

Fabio Somenzi

Curriculum Vitae

February 1, 2023

Biography: Fabio Somenzi received the Dr. Eng. degree in Electronic Engineering from Politecnico di Torino, Italy, in 1980, filing a thesis on automatic test pattern generation for sequential circuits. He was with SGS-Thomson Microelectronics from 1982 to 1989 as responsible for computer-aided digital design.

From 1984 to 1987 he taught digital logic design at the Computer Science Department of the University of Milano, Italy. In 1987 he visited the Electrical Engineering and Computer Science Department of the University of California, Berkeley. Since 1989 he has been with the Department of Electrical and Computer Engineering of the University of Colorado, Boulder, where he is currently a Full Professor.

Personal Data: U.S. Citizen.

Education: Dr. Eng. Degree in Electronic Engineering (summa cum laude) Politecnico di Torino, Italy, 1980.

Professional Experience:

2001–present: Professor, Department of Electrical, Computer, and Energy Engineering University of Colorado.

1993–2001: Associate Professor, Department of Electrical and Computer Engineering University of Colorado.

1989–1993: Assistant Professor, Department of Electrical and Computer Engineering University of Colorado.

1987: Visiting Industrial Fellow, Electrical Engineering and Computer Science Department, University of California, Berkeley.

1984–1987: Adjunct Professor, Computer Science Department, Università di Milano, Italy.

1982–1989: SGS-Thomson Microelectronics, Agrate Brianza (MI), Italy. Responsible for computer aids for digital design.

1981: Served in Italian Army.

Awards:

- D'Ovidio Award as outstanding graduate of Politecnico di Torino for the academic year 1979–1980.

- Best Paper Award. Design Automation Conference, June 2000.
- Best Paper Award. Formal Methods in Computer Aided Design, November 2011.

Professional Activities:

- Associate Editor for IEEE Transactions on Computer-Aided Design (1994–1998).
- Coordinating editor for Journal of Formal Methods in System Design (2005–present).
- Reviewer for:
 - IEEE Transactions on Computer-Aided Design;
 - IEEE Transaction of Computers;
 - Journal of Formal Methods in System Design;
 - Linear Algebra and its Applications;
 - Journal of Parallel and Distributed Computing;
 - Journal of Electronic Testing Theory and Applications;
 - IEEE Design and Test;
 - IEEE Design Automation Conference;
 - IFIP VLSI Conference;
 - European Test Conference.
- Member of the Program Committee of:
 - International Conference on Computer Aided Verification (1994, 1995, 1998–2004, 2006, 2007, 2008, 2009, 2014, 2015, 2016, 2017, 2020 (Co-chair 2003)).
 - Tools and Algorithms for the Construction and Analysis of Systems (TACAS).
 - IEEE International Conference on Computer Aided Design (1989, 1992–1995, 1998, 2001–2002, 2006, 2008).
 - ACM/IEEE Design Automation Conference (1995–1997, 2007, 2008).
 - IEEE European Conference on Design Automation (1990, 1992–1994, 2001, 2003).
 - IEEE International Conference on Computer Design (1992, 1993, 1994, 1999, 2000).
 - Formal Methods in Computer-Aided Design (2006–2012).
 - IEEE European Design for Testability Workshop (1987).
 - MCNC International Workshop on Logic Synthesis (1989–2001 (Program Chair 1995, Executive Committee 1998, General Chair 1999)).
 - IFIP International Workshop on Logic and Architecture Synthesis (1990).

- International Symposium on Low Power Electronics and Design (1996, 2000).
- International Conference on Application of Concurrency to System Design (1998).
- Computer Aided Design and Test Decision Diagrams - Concepts and Applications (1999, 2001).
- International SPIN Workshop on Model Checking of Software (2001).
- IEEE Asia-Pacific Design Automation Conference (2003).
- International Workshop on Bounded Model Checking (2004, 2005).
- IBM Verification Conference (2006).
- Workshop on Verification and Debugging (2006, co-organizer).

Ph.D. Thesis Advisor:

- H. Cho, “Reachability Analyses and Their Applications in Test Generation and Logic Optimization for Sequential Circuits,” 1993.
- J.-K. Rho, “Finite State Models for the Optimization and Verification of Digital Systems,” 1993.
- R. I. Bahar, “Methods for Timing Analysis and Logic Synthesis to Decrease Power Dissipation of VLSI Circuits,” 1995.
- W. Lee, “Approximate Model Checking,” 1998.
- K. Ravi, “Adaptive Techniques to Improve State Space Search in Formal Verification,” 1999.
- M. Escobar, “Efficient Solution of Satisfiability Problems in CAD Applications,” 1999.
- B. Kumthekar, “Layout Conscious Logic Optimization Techniques for Power and Delay Reduction in FPGAs,” 2000.
- I.-H. Moon, “Efficient Reachability Algorithms in Symbolic Model Checking,” 2000.
- R. P. Bloem, “Search Techniques and Automata for Symbolic Model Checking,” 2001.
- HoonSang Jin “Efficient Algorithms for Finding All Satisfying Assignments of a Propositional Formula,” 2005.
- Mohammad Awedh, “Proving properties for Bounded Model Checking” 2006.
- Bing Li, “Satisfiability-based Abstraction Refinement in Symbolic Model Checking,” 2006.
- David Ward, “Exploiting High-Level Design Control and Data Structures for Hardware Verification,” 2007.
- Kuntal Nanshi, “Proving Properties of Digital Systems with Abstraction-Guided Simulation,” 2009.

- Hyondeuk Kim, “Efficient SMT Solving for Hardware Model Checking,” 2010.
- Hyojung Han, “Increasing The Effectiveness of Deduction in Propositional SAT Solvers,” 2011.
- Saqib bin Sohail, “Improving the Efficiency and Quality of Omega-Regular Synthesis,” 2014.
- Zyad Hassan, “Incremental, Inductive Model Checking,” 2014.
- Yan Zhang, “Statistically Sound Verification and Optimization of Black-Box Systems,” 2014 (co-advised).

M.S. Student Advisor:

- Sankaranarayanan Gurumurthy
- Mitra Purandare
- Huthasana Kalyanam
- David Morgan
- Saloni Shah
- Tara Weber

Current Ph.D. Student Advisor:

- Mateo Perez, Logic Specifications for Reinforcement Learning, (co-advised).

Funding History

Principal Investigator for the following contracts and grants.

- “Large Scale Hardware Validation and Synthesis,” SRC contract SRC-98-DJ-620, 1998–2001, \$450,000.
- Gift, Fujitsu, Inc., \$40,000.
- “A Verification Manager for Adaptive Model Checking,” NSF award CCR-9971195, 1999–2002, \$605,599.
- “Formal Verification Applied to Arithmetic-Logic Blocks,” ST Microelectronics Project 153, 1999–2000, \$30,000.
- “Combining Fixpoint Computations and CNF Satisfiability in Model Checking,” SRC award 99-TJ-730, 1999–2002, \$150,000.
- Cisco Systems, 1999, \$25,000.

Co-principal Investigator for the following contracts and grants.

- “Synthesis and Verification of Combinational, Sequential, and Behavioral Logic,” NSF/DARPA Grant MIP-8719546, 1992–1994, \$837,000.
- “CAD tools for the Verification/Testing/Synthesis Interface,” SRC contract 91-DJ-206, 1991–1993, \$225,000.
- “Synthesis of Optimal, Testable Systems,” Fujitsu Ltd., 1991–1993, \$225,000.
- “Symbolic Graph Algorithms,” proposal to NSF for supplement to Grant MIP-8719546 for undergraduate research, 1993, \$10,000.
- “Symbolic methods for Activity Driven Low-Power Synthesis,” SRC contract 94-DJ-560, 1994–1996, \$300,000.
- “An Integrated VHDL-based Synthesis and Verification System for VLSI Systems,” NSF/DARPA Grant MIP-9422268, 1995–1997, \$773,215.
- “CAD Tools for the Verification/Testing/Synthesis Interface,” Fujitsu Ltd., 1994–1996, \$300,000.
- NSF supplement for collaborative research with University of Leiden, 1995, \$59,658.
- “A High Performance Computing Environment for Symbolic Synthesis and Verification,” NSF CISE Program Research Instrumentation Proposal CDP-9422168, 1995, \$104,000.
- “Efficient Data Structures for Computer-Aided Design,” NSF Division of International Programs, INT-9726711, 1998–2000, \$11,400.
- “Stepwise-Relative Inductive Generalization for Hardware Model Checking,” SRC 2011-TJ-2220, 2011-2012, \$50,000.

- “Efficient Data Structures for Computer-Aided Design,” NSF Division of International Programs, INT-9815662, 1999-2001, \$9,700.
- “Inductive, Incremental Verification: IC3 and Beyond,” SRC 2012-2015, \$510,000.
- “Incremental Inductive Verification: A New Direction for Model Checking,” NSF CISE, Award 1219067, 2012-2015, \$496,992.
- “Learning to Control Safety-Critical Systems.” RIO. Years: 2019-2020. Amount \$50,000, co-PI.
- “Omega-Regular Objectives for Model-Free Reinforcement Learning,” NSF CISE, Award 2009022, 2020-2023, \$500,000, co-PI.
- EEAIL IRT seed grant. “Integrating Reinforcement Learning and Formal Requirements in Programming Curriculum.” Amount: \$20,000. Award year: 2021, co-PI.

Research Interests. Fabio Somenzi has published two books and over 200 papers on the verification, synthesis, optimization, simulation, and testing of digital and cyberphysical systems.

References

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- [2] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Alternating good-for-MDPs automata. In *ATVA: Automated Technology for Verification and Analysis*, pages 303–319, October 2022. LNCS 13505.
- [3] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. An impossibility result in automata-theoretic reinforcement learning. In *ATVA: Automated Technology for Verification and Analysis*, pages 42–57, October 2022. LNCS 13505.
- [4] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Reinforcement learning with guarantees that hold for ever. In *FMICS: Formal Methods for Industrial Critical Systems*, pages 3–7, September 2022. LNCS 13487.
- [5] A. Lavaei, M. Perez, M. Kazemi, F. Somenzi, S. Soudjani, A. Trivedi, and M. Zamani. Compositional reinforcement learning for discrete-time stochastic control systems. *CoRR*, abs/2208.03485, 2022.
- [6] M. Kazemi, M. Perez, F. Somenzi, S. Soudjani, A. Trivedi, and A. Velasquez. Translating omega-regular specifications to average objectives for model-free reinforcement learning. In *AAMAS: Autonomous Agents and Multiagent Systems*, pages 732–741, May 2022.
- [7] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Model-free reinforcement learning for lexicographic omega-regular objectives. In *Formal Methods, FM 2021*, pages 142–159, 2021. LNCS 13047.
- [8] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Mungojerrie: Reinforcement learning of linear-time objectives. *CoRR*, abs/2106.09161, 2021.
- [9] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Model-free reinforcement learning for branching Markov decision processes. In *Computer Aided Verification, Proceedings, Part II*, pages 651–673, 2021. LNCS 12760.
- [10] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Faithful and effective reward schemes for model-free reinforcement learning of omega-regular objectives. In *ATVA: Automated Technology for Verification and Analysis*, pages 108–124, 2020. LNCS 12302.

- [11] E. M. Hahn, M. Perez, S. Schewe, F. Somenzi, A. Trivedi, and D. Wojtczak. Model-free reinforcement learning for stochastic parity games. In *CONCUR: International Conference on Concurrency Theory*, pages 21:1–21:16, September 2020. LIPIcs 171.
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