Symposium on Massively Open Online Courses (MOOCs) (2013), Member of Campus Education Innovation Group (headed by Prof. William Kuskin, Associate Vice Provost for Education Innovation), Integrated degree program in general studies curriculum committee (cross-campus initiative involving all CU campuses, 2017-2019).

Publications

Notes: The DBLP server maintains an up-to-date index of computer science related publications at <http://www.informatik.uni-trier.de/~ley/db/>.

A ★ next to co-author indicates a pre/post doctoral trainee.

Journals/Book Chapters

- [T21] Saeid Tizpaz-Niari, Pavol Cerny, Sriram Sankaranarayanan, and Ashutosh Trivedi, Quantitative estimation of side-channel leaks with neural networks. *Int. J. Softw. Tools Technol. Transf.* 23(4): 641-654 (2021)
- [S21] Sriram Sankaranarayanan, Technical perspective: An elegant model for deriving equations, *Communications of ACM*, 64 (7), pp. 90, 2021 (**Note:** Invited short technical perspective).
- [S20] Sriram Sankaranarayanan, Quantitative Analysis of Programs with Probabilities and Concentration of Measure Inequalities. *Foundations of Probabilistic Programming* (Editors: Gilles Barthe, Joost-Pieter Katoen, and Alexandra Silva), Cambridge University Press, 2020. (**Note:** Peer reviewed book chapter).
- [K+20] Taisa Kushner*, Marc D. Breton and Sriram Sankaranarayanan, Multi-hour Blood Glucose Prediction in T1D: A Patient Specific Approach using Shallow Neural Network Models. *Diabetes Technology and Therapeutics*, 2020.
- [J+19] Jyotirmoy Deshmukh, and Sriram Sankaranarayanan, Formal Techniques for Verification and Testing of Cyber-Physical Systems. In *Design Automation of Cyber-Physical Systems* (Arquimedes Canedo and Mohammad Al Faruque), pp. 69-105 (2019). (**Note:** Peer reviewed book chapter).
- [F+19] Gregory Forlenza, Taisa Kushner*, Laurel Messer, R. Paul Wadwa, and Sriram Sankaranarayanan, Factory-Calibrated Continuous Glucose Monitoring: How and Why It Works, and the Dangers of Reuse Beyond Approved Duration of Wear. *Diabetes: Technology and Therapeutics* Vol. 21(4), pp. 222-229 (2019).
- [H+19] Hadi Ravanbakhsh*, and Sriram Sankaranarayanan, Learning control lyapunov functions from counterexamples and demonstrations. *Autonomous Robots* 43(2): 275-307 (2019).
- [GS19] Jessica Gronski*, Mohamed-Amin Ben Sassi, Stephen Becker and Sriram Sankaranarayanan, Template Polyhedron and Bilinear Programming. *Formal Methods in Systems Design*, 54(1), 26-63 (2019).
- [K19] Taisa Kushner*, B. Wayne Bequette, Faye Cameron, Gregory P. Forlenza, David M. Maahs, and Sriram Sankaranarayanan, Models, Devices, Properties, and Verification of Artificial Pancreas Systems. *Automated Reasoning for Systems Biology and Medicine 2019*: 93-131. (**Note:** Peer reviewed book chapter).
- [B+18] Ezio Bartocci, Jyotirmoy Deshmukh, Alexandre Donze, Georgios Fainekos, Oded Maler, Dejan Nickovic, and Sriram Sankaranarayanan, Specification-Based Monitoring of Cyber-Physical Systems: A Survey on Theory, Tools and Applications. In E. Bartocci and Y. Falcone (eds): *Lectures on Runtime Verification*, Volume 10457 of *Lecture Notes in Computer Science* pp. 135-175, 2018. (**Note:** Peer reviewed book chapter).
- [R+18] Pierre Roux, Yuen-Lam Voronin*, and Sriram Sankaranarayanan, Validating numerical semidefinite programming solvers for polynomial invariants. *Formal Methods in System Design* 53(2): 286-312 (2018).
- [CMS17] Xin Chen*, Sergio Mover*, and Sriram Sankaranarayanan, Compositional Relational Abstraction for Nonlinear Systems In *ACM Transactions on Embedded Computing Systems* (Special Issue for EMSOFT 2017) Vol. 16(5s), pp. 187 (2017). **Note:** EMSOFT 2017 Best Paper Award Nomination
- [SKCB+17] Sriram Sankaranarayanan, Suhas Akshar Kumar*, Faye Cameron, B. Wayne Bequette, Georgios E. Fainekos, and David M. Maahs, *Model-based falsification of an artificial pancreas control system*. *SIGBED Review* 14(2): 24-33 (2017).
- [SSCA16] Mohamed Amin Ben Sassi*, Sriram Sankaranarayanan, Xin Chen*, and Erika Ábrahám, Linear relaxations of polynomial positivity for polynomial Lyapunov function synthesis. *IMA J. Math. Control & Information* 33(3): 723-756 (2016)

- [S16] Sriram Sankaranarayanan, *Change-Of-Bases Abstractions for Non-Linear Systems*. Nonlinear Analysis: Hybrid Systems Vol. 19, pp. 107-133 (2016).
- [F15] Gregory P. Forlenza, Sriram Sankaranarayanan, and David M. Maahs, *Refining the Closed Loop in the Data Age: Research-to-Practice Transitions*. Diabetes Technology (Editorial) In Diabetes Technology and Therapeutics Vol. 17(5), pp. 304-306 (2015).
- [B++15] Mohamed Amin Ben Sassi*, Sriram Sankaranarayanan, Xin Chen*, and Erika Abraham, Linear Relaxations of Polynomial Positivity for Polynomial Lyapunov Function Synthesis, IMA Journal of Mathematical Control and Information Vol. dnv003, pp. 39 (2015).
- [I++14] Franjo Ivancic, Gogul Balakrishnan, Aarti Gupta, Sriram Sankaranarayanan, Naoto Maeda, Takashi Imoto, Rakesh Pothengil, and Mustafa Hussain, *Scope bounded software verification in Varvel*. Journal of Automated Software Engineering (J. ASE), pp. 1-14 (2014).
- [K+2014] tephem M. Kissler, Cody Cichowitz, Sriram Sankaranarayanan, and David M. Bortz. *Determination of personalized diabetes treatment plans using a two-delay model*. Journal of Theoretical Biology, 359(Oct), 101-111, 2014.
- [CSC+14] Arlen Cox*, Sriram Sankaranarayanan, and Bor-Yuh Evan Chang, *A bit too precise? Bounded verification of quantized digital filters*. Journal of Software Tools for Technology Transfer (STTT Journal), 16(2), 175–190, (2014).
- [AFS+13] Houssam Abbas, Georgios E. Fainekos, Sriram Sankaranarayanan, Franjo Ivancic, and Aarti Gupta: *Probabilistic Temporal Logic Falsification of Cyber-Physical Systems*. ACM Trans. Embedded Comput. Syst. 12(2s): 95 (2013)
- [KSG13] Vineet Kahlon, Sriram Sankaranarayanan, and Aarti Gupta. *Static Analysis for Concurrent Programs with Applications to Data Race Detection*. Journal of Software Tools for Technology Transfer (STTT Journal), vol. 15(4), 321-336 (2013).
- [DES11] Jyotirmoy V. Deshmukh*, E. Allen Emerson, and Sriram Sankaranarayanan, *Symbolic modular deadlock analysis*. Autom. Softw. Eng. **18** (2011), no. 3-4, 325–362.
- [SSM08] Sriram Sankaranarayanan, Henny Sipma, and Zohar Manna. *Constructing invariants for hybrid systems*. Formal Methods in System Design, 32(1):25–55, 2008.
- [FSS05] Bernd Finkbeiner, Sriram Sankaranarayanan, and Henny Sipma. *Collecting statistics over runtime executions*. Formal Methods In System Design, 27(3):253–274, 2005.
- [DCDS01] Pallab Dasgupta, P.P. Chakrabarti, Jatinder Deka, and Sriram Sankaranarayanan. *Min-max computation tree logic*. Artificial Intelligence, 127(1):137–162, 2001.
- [VPSS00] Pradeep Verma, B.S. Panwar, Arjun Singh, and **S. Sriram**. *Metastability reduction by aperture transformation*. IET Electronics Letters, 36(6):501–503, 2000.

Note: A * next to co-author indicates a pre/post doctoral trainee. Acceptance rates for selective conference papers provided, if known.

LNCS Chapters & Conference Proceedings (Peer Reviewed)

- [Reed/22] Alec Reed, Guillaume O Berger, Sriram Sankaranarayanan, and Chris Heckman, *Verified Path Following Using Neural Control Lyapunov Functions*, Conference on Robot Learning (CoRL) 2022.
- [Majid/22] Keyvan Majid, Geoffrey Mitchell Clark, Tanmay Khandait, Siyu Zhou, Sriram Sankaranarayanan, Georgios Fainekos and Heni Amor, *Safe Robot Learning in Assistive Devices through Neural Network Repair*, Conference on Robot Learning (CoRL) 2022.

- [Jensen/22b] Emily Jensen *, Maya Luster, Brandon Pitts, and Sriram Sankaranarayanan, Using Artificial Potential Fields to Model Driver Situational Awareness, Workshop on Human Cyber-Physical Systems (CPHS) 2022.
- [B+22] Guillaume O. Berger*, Monal Narasimhamurthy*, Kandai Watanabe *, Morteza Lahijanian and Sriram Sankaranarayanan, An Algorithm for Learning Switched Linear Dynamics from Data, Neural Information Processing Systems (NeurIPS) 2022 (Acceptance Rate: ~26%).
- [BS22] Guillaume O. Berger* and Sriram Sankaranarayanan, Learning fixed-complexity polyhedral Lyapunov functions from counterexamples, IEEE Conference on Control and Decision (CDC) 2022.
- [J+22] Emily Jensen*, Maya Luster*, Hansol Yoon*, Brandon Pitts, and Sriram Sankaranarayanan, Mathematical Models of Human Drivers Using Artificial Risk Fields, IEEE Intelligent Transportation Systems Conference (ITSC), 2022.
- [MS22] Monal Narasimhamurthy* and Sriram Sankaranarayanan, Decoding Output Sequences for Discrete-Time Linear Hybrid Systems. Hybrid Systems: Computation and Control, 2022: 6:1-6:7, ACM.
- [CS22] Xin Chen and Sriram Sankaranarayanan, Reachability Analysis for Cyber-Physical Systems: Are We There Yet? NASA Formal Methods Symposium, 2022: 109-130. (**Note:** Invited Keynote Talk/Paper).
- [WRSL21] Kandai Watanabe*, Nicholas Renninger*, Sriram Sankaranarayanan, and Morteza Lahijanian, Probabilistic Specification Learning for Planning with Safety Constraints, In Intelligent Robots and Systems (IROS), 2021.
- [YS21] Hansol Yoon*, and Sriram Sankaranarayanan, Predictive Runtime Monitoring for Mobile Robots using Logic-Based Bayesian Intent Inference, In International Conference on Robotics and Automation (ICRA), IEEE Press, 2021.
- [SCGP20] Sriram Sankaranarayanan, Yi Chou*, Eric Goubault, and Sylvie Putot, Reasoning about Uncertainties in Discrete-Time Dynamical Systems using Polynomial Forms. In Advances in Neural Information Processing System (NeurIPS), Curran Publishers, (**Acceptance Rate:** 20.1%).
- [CYS20] Yi Chou*, Hansol Yoon*, and Sriram Sankaranarayanan, Predictive Runtime Monitoring of Vehicle Models Using Bayesian Estimation and Reachability Analysis. In Intl. Conference on Intelligent Robots and Systems (IROS), IEEE Press 2020. (**Acceptance Rate:** 45%).
- [FMRST20] Emmanuel Filiot, Nicolas Mazzocchi, Jean-Francois Raskin and Sriram Sankaranarayanan and Ashutosh Trivedi, Weighted Transducers for Robustness Verification In Intl. Conference on Concurrency Theory (CONCUR), pp. 17:1–17:21 (2020). (**Acceptance Rate:** 40%).
- [S20A] Sriram Sankaranarayanan, Reachability Analysis Using Message Passing over Tree Decompositions. In International Conference on Computer-Aided Verification (CAV), Vol. 12224 of Lecture Notes in Computer Science, pp. 604–628 (2020). (**Acceptance Rate:** 25%).
- [F+20] Shenghua Feng*, Mingshuai Chen, Bai Xue, Sriram Sankaranarayanan, and Naijun Zhan, Unbounded-Time Safety Verification of Stochastic Differential Dynamics. In International Conference on Computer-Aided Verification (CAV), Volume 12225 of Lecture Notes in Computer Science, pp. 327 – 348 (2020). (**Acceptance Rate:** 25%).
- [KSB20] Taisa Kushner* and Sriram Sankaranarayanan and Marc Breton, Conformance verification for neural network models of glucose-insulin dynamics. In Hybrid Systems: Computation and Control, pp. 13:1–13:12 (2020). (**Acceptance Rate:** 39%).

- [CDS19] Arthur Clavière*, Souradeep Dutta*, and Sriram Sankaranarayanan: Trajectory Tracking Control for Robotic Vehicles Using Counterexample Guided Training of Neural Networks. International Conference on Planning and Scheduling (ICAPS), pp. 680-688 (2019). (**Acceptance Rate:** 32%).
- [DRLSC19] Guohui Ding*, Hadi Ravanbakhsh*, Zhiyuan Liu*, Sriram Sankaranarayanan, and Lijun Chen: Distributed Online Convex Programming for Collision Avoidance in Multi-agent Autonomous Vehicle Systems. American Control Conference, pp. 2771-2776 (2019). (**Acceptance Rate:** 64%).
- [DCS19] Souradeep Dutta*, Xin Chen, Sriram Sankaranarayanan: Reachability analysis for neural feedback systems using regressive polynomial rule inference. Hybrid Systems: Computation and Control (HSCC), pp. 157-168 (2019). (**Acceptance Rate:** 24%, special session on verified autonomous systems).
- [DCJST] Souradeep Dutta*, Xin Chen, Susmit Jha, Sriram Sankaranarayanan, Ashish Tiwari: Sherlock - A tool for verification of neural network feedback systems: demo abstract, Hybrid Systems: Computation and Control (HSCC), pp. 262-263 (2019) (**Note:** Best Demo/Poster Award, Acceptance Rate unknown).
- [NKDS19] Monal Narasimhamurthy*, Taisa Kushner*, Souradeep Dutta*, Sriram Sankaranarayanan: Verifying Conformance of Neural Network Models. Intl. Conference on Computer-Aided Design, 2019: 1-8. (**Note:** Invited paper for special session).
- [RSS19] Hadi Ravanbakhsh*, Sriram Sankaranarayanan, Sanjit A. Seshia: Formal Policy Learning from Demonstrations for Reachability Properties. International Conference on Robotics and Automation (ICRA), pp. 6037-6043 (2019). (**Acceptance Rate:** 42%).
- [CS19] Yi Chou*, Sriram Sankaranarayanan: Bayesian Parameter Estimation for Nonlinear Dynamics Using Sensitivity Analysis. International Joint Conference on Artificial Intelligence (IJCAI), pp. 5708-5714 (2019). (**Acceptance Rate:** 22%).
- [SDM19] Sriram Sankaranarayanan, Souradeep Dutta*, Sergio Mover: Reaching Out Towards Fully Verified Autonomous Systems. Reachability Problems, pp. 22-32 (2019). (**Note:** Invited paper and talk.)
- [FHS19] Georgios Fainekos, Bardh Hoxha, Sriram Sankaranarayanan: Robustness of Specifications and Its Applications to Falsification, Parameter Mining, and Runtime Monitoring with S-TaLiRo. Intl. Conference on Runtime Verification (RV), pp. 27-47 (2019). (**Note:** Invited tutorial.)
- [NCST19] Saeid Tizpaz-Niari*, Pavol Cerný, Sriram Sankaranarayanan, Ashutosh Trivedi: Efficient Detection and Quantification of Timing Leaks with Neural Networks. Intl. Conference on Runtime Verification (RV) pp. 329-348 (2019). (**Note:** Award paper invited to special issue in STTT Journal, **Acceptance Rate:** 63%).
- [Y+19] Hansol Yoon, Yi Chou, Xin Chen, Eric Frew, and Sriram Sankaranarayanan, Predictive Runtime Monitoring for Linear Stochastic Systems and Applications to Geofence Enforcement for UAVs. In International Conference on Runtime Verification (RV), pp. 349–367 (2019). (**Acceptance Rate:** 63%).
- [RAHS18] Hadi Ravanbakhsh*, Sina Aghli*, Christoffer Heckman, and Sriram Sankaranarayanan, Path-Following through Control Funnel Functions In Intelligent Robotics and Systems (IROS), pp. 401–408, 2018. (**Acceptance Rate:** 47%).
- [DKS18] Souradeep Dutta*, Taisa Kushner*, and Sriram Sankaranarayanan, Robust Data-Driven Control of Artificial Pancreas Systems using Neural Networks In Computational Methods in Systems Biology, Volume 11905 of Lecture Notes In Computer Science, pp. 183-202, 2018. (**Acceptance Rate:** ~45%).

- [DJST18] Souradeep Dutta*, Susmit Jha, Sriram Sankaranarayanan, and Ashish Tiwari, Learning and Verification of Feedback Control Systems using Feedforward Neural Networks In IFAC Conference on Analysis and Design of Hybrid Systems (ADHS), pp. 151- 156, 2018 (**Acceptance Rate:** ~67%).
- [KBMS18] Taisa Kushner*, David Bortz, David Maahs, and Sriram Sankaranarayanan, A Data-Driven Approach to Artificial Pancreas Verification and Synthesis. In Intl. Conference on Cyber-Physical Systems (ICCPs'18), pp. 242-252, 2018. (**Acceptance Rate:** 31%)
- [DJST18] Souradeep Dutta*, Susmit Jha, Sriram Sankaranarayanan, and Ashish Tiwari, Output Range Analysis for Deep Feedforward Neural Networks In Proceedings of NASA Formal Methods Symposium (NFM), Volume 10811 of Lecture Notes In Computer Science pp. 121-138, 2018. (**Acceptance Rate:** 33%)
- [MS18] Sergio Mover*, Sriram Sankaranarayanan, Rhys Olsen*, and Bor-Yuh Evan Chang, Mining framework usage graphs from app corpora In International Conference on Software Analysis, Evolution and Reengineering (SANER), pp. 277-289, 2018. Note: Winner of IEEE TCSE Distinguished Paper Award. (**Acceptance Rate:** 27%).
- [SS17] Sriram Sankaranarayanan, and Mohamed Amin Ben Sassi, Template Polyhedra with a Twist In Static Analysis Symposium (SAS), Volume 10422 of Lecture Notes in Computer Science pp. 321-341, 2017 (**Acceptance Rate:** 44%, **Award paper:** Invited to special issue on formal methods in systems design).
- [CS17] Xin Chen*, and Sriram Sankaranarayanan, Model-Predictive Real-Time Monitoring of Linear Systems In IEEE Real-Time Systems Symposium (RTSS), pp. 297-306, 2017. (**Acceptance Rate:** 25%).
- [CCS17] Yi Chou*, Xin Chen*, and Sriram Sankaranarayanan, *A Study of Model-Order Reduction Techniques for Verification*, Proc. of Workshop on Numerical Software Verification, 2017, 98-13, Volume 10381 of Lecture Notes in Computer Science, Springer 2017. (**Acceptance Rate:** Unknown).
- [CDS17] Xin Chen*, Souradeep Dutta*, and Sriram Sankaranarayanan, *Formal Verification of a Multi-Basal Insulin Infusion Control Model*. Proc. of Workshop ARCH@CPSWeek, 2017: 75-91. (**Acceptance Rate:** Unknown).
- [DST17] Ram Das Diwakaran*, Sriram Sankaranarayanan and Ashutosh Trivedi, *Analyzing neighborhoods of falsifying traces in cyber-physical systems*, International Conference on Cyber-Physical Systems 2017, 109-119, ACM Press. (**Acceptance Rate:** 30%).
- [RS17] Hadi Ravanbakhsh* and Sriram Sankaranarayanan, Learning Lyapunov (Potential) Functions from Counterexamples and Demonstrations. Robotics: Science and Systems 2017. (**Acceptance Rate:** 31%, invited to special issue on Autonomous Robots.).
- [SS17] Sriram Sankaranarayanan and Mohamed Amin Ben Sassi*, *Template Polyhedra with a Twist*. Static Analysis Symposium 2017: 321-341. (**Acceptance Rate:** 44%, **Invited to special issue**).
- [S+17] Saeid Tizpaz-Niari*, Pavol Cerny, Bor-Yuh Evan Chang, Sriram Sankaranarayanan, and Ashutosh Trivedi. *Discriminating Traces with Time*. TACAS (2) 2017: 21-37 (**Acceptance Rate:** 25%).
- [HS16] Hadi Ravanbakhsh*, and Sriram Sankaranarayanan, *Robust Controller Synthesis of Switched Systems Using Counterexample Guided Framework*. ACM/IEEE Conference on Embedded Software (EMSOFT), 8:1-8:10 (2016). (**Acceptance Rate:** 23%).
- [CS16] Xin Chen*, and Sriram Sankaranarayanan, *Decomposed Reachability Analysis for Nonlinear Systems*. RTSS 2016: 13-24, IEEE Press. (**Acceptance Rate:** 23%).

- [RVS16] Pierre Roux, Yuen-Lam Voronin*, and Sriram Sankaranarayanan, *Validating Numerical Semidefinite Programming Solvers for Polynomial Invariants*. Static Analysis Symposium (SAS), Volume 9837 of Lecture Notes in Computer Science pp. 424–446 (2016). (**Acceptance Rate:** 38%).
- [ZSDJ16] Aditya Zutshi*, Sriram Sankaranarayanan, Jyotirmoy Deshmukh, and Xiaoqing Jin, *Symbolic-Numeric Reachability Analysis of Closed-Loop Control Software In Hybrid Systems: Computation and Control (HSCC)*, pp. 135-144 (2016). (**Winner** best student paper award. **Acceptance Rate:** 47%)
- [BGPCS16] Olivier Bouissou, Eric Goubault, Sylvie Putot, Aleksandar Chakarov*, and Sriram Sankaranarayanan, *Uncertainty Propagation using Probabilistic Affine Forms and Concentration of Measure Inequalities*. In Tools and Algorithms for Construction and Analysis of Systems (TACAS), Volume 9636 of Lecture Notes in Computer Science pp. 225-243 (2016). (**Acceptance Rate:** 28%)
- [CVS16] Aleksandar Chakarov*, Yuen-Lam (Vris) Voronin*, and Sriram Sankaranarayanan, *Deductive Proofs of Almost Sure Persistence and Recurrence Properties*. Tools and Algorithms for Construction and Analysis of Systems (TACAS), Volume 9636 of Lecture Notes in Computer Science pp. 260-279 (2016). (**Acceptance Rate:** 28%)
- [RS15] Hadi Ravanbakhsh*, and Sriram Sankaranarayanan, *Counter-Example Guided Synthesis of Control Lyapunov Functions For Switched Systems*. IEEE Control and Decision Conference (CDC), pp. 4232-4239 (2015). (**Acceptance Rate:** 57%).
- [ZSG15] Yan Zhang*, Sriram Sankaranarayanan, and Benjamin Gyori, *Simulation-Guided Parameter Synthesis for the Chance-Constrained Optimization of Control Systems*. Proc. International Conference on Computer-Aided Design (ICCAD), pp. 208-215 (2015). (**Acceptance Rate:** ~25%).
- [CFMS15] Faye Cameron, Georgios Fainekos, David M. Maahs, and Sriram Sankaranarayanan, *Towards a Verified Artificial Pancreas: Challenges and Solutions for Runtime Verification In Proceedings of Runtime Verification (RV'15)*, Volume 9333 of Lecture Notes in Computer Science pp. 3-17 (2015). (**Invited (Keynote) Paper**).
- [BSG14] Amin Ben-Sassi*, Sriram Sankaranarayanan and Antoine Girard. *Iterative Computation of Polyhedral Invariants Sets for Polynomial Dynamical Systems*. IEEE Conference on Decision and Control (CDC), 2014. (**Acceptance Rate:** 56%).
- [CSA14] Xin Chen*, Sriram Sankaranarayanan and Erika Ábraham. *Under-approximate Flowpipes for Non-linear Continuous Systems*, Formal Methods in Computer-Aided Design (FMCAD), pp. 59-66, 2014 (**Acceptance Rate:** ~40%).
- [ZSS14] Yan Zhang*, Sriram Sankaranarayanan and Fabio Somenzi. *Statistically Sound Verification and Optimization for Complex Systems*. Automated Technology for Verification and Analysis (ATVA), Volume 8837 of Lecture Notes in Computer Science, pp. 411-427, 2014. (**Acceptance Rate:** ~35%).
- [RS14] Hadi Ravanbakhsh* and Sriram Sankaranarayanan. *Infinite Horizon Safety Controller Synthesis through Disjunctive Polyhedral Abstract Interpretation*. International Conference on Embedded Software (EMSOFT), pp. 15:1-15:10, 2014, ACM Press. (**Acceptance Rate:** 24%).
- [ZSDK14] Aditya Zutshi*, Sriram Sankaranarayanan, Jyotirmoy V. Deshmukh and James Kapinski. *Multiple Shooting, CEGAR-based Falsification for Hybrid Systems*. International Conference on Embedded Software (EMSOFT), pp. 5:1-5:10, 2014, ACM Press. (**Acceptance Rate:** 24% , **Winner:** ACM SIGBED Best Paper Award.)
- [CS14] Aleksandar Chakarov* and Sriram Sankaranarayanan. *Expectation Invariants for Probabilistic Program Loops as Fixed Points*. Static Analysis Symposium (SAS), Volume 8723 of Lecture Notes in Computer Science, pp. 85-100, 2014. (**Acceptance Rate:** 37%, **Winner:** Radhia Cousot Best Young Researcher Paper Award.)

- [GJPS14] Eric Goubault, Jacques-Henri Jourdan, Sylvie Putot and Sriram Sankaranarayanan. *Finding Non-Polynomial Positive Invariants and Lyapunov Functions for Polynomial Systems through Darboux Polynomials*. American Control Conference (ACC), pp. 3571 - 3578, 2014, IEEE Press.
- [CCS14] Arlen Cox*, Bor-Yuh Evan Chang and Sriram Sankaranarayanan. *QUICr: A Reusable Library for Parametric Abstraction of Sets and Numbers*. Computer-Aided Verification (CAV), 2014, Volume 8559 of Lecture Notes in Computer Science, 866-873. (**Acceptance Rate:** 25%).
- [KDSA14] James Kapinski, Jyotirmoy V. Deshmukh, Sriram Sankaranarayanan, and Nikos Arechiga. *Simulation-Guided Lyapunov Analysis for Hybrid Dynamical Systems*. Hybrid Systems: Computation and Control (HSCC), 2014, 133-142, ACM Press. (**Acceptance Rate:** 46%).
- [SJS14] Peter Schrammel, Bertrand Jeannot and Sriram Sankaranarayanan. *Abstract Acceleration of General Linear Loops*. ACM SIGPLAN Principles of Programming Languages (POPL), 2014, 529-540, ACM Press. (**Acceptance Rate:** 18%).
- [ZSS14] Yan Zhang*, Sriram Sankaranarayanan and Fabio Somenzi. *Sparse Statistical Model Inference for Analog Circuits under Process Variations*. Asia and South Pacific Design Automation Conference (ASP-DAC 2014), 449-454, IEEE Press. (**Acceptance Rate:** 31.4%)
- [ZSDK13] Aditya Zutshi*, Sriram Sankaranarayanan, Jyotirmoy Deshmukh and James Kapinski. *A Trajectory Splicing Approach to Concretizing Counter-Examples for Hybrid Systems*. IEEE Conference on Decision and Control (CDC 2013), 3918-3925, IEEE Press. **Invited Submission to Special Session on Formal Methods in Control.**
- [SCA13] Sriram Sankaranarayanan, Xin Chen* and Erika Abraham. *Lyapunov Function Synthesis Using Handelman Representations*. IFAC conference on Nonlinear Control Systems (NOLCOS), 2013. **Invited Submission to Special Session on Reliable Methods for Control Systems.**
- [CAS2013] Xin Chen*, Erika Abraham, and Sriram Sankaranarayanan. *Flow*: An Analyzer for Non-linear Hybrid Systems*. Computer-Aided Verification (CAV) 2013, Volume 8044 of Lecture Notes in Computer Science (LNCS), 258-263. (**Acceptance Rate:** 30%).
- [CS2013] Aleksandar Chakarov* and Sriram Sankaranarayanan. *Probabilistic Program Analysis with Martingales*. Computer-Aided Verification (CAV) 2013, Volume 8044 of Lecture Notes in Computer Science (LNCS), 511-526. (**Acceptance Rate:** 30%).
- [CCS2013] Arlen Cox*, Bor-Yuh Evan Chang, and Sriram Sankaranarayanan. *QUIC Graphs: Relational Invariant Generation for Containers*. European Colloquium on Object-Oriented Programming (ECOOP) 2013, Vol. 7920 of *Lecture Notes in Computation* (LNCS), 401-425. (**Acceptance Rate:** 25%, **Winner: Distinguished Artifact Award.**)
- [ZSSCA] Yan Zhang*, Sriram Sankaranarayanan, Fabio Somenzi, Xin Chen, and Erika Abraham. *From statistical model checking to statistical model inference: Characterizing the effect of process variations in analog circuits*. Intl. Conference Computer-Aided Design (ICCAD) 2013: 662-669. **Acceptance Rate:** 26.0%.
- [CSV13] Swarat Chaudhuri, Sriram Sankaranarayanan, Moshe Y. Vardi: *Regular Real Analysis*. IEEE Symposium on Logic in Computer Science (LICS) 2013: 509-518. **Acceptance Rate:** 34.5%.
- [SCG13] Sriram Sankaranarayanan, Aleksandar Chakarov*, Sumit Gulwani. *Static analysis for probabilistic programs: Inferring whole program properties from finitely many paths*. ACM Conference on Programming Languages Design and Implementation (PLDI) 2013: 447-458. (**Acceptance Rate:** ~22%, **Winner: ACM SIGPLAN Distinguished Paper Award**).

- [GCSY13] Paul Givens*, Aleksandar Chakarov*, Sriram Sankaranarayanan and Tom Yeh. *Exploring the Internal State of User Interfaces by Combining Computer Vision Techniques with Grammatical Inference*. Intl. Conference on Software Engg. (ICSE), New and Emerging Ideas Track, 2013. **Acceptance Rate:** $\sim 22\%$
- [SF+12] Sriram Sankaranarayanan, Chris Miller*, Rangarajan Rangunathan, Hadi Ravanbakhsh* and Georgios Fainekos, *A Model-Based Approach to Synthesizing Insulin Infusion Pump Usage Parameters for Diabetic Patients*. Allerton Conference 2012, IEEE Press. (**Invited Paper**).
- [CAS12] Xin Chen*, Erika Abraham and Sriram Sankaranarayanan, *Taylor Model Flowpipe Construction for Non-Linear Hybrid Systems*. IEEE Real-Time Systems Symposium (RTSS), IEEE Press, 2012, pp. 183–192. **Acceptance Rate:** $\sim 20\%$.
- [ZSS12] Yan Zhang*, Sriram Sankaranarayanan and Fabio Somenzi, *Piecewise Linear Modeling of Nonlinear Devices for the Formal Verification of Analog Circuits*. Formal Methods in Computer-Aided Design (FMCAD), IEEE Press, 2012. **Acceptance Rate:** $\sim 30\%$.
- [SF12] Sriram Sankaranarayanan and Georgios Fainekos, *Simulating Insulin Infusion Pump Risks by In-Silico Modeling of the Insulin-Glucose Regulatory System*. Computational Methods in Systems Biology (CMSB), Lecture Notes in Computer Science, vol. 7605, Springer, 2012, pp. 322–342. **Acceptance Rate:** 36%.
- [SSSC12] Alejandro Sanchez, Sriram Sankaranarayanan, César Sánchez and Bor-Yuh Evan Chang, *Invariant Generation for Parametrized Systems Using Self-Reflection*. Static Analysis Symposium (SAS), Lecture Notes in Computer Science, vol. 7460, Springer, 2012, pp. 146–162. **Acceptance Rate:** 40%.
- [FSUY12] Georgios E. Fainekos, Sriram Sankaranarayanan, Koichi Ueda and Hakan Yazarel, *Verification of Automotive Control Applications Using S-Taliro*. Proc. of American Control Conference (ACC), *Invited session on verification of automotive control systems*.
- [SF12] Sriram Sankaranarayanan and Georgios E. Fainekos, *Falsification of temporal properties of hybrid systems using the cross-entropy method*. Hybrid Systems: Computation and Control (HSCC), ACM Press, 2012, pp. 125–134. **Acceptance Rate:** $\sim 40\%$.
- [KFS12] Kangjin Kim, Georgios E. Fainekos, and Sriram Sankaranarayanan, *On the revision problem of specification automata*. International Conference on Robotics and Applications (ICRA), IEEE Press, 2012, pp. 5171–5176. **Acceptance Rate:** 40%.
- [ZST12] Aditya Zutshi*, Sriram Sankaranarayanan, and Ashish Tiwari, *Timed relational abstractions for sampled data control systems*. Computer-Aided Verification (CAV), Lecture Notes in Computer Science, vol. 7358, Springer, 2012, pp. 343–361. **Acceptance Rate:** 21%.
- [YB+12] Jing Yang, Gogul Balakrishnan, Naoto Maeda, Franjo Ivancic, Aarti Gupta, Nishant Sinha, Sriram Sankaranarayanan, and Naveen Sharma, *Object model construction for inheritance in c++ and its applications to program analysis*. Compiler Construction (CC), Lecture Notes in Computer Science, vol. 7210, Springer, 2012, pp. 144–164. **Acceptance Rate:** 26%.
- [CSC12] Arlen Cox, Sriram Sankaranarayanan, and Bor-Yuh Evan Chang, *A bit too precise? bounded verification of quantized digital filters*. Tools and Algorithms for the Construction and Analysis of Systems (TACAS), Lecture Notes in Computer Science, vol. 7214, Springer, 2012, pp. 33–47. (**Acceptance Rate:** 25%, **Award Paper:** **Invitation to STTT Journal Special Issue**).
- [ST11] Sriram Sankaranarayanan and Ashish Tiwari, *Relational abstractions for continuous and hybrid systems*. Computer-Aided Verification (CAV), Lecture Notes in Computer Science, vol. 6806, Springer, 2011, pp. 686–702. **Acceptance Rate:** 21%.

- [SHL11] Sriram Sankaranarayanan, Hadjar Homaei*, and Clayton Lewis, *Model-based dependability analysis of programmable drug infusion pumps*. Formal Techniques for Analysis of Timed Systems (FOR-MATS), Lecture Notes in Computer Science, vol. 6919, 2011, pp. 317–334. **Acceptance Rate:** 46%.
- [IBGS+11] Franjo Ivančić, Gogul Balakrishnan, Aarti Gupta, Sriram Sankaranarayanan, Naoto Maeda, Hiroki Tokuoka, Takashi Imoto, and Yoshiaki Miyazaki, *Dc2: A framework for scalable, scope-bounded software verification*. Automated Software Engg. (ASE), IEEE, 2011, pp. 133–142. **Acceptance Rate:** 15%.
- [BCSS11] Sam Blackshear*, Bor-Yuh Evan Chang, Sriram Sankaranarayanan, and Manu Sridharan, *The flow-insensitive precision of andersen’s analysis in practice*. Static Analysis Symposium (SAS), Lecture Notes in Computer Science, vol. 6887, 2011, pp. 60–76. **Acceptance Rate:** 32%.
- [CSF11] Aleksandar Chakarov*, Sriram Sankaranarayanan, and Georgios Fainekos, *Combining time and frequency domain specifications for periodic signals*. Runtime Verification (RV), Lecture Notes in Computer Science, Springer, 2011. **Acceptance Rate:** 42%.
- [BS11] Huxley Bennett* and Sriram Sankaranarayanan, *Model Counting Using the Inclusion-Exclusion Principle (Extended Abstract)*. Theory and Applications of Satisfiability Testing (SAT), Volume 6695 of Lecture Notes in Computer Science (LNCS), pp. 362–363, 2011.
- [S11] Sriram Sankaranarayanan, *Automatic Abstraction of Non-Linear Systems using Change of Variables Transformations*. Hybrid Systems: Computation and Control (HSCC), ACM Press, pp. 143 – 152, 2011.
- [ALFS11] Yeshwant Annapureddy, Che Li, Georgios Fainekos and Sriram Sankaranarayanan, *S-Taliro: A Tool for Temporal Logic Falsification of Hybrid Systems*. Tools and Algorithms for Construction and Analysis of Systems (TACAS), volume 6605 of Lecture Notes in Computer Science (LNCS), pp. 254–257, 2011.
- [CS11] Michael A. Colón and Sriram Sankaranarayanan, *Generalizing the Template Polyhedral Domain*. European Symposium on Programming (ESOP), volume 6602 of Lecture Notes in Computer Science (LNCS), pp. 176–195, 2011. **Acceptance Rate:** 30%.
- [FCS11] Robert C. Frohardt*, Bor-Yuh Evan Chang and Sriram Sankaranarayanan, *AccessNets: Modeling Access to Physical Spaces*. Verification, Model-Checking and Abstract Interpretation (VMCAI), Volume 6538 of Lecture Notes in Computer Science (LNCS), pp. 184–198, 2011. **Acceptance Rate:** 30%.
- [IGS10] Franjo Ivančić, Malay Ganai, Sriram Sankaranarayanan and Aarti Gupta, *Numerical Stability Analysis of Floating Point Computations using Software Model Checking*. ACM/IEEE Intl. Conference on Formal Methods and Models for Codesign (MEMOCODE), 2010, IEEE Press, pp. 49–58. **Acceptance Rate:** 33%.
- [G+10] Sicun Gao*, Malay Ganai, Franjo Ivančić, Aarti Gupta, Sriram Sankaranarayanan and Edmund Clarke, *Integrating Interval Constraint Propagation (ICP) with Linear Real Arithmetic (LRA) for deciding nonlinear real arithmetic*. Formal Methods in Computer-Aided Design (FMCAD), 2010, IEEE Press, pp. 81–89. **Acceptance Rate:** 38%.
- [TS+10] Truong Nghiem*, Sriram Sankaranarayanan, Georgios Fainekos, Franjo Ivančić, and Aarti Gupta, *Robust Falsification of Metric Temporal Logic Properties of Hybrid Systems using Monte-Carlo Sampling*. Hybrid Systems: Computation and Control (HSCC), Apr. 2010, ACM Press, pp. 211–220. **Acceptance Rate:** 29%.
- [S10] Sriram Sankaranarayanan, *Automatic Invariant Generation for Algebraic Hybrid Systems Using Ideal Fixed Points*. Hybrid Systems: Computation and Control (HSCC), Apr. 2010, ACM Press. pp. 221–230. **Acceptance Rate:** 29%.

- [HSIA10] William R. Harris*, Sriram Sankaranarayanan, Franjo Ivančić, and Aarti Gupta, *Satisfiability modulo path programs*. ACM Principles of Programming Languages (POPL), ACM Press, Jan 2010. pp. 71–82. **Acceptance Rate:** 19%.
- [FSIA09] Georgios E. Fainekos*, Sriram Sankaranarayanan, Franjo Ivančić, and Aarti Gupta, *Robustness of simulink simulations*. IEEE Real-Time Systems Symposium (RTSS), IEEE Press, Dec 2009. pp. 345–354. **Acceptance Rate:** ~21%.
- [DAS09] Jyotirmoy Deshmukh*, E. Allen Emerson, and Sriram Sankaranarayanan, *Symbolic deadlock analysis in concurrent libraries and their clients*. Automated Software Engg. (ASE), ACM Press, Nov 2009. pp. 480–491. (**Winner: ACM SIGSOFT distinguished paper award, Acceptance Rate:** ~17%).
- [BSIG09] Gogul Balakrishnan, Sriram Sankaranarayanan, Franjo Ivancic, and Aarti Gupta, *Refining the control structure of loops using static analysis*, ACM Conference on Embedded Software (EMSOFT), ACM, 2009, pp. 49–58. **Acceptance Rate:** 31%.
- [KAIR+09] Aditya Kanade, Rajeev Alur, Franjo Ivancic, S. Ramesh, Sriram Sankaranarayanan, and K. C. Shashidhar, *Generating and analyzing symbolic traces of simulink/stateflow models*. Computer-Aided Verification (CAV), Lecture Notes in Computer Science, vol. 5643, Springer, 2009, pp. 430–445.
- [KSG09] Vineet Kahlon, Sriram Sankaranarayanan, and Aarti Gupta, *Semantic reduction of thread interleavings in concurrent programs*. Tools and Algorithms for the Construction and Analysis of Systems (TACAS), Lecture Notes in Computer Science, vol. 5505, 2009, pp. 124–138. (**Award Paper: Invited submission to Software Tools for Technology Transfer Journal, 2010**).
- [SCIG08] Sriram Sankaranarayanan, Swarat Chaudhuri, Franjo Ivancic, and Aarti Gupta. *Dynamic inference of likely data preconditions over predicates by tree learning*. Intl. Symp. Software Testing & Analysis (ISSTA), pages 295–306. ACM, 2008.
- [SIG08] Sriram Sankaranarayanan, Franjo Ivancic, and Aarti Gupta. *Mining library specifications using inductive logic programming*. Intl. Symp. on Software Engg. (ICSE), pages 131–140. ACM, 2008.
- [BSI+08] Gogul Balakrishnan, Sriram Sankaranarayanan, Franjo Ivancic, Ou Wei*, and Aarti Gupta. *SLR: Path-sensitive analysis through infeasible-path detection and syntactic language refinement*. Static Analysis Symposium (SAS), volume 5079 of Lecture Notes in Computer Science, pages 238–254. Springer, 2008.
- [SDI08a] Sriram Sankaranarayanan, Thao Dang, and Franjo Ivancic. *A policy iteration technique for time elapse over template polyhedra*. Hybrid Systems: Computation and Control (HSCC), volume 4981 of Lecture Notes in Computer Science, pages 654–657. Springer, 2008.
- [SDI08b] Sriram Sankaranarayanan, Thao Dang, and Franjo Ivancic. *Symbolic model checking of hybrid systems using template polyhedra*. Tools and Analysis for Construction and Analysis of Systems (TACAS), volume 4963 of Lecture Notes in Computer Science, pages 188–202. Springer, 2008.
- [SIG07] Sriram Sankaranarayanan, Franjo Ivancic, and Aarti Gupta. *Program analysis using symbolic ranges*. Static Analysis Symposium (SAS), volume 4634 of Lecture Notes in Computer Science, pages 366–383, 2007.
- [KYSG07] Vineet Kahlon, Yu Yang*, Sriram Sankaranarayanan, and Aarti Gupta. *Fast and accurate static data-race detection for concurrent programs*. Computer-Aided Verification (CAV), volume 4590 of Lecture Notes in Computer Science, pages 226–239, 2007.
- [SCJI07] Sriram Sankaranarayanan, Richard M. Chang*, Guofei Jiang, and Franjo Ivancic. *State space exploration using feedback constraint generation and monte-carlo sampling*. ESEC/SIGSOFT Foundations of Software Engineering (FSE), pages 321–330. ACM, 2007.

- [SCSM06] Sriram Sankaranarayanan, Michael Colón, Henny B. Sipma, and Zohar Manna. *Efficient strongly relational polyhedral analysis*. Verification: Model Checking and Abstract Interpretation (VMCAI), volume 3855 of Lecture Notes in Computer Science, pages 111–125, 2006.
- [SISG06] Sriram Sankaranarayanan, Franjo Ivancic, Ilya Shlyakhter, and Aarti Gupta. *Static analysis in disjunctive numerical domains*. Static Analysis Symposium (SAS), volume 4134 of Lecture Notes in Computer Science, pages 3–17, 2006.
- [SSM06] Sriram Sankaranarayanan, Henny Sipma, and Zohar Manna. *Fixed point iteration for computing the time elapse operator*. Hybrid Systems: Computation and Control (HSCC), volume 3927 of Lecture Notes in Computer Science, pages 537–551, 2006.
- [DSSO05] Ben D'Angelo, Sriram Sankaranarayanan, César Sánchez, and Others. *LOLA: runtime monitoring of synchronous systems*. Proc. International Symposium on Temporal Representation and Reasoning (TIME), pages 166–174. IEEE computer society, 2005. (**Award Paper: Invited to Information and Computation Journal**).
- [SSM05] Sriram Sankaranarayanan, Henny B. Sipma, and Zohar Manna. *Scalable analysis of linear systems using mathematical programming*. Verification, Model-Checking and Abstract-Interpretation (VMCAI), volume 3385 of Lecture Notes in Computer Science, 2005. (**Award Paper: Invited to Special Issue in J. Theoretical Computer Science**).
- [SSM04c] Sriram Sankaranarayanan, Henny B. Sipma, and Zohar Manna. *Non linear invariant generation using Gröbner bases*. ACM Principles of Prog. Lang. (POPL 2004), pp.318–329, ACM Press, Jan. 2004.
- [SSM04b] Sriram Sankaranarayanan, Henny B. Sipma, and Zohar Manna. *Constructing invariants for hybrid systems*. Hybrid Systems: Computation and Control (HSCC 2004), volume 2993 of Lecture Notes in Computer Science, pages 539–555. Springer-Verlag, march 2004. (**Award Paper: Invited to appear in special issue of formal methods in systems design**).
- [SSM04a] Sriram Sankaranarayanan, Henny B. Sipma, and Zohar Manna. *Constraint-based linear-relations analysis*. Static Analysis Symposium (SAS 2004), volume 3148 of Lecture Notes in Computer Science, pages 53–69. Springer-Verlag, August 2004.
- [CSS03] Michael Colón, Sriram Sankaranarayanan, and Henny Sipma. *Linear invariant generation using non-linear constraint solving*. Computer Aided Verification (CAV), volume 2725 of Lecture Notes in Computer Science, pages 420–433. Springer-Verlag, July 2003.
- [SSS+03] César Sánchez, Sriram Sankaranarayanan, Henny Sipma, Ting Zhang, and David Dill. *Event correlation: Language and semantics*. Intl. Conference on Embedded Software (EMSOFT), volume 2855 of Lecture Notes in Computer Science, pages 323–339, 2003.
- [SSM03] Sriram Sankaranarayanan, Henny B. Sipma, and Zohar Manna. *Petri net analysis using invariant generation*. Verification: Theory and Practice, volume 2772 of Lecture Notes in Computer Science, pages 682–701. Springer-Verlag, 2003. **Invited Paper**.
- [FSS02] Bernd Finkbeiner, Sriram Sankaranarayanan, and Henny Sipma. *Collecting statistics over runtime executions*. Runtime Verification (RV 2002), volume 70 of Elec. Notes Theor. Comp. Sci, 2002. (**Award Paper: Invited to appear in special issue in J. Formal Methods in Systems Design**).

Creative Products

Significant products based on my research and teaching that have been disseminated to the community other than journal/conference publications since joining CU.

Research Software (Open Source)

S-Taliro: A toolbox based on MATLAB/Simulink for finding design defects in cyber-physical system models. Developed jointly with collaborators at Arizona State University and Toyota Motors (TEMA) USA. Cf. <https://sites.google.com/a/asu.edu/s-taliro/s-taliro>. Contributions: Contributed source code for various modules, benchmarks and ideas for development.

FlowStar: A tool for reachability analysis of hybrid/cyber-physical systems using Taylor models. Developed jointly with collaborators at University of Dayton, USA and RWTH Aachen University, Germany. <https://flowstar.org>. Contributions: Contributed source code, initial development, benchmark, testing and ideas for further development.

Fixr: A tool for automatic repair of Android programs using data mining from github. Developed jointly with Profs. Chang, Cerny, Anderson, Yeh and PhD students at CU Boulder. Contributions: Source code for graph isomorphism based property mining algorithm and various pattern classification algorithms in the toolset. Cf. <https://plv.colorado.edu/projects/fixr/>. and <https://github.com/cuplv/FixrGraphExtractor>.

Educational Tools/Software

Interactive Notes on Programming Languages: Notes on basic theory of programming languages and functional programming written using Jupyter notebooks to allow interaction between the text and the code. These notes have served as a free textbook for 1000+ undergraduates in the principles of programming languages (CSCI 3155), a core undergraduate class from 2018 - Present, completely replacing the two existing textbooks used for this class. An online freely available textbook based on these notes is envisioned. https://github.com/sriram0339/csci3155_notebooks. Contributions: Authorship, Design, Editing, Writing Software and Maintenance.

Lettuce Playground: Interactive visualization of execution of a programming language for helping undergraduate students in CSCI 3155. Helps explain concepts such as function calls, closures, scope chains, shadowing and handling of recursive functions. Cf. <https://github.com/sriram0339/LettucePlaygroundScala>. Sole designer/developer.

Control Animation Using Neural Networks: Demonstrates and visualizes neural network to animate the control of nonlinear dynamical system. Visualization includes an accurate ODE-based simulation of dynamics and visualizing the operation of neural networks for feedback. <https://github.com/sriram0339/neuralNetworkControlAnimation>. Joint with former PhD student Souradeep Dutta. Contributions: Design and Implementation of the software framework and the graphics/visualization using Java SWING libraries. Won best demo award at CPSWeek 2019 in Pittsburgh, PA.

Jupyter Notebooks: Jupyter Notebooks for visualizing and animating “popular” computer science concepts including machine learning of time series models (presented at HackCU hackathon organized by CU Boulder students), Stable Marriage problem (presented during outreach to students from Denver Public Schools and other non technical talks for undergraduate students), Chinese remainder theorem, Fractal generators and other fun topics relating to computer science and algorithms. Cf. <https://github.com/sriram0339/notebooks>

Invited Talks, Seminars and Colloquia (Since 2010)

Neural Network Models for the Artificial Pancreas and Issues of Conformance., IFIP WG 10.4 workshop on dependability, October 2022.

Are we there yet? Reachability Analysis of Cyber-Physical Systems, NASA Formal Methods Symposium Keynote Talk, May 2022.

Quo Vadis? Predicting Future Trajectories of Robots through Temporal Logics and Bayesian Inference, Oregon State University AI Seminar (Virtual), February 2022.

Game-Based Predictive Runtime Monitoring: Workshop on Synthesis (SYNT 2021), Virtually Organized as part of Computer-Aided Verification (CAV), July 2021.

Verifying Conformance for Data-Driven Models: NASA workshop on AI Safety, Virtually Organized, July 2020.

Probabilistic Programming: A guide for verificationists, Invited tutorial at Computer-Aided Verification (CAV) conference, July 2020.

Uncertainty Propagation and Concentration of Measure Inequalities, 68NQRT seminar, Inria Rennes, France, June 2020.

Verifying Conformance for Data-Driven Models: NASA Formal Methods AI Safety Workshop (online), April 2020.

Formal Verification of Neural Networks: Ecole Polytechnique (Paris) and Uber research labs (Paris), October 2019.

Formal Synthesis of Controllers from Demonstrations: Rice University CS Dept. Colloquium (October 2019), Carnegie-Mellon University (CMU) ECEE Dept. Colloquium (November 2019).

Verifying Conformance for Data-Driven Models: Invited talk at special session on verification of machine learning at ICCAD 2019 (November 2019).

Reaching out towards fully verified autonomous systems: Keynote talk at Reachability Problems (RP 2019) in Brussels, Belgium (September 2019) and StatOpt/ML seminar at University of Colorado Boulder (November 2019).

Data-Driven Models for Artificial Pancreas Controllers, University of California, Berkeley, USA, 2019.

Data-Driven Models for Artificial Pancreas Controllers, Medtronic Inc (delivered jointly with Taisa Kushner), 2019.

Learning Control Lyapunov Functions from Demonstrations, University of British Columbia, Vancouver, 2018.

Concentration of Measure Inequalities and Probabilistic Programs, Joint Keynote speaker for NSAD 2017 and TAPAS 2017.

Concentration of Measure Inequalities and Probabilistic Programs, Invited talk at IFIP WG2.2 meeting in Bordeaux, France, 2017.

Concentration of Measure Inequalities and Probabilistic Programs, Invited Lectures at the Summer school on foundations of programming, Braga, Portugal, 2017.

Formal Verification of Artificial Pancreas Controllers, Stanford University, CA.

From Finitely many simulations to flowpipes, Keynote talk at SETTA 2016, Beijing, China.

Automatic synthesis of controllers from specifications using control certificates, CPS V&V Workshop, Reykjavik, Iceland (May 2016).

Controller Synthesis for Switched Nonlinear Systems through Satisfiability-Modulo Theory (SMT) solver, Workshop on Switching, Dynamics and Verification, Poincaré Inst. Paris, France (Jan 2016).

Expectation Invariants of Probabilistic Programs, Colloquium at RWTH Aachen University (Sep. 2015).

Simulation-Based Falsification of Cyber-Physical Systems, Invited Keynote Talk, Runtime Verification (Sep. 2015).

Symbolic-Numeric Reachability Analysis of Hybrid Systems, SNR Workshop, San Francisco, CA (July 2015).

Simulation-Based Parameter Tuning for Control Systems, Toyota Motors Workshop on Verification and Validation, Los Angeles, (Dec. 2014).

Martingale Techniques for Probabilistic Systems, CMU Workshop on V&V of Cyber-Physical Systems, Pittsburgh, (Dec. 2014).

Invariance and Termination of Probabilistic Programs, Delft Center for Systems and Control, TU Delft, Netherlands (Oct. 2014).

Simulation-Based Falsification of Cyber-Physical Systems, Invited tutorial at Dagstuhl workshop on Cyber-Physical Systems, Schloss Dagstuhl, Germany (April 2014).

Formal Verification of Artificial Pancreas Controllers, Cyber-Physical Systems Distinguished Lecture at University of New Mexico, Albuquerque, NM (April 2014).

Verifying Artificial Pancreas Controllers through Simulation, Research in Progress Colloquium at Barbara Davis Center, University of Colorado, Anschutz Medical Center, Denver (April 2014).

Invariance and Termination of Probabilistic Programs, Invited colloquium at Arizona State University, School of Engineering (Jan 2014).

Optimal Falsifications of Cyber-Physical Systems, Invited talks at the University of Denver (October 2013), Microsoft Research Redmond (October 2013).

Formal Verification of Human-Machine Interactions, NSF CPS PI meeting talk, Washington, D.C. (Sep 2013).

Probabilistic Program Analysis Using Martingales, Invited talks at French Atomic Energy Agency (CEA), Paris (July 2013); RWTH Aachen University Germany (July 2013); Ecole Normale Supérieure, France (July 2013); Verimag, University Joseph Fourier, Grenoble, France (July 2013); Chennai Mathematics Institute (August 2013), Microsoft Research Labs India (August 2013).

Static Analysis in the Continuously Changing World, Invited (keynote) talk at Static Analysis Symposium (SAS 2013), Seattle, WA. (June 2013).

Model-Based Analysis and Synthesis of Insulin Infusion Pump Usage Strategies, Dept. of Computer Science Seminar, Oxford University, UK. October 2012.

Finding Falsifications in Complex Cyber-Physical Systems, Dept. of Computer Science, University of Colorado, Boulder. September 2012.

Falsifying Temporal Properties of System-of-Systems using S-Taliro, Safe and Secure Software Symposium (S5), Dayton, OH, May 2012.

Invariant Synthesis for Hybrid Systems, Dept. of Computer Science and Mathematics, Colorado School of Mines, Nov. 2011.

Formal Verification of Hybrid Systems, Institute for Mathematical Sciences, National University of Singapore, Sept. 2011.

Model-Based Testing of Human Machine Interfaces, University of Pennsylvania, Precise Seminar, Nov 2010.

Invariant Generation using Constraints, University of Pennsylvania, Architecture and Verification Seminar, Nov 2010.

Formal Verification of Hybrid Systems, CU Boulder, Applied Math Department, Oct. 2010.

Algebraic Techniques for Solving Reachability Problems in Continuous Systems, Computer Science & Engineering Seminar at Indian Institute of Technology, Kharagpur, India, June 2010.

Program Analysis and Geometry, Invited talk at BMAC seminar, Dept. of Computer Science, Colorado State University, Jan 2010.

Other Information

Citizenship: USA.

Other Skills and Achievements: Indian classical musician – vocalist and *veena* player in the carnatic musical tradition with 20+ years of formal training.