

Computing Community Consortium

Dr. Erwin Gianchandani
Director, Computing Community Consortium
Computing Research Association

Georgetown University
October 18, 2011



<http://cra.org/ccc>



Objective

- Overview of the Computing Research Association
- The Computing Community Consortium - and our visioning process
- Future directions for the field

CRA as an organization



<http://cra.org/ccc>



Computing Research Association

Arizona State University - CSE
Auburn University - CSSE
Ball State University - CS
Boston College - CS
Boston University - CS
Bowdoin College - CS
Bowling Green State University - CS
Bradley University - CS
Brandeis University - CS
Brigham Young University - CS
Brown University - CS
Bryn Mawr College - MCS
Bucknell University - CS
California Institute of Technology - CS
California Polytechnic State University - CS
California State University, Chico - CS
Carnegie Mellon University - CS
Case Western Reserve University - EECS
City University of New York, Graduate Center - CS
Clemson University - CS
Colgate University - CS
College of William & Mary - CS
Colorado School of Mines - MCS
Colorado State University - CS
Columbia University - CS
Cornell University - CS
Cornell University - ECE
Dalhousie University - CS
Dartmouth College - CS
DePaul University - CS
Drexel University - CS
Drexel University - IST
Duke University - CS
Emory University - MCS
Florida Atlantic University - CSE
Florida Institute of Technology - CS
Florida International University - CS
Florida State University - CS
Florida State University - IS
George Mason University - CS
George Washington University - CS
Georgia Institute of Technology - CSE
Georgia Southern University - IT
Georgia State University - CIS
Georgia State University - CS
Grinnell College - MCS
Harvard University - CS
Harvey Mudd College - CS
Hofstra University - CS
Illinois Institute of Technology - CS
Illinois State University - ACS
Indiana University - CS
Indiana University - I
Iowa State University - CS
Iowa State University - ECE

Johns Hopkins University - CS
Johns Hopkins University - SI
Juniata College - IT & CS
Kansas State University - CIS
Kent State University - CS
Lafayette College - CS
Lehigh University - CSE
Long Island University - ICS
Louisiana State University - CS
Loyola University, Chicago - CS
Massachusetts Institute of Technology - EECS
Miami University - CS
McMaster University - CE&S
Michigan State University - CSE
Michigan Technological University - CS
Mississippi State University - CS
Montana State University - CS
Montclair State University - CS
National University of Singapore - CS/IS
Naval Postgraduate School - CS
New Jersey Institute of Technology - CCS
New Mexico State University - CS
New York University - CS
North Carolina State University - CS
Northeastern University - CIS
Northwestern University - ECE
Nova Southeastern University - CS
Oakland University - CSE
Ohio State University - CSE
Ohio State University - EECS
Oklahoma State University - CS
Old Dominion University - CS
Oregon Health & Science University - CSE
Oregon State University - EECS
Pace University - CSIS
Pennsylvania State University - CSE
Pennsylvania State University - IST
Polytechnic University - CIS
Pomona College - MCS
Portland State University - CS
Princeton University - CS
Purdue University - CS
Purdue University - ECE
Rensselaer Polytechnic Institute - CS
Rice University - CS
Rochester Institute of Technology - CS
Roosevelt University - CS&T
Rutgers University, Busch Campus - CS
Saint Louis University - MCS
Santa Clara University - CE
Simon Fraser University - CS
Singapore Management University - IS
Southern Illinois University, Carbondale - CS
Southern Methodist University - CSE
Southern Polytechnic State University - CSE

Stanford University - CS
State University of New York, Albany - CS
State University of New York, Binghamton - CS
State University of New York, Stony Brook - CS
Stevens Institute of Technology - CS
Swarthmore College - CS
Syracuse University - IS
Temple University - CIS
Texas A&M University - CS
Texas State University - CS
Toyota Technological Institute at Chicago - CS
Tufts University - CS
Tulane University - EECS
Union College - CS
University at Buffalo - CSE
University at Buffalo - IS
University of Alabama, Birmingham - CIS
University of Alabama, Tuscaloosa - CS
University of Alberta - CS
University of Arizona - CS
University of Arkansas - CSCE
University of Arkansas at Little Rock - I
University of Calgary - CS
University of California, Berkeley - EECS
University of California, Berkeley - IMS
University of California, Davis - CS
University of California, Irvine - ICS
University of California, Los Angeles - CS
University of California, Riverside - CSE
University of California, San Diego - CSE
University of California, Santa Barbara - CS
University of California, Santa Cruz - CE
University of California, Santa Cruz - CS
University of Central Florida - CS
University of Chicago - CS
University of Cincinnati - ECECS
University of Colorado, Boulder - CS
University of Delaware - CIS
University of Denver - CS
University of Florida - CISE
University of Georgia - CS
University of Hawaii - ICS
University of Houston - CS
University of Houston - ECE
University of Idaho - CS
University of Illinois, Chicago - CS
University of Illinois, Urbana Champaign - CS
University of Illinois, Urbana Champaign - ECE
University of Iowa - CS
University of Kansas - EECS
University of Kentucky - CS
University of Louisiana at Lafayette - CACS
University of Louisville - CECS
University of Maine - CS
University of Maryland - CS

University of Maryland, Baltimore Co - CSEE
University of Maryland, Baltimore Co - IS
University of Massachusetts, Amherst - CS
University of Massachusetts, Boston - CS
University of Michigan - EECS
University of Michigan - I
University of Michigan, Dearborn - CIS
University of Minnesota - CSE
University of Minnesota, Duluth - CS
University of Mississippi - CIS
University of Missouri, Columbia - CS
University of Missouri, Rolla - CS
University of Montana - CS
University of Montreal - CS
University of Nebraska at Omaha - CS/IST
University of Nebraska, Lincoln - CSE
University of Nevada, Las Vegas - CS
University of Nevada, Reno - CSE
University of New Brunswick - CS
University of New Hampshire - CS
University of New Mexico - CS
University of New Mexico - ECE
University of North Carolina at Chapel Hill - CS
University of North Carolina at Chapel Hill - SILS
University of North Carolina, Charlotte - IT
University of North Dakota - CS
University of North Texas - CS
University of Notre Dame - CSE
University of Oklahoma - CS
University of Oregon - CIS
University of Pennsylvania - CIS
University of Pittsburgh - CS
University of Pittsburgh - IS
University of Puget Sound - MCS
University of Rochester - CS
University of South Alabama - CIS
University of South Carolina - CSE
University of South Florida - CSE
University of Southern California - CS
University of Southern California - EES
University of Tennessee, Knoxville - CS
University of Texas, Arlington - CSE
University of Texas, Austin - CS
University of Texas, Dallas - CS
University of Texas, El Paso - CS
University of Toronto - CS
University of Tulsa - MCS
University of Utah - CS
University of Virginia - CS
University of Washington - CSE
University of Washington - I
University of Washington, Bothell - CS
University of Washington, Tacoma - CSS
University of Waterloo - CS
University of Wisconsin, Madison - CS

University of Wisconsin, Milwaukee - EECS
University of Wyoming - CS
Utah State University - CS
Vanderbilt University - EECS
Virginia Commonwealth University - CS
Virginia Tech - CS
Wake Forest University - CS
Washington State University - EECS
Washington University in St. Louis - CS
Wayne State University - CS
West Virginia University - CSEE
Western Michigan University - CS
Williams College - CS
Worcester Polytechnic Institute - CS
Wright State University - CSE
Yale University - CS
York University - CS

Sun Microsystems (Sponsoring Member)
Microsoft Corporation (Sustaining Member)
IBM Research (Supporting Member)

Accenture Technology Labs
Argonne National Laboratory
Avaya
CA Labs
Computer Science Research Institute,
Sandia National Labs
Fraunhofer Center for
Experimental Software Engineering
Fujitsu Laboratories of America
Google
Hewlett-Packard Company
IDA Center for Computing Sciences
Intel Corporation
Lawrence Berkeley National Laboratory
Los Alamos National Laboratory
Lucent Technologies, Bell Labs
McAfee Research
Mitsubishi Electric Research Labs
National Center for Atmospheric Research
NCSA
NEC Laboratories America
NTT DoCoMo USA Labs
Pacific Northwest National Laboratory
Panasonic Information &
Networking Technologies Lab
Ricoh Innovations
San Diego Supercomputer Center
SAP Labs
SRI International
Telcordia Technologies

<http://cra.org/cce>



Mission and activities



- Strengthen research and education in the computing fields
 - Working to influence **policy** that impacts computing research
 - Encouraging the development of **human resources**
- Contributing to the cohesiveness of the professional **community**
- Collect and disseminate **information** about the importance and state of computing research

Gov't. Affairs



Table 1. PhD Production by Type of Department and Rank

Department, Rank	PhDs Produced	Avg. per Dept.	PhDs Next Year	Avg. per Dept.
US CS 1-12	215	20.8	288	26.2
US CS 13-24	215	17.9	241	20.1
US CS 25-36	117	10.6	205	17.1
US CS Other	806	8.0	962	8.4
US CS Total	1,501	10.0	1,696	11.3

Taulbee
Survey



What is the CCC?



<http://cra.org/ccc>



What is the CCC?



- Established in 2006 through a multi-year cooperative agreement between the National Science Foundation and CRA
- Provides a voice for the national computing research community
- Facilitates the development of a bold, multi-themed vision for computing research - and communicates this vision to stakeholders



A broad-based Council

Leadership:

- Ed Lazowska, U of Washington (Chair)
- Susan Graham, UC-Berkeley (Vice-Chair)
- Erwin Gianchandani, CRA (Director)

Terms ending 2014:

- Deborah Crawford, Drexel
- Gregory Hager, Johns Hopkins
- John Mitchell, Stanford
- Bob Sproull, Oracle (ret.)
- Josep Torrellas, UIUC

Terms ending 2013:

- Randy Bryant, CMU
- Lance Fortnow, Northwestern
- Eric Horvitz, Microsoft Research
- Hank Korth, Lehigh
- Beth Mynatt, Georgia Tech
- Fred Schneider, Cornell
- Margo Seltzer, Harvard

Terms ending 2012:

- Stephanie Forrest, U of New Mexico
- Chris Johnson, U of Utah
- Anita Jones, U of Virginia
- Frans Kaashoek, MIT
- Ran Libeskind-Hadas, Harvey Mudd
- Robin Murphy, Texas A&M

Rotated off:

- Greg Andrews, U of Arizona (ret.) (2009)
- Bill Feiereisen, Intel (2011)
- Dave Kaeli, Northeastern (2011)
- Dick Karp, UC-Berkeley (2010)
- John King, U of Michigan (2011)
- Peter Lee, Microsoft Research (2009)
- Andrew McCallum, U-Mass (2010)
- Karen Sutherland, Augsburg U (2009)
- Dave Waltz, Columbia (2010)

Meets three times a year, including an annual summer meeting in Washington, DC



<http://cra.org/ccc>



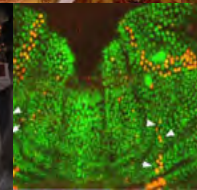
A multitude of activities

- **Community-initiated visioning:**
 - Workshops that bring researchers together to discuss “out-of-the-box” ideas
 - Challenges & Visions tracks at conferences
- **Outreach to the White House, Federal funding agencies:**
 - Outputs of visioning activities
 - Short reports to inform policy makers
 - Task Forces -- Health IT, Sustainability IT, and Data Analytics

Computing Research That Changed The World



Computing Innovation Fellows Project

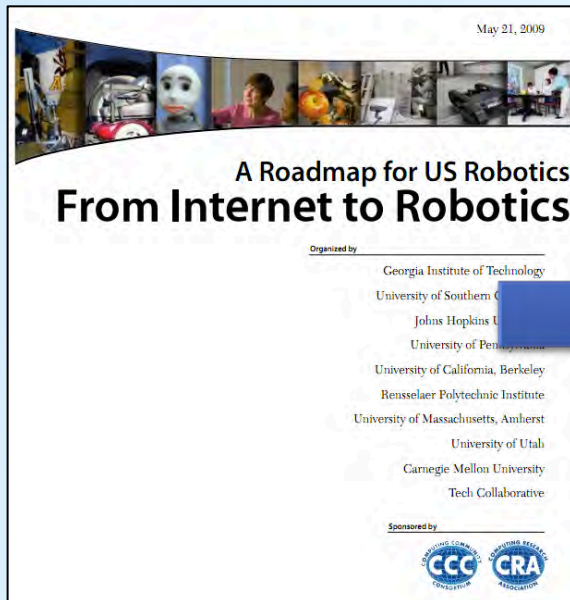


This Week's Highlight:
Fruit Fly Suggests New
Solution to Computer
Networking Problem

*LANDMARK CONTRIBUTIONS BY
STUDENTS IN COMPUTER SCIENCE*

*undergraduate and graduate students that
have made truly game-changing contributions
in the course of their studies*

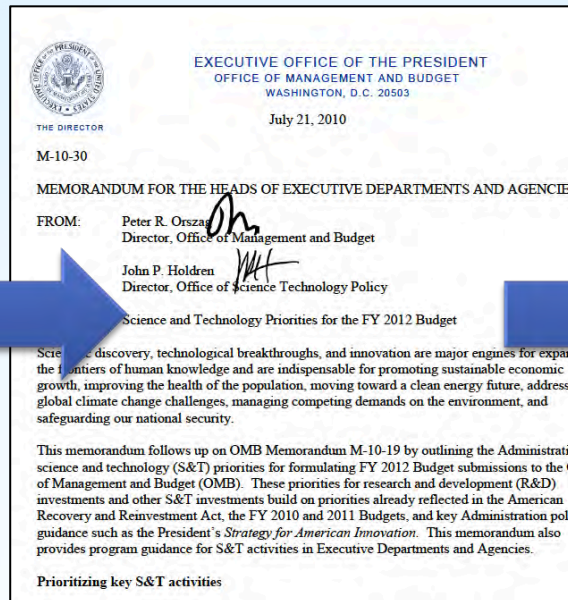
Visioning: Robotics success



4 meetings during
summer 2008

Roadmap published
May 2009

*Extensive discussions
between visioning
leaders & agencies*



OSTP issues directive
to all agencies
to include robotics in
FY 12 budgets



National Robotics
Initiative is
announced

Henrik Chistensen
Georgia Tech



<http://cra.org/ccc>



Visioning: Progress to date

Community visioning activities	Participants	Organizations
Networking science & engineering	109	44
Cyber-physical systems	100	47
Robotics	141	79
“Big Data” Computing	81	46
Theoretical computer science	39	26
Global development (ICT4D)	56	37
Learning technologies	55	30
Health information technology	121	102
Cross-layer reliability	121	45
Free & open source software	45	35
Advancing computer architecture	In progress	
Interactive technologies	In progress	
Sustainability & IT	In progress	

“Transition Team” white papers

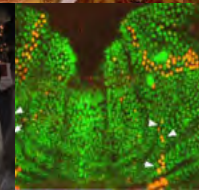
- Sensed and seized an opportunity to influence Federal science policy through the Presidential transition team
- 19 papers produced in late 2008 & early 2009
 - 30 separate authors
- Many highly influential:
 - Re-envisioning DARPA - Peter Lee, Randy Katz
 - Infrastructure for eScience & eLearning/Unleashing Waves of Innovation - Ed Lazowska, Peter Lee, Chip Elliott, and Lary Smarr
 - Security is Not a Commodity - Stefan Savage, Fred Schneider
 - Synthetic Biology - Drew Endy
 - Big Data Computing - Randy Bryant, Randy Katz, Ed Lazowska
 - The Ocean Observatories Initiative - John Delaney, John Orcutt, Robert Weller
 - Cyber-Physical Systems - Janos Sztipanovits, Jack Stankovic

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Public outreach: CCC Blog

**The Computing Community Consortium Blog**
A Service for the Computing Research Community

Home | Site Admin | Log out

Home About the CCC About this blog

"Improving Brain-Computer Interfaces"

October 17th, 2011 by Erwin Gianchandani | [Edit this entry](#) 0 Comments and 3 Reactions

A *Science Nation* story published today describes a public-private partnership funded in part by the National Science Foundation (NSF) that is attempting to link mind and machine to ultimately improve the living conditions of those with "locked-in syndrome" — a malady in which people with normal cognitive brain activity suffer severe paralysis, often from injuries or an illness such as Lou Gehrig's disease.




From the *Science Nation* article (see a video after the jump):

» [Read more: "Improving Brain-Computer Interfaces"](#)

Posted in [big science](#), [research horizons](#), [research news](#) 0 Comments and 3 Reactions

**SUBSCRIBE**
to the CCC Blog Feed

**LATEST TWEET**
"Improving Brain-Computer Interfaces"
<http://t.co/SrgTErBA>
Follow CCC on twitter here.

RECENT POSTS

- ["Improving Brain-Computer Interfaces"](#)
- [Administration Seeking Input on National Bioeconomy Blueprint](#)
- [First Person: "One of My Most Exciting Internship Experiences"](#)
- [Announcing the 2011 Computing Innovation Fellows](#)
- [Susan Graham to Receive Ken Kennedy Award](#)

MOST READ POSTS

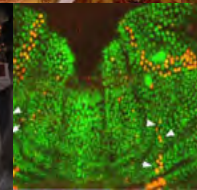
- ["Improving Brain-Computer Interfaces" \(22\)](#)
- [Administration Seeking Input on National Bioeconomy Blueprint \(15\)](#)
- [Announcing the 2011 Computing Innovation Fellows \(4\)](#)

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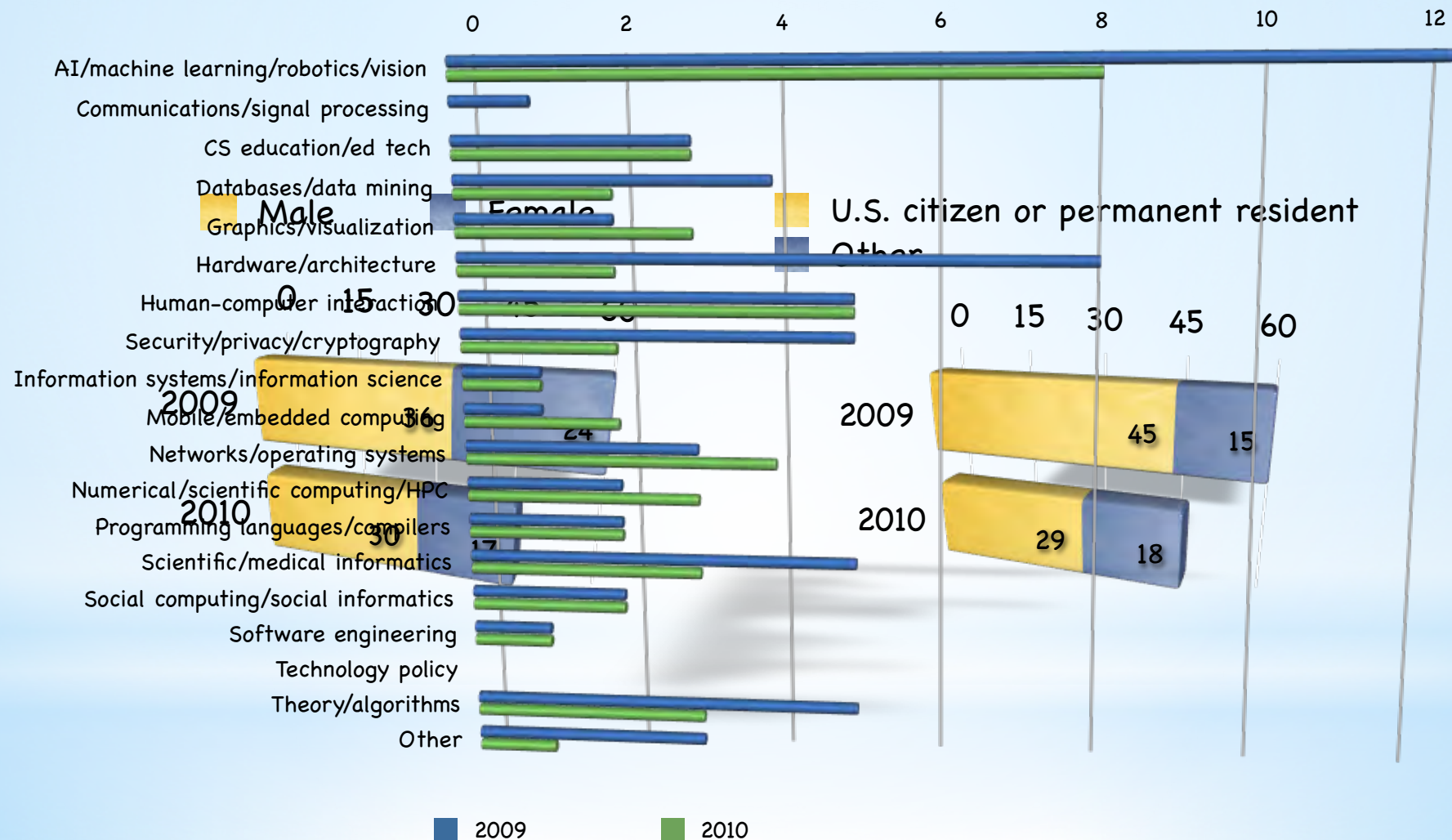
- **Public relations efforts:**
 - Library of Congress symposia
 - Research “Highlight of the Week”
 - CCC Blog [<http://cccblog.org/>]
- **Nurturing the next generation of leaders:**
 - Computing Innovation Fellows Project
 - “Landmark Contributions by Students”
 - Leadership in Science Policy Institute

Next generation: CIFellows Project

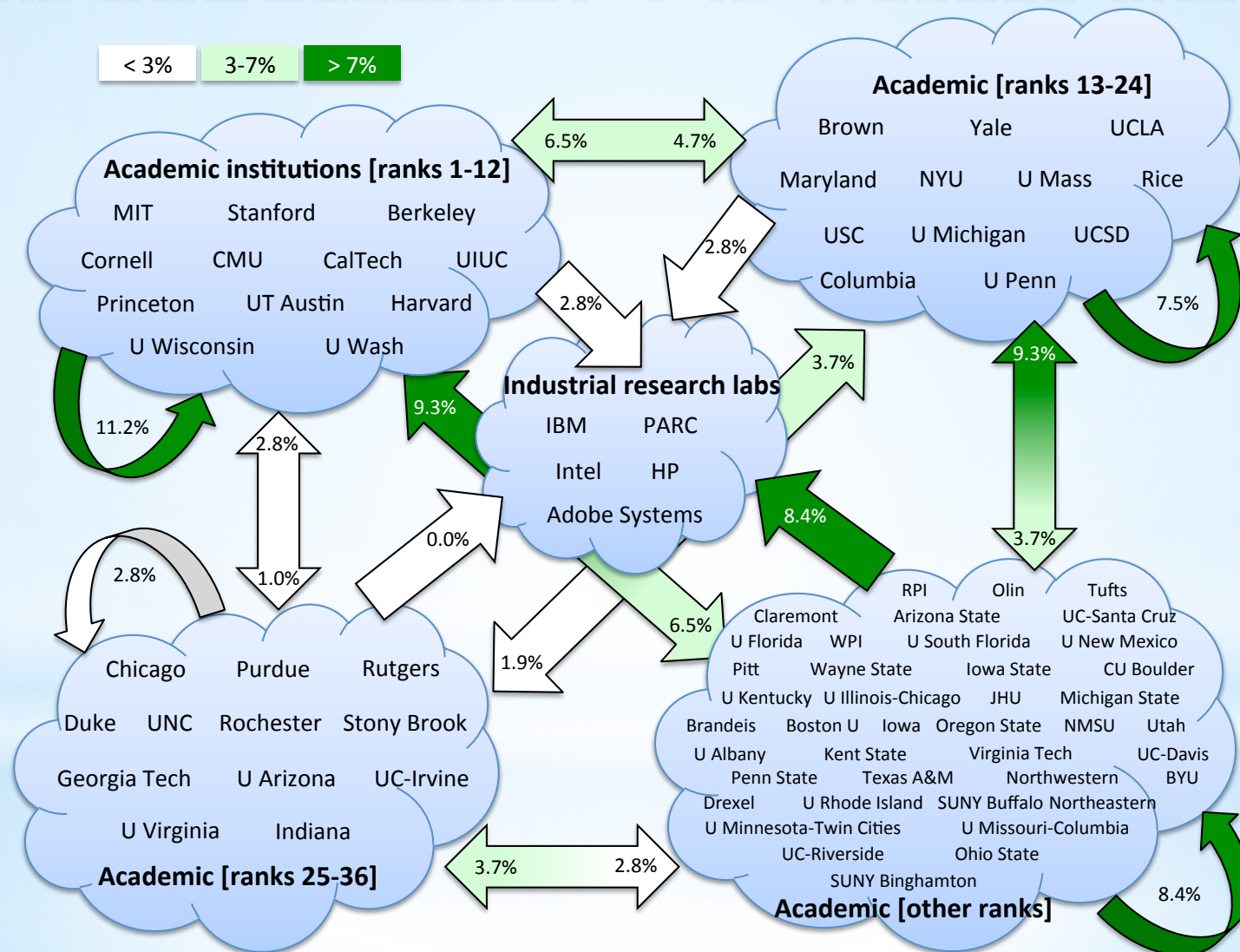
- Established in 2009 with NSF/CISE funding
- Provides recent CS Ph.D.s one- to two-year postdoctoral positions
- Goal is to retain new Ph.D.s in research & teaching during difficult economic times
- 60 CIFellows funded in 2009
 - 19 left the program after year 1
 - 39 have now found tenure-track faculty or industrial research positions
- Another 47 CIFellows funded in 2010, 20 in 2011
- A research project in and of itself...



Next generation: CIF demographics

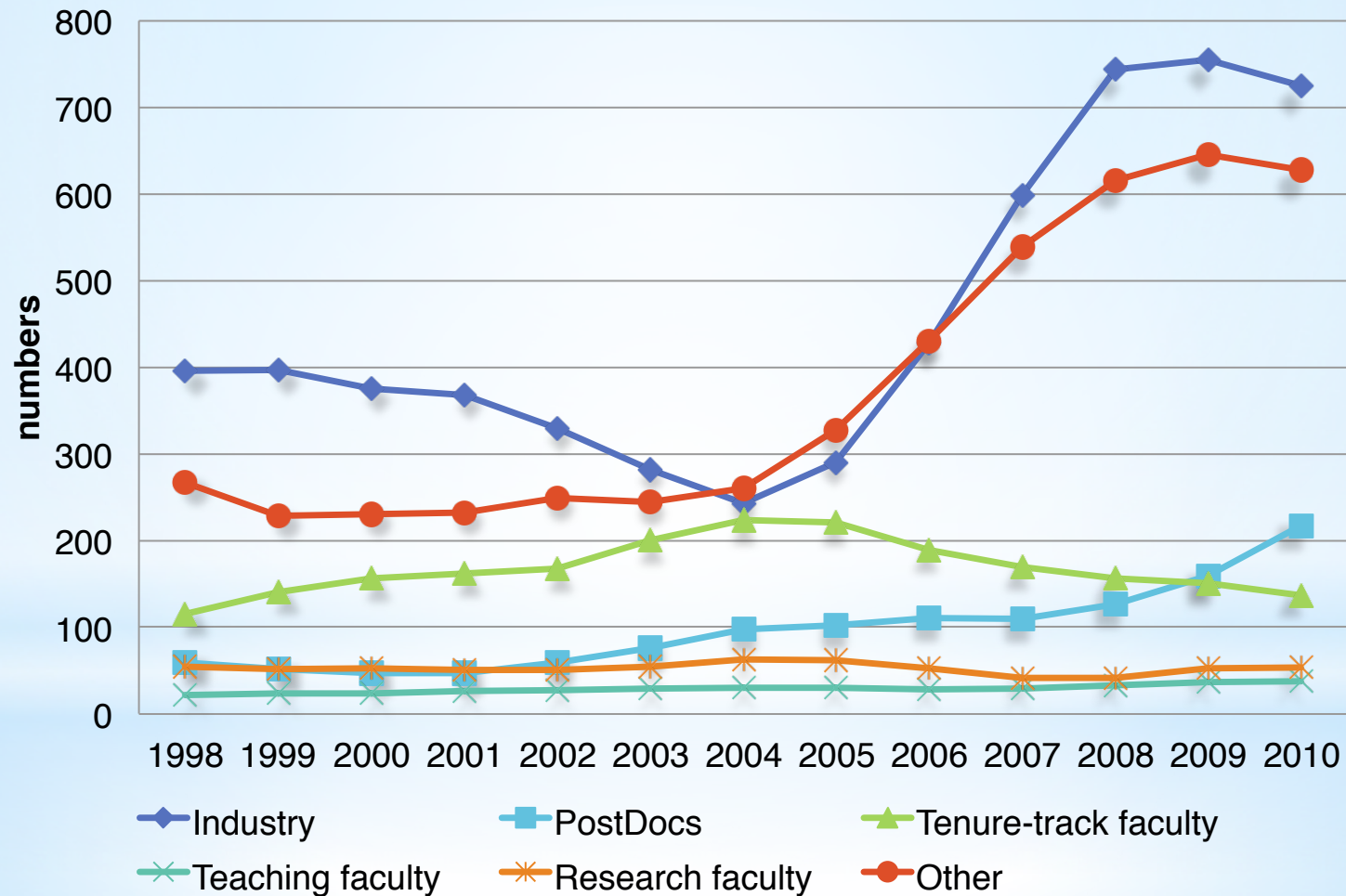


Next generation: CIF “cross-flow”



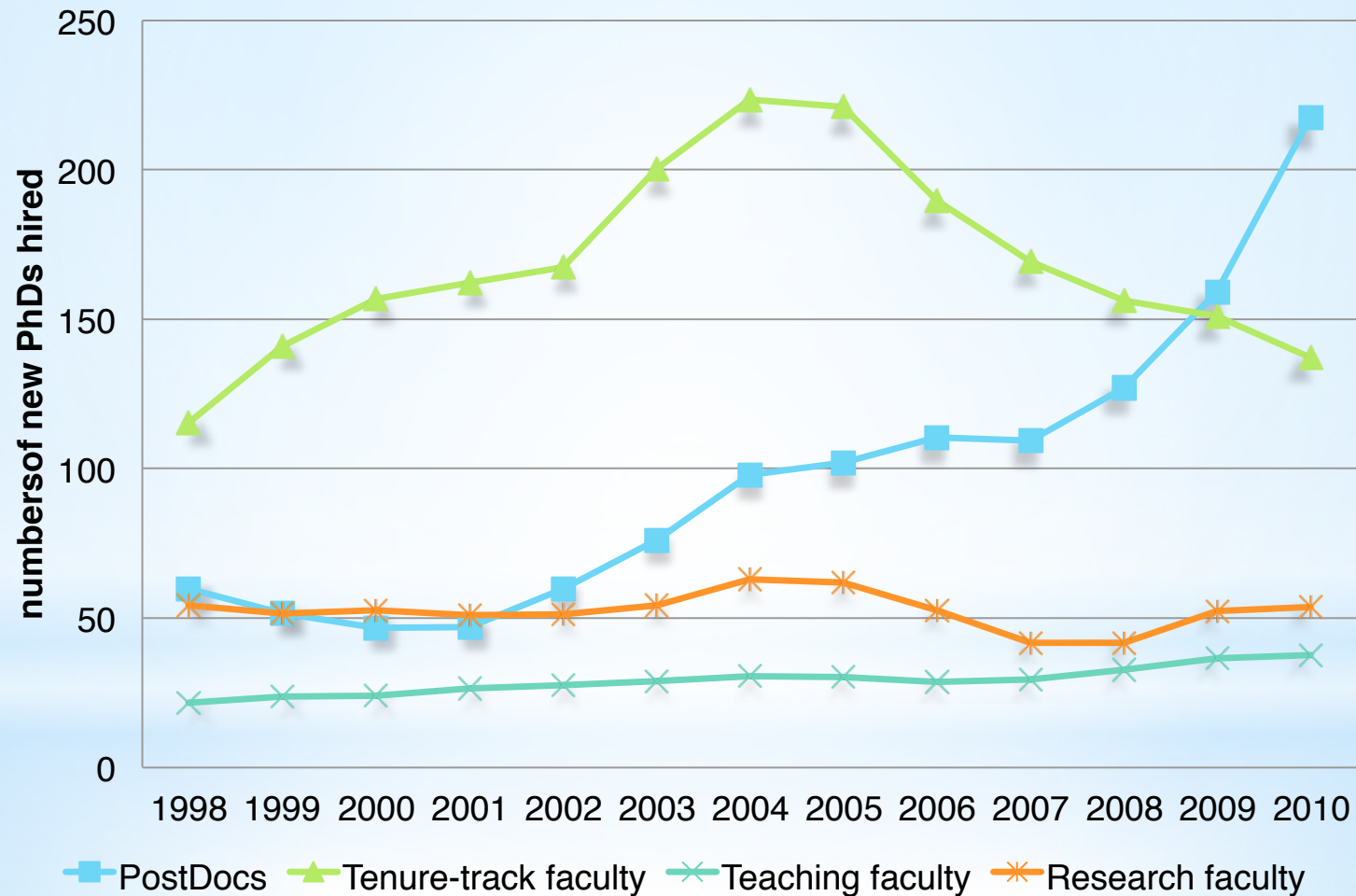
Next generation: Postdocs in CS

Numbers of New Ph.D.s Hired



Next generation: Postdocs in CS II

Numbers of New Ph.D.s Hired



Next generation: Undergraduates

COMPUTER SCIENCE RESEARCH OPPORTUNITIES AND GRADUATE SCHOOL

A Resource for
Undergraduates...

Welcome! This website is intended to help undergraduates in computing fields find summer research opportunities and resources for applying to graduate school.

URO Zone

Undergraduate
Research
Opportunities

Considering Grad School?

Q & A with grad
students and
faculty

Application Process

Reflections by
grad students and
faculty

A Day in the Life

A blog by current
grad students

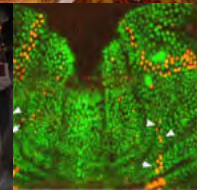
<http://cra.org/ccc/csgrs>

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Future directions

The CS job market is **red** hot

“As the rest of the country fights stubbornly high unemployment, the shortage of qualified engineers has grown acute in the last six months, tech executives and recruiters say, as the flow of personal or venture capital investing has picked up. In Silicon Valley, along the southern portion of the San Francisco Bay in California, and other tech hubs like New York, Seattle and Austin, Tex., start-ups are sprouting by the dozen, competing with well-established companies for the best engineers, programmers and designers. At the same time, all the companies are seeking ever more specialized skills.”



The New York Times

-- “*Silicon Valley Hiring Perks,*”
March 25, 2011

By the numbers perks

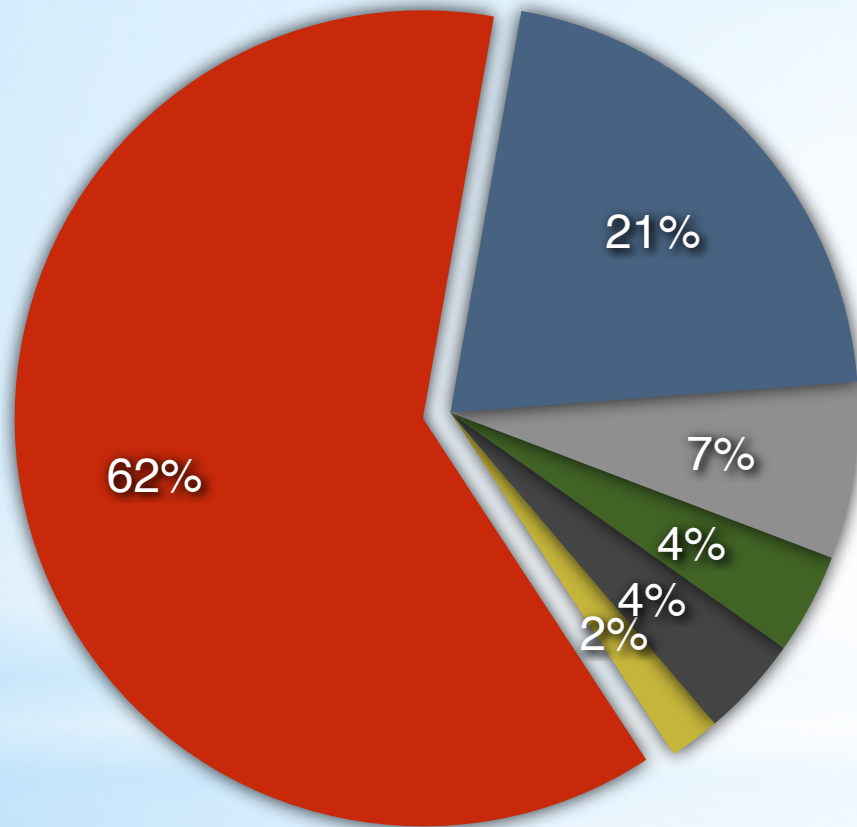
- * Extraordinary competition for CS majors right now
- * Starting salaries as high as \$105,000
- * Weekly lessons about entrepreneurship
- * Free meals, haircuts, iPads, shuttle busses, and stock options



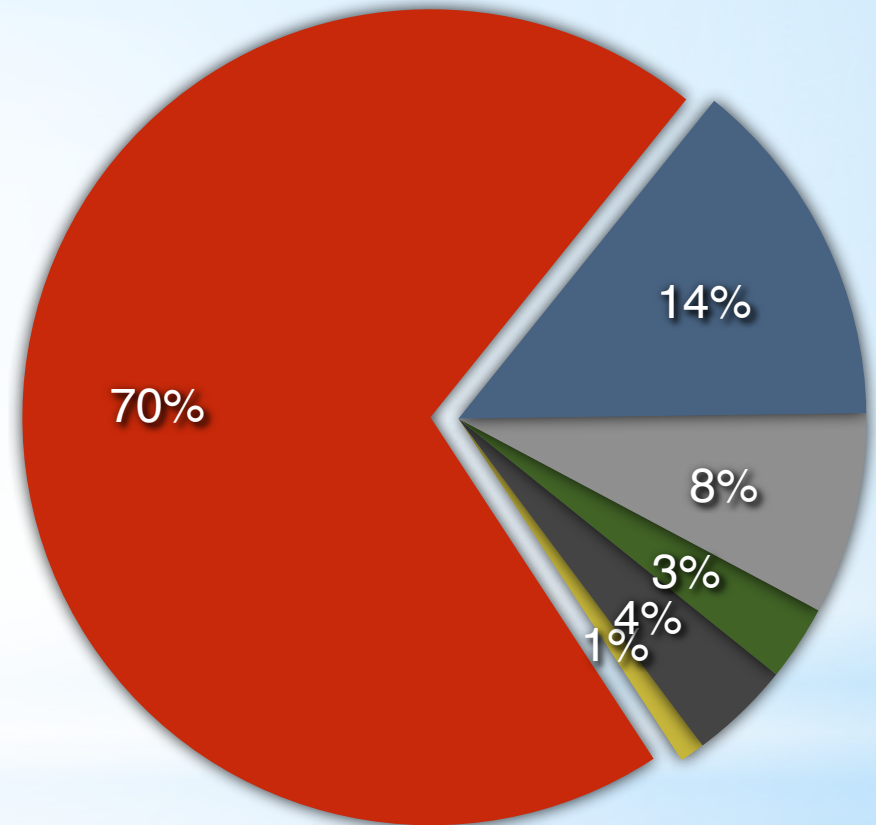
The New York Times

Where the jobs are

Projected S&E Job Openings
(new jobs + net replacements, 2006-2016)



Projected S&E Job Creation
(new jobs, 2006-2016)



- Computer Specialists
- Engineers
- Social Scientists
- Life Scientists
- Physical Scientists
- Mathematical Scientists

Source: U.S. Bureau of Labor Statistics, 2007

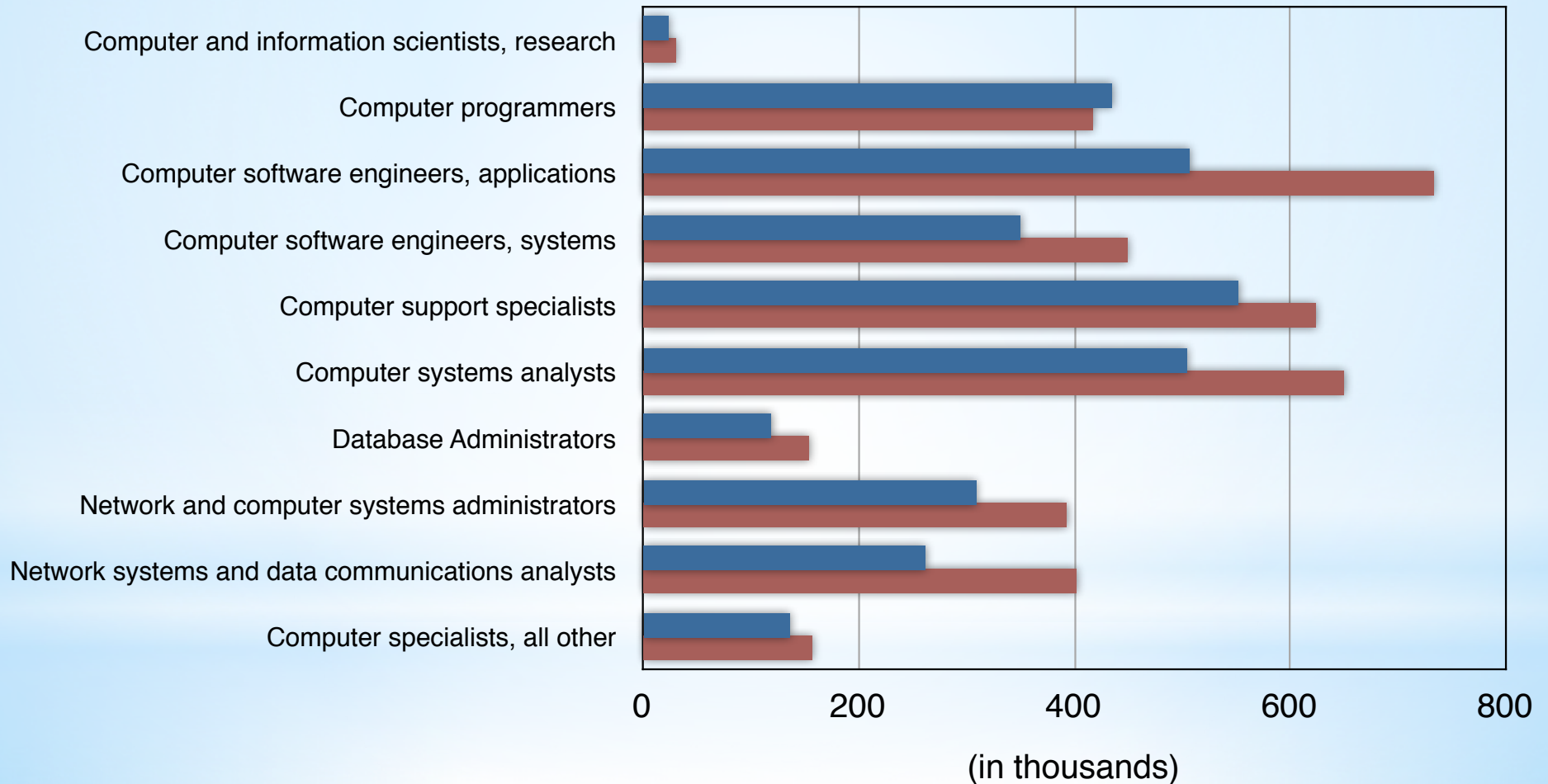


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Where in computing the jobs are

Actual, Projected IT Occupational Employment, 2006-2016



Source: U.S. Bureau of Labor Statistics, 2007

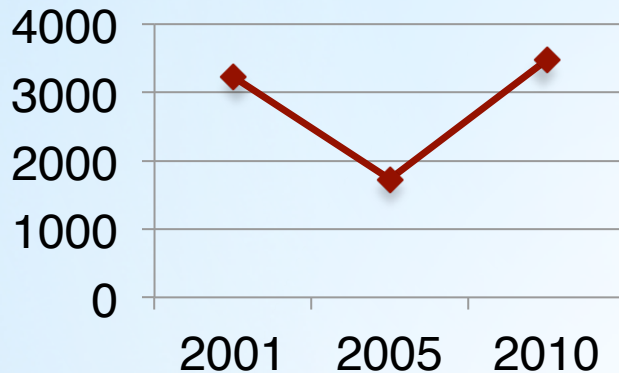


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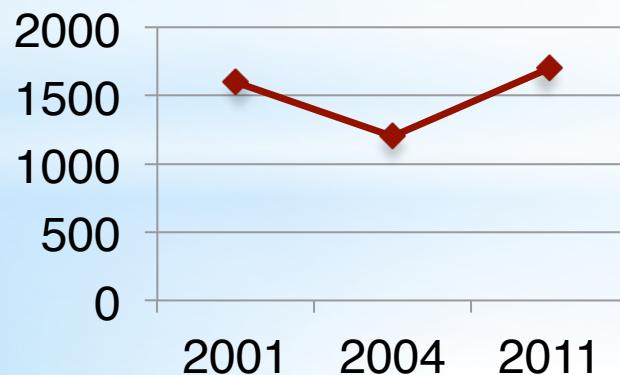


Promising signs: Tale of four cities

CMU (applicants)



UW (enrollments)



Stanford (enrollments)

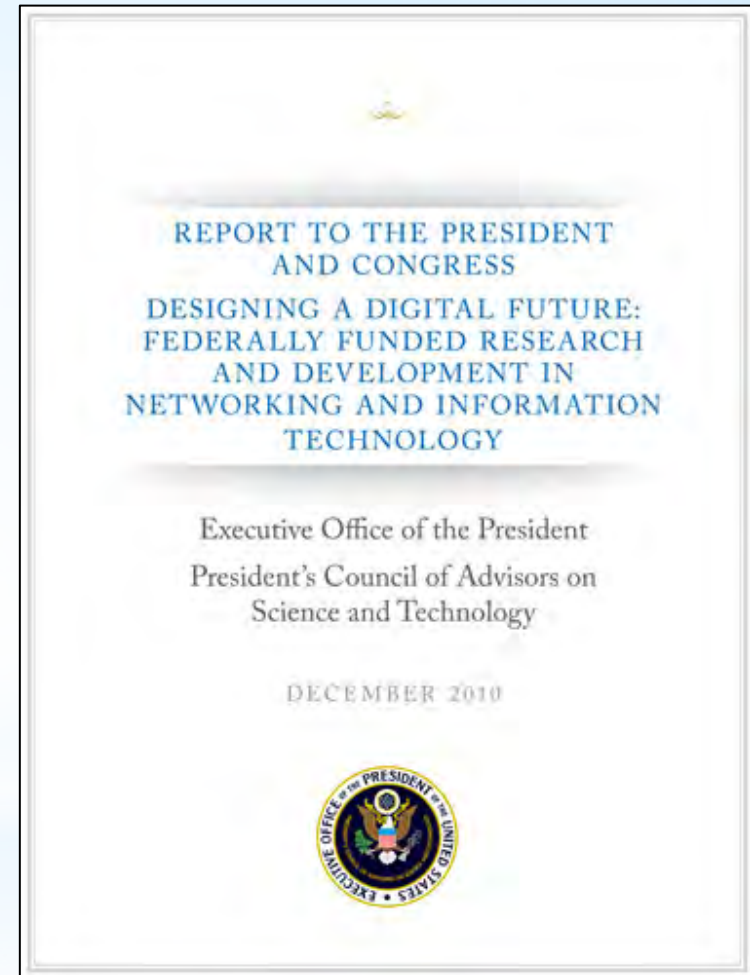
- Previous record in 1999-2000: 762 students
- Bottomed out in 2006-07
- **New record in 2010-11: 1,087**
 - Year-to-year growth of 51%
 - Spring enrollment up 120%

MIT (enrollments)

- **Introductory CS course is single most popular course** (out of 2,000+ MIT courses in a broad range of fields)

A report on the future of the field

- Issued by the President's Council of Advisors on Science and Technology (PCAST)
- About the nationwide Networking & Information Technology R&D (“NITRD”) initiative
- An excellent roadmap for the field
- About a third of PCAST's Working Group was comprised of CCC Council members



The PCAST report

- Health information technology
 - “Go well beyond the current national program to adopt electronic health records”
 - “Make possible comprehensive lifelong multi-source health records for individuals; enable both professionals and the public to obtain and act on health knowledge from diverse and varied sources as part of an interoperable health IT ecosystem; and provide appropriate information, tools, and assistive technologies that empower individuals to take charge of their own health and reduce costs.”

Health IT

- Workshop with 100+ computer scientists, systems engineers, social scientists, care practitioners
- Produced a report summarizing key research questions and directions
- NSF/CISE initiated Smart Health & Wellbeing in FY 2011



- From data to knowledge to action -- enabling evidence-based healthcare
- Empowering people -- providers and consumers -- improves healthcare quality
- Computer-based augmentation of human learning, reasoning, decision-making, and physical motion significantly enhances human capabilities
- Healthcare is a complex, large-scale, adaptive distributed evolving system
- The Importance of Collaborative Government Investment



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The PCAST report II

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 - “Go well beyond the current national program to adopt electronic health records”
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- Energy and transportation
 - “dynamic power management broadly; interoperable standards for real-time control; low-power systems and devices; and improved surface and air transportation.”

Computational Sustainability

- Workshop with 60+ computer scientists, systems engineers, social scientists, “sustainability scientists”
- Produced a report on key research questions and directions
- NSF has announced 2012 solicitation for SEES initiative



- Big Data
 - Temporal & geographic
 - Very large, heterogeneous (graphical structures, sampled measurements, images, extensive networks, social network)

Special tracks at AAAI, ACM SIGDEV, CHI, ICML, and Pervasive, with CCC “Best Paper” awards

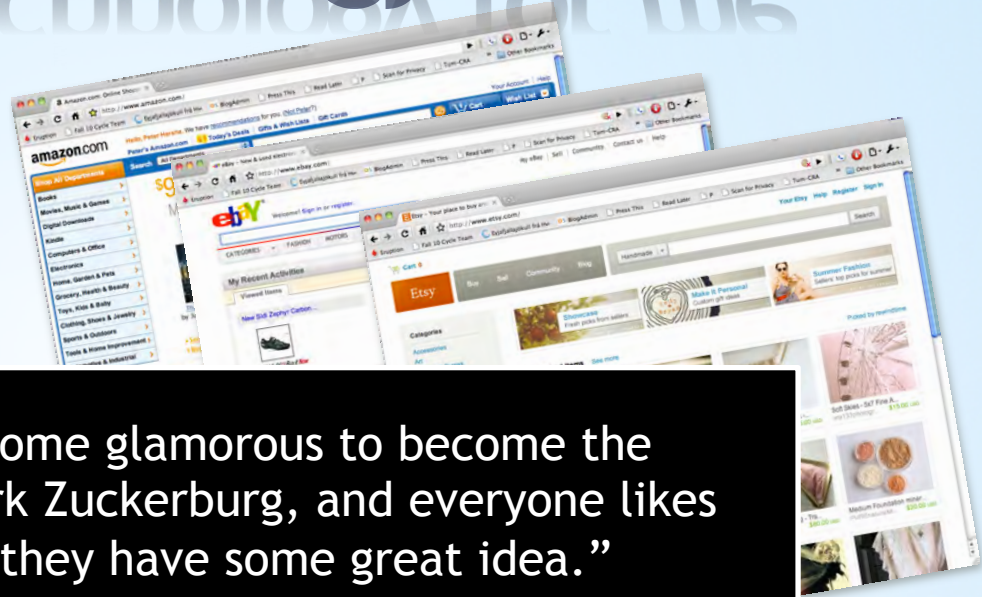
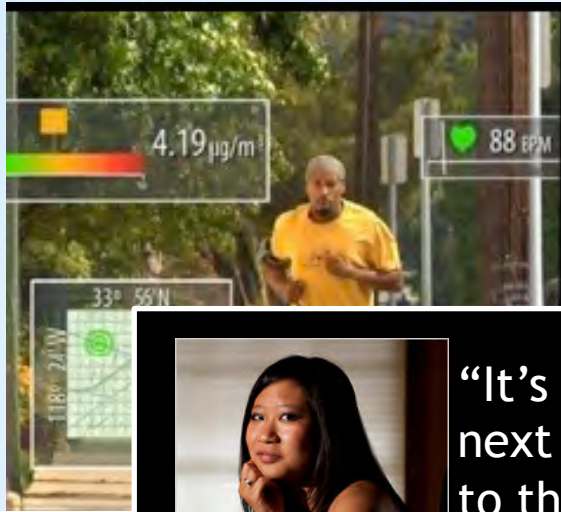
- Maintenance, annotation, analytics, archiving structure
- Aggregations of personal data
- Targeting feedback systems
- Quality & transparency of models
- Understanding human needs, encouraging behavior changes

PCAST report III

- Improving health care
 - Enabling the smart grid
 - Revolutionizing transportation
 - Ensuring our national defense
 - Enabling the future of networking
 - Delivering personalized education
 - Empowering the developing world
 - Driving advances in all fields of science & engineering
- } cybersecurity

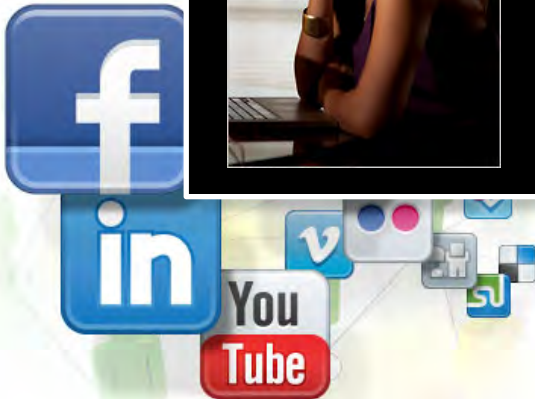
Key drivers

Key drivers: technology for *me*



“It’s become glamorous to become the next Mark Zuckerberg, and everyone likes to think they have some great idea.”

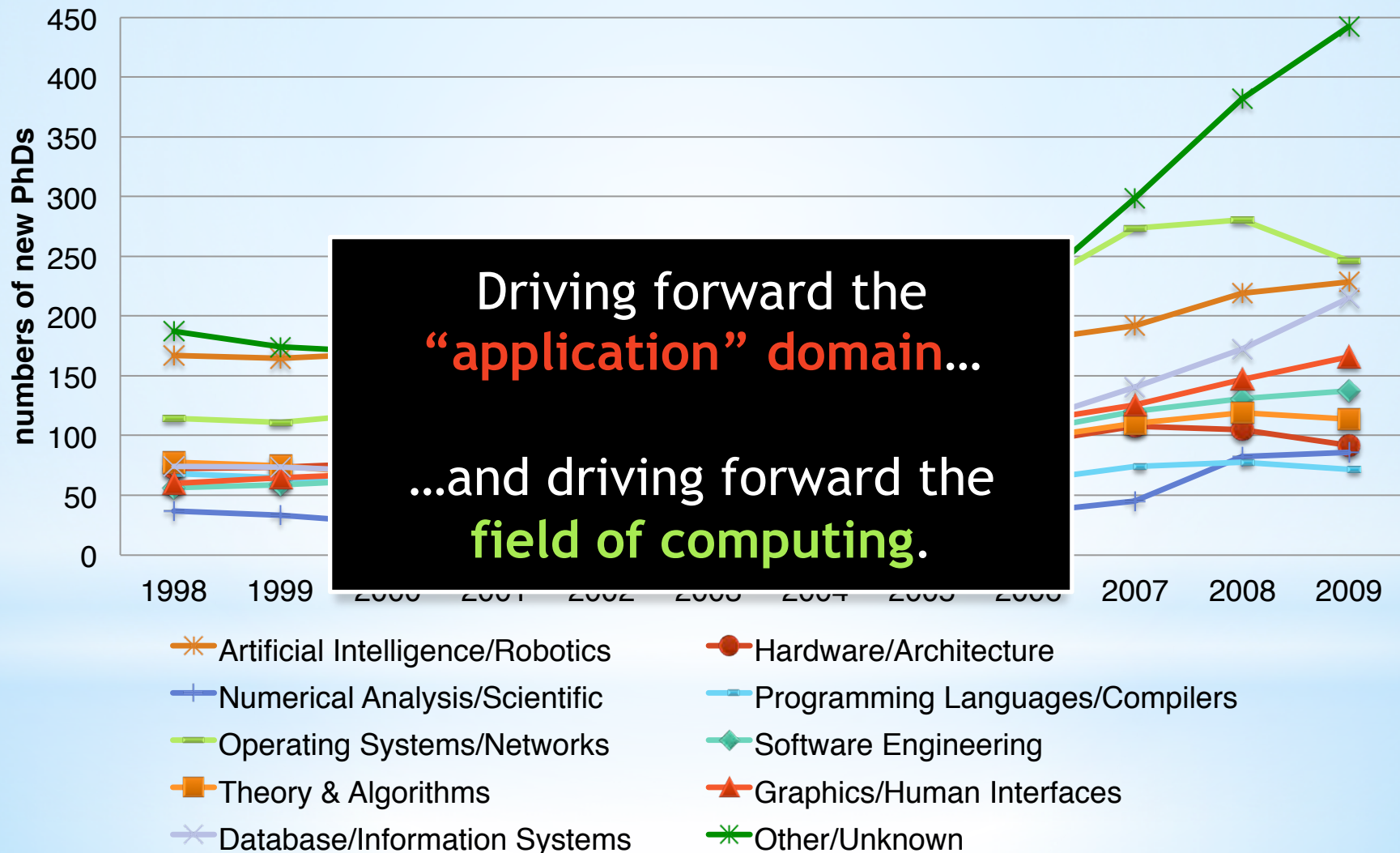
--Keila Fong, Yale University undergraduate



Key drivers: information

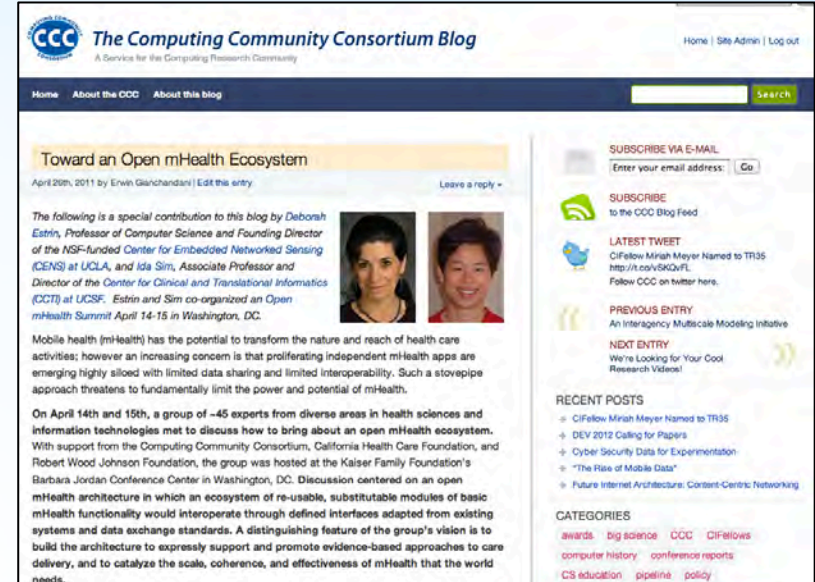
- * Just about every field is becoming an information field
- * “NIT is arguably unique among all fields of science and engineering in the breadth of its impact ... Recent technological and societal trends place the further advancement and application of NIT squarely at the center of our Nation’s ability to achieve essentially all of our priorities and to address essentially all of our challenges ... All indicators - all historical data, and all projections - argue that NIT is the dominant factor in America’s science and technology employment.
-- *PCAST report, December 2010*

The shift toward interdisciplinary



A community effort

- Propose visioning activities, white papers, Challenges & Visions tracks at research conferences
- Put together short videos for undergraduates
- Contribute to the CCC Blog
- Send us a research highlight for the Highlight of the Week



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