Sanjit A. Seshia

Curriculum Vitae

Department of Electrical Engineering & Computer Sciences
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Research Interests

Formal Methods, Computational Logic, Embedded/Cyber-Physical Systems, Computer Security, Electronic Design Automation, Programming Languages, Artificial Intelligence, Theory.

Academic Appointments

07/2022-date	**University of California, Berkeley**, USA *Cadence Founders Chair Professor* Department of Electrical Engineering and Computer Sciences
07/2016-date	**University of California, Berkeley**, USA *Professor* Department of Electrical Engineering and Computer Sciences and Group in Logic and the Methodology of Science *Affiliated Faculty*, Simons Institute for the Theory of Computing, Berkeley Artificial Intelligence Research (BAIR), and Industrial Cyber-Physical Systems Center (iCyPhy)
07/2017-06/2019 & 07/2022 - date	**Indian Institute of Technology, Bombay**, India *Visiting Professor* Department of Computer Science & Engineering
09/2017-12/2017	**Stanford University**, USA *Visiting Professor* Computer Science Department
07/2011-06/2016	**University of California, Berkeley**, USA *Associate Professor* Department of Electrical Engineering and Computer Sciences and Group in Logic and the Methodology of Science
02/2013-05/2013	**Massachusetts Institute of Technology**, USA *Visiting professor* Computer Science and Artificial Intelligence Laboratory
07/2005-06/2011	**University of California, Berkeley**, USA *Assistant Professor* Department of Electrical Engineering and Computer Sciences

Education

1998-2005	**Carnegie Mellon University**, Pittsburgh, USA

- *Ph.D. in Computer Science* (May 2005)
  Thesis: Adaptive Eager Boolean Encoding for Arithmetic Reasoning in Verification
- *M.S. in Computer Science* (August 2000)

1994-1998	**Indian Institute of Technology Bombay**, India

- *B.Tech. in Computer Science & Engineering* (May 1998)
  Thesis: Multisensor Image Alignment and Fusion

Selected Awards and Honors

- Cadence Founders Chair Professorship at the University of California, Berkeley (2022)
- Computer-Aided Verification (CAV) Award (2021)
  For pioneering contributions to the foundations of the theory and practice of satisfiability modulo theories (SMT)
- Fellow of the Association for Computing Machinery (ACM) (2020)
  Recognized for contributions to formal verification, inductive synthesis, and cyber-physical systems
- ACM/IEEE International Conference on Software Engineering (ICSE) Most Influential Paper Award (2020)
  Awarded to the ICSE 2010 paper judged to have had the most influence on the theory or practice of software engineering during the 10 years since its original publication
- IEEE Technical Committee on Cyber-Physical Systems (TCCPS) Mid-Career Award (2019)
  For fundamental contributions to formal methods for cyber-physical systems design and to cyber-physical systems education
- Fellow of the Institute of Electrical and Electronics Engineers (IEEE) (2018)
  Recognized for contributions to formal methods for inductive synthesis and algorithmic verification
- Donald O. Pederson Best Paper Award for the IEEE Transactions on Computer-Aided Design of Circuits and Systems (2017)
  Awarded to the best paper in the two calendar years preceding the award
- ASEE Frederick Emmons Terman Award (2016)
  Given to an Electrical and Computer Engineering educator in recognition of contributions to the profession
- Prof. R. Narasimhan Lecture Award, Tata Institute of Fundamental Research, India (2013)
  Given in recognition of advances in hardware, software, theoretical aspects of computing, or applications of computing
- Presidential Early Career Award for Scientists and Engineers – PECASE
  Awarded by the White House in 2008; one of 67 awardees nation-wide in all fields of science and engineering
- Alfred P. Sloan Research Fellowship (2008)
- Hellman Family Faculty Fund Award, UC Berkeley (2008)
- NSF CAREER Award (2007)
- School of Computer Science Distinguished Dissertation Award, Carnegie Mellon University (2005)
  Nominated for 2005 ACM Doctoral Dissertation Award
- National Defense Science and Engineering Graduate (NDSEG) Fellowship (1999-2002)

Conference best paper awards are included in the list of publications below.

Selected Other Professional Experience

Gran Sasso Science Institute, L'Aquila, Italy

Member of Scientific Committee May 2018 – date

Isaac Newton Institute, University of Cambridge, UK
Invited participant in Programme on Verified Software   July 2022 - August 2022

Decyphir, Inc., Berkeley, CA, USA
Co-Founder and Chief Scientist   November 2016 – November 2017

Microsoft Research India, Bangalore, India
Visiting Researcher   June 2017 – July 2017

Compaq/HP Systems Research Center, Palo Alto, CA, USA
Consultant   September 2001 – May 2002

Publications

(Electronic copies of papers are available at http://www.eecs.berkeley.edu/˜sseshia/#pubs.)

Books, Book Chapters, Edited Volumes, and Ph.D. Thesis

Satisfiability Modulo Theories,
     Clark Barrett, Roberto Sebastiani, Sanjit A. Seshia, and Cesare Tinelli,
     Chapter in Handbook of Satisfiability, IOS Press, Second Edition, 2021.
     Appeared earlier in First Edition, 2009.

Introduction to Embedded Systems: A Cyber-Physical Systems Approach,
     Edward A. Lee and Sanjit A. Seshia,
     Second Edition, MIT Press, http://LeeSeshia.org, 2016.
     – previously Second Edition published online and via lulu.com, 2015.
     – First Edition published in 2011.

An Introductory Lab in Embedded and Cyber-Physical Systems,
     Jeff C. Jensen, Edward A. Lee and Sanjit A. Seshia,
     First Edition, http://LeeSeshia.org/lab/, 2014.

Modeling for Verification,
     Sanjit A. Seshia, Natasha Sharygina, and Stavros Tripakis,
     Chapter in Handbook of Model Checking, Springer-Verlag, 2018. (Early version published online in 2014.)

Proceedings of the 23rd ACM International Conference on Hybrid Systems: Computation and Control (HSCC),
     Aaron Ames, Sanjit A. Seshia, and Jyotirmoy Deshmukh (editors),
     ACM Press, April 21-24, 2020.

Proceedings of the 7th International Conference on Verified Software: Theories, Tools, and Experiments (VSTTE),
     Arie Gurfinkel and Sanjit A. Seshia (editors),
     LNCS vol. 9593, San Francisco, CA, USA, July 18-19, 2015.

Proceedings of the 24th International Conference on Computer Aided Verification (CAV),
     P. Madhusudan and Sanjit A. Seshia (editors),
     LNCS vol. 7358, Berkeley, CA, USA, July 7-13, 2012.

Adaptive Eager Boolean Encoding for Arithmetic Reasoning in Verification,
     Sanjit A. Seshia,
     Ph.D. Thesis, Carnegie Mellon University, May 2005.
     Co-winner, 2005 SCS Distinguished Dissertation Award.

Refereed Conference and Journal Papers

1. Adwait Godbole, Yatin Manerkar, and Sanjit A. Seshia,
   Automated Conversion of Axiomatic to Operational Models: Theoretical and Practical Results,
   In Proceedings of the IEEE International Conference on Formal Methods in Computer-Aided Design (FM-CAD), October 2022.

2. Niklas Lauffer, Beyazit Yalcinkaya, Marcell Vazquez-Chanlatte, Ameesh Shah, and Sanjit A. Seshia,
   Learning Deterministic Finite Automata Decompositions from Examples and Demonstrations,
   In Proceedings of the IEEE International Conference on Formal Methods in Computer-Aided Design (FM-CAD), October 2022.

3. Yash Vardhan Pant, Balasaravanan Thoravi Kumaravel, Ameesh Shah, Erin Kraemer, Marcell Vazquez-Chanlatte, Kshitij Kulkarni, Bjoern Hartmann, and Sanjit A. Seshia,
   Modeling and Influencing Human Attentiveness in Autonomy-to-Human Perception Hand-offs,
   In 23rd IEEE International Conference on Intelligent Transportation Systems (ITSC), September 2022.
   Earlier version: Technical Report UCB/EECS-2021-8, EECS Department, UC Berkeley, March 2021.

4. Elizabeth Polgreen, Kevin Cheang, Pranav Gaddamadugu, Adwait Godbole, Kevin Laeufer, Shaokai Lin, Yatin A. Manerkar, Federico Mora, and Sanjit A. Seshia,
   UCLID5: Multi-modal Formal Modeling, Verification, and Synthesis,
   In 34th International Conference on Computer Aided Verification (CAV), pp. 538-551, Lecture Notes in Computer Science 13371, Springer, August 2022.

5. Sanjit A. Seshia, Dorsa Sadigh, and S. Shankar Sastry,
   Toward Verified Artificial Intelligence,
   Communications of the ACM, 65(7):46-55, July 2022.
   Earlier version: *Towards Verified Artificial Intelligence*, ArXiv e-prints, vol. 1606.08514, July 2016.

6. Inigo Incer, Albert Benveniste, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
   Hypercontracts,
   In Proceedings of the 14th NASA Formal Methods Symposium (NFM), pp. 674-692, June 2022.

7. Sanjit A. Seshia,
   Explorations in Cyber-Physical Systems Education,
   Communications of the ACM, 65(5):60-69, May 2022.

8. Edward Kim, Jay Shenoy, Sebastian Junges, Daniel J. Fremont, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
   Querying Labelled Data with Scenario Programs for Sim-to-Real Validation,
   In Proceedings of the International Conference on Cyber-Physical Systems (ICCPS), pp. 34-45, April 2022.

9. Daniel J. Fremont, Edward Kim, Tommaso Dreossi, Shromona Ghosh, Xiangyu Yue, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
   Scenic: A Language for Scenario Specification and Data Generation, Machine Learning Journal, Springer, February 2022.

10. Abdus Salam Azad, Edward Kim, Mark Wu, Kimin Lee, Ion Stoica, Pieter Abbeel, Alberto Sangiovanni-Vincentelli, and Sanjit A. Seshia,
    Programmatic Modeling and Generation of Real-time Strategic Soccer Environments for Reinforcement Learning,
    In Thirty-Sixth AAAI Conference on Artificial Intelligence (AAAI), pp. , AAAI Press, February 2022.

11. Sicheng Zhao, Xiangyu Yue, Shanghang Zhang, Bo Li, Han Zhao, Bichen Wu, Ravi Krishna, Joseph E. Gonzalez, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia, and Kurt Keutzer,
    A Review of Single-Source Deep Unsupervised Visual Domain Adaptation,
    IEEE Transactions on Neural Networks and Learning Systems, 33(2):473-493, 2022.

12. Elizabeth Polgreen, Andrew Reynolds, and Sanjit A. Seshia,

Satisfiability and Synthesis Modulo Oracles,
In Proceedings of the 23rd International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI), January 2022.
Earlier version: Technical Report UCB/EECS-2021-10, EECS Department, UC Berkeley, April 2021.

13. Hazem Torfah, Shetal Shah, Supratik Chakraborty, S. Akshay and Sanjit A. Seshia,
Synthesizing Pareto-Optimal Interpretations for Black-Box Models,
In Proceedings of the IEEE Conference on Formal Methods in Computer-Aided Design (FMCAD), October 2021.

14. Kesav Viswanadha, Edward Kim, Francis Indaheng, Daniel J. Fremont, Sanjit A. Seshia,
Parallel and Multi-Objective Falsification with Scenic and VerifAI,
In International Conference on Runtime Verification (RV), October 2021.

15. Victoria Tuck, Yash Vardhan Pant, Sanjit A. Seshia, Shankar Sastry,
DEC-LOS-RRT: Decentralized Path Planning for Multi-Robot Systems with Line-Of-Sight Constrained Communication,
In IEEE Conference on Control Technology and Applications (CCTA), August 2021.

16. Sebastian Junges, Hazem Torfah, and Sanjit A. Seshia,
Runtime Monitors for Markov Decision Processes,
In 33rd International Conference on Computer-Aided Verification (CAV), July 2021, pages 553-576.

17. Steven Holtzen, Sebastian Junges, Marcell Vazquez-Chanlatte, Todd D. Millstein, Sanjit A. Seshia, and Guy Van den Broeck,
Model Checking Finite-Horizon Markov Chains with Probabilistic Inference,
In 33rd International Conference on Computer-Aided Verification (CAV), July 2021, pages 577-601.

18. Sebastian Junges, Nils Jansen, and Sanjit A. Seshia,
Enforcing Almost-Sure Reachability in POMDPs,
In 33rd International Conference on Computer-Aided Verification (CAV), July 2021, pages 602-625.

19. Marcell Vazquez-Chanlatte, Sebastian Junges, Daniel J. Fremont, and Sanjit Seshia,
Entropy-Guided Control Improvisation,
In Proceedings of Robotics: Science and Systems XVII (RSS), July 2021.

20. Nikhil Pimpalkhare, Federico Mora, Elizabeth Polgreen, and Sanjit A. Seshia,
MedleySolver: Online SMT Algorithm Selection,
In Proceedings of the 24th International Conference on Theory and Applications of Satisfiability Testing (SAT), July 2021, pages 453-470.

21. Shivendra Kushwah, Ankush Desai, Pramod Subramanyan, and Sanjit A. Seshia,
PSec: Programming Secure Distributed Systems using Enclaves,
In Proceedings of the ACM Asia Conference on Computer and Communications Security (AsiaCCS), June 2021, pages 802-816.

22. Shromona Ghosh, Yash Vardhan Pant, Hadi Ravanbakhsh, and Sanjit A. Seshia,
Counterexample-Guided Synthesis of Perception Models and Control,
In Proceedings of the American Control Conference (ACC), May 2021, pages 3447-3454.
Previous technical report version: ArXiv e-prints, vol. 1911.01523, November 2019.

23. Yash Vardhan Pant, He Yin, Murat Arcak, and Sanjit A. Seshia,
Co-design of Control and Planning for Multi-rotor UAVs with Signal Temporal Logic Specifications,
In Proceedings of the American Control Conference (ACC), May 2021, pages 4209-4216,

24. Andreea B. Alexandru, Konstantinos Gatsis, Yasser Shoukry, Sanjit A. Seshia, Paulo Tabuada, and George J. Pappas,
Cloud-Based Quadratic Optimization With Partially Homomorphic Encryption,
IEEE Transactions on Automatic Control, vol. 66(5), May 2021, pages 2357-2364.

25. Pashootan Vaezipoor, Gil Lederman, Yuhuai Wu, Chris J. Maddison, Roger B. Grosse, Sanjit A. Seshia, and Fahiem Bacchus,
Learning Branching Heuristics for Propositional Model Counting,
In Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI), February 2021, pages 12427-12435.

26. Sumukh Shivakumar, Hazem Torfah, Ankush Desai, and Sanjit A. Seshia,
SOTER on ROS: A Run-Time Assurance Framework on the Robot Operating System,
In International Conference on Runtime Verification (RV), October 2020, pages 184-194.

27. Daniel J. Fremont, Edward Kim, Yash Vardhan Pant, Sanjit A. Seshia, Atul Acharya, Xantha Bruso, Paul Wells, Steve Lemke, Qiang Lu, and Shalin Mehta,
Formal Scenario-Based Testing of Autonomous Vehicles: From Simulation to the Real World,
In Proc. IEEE Intelligent Transportation Systems Conference (ITSC), September 2020.

28. Marcell Vazquez-Chanlatte and Sanjit A. Seshia,
Maximum Causal Entropy Specification Inference from Demonstrations,
In 32nd International Conference on Computer-Aided Verification (CAV), July 2020.

29. Daniel J. Fremont, Johnathan Chiu, Dragos D. Margineantu, Denis Osipychev, and Sanjit A. Seshia,
Formal Analysis and Redesign of a Neural Network-Based Aircraft Taxiing System with VerifAI,
In 32nd International Conference on Computer-Aided Verification (CAV), July 2020.

30. Edward Kim, Divya Gopinath, Corina S. Pasareanu, and Sanjit A. Seshia,
A Programmatic and Semantic Approach to Explaining and Debugging Neural Network Based Object Detectors,
In Proc. IEEE Conference on Computer Vision and Pattern Recognition (CVPR), June 2020.

31. Gil Lederman, Markus N. Rabe, Sanjit A. Seshia, and Edward A. Lee,
Learning Heuristics for Quantified Boolean Formulas through Reinforcement Learning,
In Proc. International Conference on Learning Representations (ICLR), April 2020.
First version: Arxiv.org technical report, vol. 1807.08058, July 2018.

32. Matthew Weber, Baihong Jin, Gil Lederman, Yasser Shoukry, Edward A Lee, Sanjit A. Seshia, and Alberto L. Sangiovanni-Vincentelli,
Gordian: Formal Reasoning-based Outlier Detection for Secure Localization,
ACM Transactions on Cyber-Physical Systems, 4(4), 2020.

33. Tommaso Dreossi, Alexandre Donze, and Sanjit A. Seshia,
Compositional Falsification of Cyber-Physical Systems with Machine Learning Components,
Journal of Automated Reasoning 63(4): 1031–1053, 2019.
Conference version in Proceedings of the NASA Formal Methods Conference (NFM), May 2017, pages 357–372.

34. Susmit Jha, Ashish Tiwari, Sanjit A. Seshia, Tuhin Sahai, Natarajan Shankar,
TeLEx: Learning Signal Temporal Logic from Positive Examples using Tightness Metric,
Formal Methods in System Design, 54(3): 364–387, 2019.

35. Micah Carroll, Rohin Shah, Mark K. Ho, Tom Griffiths, Sanjit A. Seshia, Pieter Abbeel, and Anca D. Dragan,
On the Utility of Learning about Humans for Human-AI Coordination,
In Proc. Neural Information Processing Systems (NeurIPS), December 2019, pages 5175–5186.

36. Albert Magyar, David Biancolin, John Koenig, Sanjit Seshia, Jonathan Bachrach, Krste Asanovic,
Golden Gate: Bridging The Resource-Efficiency Gap Between ASICs and FPGA Prototypes, In ACM/IEEE International Conference on Computer-Aided Design (ICCAD), November 2019, pages 1–8.

37. Tommaso Dreossi, Daniel J. Fremont, Shromona Ghosh, Edward Kim, Hadi Ravanbakhsh, Marcell Vazquez-Chanlatte, and Sanjit A. Seshia,

VerifAI: A Toolkit for the Formal Design and Analysis of Artificial Intelligence-Based Systems,
In 31st International Conference on Computer Aided Verification (CAV), July 2019.

38. Eric Kim, Murat Arcak, and Sanjit A. Seshia,
Flexible Computational Pipelines for Robust Abstraction-Based Control Synthesis,
In 31st International Conference on Computer-Aided Verification (CAV), July 2019.

39. Kevin Cheang, Cameron Rasmussen, Sanjit A. Seshia, and Pramod Subramanyan,
A Formal Approach to Secure Speculation,
In Proceedings of the Computer Security Foundations Symposium (CSF), June 2019.

40. Daniel J. Fremont, Tommaso Dreossi, Shromona Ghosh, Xiangyu Yue, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
Scenic: A Language for Scenario Specification and Scene Generation,
In Proceedings of the 40th annual ACM SIGPLAN conference on Programming Language Design and Implementation (PLDI), June 2019.

41. Ankush Desai, Shromona Ghosh, Sanjit A. Seshia, Natarajan Shankar, and Ashish Tiwari,
A Runtime Assurance Framework for Programming Safe Robotics Systems,
In IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), June 2019.

42. Hadi Ravanbakhsh, Sriram Sankaranarayanan, and Sanjit A. Seshia,
Formal Policy Learning from Demonstrations,
In Proceedings of the International Conference on Robotics and Automation (ICRA), May 2019, pages 6037–6043.

43. Shromona Ghosh, Somil Bansal, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia and Claire Tomlin,
A New Simulation Metric to Determine Safe Environments and Controllers for Systems with Unknown Dynamics,
In Proceedings of the 12th International Conference on Hybrid Systems: Computation and Control (HSCC), April 2019, pages 185–196.

44. Dorsa Sadigh, S. Sankar Sastry, and Sanjit A. Seshia,
Verifying Robustness of Human-Aware Autonomous Cars,
Proceedings of the 2nd IFAC Conference on Cyber-Physical and Human Systems (CPHS), December 2018, pages 131–138.

45. Marcell Vazquez-Chanlatte, Susmit Jha, Ashish Tiwari, Mark K. Ho, and Sanjit A. Seshia,
Learning Task Specifications from Demonstrations,
In Proceedings of the Annual Conference on Neural Information Processing Systems (NeurIPS), December 2018, pages 5372–5382.

46. Marcell Vazquez-Chanlatte, Shromona Ghosh, Jyotirmoy V. Deshmukh, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
Time-Series Learning Using Monotonic Logical Properties,
In Proceedings of the 18th International Conference on Runtime Verification (RV), November 2018, pages 389–405.

47. Ankush Desai, Amar Phanishayee, Shaz Qadeer and Sanjit A. Seshia,
Compositional Programming and Testing of Dynamic Distributed Systems,
Proceedings of the ACM on Programming Languages (PACMPL), Volume 2, OOPSLA, November 2018, pages 159:1–159:30.

48. Dorsa Sadigh, Nick Landolfi, Shankar S. Sastry, Sanjit A. Seshia, Anca D. Dragan,
Planning for Cars that Coordinate with People: Leveraging Effects on Human Actions for Planning and Active Information Gathering over Human Internal State,
Autonomous Robots, Vol. 42, Num. 7, October 2018, pages 1405–1426.

49. Yasser Shoukry, Pierluigi Nuzzo, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia, George J. Pappas,

and Paulo Tabuada,
SMC: Satisfiability Modulo Convex Programming, Proceedings of the IEEE, Vol. 106, Num. 9, September 2018, pages 1655–1679.

50. Daniel Fremont and Sanjit A. Seshia,
Reactive Control Improvisation,
In Proceedings of the 30th International Conference on Computer Aided Verification (CAV), July 2018, pages 307–326.

51. Markus Rabe, Leander Tentrup, Cameron Rasmussen, and Sanjit A. Seshia,
Understanding and Extending Incremental Determinization for 2QBF,
In Proceedings of the 30th International Conference on Computer Aided Verification (CAV), July 2018, pages 256–274.

52. Tommaso Dreossi, Shromona Ghosh, Xiangyu Yue, Kurt Keutzer, Alberto Sangiovanni-Vincentelli, and Sanjit A. Seshia,
Counterexample-Guided Data Augmentation,
In Proceedings of the 27th International Joint Conference on Artificial Intelligence (IJCAI), July 2018, pages 2071–2078.

53. Marcell Vazquez-Chanlatte, Shromona Ghosh, Vasumathi Raman, Alberto Sangiovanni-Vincentelli, and Sanjit A. Seshia,
Generating Dominant Strategies for Continuous Two-Player Zero-Sum Games,
In Proceedings of the IFAC Conference on Analysis and Design of Hybrid Systems (ADHS), July 2018, pages 7–12.

54. Xiangyu Yue, Bichen Wu, Sanjit A. Seshia, Kurt Keutzer, Alberto L. Sangiovanni-Vincentelli,
A LiDAR Point Cloud Generator: From a Virtual World to Autonomous Driving,
In Proceedings of the 2018 ACM on International Conference on Multimedia Retrieval (ICMR), June 2018, pages 458–464.

55. Yasser Shoukry, Michelle Chong, Masashi Wakaiki, Pierluigi Nuzzo, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia, Joao Pedro Hespanha, and Paulo Tabuada,
SMT-Based Observer Design for Cyber-Physical Systems under Sensor Attacks,
ACM Transactions on Cyber-Physical Systems (TCPS), 2(1):5:1–5:27, February 2018.

56. Yi-Chin Wu, Vasumathi Raman, Blake C. Rawlings, Stéphane Lafortune, and Sanjit A. Seshia,
Synthesis of Obfuscation Policies to Ensure Privacy and Utility,
Journal of Automated Reasoning, 60(1):107–131, January 2018.

57. Susmit Jha, Vasumathi Raman, Dorsa Sadigh, and Sanjit A. Seshia,
Safe Autonomy Under Perception Uncertainty Using Chance-Constrained Temporal Logic,
Journal of Automated Reasoning, 60(1):43–62, January 2018.

58. Yasser Shoukry, Pierluigi Nuzzo, Ayca Balkan, Indranil Saha, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia, George J. Pappas, and Paulo Tabuada,
Linear Temporal Logic Motion Planning for Teams of Underactuated Robots Using Satisfiability Modulo Convex Programming,
In Proceedings of the 56th IEEE Annual Conference on Decision and Control (CDC), December 2017, pages 1132–1137.

59. Eric S. Kim, Sadra Sadraddini, Calin Belta, Murat Arcak, and Sanjit A. Seshia,
Dynamic Contracts for Distributed Temporal Logic Control of Traffic Networks,
In Proceedings of the 56th IEEE Annual Conference on Decision and Control (CDC), December 2017, pages 3640–3645.

60. Susmit Jha and Sanjit A. Seshia,
A Theory of Formal Synthesis via Inductive Learning,
Acta Informatica, 54(7):693–726, November 2017.

Previous version appeared in ArXiv e-prints, vol. 1505.03953, May 2015.

61. Pramod Subramanyan, Rohit Sinha, Ilia A. Lebedev, Srinivas Devadas, and Sanjit A. Seshia,
    A Formal Foundation for Secure Remote Execution of Enclaves,
    In Proceedings of the ACM SIGSAC Conference on Computer and Communications Security (CCS),
    November 2017, pages 2435–2450.
    ⋆ *Best paper award.* ⋆

62. Yasser Shoukry, Alberto Puggelli, Pierluigi Nuzzo, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia,
    and Paulo Tabuada,
    *Secure State Estimation for Cyber-Physical Systems under Sensor Attacks: A Satisfiability Modulo Theory
    Approach*,
    IEEE Transactions on Automatic Control, 62(10):4917–4932, October 2017.

63. Sanjit A. Seshia, Shiyan Hu, Wenchao Li, and Qi Zhu,
    Design Automation of Cyber-Physical Systems: Challenges, Advances, and Opportunities,
    IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 36(9):1421–1434, September 2017.

64. Eric S. Kim, Murat Arcak, and Sanjit A. Seshia,
    Symbolic Control Design for Monotone Systems with Directed Specifications,
    Automatica, 83:10–19, September 2017.

65. Ankush Desai, Tommaso Dreossi, and Sanjit A. Seshia,
    Combining Model Checking and Runtime Verification for Safe Robotics,
    In Proceedings of the 17th International Conference on Runtime Verification (RV), September 2017, pages
    172–189.

66. Susmit Jha, Ashish Tiwari, Sanjit A. Seshia, Tuhin Sahai, and Natarajan Shankar,
    TeLEx: Passive STL Learning Using Only Positive Examples,
    In Proceedings of the 17th International Conference on Runtime Verification (RV), September 2017, pages
    208–224.

67. Rohit Sinha, Sriram K. Rajamani, and Sanjit A. Seshia,
    A Compiler and Verifier for Page Access Oblivious Computation,
    In Proceedings of the 11th Joint Meeting on Foundations of Software Engineering (ESEC/FSE), September
    2017, pages 649–660.

68. Jyotirmoy V. Deshmukh, Alexandre Donze, Shromona Ghosh, Xiaoqing Jin, Garvit Juniwal, and Sanjit A.
    Seshia,
    Robust Online Monitoring of Signal Temporal Logic,
    Formal Methods in System Design, 51(1):5–30, August 2017.

69. Marcell Vazquez-Chanlatte, Jyotirmoy V. Deshmukh, Xiaoqing Jin, and Sanjit A. Seshia,
    Logical Clustering and Learning for Time-Series Data,
    In Proceedings of the 29th International Conference on Computer Aided Verification (CAV), July 2017,
    pages 305–325.

70. Dorsa Sadigh, Anca D. Dragan, Shankar Sastry, and Sanjit A. Seshia,
    Active Preference-Based Learning of Reward Functions,
    In Proceedings of Robotics: Science and Systems XIII (RSS), July 2017.

71. Negar Mehr, Dorsa Sadigh, Roberto Horowitz, S. Shankar Sastry, and Sanjit A. Seshia,
    Stochastic Predictive Freeway Ramp Metering from Signal Temporal Logic Specifications,
    In Proceedings of the American Control Conference (ACC), May 2017, pages 4884–4889.

72. Eric S. Kim, Murat Arcak, and Sanjit A. Seshia,
    A Small Gain Theorem for Parametric Assume-Guarantee Contracts,
    In Proceedings of the 10th International Conference on Hybrid Systems: Computation and Control (HSCC),

April 2017, pages 207–216.

73. Yasser Shoukry, Pierluigi Nuzzo, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia, George J. Pappas, Paulo Tabuada,
SMC: Satisfiability Modulo Convex Optimization,
In Proceedings of the 10th International Conference on Hybrid Systems: Computation and Control (HSCC), April 2017, pages 19–28.

74. Ankush Desai, Indranil Saha, Jianqiao Yang, Shaz Qadeer, and Sanjit A. Seshia,
Drona: A Framework for Safe Distributed Mobile Robotics,
In Proceedings of the 8th International Conference on Cyber-Physical Systems (ICCPS), April 2017, pages 239–248.

75. Daniel Fremont, Markus N. Rabe, and Sanjit A. Seshia,
Maximum Model Counting,
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15th International Conference on Computer-Aided Verification (CAV), LNCS 2725, pages 154–166, July 2003.

175. Sanjit A. Seshia, Shuvendu K. Lahiri, and Randal E. Bryant,
A Hybrid SAT-Based Decision Procedure for Separation Logic with Uninterpreted Functions,
40th Design Automation Conference (DAC), pages 425–430, June 2003.
Best paper finalist. In top 14 out of 152 accepted papers and 628 submissions.

176. Shuvendu K. Lahiri, Sanjit A. Seshia, and Randal E. Bryant,
Modeling and Verification of Out-of-Order Microprocessors Using UCLID,
4th International Conference on Formal Methods in Computer-Aided Design (FMCAD), LNCS 2517, pages 142-159, November 2002.

177. Randal E. Bryant, Shuvendu K. Lahiri, and Sanjit A. Seshia,
Modeling and Verifying Systems Using a Logic of Counter Arithmetic with Lambda Expressions and Uninterpreted Functions,
14th International Conference on Computer-Aided Verification (CAV), LNCS 2404, pages 78–92, July 2002.

178. Ofer Strichman, Sanjit A. Seshia, and Randal E. Bryant,
Deciding Separation Formulas with SAT,
14th International Conference on Computer-Aided Verification (CAV), LNCS 2404, pages 209–222, July 2002.

179. Sanjit A. Seshia, R. K. Shyamasundar, Anup K. Bhattacharjee, and S. D. Dhodapkar,
A Translation of Statecharts to Esterel,
1st World Congress on Formal Methods (FM), LNCS 1709, pages 983–1007, September 1999.

180. Anup K. Bhattacharjee, S. D. Dhodapkar, Sanjit A. Seshia, and R. K. Shyamasundar,
PERTS: A Graphical Environment for the Specification and Verification of Reactive Systems,
Journal of Reliability Engineering and System Safety, 71(3), 2001, pages 299–310 (erratum: vol. 72(2)).
Earlier version in SAFECOMP'99, LNCS 1698, pages 431–444, September 1999.

Invited Papers and Tutorials (lightly refereed/unrefereed)

181. Hazem Torfah, Carol Xie, Sebastian Junges, Marcell Vazquez-Chanlatte, and Sanjit A. Seshia,
Learning Monitorable Operational Design Domains for Assured Autonomy,
In Proceedings of the International Symposium on Automated Technology for Verification and Analysis (ATVA), October 2022.

182. Sanjit A. Seshia, Somesh Jha, and Tommaso Dreossi,
Semantic Adversarial Deep Learning,
IEEE Design and Test, 37(2): pages 8–18, April 2020.
Conference version in Proceedings of the 30th International Conference on Computer Aided Verification (CAV), July 2018, pages 3–26.

183. Sanjit A. Seshia,
Introspective Environment Modeling,
In International Conference on Runtime Verification (RV), October 2019, pages 15–26.

184. Sanjit A. Seshia and Pramod Subramanyan,
UCLID5: Integrating Modeling, Verification, Synthesis and Learning,
Proceedings of the 15th ACM/IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE), October 2018, pages 1–10.

185. Sanjit A. Seshia, *et al.*,
Formal Specification for Deep Neural Networks,
In Proceedings of the International Symposium on Automated Technology for Verification and Analysis (ATVA), October 2018, pages 20–34.

186. William R. Harris, Somesh Jha, Thomas W. Reps, and Sanjit A. Seshia,
Program Synthesis for Interactive-Security Systems,

Formal Methods in System Design, 51(2):362–394, November 2017.

187. Sanjit A. Seshia,
New Frontiers in Formal Methods: Learning, Cyber-Physical Systems, Education, and Beyond,
CSI Journal of Computing, Vol. 2, No. 4, pages R1:3–R1:13, June 2015.

188. Sanjit A. Seshia, Dorsa Sadigh, and S. Shankar Sastry,
Formal Methods for Semi-Autonomous Driving,
In Proceedings of the Design Automation Conference (DAC), June 2015, pages 148:1–148:5.

189. Edward A. Lee *et al.*,
The Swarm at the Edge of the Cloud,
IEEE Design and Test of Computers, Special Issue on Cloud Computing for Embedded Systems, 2014.

190. Rajeev Alur, Rastislav Bodik, Garvit Juniwal, Milo M. K. Martin, Mukund Raghothaman, Sanjit A. Seshia, Rishabh Singh, Armando Solar-Lezama, Emina Torlak, and Abhishek Udupa,
Syntax-Guided Synthesis,
In Proceedings of the IEEE International Conference on Formal Methods in Computer-Aided Design (FM-CAD), October 2013, pages 1–17.

191. Sanjit A. Seshia,
Verifying High-Confidence Interactive Systems: Electronic Voting and Beyond,
In 14th International Conference on Distributed Computing and Networking (ICDCN), pages 1–10, January 2013.

192. Jeff C. Jensen, Edward A. Lee, and Sanjit A. Seshia,
An Introductory Capstone Design Course on Embedded Systems,
In Proceedings of the IEEE International Symposium on Circuits and Systems (ISCAS), May 2011.

193. Sanjit A. Seshia,
Quantitative Analysis of Software: Challenges and Recent Advances,
Invited paper at the 7th International Workshop on Formal Aspects of Component Software, October 2010.

194. Subhasish Mitra, Sanjit A. Seshia, and Nicola Nicolici,
Post-Silicon Validation: Opportunities, Challenges and Recent Advances,
Invited special session paper at the Design Automation Conference (DAC), pages 12–17, June 2010.

195. Edward A. Lee, Slobodan Matic, Sanjit A. Seshia, and Jia Zou,
The Case for Timing-Centric Distributed Software,
Invited paper at the 2nd International Workshop on Cyber-Physical Systems (WCPS), pages 57–64, June 2009.

196. Daniel Kroening and Sanjit A. Seshia,
Formal Verification at Higher Levels of Abstraction,
Invited tutorial at International Conference on Computer-Aided Design (ICCAD), pages 572–578, November 2007.

197. Randal E. Bryant and Sanjit A. Seshia,
Decision Procedures Customized for Formal Verification,
Invited paper at the Conference on Automated Deduction (CADE), pages 255–259, July 2005.

Refereed Workshop Papers

198. Tommaso Dreossi, Shromona Ghosh, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
A General Formalization of Robustness for Deep Neural Networks,
In AAAI Spring Symposium on Verification of Neural Networks, March 2019.

199. Tommaso Dreossi, Shromona Ghosh, Alberto L. Sangiovanni-Vincentelli, and Sanjit A. Seshia,
Systematic Testing of Convolutional Neural Networks for Autonomous Driving,
In ICML Workshop on Reliable Machine Learning in the Wild (RMLW), August 2017.

200. Susmit Jha, Sanjit A. Seshia and Xiaojin (Jerry) Zhu,
On the Teaching Dimension of Octagons for Formal Synthesis,
In 5th Workshop on Synthesis (SYNT), July 2016.

201. Matthew Fong and Sanjit A. Seshia,
Stoichiometrically Minimal Source Pathways via Model Checking,
In Proceedings of the 7th International Workshop on Bio-Design Automation (IWBDA), August 2015.

202. Yasser Shoukry, Pierluigi Nuzzo, Alberto Puggelli, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia,
Mani Srivastava, and Paulo Tabuada,
Imhotep-SMT: A Satisfiability Modulo Theory Solver for Secure State Estimation,
In 13th International Workshop on Satisfiability Modulo Theories (SMT), July 2015.

203. Susmit Jha and Sanjit A. Seshia,
Are There Good Mistakes? A Theoretical Analysis of CEGIS,
In 3rd Workshop on Synthesis (SYNT), July 2014, pages 84–99.

204. Daniel J. Fremont and Sanjit A. Seshia,
Speeding Up SMT-Based Quantitative Program Analysis,
In 12th International Workshop on Satisfiability Modulo Theories (SMT), July 2014.

205. Dorsa Sadigh, Katherine Driggs-Campbell, Alberto Puggelli, Wenchao Li, Victor Shia, Ruzena Bajcsy,
Alberto L. Sangiovanni-Vincentelli, S. Shankar Sastry, and Sanjit A. Seshia,
Data-Driven Probabilistic Modeling and Verification of Human Driver Behavior,
Formal Verification and Modeling in Human-Machine Systems, AAAI Spring Symposium, March 2014.

206. Jeff C. Jensen, Edward A. Lee, and Sanjit A. Seshia,
Virtualizing Cyber-Physical Systems: Bringing CPS to Online Education,
In First Workshop on CPS Education (CPS-Ed), April 2013.

207. Susmit Jha and Sanjit A. Seshia,
Synthesis of Optimal Fixed-Point Implementations of Numerical Software Routines,
In 6th International Workshop on Numerical Software Verification (NSV), April 2013.

208. Wenchao Li, Susmit Jha, and Sanjit A. Seshia,
Generating Control Logic for Optimized Soft Error Resilience,
In 9th Workshop on Silicon Errors in Logic - System Effects (SELSE), March 2013.

209. Saurabh Srivastava, Tim Hsiau, Sarah Chasins, Jonathan Kotker, Yen-Sheng Ho, Paul Ruan, Jeff Tsui,
Stephi Hamilton, Jene Li, J. Christopher Anderson, Sanjit A. Seshia, and Rastislav Bodik,
Biochemistry as a Programming Language,
In Off the Beaten Track (OBT/POPL), January 2013.

210. Dorsa Sadigh, Sanjit A. Seshia, and Mona Gupta,
Automating Exercise Generation: A Step towards Meeting the MOOC Challenge for Embedded Systems,
In Proceedings of the Workshop on Embedded Systems Education (WESE), ESWeek, October 2012.

211. Saurabh Srivastava, Jonathan Kotker, Stephi Hamilton, Paul Ruan, Jeff Tsui, J. Christopher Anderson,
Rastislav Bodik, and Sanjit A. Seshia,
Pathway Synthesis Using the Act Ontology,
In Proceedings of the 4th International Workshop on Bio-Design Automation (IWBDA), June 2012.

212. Edward A. Lee and Sanjit A. Seshia,
An Introductory Textbook on Cyber-Physical Systems,
In Proceedings of the Workshop on Embedded Systems Education (WESE), ESWeek, October 2010.

213. Susmit Jha, Wenchao Li, and Sanjit A. Seshia,
Localizing Transient Faults Using Dynamic Bayesian Networks,
In IEEE International High Level Design Validation and Test (HLDVT) Workshop, November 2009.

214. Randal E. Bryant, Shuvendu K. Lahiri, and Sanjit A. Seshia,

Deciding CLU Logic Formulas via Boolean and Pseudo-Boolean Encodings,
1st International Workshop on Constraints in Formal Verification (CFV), associated with Principles and Practice of Constraint Programming (CP), September 2002.

215. Nicholas J. Hopper, Sanjit A. Seshia, and Jeannette M. Wing,
A Comparison and Combination of Theory Generation and Model Checking for Security Protocol Analysis,
Workshop on Formal Methods in Computer Security (FMCS), associated with Computer-Aided Verification (CAV), July 2000.

Technical Reports (those that do not substantially overlap with the above papers)

216. Sanjit A. Seshia,
Compositional Verification without Compositional Specification for Learning-Based Systems,
Technical Report UCB/EECS-2017-164, EECS Department, UC Berkeley, November 2017.

217. Sanjit A. Seshia, Ed.,
Formal Methods for Engineering Education,
Technical Report UCB/EECS-2015-170, EECS Department, UC Berkeley, June 2015.

218. Daniel Bundala and Sanjit A. Seshia,
On Systematic Testing for Execution-Time Analysis,
ArXiv e-prints, vol. 1506.05893, June 2015.

219. Edward A. Lee *et al.*,
The TerraSwarm Research Center (TSRC) (A White Paper),
Technical report UCB/EECS-2012-207, EECS Department, UC Berkeley, November 2012.

220. Shuvendu Lahiri and Sanjit A. Seshia, Eds.,
Proceedings of the 9th International Workshop on Satisfiability Modulo Theories (SMT) 2011,
Technical report UCB/EECS-2011-80, EECS Department, UC Berkeley, July 2011.

221. Daniel Holcomb, Wenchao Li, and Sanjit A. Seshia,
Algorithms for Green Buildings: Learning-Based Techniques for Energy Prediction and Fault Diagnosis,
Technical report UCB/EECS-2009-138, EECS Department, UC Berkeley, October 2009.

222. John C. Eidson, Edward A. Lee, Slobodan Matic, Sanjit A. Seshia, and Jia Zou,
Time-centric Models For Designing Embedded Cyber-physical Systems,
Technical report UCB/EECS-2009-135, EECS Department, UC Berkeley, October 2009.

223. Sumit Gulwani and Sanjit A. Seshia, Eds.,
Proceedings of the 1st Workshop on Quantitative Analysis of Software (QA'09), Technical report UCB/EECS-2009-93, EECS Department, UC Berkeley, June 2009.

224. Susmit Jha, Sanjit A. Seshia, and Rhishikesh Limaye,
On the Computational Complexity of Satisfiability Solving for String Theories,
Technical report UCB/EECS-2009-41, EECS Department, UC Berkeley, March 2009.

225. Bryan Brady, Randal E. Bryant and Sanjit A. Seshia,
Abstracting RTL Designs to the Term Level,
Technical report UCB/EECS-2008-136, EECS Department, UC Berkeley, October 2008.

226. Orna Kupferman, Wenchao Li, and Sanjit A. Seshia,
On the Duality between Vacuity and Coverage,
Technical report UCB/EECS-2008-26, EECS Department, UC Berkeley, March 2008.

227. Dave King, Susmit Jha, Trent Jaeger, Somesh Jha, and and Sanjit A. Seshia,
On Automatic Placement of Declassifiers for Information-Flow Security,
Technical Report NAS-TR-0083-2007, Network and Security Research Center, Pennsylvania State University, November 2007.

228. Sanjit A. Seshia,

Integrated Verification for Robust Computing,
Technical report UCB/EECS-2006-103, EECS Department, UC Berkeley, July 2006.

229. Sanjit A. Seshia, Guy E. Blelloch, and Robert W. Harper,
A Performance Comparison of Interval Arithmetic and Error Analysis in Geometric Predicates,
CMU-CS-00-172, Computer Science Department, Carnegie Mellon University, December 2000.

230. Sanjit A. Seshia and Randal E. Bryant,
The Hardness of Approximating Minima in OBDDs, FBDDs and Boolean functions,
CMU-CS-00-156, Computer Science Department, Carnegie Mellon University, August 2000.

Patents

1. Xiaoqing Jin, Alexandre Donzé, Jyotirmoy Deshmukh, and Sanjit A. Seshia,
Systems and Methods for Mining Temporal Requirements from Block Diagram Models of Control Systems,
U.S. Patent Number 9,081,900, filed October 15, 2012, issued July 15, 2015.

2. J. Christopher Anderson, Timothy Hsiau, Saurabh Srivastava, Paul Ruan, Jonathan Kotker, Rastislav Bodik, and Sanjit A. Seshia,
Method for Biosynthesis of Acetaminophen,
U.S. Patent Application No.: 62/056,866, filed September 29, 2014.

Software: Several software distributions based on the research reported in the publications above are publicly available at: http://www.eecs.berkeley.edu/˜sseshia/#software.

Talks

Keynote Talks/Invited Colloquia

1. *Towards Verified Autonomous Intelligent Cyber-Physical Systems*,
Invited colloquium, Department of Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA, September 23, 2022.

2. *Formal Inductive Synthesis and Specification Inference*,
Keynote talk, International Workshop on Design Automation for CPS and IoT (DESTION), May 3, 2022.

3. *Algorithmic Improvisation for Dependable Intelligent Autonomy*,
Keynote talk, 40th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS), online, December 17, 2020.

4. *Verified Artificial Intelligence and Autonomy*,
Keynote talk, NASA Formal Methods Symposium, online, May 13, 2020.
Keynote talk, International Conference on Formal Engineering Methods, online, March 1, 2021.
Invited talk, SafeTRANS Industrial Day, December 13, 2021.
Invited talk, IFIP WG10.4 IVDS Workshop, January 31, 2021.
Chair's Distinguished Lecture Series, Dept. of Aerospace Engineering, University of Michigan Ann Arbor, September 17, 2020.

5. *Verified Artificial Intelligence: A Runtime Verification Perspective*,
Keynote talk, International Conference on Runtime Verification (RV), 3rd World Congress on Formal Methods, Porto, Portugal, October 11, 2019.

6. *Algorithmic Improvisation for Dependable and Secure Autonomy*,
Keynote talk, 15th IEEE International Conference on Embedded Software and Systems, Las Vegas, NV, June 2, 2019.

7. *Verified Artificial Intelligence: A Design Automation Perspective*,
Keynote talk, International Workshop on Design Automation of CPS (DACPS), Las Vegas, NV, June 2,

2019.
- Also Invited talk, DESTION Workshop, CPS-IoT Week, Montreal, Canada, April 15, 2019.

8. *Towards Verified Artificial Intelligence*,
Invited Colloquium, 2018 Fall Distinguished Speaker Series, Computer Science Department, University of Virginia, Charlottesville, VA, October 26, 2018.
Keynote talk, International Symposium on Automated Technology for Verification and Analysis (ATVA), Los Angeles, CA, October 8, 2018.
Keynote talk, MLSE International Symposium, NII, Tokyo, Japan, October 18, 2019.
Keynote talk, Workshop on Dependable and Secure Machine Learning (DSML), Dependable Systems and Networks conference, Portland, OR, June 24, 2019.
Earlier versions given as:
- Keynote talk, International Symposium on Dependable Software Engineering: Theories, Tools and Applications, Changsha, China, October 24, 2017.
- SystemX Seminar, Stanford University, Stanford, CA, May 17, 2018.

9. *UCLID5: Integrating Modeling, Verification, Synthesis, and Learning*,
Keynote talk, 16th ACM-IEEE International Conference on Formal Methods and Models for System Design (MEMOCODE), Beijing, China, October 15, 2018.
- Also Invited Tutorial, SAT-SMT Winter School, IIT Bombay, Mumbai, India, December 8, 2019.

10. *Towards Safe, Intelligent, and Interactive Autonomous Systems*,
ECE Colloquium, University of California at Los Angeles (UCLA), Los Angeles, CA, October 2, 2017.

11. *Towards Principled Design of Human Cyber-Physical Systems*,
Invited Colloquium, Tata Insitute of Fundamental Research (TIFR), Mumbai, India, December 7, 2016.

12. *Formal Inductive Synthesis for Cyber-Physical Systems*,
Keynote talk, Workshop on High Consequence Control Verification (HCCV), Toronto, Canada, July 18, 2016.
- Also Cyber-Physical Systems Seminar, University of Southern California (USC), February 22, 2017.

13. *Verification by, for, and of Humans: Formal Methods for Cyber-Physical Systems and Beyond*,
ECE Colloquium, University of Illinois at Urbana-Champaign, March 19, 2015.
- Also CS Seminar, National University of Singapore, Singapore, November 23, 2015.

14. *Formal Methods for Lab-Based MOOCs: Cyber-Physical Systems and Beyond*,
Keynote talk at Workshop on Embedded and Cyber-Physical Systems Education (WESE), October 16, 2014.
- Also given at the Indian Institute of Technology, Bombay, India, October 20, 2014.

15. *The Logic of Cars: Reasoning about Cyber-Physical Systems with Computational Logic*,
Logic Colloquium, University of California, Berkeley, CA, October 3, 2014.

16. *Verifying High-Confidence Interactive Systems: Electronic Voting and Beyond*,
Keynote talk, 14th International Conference on Distributed Computing and Networking (ICDCN), January 5, 2013.
A version of this talk also given as:
- Prof. R. Narasimhan Memorial Lecture, Tata Insitute of Fundamental Research (TIFR), Mumbai, India, January 9, 2013.

17. *Verification of Cyber-Physical Software Systems: Challenges and Recent Advances*,
Keynote talk, 5th ICES Annual Conference on World-wide Trends and Challenges in Embedded Systems, Stockholm, Sweden, August 30, 2012.

18. *Formal Methods for Dependable Computing: From Models, through Software, to Circuits*,
Invited talk, CITRIS Research Exchange, Berkeley, CA, November 3, 2010.

19. *Quantitative Analysis of Software: Challenges and Recent Advances*,

Keynote talk, 7th International Workshop on Formal Aspects of Component Software, Guimaraes, Portugal, October 16, 2010.

20. *Verification-Guided Error Resilience*,
Sundaram Seshu Scholar Lecture, Coordinated Science Laboratory, University of Illinois at Urbana-Champaign, October 29, 2008.
   - Also given at the CANDE Workshop, Pacifica, CA, November 8, 2008.

21. *Adaptive Eager Boolean Encoding for Arithmetic Reasoning in Verification*,
SCS Distinguished Lecture Series, Carnegie Mellon University, February 2, 2006.

Invited Talks/Tutorials/Panels

1. *Formal Methods for AI Safety*,
Invited talk at NSF Workshop on Provably Safe and Beneficial AI, Berkeley, CA, October 7, 2022.

2. *Future of Verified-AI Based Autonomy*,
Invited panel at the Federated Logic Conferences (FLoC), Haifa, Israel, August 7, 2022.

3. *Environment Modeling for Verified AI*,
Invited talk at Safe Reinforcement Learning Workshop at IJCAI, online, July 23, 2022.

4. *Formal Specification and Modeling for Verified AI*,
Invited talk at Dagstuhl Seminar on "Machine Learning and Logical Reasoning: The New Frontier", July 21, 2022.

5. *Formal Design of AI-Based Autonomy with Scenic and VerifAI*,
Invited talk at Workshop on Human-Centered Intelligent Services: Safe and Trustworthy, CVPR, online, June 20, 2022.

6. *UCLID5's Elements: Formal Modeling, Verification, Synthesis, and Learning*,
Invited tutorial lectures at 11th SRI Summer School on Formal Techniques, Menlo Park, CA, June 2-4, 2022.

7. *Design Automation for Autonomous Intelligent Cyber-Physical Systems*,
Invited talk at Berkeley Annual Research Symposium (BEARS), Berkeley, CA, April 25, 2022.

8. *Formal Specification for Machine Learning Systems*,
Invited talk at Workshop on Hyperproperties: Advances in Theory and Practice, online, October 18, 2021.
Also given at Workshop on Verified Learning and Autonomy in CPS, Isaac Newton Institute, Cambridge, UK, July 26, 2022.

9. *Formal Analysis of AI-Based Autonomy: From Modeling to Runtime Assurance*,
Invited tutorial at International Conference on Runtime Verification (RV), online, October 14, 2021.

10. *Towards Verified-AI Based Autonomy with Scenic and VerifAI*,
Invited panel at Formal Methods in Robotics at International Conference on Intelligent Robots and Systems (IROS), online, October 1, 2021.

11. *Verified AI-Based Autonomy: A Numerical Simulation Perspective*,
Keynote talk, Workshop on Numerical Software Verification (NSV), online, July 18, 2021.

12. *Frontiers in Cyber-Physical Systems Research and Education*,
Invited talk and panel, Vaibhav Summit, online, October 11, 2020.

13. *Towards Verified Artificial Intelligence with VerifAI and Scenic*,
Keynote talk, Workshop on Monitoring and Testing of CPS (MT-CPS), CPS-IoT Week, online, April 21, 2020.
   - Also given as Invited Tutorial, SAT-SMT Winter School, IIT Bombay, Mumbai, India, December 8, 2019.

14. *Verified Artificial Intelligence: An Environment Modeling Perspective*,
Invited talk at Trustworthy AI Symposium, Columbia University, New York, NY, October 30, 2019.

15. *Towards Verified Deep Learning*,

Invited talk at Workshop on Emerging Challenges in Deep Learning, Simons Insitute, Berkeley, CA, August 7, 2019.

16. *Formal Methods, Machine Learning, and Cyber-Physical Systems*,
Invited Tutorial at the International Symposium on Automated Technology for Verification and Analysis (ATVA), Los Angeles, CA, October 7, 2018.

17. *Towards Verified Artificial Intelligence*,
Invited talk at Google DeepMind, London, UK, July 20,2018.
• Also given at Microsoft Research Cambridge, UK, July 25, 2018.
• Also given at SRI International, Menlo Park, CA, August 16, 2018.

18. *Specification and Verification for Robots that Learn*,
Invited talk at Workshop on Robots, Morality, Trust through the Verification Lens, Federated Logic Conferences, Oxford, UK, July 19, 2018.

19. *Towards Provably Secure Computing using Formal Methods*,
Invited Tutorial at ACACES Summer School, Rome, Italy, July 9-13, 2018.

20. *Towards Safe, Interactive, and Intelligent Autonomy*,
Invited panel at NSF Workshop on Semi-Autonomous Trucks, Alexandria, VA, June 28, 2018.

21. *Formal Methods for Deep Learning*,
Invited Talk at 55th Design Automation Conference, San Francisco, CA, June 27, 2018.

22. *Dependable Real-Time Decision Making in Cyber-Physical Systems*,
Invited talk at Simons Institute Workshop on Societal Networks, Berkeley, CA, March 26, 2018.

23. *Oracle-Guided Synthesis of Machine Learning Models*,
Invited talk at Dagstuhl Seminar "Machine Learning and Model Checking Join Forces", March 20, 2018.

24. *Control Improvisation*,
Invited talk at 30 years of the Ramadge-Wonham Theory of Supervisory Control: A Retrospective and Future Perspectives, Melbourne, Australia, December 11, 2017.

25. *Formal Methods meets Machine Learning: Explorations in Cyber-Physical System Design*,
Invited talk at EE & CS Departments, Stanford University, Stanford, CA, December 4, 2017.

26. *Satisfiability Modulo Convex Programming*,
Invited talk, ICCAD Workshop on Non-Conventional Approaches to Hard Optimization, November 16, 2017.
• Also given at CSE Department, Indian Institute of Technology Bombay, Mumbai, India, August 11, 2017.

27. *Explorations in Cyber-Physical Systems Education*,
Invited talk, Principles of Modeling: Edward A. Lee Festschrift Symp., Berkeley, CA, October 13, 2017.

28. *Towards Safe and Interactive Intelligent Autonomous Systems*,
Invited talk, Microsoft Research India, Bangalore, India, July 5, 2017.
• Also given at Robert Bosch Center for CPS, Indian Institute of Science, Bangalore, India, July 13, 2017.
• Also given at CSE Department, Indian Institute of Technology Bombay, Mumbai, India, August 11, 2017.

29. *Provably Secure Computing using Verified Software and Trusted Hardware*,
Invited Colloquium, CSA Department, Indian Institute of Science, Bangalore, India, June 27, 2017.
• Also given at DATA61 Seminar, Sydney, Australia, December 18, 2017.
• Also given at Stanford Software Seminar, Stanford, CA, November 9, 2017.

30. *Principles for Verified Artificial Intelligence*,
Invited talk at the 54th Design Automation Conference, Austin, TX, June 21, 2017.

31. *Game-Theoretic Learning for Verification and Control*,
Invited talk at Dagstuhl Seminar "Game Theory in AI, Logic, and Algorithms", March 16, 2017.

32. *Diversity and Resilience through Control Improvisation*,
Invited talk at the Workshop on Heterogeneity, Diversity, and Resilience in Multi-Robot Systems, Arlington,

VA, August 15, 2016.

33. *Formal Inductive Synthesis: Theory and Applications*,
    Invited lecture at the RiSE Spring School on Logic and Verification, Vienna, Austria, April 15, 2016.
    - Also invited tutorial at Haifa Verification Conference, Haifa, Israel, November 14, 2016.
    - Also invited lecture series at SAT/SMT winter school, TIFR, Mumbai, India, December 8, 2016.

34. *Understanding the Typical-Case Complexity in Formal Verification*,
    Invited talk at Simons Institute Workshop on Learning, Algorithm Design and Beyond Worst-Case Analysis, Berkeley, CA, November 17, 2016.

35. *A Theory of Algorithmic Improvisation*,
    Invited talk at Microsoft Research India, Bangalore, December 21, 2015.
    - Also given at the Indian Institute of Technology, Bombay, India, January 14, 2016 and at the Tata Institute of Fundamental Research, Mumbai, India, January 11, 2016.

36. *Formal Methods for Semi-Autonomous Driving*,
    Invited talk at the 52nd Design Automation Conference, San Francisco, CA, June 11, 2015.

37. *Synthesis and Inductive Learning*,
    Invited lectures at the NSF ExCAPE Summer School on Synthesis, Cambridge, MA, June 23-25, 2015.
    - Shorter version given at the SAT/SMT Summer School, Stanford, CA, July 17, 2015.

38. *Design and Verification of Cyber-Physical Systems and Robotics*,
    Invited talk at National Instruments (NI) Week, Austin, TX, August 5, 2014.
    - Also given at the NI CPS Round Table, Pisa, Italy, November 24, 2014.

39. *Lab-based MOOCs: Cyber-Physical Systems, Robotics, and Beyond*,
    Invited talk at National Instruments (NI) Week, Austin, TX, August 4, 2014.
    - Shorter version at Learning with MOOCs (LWMOOCs) workshop, Cambridge, MA, August 13, 2014.

40. *Human-in-the-Loop Robotics: Specification, Verification, and Synthesis*,
    Invited talk at 5th Workshop on Formal Methods for Robotics and Automation (FMRA/RSS), Berkeley, CA, July 12, 2014.

41. *Validation of Industrial-Scale Real-Time Embedded Systems*,
    Invited Tutorial at 51st Design Automation Conference (DAC), San Francisco, CA, June 2, 2014.

42. *Integrating Induction and Deduction for Synthesis*,
    Invited talk at Americal Control Conference (ACC), Special Session on Software Synthesis, Washington, DC, June 19, 2013.

43. *Term-Level Verification of the Secure Thin Intermediation Layer*,
    Dagstuhl Seminar on Bugs and Defects in Electronic Systems: the Next Frontier, Schloss Dagstuhl, Germany, April 22, 2013.

44. *Quantitative Verification of Embedded Software: The GameTime Approach*,
    Invited talk at LCCC Workshop on Formal Verification of Embedded Control Systems, Lund, Sweden, April 19, 2013.

45. *Verification and Synthesis for Cyber-Physical Properties*,
    Invited talk, 50th Annual Allerton Conference on Communication, Control, and Computing, Allerton, IL, October 3, 2012.

46. *Verification and Synthesis by Sciduction*,
    Invited talk, University of Texas, Austin, October 31, 2011.
    Versions of this talk also given at the following venues: IST Austria, April 17, 2012; Microsoft Research, Cambridge, UK, April 19, 2012, and Université Libre de Bruxelles, Brussels, Belgium, April 23, 2012.

47. *UCLID's Elements: Term-Level Verification and SMT Solving*,
    Invited talk, SMT/SAT Summer School, MIT, Cambridge, MA, June 15, 2011.

48. *Verifying Timing-Centric Software Systems*,

Invited talk, 11th Annual Conference on High Confidence Software and Systems (HCSS), May 4, 2011.

49. *Voting Machines and Automotive Software: Explorations with SMT at Scale*,
Seminar on Deduction at Scale, Ringberg Castle, Germany, March 7, 2011.

50. *Quantitative Verification of Software: Challenges and Recent Advances*,
Invited talk, 24th IEEE International Conference on VLSI Design and 10th Conference on Embedded Software, Chennai, India, January 6, 2011.
Also given at Coverity, Inc., February 8, 2011.

51. *On Voting Machine Design for Verification and Testability*,
Invited talk, 2nd IEEE International Workshop on Reliability Aware System Design and Test, Chennai, India, January 6, 2011.

52. *The Challenge of Environment Modeling in Verifying Cyber-Physical Software Systems*,
Workshop on Usable Verification, Redmond, WA, November 15, 2010.

53. Invited panelist, *The Verification Challenge of Low-Level Embedded Software*,
IEEE International Conference on Formal Methods in Computer Aided Design (FMCAD), Lugano, Switzerland, October 22, 2010.

54. *Quantitative Verification and Synthesis of Systems*,
Invited talk, Strategic Directions in Software at Scale (SaS), Berkeley, CA, August 18, 2010.

55. *Integrating Induction and Deduction for Verification and Synthesis*,
Software Seminar, Computer Science Department, Stanford University, June 1, 2010.

56. *Voting Machine Design for Verification and Testability*,
Microsoft Research, Redmond, WA, March 19, 2010.

57. *Mutations for Evaluating Coverage and Fault Tolerance*,
Microsoft Research, Bangalore, India, August 5, 2008.

58. *Formal Verification at Higher Levels of Abstraction*,
Tutorial at International Conference on Computer-Aided Design (ICCAD), November 8, 2007.

59. *SAT-Based Decision Procedures and Malware Detection*,
Software Seminar, Computer Science Department, Stanford University, November 29, 2005.

60. *Reasoning about Reliability and Security Using Boolean Methods*,
General Motors India Science Laboratory, July 21, 2005.

61. *UCLID: Deciding Combinations of Theories via Eager Translation to SAT*,
Stanford/SRI Summer School on Combination of Decision Procedures, August 10, 2004.

62. *The Small Model Property of Integer Linear Arithmetic*,
Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA, July 22, 2004.

63. *First-Order Decision Procedures Based on Eager SAT-Encodings*,
Tata Institute of Fundamental Research, Mumbai, India, January 2, 2004.

64. *Translating Quantified Separation Logic to Quantified Boolean Logic*,
Dagstuhl Seminar on Deduction and Infinite-State Model Checking, Germany, April 24, 2003.

65. *A SAT-Based Decision Procedure for Infinite-State System Verification*,
Microsoft Research, Redmond, November 8, 2002.

Selected Conference Presentations

66. *Formal Inductive Synthesis and Oracle-Guided Inductive Synthesis*,
Dagstuhl Seminar on Machine Learning and Formal Methods, August 29, 2017.

67. *On the Teaching Dimension of Octagons for Formal Synthesis*,
5th Workshop on Synthesis (SYNT), Toronto, Canada, July 17, 2016.

68. *CPSGrader: Formal Methods for Lab-Based MOOCs*,

3rd Workshop on Programming Languages Technology for Massive Open Online Courses (PLOOC), Portland, OR, June 14, 2015.

69. *Meeting the MOOC Challenge for Embedded Systems*,
1st Workshop on Programming Languages Technology for Massive Open Online Courses (PLOOC), Seattle, WA, June 21, 2013.

70. *Virtualizing Cyber-Physical Systems: Bringing CPS to Online Education*,
First Workshop on CPS Education (CPS-Ed), CPSWeek, Philadelphia, April 8, 2013.

71. *Sciduction: Combining Induction, Deduction, and Structure for Verification and Synthesis*,
Design Automation Conference (DAC), San Francisco, June 5, 2012.

72. *Satisfiability Modulo Theories*,
Tutorial at International Conference on Computer-Aided Design (ICCAD), San Jose, November 2, 2009.

73. *Game-Theoretic Timing Analysis*,
IEEE/ACM International Conference on Computer-Aided Design (ICCAD), San Jose, November 11, 2008.

74. *Teaching Embedded Systems to Berkeley Undergraduates*,
NSF Workshop "From Embedded Systems to Cyber-Physical Systems: A Review of the State-of-the-Art and Research Needs", St. Louis, April 21, 2008.

75. *Autonomic Reactive Systems via Online Learning*,
4th International Conference on Autonomic Computing (ICAC), June 14, 2007.

76. *Verification-Guided Soft Error Resilience*,
10th International Conference on Design Automation and Test in Europe (DATE), April 19, 2007.

77. *Modeling and Verifying Circuits Using Generalized Relative Timing*,
11th IEEE International Symposium on Asynchronous Circuits and Systems (ASYNC), March 15, 2005.

78. *Deciding Quantifier-Free Presburger Arithmetic Using Parameterized Solution Bounds*,
19th Annual IEEE Symposium on Logic in Computer Science (LICS), July 14, 2004.

79. *Unbounded, Fully Symbolic Model Checking of Timed Automata Using Boolean Methods*,
15th International Conference on Computer-Aided Verification (CAV), July 10, 2003.

80. *A Hybrid SAT-Based Decision Procedure for Separation Logic with Uninterpreted Functions*,
40th Design Automation Conference (DAC), June 4, 2003.

81. *Modeling and Verifying Systems Using CLU Logic*,
14th International Conference on Computer-Aided Verification (CAV), July 28, 2002.

82. *A Translation of Statecharts to Esterel*,
1st World Congress on Formal Methods (FM), September 21, 1999.
- Also given at Microsoft Research, Cambridge, U.K. (September 24, 1999)

Selected Seminars and Colloquia

83. *Model Counting, Random Sampling, and Improvisation*,
Qualcomm Research Silicon Valley, Santa Clara, CA, June 9, 2015.

84. *Solvers, Abstraction, and Inductive Learning*,
Dagstuhl Seminar on Decision Procedures and Abstract Interpretation, August 27, 2014.

85. *Human-in-the-Loop Embedded Systems: Specification, Design, and Verification*,
Given at the following venues:
    - Tata Institute of Fundamental Research, India, January 2, 2014
    - Indian Institute of Technology, Bombay, India, Jaunary 7, 2014.
    - Microsoft Research India, Bangalore, India, January 10, 2014.

86. *Formal Performance Verification of NoC Designs*,
Seminar, CSAIL, MIT, Cambridge, MA, May 2, 2013.

87. *Verification with Small and Short Worlds*,
    CSAIL Security Seminar, MIT, Cambridge, MA, April 3, 2013.

88. *Integrating Induction, Deduction, and Structure for Synthesis*,
    ExCAPE Summer School, Berkeley, CA, June 12, 2013.
    A version of this talk also given at Verimag Laboratory, Grenoble, France, March 19, 2013.

89. *Specification Mining for Controller Verification and Synthesis*,
    CMACS Seminar, Carnegie Mellon University, Pittsburgh, PA, May 22, 2013.

90. *From Security to Cyber-Physical Systems: The Sciductive Approach to Verification and Synthesis*,
    Joint CSE/EE Seminar, Indian Institute of Technology, Bombay, January 3, 2011.

91. *On Voting Machine Design for Verification and Testability*,
    Tata Institute of Fundamental Research, Mumbai, December 28, 2010.

92. *Integrating Induction and Deduction for Verification and Synthesis*,
    Given at the following venues:
    - University of Texas, Austin, TX, April 15, 2010.
    - PRECISE Center Seminar, University of Pennsylvania, Philadelphia, PA, May 19, 2010.
    - CMACS Seminar, Carnegie Mellon University, Pittsburgh, PA, May 21, 2010.

93. *Game-Theoretic Quantitative Analysis of Embedded Software*,
    Given at the following venues:
    - Princeton University, Princeton, NJ, November 12, 2009.
    - EPFL, Lausanne, Switzerland, July 3, 2009.
    - Technical University of Vienna, Austria, July 10, 2009.
    - University of Salzburg, Austria, July 13, 2009.
    - Bruno Kessler Foundation (FBK), Trento, Italy, July 14, 2009.

94. *Game-Theoretic Timing Analysis*,
    Given at the following venues:
    - CHESS Seminar Series, UC Berkeley, September 23, 2008.
    - Microsoft Research, Redmond, WA, November 18, 2008.
    - Intel Strategic CAD Labs, Hillsboro, OR, November 21, 2008.

95. *Diagnosis, Repair, and Multi-Armed Bandits*,
    DES/CHESS Seminar, University of California, Berkeley, May 8, 2007.
    • Also given at SRI International, Menlo Park, May 23, 2007.

96. *SAT-Based Decision Procedures and Software Security*,
    Programming Systems Seminar, University of California, Berkeley, October 24, 2005.

97. *Reasoning about Timed Systems Using Boolean Methods*,
    CHESS Seminar, University of California, Berkeley, October 11, 2005.

98. *Boolean Methods in Computer Reliability and Security*,
    Joint CSE/EE Seminar, Indian Institute of Technology, Bombay, August 11, 2005.

99. *Reasoning about Reliability and Security Using Boolean Methods*,
    Given at the following venues:
    - Dept. of Computer Science and Engineering, UC San Diego, April 27, 2005.
    - Computer Sciences Department, University of Wisconsin, Madison, April 25, 2005.
    - Information Science and Technology Seminar, California Inst. of Technology, April 20, 2005.
    - Microsoft Research, Redmond, April 18, 2005.
    - EECS Special Seminar, Massachusetts Institute of Technology, April 14, 2005.
    - EECS Colloquium, University of California, Berkeley, April 6, 2005.
    - CSE Colloquium, University of Washington, Seattle, March 31, 2005.
    - Dept. of Electrical and Computer Engineering, University of Texas, Austin, March 24, 2005.

100. *Boolean Methods for Arithmetic Reasoning*,
    Dept. of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, March 8, 2005.
101. *Modular Verification of Multithreaded Software*,
    SCS Student Seminar Series, Carnegie Mellon University, April 12, 2002.

Teaching and Advising Experience

Teaching at UC Berkeley

Spring '22,'21, '20-'18, '16, '15, '11, '07, '06; Fall 2012 & 2009	*Formal Methods: Specification, Verification, and Synthesis* (EECS 219C). (Course title prior to Spr'18: *Computed-Aided Verification*.) Advanced graduate course on formal methods with a focus on algorithmic techniques such as model checking and satisfiability solving (SAT/SMT). Innovations since 2012 include a strong emphasis on synthesis and new material on the connections between inductive machine learning and formal methods.
Fall '21, '20, '19, '18, '15, '13 & '12, Spring 2011, 2009 & 2008	*Introduction to Embedded Systems* (EECS 149). Upper-division undergraduate course on embedded systems. Co-created and developed this undergraduate course at UC Berkeley, taught for the first time in Spring 2008. • The Spring 2008 offering was numbered EECS 124. Co-taught with Prof. Edward Lee in Fall 2013 & 2012, Spring 2011 and Spring 2008; with Prof. Prabal Dutta in Fall 2018-20.
Fall 2016	*Discrete Mathematics and Probability Theory* (CS 70). Lower-division undergraduate course introducing students to discrete mathematics and probability theory with an emphasis on foundational aspects for electrical engineering and computer science (co-taught with Prof. Jean Walrand). Enrollment of nearly 700 students.
Spring 2014	*Formal Methods for Engineering Education* (CS 294-98). Research-oriented graduate course exploring the use of formal methods to develop technologies for education, especially for online education.
Fall 2013, 2010 & 2011	*Fundamental Algorithms for System Modeling, Analysis, and Optimization* (EECS 144/244). A joint offering of an upper-division undergraduate course (144) and core graduate course (244) on fundamental algorithmic techniques underlying the design methodology for complex systems, using integrated circuit design as an example (co-taught with Professors Edward Lee, Jaijeet Roychowdhury, and Stavros Tripakis). Co-created EECS 144, an undergraduate course at UC Berkeley, offered for the first time in Fall 2010. The existing graduate course EECS 244 has been revised significantly.
Spring 2010, Spring 2008, & Fall 2006	*Computability and Complexity* (CS 172). Upper-division undergraduate course on automata theory, computability, and complexity theory.
Fall 2005, 2007, & 2008	*Introduction to Computer-Aided Design of Integrated Circuits* (EECS 244, co-taught with Prof. Kurt Keutzer). Core graduate course on CAD for ICs.
Fall 2007	*Current Berkeley Research in Programming Systems* (CS 294-25). Research-oriented graduate course in programming systems (co-taught with Professors R. Bodik, K. Sen, D. Song, and K. Yelick).

Massive Open Online Courses (MOOCs): Led the creation and offering of EECS149.1x, a MOOC on *Cyber-Physical Systems* offered on the edX platform. This course, based on EECS 149 at UC Berkeley, is amongst the *first* courses on this topic offered on any of the three leading platforms for online courses. This MOOC is also the first to deploy automatic grading technology based on formal methods with "virtual lab" software, CPSGrader, created by my group.

Graduate Student Advisees

Current:

- Sahil Bhatia, Ph.D. in EECS (November 2021 – date) (co-advised with Prof. A. Cheung)
- Kevin Cheang, Ph.D. in EECS (July 2018 – date)
- Pei-Wei Chen, Ph.D. in EECS (April 2022 – date)
- Adwait Godbole, Ph.D. in EECS (April 2021 – date)
- Edward Kim, Ph.D. in EECS (January 2018 – date) (co-advised with Prof. A. Sangiovanni-Vincentelli)
- Niklas Lauffer, Ph.D. in EECS (April 2022 – date) (co-advised with Prof. S. Russell)
- Shaokai Lin, Ph.D. in EECS (January 2021 – date) (co-advised with Prof. E. Lee)
- Federico Mora, Ph.D. in EECS (October 2019 – date)
- Ameesh Shah, Ph.D. in EECS (Feb. 2021 – date)
- Victoria Tuck, Ph.D. in EECS (April 2022 – date) (co-advised with Prof. S. Sastry)
- Justin Wong, Ph.D. in EECS (June 2021 – date) (co-advised with Prof. J. Gonzalez)
- Beyazit Yalcinkaya, Ph.D. in EECS (Feb. 2022 – date)

Graduated:

- Marcell Vazquez-Chanlatte, Ph.D. in EECS (graduated May 2022)
- Gil Lederman, Ph.D. in EECS (graduated May 2021) (co-advised with Prof. E. A. Lee)
- Benjamin Caulfield, Ph.D. in EECS (graduated May 2021) (co-advised with Prof. S. Tripakis)
- Ankush Desai, Ph.D. in EECS (graduated December 2019)
- Shromona Ghosh, Ph.D. in EECS (graduated December 2019) (co-advised with Prof. A. Sangiovanni-Vincentelli)
- Daniel Fremont, Ph.D. in Logic & the Methodology of Science (graduated August 2019)
  ⋆ Recipient of the 2020 ACM SIGBED Paul Caspi Memorial Dissertation Award.
- Eric Kim, Ph.D. in EECS (graduated August 2019) (co-advised with Prof. M. Arcak)
- José Rafael Valle Gomes da Costa, Ph.D. in Computational and Data Science and Engineering (graduated January 2018) (co-advised with Prof. E. Campion)
- Rohit Sinha, Ph.D. in EECS (graduated December 2017)
- Dorsa Sadigh, Ph.D. in EECS (graduated August 2017) (co-advised with Prof. S. Shankar Sastry)
- Wenchao Li, Ph.D. in EECS (graduated December 2013)
  ⋆ Recipient of the 2015 ACM SIGDA Outstanding Dissertation Award.
- Daniel Holcomb, Ph.D. in EECS (graduated December 2013)
- Susmit Jha, Ph.D. in EECS (graduated December 2011)
- Bryan Brady, Ph.D. in EECS (graduated May 2011)
- Qiancheng (Mark) Wu, M.S. in EECS (graduated May 2022)
- Jonathan Shi, M.S. in EECS (graduated May 2022)
- Pranav Gaddamadugu, M.S. in EECS (graduated Aug 2021)
- Kesav Viswanadha, M.S. in EECS (graduated May 2021)
- Lakshya Jain, M.S. in EECS (graduated May 2020)
- Shivendra Kushwah, M.S. in EECS (graduated May 2020)

- Sumukh Shivakumar, M.S. in EECS (graduated May 2020)
- Cameron Rasmussen, M.S. in EECS (graduated May 2019)
- Nishant Totla, M.S. in EECS (graduated December 2016)
- Matthew Fong, M.S. in EECS (graduated May 2015)
- Garvit Juniwal, M.S. in EECS (graduated December 2014)
- Zachariah Wasson, M.S. in EECS (graduated May 2014)
- Wei Yang Tan, M.S. in EECS (graduated May 2014)
- Jonathan Kotker, M.S. in EECS (graduated May 2013)
- Rhishikesh Limaye, M.S. in EECS (graduated May 2010)

Visiting Ph.D. Students: Luigi Di Guglielmo (Univ. Verona, Italy, 05/2011 - 11/2011); Yasser Shoukry (UCLA, 05/2014 - 05/2015)

M.Eng. Students: Kevin Albers, Robert Bui, Jose Oyola, Naren Vasanad (2014-15, co-advised with Prof. E. A. Lee)

Postdoctoral Researchers

Current:

- Inigo Icer (May 2022 - date) (co-mentored with Prof. R. Murray and Prof. A. Sangiovanni-Vincentelli)
- Hussein Sibai Pick (Nov. 2021 - date) (co-mentored with Prof. M. Arcak)
- Lauren Pick (Nov. 2021 - date) (co-mentored with Prof. A. Albarghouthi)
- Hazem Torfah (Jan. 2020 - date)

Graduated:

- Yatin Manerkar (Mar. 2021 - Aug. 2021)
- Sebastian Junges (Feb. 2020 - Aug. 2021)
- Yash Vardhan Pant (Oct. 2019 - Jul. 2021) (co-advised with Prof. B. Hartmann and Prof. R. Murray)
- Elizabeth Polgreen (Sep. 2019 - Dec. 2020)
- Mark Ho (Jan. 2018 - Dec. 2019) (co-advised with Prof. T. Griffiths)
- Hadi Ravanbakhsh (July 2018 - Dec. 2019)
- Tommaso Dreossi (Jan. 2016 - Mar. 2019)
- Markus Rabe (Apr. 2015 - Aug. 2018)
- Pramod Subramanyan (Jan. 2017 - May 2018)
- Yasser Shoukry (Sep. 2015 - June 2017) (co-advised with Prof. P. Tabuada, UCLA and Prof. G. Pappas, U. Penn)
- Alexandre Donzé (Mar. 2012 - Dec. 2016)
- Yi-Chin Wu (Nov. 2014 - Apr. 2016) (co-advised with Prof. S. Lafortune, U. Michigan)
- Vasumathi Raman (July 2013 - June 2015) (co-advised with Prof. R. Murray, Caltech)
- Indranil Saha (July 2013 - June 2015) (co-advised with Prof. G. Pappas, U. Penn)
- Daniel Bundala (Sep. 2014 - July 2015)
- Rüdiger Ehlers (Sep. 2012 - Aug. 2013) (co-advised with Prof. H. Kress-Gazit, Cornell)

Undergraduate Advisees

Amar Shah (EECS, UC Berkeley, Sep. 2022 - date); Selena Kim (EECS, UC Berkeley, Jan. 2022 - date); Alton Sturgis (EECS, UC Berkeley, Aug. 2021 - date); Francis Indaheng (EECS, UC Berkeley, Jan. 2020 - May 2022); Johnathan Chiu (EECS, UC Berkeley, Aug. 2019 - Jan 2022); Nicolas Chan (EECS, UC Berkeley, Aug. 2020 - May 2021); Han Qi (EECS, UC Berkeley, Jan. - May 2021); Nikhil Pimpalkhare (EECS, UC Berkeley, Jan. 2020 - May 2021); Yifan Ning (EECS, UC Berkeley, Aug. - Dec. 2019); Lakshya Jain (CS,

UC Berkeley, Aug. 2018 - May 2019); Sumukh Shivakumar (EECS, UC Berkeley, Jan. 2018 - May 2019); Cameron Rasmussen (EECS, UC Berkeley, Nov. 2016 - May 2018); Nathan Mull (Math., UC Berkeley, May 2015 - May 2016); Linh Pham (EECS, UC Berkeley, May - August 2015); James Ferguson (EECS, UC Berkeley, Jan. 2012 - Dec. 2013); Sophie Libkind (Swarthmore College, SUPERB/NSF REU participant, Jun. - Aug. 2013); Paul Ruan (EECS, UC Berkeley, Jan. 2012 - May 2013); Jacob Levine (EECS, UC Berkeley, Jan. 2012 - May 2012); Mona Gupta (EECS/NE, UC Berkeley, May 2012 - Dec. 2012); Hanchen Tang (EECS, UC Berkeley, May - Aug. 2012); Xu Chen (EECS, UC Berkeley, Jan. - Dec. 2012); Dorsa Sadigh (EECS, UC Berkeley, Jan. - Dec. 2011); Lisa Yan (EECS, UC Berkeley, Jan. - Dec. 2011); Johny Lam (EECS, UC Berkeley, May - Dec. 2010); Rohan Desai (EECS, UC Berkeley, May - Jun. 2010); Lili Dworkin (Haverford College, SUPERB/NSF REU participant, Jun. - Aug. 2010); Min Xu (EECS, UC Berkeley, Aug. 2008 - Jun. 2009); Jeff Jensen (EECS, UC Berkeley, Aug. - Dec. 2008); Lei Huang (EECS, UC Berkeley, Aug. - Dec. 2008); Adam Harwayne (EECS, UC Berkeley, Aug. - Dec. 2008); Daniel Wong (EECS, UC Berkeley, Jan. - Jun. 2008); Kedar Kanitkar (EECS, UC Berkeley, Jan. - Dec. 2007); Wenchao Li (EECS, UC Berkeley, Jun. 2006 - May 2007); Timothy Washington (CIS, Clark Atlanta University, SUPERB-IT participant, Jun. - Aug. 2006); Yinmeng N. Zhang (Computer Science, CMU, Sep. 2004 - May 2005); Andrew P. Lin (Mathematical Sciences, CMU, May 2003 - Apr. 2004).

Ph.D. Qualifying Exam / Dissertation Committees
Adam Chlipala (EECS, UC Berkeley, Apr. 2006), Donald Chai (EECS, UC Berkeley, May 2006), David Molnar (EECS, UC Berkeley, May 2006), Wei Zheng (EECS, UC Berkeley, Oct. 2006), Michael Case (EECS, UC Berkeley, May 2007), Nathan Kitchen (EECS, UC Berkeley, May 2007), Guoqiang Wang (EECS, UC Berkeley, May 2007), Haibo Zeng (EECS, UC Berkeley, May 2007), Thomas Feng (EECS, UC Berkeley, Jan. 2008), Armando Solar-Lezama (EECS, UC Berkeley, Feb. 2008). Mark Whitney (EECS, UC Berkeley, Mar. 2008), Gilad Arnold (EECS, UC Berkeley, Mar. 2008), Matthew Moskewicz (EECS, UC Berkeley, Feb. 2009), Yang Yang (EECS, UC Berkeley, Oct. 2009). Shanna-Shaye Forbes (EECS, UC Berkeley, Dec. 2010), Sayak Ray (EECS, UC Berkeley, April 2011), Cynthia Sturton (EECS, UC Berkeley, Dec. 2011), Dai Bui Nguyen (EECS, UC Berkeley, May 2012), Tobias Welp (EECS, UC Berkeley, May 2012), Chia Yuan Cho (EECS, UC Berkeley, Dec. 2012), Eloi Periera (CEE, UC Berkeley, Dec. 2012), Pierluigi Nuzzo (EECS, UC Berkeley, Jul. 2013), Chung-Wei Lin (EECS, UC Berkeley, Nov. 2013), Michael Zimmer (EECS, UC Berkeley, Nov. 2013), Sam Coogan (EECS, UC Berkeley, Feb. 2014), Jiang Long (EECS, UC Berkeley, Mar. 2014), Alberto Puggelli (EECS, UC Berkeley, May 2014), Ilge Akkaya (EECS, UC Berkeley, Jun 2014), Yifei Yuan (CS, U.Penn., Apr. 2015), Baruch Sterin (EECS, UC Berkeley, Apr. 2015), Yu-Yun Dai (EECS, UC Berkeley, Nov. 2015), Markus Rabe (Saarland Univ., Feb. 2016), Antonio Iannopollo (EECS, UC Berkeley, Apr. 2016), Omid Bagherieh (ME, UC Berkeley, Apr. 2016), Hokeun Kim (EECS, UC Berkeley, May 2016), Yen-Sheng Ho (EECS, UC Berkeley, Oct. 2016), Matthew Weber (EECS, UC Berkeley, Feb. 2017), Rafael Dutra (EECS, UC Berkeley, Mar. 2018), Anna Lukina (TU Vienna, Jun. 2019), Albert Magyar (EECS, UC Berkeley, Aug. 2019), David Biancolin (EECS, UC Berkeley, Aug. 2019), Stanley Smith (EECS, UC Berkeley, Sep. 2019), Inigo Incer (EECS, UC Berkeley, Sep. 2019), Hazem Torfah (Saarland Univ., Dec. 2019), Rohit Ramesh (EECS, UC Berkeley, Mar. 2020), Dayeol Lee (EECS, UC Berkeley, Apr. 2020), Xiangyu Yue (EECS, UC Berkeley, Apr. 2021), Sandip Ghosal (IIT Bombay, Jul. 2021).

M.S. Dissertation Committees
Thomas Feng (EECS, UC Berkeley, Fall 2008), Shanna-Shaye Forbes (EECS, UC Berkeley, Spring 2009), Jeff Jensen (EECS, UC Berkeley, Fall 2009), Cynthia Sturton (EECS, UC Berkeley, Fall 2010), Nikunj Bajaj (EECS, UC Berkeley, Fall 2014), John Finn (EECS, UC Berkeley, Spring 2015).

Professional Activities and Service

Professional Memberships: ACM (Fellow), IEEE (Fellow), IEEE Computer Society

Editorial Boards and Conference Committees:

- Associate Editor, ACM Transactions on Embedded Computing Systems (TECS), (5/2020 - date)
- Associate Editor, IEEE Transactions on Computer-Aided Design of Circuits and Systems (TCAD) (7/2012 - 12/2014)
- Associate Editor, CSI Journal of Computing, Computer Society of India (7/2011 - date)
- Associate Editor, IEEE Embedded Systems Letters (12/2008 - 12/2010)
  – co-edited special issue on Automotive Embedded Systems (March-May, 2010)
- Program co-chair, 23rd ACM Conference on Hybrid Systems: Computation and Control (HSCC), 2020.
- Program co-chair, 24th International Conference on Computer-Aided Verification (CAV), 2012.
- Program co-chair, 7th Working Conference on Verified Software: Theories, Tools, and Experiments (VSTTE), 2015.
- Chair of Verification track and Member of Technical Program Committee, IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2010 & 2011.
- Program co-chair, 9th International Workshop on Satisfiability Modulo Theories (SMT), 2011.
- Program co-chair, 1st Workshop on Quantitative Analysis of Software (QA), 2009.
- Co-organizer, Dagstuhl Seminar on Machine Learning and Formal Methods, Schloss Dagstuhl, Germany, August 27 - September 1, 2017.
- Co-organizer, Dagstuhl Seminar on Decision Procedures and Abstract Interpretation, Schloss Dagstuhl, Germany, August 24-29, 2014.
- Member, Program Committee, Inaugural Cyber-Physical Systems (CPS) Rising Stars Workshop, 2022.
- Member, Program Committee, 33rd International Conference on Computer-Aided Verification (CAV), 2021.
- Member, Program Committee, 2nd and 3rd Annual Learning for Dynamics and Control Conference (L4DC), 2020 & 2021.
- Senior Member, Program Committee, 31st International Conference on Computer-Aided Verification (CAV), 2019.
- Member, Program Committee, 22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2019.
- Member, Program Committee, 24th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2019.
- Member, Program Committee, 30th International Conference on Computer-Aided Verification (CAV), 2018.
- Member, Program Committee, 12th Haifa Verification Conference (HVC), 2016.
- Member, Program Committee, 5th Workshop on Synthesis (SYNT), 2016.
- Member, Program Committee, 28th International Conference on Computer-Aided Verification (CAV), 2016.
- Member, Program Committee, 17th International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI), 2016.
- Member, Program Committee, 20th International Symposium on Formal Methods (FM), 2015.
- Member, ACM Student Research Competition Selection Committee, ACM/IEEE 17th International Conference on Model Driven Engineering Languages and Systems (MODELS), 2014.
- Member, Program Committee, 23rd International Conference on Computer-Aided Verification (CAV), 2011.
- Member, Program Committee, 3rd NASA Formal Methods Symposium, 2011.
- Member, Program Committee, ACM International Conference on Embedded Software (EMSOFT), 2010.
- Member, Program Committee, ACM/IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE), 2010.
- Member, Program Committee, Hardware Verification Workshop (HWVW), 2010.
- Member, Program Committee, 16th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2010.
- Member, Technical Program Committee, IEEE/ACM International Conference on Computer-Aided Design

(ICCAD), 2008 & 2009.
- Member, Program Committee, 4th International Workshop on Automated Formal Methods (AFM), 2009.
- Member, Program Committee, International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS), 2009.
- Member, Program Committee, 21st International Conference on Computer-Aided Verification (CAV), 2009.
- Member, Program Committee, Workshop on Practical Aspects of Automated Reasoning (PAAR), 2008.
- Member, Best Paper Award Committee, IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2007.
- Member, Program Committee, 18th International Conference on Computer-Aided Verification (CAV), 2006.

Other Professional Committee Service:
- Member, World Economic Forum Safe Drive Initiative Steering Committee, 1/2021-date.
- Member, World Economic Forum Safe Drive Initiative Technical Working Group, 5/2020-12/2020.
- Member, Autonomous Vehicle Safety Metrics Advisory Committee, American Automobile Association NCNU project, 8/2019-12/2019.
- Member, IEEE TCCPS Award Committee, 2021.
- Member of IEEE Computer Society Fellows Evaluation Committee, 2018.

Large Project/Center Leadership:
- Lead PI of the LOGiCS project, a multi-institution, multi-year project funded by the Defense Advanced Research Projects Agency (DARPA), 2020-24.
- Lead PI of the VeHICaL project, a multi-institution, multi-year "Frontier" project funded by the National Science Foundation (NSF), 2016-23.
- Co-leader of Theme on *Methodologies, Models, and Tools*, the *TerraSwarm Research Center*, a multi-institution, multi-year project funded by SRC/DARPA, 2013-17.

Reviewing Grant Proposals: (2006-21)
- National Science Foundation Panels.
- Israel-U.S. Binational Science Foundation, Austrian Science Foundation.

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