The Computing Community Consortium
Catalyzing and Enabling Computing Research

Gregory D. Hager
CCC Vice-Chair
Johns Hopkins University
An Overview of the Computing Community Consortium

- A standing committee of the Computing Research Association founded in 2006
- Funded by NSF under a Cooperative Agreement
- Facilitates the development of a bold, multi-themed vision for computing research - and communicates this vision to stakeholders
- Led by a broad-based Council
- Chaired by Susan Graham
- Staffed by CRA
The mission of Computing Research Association's (CRA) Computing Community Consortium (CCC) is to **catalyze** the computing research community and **enable** the pursuit of innovative, high-impact research.

CCC conducts activities that **strengthen** the research community, **articulate** compelling **research visions**, and **align** those visions with pressing **national and global challenges**.

CCC **communicates** the importance of those visions to **policymakers**, government and **industry stakeholders**, the **public**, and the **research community** itself.
The CCC Council

Leadership

- Susan Graham, UC Berkeley (Chair)
- Greg Hager, Johns Hopkins (Vice Chair)
- Ed Lazowska, U. Washington (Past Chair)
- Ann Drobnis, Director
- Kenneth Hines, Program Associate
- Andy Bernat, CRA Executive Director

Terms ending 6/2016

- Randy Bryant, CMU
- Limor Fix, Intel
- Mark Hill, U. Wisconsin, Madison
- Tal Rabin, IBM Research
- Daniela Rus, MIT
- Ross Whitaker, Univ. Utah

Terms ending 6/2015

- Liz Bradley, Univ. Colorado
- Sue Davidson, Univ. Pennsylvania
- Joe Evans, Univ. Kansas
- Ran Libeskind-Hadas, Harvey Mudd
- Elizabeth Mynatt, Georgia Tech
- Shashi Shekhar, Univ. Minnesota

Terms ending 6/2014

- Deborah Crawford, Drexel
- Anita Jones, Univ. Virginia
- Fred Schneider, Cornell
- Bob Sproull, Sun Labs Oracle (ret.)
- Josep Torrellas, Univ. Illinois

Stehanie Forrest, Univ. New Mexico
Robin Murphy, Texas A&M
John King, Univ. Michigan
Dave Waltz, Columbia
Karen Sutherland, Augsburg College

Chris Johnson, Univ. Utah
Bill Feiereisen, LANL
Dick Karp, UC Berkeley
Greg Andrews, Univ. Arizona
Frans Kaashoek, MIT
Dave Kaeli, Northeastern
Andrew McCallum, UMass
Peter Lee, Carnegie Mellon

http://cra.org/ccc
What Distinguishes CCC?

- Proactive, rapid response
  - Identify, plan, and execute in a matter of weeks to months

- Community-based
  - Find and foster ideas from germination to fruition and beyond

- Leadership incubator
  - Everyone must do something!
A Multitude of Activities

- Community-initiated visioning:
  - Workshops 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, Data Analytics

- 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
## Catalyzing: Visioning exercises

<table>
<thead>
<tr>
<th>Community visioning activities</th>
<th>Participants</th>
<th>Organizations</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network science &amp; engineering</td>
<td>109</td>
<td>44</td>
<td>completed</td>
</tr>
<tr>
<td>“Big Data” Computing</td>
<td>81</td>
<td>46</td>
<td>multi-agency initiative launched</td>
</tr>
<tr>
<td>Theoretical computer science</td>
<td>39</td>
<td>26</td>
<td>completed</td>
</tr>
<tr>
<td>Global development (ICT4D)</td>
<td>56</td>
<td>37</td>
<td>completed</td>
</tr>
<tr>
<td>Cyber-physical systems</td>
<td>100</td>
<td>47</td>
<td>multi-agency initiative launched</td>
</tr>
<tr>
<td>Free &amp; open source software</td>
<td>45</td>
<td>35</td>
<td>completed</td>
</tr>
<tr>
<td>Learning technologies</td>
<td>55</td>
<td>30</td>
<td>following up</td>
</tr>
<tr>
<td>Robotics</td>
<td>141</td>
<td>79</td>
<td>multi-agency initiative launched</td>
</tr>
<tr>
<td>Cross-layer reliability</td>
<td>121</td>
<td>45</td>
<td>DARPA program launched</td>
</tr>
<tr>
<td>Advancing computer architecture</td>
<td>38</td>
<td>25</td>
<td>NSF program launched</td>
</tr>
<tr>
<td>Interactive technologies</td>
<td>74</td>
<td>42</td>
<td>completed</td>
</tr>
<tr>
<td>Health information technology</td>
<td>121</td>
<td>102</td>
<td>multiple programs launched</td>
</tr>
</tbody>
</table>
## Catalyzing: Visioning exercises

<table>
<thead>
<tr>
<th>Community visioning activities</th>
<th>Participants</th>
<th>Organizations</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability &amp; IT</td>
<td>72</td>
<td>43</td>
<td>NSF program launched</td>
</tr>
<tr>
<td>Global Development</td>
<td>50</td>
<td></td>
<td>completed</td>
</tr>
<tr>
<td>Disaster Management</td>
<td>57</td>
<td>31</td>
<td>completed</td>
</tr>
<tr>
<td>Spatial Computing</td>
<td>73</td>
<td>47</td>
<td>following up</td>
</tr>
<tr>
<td>Computing and Healthcare</td>
<td>97</td>
<td>57</td>
<td>multi-agency initiative launched</td>
</tr>
<tr>
<td>Software Assurance and Trustworthy Semiconductor Design and Manufacture</td>
<td>58</td>
<td>37</td>
<td>completed</td>
</tr>
<tr>
<td>Multidisciplinary Research for Online Education</td>
<td>82</td>
<td>41</td>
<td>following up</td>
</tr>
<tr>
<td>Privacy R&amp;D</td>
<td>39</td>
<td>31</td>
<td>completed</td>
</tr>
<tr>
<td>Extreme Scale Design Automation</td>
<td>23*</td>
<td>14*</td>
<td>In progress</td>
</tr>
<tr>
<td>Financial Cyberinfrastructure</td>
<td>28</td>
<td>14</td>
<td>Multi-initiative launched</td>
</tr>
<tr>
<td>Mid-Scale Infrastructure Investments for Computing Research</td>
<td>24</td>
<td>18</td>
<td>NSF program launched</td>
</tr>
</tbody>
</table>
Catalyzing and Enabling: Robotics

4 meetings during summer 2008
Roadmap published May 2009
Extensive discussions between visioning leaders & agencies

OSTP issues directive to all agencies in summer 2010 to include robotics in FY 12 budgets

National Robotics Initiative announced in summer 2011

Henrik Chistensen
Georgia Tech

http://cra.org/ccc
Catalyzing and Enabling: Big Data

A Series on Data Analytics: From Data to X

From Data to Knowledge to Action: A Global Enabler for the 21st Century

Eric Horvitz, Microsoft Research and Tom Mitchell, Carnegie Mellon University

Enabling Evidence-Based Healthcare [PDF | Word]

Eric Horvitz, Computing Research Association

Enabling an Initiative in "New Biology" [PDF | Word]

Chase Hensel, Computing Research Association and Erwin P..r.

Enabling 21st Century Discovery in Science and Engineering

Randal E. Bryant, Carnegie Mellon University and Ed Lazowska

Enabling Advanced Intelligence and Decision-Making for America

Randal E. Bryant, Carnegie Mellon University, Jamie S. Carbon, Tom Mitchell, Carnegie Mellon University

Enabling a Revolution in New Transportation [PDF | Word]

Sebastian Thrun, Stanford University, Chase Hensel, Computing Research Association

Enabling Personalized Education [PDF | Word]

Beverly Park Wolf, University of Massachusetts-Amherst, NSF Computing Research Association

Enabling the Smart Grid [PDF | Word]


Challenges and Opportunities with Big Data [PDF]

A community white paper developed by leading researchers in the area

2008 2008 2010 2012

http://cra.org/ccc
Catalyzing and Enabling: Architecture

Workshop on Advanced Computer Architecture Research (ACAR-I)

Failure is not an Option: Popular Parallel Programming

Organizers: Josep Torrellas (University of Illinois) and Mark Oskin (University of Washington).

Steering Committee: Chita Das (Pennsylvania State University), William Harrod (ARPA), Mark Hill (University of Wisconsin), James Larus (Microsoft Research), Margaret Martonosi (Princeton University), Jose Maria (IBM Research), and Kurri Oikarinen (Skanstan University).


Funded by the Computing Research Association (CRA) as a “visionary exercise” meant to promote forward-thinking in computer research and then bring those ideas to a funded project.

21st Century Computer Architecture

A community white paper

May 25, 2012

1. Introduction and Summary

Information and communication technology (ICT) is transforming our world: healthcare, education, science, commerce, government, defense, and entertainment to mention just a few. In the past few years, the trend toward ever-smaller, ever-faster, and ever-cheaper devices has made computer technology available to everyone and everywhere.

2010

2012

2013

2010

2010

2012

2013

Josep Torrellas
UIUC

Mark Oskin
Washington

Mark Hill
Wisconsin

http://cra.org/ccc
Communicating: PCAST NITRD Report

- 1/3 of the PCAST NITRD Working Group members were CCC Council members
- The report drew extensively on CCC White Papers
- An excellent roadmap for the field
- The challenge now: continuing to translate it into action
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.”
National Challenges: Healthcare

- Identify research challenges and opportunities

- Connect researchers, practitioners, industry

- Identify proof-of-concept models to drive research and translation
Directorate for Computer & Information Science & Engineering

SMART HEALTH AND WELLBEING (SHW)

CONTACTS
See program guidelines for contact information.

SYNOPSIS
Information and communications technology can be transformative if it is designed and implemented to provide safe, effective, efficient, equitable, and patient-centered health and wellness services. Doing so requires leveraging the scientific methods and knowledge bases of a broad range of computing and communication research perspectives. Some illustrative examples are described here. Protecting patient privacy while providing legitimate anytime, anywhere access to health services will require new security and cryptographic solutions. Personalized medicine will require advances in information retrieval, data mining, and decision support software systems. Continuous monitoring and real-time, customized feedback on health and behavior will rely on remote and networked sensors and actuators, mobile platforms, novel interactive displays, and advances in computing and networking infrastructure. Data collected by sensors, at clinics, and labs need to be anonymized and aggregated for community-wide health awareness and maintenance. Such data, especially collected over populations, can lead to inferences about best practices and cost savings in providing health services. Virtual worlds, robotics, image, and natural language understanding can facilitate better and more efficient delivery of health services. Software-controlled and interoperable medical devices are necessary for providing safe critical care. Healthcare systems and applications must be usable, to preclude or minimize failures due to human error; and they have to be useful, by matching the mental model of users, from provider to patient, so people make appropriate decisions and choices. These examples are meant to convey the breadth of computing areas that...
National Challenges: Healthcare

October 2012 Workshop

Beth Mynatt, Greg Hager
Susan Graham, Eric Horvitz
Deborah Estrin, Kevin Johnson
Christopher Chute, Kevin Patrick

http://cra.org/ccc
A Broad Conversation

Health Interests

- Wellness/disease prevention: 19%
- Interventional systems: 10%
- Mental health: 5%
- Behavioral science: 14%
- Diagnostic medicine: 5%
- Critical care: 6%
- Chronic care: 19%
- Outpatient management: 6%

Technology Interests

- Sensing/observation/data collection: 17%
- Data analytics: 18%
- Imaging and image analysis: 4%
- Mobile applications: 19%
- Language/speech/text processing: 2%
- Information security and privacy: 4%
- Collaborative computing: 7%
- Social computing: 5%
- Robotics: 4%
- Other: 6%
- Human computer interaction: 14%

http://cra.org/ccc
Directorate for Computer & Information Science & Engineering

SMART HEALTH AND WELLBEING (SHW)

CONTACTS
See program guidelines for contact information.

SYNOPSIS
Information and communications technologies are poised to transform our access to and participation in our own health and well-being. The complexity of this challenge is being shaped by concomitant transformations to the fundamental nature of what it means to be healthy. Having good health increasingly means managing our long-term care rather than sporadic treatment of acute conditions; it places greater emphasis on the management of wellness rather than healing illness; it acknowledges the role of home, family, and community as significant contributors to individual health and wellbeing as well as the changing demographics of an increasingly aging population; and it recognizes the technical feasibility of diagnosis, treatment, and care based on an individual's genetic makeup and lifestyle. The substrate of 21st century healthcare will be computing and networking concepts and technologies whose transformative potential is tempered by unresolved core challenges in designing and optimizing them for applicability in this domain.

The goal of the Smart Health and Wellbeing program is to seek improvements in safe, effective, efficient, equitable, and patient-centered health and wellness services through innovations in computer and information science and engineering. Doing so requires leveraging the scientific methods and knowledge bases of a broad range of computing and communication research perspectives.

Some illustrative examples are described here. Protecting patient privacy while providing legitimate anytime, anywhere access to health services will require new security and cryptographic solutions. Personalized medicine will require advances in information retrieval, data mining, and decision support software systems. Continuous monitoring and real-time, customized feedback on health and behavior will rely on remote and networked sensors and actuators, mobile platforms, novel interactive displays, and advances in computing and networking infrastructure. Data collected by sensors, at clinics, and labs need to be anonymized and aggregated for community-wide health awareness and maintenance. Such data, especially collected over populations, can lead to inferences about best practices and cost savings in providing health services. Virtual worlds, robotics, image, and natural language understanding can facilitate better and more efficient delivery of health services. Software-controlled and interoperable medical devices are necessary for providing safe critical care. Healthcare systems and applications must be usable, to preclude or minimize failures due to human error; and they have to be useful, by matching the mental model of users, from provider to patient, so people make appropriate decisions and choices. These examples are meant to convey the breadth of computing areas that...
The PCAST report II

- 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.”

- 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 summarizing key research questions and directions
- NSF has announced several FY 2012 solicitations as part of its SEES initiative

- Big Data
  - Temporal & geographic
  - Very large, heterogeneous (graphical structures, sampled measurements, images, extensive notes/comments, social network data, etc.)
  - (Meta)data provenance, federation, curation, visualization, analytics, archiving

- Common infrastructure
- Privacy & security
  - Aggregations of personal data
  - Targeting feedback systems
- Quality & transparency of models
- Understanding human needs, encouraging behavior changes
Computational Sustainability

- Workshop with 60+ computer scientists, systems engineers, social scientists, "sustainability scientists"
- Produced a report summarizing key research questions and directions
- NSF has announced several FY 2012 solicitations as part of its SEES initiative

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

- Big Data
  - Temporal & geographic
  - Very large, heterogeneous (graphical structures, sampled measurements, images, extensive notes/comments, social network (Meta)data, provenance, federation, curation, visualization, analytics, archiving)
  - Aggregations of personal data
  - Targeting feedback systems
  - Quality & transparency of models
  - Understanding human needs, encouraging behavior changes
Communicating: NITRD Symposium (2/16/2012)
Communicating: Leadership in Science Policy Inst. (November 2011, April 2013)

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

Milt Corn, NIH

Henry Kelly, DoE

Attendees

Agenda

8:30 am - 9:00 am
Welcome [100 KB PDF] [Referenced videos - Lazowska | Bartlett | Brooks]
(Fred Schneider, Cornell, Workshop Chair)

Lay out the goals of the workshop: to provide a crash course in relevant science policy issues and the mechanics of policymaking, including an overview of how federal science policy is crafted, how it’s implemented, and where are the opportunities for members of the community to participate in the policy-making process.

9:00 am - 10:30 am
Interacting with Agencies/Creating New Initiatives
(Jeannette Wing, CMU [143 KB PDF]; Milt Corn, NIH [242 KB PDF]; Henry Kelly, DoE)

The agencies are where the science-policy rubber hits the road, where decisions are made in both the administrative and legislative branches: get implemented, and the most common avenue for individuals in the science community to interact with the federal government. Influencing policy decisions at the agency level can require a somewhat different skill set and somewhat different approach than influencing your faculty peers, the Congress, or the White House. Agencies also provide opportunities for individuals in the community to directly shape federal policy in their field, by serving on an agency advisory committee, or by taking a rotation as a program manager, division director, or office director. This session will cover agency budget process and will discuss opportunities for scientists to advise and engage federal science agencies like NSF, DOE, and NIH. The speakers will discuss the mechanics of how agency new initiatives get started, focusing on the culture and traditions that constitute the lens through which agencies view themselves and are viewed by others. In practical terms, how is success measured? To what extent is outside advice sought and in support of what kinds of activities? What kinds of advice and modes of engagement are unlikely to be effective?

Logistics

Date: November 7, 2011
Location: Hyatt Regency Capitol Hill, Washington, DC

Participation in the workshop will include breakfast and lunch at the workshop, as well as a reception with workshop speakers and other interested guests at the conclusion of the meeting. Hotel accommodations for two nights (before and after the workshop) as well as reimbursement for airfare and other travel expenses will be provided by the workshop (through funding from CCC).

http://cra.org/ccc
Public outreach: CCC Blog

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

“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 VIA E-MAIL
Enter your email address: Go

SUBSCRIBE to the CCC Blog Feed

LATEST TWEET
"Improving Brain-Computer Interfaces"
http://tao/5gTEn0A
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 (46)
New Challenges in a Rapidly Expanding World of Computing?

http://cra.org/ccc
2011-2012 Employment Data by Sector

- Theory and Algorithms
- Software Engineering
- Social Computing / Social Informatics
- Scientific / Numerical Computing
- Robotics / Vision
- Programming Language / Compilers
- Operating Systems
- Networks
- Information Systems
- Information Science
- Information Assurance / Security
- Informatics: Biomedical / Other Science
- High-Performance Computing
- Human-Computer Interaction
- Hardware / Architecture
- Graphics / Visualization
- Database / Information Retrieval
- Computer-Supported Cooperative Work
- Artificial Intelligence

Non-Academic
Academic

http://cra.org/ccc
2011-2012 Employment for PhD Graduates by Sector

1/4 of the total are TT
1/2 are postdocs!
In recent years, new PhD’s in the CS&E community have increasingly chosen postdoc training assignments in their pursuit of research careers. Large numbers of postdocs in CS&E are a new phenomenon for us. Our community has an opportunity, as a field, to institutionalize a set of best practices, drawn from our own experience and that of postdocs in other fields and to establish a culture that provides postdocs a superb enriching experience that launches their research careers.
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
Implications for academia
Implications for academia

New Drivers: Industry, Society, Government, Science
Implications for academia
CCC: Catalyzing and Enabling Computing Research

Gregory D. Hager
CCC Vice-Chair
Johns Hopkins University