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Education

- Ph.D, Computer Science, Carnegie Mellon University, January 1989; Title: Concurrent Constraint Programming; Advisor: Dana S. Scott.

- M.S., Computer Science, Carnegie Mellon University, 1985.

- B.Tech., Electrical Engineering, Indian Institute of Technology, Kanpur, India, 1982.

Professional Interests

I work now at the heart of cognitive computing – figuring out how to build bots that "know deeply, reason with purpose, learn continuously and interact naturally." Broadly, I am working to broaden logic/programming languages with machine learning at the core, to better attack messy, real world (reasoning) problems. Concretely, I am working on deep natural language understanding and probabilistic programming:

- Natural language understanding: moving from a deep linguistic analysis of text to a formal representation that can be used for reasoning. Goal is to be able to answer in domains such as legal / compliance / financial professional-level questions (e.g. what para-legals do today). Current technical approach is to build semantic parsers based on constructing semantic forms from the output of dependency parsers/LFG parsers using "glue", motivated by recent work of Reddy et al on "deplambda". This speaks to work I did at PARC 25 years ago on attacking the syntax/semantics interface for natural language, and my work there on knowledge representation and reasoning.

  The enormously exciting ideas on the table now are to augment deep linguistically-motivated analyses of natural language utterances with machine learning techniques to achieve depth and scale.

- Probabilistic (constraint) programming + machine learning: The Achilles' heel of deep learning is the reliance on massive amounts of data. My interest is in moving to "small" learning (particularly for reasoning) – working on "theory sketches", approximate logical theories that have "holes" in them that can be filled by training against data. Again, my focus is on getting to robust, scalable, real-world reasoning in complex domains.

To this work I bring a very broad and diverse background in theoretical computer science (logic, semantics, algorithms), programming systems (concurrent, constraint-based computing, high-performance computing, programming languages) and artificial intelligence (model-based computing, diagnosis, natural language processing, machine learning and probabilistic logic representations).

I have worked for over 25 years in Corporate Research (9 years at Xerox PARC on AI and constraint programming, 4 years at AT&T Research on Instant Messaging and Network Communities, and 13 years at IBM TJ Watson on X10, scale-out programming, analytics and, now, AI). I have also spent 4 years at three startups (Carnegie Group Inc, Vayusphere, Kirusa). And, I was a Professor of Computer Science and Engineering at Penn State University for a year.

I combine a natural proclivity for vision, intuition, conception and fundamental research with a passion to develop systems, lead teams and get the product out the door.

Employment and other work

- May 2016 – onwards: Chief Scientist, Deep Compliance, Cognitive Computing Research at IBM TJ Watson, focused on developing a framework for strategic research in the compliance / legal / financial spaces.

- January 2015 – May 2016: Distinguished Research Staff Member, reporting to VP, Cognitive Computing Research at IBM TJ Watson.

- February 2014 – January 2015: Chief Scientist, Computation as a Service Research Division at IBM TJ Watson.

- 2012 December – May 2016: Chief Scientist, IBM Continuous Insight (concurrent with Research position).

- 2009 – 2013: Adjunct Professor, Columbia University, NY. Taught a course on X10 for five years with Prof Martha Kim.

- 2009 – Waseda University, Global COE Visiting Professor.

- February 2008 – February 2014: *Manager, Advanced Programming Languages*, IBM TJ Watson.

- September 2003 – onwards: *Research Staff Member*, IBM TJ Watson.

- August 2002 – Sep 2003: *Professor of Computer Science and Engineering*, Penn State University. Area: Programming, Languages and Systems.

- June 2001 – August 2002: *Vice President, Engineering*, Kirusa.

  Responsible for recruiting the engineering team, developing product plans, architecting the product, and delivering the product. Product to be trialled with carrier customers in Europe in June 2002. Work involves development and implementation of XML-based Multimodal markup language, for delivery over 2.5G (GPRS) networks. Sophisticated integration work, involving WML, VoiceXML, HTML, SALT, XML technologies, delivered using a J2EE infrastructure, and native PocketPC clients that process speech. Doing significant background work on understanding distributed speech recognition, and efficient delivery of (possibly processed) speech over GPRS. Also responsible for the company's Applications group, Product Delivery group, and the company's IT infrastructure.

  Since August 2002, continuing as a Consultant to Kirusa.

- December 2000 - June 2001: *Chief Technology Officer*, Vayusphere.

  Responsible for recruiting engg team in San Diego and Mountain View (Dev Directors, Architects, Engineers; QA Staff).

  Responsible for defining, architecting and shipping first set of products (Monsoon Real-time Messaging Platform), setting the technical direction for the company, evaluating vendor technology, and parterning with business development.

  Responsible for the "vision sell" which brought in the company's first major customer.

  Shipped product end of May 2001.

- July 2000 - December 2000: *Director, Development*, Vayusphere.

  Employee #6 at Vayusphere. Designed, directed and architected the implementation of Vayusphere Instant Messaging. (See "Systems work" section below for description of work.)

Designed and implemented agent architecture used to establish client-side extensibility (e.g. integration with Outlook/Exchange) and buddy services. The success of this work caused the Board to re-center the company around (Wireless) Instant Messaging.

Named on the Times Digital "Movers and Shakers for 2001" list (Nov 2000) for Internet Messaging.

- November 99 - July 2000: *Technology Leader, Instant Messaging and Presence*, AT&T Shannon Labs.

  Secured commitment from AT&T Wireless to trial AT&T Instant Messaging for their Pocket Net service.

  Grew the Labs Instant Messaging team. At its peak, the work involved over 40 people, with about 15 managers.

  Continued strategic work for AT&T leadership on Instant Messaging.

  Continued as Co-chair of IETF IMPP WG. Led industry discussions, culminating in the formation of the IMUnified group including MSN, Yahoo, AT&T, and other players. Oversaw initial development of the IMUnified protocol.

- November 98 - November 99: *District Manager, Network Community Platform Group*, AT&T Shannon Labs

  Led the design, architecture and development of AT&T Instant Messaging, based on Matrix. Formed the team from scratch. (See description of System work below.)

  Managed the growth of the team from a small research-based group to a production group incorporating standard AT&T practices in requirements development, system testing, MR management and operations management.

  Leveraged an offshore implementation team in India to manage low-cost, round-the-clock development efforts.

  Provided strategic input on Instant Messaging to members of the AT&T Operations Group (President of AT&T Labs, President of AT&T Corporate Strategy, and Chief Counsel for AT&T). Led discussions with industry on interoperable Instant Messaging.

  Obtained $10m for Instant Messaging and Presence work for 2000 from the AT&T Operations Group (chaired by Mike Armstrong), as part of the IP Platform work.

  Obtained funding from AT&T Consumer Servics for a Trial of AT&T Instant Messaging.

  Co-Chaired the IETF Working Group on Instant Messaging and Presence Protocols (IMPP). All the major industry players – Microsoft, Yahoo, AOL – have agreed to support the work of this industry group.

  Industry spokesperson for national media (WSJ, USA Today, NY Times, Washington Post, SJ Mercury News ...) on Instant Messaging.

- September 96 - November 98: *Principal Member, Technical Staff*, AT&T Shannon Labs

  Developed and implemented the underlying ideas for Matrix, an architecture for extensible network spaces based on Java.

  Java evangelist within AT&T.

  Identified a major security bug in the design for Java class-loaders in JDK 1.1, and worked with Java designers at JavaSoft (Gilad Bracha, Sheng Liang) to fix the bug. See their paper in OOPSLA 99.

  Ran Meadows, a school-centered network community (base on MOO technology) involving multiple school districts in New Jersey and abroad.

- November 87 — September 96: *Member, Research Staff*, Xerox Palo Alto Research Center.

  Developed the notion of concurrent constraint programming languages.

  Initiated and led the thrusts at PARC in model-based computing, hybrid computing and network communities.

  (See description of research work below.)

- April 86 — November 87: *Artifical Intelligence Scientist*, Advanced Product Developments Group, Carnegie Group Inc.

  Helped initiate the "Carnegie Inference Language" project, to develop the next generation of expert-system development tools. Co-led language design, which was based on ideas from production systems, concurrent logic programming and object-oriented programming.

- January 85 — March 86: *Consultant*, Carnegie Group Inc, Pittsburgh. Designed and implemented CRL-Prolog.

Academic awards and Industry recognition

2015 ACM SIGPLAN OOPSLA Ten-year "Most Influential Paper" award (for 2005 OOPSLA X10 paper).

2013 IBM Outstanding Scientific Accomplishment for X10

2013 IBM Outstanding Technical Achievement, for contribution to PERCS

2012 HPC Challenge Award for "Best Performance" for X10, at SuperComputing 2012.

2009 HPC Challenge Award for "Best Performance" for X10 and UPC, at SuperComputing 2009.

2008 HPC Challenge Award for "Most productive research implementation" for X10 and UPC, at SuperComputing 2008.

2007 HPC Challenge Award for "Most productive research implementation" for X10 (on behalf of X10 team), at SuperComputing 2007.

2004: "Most influential paper in 20 years in Concurrent Constraint Programming" award from the Association of Logic Programming for POPL90 paper (w/ Martin Rinard).

2002: Invited Expert of the W3C Working Group on Multi-Modal Interaction.

2001: Co-Chair of the WG on Presence and Instant Messaging (PRIM), IETF.

1998-2000: Co-Chair of the WG on Instant Messaging and Presence Protocols (IMPP), IETF.

1994: Excellence in Research Award, Xerox PARC.

1992: Excellence in Support of Research Award, Xerox PARC.

1989: ACM Doctoral Dissertation Award for the best Computer Science PhD Thesis in 1989. Thesis published by MIT Press.

1982: Ratan Swaroop Gold Medal for all-round excellence, Indian Institute of Technology, Kanpur.

1982: Scholarship from the Inlaks Foundation for graduate studies at the Programming Research Group at Oxford; Fellowship offers from Univ. of Minnesota; scholarship offer from Carnegie-Mellon, Wisconsin-Madison, Brown, etc. in Computer Science.

1982: Second prize in All-India Student Paper Contest of the Computer Society of India for Design and implementation of the C-code abstract machine for CCN-PASCAL.

1980: Merit Scholarship for being the top-ranked student in the "core" (first 2.5/5) years at IIT.

1977: Award for ranking in the first 35 (out of over 50,000) in the nation in the All-India Higher Secondary (school-leaving) examination. Awarded a National Merit Scholarship by the Government of India.

1977: Ranked 6th (out of $> 60,000$) in the Joint Entrance Exam for all the IITs.

1977: Awarded one of five scholarships from India for a Baccalaureate at the United World College, Singapore.

Research Grants

- Principal Investigator on "Resilient X10", 2 yr, $500K grant from AFRL, 2013-2014. (IBM Watson Research Lab)

- Co-Principal Investigator (with Dave Grove), sub-contracting to MIT on DoE X-Stack award "CAP$\hat{3}$: A Computer-Aided Performance Programming Platform", 3 yr, $1500K, DoE, 2012-2014. (IBM TJ Watson Research). DoE extended the award by one year, 2015.

- Co-Principal Investigator (with Danny Bobrow), "Testing of hybrid and reactive systems", 1 yr, $150K NASA, 1994-1995. (Xerox PARC)

- Principal Investigator, "Timed Concurrent Constraint Programming", 2 yrs, $120K, ONR, 1994–1996. (Xerox PARC)

- Co-Principal Investigator (with Danny Bobrow), "Articulate Spaces: Model-based authentic environments for Collaborative Learning", 2 yrs, $2000K ARPA, Department of Defense, 1995-1997.

- Co-Principal Investigator (with Danny Bobrow, Billie Hughes, Jim Walters), "Collaborative learning spaces", NSF, 1 year, 1996-97.

In addition, in 1991 Seif Haridi (Director, Swedish Institute of Computer Science, Stockholm) and I conceived of the ACCLAIM project (Advanced Concurrent Constraint Languages — Applications, Implementation and Methodology). The project was funded for several million ECUs by ESPRIT, the European Community Research Funding Agency, and involved the Max-Planck Institut and DEC Paris Research Lab, INRIA, DFKI, SICS, RISC Linz, Universidad Politecnica de Madrid, Universita di Pisa, Marseille Luminy and Katholieke Universiteit Leuven. The list of deliverables from the project at

    http://www.sics.se/ps/acclaim/deliverables/perpartner.html

enumerates approximately a hundred papers on concurrent constraint programming.

Teaching

- Graduate course on Big Data Applications in X10, U. Padova, June 2014.

- Graduate course on Big Data Analysis in X10, U. Padova, April 2013.

- Designed and taught a senior-level course on "Principles and Practice of Parallel Programming" at Columbia U. (w/ Prof Martha Kim), Fall 2009, 2010, 2011, 2012, 2013. Course is now part of regular CS curriculum. Course is organized around X10.

- Lectures on X10, Waseda U., 2008.

- Summer course on X10, U. Pisa, July 2007.

- 2-week summer course on "Hybrid Constraint Programming", (w/ Prof R Jagadeesan) at ESSLLI, Nancy, France, August 2004.

- CS 598f "Concurrent Constraint Programming as a Foundation for Model-based Programming", Graduate course, Penn State, Spring 2003.

- CS 428 "Programming Languages", Penn State, Fall 2002.

Theses

Thesis committee member

- Stefan Muller "Latency-hiding Work-stealing" – tentative (PhD exp. 2017, CMU Computer Science)(Advisor: Umut Acar)

- Arvind Neelkanthan "Knowledge Representation and Reasoning with Deep Neural Networks" (PhD exp. 2017, U Mass, Amherts)(Advisor: Andrew McCullum)

- Laura Tittolo "An Abstract Interpretation Framework for Diagnosis and Verification of Timed Concurrent Constraint Languages" (PhD 2014, U. Udine) (Advisor: Marco Comini)

- Sophia Knight "The Epistemic View of Concurrency Theory" (PhD 2013, LiX Polytechnique) (Advisor: Frank Valencia, Catuscia Palamidessi)

- Carlos Olarte "Universal Temporal Concurrent Constraint Programming" (PhD 2009, LiX Polytechnique) (Advisor: Frank Valencia)

- Venkatesh Mysore "Algorithmic Algebraic Model Checking: Hybrid Automata and Systems Biology" (PhD 2005, New York University) (Advisor: Bud Mishra)

- Paul Ruet "Logique non-commutative et programmation concurrente par constraints" (PhD 1996, University of Paris) (Advisor: Francois Fages)

- Eric Torng "Non-omniscient scheduling" (PhD 1994, Stanford University) (Advisor: Rajeev Motwani)

- Francesca Rossi "Constraints and Concurrency" (PhD 1993, University of Pisa) (Advisor: Ugo Montanari)

Thesis adviser

- Clifford Tse, "Linear Janus" (Master's thesis 1992, MIT Laboratory for Computer Science) MIT-PARC VI-A student

Books

- Proceedings of ASIAN 03, ed. Vijay Saraswat, Springer Verlag LNCS 2896, 2003.

- Constraint Programming: The Newport Papers, ed. Vijay Saraswat and Pascal van Hentenryck, MIT Press, 1995.

- Proceedings of the 1991 International Symposium on Logic Programming, ed. Vijay Saraswat and Kazunori Ueda, MIT Press, 1991.

- Vijay Saraswat "Concurrent Constraint Programming" MIT Press Logic Programming and Doctoral Dissertation Award Series, 1991.

Edited journal issues

- Vijay Saraswat, Pascal van Hentenryck Special issues of CONSTRAINTS on Strategic Directions in Constraint Programming, February 1997.

- Pascal van Hentenryck, Vijay Saraswat, ed. "Constraint Programming", in Special Issue of ACM Computing Surveys on Strategic Directions in Computer Science, February 1997.

Systems work

2012-onwards Initiated the Resilient X10 project – extending X10 so it is able to internalize node failure, and continue to operate.

2011-onwards Let the META research project on middleware for events, transactions and analytics. This has led to work on an IBM product, Continuous Insight. Analytics Architect for CI, and also Chief Scientist for CI, contributing to overall architecture and Rule language design.

2010-onwards Initiated the M3R project – a re-implementation of Hadoop in X10, keeping data in main memory across a cluster. Integrated into IBM SPSS products.

2004-onwards Leader of the X10 programming language being designed and implemented at the IBM TJ Watson Research Center. Author of the X10 language manual, principal implementer of the initial version of the compiler.

2002-onwards The Java concurrent constraint programming system Implementing the jcc system under the Lesser GPL licence on SourceForge. The system implements the (default) (timed) concurrent constraint programming framework in Java, for embedded and discrete- and continuous-time computing. The implementation is targeted for model-based programming applications in the NASA domain (Mars rovers), and in the systems biology domain.

2001-2002 Kirusa Multimodal Platform.

As VP Engineering, leading the team that is developing and delivering KMMP. Chief architect for the product, which supports the development of multimodal applications (those which simultaneously use voice and visual interfaces) for wireless devices. The product is primarily based on Java proxy/servlet technology and is designed for 2.5G networks (e.g. GPRS), and processes the XML-based multimodal markup language (M3L), which integrates the WAP Markup Language (WML) and the voice markup language (VoiceXML).

Chief designer of M3L, and author of the language spec.

2000-2001 Vayusphere Monsoon Real-time Messaging System.

Director of the group, designer and chief server-side implementer. Monsoon features a scalable, open, extensible architecture for Instant Messaging, with two-way interop with email. All server-side code was in Java 2; the system also used an Oracle Database, and made extensive use of open source components (Apache, Tomcat (servlet runner), James (mail engine)). Designed a simple wire protocol which is used for all server-to-server and client-to-server communication.

Supervised development of native clients in C and C++ for the RIM Mobitex devices, wireless Palm OS devices, and wireless BREW devices. Supervised development in Delphi of a full-featured Windows desktop client. Supervised development of HDML/WAP clients for phones.

Assembled the engineering and QA team from scratch, and had the product ready for beta in under three months. Development and QA teams were scattered over Mountain Lakes (NJ), Mountain View (Ca), San Diego (Ca), Oakland (Ca) and Indiana, and at peak numbered approx 20 people.

Product released to first customer (major national ISP) in nine months.

1999-2000 AT&T Instant Intercom.

Founded, staffed and directed the development team that delivered AT&T's instant messaging system into trial with AT&T Wireless in March 2000. I was the main designer and architect, and chief server-side implementer. After I left AT&T, the system was deployed by AT&T Worldnet. In production use for some years, it had been downloaded by over 120,000 users, and supported approx 20,000 simultaneous users. It had been designed to scale to a million registered and 100,000 simultaneous users.

The system features a modular architecture with several different kinds of servers (IM servers, Presence servers, Chat room servers). I designed the binary extensible protocol (documented in an IETF Draft) used by servers to communicate with each other and with clients. Supervised the design of a C++ I/O module to circumvent scalability limitations of Java's synchronous I/O architecture.

Supervised development of a native Windows client in Delphi, a Java applet client, a black-phone voice client (using PML, a precursor to VoiceXML), and of an HDML client (in collaboration with AT&T Wireless).

1997-1998 AT&T Matrix.

Built the first version of the Matrix system in Java 1.1. AT&T Matrix was a persistent network community server that could be extended by programming world objects in Java. A Matrix server is accessed through a Matrix client (developed in Java using Swing). Servers and clients communicate through a completely self-contained *session-oriented Remote Method Invocation* (SMI) system designed and implemented after analyzing the very poor design of the initial Java RMI system. SMI uses Java's native object serialization and class loaders. World objects provided their own graphical user interface, displayed in clients.

Supervised development of a Java Swing-based client, and the development of several world objects (games, bulletin boards, chat rooms). Core team grew to approx. half a dozen people, before project was converted into an Instant Messaging project (see below).

The system was demonstrated to several people in the Labs, was in use by the development team, and served as the basis for an internal Instant Messaging trial for several hundred people in AT&T Labs in summer 1999.

The success of this work led to the invitation to form the Network Communities Platform Group (NCPG) in AT&T Labs in November 1998.

1997 Meadows.

Founded the Meadows online community for parents, school-children and teachers across multiple school districts. Responsible for running the MOO, and extending it with various objects.

Taught classes in elementary and middle school (2d grade to 6th grade) on Meadows.

1995 Pueblo.

Founded the Pueblo online community (pueblo.xerox.com 7777), using the MOO system, with Jim Walters and Billie Hughes of Phoenix College, January 1995. As of May 1996, the community had over 1000 characters, including over 300 students from Phoenix and New York, and has over 20,000 objects.

Responsible for running the MOO, and creating many world objects.

1992-1994 Model-based Computing.

While at Xerox PARC, initiated and led a project on constraint-based machine control. Implemented the first version of a constraint-based real-time scheduler in C++, and supervised a small team of engineers at Xerox Engineering in Rochester (New York). Code was shipped in the embedded controller for Xerox' digital mid-volume reprographics engines. This work led to several US Patents, and an award for Excellence in Research from Xerox PARC.

1992 QD-Janus

Collaborated with Saumya Debray on the QD Janus implementation. See "S.K. Debray, QD-Janus: A sequential implementation of Janus in Prolog, Software Practice and Experience, Volume 23, Number 12, December 1993, pp. 1337-1360."

1986 CRL-Prolog, CRL-OPS

While a scientist at Carnegie Group Inc., designed and implemented CRL-Prolog — a fast Prolog implementation that compiles into Common Lisp and is closely integrated with the frame-based language CRL. Supervised the implementation of CRL-Ops. CRL-Prolog and CRL-Ops were shipped as part of the product *Knowledge Craft*.

United States patents

Please see online lists with the patent office for uptodate information.

IBM

- US Patent 20150254558 "Global Production Rules for Distributed Data", with Matthew Arnold, Martin Hirzel, Avraham Shinnar, Jerome Simeon, Lionel Villard

- US Patent US 914 7373 B2 "Transparent efficiency for in-memory execution of map reduce job sequences", with David Cunningham, Ben Herta, Avi Shinnar.

- US Patent 8,924,946 on "Systems and methods for automatically optimizing high performance computing programming languages", with Ganesh Bikshandi, Krishna Nandivada Venkata and Igor Peshansky, dated December 30, 2014

- US Patent 8,726,238 on "Interactive, iterative program parallelization based on dynamic feedback", with Robert Fuhrer and Evelyn Duesterwald, dated May 13, 2014.

- US Patent 8,869,155 on "Increasing parallel program performance for irregular memory access problems with virtual data partitioning and hierarchical collectives", with George Almasi, Guojing Cong, David Klapecki, dated Oct 21, 2012.

- US Patent 8,266,394 on "Methods for single-owner multi-consumer work queues for repeatable tasks". with Maged Michael and Martin Vechev, dated Sep 11, 2012.

- US 20120304178 A1 "Concurrent reduction optimizations for thieving schedulers"

Kirusa

Several patent applications have been filed by Kirusa based on my work in multi-modal systems.

- US Patent 7,275,217, 2007 on "System and method for multi-modal browsing with integrated update feature", with Vijaybalaji Prasanna, Rohitashva Mathur and Shirish Vaidya, on Sep 25, 2007.

AT&T

- US Patent 20020071539 A1 on "Method and apparatus for telephony-enabled instant messaging".

- Patent pending on "Multi-modal directories for telephonic applications", WO 2003015388 A1.

PARC

Patents resulting from model-based scheduling work at Xerox PARC:

- US 5,831,853 "Automatic construction of digital controllers/device drivers for electro-mechanical systems using component models", 11/98

- US 5,701,557 "Machine graphs and capabilities to represent document output terminals composed of arbitrary configurations", 12/97

- US 5,696,893 "System for generically describing and scheduling operations of modular printing machine", 12/97

- US 5,631,740 "Transducers with constraints model for print scheduling", 5/97

- US 5,617,214 "Commitment groups to generalize the scheduling of interdependent document output terminal capabilities", 4/97

- US 5,504,568 "Print sequence scheduling system for duplex printing apparatus", 4/96

Publications

Please see Google Scholar for up-to-date lists.

AI, Logic, Knowledge Representation and Reasoning

- C Cornelio, V Saraswat "Expressing Probabilistic Grahical Models in RCC", AAAI 2017 Workshop on Symbolic Inference and Optimization.

- A Loreggia, H Samulowitz, Y Malitsky, V Saraswat "Deep Learning for Algorithm Portfolios", AAAI 2016.

- V Saraswat and J Milthorpe "The Continuous Allreduce algorithm for asynchronous stochastic gradient descent", NIPS 2015 Workshop on Non-Convex Optimization for Machine Learning: Theory and Practice.

- C Cornelio, A Loreggia, V Saraswat "Logical Conditional Preference Theories", MPREF workshop, IJCAI 2015.

- U Grandi, A Loreggia, F Rossi and V Saraswat. A Borda Count for Collective Sentiment Analysis. Annals of Mathematics and Artificial Intelligence, special issue on "Preferences and Computational Social Choice", 2015.

- U Grandi, A Loreggia, F Rossi and V Saraswat. "From Sentiment Analysis to Preference Aggregation". In Proceedings of the 2014 International Symposium on Artificial Intelligence and Mathematics (ISAIM-2014), 2014.

- R Jagadeesan and G Nadathur and V Saraswat "Testing concurrent systems: An interpretation of intuitionistic logic", Proceedings of FST&TCS, December 2005.

- M Fromherz, V Saraswat and D Bobrow "Model-based computing: Developing flexible machine control software", Artificial Intelligence, 114(1-2): 157-202 (1999)

- V Gupta, R Jagadeesan and V Saraswat "Probabilistic Concurrent Constraint Programming", Proceedings of the International Conference on Concurrency Theory, LNCS, CONCUR '97, 243-257.

- M Fromherz, V Gupta and V Saraswat, "CC — A generic framework for domain specific languages", Workshop on Domain-oriented specification languages, POPL 97.

- M Fromherz and V Saraswat "Model-based computing: using concurrent constraint programming for modeling and model compilation", U. Montanari and F. Rossi (ed.) Principles and Practices of Constraint Programming, CP'95, Springer-Verlag, LNCS 976, Sep 1995, pp. 629–635.

- Y Iwasaki, A Farquhar, V Saraswat, D Bobrow and V Gupta "Modeling time in hybrid systems: How fast is "instantaneous"?", Proceedings of the International Joint Conference on Artificial Intelligence, Montreal, August, 1995.

- H Wong and M Fromherz and V Gupta and V Saraswat. "Control-based programming of electro-mechanical controllers." Proceedings of the IJCAI Workshop on Executable Temporal Logics, Montreal, August 1995.

- V Gupta and V Saraswat and P Struss, "A model of a photocopier paper path", Proceedings of the 2nd IJCAI Workshop on Engineering Problems for Qualitative Reasoning, August 1995.

- M Fromherz and V Saraswat "Model-based computing: constructing constraint-based software for electro-mechanical systems" Practical Applications of Constraint Technology, Paris, France, April 1995, pp. 63-66.

- M Fromherz, D Bell, D Bobrow, B Falkenhainer, V Saraswat and M Shirley " RAPPER: The Copier Modeling Project", Working Papers of the Eight International Workshop on Qualitative Reasoning about physical systems", pages 1-12, June 1994.

- O Raiman and J de Kleer and V Saraswat "Critical reasoning", Proceedings of the International Joint Conference on Artificial Intelligence, 1993.

- P Codognet and V Saraswat, "Abduction in Concurrent Constraint Languages", Proceedings of the First Compulog Network meeting on Logic Programming and Artificial Intelligence, London, U.K., 1992.

- O Raiman and J de Kleer and V Saraswat and Mark Shirley "Characterizing non-intermittent faults", Proceedings of the National Conference on Artificial Intelligence, June 1991.

- V Saraswat, J de Kleer and O Raimon "Contributions to the theory of diagnosis", International Workshop on Principles of Diagnosis, Stanford University, July 1990.

- V Saraswat "CP as a general-purpose constraint-language", AAAI 1987.

Natural language

- Introduction. (M Dalrymple, F Pereira, John Lamping, V Saraswat) In *Semantics And Syntax in Lexical Functional Grammar: The Resource Logic Approach* edited by M Dalrymple. The MIT Press, 1999.

- LFG qua Concurrent Constraint Programming. (V Saraswat) In *Semantics And Syntax in Lexical Functional Grammar: The Resource Logic Approach* edited by M Dalrymple. The MIT Press, 1999.

- Relating Resource-based semantics to categorial semantics. (Mary Dalrymple, V Gupta, John Lamping, and V Saraswat) In *Semantics And Syntax in Lexical Functional Grammar: The Resource Logic Approach* edited by M Dalrymple. The MIT Press, 1999.

- Quantification, Anaphora and Intensionality (Mary Dalrymple, John Lamping, F Pereira, and V Saraswat) In *Journal of Logic, Language and Information 6 (3), pp 219-273, July 1997.*

- A Deductive Account of Quantification in LFG. (Mary Dalrymple, John Lamping, F Pereira, and V Saraswat) In *Quantifiers, Deduction, and Context*, ed. Makoto Kanazawa, Christopher J. Piñón, and Henriette de Swart. Stanford, California: Center for the Study of Language and Information. 1996.

- Andrew Kehler, M Dalrymple, John Lamping, and V Saraswat The Semantics of Resource Sharing in Lexical-Functional Grammar. Proceedings of the 1995 Meeting of the European Chapter of the Association for Computational Linguistics, Dublin, Ireland. March 1995.

- M Dalrymple, John Lamping, F Pereira, and V Saraswat Intensional Verbs Without Type-Raising or Lexical Ambiguity. In Logic, Language and Computation, volume 1, ed. Jerry Seligman and Dag Westerstaahl. Stanford, California: Center for the Study of Language and Information. 1996. Also in Proceedings of the Conference on Information-Oriented Approaches to Logic, Language and Computation/Fourth Conference on Situation Theory and its Applications, Saint Mary's College of California, Moraga, California. June 1994.

- M Dalrymple, J Lamping, and V Saraswat. 1993. LFG semantics via constraints. In Proceedings of the Sixth Meeting of the European ACL, University of Utrecht, April. European Chapter of the Association for Computational Linguistics.

- M Dalrymple, A Hinrichs, J Lamping, and V Saraswat. The resource logic of complex predicate interpretation. In Proceedings of the 1993 Republic of China Computational Linguistics Conference (ROCLING), Hsitou National Park, Taiwan, September. Computational Linguistics Society of R.O.C.

Parallel Constraint Solvers

- D Munera, D Diaz, S Abreu, F Rossi, V Saraswat, P Codognet "Solving Hard Stable Matching Problems via Local Search and Cooperative Parallelization", 29th AAAI Conference on Artificial Intelligence, 2015.

- D Bergman, A Cire, A Sabharwal, H Samulowitz, V Saraswat, W Jan van Hoeve: "Parallel Combinatorial Optimization with Decision Diagrams", CPAIOR, 2014.

- B Bloom, D Grove, B Herta, A Sabharwal, H Samulowitz, V Saraswat "SatX10: A Scalable Plug&Play Parallel SAT Framework", in Proceedings of the 15th International Conference on Theory and Applications of Satisfiability Testing (SAT 2012).

Programming Languages and Systems

X10

- O Tardieu, B Herta, D Cunningham, D Grove, P Kambadur, V Saraswat, A Shinar, M Takeuchi, M Vaziri, W Zhang "X10 and APGAS at Petascale", ACM Transactions on Paralllel Computing, March 2016

- S Hamouda, J Milthorpe, P Strazdins, V Saraswat "A Resilient Framework for Iterative Linear Algebra Applications in X10", 16th IEEE International Workshop on Parallel and Distributed Scientific and Engineering Computing, PDSEC 2015.

- S Crafa, D Cunningham, V Saraswat, Avraham Shinnar, O Tardieu "Semantics of (Resilient) X10", ECOOP 2014.

- D Cunningham, D Grove, B Herta, Arun Iyengar, Kiyokuni Kawachiya, Hiroki Murata, V Saraswat, Mikio Takeuchi O Tardieu "Resilient X10: efficient failure-aware programming", PPoPP 2014.

- O Tardieu, B Herta, D Cunningham, D Grove, Prabhanjan Kambadur, V Saraswat, Avraham Shinnar, Mikio Takeuchi, Mandana Vaziri "APGAS at Peta-scale", PPoPP 2014.

- Wei Zhang, O Tardieu, D Grove, B Herta, T Kamada, V Saraswat, M Takeuchi "GLB: Life-line based Global Load Balancing library in X10", Workhop on Parallel Programming for Analytic Applications, PPoPP 2014.

- T Yuki, P Feautrier, S Rajopadhye, V Saraswat "Array dataflow analysis for polyhedral X10 programs", PPoPP 2013.

- M Takeuchi, D Cunningham, D Grove, V Saraswat "Java interoperability in Managed X10", Proceedings of Third ACM SIGPLAN X10 Workshop, pp 39–46.

- O Tardieu, N Nystrom, I Peshansky and V Saraswat "Constrained Kinds", OOPSLA 2012.

- Y Zibin, D Cunningham, I Peshansky, V Saraswat "Object initialization in X10", ECOOP 2012.

- A Shinnar, D Cunningham, V Saraswat, B Herta "M3R: increased performance for in-memory Hadoop jobs", VLDB 2012.

- V Saraswat, P Kambadur, S Kodali, D Grove, S Krishnamoorthy "Lifeline-based global load balancing", PPoPP 2011.

- D Cunningham, R Bordawekar, V Saraswat "GPU programming in a High-level language: compiling X10 to CUDA", Proceedings of the ACM SIGPLAN X10 workshop, 2011.

- D Grove, O Tardieu, D Cunningham, B Herta, I Peshansky, V Saraswat "A Performance Model for X10 Applications", Proceedings of the ACM SIGPLAN X10 workshop, 2011.

- V Saraswat, George Almasi, Ganesh Bikshandi, Calin Cascaval, D Cunningham, D Grove, Sreedhar Kodali, Igor Peshansky, O Tardieu "The Asynchronous Partitioned Global Address Space Model", AMP'10: Proceedings of the First Workshop on Advanced in Message Passing, 2010.

- Ganesh Bikshandi, Jose Castanos, Sreedhar Kodali, Krishna Nandivada, Igor Peshansky, V Saraswat, Sayantan Sur, Pradeep Varma, Tong Wen "Efficient, Portable Implementation of Asynchronous Multi-place Programs", PPoPP 2009.

- Maged Michael, Martin Vechev and V Saraswat "Idempotent Work stealing", PPoPP 2009.

- Nathaniel Nystrom, V Saraswat, Jens Palsberg and Christian Grothoff "Constrained types for OO Languages", OOPSLA 2008.

- Guojing Cong, Sreedhar Kodali, Sriram Krishnamoorthy, Doug Lee, V Saraswat and Tong Wen "Solving irregular graph problems using adaptive work-stealing", ICPP 2008.

- Satish Chandra, V Saraswat, Vivek Sarkar and Ratislav Bodik, "Type Inference for Locality Analysis of Distributed Data Structures", Proceedings of the ACM Symposium on Principles and Practice of Parallel Programming, 2008.

- V Saraswat, R Jagadeesan, Maged Michael and Christoph von Praun, "A Theory of Memory Models", Proceedings of the ACM Symposium on Principles and Practice of Parallel Programming, March 2007.

- Philippe Charles, Christian Grothoff, Kemal Ebcioglu, Allan Kielstra, Christoph von Praun, V Saraswat and Vivek Sarkar "X10: An Object-oriented Approach to Non-Uniform Cluster Computing", Onwards! Track of the Proceedings of OOPSLA 2005.

- V Saraswat and R Jagadeesan "Concurrent Clustered Programming", Proceedings of CONCUR, 2005.

- "Report on the Experimental Language X10", principal author, July 2005.

Semantic foundations for concurrent programming

- V Saraswat, V Gupta, R Jagadeesan "TCC, With History", Horizons of the Mind, 2014, pp 458-475.

- Catuscia Palamidessi, V Saraswat, Frank Valencia and Bjorn Victor "On the expressiveness of linearity and persistence in the pi-calculus", LICS 2006.

- V Saraswat "Constraint-Based Memory Machines: A framework for Java Memory Models", ASIAN 2004, pp 494-508.

- V Saraswat and R Jagadeesan "Static support for capabilities in Java", Second APPSEM workshop, U of Nottingham, April 2003.

- V Gupta, R Jagadeesan and V Saraswat "Models of concurrent constraint programming", Proceedings of the International Conference on Concurrency Theory, LNCS 1119 August 1996.

- V Gupta, R Jagadeesan and V Saraswat "Truly Concurrent Constraint Programming", Theoretical Computer Science, Volume 278, pp 223-255, 2002. Conference version in Proceedings of the International Conference on Concurrency Theory, LNCS 1119 August 1996.

- Ugo Montanari, F Rossi, and V Saraswat "Event structure semantics for concurrent constraint programming", 1994.

- Ugo Montanari, F Rossi, and V Saraswat "CC programs with both in- and non-determinism", 1994.

- Prakash Panangaden, V Saraswat, Phillip J. Scott and Robert Seely, "A Hyperdoctrinal view of concurrent constraint programming", Proceedings of the REX Workshop on Semantics: Foundations and Applications, eds. J. W. deBakker, W.-P. de Rover and G. Rozenberg, LNCS 666, pp 457-476, 1993.

- V Saraswat "The category of constraint systems is Cartesian-closed", Proceedings of the Symposium on Logic in Computer Science, Santa Cruz, June 1992.

- R Jagadeesan, V Saraswat and Vasant Shanbhogue "Angelic non-determinism in concurrent constraint programming", Technical Report, Xerox PARC, 1992.

- V Saraswat and Rinard M. and Panagaden, P. "Semantic foundations for concurrent constraint programming", *Proceedings of the ACM Symposium on Principles of Programming Languages*, Orlando, January 1991.

- Patrick Lincoln and V Saraswat "Proofs as concurrent processes: A logical interpretation for concurrent constraint programming", Technical Report, Systems Sciences Laboratory, Xerox PARC, November 1991. (Revised report, Penn State University, April 2003.)

- V Saraswat and Rinard, M. "Concurrent constraint programming", Proceedings of the ACM Symposium on Principles of Programming Languages 1990, San Fransisco, January 1990.

- V Saraswat "A somewhat logical formulation of CLP synchronization primitives", Proceedings of Logic Programming, August 1988, MIT Press.

- V Saraswat "The language **CP**: Definition and Operational semantics", in Proceedings of the ACM SIGACT-SIGPLAN Conference on Principles of Programming Languages, Munich, January 1987.

- V Saraswat "CP as a general-purpose constraint-language", Proceedings of the National Conference on Artificial Intelligence, (AAAI), Seattle, July 1987.

- V Saraswat "The language GHC: operational semantics and comparison with **CP(!, |)**", Proceedings of the Fourth IEEE Symposium on Logic Programming, San Fransisco, September 1987.

- V Saraswat "Partial Correctness semantics for **CP(!, |, &)**", Proceedings of the Conference on Foundations of Software Technology and Theoretical Computer Science, Springer Verlag LNCS 206, pp. 347-368, December 1985.

Real-time and hybrid systems

- V Gupta, R Jagadeesan and V Saraswat "Computing with Continuous Change", Science of Computer Programming, 30 (1:2) 3-49, 1998.

- V Saraswat, R Jagadeesan and V Gupta "Timed Default Concurrent Constraint Programming", In Journal of Symbolic Computation 22 (5,6) 475–520, 1996. Extended abstract published in the Proceedings of the ACM Symposium on Principles of Programming Languages, San Fransisco, 1995.

- V Gupta, R Jagadeesan and V Saraswat "Hybrid CC, Hybrid Automata, and Prgram Verification", Hybrid Systems Workshop, DIMACS, Rutgers, October 1995. Appeared in Hybrid Systems III Verification and Control ed. R. Alur, T.A. Henzinger, E.D. Sontag (LNCS 1066), Springer-Verlag, Berlin, 1996.

- V Gupta, R Jagadeesan, V Saraswat, and Daniel Bobrow "Programming in Hybrid Constraint Languages", Hybrid Systems Workhsop, Cornell, October 1994. Hybrid Systems II, ed. P. Antsaklis, W. Kohn, A. Nerode, S. Sastry (LNCS 999), Springer-Verlag, Berling, 1995.

- V Saraswat, R Jagadeesan and V Gupta "Foundations of Timed Concurrent Constraint Programming", Proceedings of the Symposium on Logic in Computer Science, Paris, July 1994.

- V Saraswat, R Jagadeesan and V Gupta "Programming in Timed Concurrent Constraint Programming", Chapter in Constraint Programming, ed. B. Mayoh and E. Tyugu, NATO ASI Workshop, April 1994.

Concurrent programming languages and paradigms

- V Saraswat, R Jagadeesan and V Gupta "jcc: Integrating timed default concurrent constraint programming into java", Proceedings of the Eleventh Portugese Conference on Artificial Intelligence (EPIA '03), Springer Verlag LNCS, December 2003.

- V Saraswat "Java is not type-safe", Web-note `http://www.research.att.com/ vj/bug.html`. Described a major bug in the design of the class-loader mechanism. This was acknowledged and fixed by Sun in a major redesign. See Bracha and Liang's paper in OOPSLA 98.

- Pascal van Hentenryck, Yves Deville, V Saraswat "Design, implementation and evaluation of the constraint language cc(FD)", Journal Of Logic Programming 37(1-3):139-164 (1998). Conference paper in LNCS 910, pp 293-316 (1994).

- V Saraswat and Patrick Lincoln "Higher-order, linear concurrent constraint programming", Xerox PARC Technical report, August 1992.

- V Saraswat and Kenneth Kahn and Jacob Levy " Janus: A step towards distributed constraint programming", *Proceedings of the North American Conference on Logic Programming*, Austin, Texas, October 1990.

- Kenneth Kahn and V Saraswat "Actors as a special case of concurrent constraint (logic) programming", *Proceedings of the ECOOP/OOPSLA conference, 1990.*

The Janus work has significantly influenced the development of the (distributed, secure) language E, currently being developed by an open source group (`www.erights.org`), and partly funded by a DARPA grant to Mark S. Miller.

Constraint programming in Software Engineering

- R Jagadeesan, Will Marrero, Corin Pitcher and V Saraswat "Timed Constraint Programming: A Declarative Approach to Usage Control", Proceedings of Principles and Practices of Declarative Programming, June 2005.

- V Saraswat "Compositional Computing", CONSTRAINTS 2(1):95-97 (1997)

- F Rossi and V Saraswat "Constraint Programming", in Encyclopedia of Computer Science and Technology (entry: Constraint Programming), A. Kent and J.G. Williams eds, Marcel Drekker Inc, 1994.

Program Sketching

- Armando Solar-Lezama, Gilad Arnold, Liviu Tancau, Ratislav Bodik, V Saraswat and Sanjit Seshia "Sketching Stencils", in ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI '07).

- Armando Solar-Lezama, Liviu Tancau, Ratislav Bodik, V Saraswat "Combinatorial Sketching for Finite Programs", in ASPLOS 2006.

Concurrent programming: techniques, algorithms

- Rajeev Motwani, Suresh Venkatsubramaniam, Rina Panigrahy, V Saraswat "On the decidability of accessibility problems", ACM Symposium on the Theory of Computing, 2000.

- Eric Torng, Rajeev Motwani, and V Saraswat "Online scheduling with lookahead: Multipass assembly lines" INFORMS Journal on Computing, 1998.

- Saraswat, V.A. et al. "Detecting stable properties of networks in concurrent logic programming languages", in Proceedings of the ACM Conference on Principles of Distributed Computing, Toronto, August 1988.

- V Saraswat "Merging many streams efficiently: the importance of atomic commitment", chapter in "Concurrent Prolog: Collected Papers", ed. E. Shapiro, MIT Press, December 1987.

Applications

Visual programming

- Kenneth M. Kahn and V A. Saraswat "Complete visualization of concurrent programs and their execution", Proceedings of the IEEE Workshop on Visual Programming, October 1990.

This work led to a rich body of work on Visual Programming, cf. Pictorial Janus systems, and also to the company *Animated Programs* founded by Ken Kahn. The company has introduced a revolutionary product for school-children "ToonTalk", in the tradition of Logo. See `www.toontalk.com`.

Multi-modal Systems

- Stephane Maes and V Saraswat "Multi-Modal Requirements", W3C Note, January 2003.

Network communities

- V Saraswat and F Pereira "Interaction media: Some thoughts on models for cyberspace", Proceedings of the Virtual Worlds in Simulation Conference, San Francisco, January 1999.

- V Saraswat "Design requirements for network spaces", Proceedings of the Virtual Worlds in Simulation Conference, San Francisco, January 98.

- Jay Carlson, Roger Crew, Ken Fox, Richard Goddard, Dave Kormann, Erik Ostrom, John Ramsdell, V Saraswat, Andrew Wilson "The MUD Client Protocol, Version 2.1", http://www.moo.mud.org/mcp2.

- V Saraswat "The dog, the catcher, the fish and the frying pan: Melding work, play and theater in network community", Virtual Communities 97, February 1997, Sydney, Australia.

- Vicki O'Day, Daniel Bobrow, Billie Hughes, Kimberly Bobrow, V Saraswat, JoAnne Talazus, Jim Walters, Cynde Welbes "Community Designers", Participatory Design Conference, 1996.

- Daniel Bobrow, Vicki O'Day, V Saraswat, Billie Hughes and Jim Walters "Learning through computationally-mediated conversations: Interaction and Construction in virtual spaces", Presented at the Annual Meeting of the American Anthropological Association, Washington D.C., November 1995.

Professional activities

Selected Invited Presentations

- Invited talk at ILP'16 (Inductive Logic Programming), London, Sep 2016.

- Invited talk at DISCO'16, Crete, Greece, June 2016.

- Invited talk on X10 at U Pennsylvania, Feb 2015.

- Invited talk on "Writing Robust Applications in Resilient X10" at ACSI 2015, Tsukuba, Jan 2015.

- Invited talk at Exascale Runtime workshop on Resilient X10 at TU Munich, December 2014.

- Invited talk on Resilient X10 at ETH Software Correctness and Reliability Worshop, Zurich, October 2014.

- Participant in School on "Constraints, Data and Optimization", Dagstuhl, October 2014.

- Invited talk at CP'14, Lyon, September 2014.

- Keynote on "Computing in the post-cloud era" InForum, Porto, Portugal, September 2014.

- Invited talk on "Programming in X10", Department of Engineering, Padua University, June 2014.

- Invited talk on "C10: Probabilistic Concurrent Constraint Programming" at Software Day, Tsinghua University, April 2014.

- Invited talk on "Constraints Solvers in X10" at CPAIOR 2013.

- Invited talk on X10 at AICS International Symposium, Kobe, February 2013.

- Invited talk at Parallel Constraint Solver workshop at Shonan, Tokyo, May 2012.

- Invited talk at Yonezawa Festschrifft, Kobe, May 2012.

- Invited talk at PMCS Workshop, International Conference on Constraint Programming (CP'11), Perugia, Sep 2011.

- Keynote at Ohio LinuxFest 2011 on "Programming in the Concurrency Era: The X10 Programming Language", Columbus, Sep 2011.

- Keynote at LCPC on "Constrained types: What they are, and what they can do for you", Fort Collins, Sep 2011.

- PGAS Tutorial at Supercomputing 2008 (with Tarek el-Ghazawi and Brad Chamberlain).

- Lectures at Waseda University as Global COE Visiting Professor, April 2008.

- "X10: Programming Parallel machines, productively", Keynote talk at ASPLAS 2007, November Singapore.

- X10 tutorial at PACT 2006, OOPSLA 2006, PPoPP 2007, PLDI 2007.

- X10 lectures at "Trends in Concurency" Summer School at Bertinoro, Italy.

- "X10: An Object-Oriented Approach to Non-uniform Computing", IBM PL Day, April 2005.

- "Hybrid Synchronous Languages", NYU, March 2005.

- "Hybrid Constraint Programming", ETAPS Workshop on "Synchronous Languages, Applications and Programming", Barcelona, March 2004.

- "The Emergence of Systems Biology", NJPLS February 2004.

- Penn State Logic Seminar, "The logic of concurrent constraint programming", April 2003.

- Invited participant, CUE Workshop on Component-based systems, Macau, China SAR, October 2002.

- IBM Research (T.J. Watson Research Lab) "Java as a metalinguistic framework", September 2002.

- IBM Research (T.J. Watson Research Lab) "The design of M" October 2002.

- Chair, session on Multimodal Instant Messaging (Pulver Presence and Instant Messaging Industry meeting), October 2001.

- Chair, session on Wireless Instant Messaging (Pulver Presence and Instant Messaging Industry meeting), October 2000.

- Invited Plenary Talk at "Instant Messaging 2000", Boston, May 2000.

- Tutorial on Concurrent Constraint Programming at CONCUR '96, Pisa Italy.

- Invited Talk at Workshop on Language, Logic and Information, CSLI, May 1996.

- Stanford University Theory Group, "Hybrid Constraint Programming", May 1996.

- Distinguished Seminar in Programming Languages, U. of Chicago, May 1996 "Virtual World Programming Languages".

- Invited talk, First International Conference on Constraint Programming, Cassiss, France, September 1995.

- Invited to attend Institute on Semantics of Programming Languages at Newton Institute, Cambridge, August 1995.

- Keynote talk, First International Workshop on Concurrent Constraint Programming, Venice, May 1995.

- Invited Talk on Timed Concurrent Constraint Programming, Royal Institute of Mathematics, Kyoto, August 1994.

- Workshop on Information Systems, Cosener House, Oxford, March 1992 (organized by Samson Abramsky and Bill Rounds).

- Sixth Italian Logic Programming Conference (GULP '91) on "The Past as Prolog: Beyond Logic Programming".

- Tutorial on "The semantics of concurrent constraint programming languages" at the North American Logic Programming Conference, Austin, Texas, October 1990.

- Tutorial on "The paradigm of concurrent constraint programming", at the Seventh International Conference on Logic Programming, Jerusalem, June 1990.

- "Gigalips Workshop", Swedish Institute of Computer Science, Stockholm, April 1989 (organized by Seif Haridi).

- Workshop on "Languages and Constraints" University of Rhode Island, April 1988 (organized by J. Cohen and J-.L.Lassez).

- AAAI-sponsored workshop on "Concurrent Logic Programming and Open systems", Xerox PARC, September 1987 (organized by Ken Kahn).

- Talks on various aspects of concurrent constraint programming at CMU, Cornell, MIT, Yale, UC Berkeley, Oxford University, U. of Edinburgh, Imperial College, University of Texas at Austin, AT&T Bell Labs, U. of Pennsylvania, IBM T.J. Watson Research Center, U. of Utah, U. of Arizona, U. of Pisa, INRIA Versailles, Swedish Institute of Computer Science, Bristol Univ., Penn State University etc.

Refereeing responsibilities

- Journal of Logic Programming;

- Artificial Intelligence;

- Journal of the Association for Computing Machinery;

- Theoretical Computer Science;

- IEEE Computer;

- IEEE Software;

- National Science Foundation (multiple panels)

- DoE ASCR (multiple panels)

- Science of Computer Programming

- IEEE Transactions on Computers;

Editorial and Review Responsibilities

- Program Committee, AAAI 2016, PPoPP 2016.

- Program Committee, PPoPP 2014, ParSearchOpt 2014, EuroPar 2014.

- Program Committee, PPoPP 2013, SuperComputing 2013.

- Program Committee, OOPSLA 2010, PPoPP 2010; External Program Committee, PLDI 2010.

- Program Committee, LICS 2009.

- Program Committee, Coordination, 2008; Places 2008.

- Program Committee, Compiler Construction, 2007.

- Program Committee, European Symposium on Programming, 2007.

- Program Committee, HiPC, 2007.

- Program Committee, Concur 2005.

- Program Committee, Interational Conference on Supercomputing 2005.

- Program Committee, Workshop on Productivity in High Performance computing, 2005.

- Editorial Advisor, Journal for Logic Programming till 2004.

- Program Committee, COLOPS 2004.

- Program Committee, Computational Methods in Systems Biology, 2004.

- Chair, Program Committee, ASIAN 2003. Proceedings published by Springer Verlag.

- Session Organizer for "Web services", Second Workshop, Venice, Oct 2003. Invited by the Steering Committee for the CUE Initiative on The Scientific Foundation of Informatics as an Engineering Discipline.

- Co-organizer, Dagstuhl seminar on Concurrent Constraint Programming, 1997.

- Program Committee, ASIAN 1996.

- Program Committee, Algebraic and Logic Programming, 1996;

- Program Committee, Principles of Programming Languages, 1996.

- Program Committee, Principles and Practice of Constraint Programming, 1994.

- Co-organizer and Co-Program Chair, Principles and Practice of Constraint Programming, 1993.

- Program Committee, Fifth Generation Computer Systems, 1992.

- Program Committee, Algebraic and Logic Programming, 1992;

- Program Co-Chairman, International Logic Programming Symposiumm, 1991;

- Program Committes, North American Logic Programming Conference, 1989, 1990;

- Program Committee, International Conference on Logic Programming, 1990,1991;

Professional Societies

ACM (SIGPLAN).

Past member of Association for Logic Programming, IEEE, American Association for Artificial Intelligence, European Association for Theoretical Computer Science, American Anthropological Association, American Association for the Advancement of Science, SIAM.