The Computing Community Consortium: An Update

Ed Lazowska

Bill & Melinda Gates Chair in
Computer Science & Engineering
University of Washington

Chair, Computing Community Consortium

GENI Engineering Conference
July 2009

http://www.cra.org/ccc/

This morning …

- Quick background on the Computing Community Consortium
- Principal activities since October 2008
  - Transition Team white papers
  - Library of Congress symposium
  - Computing Innovation Fellows project
  - Current
    - Computing research and health care
    - Computing research and energy
- NetSE Research Agenda

The Computing Community Consortium

- A cooperative agreement between NSF and CRA
- Catalyze the computing research community …
  - to envision long-range, more audacious research challenges
  - to build momentum around such visions
  - to state them in compelling ways
  - to move them towards funded initiatives
  - to ensure "science oversight" of large-scale initiatives

THE COUNT

Internet, Mobile Phones Named Most Important Inventions

By PHYLLIS KORKKI
Published: March 7, 2009

In response to the shouted-out question, "What are some of the greatest inventions of all time?," nearby office workers in a recent informal survey gave the following answers: the wheel, the engine, the ballpoint pen, diapers and the cheese Danish.

Life Changers

The top innovations of the last 30 years, according to judges at the Wharton School of the University of Pennsylvania.

1. Internet, broadband
2. PC and laptop computers
3. Mobile phones
4. E-mail
5. DNA testing and sequencing
6. Magnetic resonance imaging
7. Microprocessors
8. Fiber optics
9. Office software
10. Laser/robotic surgery
11. Open-source software
12. Light-emitting diodes
13. Liquid crystal display
14. GPS devices
15. E-commerce and auctions
16. Media file compression
17. Microfinance
18. Photovoltaic solar energy
19. Large-scale wind turbines
20. Internet social networking

THE NEW YORK TIMES

A panel of eight judges from the Wharton School of the University of Pennsylvania was required to go back only 30 years — not to the dawn of history — when asked a similar question. So its answers, of course, were very different.

In the survey, the Internet was voted the biggest innovation of the last three decades, followed by computers, mobile phones and e-mail. The survey was sponsored by Knowledge@Wharton, the school's business publication, and PBS's "Nightly Business Report."

Good, important choices all, but for classic, long-lasting appeal, they still can't beat the wheel. **PHYLLIS KORKKI**

A version of this article appeared in print on March 8, 2009, on page BU2 of the New York edition.

Next Article in Business (22 of 29) »

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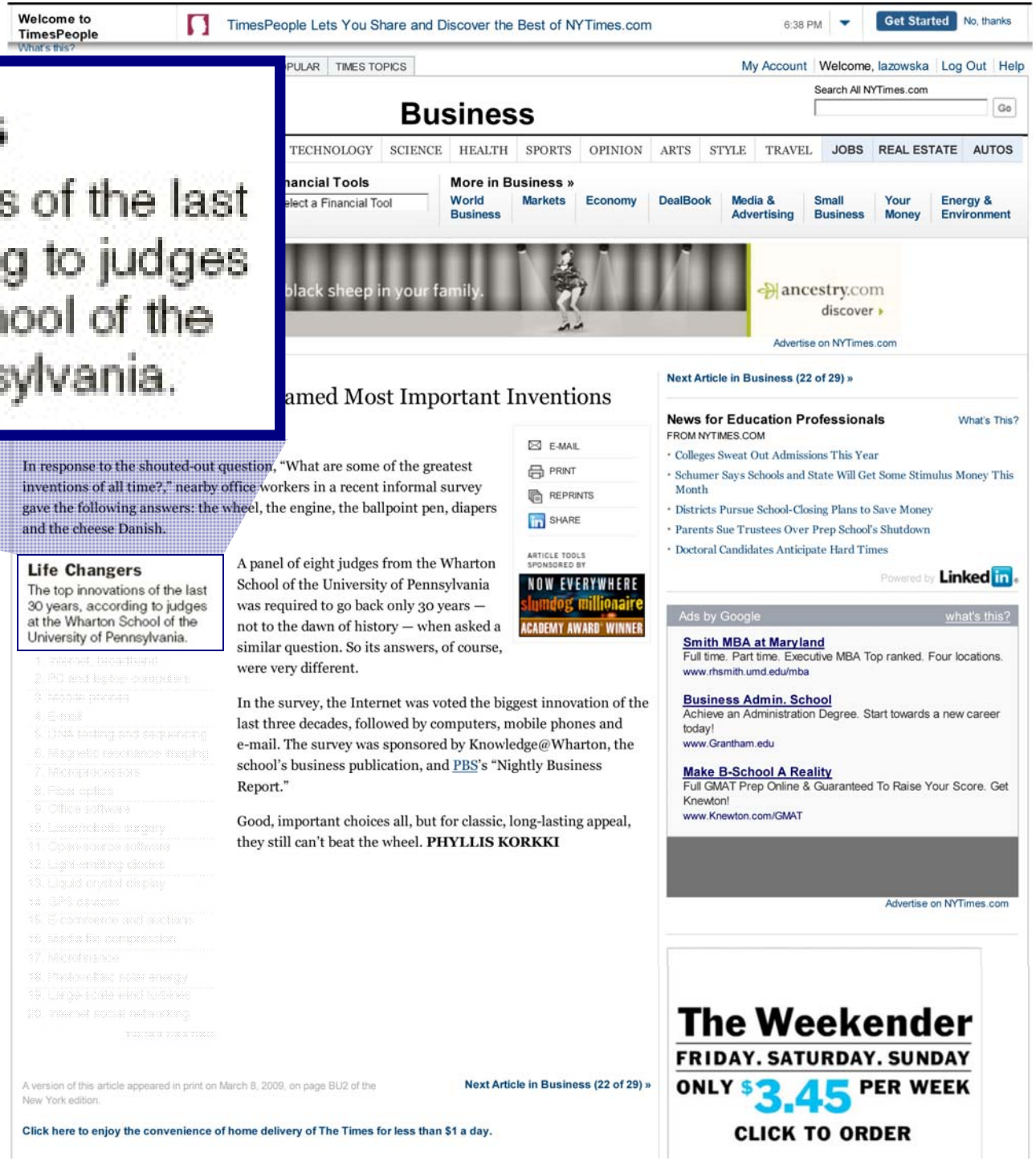

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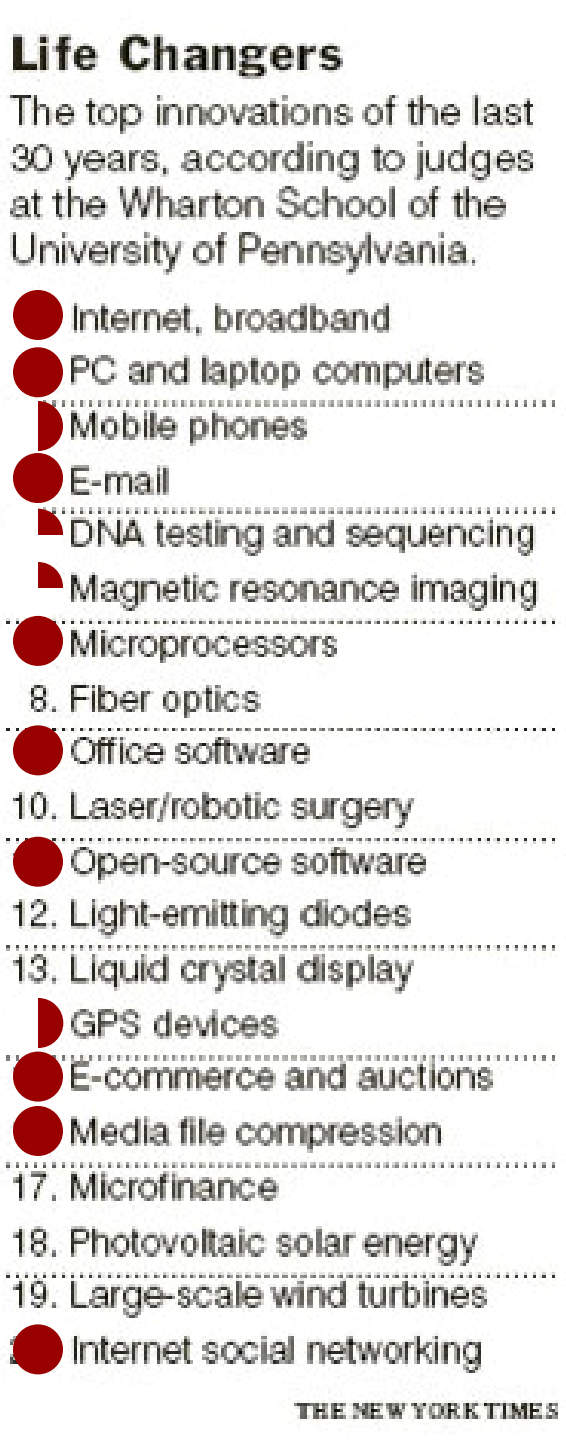

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Imagine spending a day without information technology

- A day without the Internet and all that it enables
- A day without diagnostic medical imaging
- A day during which automobiles lacked electronic ignition, antilock brakes, and electronic stability control
- A day without digital media – without wireless telephones, high-definition televisions, MP3 audio, DVD video, computer animation, and videogames
- A day during which aircraft could not fly, travelers had to navigate without benefit of GPS, weather forecasters had no models, banks and merchants could not transfer funds electronically, factory automation ceased to function, and the US military lacked technological supremacy

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- A day without diagnostic medic
- A day during which automobiles antilock brakes, and electronic
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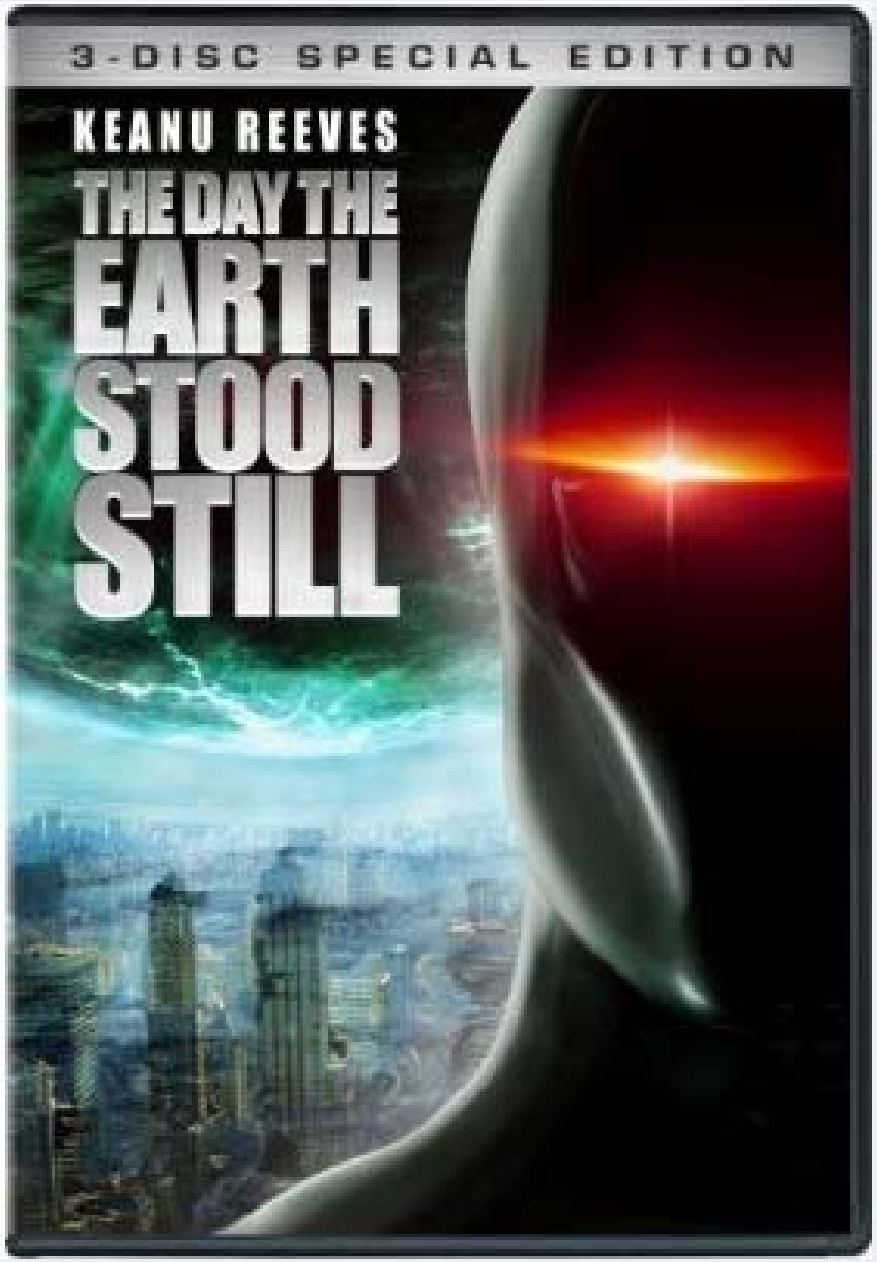
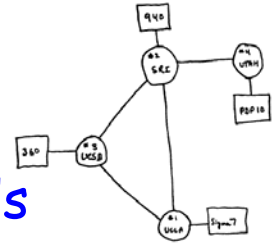
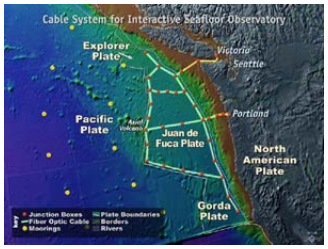
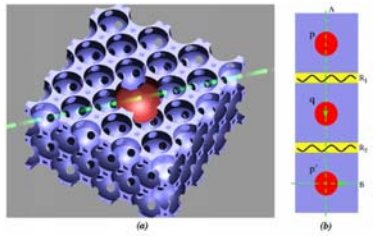


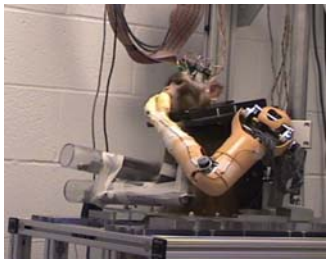
The future is full of opportunity

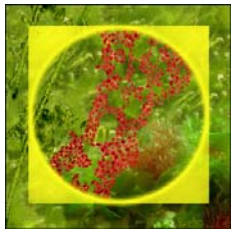
- Creating the future of networking
- Driving advances in all fields of science and engineering
- Revolutionizing transportation
- Personalized education
- The Smart Grid
- Predictive, preventive, personalized medicine
- Quantum computing
- Empowerment of the developing world
- Personalized health monitoring => quality of life
- Neurobotics
- Synthetic biology



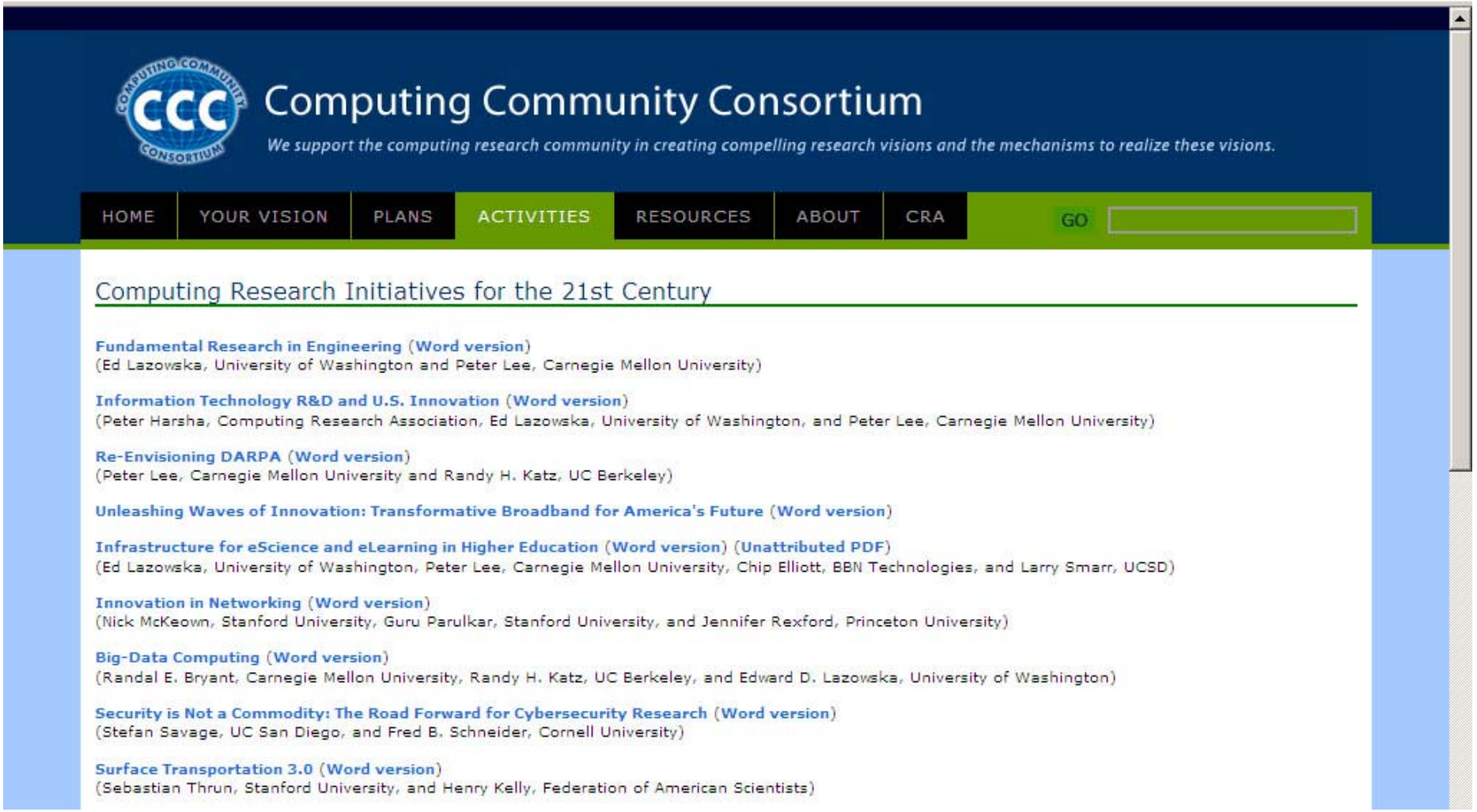








November-December: Transition Team white papers



Computing Community Consortium

We support the computing research community in creating compelling research visions and the mechanisms to realize these visions.

HOME | YOUR VISION | PLANS | ACTIVITIES | RESOURCES | ABOUT | CRA | GO

Computing Research Initiatives for the 21st Century

Fundamental Research in Engineering (Word version)
(Ed Lazowska, University of Washington and Peter Lee, Carnegie Mellon University)

Information Technology R&D and U.S. Innovation (Word version)
(Peter Harsha, Computing Research Association, Ed Lazowska, University of Washington, and Peter Lee, Carnegie Mellon University)

Re-Envisioning DARPA (Word version)
(Peter Lee, Carnegie Mellon University and Randy H. Katz, UC Berkeley)

Unleashing Waves of Innovation: Transformative Broadband for America's Future (Word version)

Infrastructure for eScience and eLearning in Higher Education (Word version) (Unattributed PDF)
(Ed Lazowska, University of Washington, Peter Lee, Carnegie Mellon University, Chip Elliott, BBN Technologies, and Larry Smarr, UCSD)

Innovation in Networking (Word version)
(Nick McKeown, Stanford University, Guru Parulkar, Stanford University, and Jennifer Rexford, Princeton University)

Big-Data Computing (Word version)
(Randal E. Bryant, Carnegie Mellon University, Randy H. Katz, UC Berkeley, and Edward D. Lazowska, University of Washington)

Security is Not a Commodity: The Road Forward for Cybersecurity Research (Word version)
(Stefan Savage, UC San Diego, and Fred B. Schneider, Cornell University)

Surface Transportation 3.0 (Word version)
(Sebastian Thrun, Stanford University, and Henry Kelly, Federation of American Scientists)

Robotics (**Word version**)
(Rodney Brooks, MIT)

The Ocean Observatories Initiative (**Word version**)
(John Delaney, University of Washington, John Orcutt, Scripps Institute of Oceanography, and Robert Weller, Woods Hole Oceanographic Institution)

Quality of Life Technology (**Word version**)
(Howard Wactlar, Carnegie Mellon University, and Takeo Kanade, Carnegie Mellon University)

P4 Medicine (**Word version**)
(Leroy Hood, Institute for Systems Biology, and David Galas, Battelle Memorial Institute)

"Smart Grid": R&D for an Intelligent 21st Century Electrical Energy Distribution Infrastructure (**Word version**)
(Randy H. Katz, UC Berkeley)

Quantum Computing (**Word version**)
(Scott Aaronson, MIT, and Dave Bacon, University of Washington)

Synthetic Biology (**Word version**)
(Drew Endy, Stanford, and Ed Lazowska, University of Washington)

Computer Architecture (**Word version**)
(David Patterson, UC Berkeley)

Cyber-Physical Systems: A National Priority for Federal Investment in Infrastructure and Competitiveness (**Word version**)
(Janos Sztipanovits, Vanderbilt University, and John Stankovic, University of Virginia)

Post your comments on the **Computing Community Consortium blog**!

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Phone: 202-234-2111 | Fax: 202-667-1066 | E-mail: webmaster @ cra.org

Unleashing Waves of Innovation
Transformative Broadband for America's Future

Version 15: March 22, 2009[1]

Executive Summary

A forward-thinking National Broadband Strategy should focus on the transformative power of advanced networks to unleash new waves of innovation, jobs, economic growth, and national competitiveness – and to create new tools to deliver health care, education, and a low carbon economy. ARRA broadband decisions should target high-impact investments with those criteria in mind. They should seek to rebuild U.S. global leadership in networking – and the economic innovations that networking can create. Broadband investments should "pull from the future."

A proven track record of innovating in networking and its applications, of deploying and continually upgrading advanced networks, and of extending those networks to the unserved and underserved across our nation, lies not with telephone or cable companies, nor with most state governments, but with our nation's colleges and universities and the state, regional and national research and education networks that this community has built, in many instances forged through partnerships with telecommunications providers and state agencies to achieve these goals. A National Broadband Strategy should begin with America's colleges and universities and the state, regional and national research and education networks that connect them and extend to

January: CCC Council renewal

- Chair
  - Ed Lazowska
- Terms expire 2012
  - Stephanie Forrest
  - Chris Johnson
  - Anita Jones
  - M. Frans Kaashoek
  - Ran Lebeskind-Hadas
  - Robin Murphy

- Rotated off
  - Greg Andrews
  - Karen Sutherland
- Terms expire 2011
  - Bill Feiereisen
  - Susan Graham (v ch)
  - Dave Kaeli
  - John King
  - Peter Lee
  - Bob Sproull
- Terms expire 2010
  - Dick Karp
  - Andrew McCallum
  - Beth Mynatt
  - Fred Schneider
  - David Tennenhouse
  - Dave Waltz

March: Library of Congress Symposium


The LIBRARY of CONGRESS
Computing Research That Changed The World
Organized by the Computing Community Consortium
Honorary Co-Sponsors:
Congressman Bart Gordon (D-TN)
Congressman Ralph Hall (R-TX)
Congressman Daniel Lipinski (D-IL)
Congressman Vern Ehlers (R-MI)
Congressman Rush Holt (D-NJ)
Senator Jay Rockefeller (D-WV)
March 25, 2009

Agenda

- Game-changing advances of the recent past
- Advances that are on the horizon, and what will be needed to achieve them
- Lessons that can further increase the already remarkable effectiveness of the IT R&D ecosystem
- Synthesis (and some demonstrations)

Session 1: The Internet and the World Wide Web

9:00 - 10:20

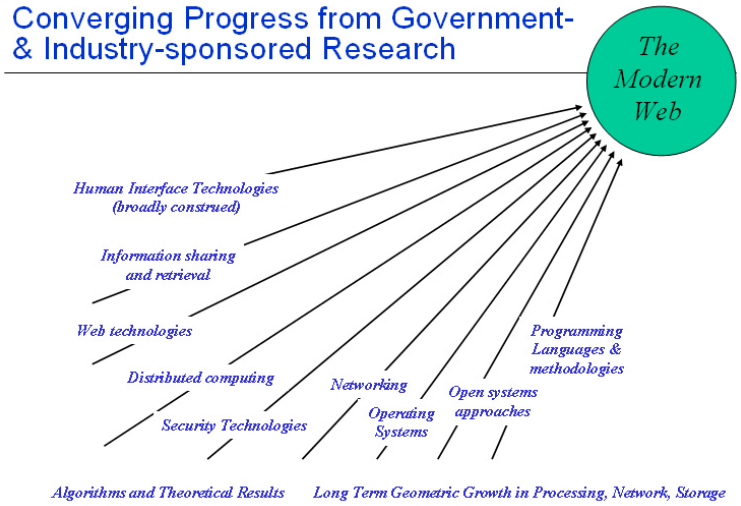
Why We're Able to Google
Alfred Spector (Google)

The Magic of the "Cloud": Supercomputers for Everybody, Everywhere
Eric Brewer (University of California, Berkeley)

Human Computation
Luis von Ahn (Carnegie Mellon University)

Discussion by the speakers of future challenges and synergies

Why We're Able to Google™



Dr. Alfred Z. Spector
VP, Research and Special Initiatives
Google, Inc.

Internet and the World Web Panel, March 25, 2009

Computing Research that Changed the World

The Magic of the Cloud:

Supercomputers for Everyone, Everywhere

Prof. Eric A. Brewer

UC Berkeley

Human Computation

Luis von Ahn

Carnegie Mellon University

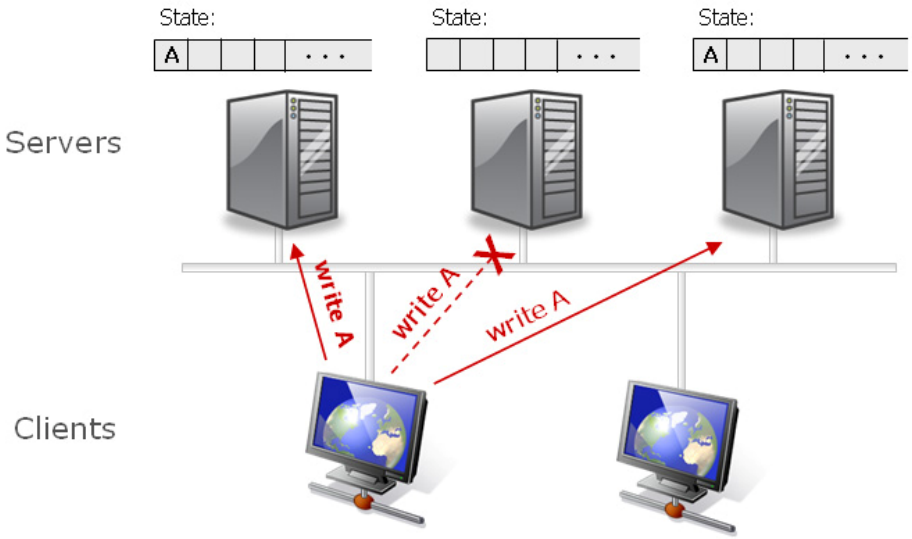
Session 2: Evolving Foundations — 10:40 - 12:00

Security of Online Information
Barbara Liskov (Massachusetts Institute of Technology)

Learning to Improve Our Lives
Daphne Koller (Stanford University)

Global Information Networks
Jon Kleinberg (Cornell University)

Discussion by the speakers of future challenges and synergies

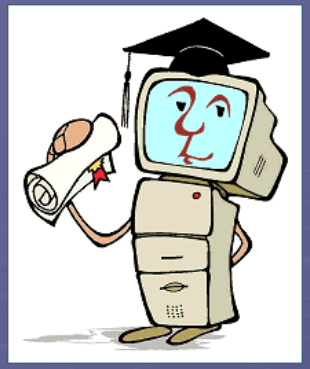


Security of Online Information

Barbara Liskov

MIT CSAIL

March 2009



Learning

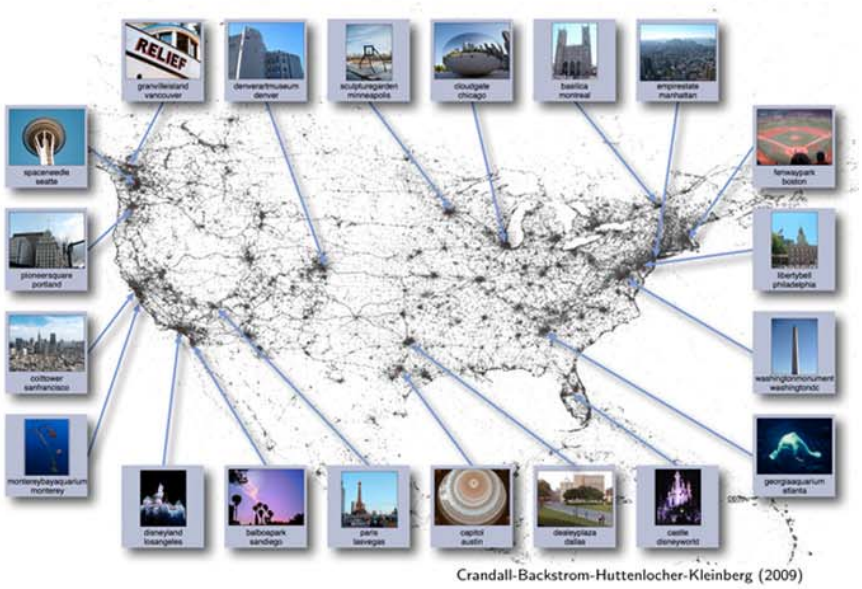
to improve our lives

Daphne Koller
Stanford University

Global Information Networks

Jon Kleinberg

Cornell University



Crandall-Backstrom-Huttenlocher-Kleinberg (2009)

Session 3: The Transformation of the Sciences via Computation 1:00 - 2:20

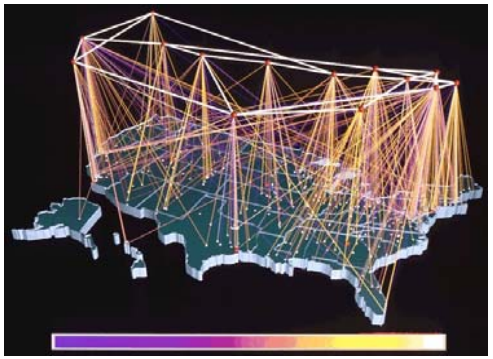
Supercomputers and Supernetworks are Transforming Research
Larry Smarr (University of California, San Diego)

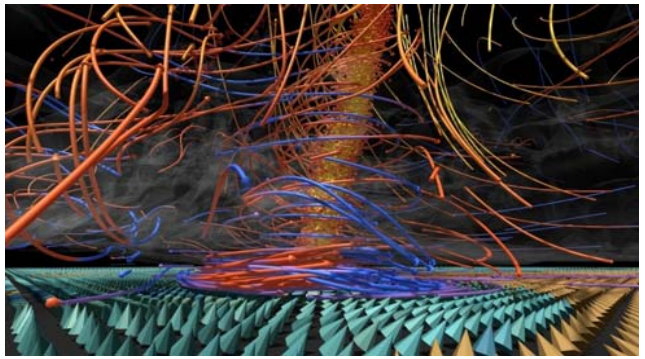
Computing and Visualizing the Future of Medicine
Chris Johnson (University of Utah)

Zooming In On Life
Gene Myers (Howard Hughes Medical Institute)

Discussion by the speakers of future challenges and synergies

Supercomputers and Supernetworks are Transforming Research





Dr. Larry Smarr

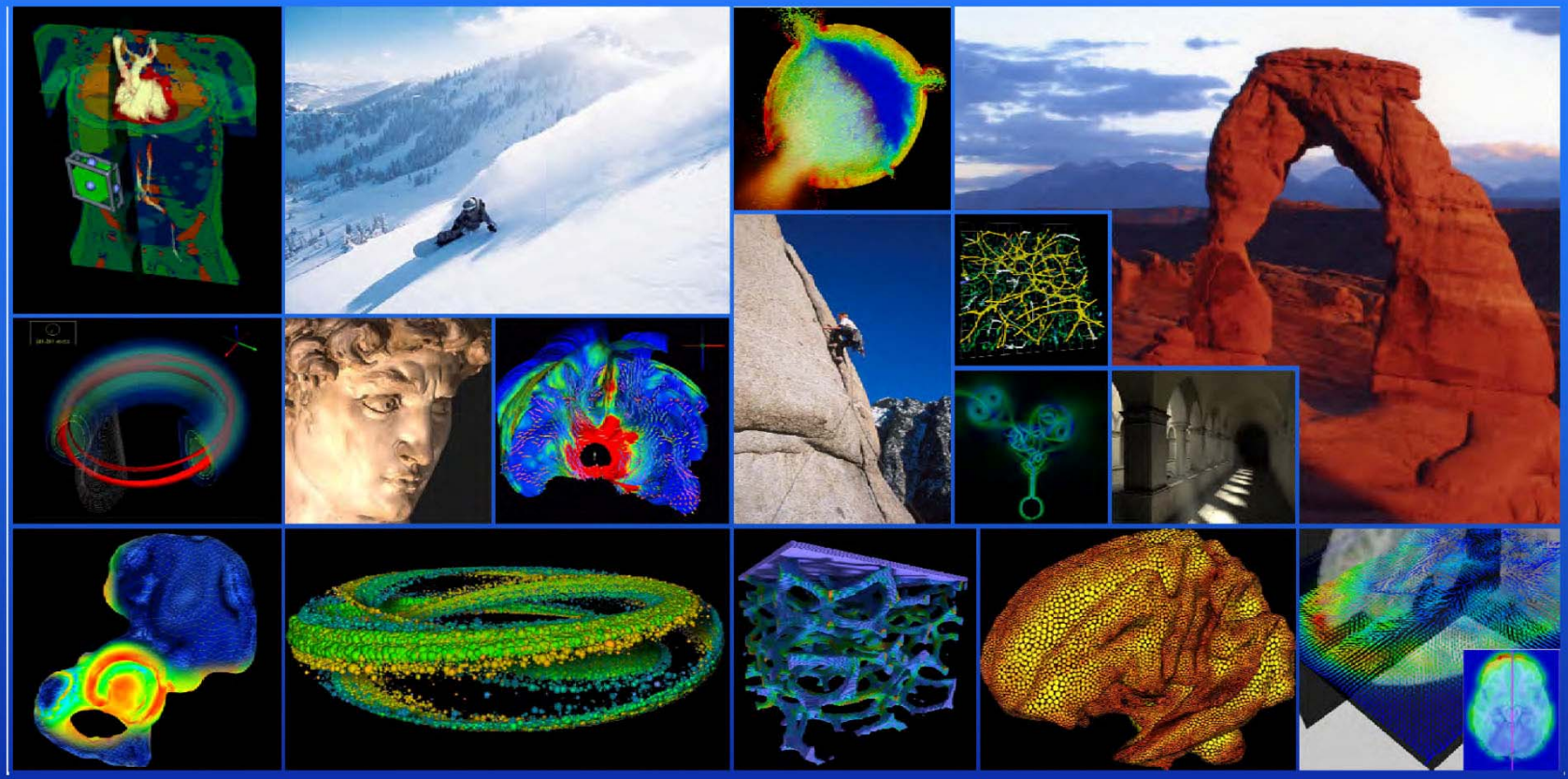
Director, California Institute for Telecommunications and Information Technology

Harry E. Gruber Professor,

Dept. of Computer Science and Engineering

Jacobs School of Engineering, UCSD

Computing and Visualizing the Future of Biomedicine



Chris Johnson
Scientific Computing and Imaging Institute
University of Utah


HHMI
janelia farm
research campus
Zooming in On Life
Gene Myers
Group Leader
HHMI Janelia Farm Research Campus

Session 4: Computing Everywhere! 2:30 - 3:50

Sensing Everywhere!
Deborah Estrin (University of California, Los Angeles)

Pixels Everywhere!
Pat Hanrahan (Stanford University)

Robotics Everywhere!
Rodney Brooks (Massachusetts Institute of Technology and Heartland Robotics)

Discussion by the speakers of future challenges and synergies

Sensing Everywhere!
from ecosystems to human systems

Professor Deborah Estrin

NSF Science and Technology Center for Embedded Networked Sensing (CENS)

UCLA Computer Science Department

destrin@cens.ucla.edu

… in collaboration with faculty, students and staff at CENS

We gratefully acknowledge the support of our sponsors, including the National Science Foundation, Nokia, Intel Corporation, Cisco Systems Inc., Sun Inc., Google, Microsoft Research, UC Micro, Crossbow Inc., T-mobile, Conservation International, and the participating campuses.

http://urban.cens.ucla.edu

Pixels Everywhere

Media Tech and How it Changed the World

Pat Hanrahan

Department of Computer Science

Stanford University

Robots Everywhere!

Rodney Brooks

Massachusetts Institute of Technology

iRobot Corporation

Heartland Robotics

Evaluation Session: Moving Forward

4:00 - 5:00

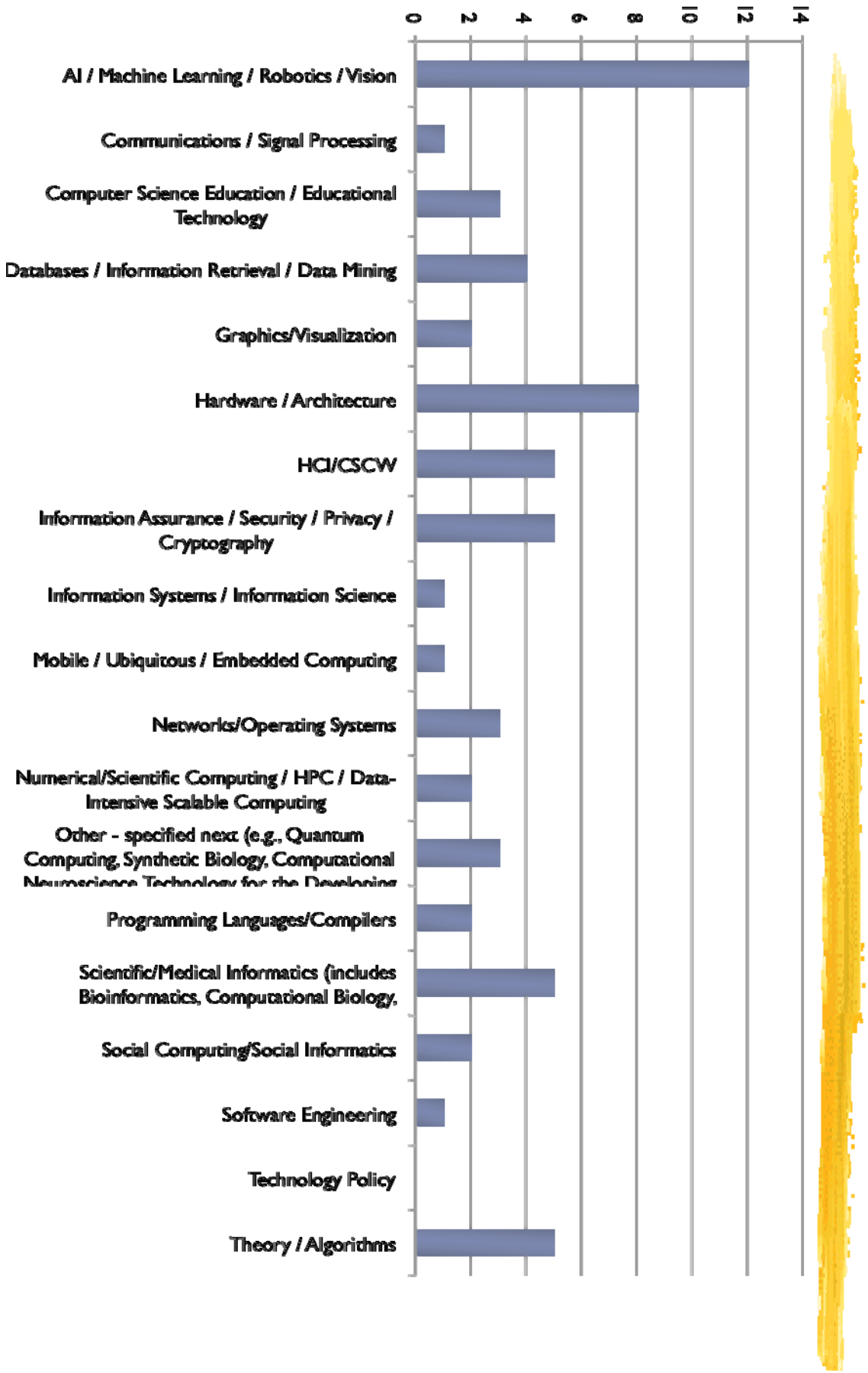
> Discussion by the speakers and the audience of what factors made these achievements possible and what factors will accelerate future advances.

> Moderators: Susan Graham (University of California, Berkeley) and Peter Lee (Carnegie Mellon University)

Walk to Madison Hall, James Madison Building, Library of Congress	5:00 - 5:30
Closing Session	5:30

April-July: Computing Innovation Fellows Project

- > 1200 prospective mentors
- > 500 applicants
- 60 awardees
  - > 40 distinct Ph.D. institutions
  - > 40 distinct mentoring institutions
    - 85% academic, 15% industrial
  - 75% citizen or permanent resident
  - 40% female
  - 12% under-represented minority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AI / Machine Learning / Robotics / Vision
Communications / Signal Processing
Computer Science Education / Educational Technology
Databases / Information Retrieval / Data Mining
Graphics/Visualization
Hardware / Architecture
HCI/CSCW
Information Assurance / Security / Privacy / Cryptography
Information Systems / Information Science
Mobile / Ubiquitous / Embedded Computing
Networks/Operating Systems
Numerical/Scientific Computing / HPC / Data-Intensive Scalable Computing
Other - specified next (e.g., Quantum Computing, Synthetic Biology, Computational
Programming Languages/Compilers
Scientific/Medical Informatics (includes Bioinformatics, Computational Biology,
Social Computing/Social Informatics
Software Engineering
Technology Policy
Theory / Algorithms


DARPA

Current

- Computing research and health care
- Computing research and energy

NetSE Research Agenda

Network Science and Engineering (NetSE) Research Agenda

A Report of the Network Science and Engineering Council

July 2009