Jeanne Ferrante

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Career Goal

Leadership position emphasizing service, community, and diversity.

Education

- Ph.D., 1974, Mathematics, MIT, Cambridge MA.

    Thesis: "Some Upper and Lower Bounds on Decision Procedures in Logic"

- B.A., 1969, Natural Sciences, High Honors in Mathematics, New College at Hofstra University, Hempstead, NY

Recognition

- Thomas A. Kanneman Outstanding Service Award, SD County Engineering Council, 2009

- Athena San Diego Pinnacle Educator of the Year Award, 2007

- ACM Sigplan Programming Languages Achievement Award for the development of Static Single Assignment (SSA) form (with Ron Cytron, Barry Rosen, Mark Wegman and Ken Zadeck). SSA is a program representation that yields faster, more compact and powerful program optimizations, and the award recognizes SSA as a "significant and lasting contribution to the field of programming languages". My contributions led to algorithms that efficiently compute SSA, enabling its implementation in many commercial and research compilers, including GCC (GNU Compiler Collection). 2006

- IEEE Fellow, for contributions to optimizing and parallelizing compilers. 2005

- Highly Cited Researcher, a designation given to "less than one-half percent of all publishing researchers," ISIHighlyCited.com. 2005

- UCSD Community Champion for Diversity Award, Academic Affairs. 2004, 2012

- ACM Fellow, for the development of intermediate program representations for program optimization and parallelization that are fundamental to current optimizing compilers. 1996

- IBM Outstanding Innovation Award, for co-inventing Static Single Assignment form. 1992

- IBM Outstanding Innovation Award, for co-inventing the Program Dependence Graph, a program representation of essential control and data flow to expose maximal parallelism. 1988

Employment

- 1994 - present: University of California, San Diego

  – Associate Vice Chancellor for Faculty Equity, July, 2008 - 2013

  Provided academic leadership in advancing faculty diversity. Helped initiate Faculty Equity Advisors in each UCSD school/division. Worked with the Advisors to remove barriers to faculty equity in policies and procedures and foster an inclusive climate. Accomplishments include:
    * Initiated and implemented new recruiting procedures that promote and incorporate faculty contributions to diversity
    * Annual New Chairs Orientation and quarterly Department Chairs Forums
    * Initiated and implemented annual search committee orientations on best practices
    * Put in place new Academic Advancement Advising program that matches ex-members of the committee for academic review with junior faculty prior to tenure
    * Co- or campus PI on 3 NSF PAID grants to foster gender equity in STEM (2007 – 2016)

  – Professor, Computer Science and Engineering Department, 1994 - present

    * Co-Founder, Hierarchical Tiling Laboratory
    * P.I. or Co-P.I. on $5 million in grants and gifts from National Science Foundation, UC Micro, Intel, and other foundations
    * Taught undergraduate courses in Compilers, Theory of Computation, Women in Computing, Principles of Team Engineering, and Team Engineering Laboratory with average recommendation rating 90 %
    * Taught graduate courses in parallelism, program analysis, and optimization
    * Ph.D. Students Graduated
      · Val Donaldson, 1997 (Sun Microsystems)
      · Karin Högstedt, 1999 (ATT Bell Labs; SAP Research)
      · Nick Mitchell, 2000 (IBM T.J. Watson Research Center)
      · Beth Simon, 2002 (UC, San Diego)
      · Barbara Kreaseck, 2003 (Associate Professor, La Sierra University)
      · Michelle Mills Strout, 2003 (Associate Professor, Colorado State University)
      · Sagnik Nandy, 2006 (Google)
      · Michael McCracken, 2010 (Oracle/Sun)

  – Associate Dean, Jacobs School of Engineering, July 2002 - July 2013
    Quality of Undergraduate Education
    * Global Teams In Engineering Service (http://globalties.ucsd.edu): Global TIES is an academic program that partners multidisciplinary teams of undergraduates with local and global non-profit organizations. Now in its eighth year, over 300 UCSD students per year design, build and deploy projects that solve technology-based problems for community clients. As co-founder and past Executive Co-Director, my recent role has been curriculum design and development, and oversight. I was Principal Investigator of an NSF ITEST Environmental Education Initiative that funded a TIES project with middle school teachers from 2006 - 2010. TIES iss one of three UCSD programs which resulted in our inclusion for the fourth year in a row in the President's Community Service Honor Roll with Distinction. 2004 - present

Diversity, Leadership, and Gender Equity

* Faculty Recruiting: After 1995, with the adoption of UC Regents SP-2 and California Proposition 209, there was a significant drop in the diversity of new faculty hires at UC. Between 1995 and 2003, the Jacobs School hired 62 full-time Engineering faculty, of which 60 were male and 2 female, with an overall net loss of two women faculty. Starting in 2003, I worked in collaboration with the Dean, UC legal counsel, and Academic Affairs, to institute two new policies in 2004: engineering recruiting was broadened to include serious consideration of excellent candidates in all departmental areas, and faculty candidates are asked to provide contributions to diversity accomplishments so that these activities can be used in selection. From 2004 to 2009, at least two new female academic appointments were made in Engineering each year (14 out of a total of 63). In 2010-12, Engineering conducted, and I co-chaired, two divisional faculty searches with contributions to diversity as a primary criterion. These resulted in the hiring of five excellent faculty with strong accomplishments in contributing to groups underrepresented in Engineering, including the school's first two African American faculty members. Our experience with these successful practices led me to work as AVC towards their adoption campus-wide. 2003 - 2013

* Professional Development and Leadership: UCSD Women's Leadership Alliance: This grass-roots organization of over 100 senior faculty and staff promotes networking, leadership, professional development, and recognition of women campus leaders. I co-founded the group, obtained campus funding, and chair the steering committee. (http://advance.ucsd.edu) 2004 - present

* UCSD Gender Equity Summit: Brought together over 60 senior admininstrators and faculty to discuss leadership, recruitment and retention, climate, and pipeline issues. Recommendations from the Summit led to the development of the UCSD Women's Leadership Alliance. My role was Chair of the Organizing Committee and primary author of the report. 2004

– Department Chair, Computer Science and Engineering, 1996-1999, and Vice Chair for Recruiting, 1999-2000

* Recruiting: I led the effort that added eleven excellent CSE faculty members from 1996 - 2000.
* Departmental Recognition: US News and World Reports ranking of CSE's graduate computer science program improved from 30 in 1996 to 13 in 2006, a rise unmatched by any other computer science department.
* Departmental Support: CSE received its first NSF Research Infrastructure Grant ($1.5 million) in 1998. (I was co-P.I.) I also initiated and developed the CSE Industrial Liaison Program. The initial program of 7 industry sponsors brought departmental discretionary funds, as well as donations from Sun, HP, Microsoft, and Micron to furnish and renovate three student computing laboratories with over 200 computers. 1998 - 2000

- 1978 - 1994: Research Staff Member, IBM T.J. Watson Research Center, Yorktown Heights, NY

  – **PTRAN**: Most of my IBM work was on the PTRAN (Parallel Translation) project, whose goal was to generate parallel programs automatically from Fortran programs.

  – US Patents

  Compiler for machine-independent optimization of data movement, ownership transfer, and device control: Provides a method to expose to compilers the power of manipulating data transfer and ownership. (No. 5548761, issued 1996, with V. Balasundaram and J.L. Carter)

  System and method for solving monotone information propagation problems: Provides a method for constructing sparse evaluation graphs, a generalization of Static Single Assignment form, enabling more efficient solution of a large general class of data flow problems. (No. 5327561, issued 1994, with J.-D. Choi and R. Cytron)

- 1974 - 1978: Assistant Professor, Mathematics, Tufts University, Medford, MA

Visiting Positions

- Honorary Research Fellow, University of Auckland, New Zealand, 2000 - 2001

- Research Faculty, École Normale Supérieure de Lyon, 2001

- Research Scientist, University of Colorado, Boulder, 1992 - 1993

- NSF Visiting Professorship for Women, Computer Science, UC, Berkeley, 1985 - 1986

Distinguished Lectureships

- Computer Science, Colorado State University, 2001

- University of Chicago Distinguished Colloquia in Computer Science, 1999

- Programming Languages, University of Wisconsin-Madison, 1994

- ACM National Lecturer, 1984 and 1989

Additional Academic Service

- Computing Research Association, Member of Board of Directors, 2012 – present

- Advisory Boards, Gordon Engineering Leadership Center, 2009 - present; UC Santa Barbara Computer Science Department, 2012 – present

- External Reviewer, Computer Science, UC Santa Barbara, 2011; Computer Science, Purdue University, 2004; Computer Science and Engineering, University of Washington, 2000; Computer Science, Colorado University at Boulder, 1998

- ACM Programming Language Design and Implementation (PLDI): General Chair, 2007; Program Committee, 2005

- Grace Hopper Celebration of Women In Computing, TechLeaders Co-organizer, Local Arrangements Co-Chair, Computing and Community Committee, 2006; Invited Speaker, 1997

- NSF-INRIA Workshop, Scheduling for Large-Scale Distributed Platforms, Co-organizer, 2004 and 2005

- ACM Transactions on Architecture and Compiler Optimization, Associate Editor, 2003 - 2005

- International Conference on Compiler Construction (CC), Program Committee, 2004

- Euro-Par, Section Vice Chair, Compilers for High Performance, 2002

- Parallel Architectures and Compilation Techniques (PACT), sponsored by IFIP, ACM and IEEE, Program Committee, 1996 and 2000

- International Workshop on Languages and Compilers for Parallel Computing (LCPC), Co- Chair, Program Committee, 1999. Co-editor of proceedings, 1998 - 2000

- ACM Principles and Practice of Parallel Programming (PPOPP), Founding Steering Committee Chair, 1990 - 2001; Conference Chair, 1995; Program Chair, 1991; Program Committee,1990

- ACM Principles of Progamming Languages (POPL) Program Committee, 1998 and 1990; Conference Co-Chair, 1988

- Dagstuhl Seminar on Tiling for Optimal Resource Utilization, Program Organizer, 1998

- Journal of Programming Languages, Chapman and Hall, Co-editor, 1993 - 1996

- Workshop on Performance and Portability for Parallel Processing, Southampton, Co-organizer, 1993. Co-editor of resulting book, Wiley, 1994

- IEEE Frontiers of Massively Parallel Computation, Program Committee, 1992

- High Performance Computing, Networking and Storage Conference (SC'90), Session Chair, Program Analysis, 1990

- Faculty Advisor, Women In Computing, 2000 - 2010

- Invited Speaker, Mentoring for Engineering Academia II Workshop, BIRS, 2007

- CRA-W Distinguished Professor, NSF Cohort of Associate Professors Project, 2004

- Invited Speaker, CRA-W Graduate Cohort Workshop, February 2004

- Invited Speaker, CRA-W Career Mentoring Workshop, 2003

- CRA-W Distributed Mentor, summer, 2003 and summer, 1999

Research Interests

Transforming computer programs to make better use of parallelism and memory; scheduling large distributed computer systems.

Other Interests

Biking, hiking, playing piano, painting.

Selected Journal and Refereed Conference Publications

Scheduling Large Distributed Systems

O. Beaumont, L. Carter, J. Ferrante, A. Legrand, L. Marchal, Y. Robert, "Centralized versus distributed schedulers for multiple bag-of-task applications," IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2006.

B. Kreaseck, L. Carter, H. Casanova, J. Ferrante, and S. Nandy, "Interference-aware scheduling," International Journal of High Performance Computing Applications, 20(1):45–59, February 2006.

S. Nandy, L. Carter, and J. Ferrante, "GUARD: Gossip Used for Autonomous Resource Detection," IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2005.

S. Nandy, L. Carter, and J. Ferrante, "A-FAST: Autonomous Flow Approach to Scheduling Tasks," International Conference on High Performance Computing, December 2004.

C. Banino, O. Beaumont, L. Carter, J. Ferrante, A. Legrand, and Y. Robert, "Scheduling strategies for master-slave tasking on heterogeneous processor platforms," IEEE Transactions on Parallel and Distributed Systems, 15(4):319–330, April 2004.

B. Kreaseck, L. Carter, H. Casanova, and J. Ferrante, "Autonomous protocols for bandwidth-centric scheduling of independent tasks applications," IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2003.

O. Beaumont, L. Carter, J. Ferrante, A. Legrand, and Y. Robert, "Bandwidth-centric allocation of independent task on heterogeneous platforms," IEEE International Parallel and Distributed Processing Symposium (IPDPS), April 2002.

V. Donaldson and J. Ferrante, "Analyzing asynchronous pipeline schedules," International Journal of Parallel Programming, 26(1):5–42, February 1998.

Program Representations for Optimizing Compilers

L. Carter, J. Ferrante, and C. Thomborson, "Folklore confirmed: reducible flow graphs are exponentially larger," ACM Symposium on Principles of Programming Languages (POPL), January 2003.

L. Carter, E. Simon, B. Calder, L. Carter, and J. Ferrante, "Path analysis and renaming for predicated instruction scheduling," International Journal of Parallel Programming, 28(6):563–588, 2000.

L. Carter, E. Simon, B. Calder, L. Carter, and J. Ferrante, "Predicated Static Single Assignment," International Conference on Parallel Architectures and Compilation Techniques (PACT),

October 1999.

R. Cytron and J. Ferrante, "Efficiently computing φ-nodes on-the-fly," ACM Transactions on Programming Languages and Systems, 17(3):487–506, May 1995.

J.-D. Choi, R. Cytron, and J. Ferrante, "On the efficient engineering of ambitious program analysis," IEEE Transactions on Software Engineering, 20(2):105–114, February 1994.

L. Carter, J. Ferrante, and V. Bala, "XDP: A compiler intermediate language extension for the representation and optimization of data movement," International Journal of Parallel Programming, 22(5):485–518, October 1994.

R. Cytron, J. Ferrante, B. K. Rosen, M. N. Wegman, and F. K. Zadeck, "Efficiently computing static single assignment form and the control dependence graph," ACM Transactions on Programming Languages and Systems, 13(4):451–490, October 1991.

J.-D. Choi, R. Cytron, and J. Ferrante, "Automatic construction of sparse data flow evaluation graphs," ACM Symposium on Principles of Programming Languages (POPL), January 1991.

R. Cytron and J. Ferrante, "What's in a name? The value of renaming for parallelism detection and storage allocation," International Conference on Parallel Processing (ICPP), August 1987.

J. Ferrante, K. Ottenstein, and J. Warren, "The program dependence graph and its use in optimization," ACM Transactions on Programming Languages and Systems, 9(3):319–349, July 1987.

F. E. Allen, J. L. Carter, J. Fabri, J. Ferrante, W. H. Harrison, P. G. Loewner, and L. H. Trevillyan, "The experimental compiling system," IBM Journal of Research and Development, 24, November 1980. Selected as one of 7 significant software papers to be published in the IBM journals over 50 years. See http://www.research.ibm.com/journal/50th/.

Exploiting Parallelism in Computers

K. Högstedt, L. Carter and J. Ferrante, "On the parallel execution time of tiled loops," IEEE Transactions on Parallel and Distributed Systems, 14(3):307–321, March 2003.

N. Mitchell, L. Carter, J. Ferrante, and D. Tullsen, "ILP versus TLP on SMT," High Performance Computing, Networking and Storage Conference (SC), November 1999.

N. Mitchell, K. Högstedt, L. Carter, and J. Ferrante, "Quantifying the multi-level nature of tiling interactions," International Journal of Parallel Programming, 26(6):641–670, June 1998.

J. Ferrante, D. Grunwald, and H. Srinivasan, "Compile-time analysis and optimization of explicitly parallel programs," Journal of Parallel Algorithms and Applications, 12(1–3):21–56, 1997.

B. Alpern, L. Carter, and J. Ferrante, "Space-Limited Procedures: A Methodology for Portable High Performance," International Working Conference on Massively Parallel Programming Models n(MPPM-95), Germany, October 1995.

L. Carter, J. Ferrante and S. Flynn Hummel, "Efficient Multiprocessor Parallelism via Hierarchical Tiling," SIAM Conference on Parallel Processing for Scientific Computing, February 1995.

B. Alpern, L. Carter, and J. Ferrante, "Modelling parallel computers as memory hierarchies," Working Conference on Massively Parallel Programming Models, IEEE Computer Society, September 1993.

V. Bala, J. Ferrante and L. Carter, "Explicit data placement (XDP): A methodology for compile-time representation and optimization of data movement," Proceedings of the ACM Symposium on Principles and Practice of Parallel Programming, May 1993.

B. Simons, D. Alpern, and J. Ferrante, "A foundation for sequentializing parallel code," ACM Symposium on Parallel Algorithms and Architecture (SPAA), July 1990.

M. Burke, R. Cytron, J. Ferrante, and W. Hsieh, "Automatic generation of nested, fork-join parallelism," Journal of Supercomputing, 2(3):71–88, July 1989.

F. Allen, M. Burke, P. Charles, R. Cytron, J. Ferrante, V. Sarkar, and D. Shields, "PTRAN methodologies for the automatic detection of parallelism in Fortran programs: Some experimental results," ACM International Conference on Supercomputing (ICS), May 1989.

M. Burke, R. Cytron, J. Ferrante, W. Hsieh, V. Sarkar, and D. Shields, "Automatic discovery of parallelism: A tool and an experiment," ACM Symposium on Parallel Programming: Experience with Applications, Languages, and Systems, July 1988.

F. Allen, M. Burke, R. Cytron, J. Ferrante, W. Hsieh, and V. Sarkar, "A framework for determining useful parallelism," ACM International Conference on Supercomputing (ICS), July 1988.

F. Allen, M. Burke, P. Charles, R. Cytron, and J. Ferrante, "An overview of the PTRAN analysis system for multiprocessing," Journal of Parallel and Distributed Computing, 5(5):617–640, 1988.

Improving Memory Performance

M. Mills Strout, L. Carter, J. Ferrante, and B. Kreaseck "Sparse tiling for stationary iterative methods," International Journal of High Performance Computing Applications, 18(1):95–113, Spring 2004.

M. Mills Strout, L. Carter, and J. Ferrante, "Compile-time Composition of run-time data and iteration reorderings," ACM Conference on Programming Language Design and Implementation (PLDI), June 2003.

M. Mills Strout, L. Carter, J. Ferrante, and E. Simon, "Schedule-independent storage mappings for loops," International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), October 1998.

L. Carter, J. Ferrante, and S. Flynn Hummel, "Hierarchical tiling for improved superscalar performance," International Parallel Processing Symposium (IPPS), April 1995.

J. Ferrante, V. Sarkar, and W. Thrash, "On estimating and enhancing cache effectiveness," Lecture Notes in Computer Science 589, August 1991.

Computational Complexity

J. Ferrante and C. Rackoff, The computational complexity of logical theories. Springer Verlag Lecture Notes in Mathematics 718, 1979.

J. Ferrante and J. Geiser, "An efficient decision procedure for the theory of rational order," Theoretical Computer Science, 4(2):227–233, 1977.

J. Ferrante and C. Rackoff, "A decision procedure for the first order theory of real addition," SIAM Journal of Computing, 4(1):69–77, 1975.