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## RESEARCH INTERESTS

- Formal aspects of software engineering, in particular symbolic model-checking algorithms [J23] [J24] [J26] [J30] [J35] [J43] [P73] [P76] [P78] [P87] [P88] [P94] [P99] [P100] [P101] [P103] [P105] [P112] [P113] [P114] [P121] [C129] and testing [P116], as well as their parallel and distributed implementation [P97] [P102] [P106] [P107]
- Decision-diagram-based data structures and algorithms for logic [J40] [P81] [P84] [P86] [P110] [P111] [P115] [P123] and Markovian [P119] analysis
- Load balance and performance analysis of Web servers [J18] [J22] [P79] [P80] [P82] [P85] [P93] [M155]
- Distributed algorithms [J12] [J13] [J33] [P95], compositional techniques [J17] [P65] [P66] [P90] [P91] [M147] [M159], and approximation approaches [J34] [J28] [J29] [P77] for the logic and stochastic analysis of large models, including those with discrete-time and general distributions [J10] [J11] [J15] [P61] [P72] [P83] [P92] [P122]
- Performance, dependability, and safety evaluation of fault-tolerant and distributed computer systems [J9] [P60] [P62] [P63] [P71] [P104] [P108] [C126] [M145], particularly concurrent software [J6] and avionics applications [P96] [C131]
- Specification formalisms and solution algorithms for modeling tools [J25] [P120] [P48] [P64] [P68] [P74] [P89] [C128] [M148] [M151] [M156] [M157], particularly Petri nets [J38], [J36], [P59] [B135], stochastic Petri nets [J5] [J14] [P54] [P55] [P69] [P67] [C125] [C127] [B132] [B134], timed Petri nets [P109], and unbounded repetitive Markov models [J16] [J19] [J20] [J21] [P70] [P75]
- Bioinformatics algorithms for genome assembly [J37] [J39] [J41] [P118] [P117]

## EDUCATION

*April 1989* PhD, Duke University, Durham, NC, Department of Computer Science

Thesis: “Analysis of Large Stochastic Petri Net Models” [M140]. Advisor: Dr. Kishor S. Trivedi

*July 1982* Laurea *summa cum laude*, Università di Torino, Italy, Dipartimento di Informatica

Thesis: “Le Reti di Petri Stocastiche Generalizzate: uno strumento per la modellizzazione di sistemi distribuiti” [P47] [M139]. Advisor: Dr. Gianfranco Balbo

## ACADEMIC POSITIONS

*January 2014–present* Professor and Chair, Department of Computer Science, Iowa State University

*January 2014–present* Adjunct Professor, Department of Computer Science and Engineering, University of California at Riverside

*July 2003–December 2013* Professor, Department of Computer Science and Engineering, University of California at Riverside

*April 2007* On leave, Visiting Professor, Laboratoire d’Informatique de Paris 6, Paris, France  
Worked on symbolic computation of linear Petri net invariants [P111]

*January 2004–June 2006* Affiliated Professor, Department of Computer Science, The College of William and Mary, Williamsburg, VA

*July 2002–December 2003* Professor, Department of Computer Science, The College of William and Mary, Williamsburg, VA

*July 1997–June 2002* Associate Professor, Department of Computer Science, The College of William and Mary, Williamsburg, VA

*August 1992–June 1997* Assistant Professor, Department of Computer Science, The College of William and Mary, Williamsburg, VA

*October 1999–December 1999 and May 2000* On leave, Visiting Professor at the Università di Torino, Italy  
Worked on approximate Markov modeling techniques based on structured state spaces [P77].

*August 1992–December 1992* On leave, Visiting Professor at the Institut für Technische Informatik, Technische Universität Berlin, Federal Republic of Germany  
Worked on extensions of the Deterministic and Stochastic Petri Net formalism, involving mixtures of exponential and discrete distributions [P57] [P58] and its modeling applications [P56]

## **OTHER POSITIONS**

*January 2000–April 2000* Visiting faculty, HP Labs, Palo Alto, CA  
Worked on Web traffic models [P80] [P82].

*July 1993–August 2000* Consultant, Institute for Computer Applications in Science and Engineering (ICASE), NASA Langley Research Center, Hampton, VA  
Worked on reliability and performance models and solution techniques [J17] [M147], non-exponential timing [J11] [P61] [P64] [P69], and distributed approaches [J12] [J13]

*Summer 1994* Consultant, HP Labs, Palo Alto, CA  
Worked on approximate modeling of communication switches [P63]

*September 1988–July 1992* Member Technical Staff, Software Productivity Consortium, Herndon, VA  
Responsibilities in this research consortium sponsored by major aerospace and defense companies included research in modeling and technical direction for the specification and design of a hierarchical, hybrid stochastic modeling environment for software and system analysis.

*August 1984–August 1988* Research Assistant, Duke University  
Primary interests: stochastic processes [J3] [J4], Petri nets [P51], stochastic modeling [P49], performability and logic analysis of systems [J2], and parallel architectures.

*June–August 1986 and June–August 1987* Summer internships at IBM T. J. Watson Research Center, Yorktown Heights, NY, supervised by Dr. S. Lavenberg

*September 1982–July 1984* Researcher, Database Division, CSELT Research Center, Torino, Italy  
Performed research on database interfaces and mappings. Developed a relational interface for CODASYL [J1] [P44] [P45] [P46] [C124].

## HONORS AND AWARDS

*Invited speaker at SEMISH*, 39th Seminar on Hardware and Software, Curitiba, Brazil, July 2012 [M163]

*Keynote speaker at PDMC 2009*, Parallel and Distributed Methods in verification, Eindhoven, The Netherlands, November 2009 [J32]

*Microsoft Research Cambridge Award for a Paper Co-Authored by a Student at TACAS 2007*, to my PhD student Andy Jinqing Yu, for the joint paper [P103]

*Keynote speaker at EPEW/WS-FM 2005*, joint 2nd European Performance Engineering Workshop and 2nd International Workshop on Web Services and Formal Methods, Versailles, France, September 2005 [P98]

*Keynote speaker at ATPN 2004*, 25th International Conference on Application and Theory of Petri Nets, Bologna, Italy, June 2004 [P94]

*Department of Computer Science Nominee for the William and Mary Margaret Hamilton Professorship*, Spring 2003, a university-wide three-year non-renewable term professorship

*Keynote speaker at PNPM 2001*, joint Petri Nets and Performance Models, Process Algebra and Performance Models, and Probabilistic Methods in Verification Multiconference, Aachen, Germany, September 2001 [P84]

*Thirteen conference articles* [P50] [P53] [P58] [P67] [P72] [P87] [P89] [P96] [P103] [P107] [P113] [P115] [P121] invited by the conference organizers for publication in extended version in special issues of *IEEE Transactions on Software Engineering* [J2] [J8] [J14], *Performance Evaluation* [J7] [J15] [J25], *Software Tools for Technology Transfer* [J24] [J27] [J30], *Journal of Logic and Computation* [J33], *Innovations in Systems and Software Engineering* [J35], *International Journal of Foundations of Computer Science* [J40], and *Transactions on Petri Nets and Other Models of Concurrency* [J43]

*IBM Graduate Fellowship*, academic years 1985–86 and 1986–87

## PATENTS

*United States Patent 6,546,473* “Method for cache replacement of web documents”, April 8, 2003. Inventors: Ludmila Cherkasova and Gianfranco Ciardo. Assignee: Hewlett-Packard Company (Palo Alto, CA).

## JOURNAL EDITORSHIPS

2015 Guest Editor: special issue from the 2014 Petri Nets Conference, *Fundamenta Informaticae*

January 2007–present Member Editorial Board, *Transactions on Petri Nets and Other Models of Concurrency*, Springer-Verlag

(<http://www.springer.com/east/home/computer/lncs?SGWID=5-164-6-417809-0>)

January 2001–January 2005 Associate Editor, *IEEE Transactions on Software Engineering* [M158]

September 1996 Guest Editor: special issue on stochastic Petri nets, *IEEE Transactions on Software Engineering* [M149]

## STEERING COMMITTEE MEMBERSHIPS

2007–present Petri Nets (PN) [www.informatik.uni-hamburg.de/TGI/PetriNets/](http://www.informatik.uni-hamburg.de/TGI/PetriNets/)

2006–2011 Quantitative Evaluation of Systems (QEST) [www.qest.org](http://www.qest.org)

2004–present Intl. Workshop on Performability Modeling of Computer and Communication Systems (PMCCS) [www.pmccs.net](http://www.pmccs.net)

## GRANTS

January 2013–June 2014 Co-PI (G. Luetzgen PI, University of Bamberg, Germany), “Improving symbolic software verification via machine learning”, BaCaTeC – Bavaria California Technology Center, \$5,200 (travel grant).

July 2011–July 2014 Co-PI (A. Nikora PI, Jet Propulsion Lab, K. Trivedi Co-PI, Duke University), “Dependability quantification and assurance of mission-critical software systems”, NASA (UCR has a subcontract from Jet Propulsion Lab), \$510,000 (UCR portion: \$173,644)

August 2010–July 2013 PI, “A hierarchical symbolic framework to verify logic, timing, and probabilistic properties of computing systems”, National Science Foundation CCF-1018057, \$400,000 (transferred to Iowa State University as CCF-1442586, with an end date of July 31, 2015)

September 2009–January 2011 PI (X. Li Co-PI, CINVESTAV-IPN, Mexico), “Verification of active rule bases using timed Petri nets”, UC-MEXUS, \$25,000 (UCR portion: \$12,500)

September 2008–August 2009 PI, “Symbolic computation of bounds on timing and probabilistic properties of computing systems”, National Science Foundation CCF-0848463, \$74,810

July 2008–June 2009 PI, “Invariant computation using decision diagrams”, UCR Academic Senate (Omnibus grant) \$2,100

July 2007–June 2008 PI, “Techniques for complex, structured, discrete computations”, UCR Academic Senate, \$1,500

August 2006–July 2008 Co-PI (L. Bhuyan, PI, and W. Najjar, Co-PI), “Acquisition of an ultra low-latency multiprocessor system with on-board hardware accelerators”, National Science Foundation CNS-0619223, \$330,000

September 2006–June 2007 PI, “QEST 2006: 3rd International Conference on Quantitative Evaluation of Systems”, University of California Communications Research Program (CORE), \$9,000

October 2004–September 2008 Co-PI (G. Zank, PI, and N. Pogorelov, Co-PI, Department of Physics, University of California at Riverside), “ITR: A multi-scale combined hybrid-magnetohydrodynamic (MHD)-neutral atom code”, National Science Foundation ATM-0428880, \$1,662,650

September 2002–August 2007 PI (W. Stewart, North Carolina State University, co-PI), “Structured methods to evaluate the performance of distributed software”, National Science Foundation ACI-0203971, \$440,445 (total budget, including a \$214,597 subcontract to NC State)

September 2002–August 2006 PI, “ITR: Automated Verification of Asynchronous Software Systems”, National Science Foundation CCR-0219745, \$360,000

April 2002–September 2003 PI, “Formal verification of safety properties for aerospace systems through algorithms based on exhaustive state-space exploration”, National Aeronautics and Space Administration NAG-1-02095, \$154,037

*July 2001–July 2004* PI (E. Smirni co-PI), “Effective techniques and tools for resource management in clustered web servers”, National Science Foundation CCR-0098278, \$279,485

*May 2000* “Discrete-state systems: Model Checking and Performance Evaluation” (travel and educational grant), Lit. 2,500,000 plus living expenses

*October 1999* “Distributed algorithms for the solution of structured Markov models”, Consiglio Nazionale delle Ricerche, Italy (Short-Term Mobility Grant Pos. 140-4 Prot. 048238), Lit. 1,800,000 plus living expenses

*March 1999–February 2003* PI, “An advanced hierarchical hybrid environment for reliability and performance modeling”, National Aeronautics and Space Administration NAG-1-2168, \$333,788

*September 1995–August 1997* co-PI 1st year (D. Nicol PI), PI 2nd year (D. Nicol co-PI), “Integrated Modeling Project”, CACC subcontract on National Science Foundation EEC-9418765, \$36,500

*December 1994–September 1995* PI, “Integrated environment for performance, reliability, and availability modeling”, matching grant from the Virginia Center for Innovative Technology, \$39,989

*September 1994–September 1995* PI, in collaboration with Genoa Software Systems, Inc., “Integrated environment for performance, reliability, and availability modeling”, Phase I STTR award from the Army Research Office, \$100,000

*May 1993–May 1996* co-PI (D. Nicol PI), “Parallel algorithms for the simulation and analysis of stochastic Petri nets”, National Aeronautics and Space Administration, \$248,380

## PANELS

*May 2003* Dagstuhl Seminar 03201, Probabilistic Methods in Verification and Planning

*June 2000* “What is the future for Petri nets in software engineering?”, Workshop on Software Engineering and Petri Nets, Aarhus, Denmark

*May 1995* “Non-Markovian Petri Nets”, SIGMETRICS’95, Ottawa [M146]

*December 1989* “SPN Applications”, PNPM’89, Kyoto, Japan

Participant in numerous National Science Foundation (NSF) proposal review panels

Proposal reviewer for the U.K. Engineering and Physical Sciences Research Council (EPSRC)

Proposal reviewer for the Netherlands Organization for Scientific Research (NWO)

## CONFERENCE ORGANIZATIONS

*June 2014* Program Co-Chair, Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Tunis, Tunisia [B138]

*September 2010* Program Co-Chair, Quantitative Evaluation of Systems (QEST), Williamsburg, VA [B137]

*December 2006* Program Co-Chair, IEEE Pacific Rim International Symposium on Dependable Computing (PRDC), Riverside, CA [B136]

*September 2006* General Chair, Quantitative Evaluation of Systems (QEST), Riverside, CA

*June 2005* Program Co-Chair, Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Miami, FL [B135]

*September 2003* Program Co-Chair, Petri Nets and Performance Models (PNPM), Urbana-Champaign, IL [B134]

*March 2000* Vice Program Chair, IEEE Intl. Computer Performance and Dependability Symposium (IPDS), Chicago, IL

*September 1999* Tools Chair, Joint Petri Nets and Performance Models (PNPM), Process Algebras and Performance Models (PAPM) and Numerical Solution of Markov Chains (NSMC), Zaragoza, Spain

*June 1999* Organization Chair, Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Williamsburg, VA

*September 1998* General Chair, Fourth Intl. Workshop on Performability Modeling of Computer and Communication Systems (PMCCS-4), Williamsburg, VA

*September 1998* Vice General Chair, IEEE Intl. Computer Performance and Dependability Symposium (IPDS), Durham, NC

*October 1995* Program Co-Chair, Petri Nets and Performance Models (PNPM), Durham, NC [B132]

*May 1995* Co-Organizer, Dagstuhl Seminar on Performance and Dependability Modelling with Stochastic Petri Nets, Saarbrücken, Germany [B133]

*September 1996* Software Demonstration Chair, IEEE Intl. Computer Performance and Dependability Symposium (IPDS), Urbana-Champaign, IL

Member of the Program Committee:

*June 2015* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Brussels, Belgium

*Sept. 2014* Quantitative Evaluation of Systems (QEST), Florence, Italy

*May 2014* Wkshp. Research and Use of Multiformalism Mod. Meth. (WRUMMM), Brescia, Italy

*Jan. 2014* Matrix Analytic Methods in Stochastic Models, Calicut, India

*Aug. 2013* Quantitative Evaluation of Systems (QEST), Buenos Aires, Argentina

*June 2013* Model Checking Contest, Milan, Italy

*June 2013* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Milan, Italy

*Sept. 2012* Wkshp. Research and Use of Multiformalism Mod. Meth. (WRUMMM), London, UK

*Sept. 2012* Parallel and Distributed Methods in verifiCation (PDMC), London, UK

*Sept. 2012* Quantitative Evaluation of Systems (QEST), London, UK

*June 2012* Informatica Quantitativa (InfQ), Lucca, Italy

*June 2012* Intl. Wkshp. on Petri Nets and Software Eng. (PNSE), Hamburg, Germany

*June 2012* Model Checking Contest, Hamburg, Germany

*June 2012* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Hamburg, Germany

*Sept. 2011* Quantitative Evaluation of Systems (QEST), Aachen, Germany

*June 2011* 1st Wkshp. on Petri net Compositions (CompoNet), Newcastle, UK

*June 2011* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Newcastle, UK

*June 2011* Informatica Quantitativa (InfQ), Lipari, Italy

*June 2011* Intl. Conf. Dependable Systems and Networks (DSN, PDS), Hong Kong, China

*June 2010* Intl. Conf. Dependable Systems and Networks (DSN, PDS), Chicago, IL

*June 2010* Application of Concurrency to System Design (ACSD), Braga, Portugal

*June 2010* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Braga, Portugal

*June 2010* Intl. Wkshp. on Scalable and Usable Model Checking (SUMo), Braga, Portugal

*June 2010* Intl. Wkshp. on Petri Nets and Software Engineering (PNSE), Braga, Portugal

*Sept. 2009* Intl. Wkshp. on Practical Appl. of Stoch. Modelling (PASM), London, UK

*Sept. 2009* Quantitative Evaluation of Systems (QEST), Budapest, Hungary

*July 2009* Application of Concurrency to System Design (ACSD), Augsburg, Germany

*June 2009* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Paris, France  
*June 2009* Intl. Wkshp. on Petri Nets and Software Eng. (PNSE), Paris, France  
*Mar. 2009* SIMUTOOLS, Rome, Italy  
*June 2008* Application of Concurrency to System Design (ACSD), Xi'an, China  
*June 2008* Intl. Wkshp. on Petri Nets and Distributed Systems (PNDS), Xi'an, China  
*Mar. 2008* Parallel and Distributed Methods in verifiCation (PDMC), Budapest, Hungary  
*July 2007* Parallel and Distributed Methods in verifiCation (PDMC), Berlin, Germany  
*Sept. 2007* Quantitative Evaluation of Systems (QEST), Edimburgh, UK  
*Oct. 2007* IFIP WG 7.3 Symposium (PERFORMANCE) Cologne, Germany  
*Aug. 2006* Parallel and Distributed Methods in verifiCation (PDMC), Bonn, Germany  
*June 2006* SIGMETRICS, Saint-Malo, France  
*June 2006* Intl. Conf. Dependable Systems and Networks (DSN, PDS), Philadelphia, PA  
*June 2006* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Turku, Finland  
*June 2006* European Performance Engineering Wkshp. (EPEW), Budapest, Hungary  
*Mar. 2006* Tools and Algor. for the Constr. and Analysis of Syst. (TACAS), Vienna, Austria  
*Dec. 2005* Pacif Rim Dependable Computing (PRDC), Changsha, Hunan, China  
*Sept. 2005* Quantitative Evaluation of Systems (QEST), Torino, Italy  
*July 2005* Intl. Wkshp. on Practical Appl. of Stoch. Modelling (PASM), Newcastle, UK  
*June 2005* Intl. Conf. Dependable Systems and Networks (DSN, PDS), Yokohama, Japan  
*Sept. 2004* Quantitative Evaluation of Systems (QEST), Enschede, The Netherlands  
*Sept. 2004* Practical Applications of Stochastic Modelling, London, UK  
*June 2004* Intl. Conf. Dependable Systems and Networks (DSN, PDS), Firenze, Italy  
*June 2004* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Bologna, Italy  
*Sept. 2003* Numerical Solution of Markov Chains (NSMC), Urbana-Champaign, IL  
*Sept. 2003* Techniques and Tools for Computer Perf. Evaluation, Urbana-Champaign, IL  
*June 2003* Wkshp. on Stoch. Petri Nets and Related Formalisms, Eindhoven, The Netherlands  
*June 2003* Intl. Conf. Dependable Systems and Networks (DSN, PDS), San Francisco, CA  
*June 2003* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Eindhoven, The Netherlands  
*June 2003* SIGMETRICS, San Diego, CA  
*July 2002* Wkshp. on Software Performance (WOSP), Rome, Italy  
*June 2002* Intl. Conf. Dependable Systems and Networks (DSN, PDS), Washington, DC  
*June 2002* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Adelaide, Australia  
*Apr. 2002* Techniques and Tools for Computer Perf. Evaluation, London, UK  
*Oct. 2001* IEEE Intl. Conf. on Comp. Comm. and Networks (IC<sup>3</sup>N), Scottsdale, AZ  
*Sept. 2001* Proc. Alg. Perf. Mod.-Prob. Methods Verif. (PAPM-ProbMIV), Aachen, Germany  
*Sept. 2001* Petri Nets and Performance Models (PNPM), Aachen, Germany  
*Aug. 2001* Intl. Conf. Mod. Anal. Simul. Comp. Telecom. Syst. (MASCOTS), Cincinnati, OH  
*June 2001* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Newcastle, UK  
*Oct. 2000* IEEE Symp. on Reliable Distributed Systems (SRDS), Nürberg, Germany  
*Sept. 2000* 2<sup>nd</sup> Intl. Wkshp. on Software and Performance (WOSP), Ottawa, Canada  
*June 2000* Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Aarhus, Denmark  
*Mar. 2000* IEEE Intl. Computer Perf. and Depend. Symp. (IPDS), Chicago, IL  
*Mar. 2000* Techniques and Tools for Computer Perf. Evaluation, Chicago, IL  
*Oct. 1999* IEEE Symp. on Reliable Distributed Systems (SRDS), Lausanne, Switzerland

Sept. 1999 Numerical Solution of Markov Chains (NSMC), Zaragoza, Spain  
 Sept. 1999 Petri Nets and Performance Models (PNPM), Zaragoza, Spain  
 Oct. 1998 1st Intl. Wkshp. on Software and Performance (WOSP), Santa Fe, NM  
 Oct. 1998 IEEE Symp. on Reliable Distributed Systems (SRDS), Purdue University, IN  
 June 1998 Intl. Conf. Appl. and Theory of Petri Nets (ATPN), Lisbon, Portugal  
 June 1998 12<sup>th</sup> European Simulation Multiconference, Manchester University, UK  
 June 1997 Petri Nets and Performance Models (PNPM), Saint-Malo, France  
 Sept. 1996 IEEE Intl. Computer Perf. and Depend. Symp. (IPDS), Urbana-Champaign, IL  
 May 1996 SIGMETRICS'96, Philadelphia, PA  
 Feb. 1996 Intl. Conf. Mod. Anal. Simul. Comp. Telecom. Syst. (MASCOTS), San Jose, CA  
 Jan. 1995 Intl. Conf. Mod. Anal. Simul. Comp. Telecom. Syst. (MASCOTS), Durham, NC  
 Jan. 1994 Intl. Conf. Mod. Anal. Simul. Comp. Telecom. Syst. (MASCOTS), Durham, NC  
 Oct. 1993 Petri Nets and Performance Models (PNPM), Toulouse, France  
 Dec. 1991 Petri Nets and Performance Models (PNPM), Melbourne, Australia [M142]

## SOFTWARE TOOLS

*SMART, Stochastic Model checking Analyzer for Reliability and Timing.* This is a multi-formalism multi-solution tool made publicly available to universities and labs [M148] [M151] [M156] [M157] [P89] [J31]. Currently, it allows numerical solution of large Markov chains using traditional or Kronecker-based techniques, discrete-event simulation of general stochastic models, and CTL model-checking. Future planned enhancements include probabilistic model-checking capabilities and numerical-simulation hybrid solution.

*SPNP, Stochastic Petri Net Package.* Designed and implemented as part of doctoral work at Duke University [P48] [P52] [M143]. Distributed to academic and industrial sites throughout the U.S. and Europe.

*GSPNA, Generalized Stochastic Petri Net Analyzer.* Designed and implemented under contract from the Politecnico di Torino, Italy [P47]. The first tool written for the solution of Generalized Stochastic Petri Nets.

## INVITED PRESENTATIONS

December 2014 “Beyond BDDs: Advanced decision diagrams and their applications” University of Iowa, Department of Computer Science

July 2012 “Modern challenges in analyzing the correctness and performability of complex systems” 39th Seminar on Hardware and Software (SEMISH), Curitiba, Brazil

May 2012 “Exploiting model structure to encode transition relations and transition rate matrices”, Carnegie-Mellon University, Department of Computer Science

November 2009 “Parallel symbolic state-space exploration is difficult, but what is the alternative?”, International Workshop on Parallel and Distributed Methods in verification (PDMC), invited talk, Eindhoven, The Netherlands [M162]

October 2009 “Exploiting structural information to improve the analysis of discrete-state systems”, The Hong Kong University of Science and Technology



*August 2009* “Using decision diagrams for the analysis of structured discrete-state models”, University of Savoie, Annecy, France

*August 2009* “Approximate steady-state analysis of large Markov models based on the structure of their decision diagram encoding”, University of Savoie, Annecy, France

*August 2008* “Parallel symbolic algorithms: a challenge” Dagstuhl Seminar No. 08332, Distributed Verification and Grid Computing (H. Bal, L. Brim, M. Leucker, eds.) [M162]

*June 2007* “Static variable ordering and partitioning for symbolic state-space generation”, The University of York, York, UK

*April 2007* “The importance of being structural (better decision diagram algorithms for asynchronous systems)”, Laboratoire d’Informatique de Paris 6, Paris, France

*May 2006* “A general acceleration technique for symbolic state-space generation algorithms”, National Institute for Aerospace, Hampton, VA

*September 2005* “Implicit representations and algorithms for the logic and stochastic analysis of discrete-state systems”, 2nd European Performance Engineering Workshop (EPEW) and 2nd International Workshop on Web Services and Formal Methods (WS-FM), keynote talk, Versailles, France [P98]

*June 2004* “Reachability set generation for Petri nets: can brute force be smart?”, ATPN Conference keynote talk, Bologna, Italy [P94]

*June 2003* “Structural symbolic methods for software verification”, NASA Ames Research Center, Automated Software Engineering group

*May 2003* “Techniques to store Markov chains”, Dagstuhl Seminar No. 03201, Probabilistic Methods in Verification and Planning, (C. Boutilier, B. Haverkort, M. Kwiatkowska, M. Vardi, eds.)

*December 2002* “Some notes on stochastic Petri nets”, Dagstuhl Event No. 02523, Validation of Stochastic Systems (B. Haverkort, ed.)

*October 2002* “Exploiting structural information for efficient symbolic state-space generation”, Carnegie-Mellon University, Department of Computer Science

*September 2001* “What a structural world”, Joint PNPM/PAPM/ProbMIV Multiconference, Aachen, Germany, PNPM keynote talk [P84]

*October 2000* “Analytic modeling of allocation policies for tasks with heavy tail distributions”, Symposium on Advanced Performance Methods 2000, Orlando, FL [M155]

*May 2000* “Using decision diagrams for the solution of large Markov chains”, Dagstuhl Seminar No. 00181, Report No. 273, Probabilistic Methods in Verification (U. Herzog, M. Kwiatkowska, C. Meinel, M. Vardi, eds.)

*April 2000* “Structural approaches for SPN analysis”, High Performance Computing 2000, Washington, DC [P76]

*July 1998* “Distributed and parallel algorithms for state-space generation”, Politecnico di Torino, Torino, Italy

*May 1997* “Kronecker-based solution of large Markov models (with applications to the modeling of distributed software)”, at the Workshop on Software Performance Modeling and Analysis (WOSP), Ottawa, Canada [M150]

*June 1996* “Distributed State-Space Generation of Discrete-State Stochastic Models”, University of Twente, The Netherlands, and University of Aachen, Germany

## SHORT COURSES AND TUTORIALS

- August 2012 “Continuous-time Markov models” (co-taught with C. Shelton), 28th Conference on Uncertainty in Artificial Intelligence, Catalina Island, CA [J42]
- June 2010 “Decision-diagram techniques for the analysis of Petri nets”, ATPN 2010, Braga, Portugal
- September 2009 “Petri net analysis using decision diagrams”, QEST 2009, Budapest, Hungary
- June 2007 “Data representation and efficient solution: a decision diagram approach”, 7th International School on Formal Methods for the Design of Computer, Communication and Software Systems: Performance Evaluation, Bertinoro, Italy [C130]
- June 2006 “Symbolic encodings for stochastic processes”, SIGMETRICS, Saint-Malo, France [M161]
- September 2005 “Decision diagrams for logic and stochastic modeling”, QEST, Torino, Italy [M160]
- March 2005 “Decision diagrams and their applications”, Bertinoro International Spring School, Bertinoro, Italy
- September 2004 “Modeling and analysis of Markov chains using decision diagrams”, QEST, Enschede, The Netherlands [M159]
- July 2000 “Distributed and structured analysis”, 1<sup>st</sup> European Summer School in Trends in Computer Science: Formal Methods and Performance Analysis, Nijmegen, The Netherlands [C129]
- May 2000 “Discrete-state systems: model checking and performance evaluation”, two-week intensive course for doctoral students, Dipartimento di Informatica, Università di Torino
- June 1999 “Tensor based GSPN solutions”, ATPN’99, Williamsburg, VA [M154]
- June 1998 “Kronecker operators for the description and solution of large Markov models”, SIGMETRICS’98, Madison, WI [M153]
- June 1997 “Kronecker operators for the description and solution of large Markov models generated by Stochastic Petri Nets”, joint PNPM’97 and Modelling Techniques and Tools Conferences, Saint-Malo, France [M152]
- May 1994 “Stochastic Petri nets: a formalism to describe stochastic processes”, SIGMETRICS’94, Nashville, TN [M144]
- October 1993 “PNs  $\Rightarrow$  SPNs  $\Rightarrow$  GSPNs  $\Rightarrow$  DSPNs”, PNPM’93, Toulouse, France
- January 1993 “SPNP Theory and Applications”, MASCOTS’93, San Diego, CA
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- [B136] Daniel Jeske, Gianfranco Ciardo, and Yuan-Shun Dai, editors. *Proc. 12th Pacific Rim Intl. Symposium on Dependable Computing*. IEEE Comp. Soc. Press, 2006.
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- [M161] Gianfranco Ciardo. Symbolic encodings for stochastic processes. In *ACM SIGMETRICS Tutorials*, 2006.
- [M162] Gianfranco Ciardo. Parallel symbolic algorithms: a challenge. In *Distributed Verification and Grid Computing*, Dagstuhl Seminar No. 08332, pages 3–4, 2008.
- [M163] Gianfranco Ciardo. Modern challenges in analyzing the correctness and performability of complex systems, July 2012. Invited talk at SEMISH, 39th Seminar on Hardware and Software (Curitiba, Brazil).
- [M164] Gianfranco Ciardo and Andrew S. Miner. SMART: Stochastic Model checking Analyzer for Reliability and Timing, User Manual. Available at <http://smart.cs.iastate.edu>.

## ACADEMIC COURSES TAUGHT

Graduate courses at the University of California at Riverside:

- CS 206 Testing and verification techniques in software engineering*: Winter 2009, Fall 2010, Fall 2013
- CS 237 Advanced topics in modeling and simulation*: Winter 2006
- CS 239 Performance evaluation of computer networks*: Winter 2004
- CS 246 Advanced verification techniques in software engineering*: Spring 2005, Winter 2007, Winter 2008, Fall 2008, Spring 2011
- CS 260 Seminar in computer science*: Fall 2005, Fall 2009
- CS 270 Special Topics in Advanced Computer Science*: Fall 2011

Undergraduate courses at the University of California at Riverside:

- CS 150 Theory of automata and formal languages*: Fall 2005, Fall 2006, Fall 2007, Fall 2008, Winter 2012

*CS 177 Modeling and simulation: Spring 2011*

*CS 179K Project in computer science: software engineering: Winter 2005, Spring 2010, Fall 2011*

Graduate courses at William and Mary:

*CSci 616 Stochastic models in computer science: Fall 1996, Spring 1999, Spring 2001, Fall 2001, Fall 2002*

*CSci 624 Computer systems performance analysis: Spring 1995*

*CSci 746 Discrete state stochastic models: Fall 1993, Fall 1994, Spring 1996, Spring 1998, Spring 2001, Spring 2003*

Undergraduate courses at William and Mary:

*CSci 243 Discrete structures in computer science: Fall 1995, Spring 1996, Fall 1997*

*CSci 421 Database systems: Fall 1998*

*CSci 423 Finite automata and theory of computation: Spring 1993, Spring 1994, Fall 1994, Spring 1995, Fall 1995, Spring 1997, Fall 1997, Fall 2000, Fall 2001*

*CSci 435 Software Engineering: Spring 2002*

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*MS advisor, Iowa State University:*

*current Priyanka Thyagarajan*

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*current Yaping Jing*

*Post-doctoral and senior visitors, University of California at Riverside:*

*June 2011–September 2011 Dr. Marco Beccuti (Università di Torino, Italy)*

*June 2011–September 2011 Dr. Francesca Cordero (Università di Torino, Italy)*

*September 2009–August 2010 Prof. Hong Zheng (East China UST, Shanghai, China)*

*July 2008–July 2009 Prof. Tae-Hyong Kim (Kumoh National Institute of Technology, Korea)*

*PhD advisor, University of California at Riverside:*

*current Hind Al Hakami*

*current Malcolm Mumme*

*2013 Xiaoqing Jin (Toyota Technical Center)*

*2013 Yang Zhao (Microsoft)*

*2008 Min Wan (Software Engineer, Google)*

*2008 Jinqing “Andy” Yu (R&D Engineer, Synopsys)*

*2007 Ming-Ying Chung (Senior R&D Engineer, Synopsys)*

*Masters advisor, University of California at Riverside:*

*2013 Lei Wang*

*2012 Yousra Lemabachar*

*2012 Xin He*

*2010 Benjamin Smith*

2009 Dhrumil Shah  
2008 Galen Mecham  
2008 Malcolm Mumme  
2008 Min Wan  
2006 Anwar Adi  
2006 John Anderson  
2006 Teddy Matinde  
2006 Piyush Satapathi  
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2013 Denisa Duma  
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Ronald Raymond Dolbin, Jr. (Mathematics Department)  
Jeff Pettyjohn (Statistics Department)

*Undergraduate research advisor, University of California at Riverside:*

2011–2012 Mantej Singh Rajpal  
2008–2010 Diego Villaseñor (UC LEADS program)  
2008 Jevons Chen (summer internship)  
2008 Miguel Rodriguez (summer internship)

*PhD advisor, William and Mary:*

2003 Radu I. Siminiceanu, 2003 (SDE, Amazon)  
2002 Robert L. Jones (Chief Scientist, DSPlogic Inc., Germantown, MD)  
2000 Andrew S. Miner (Associate Professor, Iowa State University)

*Masters advisor, William and Mary:*

2006 Raymond J. Plante  
2003 Paul L. Grieco  
2003 Hongri Jiang  
2003 Robert M. Marmorstein  
2002 Wei “Helen” Sun  
2000 Michelle M. Griffith  
2000 Arun Mangalam  
1999 Jeff M. Maddalon  
1999 Paul Sugden  
1998 Guangzhi Li  
1997 Dawn M. Galayda  
1996 Xiaochun “Chris” Ji  
1995 Andrew S. Miner

*Undergraduate research advisor, William and Mary:*

2003 Eric W. Davis  
2003 Matthew F. Klinger  
1995 Heji Kim, 1995 (Honors, Summa cum Laude)

*Research advisor, William and Mary High-School Gifted Student Summer Program:*

2003 Amanda Burch

*External committee member:*

2012 Dario D’Amico, Università di Firenze, Italy (Laurea)  
2012 José Vander Meulen, Université Catholique de Louvain, Belgium (PhD)  
2003 Massimo Forno, Università di Torino, Italy (Laurea)  
2002 Marco Gribaudo, Università di Torino, Italy (PhD)  
1997 Ricardo Fricks, Duke University, North Carolina (PhD)  
1996 Paolo Marenzoni, Università di Parma, Italy (PhD)  
1994 James Coleman, University of Adelaide, Australia (PhD)  
1994 Reinhard German, Technical University of Berlin, Germany (PhD)

*Member of the Honors committee, William and Mary:*

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Benjamin J. Coleman

Aaron T. Hawkins

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Xiaowen “Jason” Liu

Louis Felipe Perrone

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Alma Riska

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## **ACADEMIC SERVICE**

Departmental at Iowa State University:

*January 2014–present* Chair of the Computer Science Department

Departmental at the University of California at Riverside:

*Summer 2008–Summer 2012* Graduate Advisor

*Fall 2007–Spring 2008* Member, Graduate Committee

*Fall 2004–Spring 2007* Associate Chair

*Winter 2004–Fall 2013* Member of several Ad-Hoc Committees

*Fall 2004–Spring 2007* Webmaster

*Fall 2004–Spring 2005* Member, Hiring Committee

Campus-wide at the University of California at Riverside:

*Fall 2008–Spring 2011* Member, Bourns College of Engineering Executive Committee

*Winter 2008* Member, Administration and Infrastructure Committee for the Bourns College of Engineering Retreat, responsible for the Facilities Subcommittee

*Fall 2005–Summer 2007* Member, Research Computing Advisory Group

*November 2005* Session Chair, Southern California Conference on Undergraduate Research (SCCUR)

Departmental at William and Mary:

*Fall 2002–Summer 2003* Member, Graduate Curriculum Committee  
*Fall 2001–Summer 2003* Chair, Graduate Admission Committee  
*Fall 2001–Summer 2003* Director of Graduate Studies  
*Fall 2001–Spring 2002* Chair, Faculty Search and Chair Search Committees  
*Fall 2000–Spring 2001* Chair, Personnel Committee  
*Fall 2000–Spring 2002* Member, Systems Committee  
*Fall 1998–Fall 2003* Member, Personnel Committee  
*Fall 1996–Spring 1999* Webmaster  
*Spring 1994–Fall 1999* Faculty member responsible for Communications and Publicity  
*Spring 1995, Spring 1997, Spring 2001* Member, Faculty Hiring Committee  
*Fall 1995–Spring 1996, Fall 1998–Spring 1999* Member, Curriculum Committee  
*Spring 1993–Spring 1995* Member, Examination Committee  
*1994–1998* Judge, departmental competition for the Regional ACM Programming Contest

Campus-wide at William and Mary:

*Spring 2002–Fall 2002* Member, Internal Review Team, Biology Department  
*December 1998–February 1999* Member, Search Committee for the Director of Conference Services  
*Spring 1996–Fall 1998* Member, Ad-hoc Intellectual Property Policy Committee

## **ADDITIONAL INFORMATION**

Google Scholar <http://scholar.google.com/citations?user=8rmks2cAAAAJ&hl=en>

Citations: 6016, h-index: 43, i10-index: 86 (as of February, 2015)

Member, ACM (SIGMETRICS)

Senior member, IEEE (Computer Society)

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