

Jaswinder Pal Singh

Professor, Computer Science Department
Director, Program in Integrative Information, Computer and Application Sciences (PICASso)
Princeton University, Princeton, NJ 08544
Past Chief Technology Officer, firstRain, Inc. and Right Media, Inc.
(609) 258-5329, jps@cs.princeton.edu

EDUCATION

Stanford University. Ph.D. in Electrical Engineering, 1993.

Stanford University. M.S. in Electrical Engineering, 1989.

Princeton University. B.S. in Electrical Engineering and Computer Science, 1987, summa cum laude.

PROFESSIONAL EXPERIENCE

- 7/05 – present Professor, Computer Science Department, Princeton University.
- 9/99 – present Director, Program in Integrative Computer and Application Sciences (PICASso), a multi-department, university-wide interdisciplinary program at the boundary of computer science and a broad range of application sciences, including Scalable Internet Services. Developing and fostering new interdisciplinary courses, new practice-oriented workshops in scalable computing based on needs gathered from multiple departments, new interdisciplinary seminar series, and programs in effective written and oral scientific communication, as well as funding students and running the program. Creating a core of courses for an interdisciplinary computational science curriculum, taught by faculty in different departments.
- 9/05 – present Director of Princeton portion of Center for Modeling Viral Immunity and Antagonism, a \$20+M NIH Center involving Mount Sinai School of Medicine and Princeton University. Member, Executive Committee of Center.
- 9/00 – 10/05 Co-founder and Chief Technical Officer, firstRain, Inc. (on leave from Princeton University 9/00 to 6/02). Developing novel Internet/Web applications and Internet infrastructure. Improved and developed new protocols for web-based communication and information access.
- 7/99 – 6/05 Associate Professor, Computer Science Department, Princeton University.
- 3/99 – present Consultant, NOAA Geophysical Fluid Dynamics Laboratory. Aiding in the shift from vector to parallel computing, and in the procurement of large parallel computing and analysis infrastructures.
- 2/95 – 6/99 Assistant Professor, Computer Science Department, Princeton University. Performing research in parallel computer systems and applications. Focus on (i) scalable multiprocessing in both the shared address space and message passing paradigms, including studying the programming and performance tradeoffs between the two, (ii) understanding how shared address space abstractions might be supported using commodity parts, and how applications might be restructured for such systems, and (iii) the use of high-performance computing in biology, medicine, cosmology and computer graphics. Advising several Ph.D. students in these areas.
- 2/93 - 1/95 Research Associate, Stanford University. Leading the parallel applications effort in the Stanford DASH/FLASH research groups, and studying the implications of these applications for the design of multiprocessor software and hardware systems. Evaluating performance of real and simulated systems, and developing methodologies for the above. Expanding the SPLASH suite of parallel applications to SPLASH-2. Advising several Ph.D. students.
- 10/87 – 2/93 Research Assistant, Stanford University. Developing parallel scientific and engineering applications and studying their implications for parallel processing systems, software and architecture. Studying the scaling of applications and architectures. Creating and distributing the SPLASH suite of parallel applications.
- 6/88 – 8/88 Research Intern, IBM Research, Hawthorne, New York. Developed a model of uniprocessor workload behavior and applied it to predicting cache miss rates.

HONORS

- *Presidential Early Career Award for Scientists and Engineers (PECASE)*, 1997. Awarded to twenty young scientists and engineers in the United States selected from all areas of science/engineering by the National Science Foundation.
- *Sloan Research Fellowship*, 1997. Awarded to about 10 young computer scientists every year.
- Paper selected as Best student paper in USENIX USITS Symposium, 2000.
- Paper selected for journal publication from the International Conference on Supercomputing, 1999.
- Paper selected for Journal of Computational Biology from the RECOMB computational biology conference, 1998.
- Paper selected for journal publication from the Symposium on Parallel Algorithms and Architectures, 1996.
- Paper selected for journal publication from the Symposium on Parallel Algorithms and Architectures, 1996.
- Paper nominated for Best Student Paper Award for Supercomputing'97.
- Two papers selected among best 5 submitted to the Intl. Symposium on Computer Architecture (1992 and 1993), one of them as "Impact Paper" for the Federated Computer Research Conferences, 1993.
- *Summa cum laude*, Princeton University. Princeton University Undergraduate Scholarship.
- Member of Phi Beta Kappa, Tau Beta Pi and Sigma Xi since 1987.

TEACHING

Have taught many graduate-level courses in Internet services, protocols and infrastructure, as well as in scalable distributed and parallel computing and in analysis of data.

- Spring 06 New Interdisciplinary Course: Dynamic Simulation and Data Analysis Methods for Science and Engineering. A new, interdisciplinary Graduate course offered under the PICASso program, designed to expose students from many departments across the university to a range of computational methods for analysis of data and integration with dynamic simulation models, their use in real applications from different domains, and scalable parallel computing for them. Team-taught by faculty from multiple disciplines in science and engineering.
- Fall 05 New Interdisciplinary Course: Scalable Computing Systems and Applications. A new, interdisciplinary course on parallel computing systems and applications, catering to students in a variety of departments, mostly in science and engineering (including computer science).
- Spring 04 New Interdisciplinary Course: Computational Methods and their Use Across Scientific Disciplines. A new, interdisciplinary Graduate course offered under the PICASso program, designed to expose students from many departments across the university to a range of computational methods, their use in real applications from different domains, and scalable parallel computing for them. Team-taught by faculty from multiple disciplines in science and engineering at Princeton.
- Fall 03 Scalable Internet Services, graduate course at Princeton University
- Spring 03 and 05 COS 111: Computers and Computing, undergraduate course at Princeton University
- Fall 99 and 02 Scalable Internet Services and Infrastructure, graduate course at Princeton University.
- Fall 95 – 98 Introduction to Programming Systems, sophomore course at Princeton University (4 times)
- Spring 95 – 98 Parallel Computer Architecture and Programming, graduate course at Princeton University (3 times)
- 8/95 Instructor, Parallel Computer Architecture, Western Institute in Computer Science, Stanford, CA.
- 4/93 – 6/93 Instructor, Distributed Shared Address Space Multiprocessing, a 6-week course on scalable parallel computing (hardware and software) for advanced engineers and researchers at Silicon Graphics Inc.
- 4/91 – 6/91 Project Advisor and Lecturer, Stanford University. CS 315B: Parallel Programming Project. Defined and closely advised three projects that produced realistic parallel applications.
- 4/90 – 6/90 Teaching Assistant and Lecturer, Stanford University. CS 315B: Parallel Programming Project. Defined and closely advised projects that produced realistic parallel applications in a 10-week course.
- 1/90 – 1/95 Project Advisor, Stanford University. EE 391: Special Studies in Electrical Engineering. Defined and guided projects to introduce graduate students into research in parallel processing.

Ph.D. DISSERTATIONS SUPERVISED (Completed)

- Chi Zhang. A Peer-to-peer substrate for Distributed Search Trees. 2006. Joining Google, Inc.

- Fengyun Cao. MEDYM: A distributed content-based publish-subscribe system. 2006. Currently at Goldman Sachs, Inc.
- Mao Chen. Using Explicit User Information to Improve Internet Services. August 2004. Currently at IBM T.J. Watson Research Labs.
- Yefim Shuf. Improving the Memory Performance of Java Programs. Princeton University. Completed April 2003. Currently at IBM T.J. Watson Research Labs.
- Steven Kleinstein. Princeton University. Towards Quantitative Modeling of Immune System Dynamics. Completed 2002. Starting as Assistant Professor at Yale University, 2006.
- Hongzhang Shan. Princeton University. A Comparison of Programming Models for High-Performance Parallel Computing. Completed 2001. Currently at Los Alamos National Laboratory.
- Dongming Jiang. Princeton University. Performance Portability on Shared Address Space Architectures. Protein Structure Determination in the Presence of Uncertainty: Algorithms and Parallelism, 1999. With Russ Altman (Stanford Medical School).
- Angelos Bilas, Princeton University. Using Network Interfaces to Accelerate Software Shared Memory, 1998. Currently tenured faculty at University of Toronto.
- Liviu Iftode, Princeton University. Shared Virtual Memory using Automatic Update, 1998. With Kai Li. Currently tenured faculty at Rutgers University.
- Steven Cameron Woo, Stanford University. Integrating Block Data Transfer in Cache-coherent Multiprocessors. 1997. With John Hennessy. Currently at Rambus, Inc.
- Chris Holt, Stanford University. Application and Architectural Bottlenecks in Distributed Shared Memory Multiprocessors, expected 2003. With John Hennessy. Currently at Transmeta, Inc.
- Alexander Kozlov, Stanford University. Probabilistic Inference in Belief Networks: Algorithms and Parallelism, 1998. With John Hennessy and later Daphne Koller. Currently at Silicon Graphics, Inc.

Others in progress. Served on dissertation committees of several others, past and present.

PROGRAM COMMITTEES

Have served on the program committees and as program chair and track chair of many ACM, IEEE and other conferences in scalable computing, including the International Symposium on Computer Architecture, Supercomputing/SC, SIGMETRICS Conf. on Measurement and Modeling of Computer Systems, Principles and Practice of Parallel Programming, Symposium on Parallel Algorithms and Architectures, International Conference on Supercomputing, International Parallel Processing Symposium, International Conference on Parallel Processing etc, as well as several ACM and IEEE workshops on scalable computing, data analysis and mining, architecture, and languages and compilers.

INVITED EVALUATION COMMITTEES AND TALKS

Have served on several invited government research/education program and proposal evaluation committees, including for the US Government (NOAA's procurement programs and the National Science Foundation) and the Swedish Government (Evaluating the ARTES/PAMP national program for scientific research and graduate education in high-performance computing, as well as other programs for the Swedish Research Council). Have also served as an external evaluator for faculty hiring at Uppsala University, Sweden.

Have delivered many invited presentations and lectures at a variety of international and domestic venues, including

- Conference panels and invited presentations at ISCA, ASPLOS, SIAM and other conferences and workshops
- NSF and DARPA PI meetings in scalable computing and interdisciplinary research and education
- International government programs (Sweden and India, including India's cross-IIT TECHFEST)
- U.S. universities such as UC Berkeley, U. Washington, Stanford, NYU, U of Toronto, SUNY, etc.
- International universities in Italy, Japan, Sweden and India
- Industrial research laboratories such as Microsoft, Sun, IBM, Panasonic, Siemens etc.
- Government research laboratories such as NASA, Sandia, Argonne, PPPL (plasma physics) and GFDL (climate)
- Several industrial conferences and trade shows, industrial/academic and executive summits involving web-based information access, search, dissemination/communication and intelligence.

PATENTS

Ten U.S. patents filed.

Two already awarded.

- Method and apparatus for focused discovery of documents.
- Method and apparatus for a wireless search engine.

SAMPLE GRANTS RECEIVED

(Only a small sample of different types of grants listed here, for space reasons. Only examples included are those in which I am Principal Investigator, not Co-Principal Investigator.)

- National Institutes of Health. HHSN266200500021. 9/30/05 to 9/29/10. \$20,250,000. PI of Princeton Portion.
- National Science Foundation IGERT Grant, No. DGE-9972930. 8/1/00 to 9/31/08. Funds up to fourteen graduate students per year in scalable internet services, computing and data analysis. \$2,172,000.
- National Science Foundation. Presidential Early Career Award for Scientists and Engineers (PECASE). Only computer scientist to receive it that year. 3/1/97 to 2/28/05. \$500,000.
- National Science Foundation. CISE Research Award. 9/15/98 to 8/31/03. \$980,000.
- National Science Foundation. CISE Instrumentation Award. Three projects in applications and scalable computing. \$2,172,000.
- National Science Foundation. Adaptive Performance Portable Software for Next-Generation Applications. 9/15/99 to 8/31/03. \$600,000.
- firstRain, Inc. Collaborative Student Research Grant. 9/1/00 to 6/30/01.
- National Oceanic and Atmospheric Administration. 7/1/04 to 9/30/07. \$120,000.
- Alfred P. Sloan Foundation. Sloan Research Fellowship. 9/1/98 to 9/15/2000. \$35,000.

PROFESSIONAL ORGANIZATIONS

The Association for Computing Machinery

Institute of Electrical and Electronics Engineers, Inc.

Phi Beta Kappa, Tau Beta Pi, Sigma Xi

PUBLICATIONS

One leading graduate/practitioner level textbook and over 100 refereed conference and journal publications.

Textbook

David E. Culler, Jaswinder Pal Singh. *Parallel Computer Architecture: A Hardware-Software Approach*. With Anoop Gupta. Morgan Kaufmann Publishers, 1998. Leading textbook in parallel architecture and programming.