THE ROLE OF THE COMPUTING COMMUNITY CONSORTIUM IN ADVANCING AUDACIOUS COMPUTING RESEARCH

Elizabeth Mynatt
Chair
Computing Community Consortium
The **mission** of Computing Research Association's Computing Community Consortium (CCC) is to **catalyze** the computing research community and **enable** the pursuit of innovative, high-impact research.

**COMPUTING COMMUNITY CONSORTIUM**

**Promote Audacious Thinking:**
- Community Initiated Visioning Workshops
- Blue Sky Ideas tracks at conferences

**Inform Science Policy:**
- Outputs of visioning activities
- Task Forces – Health IT, Data Analytics

**Communicate to the Community:**
- CCC Blog - [http://cccblog.org/](http://cccblog.org/)
- Great Innovative Ideas
- White Papers

**Promote Leadership and Service:**
- Industry – Academic Collaborations
- Leadership in Science Policy Institute
- Postdoc Best Practices
THE CCC COUNCIL – EXECUTIVE COMMITTEE

- Beth Mynatt, Georgia Tech (Chair)
- Mark Hill, University of Wisconsin, Madison (Vice Chair)
- Greg Hager, Johns Hopkins Univ. (Past Chair)
- Ben Zorn, Microsoft Research
- Jennifer Rexford, Princeton
- Ann Drobnis, Director
- Andy Bernat, CRA Executive Director
THE CCC COUNCIL

Terms ending June 2019
• Sampath Kannan, UPenn
• Maja Mataric, USC
• Nina Mishra, Amazon
• Holly Rushmeier, Yale

Terms ending June 2018
• Liz Bradley, (CU Boulder)
• Cynthia Dwork, Microsoft Research
• Kevin Fu, Univ. Michigan (Leave)
• Daniel P. Lopresti, Lehigh University
• Shwetak Patel, Univ. Washington
• Katherine Yelick, UC Berkeley

Terms ending June 2017
• Lorenzo Alvisi, Cornell
• Randy Bryant, CMU
• Vasant Honavar, Penn State
• Jennifer Rexford, Princeton
• Debra Richardson, UC Irvine
• Klara Nahrstedt, UIUC
• Ben Zorn, Microsoft Research
THE RAPIDLY EXPANDING WORLD OF COMPUTING

CORE CSE

- Mobile
- HCI
- Machine Learning
- Cloud Computing
- Big Data
- Sensors
- Natural Language Process

Radiating from CORE CSE:

- Medicine and Global Health
- Energy and Sustainability
- Security and Privacy
- Technology for Development
- Interacting with the Physical World
- Accessibility
- Elder Care
- Neural Engineering
- Transportation
- Scientific Discovery
- Education

Graphic: Lazowska
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National Priorities
- Agency Requests
- Open Visioning Calls
- Blue Sky Ideas

Reports  •  White Papers
- Roadmaps  •  New Leaders

Public Funding Agencies
- Science Policy Leadership

Computing Research Community Council-Led Workshops
- Community Visioning

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CCC AND FEDERAL STAKEHOLDERS

OSTP: Office of Science Technology and Policy (Holdren, Smith, Kalil, Felten)

PCAST: President’s Council of Advisors on Science and Technology (Holdren, Lander)

NITRD: Networking and Information Technology R&D

CSTB: Computer Science Telecommunications Board

Agencies: NSF, NIH, DoE, NIST, HHS / ONC, DARPA...
"The administration has a real commitment to evidence. ... We believe in following research where it exists and building it where it doesn’t."

- Tom Kalil
Deputy Director for Technology and Innovation
White House Office of Science and Technology Policy
CCC AND FEDERAL STAKEHOLDERS

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CCC AND FEDERAL STAKEHOLDERS

NITRD: Networking and Information Technology R&D
# CCC AND FEDERAL STAKEHOLDERS

NITRD: Networking and Information Technology R&D

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CCC AND FEDERAL STAKEHOLDERS

CSTB: Computer Science Telecommunications Board
CCC AND FEDERAL STAKEHOOLDERS

Agencies: NSF, NIG, DoE, NIST, HHS / ONC, DARPA...
I'M JUST A BILL!
OUTREACH: ROBOTICS

A Roadmap for US Robotics
From Internet to Robotics

M.10.30
MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES
FROM:
Peter R. Orszag
Director, Office of Management and Budget

Office of Science and Technology Policy
Roadmap published
May 2009

4 meetings during
summer 2008

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

National Robotics
Initiative announced
in summer 2011

Extensive discussions
between visioning
leaders & agencies

Henrik Chistensen

2 meetings in Spring, 2016
Report and
Congressional Briefing in
June, 2016

Outreach: Robotics

Computing Community Consortium
Catalyst
OUTREACH: ARCHITECTURE
OUTREACH: HEALTH IT

October 2009 Workshop

National Science Foundation
National Library of Medicine
American Medical Informatics Association
Office of the National Coordinator for Health Information Technology
Computing Community Consortium
Agency for Healthcare Research and Quality

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...
OUTREACH: AGING IN PLACE

Joint NIH/CCC Meeting
September 2014

Produced Workshop Report
February 2015

NIH released new RFP informed by AIP Workshop
October 2015

PCAST Report
March 2016
National Symposium to Highlight the Impact of Computing Research:

• Seven panels, two plenaries, and an early career poster session covering four main themes:
  – The Impact of Computing in Our Physical World
  – Computing Enhancing Our Lives
  – Controlling Our Data
  – Partnerships for the Future

• 130 in-person participants; over 1000 online viewers
June 7, 2016 in Washington, DC

Co-sponsored by OSTP, AAAI, CCC to discuss the successful deployments and the potential use of AI in various topics that are essential for social good.

One of four workshops the OSTP co-sponsored to identify challenges and opportunities around AI.

Over 400 participants in-person; over 3,500 participants online.
WHAT’S ON THE HORIZON?
CISE Research: Addressing National Priorities

White House Initiatives

- Big Data R&D
- National Robotics Initiative
- Understanding the Brain
- National Strategic Computing Initiative
- Smart Cities
- CS for All
- Advanced Wireless Initiative
NSF Support of Academic Basic Research
(as a percentage of total federal support)

- All Science and Engineering Fields: 24%
- Physical Sciences: 40%
- Engineering: 41%
- Environmental Sciences: 59%
- Mathematics: 61%
- Social Sciences: 67%
- Biology: 68%
- Computer Science: 82%

Wireless, virtualization: recent announcements

PAWR: Platforms for Advanced Wireless Research

• at-scale experimental exploration of robust new wireless devices, communication techniques, networks, systems
  – dynamic spectrum, mmWave, network architecture, wide-area wireless backhaul, metrology
• public-private partnership: $50M NSF/CISE investment, > $40M in industry consortium investment (7 years)
• Up to 4 wireless research testbeds
• Program solicitation NSF 16-585 seeking a project office
Over 20 companies have partnered to establish a new Industry Consortium.
Big Data Regional Innovation Hubs

- **Northeast**: Columbia University
- **West**: UCSD, UC Berkeley, UW
- **South**: NC Chapel Hill, Georgia Tech
- **MidWest**: UIUC

- **Goal**: ignite new **Big Data public-private partnerships** across the Nation
- **Hub**:
  - Consortium from academia, industry, gov’t
  - focus on Big Data challenges, opportunities for region
- **Support breadth of local stakeholders, achieve common**
  
  *Big Data goals not be possible alone*
Big Data Spokes of the BDHubs

Each Hub supports subcommitees on **topical areas of interest** ("Spokes")

BDSpokes solicitation aims to support **collaborative projects** surfaced or developed by the Hubs and Spokes

- Two award categories: **Planning Grants** (100K for 1 year) and **Spokes** ($1M total over 3 years)
- Total anticipated funding: $10M
- 10 Spokes, 10 Planning Grants anticipated
INDUSTRY – ACADEMIC COLLABORATIONS

With Big Data Regional Innovation Hubs

• **Northeast**: Young Innovator Internships, Knowledge Exchange Lecture Series, Data Science Best Practices Workshop

• **South**: Data Start Internships, PEPI Early Career Exchange Visits

• **Midwest**: Early Career Big Data Summit, Data Quality and Informal Data-An Oxymoron Workshop, Travel Grants

• **West**: Collaboratory Faire, Workshop on Data Hackathon Best Practices, Tools of the Data Journalism Trade Workshop
Smart and Connected Communities

- WH Initiative announced Sept. 2015
- Cross-Foundation DCL issued
- **Synergies:** Cyber-Physical Systems, Urban Science, Risk & Resilience, Smart and Connected Health, US Ignite, Advanced Wireless Research Initiative/PAWR, Human-Technology Frontier, ...
- Multiple community Workshops
- Proposals due Feb 2017
- NITRD Strategic Plan
NSF “Big Ideas”

NSF director unveils big ideas, with an eye on the next president and Congress

By Jeffrey Mervis | May 10, 2016, 3:30 PM
NSF Ideas for Future Investment

**RESEARCH IDEAS**
- Harnessing Data for 21st Century Science and Engineering
- Shaping the New Human – Technology Frontier
- Understanding the Rules of Life: Predicting Phenotype
- The Quantum Leap: Leading the Next Quantum Revolution
- Navigating the New Arctic
- Windows on the Universe: The Era of Multi-messenger Astrophysics

**PROCESS IDEAS**
- Growing Convergent Research at NSF
- Mid-scale Research Infrastructure
- NSF 2050
Harnessing the Data Revolution

+ **Advanced cyberinfrastructure ecosystem** for accelerating data-intensive research, including large-scale facilities

+ **Innovative educational pathways**, grounded in an education-research-based framework

---

**Theoretical foundations**
- mathematics, statistics, computer & computational science

**Systems foundations**
- data-centric algorithms, systems

**Data-intensive research** in all areas of science and engineering
NSF: Shaping the new Human-Technology Frontier

We envision a world in which technologies – sensors, communication, computation, and intelligence – are embedded around, on, and in us. We propose a bold initiative to catalyze the interdisciplinary science and engineering needed to shape that future and the human centered engineered and social systems that those technologies will enable.

- Machine intelligence
- Energy efficiency of sensing, communications and computing
- Human-centered engineered systems with cognitive and adaptive capacities, best matched to collaboration with people
- Understand how technologies affect human behavior and social organizations
- Improve and extend learning
- Address technical and social research challenges in privacy and security
The Human-Technology Frontier

Computing will be embedded around, on, and in us. These engineered systems will be more pervasive, more personal, more intimate.

Understanding how constantly evolving technologies are actively shaping our lives and how we in turn can shape those technologies, especially in the world of work

• understand benefits, risks of new technologies: efficiency, quality, productivity, human dynamics
• science and engineering: creating technologies that promise to enhance work lives
• Education: changing workplace demands changing workforce
2015 PCAST NITRD REPORT

Critical Areas:
- Cybersecurity
- Health
- Big Data and Data Intensive Computing
- Interaction with the Physical World
- Privacy
- Cyber-Human Systems
- Foundational Research
- High-Capability Computing
BETH’S SPECULATION

• Tension between augmentation and automation
• AI for Social Good
• Smart Cities and Communities (PCAST, White House / OSTP)
• Aging
• STEM / CS for all
• Increased role of public-private partnership (see new wireless initiative)
• Socio-technical systems demand different research programs and infrastructure
• Funding capability doesn't match demand on computing academic units
CCC IMPLEMENTATION PLAN: 2016-2017

1. Expanding Investments in Computing Research
   - Agencies; Initial focus on transition papers
     - Industry
       • Collaborative investments

2. Cross-Cutting Visioning
   - Research Infrastructure / Testbeds
   - Socio-Technical Systems

3. Assessment

4. Outreach and Communication
   - Academic Depts
   - Industry (including “non CS”)
   - Engagement with ACM / IEEE / NITRD / CSTB …
   - Media: Trusted Voice

5. Scalability
   - Task Forces
   - Tap CCC Alumni Network

6. Leadership Development

7. Sustainability
TASK FORCES

• Computing in the Physical World
• Convergence of Data and Computing
• Healthcare
• Privacy
• Artificial Intelligence
**CURRENT VISIONING WORKSHOPS**

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<td>Symposium on Accelerating Science</td>
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<td>Smart Health and Health IT</td>
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WHY HAVE A CCC?

- Computing Research Community
- Investments in Computing Research
- Research Beneficiaries General Public
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Computing Research Community

Investments in Computing Research

Research Beneficiaries General Public
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Investments in Computing Research

- Computing Research Community
- Potential Students
- 4 Year & International Universities
- Research Universities
- National Labs
- Industry
- Research Beneficiaries
  - General Public

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- Research Universities
- National Labs
- Industry
- Research Beneficiaries
  - General Public
WHY HAVE A CCC?

Computing Research Community

- 4 Year & International Universities
- Potential Students
- Catalyze faculty, students
- Research Universities
- Workshops Whitepapers
- National Labs
- CI Fellows

CCC Visioning

Investments in Computing Research (Agencies, Industry, General Public)

- Communications
- Research Beneficiaries
- Industry
- Big Data Industry Collaboration

Catalyze faculty, students
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