INTRODUCTION TO THE CCC AND THE CCC COUNCIL

July 18, 2018

CCC
Computing Community Consortium
Catalyst

AN OVERVIEW OF THE COMPUTING COMMUNITY CONSORTIUM

- Established in 2006 as a standing committee of the Computing Research Association (CRA)
- Funded by NSF under a Cooperative Agreement
  - Third Award began in April 2018,
    Site Visit will be September 2018
- Facilitates the development of a bold, multi-themed vision for computing research – and communicates this vision to stakeholders
- Led by a broad-based Council
- Staff based at CRA

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WHAT WE'LL TRY TO COVER

- Brief history
- Role and mission of CCC
- Organizational details
- CCC Stakeholders
- CCC Goals, Activities and Desired Outcomes
- CCC Impact

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PRE-HISTORY

In the mid-2000's, NSF CISE leaders and computing research community leaders had similar concerns regarding:

- The Federal commitment to research in general, and to computing research in particular
- Public and policymaker perception that computer science is "yesterday's news"
- Failure to articulate and coalesce around exciting research visions in computer science – research visions that would galvanize the public, policymakers, researchers, and students
- Need to groom leadership for the field
- Decrease in student interest
- GENI Project direction

This led to:

- Increased focus on these issues by NSF CISE and the computing research community
- Computing Community Consortium solicitation by NSF
- Eager response by a group of computing research community leaders under the auspices of the Computing Research Association
  - Randy Bryant
  - Susan Graham
  - Anita Jones
  - Dick Karp
  - Ken Kennedy
  - Ed Lazowska
  - Peter Lee
  - Jeff Vitter

INFORMAL MISSION

"A catalyst and enabler for the computing research community"

- Bring the community together to contribute to shaping the future of the field
- Provide leadership for the community, encouraging revolutionary, high-impact research
- Encourage the alignment of computing research with pressing national priorities and national challenges (many of which cross disciplines)
- Work with policymakers to facilitate the translation of these important research directions into funded programs
- Give voice to the community, communicating to a broad audience the many ways in which advances in computing will create a brighter future
- Grow new leaders for the computing research community

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MAJOR ORGANIZATIONAL MILESTONES

- NSF solicitation + CRA Proposal + Cooperative Agreement (2006)
- Chair appointed (Winter 2007) + Council appointed (Spring 2007)
- Vice-Chair position formalized: Fall 2007
- Full-time Director (Erwin Gianchandani) joins: Spring 2010
- Renewal proposal submitted: Spring 2011
- Steady-state organizational structure defined: Fall 2012
- Executive Committee launched: Winter 2013
- Ann Drobnis joins as Director: Spring 2013
- Regular Chair / Vice-Chair succession kicks in: Summer 2013
- Proposal and Renewal (2017)
- Third Award (2018)

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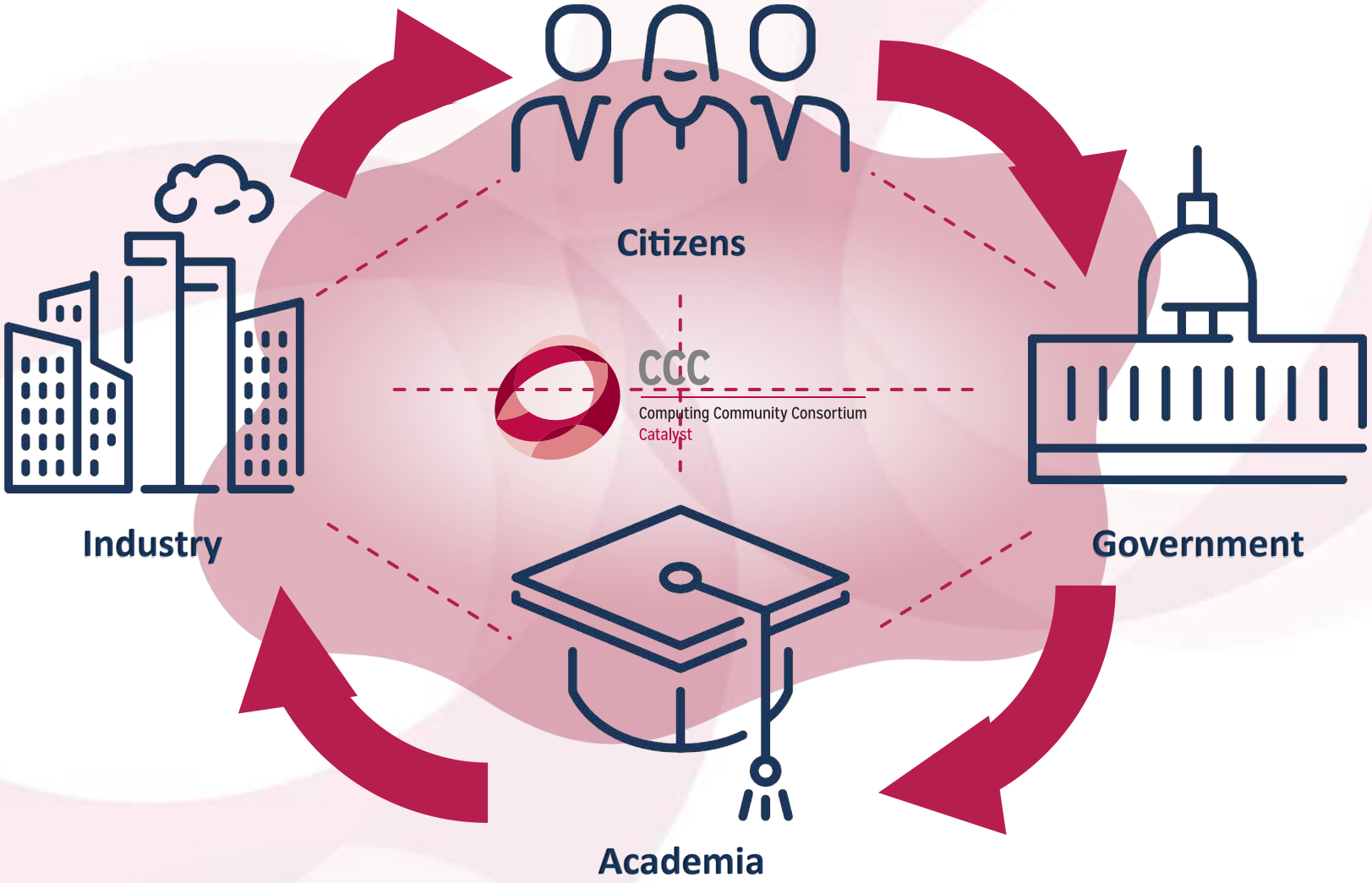
CCC: CATALYZING I.T.'S VIRTUOUS CYCLE



Icons modified from Zlatko Najdenovski, Flaticon

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.

Who

- **Council - 20members**
- **CCC/CRA Staff**
- **Chair, VC, & Director**

Inputs: Bottom-up, Internal, & Top-Down

What:

- **Workshops & Conf. Blue Sky Tracks**
- **Whitepapers & Social Media**
- **Reports Out (esp. to government)**
- **Biannual Symposium to DC'ers**

Human Development

- **Early Career Workshops & Participation**
- **Council Membership**
- **Leadership w/ Gov't (LISPI)**

ORGANIZATIONAL STRUCTURES

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CCC ORGANIZATIONAL STRUCTURE

Chair, Vice-chair

- 2 year non-staggered terms
- Vice-chair is presumptive chair

Director, Deputy Director, Program Associates (2)

- Full-time paid positions

Executive Committee

- Chair, Vice-chair, Director
- 3 at large drawn from Council for 1-year terms
- CRA Executive Director

Council

- 20 members
- 3 year terms, at most 2 consecutive terms

Support

- As needed, from CRA Staff

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WHAT DOES EXECUTIVE COMMITTEE DO?

- Each member has a major responsibility within the organization
- Oversees the work of subcommittees and working groups
- Guides the planning of new activities
- Oversees the execution of the Strategic Plan and annual Implementation Plan
- Meets biweekly by teleconference
- Meets biweekly with NSF by teleconference

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WHAT DO COUNCIL MEMBERS DO?

- Shepherd visioning activities
- Participate in topical task forces
  - Examples: AI and Robotics, Healthcare, Privacy and Fairness
  - Produce and curate relevant resources
  - Monthly teleconferences
- Develop and lead new activities
  - Examples: CIFellows, LISPI, …
- Engage with government agencies, industry, and sister organizations (NSF, ACM, Big Data Hubs…)
- Write white papers and blog posts
- Other requests as needed
- Monthly teleconferences
- Three face-to-face meetings each year

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THE CCC COUNCIL

Chair: Mark Hill
Vice Chair: Liz Bradley

Terms ending June 2021

- Ian Foster, University of Chicago
- Ronitt Rubinfeld, MIT
- Suresh Venkatasubramanian, Utah
- Daniel P. Lopresti, Lehigh University
- David C. Parkes, Harvard
- Shwetak Patel, Univ. Washington

Terms ending June 2020

- Nadya Bliss, Arizona State
- Juliana Freire, NYU
- Keith Marzullo, Maryland
- Greg Morrisett, Cornell
- Jennifer Rexford, Princeton
- Manuela Veloso, Carnegie Mellon
- Ben Zorn, Microsoft Research

Terms ending June 2019

- Sampath Kannan, Upenn
- Maja Mataric, USC
- Elizabeth Mynatt, Georgia Tech
- Nina Mishra, Amazon
- Holly Rushmeier, Yale
- Kevin Fu, Univ. Michigan


















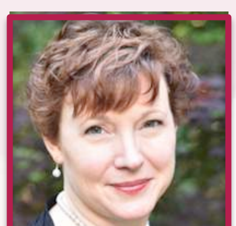


CRA STAFF

CCC Director: Ann Drobnis

Senior Program Associate: Helen Wright

Program Associate: Khari Douglas

CRA Executive Director: Andy Bernat

Other CRA Staff:

- Peter Harsha, Director of Government Affairs
- Sandra Corbett
- Sabrina Jacob







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NSF INTERACTIONS

Program Officer: Nina Amla

RELATIONSHIP TO COMPUTING RESEARCH ASSOCIATION (CRA)

NSF cooperative agreement is with CRA

CCC is a standing committee of CRA

- Andy Bernat, CRA Executive Director, is an ex officio member of the CCC Executive Committee
- Mark Hill, the CCC Chair is a member of the CRA Board of Directors
- Susan B. Davidson, the CRA chair must consent to CCC Council appointments (and is a former Council member)
- Greg Morrisett, CCC Council member and member of the CRA Board of Directors

CCC staff are based in CRA

CCC AND ITS STAKEHOLDERS

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MAJOR STAKEHOLDERS

- Computing Research Community
  - CRA
  - CSTB (Computer Science and Telecommunications Board, part of National Research Council)
  - Professional societies
  - Academic units
  - Research labs
- Industry
  - Computing industry, Major users of IT
- Public
- Government
  - See following slides

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GOVERNMENT STAKEHOLDERS

Agencies important to us

- NSF – strong ties with CISE
- NIH – growing ties with folks interested in Health IT
- DARPA – ties come and go
- DoE – ties with ASCR; interest in ARPA-E

Others that are relevant

- NIST
- HHS/ONC
- IARPA
- DoT

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GOVERNMENT STAKEHOLDERS

Networking and Information Technology R&D (NITRD)

- Legislatively mandated coordination among Federal R&D agencies
- National Coordinating Office (NCO) facilitates
  - Interagency working groups
  - Coordinating groups
  - Senior steering groups
  - Community of practice
- Director is Bryan Biegel, leaving August 1
  - Coming in is Kamie Roberts (previously NIST)

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PCAST NITRD REPORT

2010

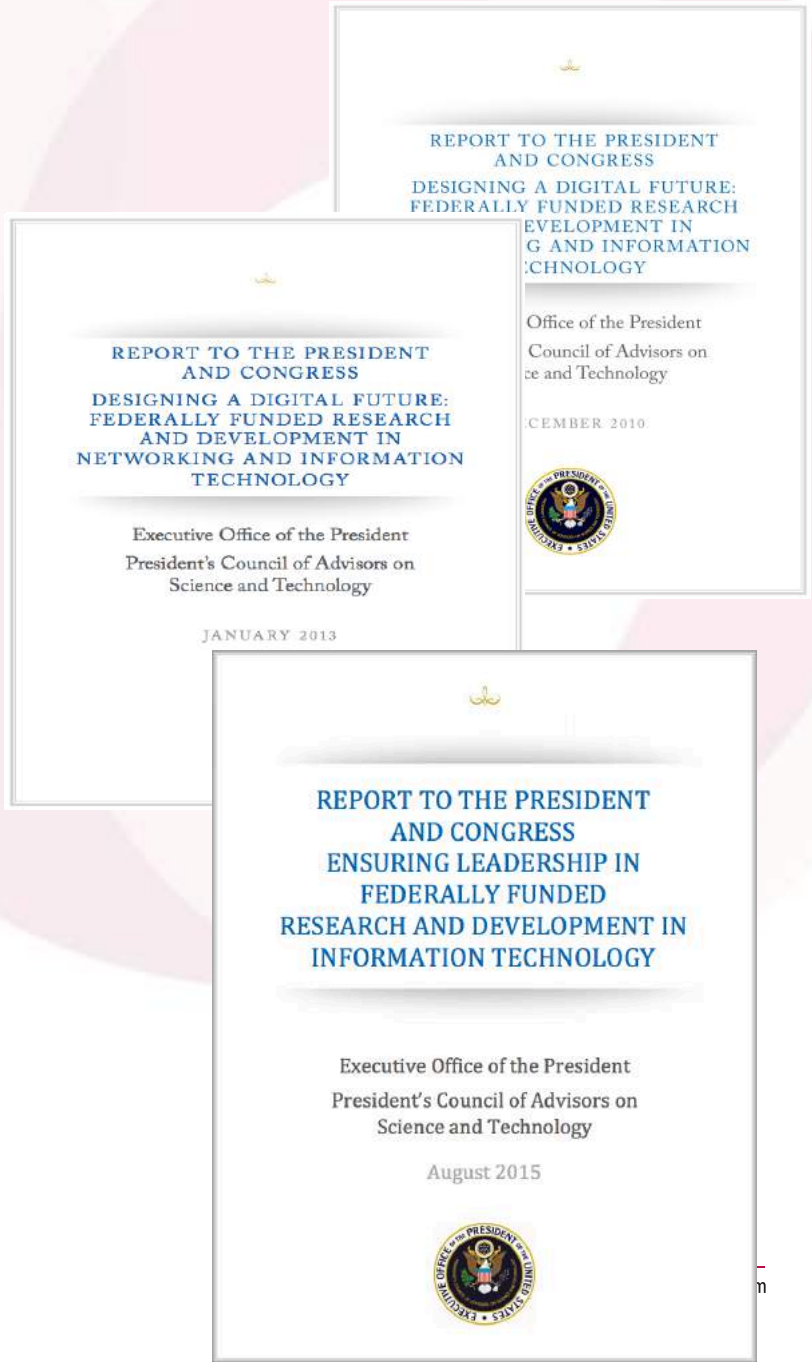
- 1/3 of the PCAST NITRD Working Group members were CCC Council Members
- The report drew extensively on CCC White Papers
- An excellent roadmap for the field

2013

- ¼ Contributing Members were CCC Council Members
- An excellent review of progress from 2010 report
- The challenge now: Continuing to translate it into action

2015

- 1/3 Contributing Members were CCC Council Members
- An update to the 2013 report, including recommendations for Federal Agencies
- The challenge now: restructuring NITRD



CCC GOALS AND ACTIVITIES

GOALS FOR CCC

1. **Bring the computing research community together to envision audacious research challenges**, and to articulate concrete pathways to enable pursuit of these challenges.

2. **Communicate** these challenges and opportunities to the broader national community.

3. **Facilitate investment** in these research challenges **by key stakeholders**.

4. **Inculcate** values of **leadership** and service by the computing research community.

5. **Inform and influence early career researchers** to engage in these community-led research challenges.

DESIRED OUTCOMES

1. **Create broad awareness of the role computing research will play in future science and technology advances** within federal agencies, philanthropic organizations, and industry through concrete examples and products.

2. **Facilitate broad engagement of the computing research community** in identifying and articulating new directions for computing research, in shaping priorities for those new directions, and in responding to existing opportunities in the computing research ecosystem.

3. **Create high-impact tangible resources** that inform stakeholders as to the current and potential impact of computing research.

4. **Sustain the CCC** as a widely accepted catalyst and voice for the computing research community.

5. **Grow leadership and community capacity** to engage in and respond to national science policy needs.

Mapping CCC Strategic Goals to Priority Outcomes

	Goal 1: Research Challenges	Goal 2: Communicate Broadly	Goal 3: Research Investments	Goal 4: Leadership	Goal 5: Influence Community
Outcome 1: Agency Awareness	✔	✔	✔		
Outcome 2: Community Engagement	✔	✔		✔	✔
Outcome 3: Tangible Resources	✔	✔	✔		✔
Outcome 4: CCC Role	✔	✔		✔	
Outcome 5: Leadership and Capacity	✔	✔	✔	✔	✔

PLANNED ACTIVITIES

- Envisioning Future Computing Research
- Engaging and Aligning with National and Computing Research Priorities
- Communicating Future Computing Research
- Cultivating Computing Leadership and Community Capacity to Engage and Respond to National Priorities

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ENVISIONING FUTURE COMPUTING RESEARCH

"The Computing Community Consortium (CCC) solicits proposals that will galvanize the community to define visions and agendas for exciting frontiers of computing research."

- Create a new community of researchers.
- Inform a new funding initiative.
- Help an extant community define a new trajectory.

Goals for next phase

- Increase our outreach and participation
- Increase the participation of industry leadership and early career researchers at Visioning Workshops

VISIONING PROCESSES

- Periodic RFP for Community Initiated Activities
- 6 workshops per year in the last 3 years
- Top-down (agency initiated)
- Bottom-up (open call)
- Sideways (council initiated, joint with other agencies,….)

Robotic Materials

Digital Computing Beyond Moore's Law

Sociotechnical Interventions for Health Disparity Reduction

Sociotechnical Cybersecurity

Cybersecurity for Manufacturers

VISIONING ACTIVITIES

- Over 45 visioning activities in 10-year history
- Average of 6 activities per year in the last 4 years
- Research areas include:
  - Smart and Pervasive Health
  - Beyond Moore's Law
  - Robotic Materials
  - Privacy by Design
  - BRAIN Initiative
  - Fairness
  - Personalized Education
- 13 workshop reports released in past 4 years
- 20 white papers released in past 4 years

Workshop	Date
Cyber- Social Learning Systems Workshop 3	January 24-25, 2017
Cyber Security for Manufacturers Workshop	March 14-15, 2017
Socio Technical Cybersecurity Workshop 2	August 8-9, 2017
Leadership in Science Policy Institute	November 6-7, 2017
Fair Representations and Fair Interactive Learning	March 18-19, 2018
Sociotechnical Interventions for Health Disparity Reduction	April 9-10, 2018
Robotic Materials	April 23-24, 2018
Digital Computing Beyond Moore's Law	May 3-4, 2018
Next Steps in Quantum Computing: Computer Science's Role	May 22-23, 2018

SUCCESSFUL VISIONING ACTIVITIES

- Engage the community and relevant stakeholders

- Facilitate broad thinking with compelling examples
- Create new avenues for (interdisciplinary) collaboration
- Prepare and energize the community for future opportunities

- Rapidly capture and synthesize ideas from the community.
- Present ideas and engage possible funders and stakeholders
- Articulate needs and barriers to research impact

BLUE SKY

Goal - Help conferences reach out beyond the usual research papers. Papers are opened ended and possibly "outrageous" or "wacky."

- 14 different tracks at 9 different conferences in last 5 years
- On average, 13 papers submitted per track at a conference
- Winners are asked to submit Great Innovative Ideas

Past CCC Chair Gregory Hager with AAAI-16 Blue Sky award winner Francesca Rossi

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BLUE SKY IDEAS CONFERENCE TRACKS

PAST

- BuildSys 2012
- Computational Sustainability Track @ AAAI 2013
- Computational Sustainability Award @ CHI 2013
- Robotics: Science and Systems 2013
- Conference on Innovation Data Systems Research (CIDR-2013)
- Autonomous Agents and MultiAgent Systems (AAMAS-2014, AAMAS-2016, AAMAS-2017)
- Foundations of Software Engineering (ACM SIGSOFT 2014)
- Advancement of Artificial Intelligence (AAAI-15, AAAI-16, AAAI-17, AAAI-18)
- Advances in GIS (ACM SIGSPATIAL 2015, ACM SIGSPATIAL 2016, ACM SIGSPATIAL 2017)
- Robotics: Science and Systems (RSS) 2015, 2017
- International Conference on Software Engineering (ICSE 2016)

UPCOMING

- ACM HyperText 2018
- International Semantic Web Conference
- AAAI-19
- iConference
- ACM SIGSPATIAL

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ENGAGING AND ALIGNING WITH NATIONAL AND COMPUTING RESEARCH PRIORITIES

- Agility to respond to requests and ideas.
- Outreach pulls together visioning with stakeholder needs and timely opportunities

- Increase scale and capacity through CCC Task Forces
- Increase engagement with industry, sister organizations and other relevant stakeholders (philanthropy)

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CCC TASK FORCES

CCC task forces are organized around national priorities, community needs, and council member interests. Our current* set of topics are:

- Cybersecurity
- Human Technology Frontier
- Artificial Intelligence
- Intelligent Infrastructure
- Privacy and Fairness
- Post Moore's Law Computing

Goal is for CCC to be **engaged in ongoing activities** around these topics, to **identify needs and opportunities** in the topic area, and to **identify actions** (generating white papers, convening a workshop, publicizing information, etc.) that have the possibility of "moving the needle" for these topics.

Annual process to determine topics, membership and priorities. Informed by major stakeholders (NSF, OSTP, PCAST, NITRD, workshops and council members). * List likely to change after this summer's meeting.

COMPUTING RESEARCH

ADDRESSING NATIONAL PRIORITIES AND SOCIETAL NEEDS

- Held first National Symposium to Highlight the Impact of Computing Research in 2016. Held second one in October 2017.
- Established a biennial Symposium to communicate the role of computing research to address national and societal priorities
- Bring in early career researchers to connect them with and invigorate the community

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COMMUNICATING

- Workshop Reports
- White Papers
  - CCC works with community to produce timely white papers that inform policymakers and the broader community on national priorities
- CCC Blog
  - Provides a continuous stream of information on advances in computing research
  - Opportunities for community to get involved
  - Forum for community discussion
- Website
  - Collection of Resources
- Great Innovative Ideas
  - A way to showcase the exciting new research and ideas generated by the computing community
- Annual events
  - CCC Symposium
  - CRA Snowbird
- Special Events
  - Early Career Researcher Symposium

Biannual Computing Research Symposium

Early Career Researcher Symposium 2018

NURTURING NEXT GENERATION OF LEADERS

Grow leadership and community capacity to engage in and respond to national science policy needs and identify new directions for computing research.

Leadership in Science Policy Institute

- Educates and trains computing researchers on how science policy in the U.S. is formulated and how to advocate for computing research
- Co-sponsored by CRA's Government Affairs Committee

Industry – Academic Collaborations

- CCC collaborated with Big Data Regional Hubs
- Activities to enhance the research of early career faculty

Postdoc Best Practices

- Program to study institutional support structures for postdocs
- 3 programs: University of Washington, NY ASCENT, Arizona

Computing Innovation Fellows (CIFellows) Project

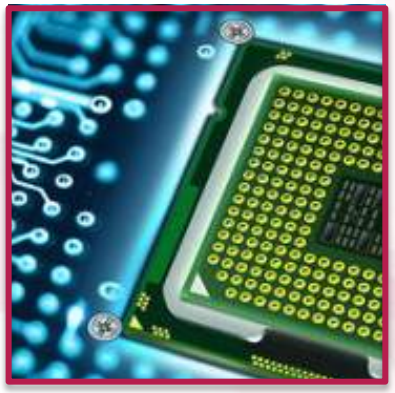
- Rapidly created the CI Fellows program to preserve human capital when faculty positions became scarce with the financial crisis

IMPACT

AMPLIFICATION

BRAIN Initiative launched in 2013.

CCC co-hosted the Brain Workshop with NSF in 2014.



CCC co-hosted the SA+TS workshop with SRC and NSF in 2013.

Produced Research Needs for Trustworthy, and Reliable Semiconductors Report in 2015.

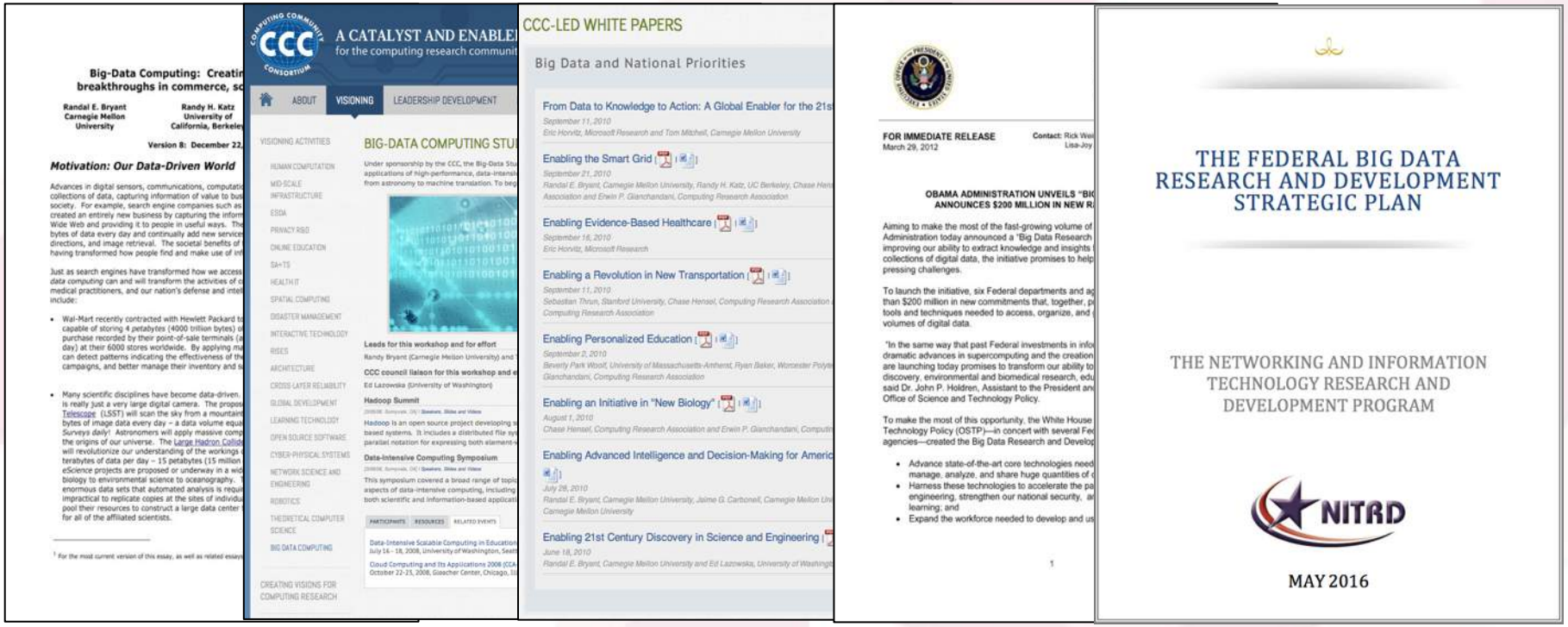
NSCI announced in July 2015.

CCC produced a series of blog posts on the topic, featuring one from Doug Burger, and the Convergence of Data and Computing task force frequently overlaps with this topic.

Smart and Connected Health Program in NSF and NIH.

CCC has hosted several workshops on related topics, including: Aging in Place (2014), Inclusive Access (2015), and Smart and Pervasive Health (2016) and produced related reports and white papers.

IMPACT: BIG DATA



2008 2008 2010 2012 2016

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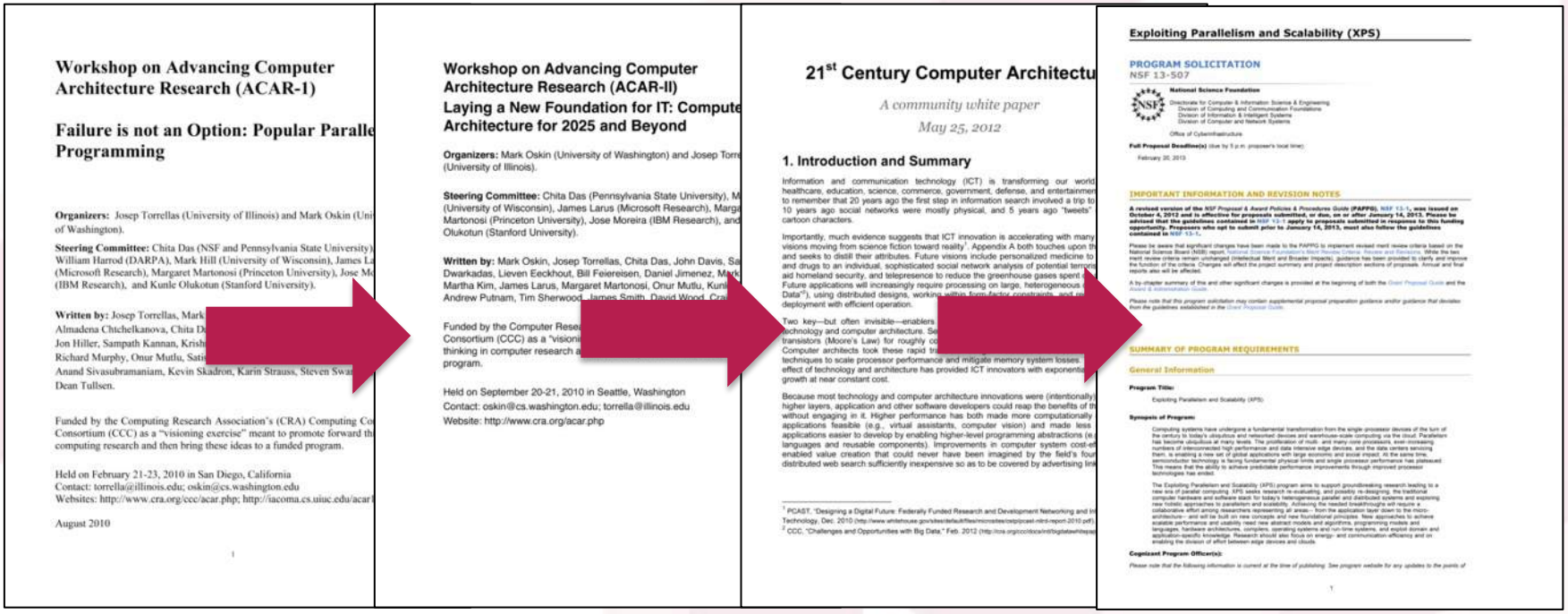
IMPACT: ARCHITECTURE



Workshop on Advancing Computer Architecture Research (ACAR-1)

Failure is not an Option: Popular Paralle Programming

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

Steering Committee: Chita Das (NSF and Pennsylvania State University) William Harrod (DARPA), Mark Hill (University of Wisconsin), James La (Microsoft Research), Margaret Martonosi (Princeton University), Jose M (IBM Research), and Kunle Olukotun (Stanford University).

Written by: Josep Torrellas, Mark Almadena Chtchelkanova, Chita D Jon Hiller, Sampath Kannan, Krish Richard Murphy, Onur Mutlu, Sati Anand Sivasubramaniam, Kevin Skadron, Karin Strauss, Steven Swa Dean Tullsen.

Funded by the Computing Research Association's (CRA) Computing Co Consortium (CCC) as a "visioning exercise" meant to promote forward th computing research and then bring these ideas to a funded program.

Held on February 21-23, 2010 in San Diego, California
Contact: torrella@illinois.edu; oskin@cs.washington.edu
Websites: http://www.cra.org/ccc/acar.php; http://iacoma.cs.uiuc.edu/acar

August 2010

Workshop on Advancing Computer Architecture Research (ACAR-II)
Laying a New Foundation for IT: Compute Architecture for 2025 and Beyond

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

Steering Committee: Chita Das (Pennsylvania State University), M (University of Wisconsin), James Larus (Microsoft Research), Marga Martonosi (Princeton University), Jose Moreira (IBM Research), and Olukotun (Stanford University).

Written by: Mark Oskin, Josep Torrellas, Chita Das, John Davis, Sa Dwarkadas, Lieven Eeckhout, Bill Feiereisen, Daniel Jimenez, Mark Martha Kim, James Larus, Margaret Martonosi, Onur Mutlu, Kuni Andrew Putnam, Tim Sherwood, James Smith, David Wood, Cra

Funded by the Computer Rese Consortium (CCC) as a "visioni thinking in computer research a program.

Held on September 20-21, 2010 in Seattle, Washington
Contact: oskin@cs.washington.edu; torrella@illinois.edu
Website: http://www.cra.org/acar.php

21st Century Computer Architectu

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 entertainmen to remember that 20 years ago the first step in information search involved a trip to 10 years ago social networks were mostly physical, and 5 years ago "tweets" cartoon characters.

Importantly, much evidence suggests that ICT innovation is accelerating with many visions moving from science fiction toward reality[1]. Appendix A both touches upon th and seeks to distill their attributes. Future visions include personalized medicine to and drugs to an individual, sophisticated social network analysis of potential terroris aid homeland security, and telepresence to reduce the greenhouse gases spent Future applications will increasingly require processing on large, heterogeneous Data"[2]), using distributed designs, working within form factor constraints, and en deployment with efficient operation.

Two key—but often invisible—enablers technology and computer architecture. Se transistors (Moore's Law) for roughly co Computer architects took these rapid tr techniques to scale processor performance and mitigate memory system losses. effect of technology and architecture has provided ICT innovators with exponenti growth at near constant cost.

Because most technology and computer architecture innovations were (intentionally higher layers, application and other software developers could reap the benefits of th without engaging in it. Higher performance has both made more computationally applications feasible (e.g., virtual assistants, computer vision) and made less applications easier to develop by enabling higher-level programming abstractions (e. languages and reusable components). Improvements in computer system cost-ef enabled value creation that could never have been imagined by the field's four distributed web search sufficiently inexpensive so as to be covered by advertising lin

[1] PCAST, "Designing a Digital Future: Federally Funded Research and Development Networking and In Technology, Dec. 2010 (http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-nitrd-report-2010.pdf).
[2] CCC, "Challenges and Opportunities with Big Data," Feb. 2012 (http://cra.org/ccc/docs/init/bigdatawhitepap

Exploiting Parallelism and Scalability (XPS)

PROGRAM SOLICITATION
NSF 13-507

National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Computing and Communication Foundations
Division of Information & Intelligent Systems
Division of Computer and Network Systems

Office of Cyberinfrastructure

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

February 20, 2013

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG), NSF 13-1, was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in NSF 13-1 apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 14, 2013, must also follow the guidelines contained in NSF 13-1.

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, National Science Foundation's Merit Review Criteria: Review and Revision. While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.

A by-chapter summary of this and other significant changes is provided at the beginning of both the Grant Proposal Guide and the Award & Administration Guide.

Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the Grant Proposal Guide.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Exploiting Parallelism and Scalability (XPS)

Synopsis of Program:

Computing systems have undergone a fundamental transformation from the single-processor devices of the turn of the century to today's ubiquitous and networked devices and warehouse-scale computing via the cloud. Parallelism has become ubiquitous at many levels. The proliferation of multi- and many-core processors, ever-increasing numbers of interconnected high performance and data intensive edge devices, and the data centers servicing them, is enabling a new set of global applications with large economic and social impact. At the same time, semiconductor technology is facing fundamental physical limits and single processor performance has plateaued. This means that the ability to achieve predictable performance improvements through improved processor technologies has ended.

The Exploiting Parallelism and Scalability (XPS) program aims to support groundbreaking research leading to a new era of parallel computing. XPS seeks research re-evaluating, and possibly re-designing, the traditional computer hardware and software stack for today's heterogeneous parallel and distributed systems and exploring new holistic approaches to parallelism and scalability. Achieving the needed breakthroughs will require a collaborative effort among researchers representing all areas – from the application layer down to the micro-architecture– and will be built on new concepts and new foundational principles. New approaches to achieve scalable performance and usability need new abstract models and algorithms, programming models and languages, hardware architectures, compilers, operating systems and run-time systems, and exploit domain and application-specific knowledge. Research should also focus on energy- and communication-efficiency and on enabling the division of effort between edge devices and clouds.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of

2010 2010 2012 2013

Josep Torrellas
UIUC

Mark Oskin
Washington

Mark Hill
Wisconsin

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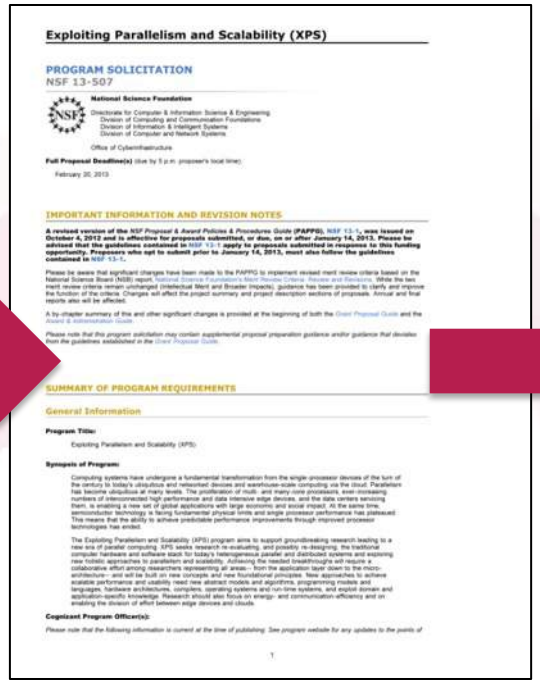
IMPACT: ARCHITECTURE


Exploiting Parallelism and Scalability (XPS)

PROGRAM SOLICITATION
NSF 13-507

National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Computing and Communication Foundations
Division of Information & Intelligent Systems
Division of Computer and Network Systems

Office of Cyberinfrastructure

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

February 26, 2013

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Exploiting Parallelism and Scalability (XPS)

Synopsis of Program:

Computing systems have undergone a fundamental transformation from the single-processor devices of the turn of the century to today's ubiquitous and networked devices and warehouse-scale computing via the cloud. Parallelism has become ubiquitous at many levels. The proliferation of multi- and many-core processors, ever-increasing numbers of interconnected high performance and data intensive edge devices, and the data centers servicing them, is enabling a new set of global applications with large economic and social impact. At the same time, semiconductor technology is facing fundamental physical limits and single processor performance has plateaued. This means that the ability to achieve predictable performance improvements through improved processor technologies has ended.

The Exploiting Parallelism and Scalability (XPS) program aims to support groundbreaking research leading to a new era of parallel computing. XPS seeks research re-evaluating, and possibly re-designing, the traditional computer hardware and software stack for today's heterogeneous parallel and distributed systems and exploring new holistic approaches to parallelism and scalability. Achieving the needed breakthroughs will require a collaborative effort among researchers representing all areas -- from the application layer down to the micro-architecture -- and will be built on new concepts and new foundational principles. New approaches to achieve scalable performance and usability need new abstract models and algorithms, programming models and languages, hardware architectures, compilers, operating systems and run-time systems, and exploit domain and application-specific knowledge. Research should also focus on energy- and communication-efficiency and on enabling the division of effort between edge devices and clouds.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of

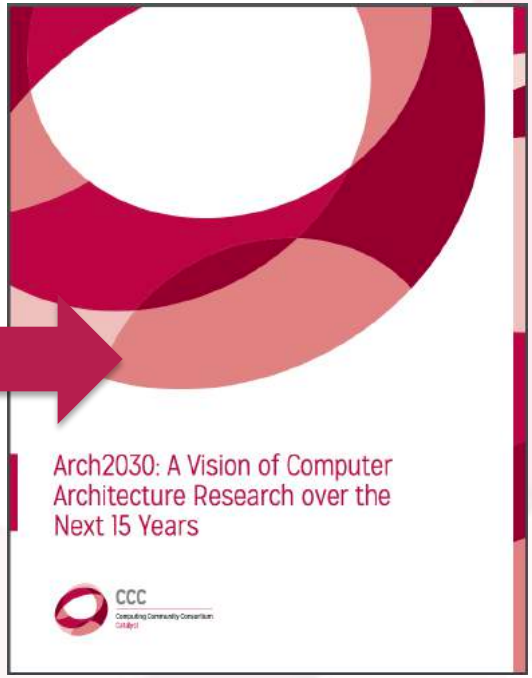
2013

Architecture 2030 Workshop @ ISCA 2016

CCC report out: Read the final report here.

Video recordings: Watch the video recordings here.

2016



2016

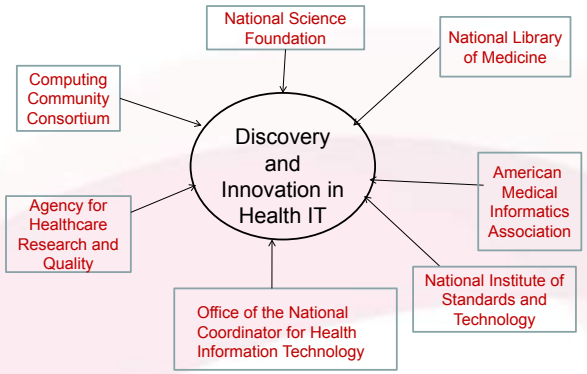
Luis Ceze
Washington

Tom Wenisch
Michigan

Mark Hill
Wisconsin

IMPACT: HEALTH IT

October 2009 Workshop



National Science Foundation
WHERE DISCOVERIES BEGIN

Directorate for Computer & Information Science & Engineering

SMART HEALTH AND WELLBEING (SHW)

CONTACTS

See program guidelines for contact information.

SYNOPSIS

Smart and Connected Health (SCH)

PROGRAM SOLICITATION
NSF 13-543

REPLACES DOCUMENT(S):
NSF 12-512

National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Computing and Communication Foundations
Division of Computer and Network Systems
Division of Information & Intelligent Systems

Directorate for Engineering

Directorate for Social, Behavioral & Economic Sciences

National Institutes of Health

October 2012 Workshop

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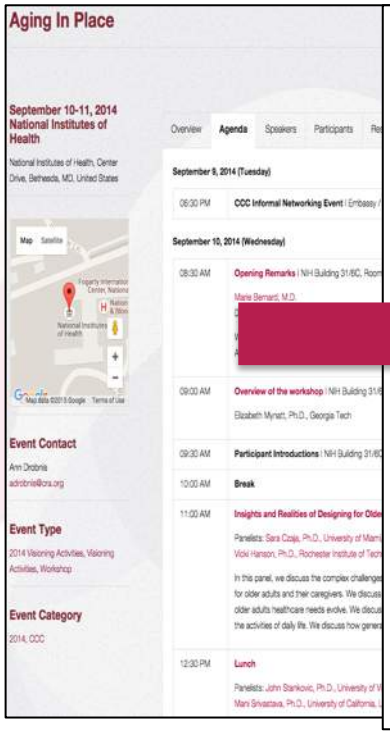
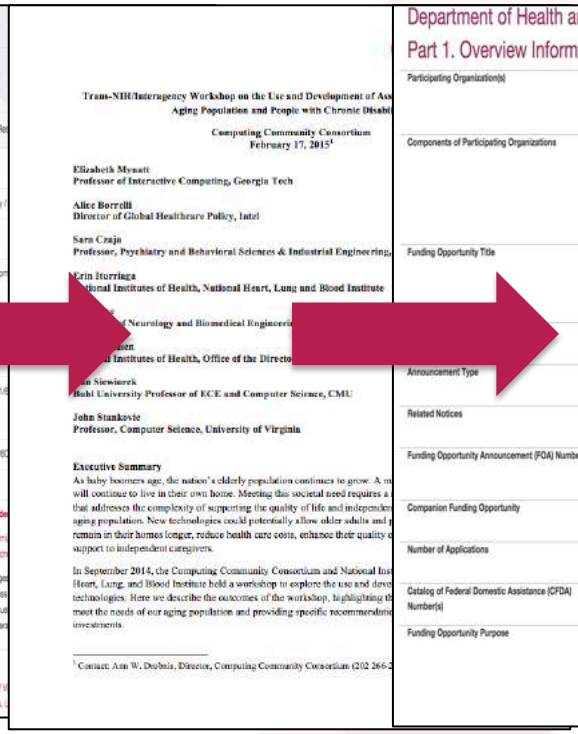
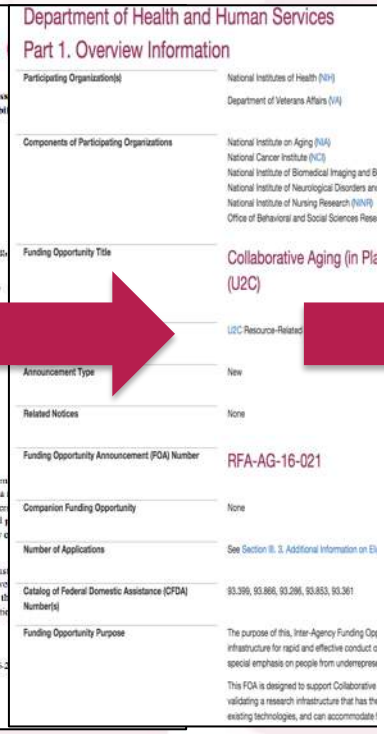
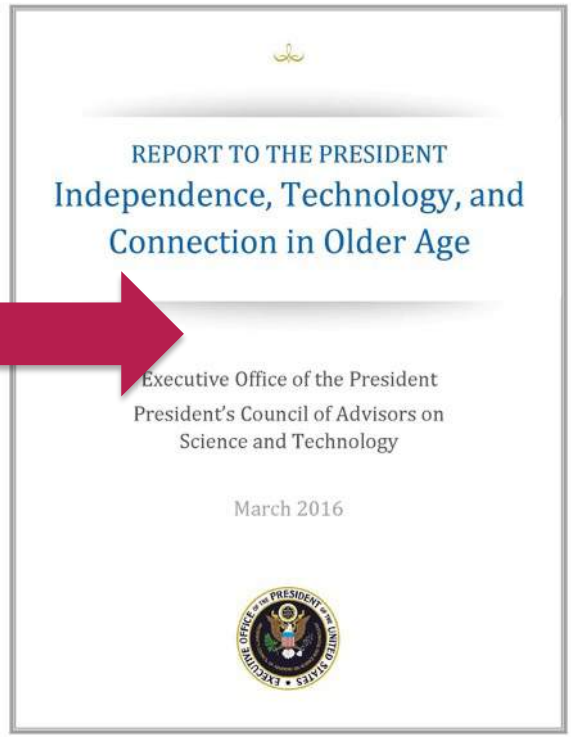
IMPACT: AGING IN PLACE









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

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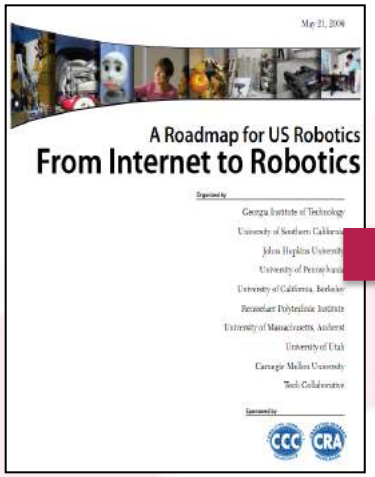
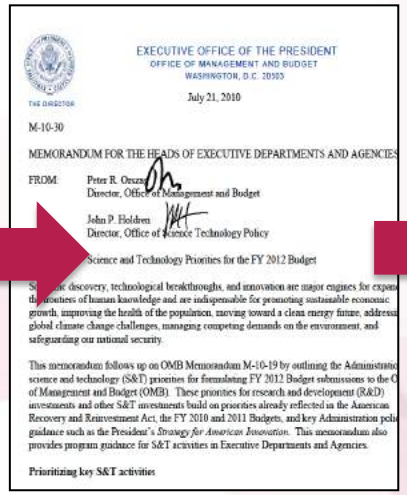
IMPACT: ROBOTICS



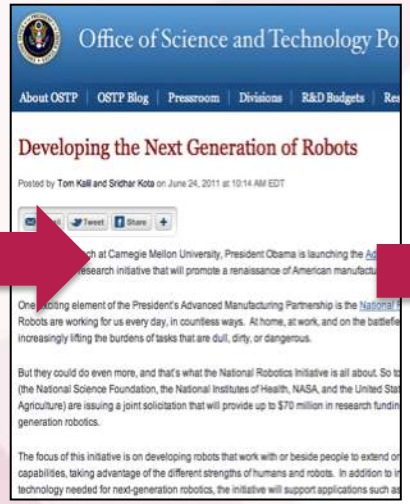
4 meetings during summer 2008

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

2 meetings in Spring, 2016

Report and Congressional Briefing in June, 2016

Henrik Chistensen

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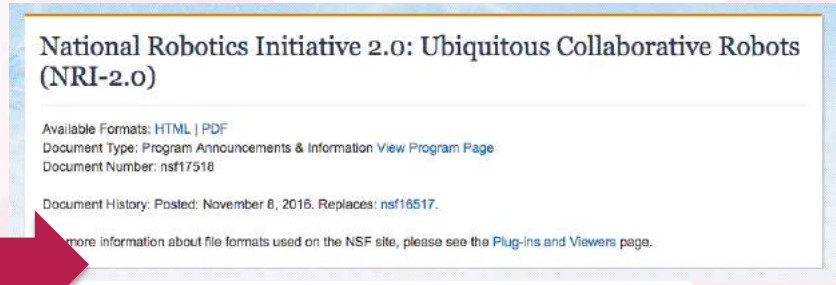
IMPACT: ROBOTICS

2 meetings in Spring, 2016

Report and
Congressional Briefing in
June, 2016

Next Generation
Robotics
published June, 2016



NRI 2.0 announced
November 2016

Henrik Chistensen

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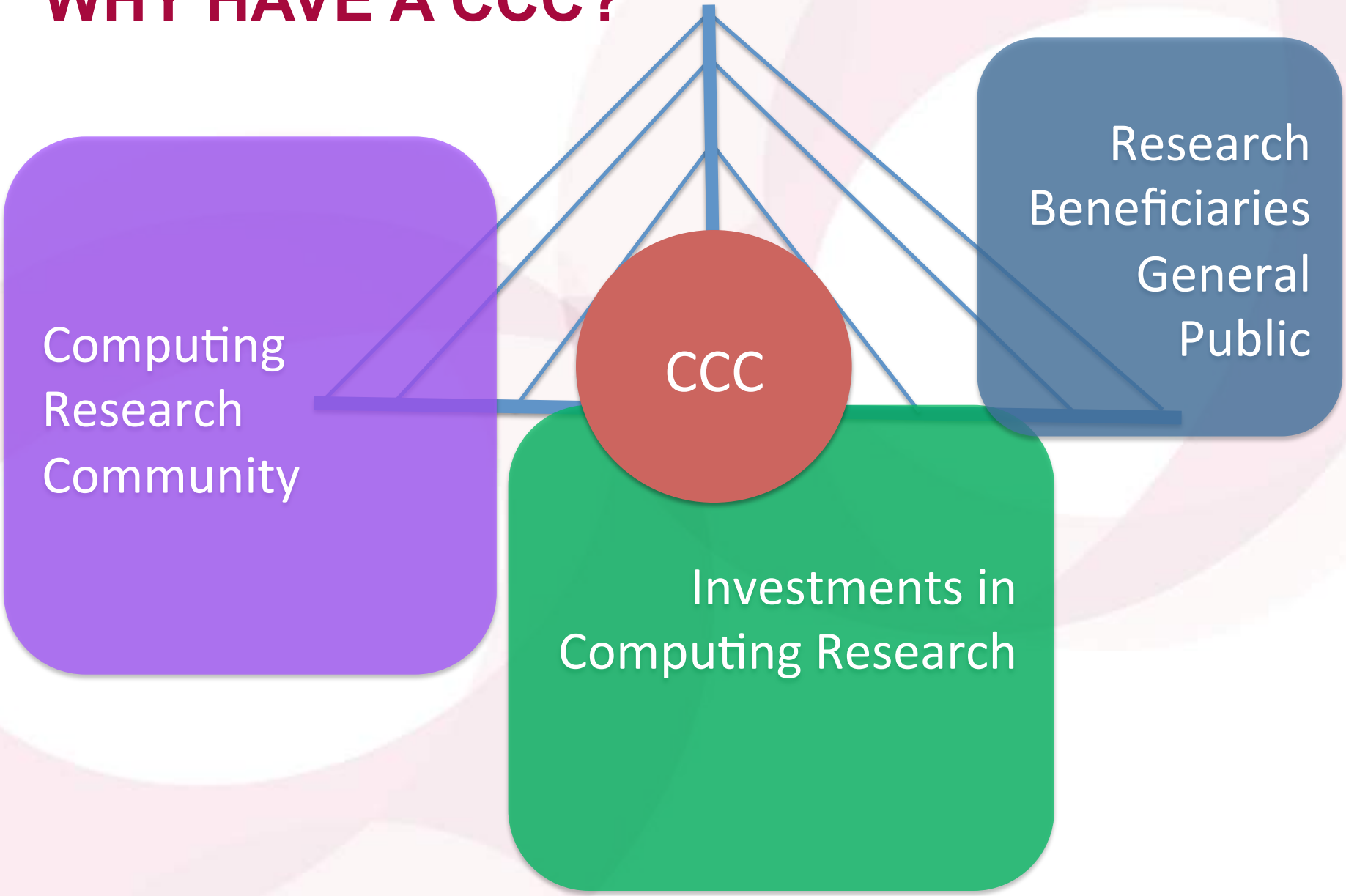
DISCUSSION, QUESTIONS, IDEAS

ADDITIONAL SLIDES

WHY HAVE A CCC?



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.

Promote Audacious Thinking:

- Community Initiated Visioning Workshops
- Blue Sky Ideas tracks at conferences

Communicate to the Community:

- CCC Blog - http://cccblog.org/
- Great Innovative Ideas
- White Papers and Workshop Reports
- Social Media
- Council member presentations

Facilitate Investment:

- Outputs of visioning activities
- Task Forces – Health, AI, Privacy etc.
- Engage with federal agencies and industry

Inculcate Leadership and Service:

- Engage with CCC Alumni and Sister Organizations
- Biennial Symposia series

Influence Early Career Researchers:

- Industry – Academic Collaborations
- Leadership in Science Policy Institute
- Postdoc Best Practices

CCC GOALS	Visioning	Connecting	Leadership	Communication
Bring the computing research community together to **envision audacious research challenges**, and to articulate concrete pathways to enable pursuit of these challenges.	Workshops and Blue Sky	Workshops	LiSPI, Postdocs, Council Members, Task Forces	CCC Blog, Great Innovative Ideas, Twitter, Facebook
Communicate these challenges and opportunities to the broader national community.		White Papers and Workshop Reports	Council, Visioning Leadership	CCC Blog, Great Innovative Ideas
Facilitate investment in these research challenges **by key stakeholders**.	Workshops and Blue Sky	Workshops	Task Forces	
Inform **and influence early career researchers** to engage in these community-led research challenges.		CI Fellows		CCC Blog, Great Innovative Ideas
Inculcate values of **leadership** and service by the computing research community.		Committee Memberships	LiSPI, Task Forces	

THE CCC COUNCIL — PAST MEMBERS

- Lorenzo Alvisi, Univ. of Texas
- Greg Andrews, Univ. Arizona
- Randy Bryant, Carnegie Mellon Debra Crawford, Drexel
- Elizabeth Churchill, Google
- Susan Davidson, Univ. PA
- Cynthia Dwork, Harvard
- Joseph Evans, Univ. KS
- Bill Feiereisen, LANL
- Limor Fix, Intel
- Stephanie Forrest, Univ. New Mexico
- Lance Fortnow, Georgia Tech
- Susan Graham, UC Berkeley
- Greg Hager, Johns Hopkins
- Vasant Honavar, Univ. of Pennsylvania
- Eric Horvitz, Microsoft Research
- Chris Johnson, Univ. Utah
- Anita Jones, UVA
- Frans Kaashoek, MIT
- Dave Kaeli, Northeastern
- Dick Karp, UC Berkeley
- John King, Univ. Michigan
- Hank Korth, Lehigh
- Ed Lazowska, Univ. of Washington, CCC Founding Chair
- Peter Lee, Carnegie Mellon
- Ran Libeskind-Hadas, Harvey Mudd
- Andrew McCallum, UMass
- John Mitchell, Stanford
- Robin Murphy, Texas A&M
- Klara Nahrstedt, UIUC
- Tal Rabin, IBM Research
- Debra Richardson, UCSD
- Daniela Rus, MIT
- Fred Schneider, Cornell
- Margo Seltzer, Harvard
- Shashi Shekhar, Univ. MN
- Bob Sproull, Formally Oracle
- Karen Sutherland, Augsburg College
- David Tennenhouse, New Venture Partners
- Josep Torrellas, UIUC
- Dave Waltz, Columbia
- Ross Whitaker, Univ. Utah
- Kathy Yelick, UC Berkeley

ACTIVITIES

Envisioning Future Computing Research

- Workshops
- Blue Sky Ideas Conference Tracks
- Computing Research Symposia: Addressing National Priorities and Societal Needs

Engaging and Aligning with National and Computing Research Priorities

- Outputs of Visioning Activities
- Short Reports / White Papers
- Task Forces

Communicating Future Computing Research

- CCC Blog (http://cccblog.org)
- Great Innovative Ideas
- Computing Research Symposia

Cultivating Computing Leadership and Community Capacity

- Postdoc Best Practices
- Industry – Academic Collaborations
- Computing Innovation Fellows (CIFellows) Project
- Leadership in Science Policy Institute (LiSPI)

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VISIONING PROPOSAL PITFALLS: WHO

- PI's or proposed attendees do not include key members from
  - relevant research communities
  - public sector
  - private sector
  - all manner of diversity
- PI's are unlikely to succeed in orchestrating the discussion, delivering outputs, or other follow-thru.
- Flawed process for identifying / soliciting community participation in workshops
- Insufficient involvement from the "customer"
  - possible funding agencies
  - other federal agencies that will benefit from the output

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VISIONING PROPOSAL PITFALLS: WHAT

- Ignorance of relevant prior efforts
- No discussion of what constitutes success and how to measure it.
- Suitable written outputs are not discussed
- No plan to evangelize new proposed activity, such as
  - Meetings with relevant Federal officials
  - Discussions with the broad research community

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DETAILS

- Project description: at most 6 pages
- Budget: $10K - $200K
  - Funds expenses in connection with meetings.
    - Typically 1 – 3 meetings
    - Covers participant support and meeting expenses
    - (CRA / CCC) handles all logistical support
  - Funds may not by used to support salary for PI's or participants

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PROPOSAL REVIEW PROCESS

- Visioning Chair (VC) or delegate iterates with PI's to produce a plausible proposal.
- Proposal sent to entire CCC.
  - **All** return short-fuse (ie 2 weeks) comments.

- VC synthesizes feedback and creates *the case*: yes/no/revise:
  - Includes all reviews, but with identifying information deleted plus a short summary
- VC sends *the case* to CCC.
- VC leads a discussion by CCC of *the case*.
- VC sends response to PI's, including
  - anonymized reviews
  - discussion of required changes
  - name of CCC liaison for the case

CCC LIAISON FOR A VISIONING ACTIVITY

- Available to PI's when planning workshops
  - Tracks the logistics
  - Provides "adult supervision"
- Attends workshops (as an observer)
- Provides feedback on outputs as they are being produced
- Exerts pressure when outputs are not being produced.

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DELIVERABLES

- [funding + 1 week]: 1 page vision statement / text for website
- [end of workshop + 2 weeks]: 1 page summary of key findings for cccblog
- [end of workshop + …]: Workshop report that will be posted on CCC web site and used in dissemination efforts.

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VISIONING ACTIVITIES: UPCOMING

- Leadership in Embedded Security Workshop (from Cybersecurity Task Force)
  - August 12-13, 2018
  - Baltimore, MD

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BLUE SKY DETAILS

- Conference Organizers write a proposal, indicating how papers will be solicited and reviewed
- Blue Sky Chair and Director read proposals and determine viability
- Once Track is approved, a CCC liaison is assigned
- VC Chair or liaison may attend the Conference to present information about the CCC and the awards

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ALIGNING WITH NATIONAL PRIORITIES

- Outputs of Visioning Activities
  - CCC held four robotics workshops in 2008, Led to National Robotics Initiative (NRI)
  - At recent 5th Anniversary of NRI
    - Congressional Briefing with demonstrations
    - CCC released follow-up report, *Next Generation Robotics*
  - CCC and NIH held an Aging in Place Workshop in 2014, led to new grant called *Collaborative Aging (in Place) Research Using Technology*
- Short Reports / White Papers
  - Intelligent Infrastructure Series
- Task Forces
  - Cybersecurity
  - Human Technology Frontier
  - Artificial Intelligence
  - Intelligent Infrastructure
  - Privacy and Fairness
  - Post Moore's Law Computing

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COMMUNICATING

CCC BLOG

Top 10 Posts in the Past Year	Views
The Surprising Security Benefits of End-to-End Formal Proofs	1,453
What Computer Science Can Teach Us About Robotics	1,153
PECASE Awards Announced	809
Pacemaker Recall Exposes National Need for Research and Education in Embedded Security	795
DARPA Broad Agency Announcement-Lifelong Learning Machines (L2M)	731
FOCUS identifies “The Best Jobs in America”	709
First Person: “Life as a NSF Program Director”	677
2016 Robotic Roadmap and the National Robotics Initiative 2.0	673
Two Hardware Security Design Flaws Affect Billions of Comptuers	653
Where the Jobs Are- 2016 Edition	634

*Top posts for 365 days ending on July 10, 2018

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CCC BLOG : LAST 10 BLOG POSTS

- ACM SIGARCH Blog- Speculating about speculation: on the (lack of) security guarantees of Spectre-V1 mitigations
- MIT Technology Review's 35 Innovators Under the Age of 35-2018
- NIST Unlinkable Data Challenge Features A $50K Grand Prize
- The CCC Welcomes New Leadership and Council Members!
- NSF and US-Israeli Binational Science Foundation (BSF) Collaborative Research Opportunities
- Learn more about the USDA/NIFA Food and Agriculture Cyber-infrastructure and Tools (FACT) Initiative!
- ACM SIGARCH Blog- Verifying Quantum Software and Hardward
- NIH Releases Strategic Plan for Data Science
- The Surprising Security Benefits of End-to-End Formal Proofs
- 2018 NAACL Student Research Workshop

*Last 10 posts on July 10, 2018

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GREAT Innovative IDEAS

Showcasing the exciting new research and ideas generated by the computing community

Automated In-Patient Monitoring in the ICU with Application to Septic Shock Prediction

May 17, 2016 / in Great Innovative Ideas /

The following Great Innovative Idea is from Katie Henry, a current PhD student in computer science at Johns Hopkins University. In addition to the department, Henry is also part of the Malone Center for Engineering in Healthcare, the Institute for Computational Medicine, and the Center for Language and Speech Processing. Henry presented her poster, *Automated in-patient monitoring in the ICU with application to septic shock prediction*, at the CCC Symposium on Computing Research, May 9-10, 2016.

The Innovative Idea

Traditional approaches to disease prediction involve a panel of experts selecting a small set of clinically meaningful measurements and using these to tabulate a score. While useful, these scores are limited because they require manual definition and testing for each new disease and are limited to features that are easy for a human to compute in their checklist. Instead, we can use machine learning techniques to automatically learn features from routinely collected data in electronic health records (EHRs) that predict which patients are at highest risk of developing a given adverse-event. As a test case, we developed TREWScore, a targeted real-time early warning score for septic shock, a whole body infection that causes organ dysfunction and dangerously low blood pressure. While best practices for treatment are still under debate, there is consensus that early intervention is critical. Current approaches to identify septic shock use checklists to detect septic shock at the actual onset of shock (systolic blood pressure < 90 mmHg); however, TREWScore was able to identify patients with a median 28 hours prior to septic shock onset at a sensitivity of 0.85 and corresponding specificity of 0.67. Additionally, over two-thirds of patients were identified prior to any sepsis-related organ dysfunction.

Impact

Septic shock is the 11th leading cause of death in the United States and with $15.4 billion in annual health care costs, it has the highest associated added costs of any ICU condition. While the true impact of a septic shock prediction score like TREWScore has to be validated in a

Embedding Ethical Principles in Collective Decision Support Systems

April 6, 2016 / in Great Innovative Ideas /

The following Great Innovative Idea is from Francesca Rossi from the University of Padova. Rossi and her colleagues Joshua Greene (Harvard University), John Tasioulas (King's College London), Kristen Brent Venable (Tulane University), and Brian Williams (Massachusetts Institute of Technology) published a paper called *Embedding Ethical Principles in Collective Decision Support Systems* which was one of the winners at the Computing Community Consortium (CCC) sponsored Blue Sky Ideas Track Competition at the 30th Association for the Advancement of Artificial Intelligence (AAAI) Conference on Artificial Intelligence (AAAI-16), February 12-17, 2016 in Phoenix, Arizona.

The Innovative Idea

We intend to model both ethical principles and safety constraints in (collective) decision making systems. We believe that current AI frameworks to model and reason with preferences, as well as risk-bound reasoning engines, can be adapted to achieve our goal.

Impact

Many AI systems are designed to work in real-life scenarios where ethical considerations are an important issue. Think of self-driving cars, elder care assistive technology, and social robots. Designing and building ethic-compliant systems will possibly impact all these application domains.

Other Research

I work on symbiotic environments for group decision making, where the environment (such as the meeting room) is essential in providing support for the group of people who need to make a decision. I also work on computational social choice, designing innovative frameworks to

COMPUTING RESEARCH
ADDRESSING NATIONAL PRIORITIES AND SOCIETAL NEEDS

National Symposium to Highlight the Impact of Computing Research:

- 2017 Topics included:
  - Intelligent Infrastructure for our Cities and Communities
  - Security and Privacy for Democracy
  - AI and Amplifying Human Abilities
  - Data, Algorithms, and Fairness

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NURTURING FUTURE LEADERS

LEADERSHIP IN SCIENCE POLICY INSTITUTE (LISPI)

To educate a cadre of computing researchers on how science policy in the U.S. is formulated and how our government works

November, 2011

- 34 attendees;
- 7 women
- 19 received financial aid
- 24 institutions represented
- 23 participants from public institutions; 7 from private; 4 from industry;

April, 2013

- 53 attendees;
- 12 women
- 6 received financial aid
- 47 institutions represented
- 40 participants from public institutions; 12 from private; 1 from industry

April, 2015

- 32 attendees;
- 5 women
- 4 received financial aid
- 27 institutions represented
- 22 from public; 6 from private; 3 from industry

November, 2017

- 24 participants
- 4 women
- 3 received financial aid
- 14 institutions
- All from public universities

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CI FELLOWS

- Computing Innovation Fellows:
  Retaining PhD graduates in the research pipeline during the economic downturn
  - 2009: 60 Fellows, 50 have permanent research positions (33 academic, 16 industry, 1 government)
  - 2010: 47 Fellows, all have permanent positions in research (27 academic, 20 industry)
  - 2011: 20 Fellows, 19 have permanent research positions (15 academic, 3 industry, 1 government)
- CERP's CI Fellows Evaluation Report – April 2014
- CI Fellows Workshop – May 22-23, 2014

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CI FELLOWS EVALUATION – KEY FINDINGS

Compared to Non-fellow Postdocs, CI Fellows

- Experienced greater independence during their postdoc
- Were more satisfied with how their postdoc prepared them for balancing work-life responsibilities
- Received higher postdoc salaries that made it easier to live and relocate
- Had higher salaries at the time of the survey

Postdoc programs in general:

- Were rated positively in terms of support, opportunities, and skills preparation
- Could be improved to reduce negative impact of relocating
- Could be more accommodating of personal and family responsibilities

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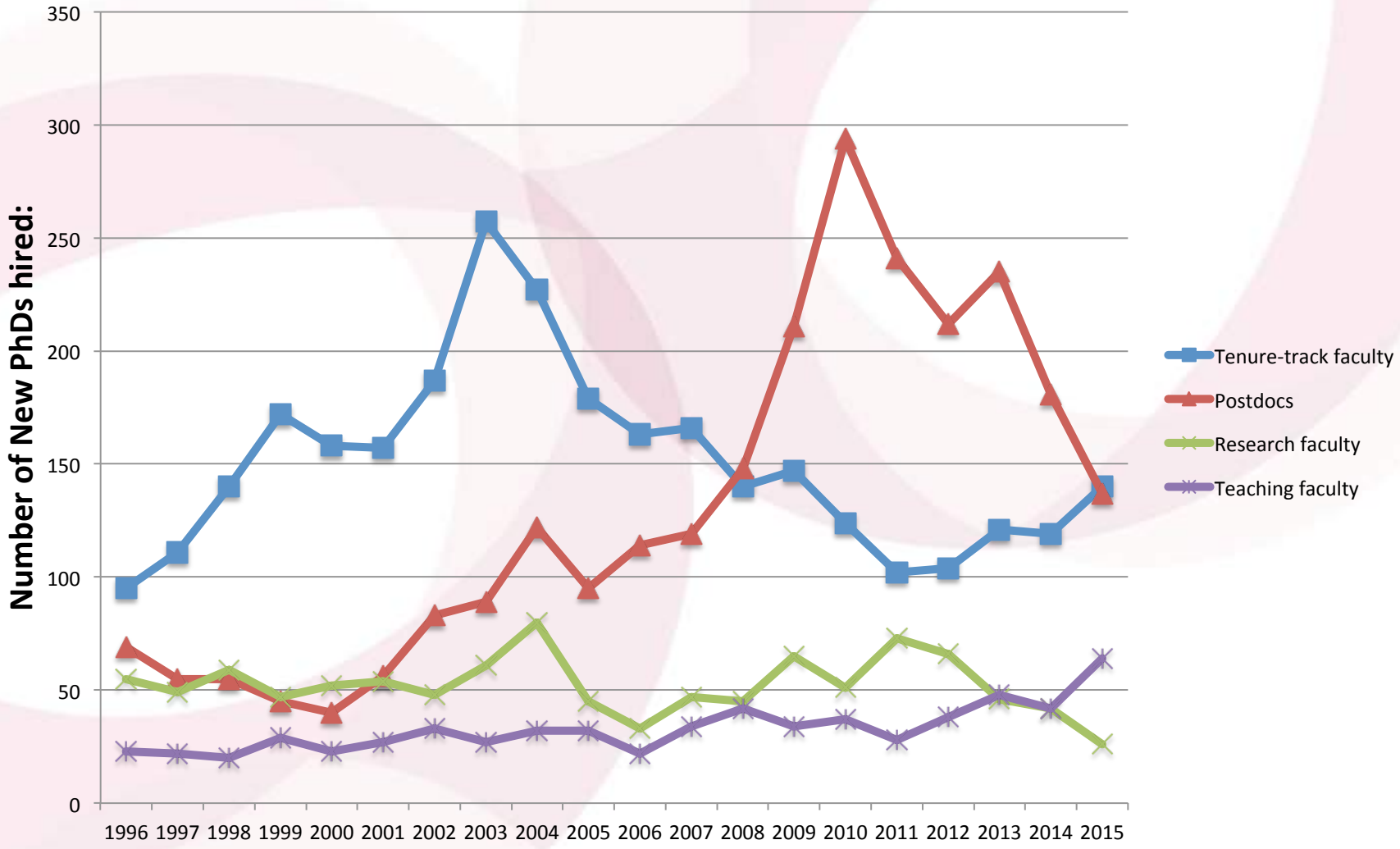
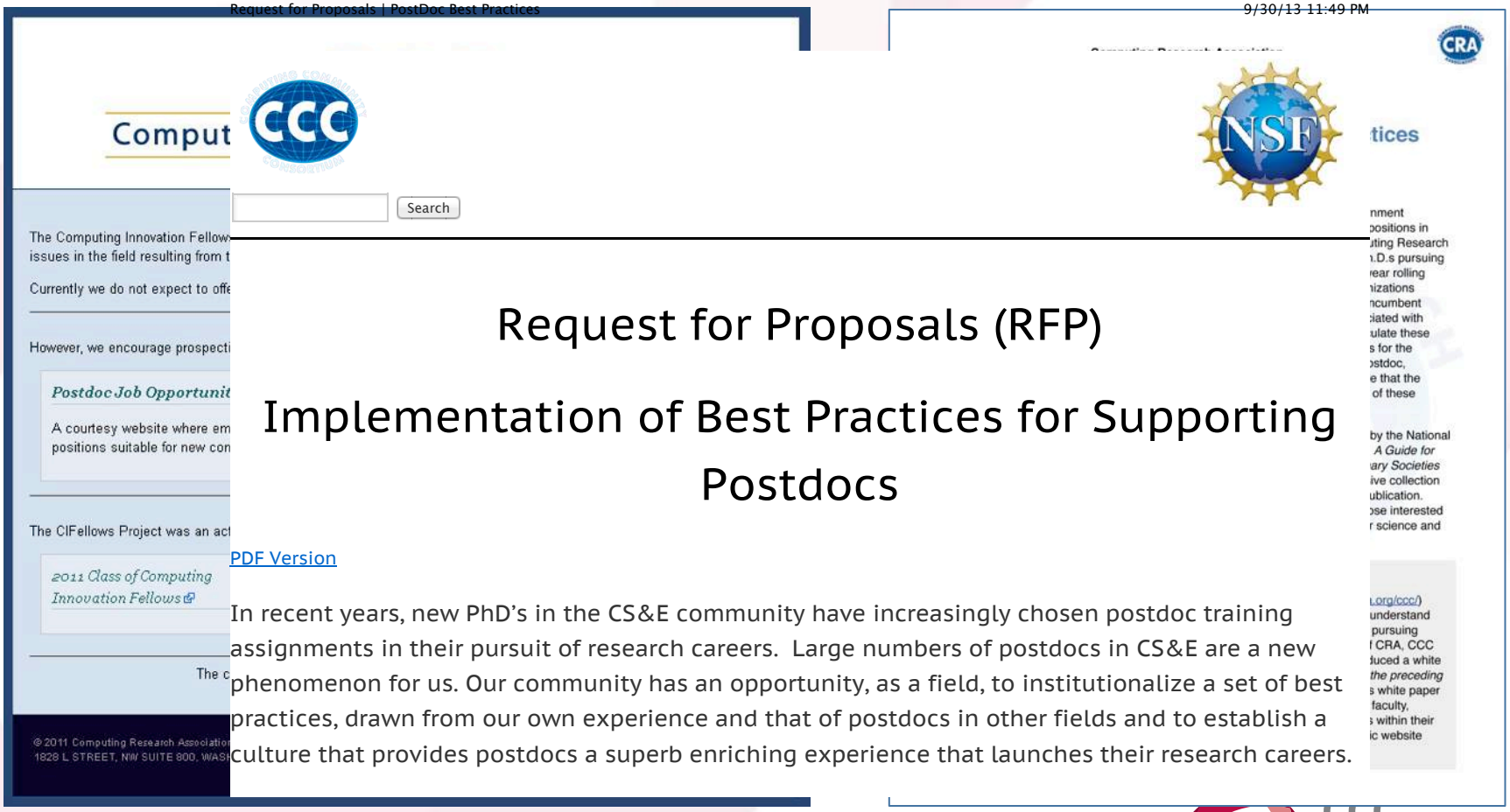
THE CHANGING COMPUTING COMMUNITY

Employment of New Ph.D.s in Tenure-Track Faculty, Industry, and Postdoc Positions
Source: CRA Taulbee Survey



COMPUTING INNOVATION FELLOWS PROJECT -> POSTDOC BEST PRACTICES



POSTDOC BEST PRACTICES

3 Projects began in April, 2014 for 3 years

- ASCENT: Advancing computer Science Careers through Enhanced Networking and Training
  - Columbia, Cornell, CUNY, NYU, Teacher's College
- Taking Collective Responsibility for the Postdoc Experience
  - University of Washington
- A Foundational Model for Postdoctoral Programs in Computer Science & Engineering at Large Universities
  - Arizona State University, with University of Arizona and Northern Arizona University

Postdoc programs recently wrote a CACM Viewpoint on the program's findings 2 years in. Key takeaways include:

- Thoughtful postdoc evaluation of career goals through Individual Development Plans (IDP)
- Quality Mentoring through hands on advisor (UW), non-advisor "Champions" (AZ), or mentor pool (NY ASCENT)
- Postdoc specific skill development programs
- Networking through industry speakers, networking events, workshops, and travel grants
- Sense of belonging through postdoc specific events and institutional support from dedicated staff

All 3 programs have been given an extension through June 2018.

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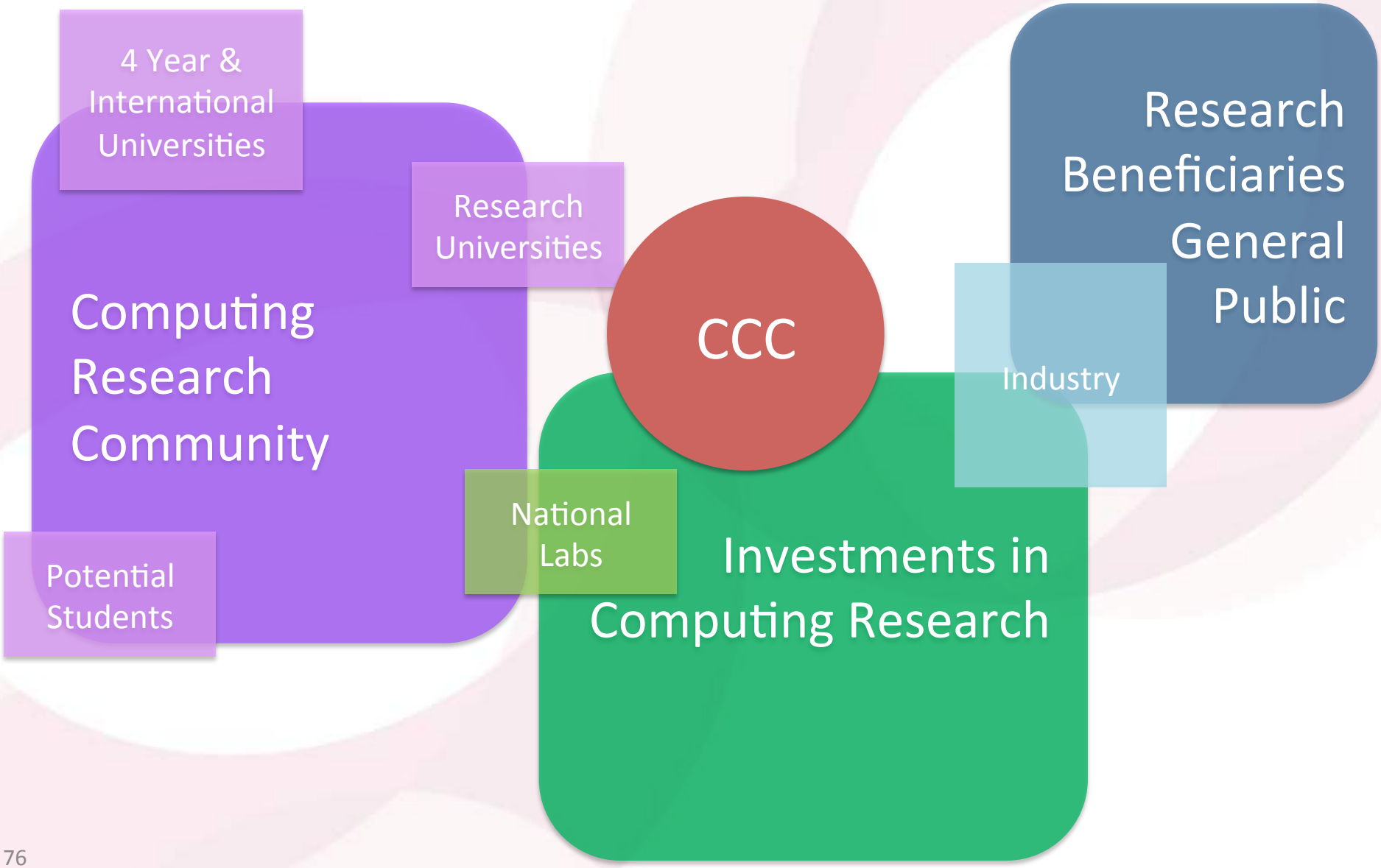
INDUSTRY – ACADEMIC COLLABORATIONS

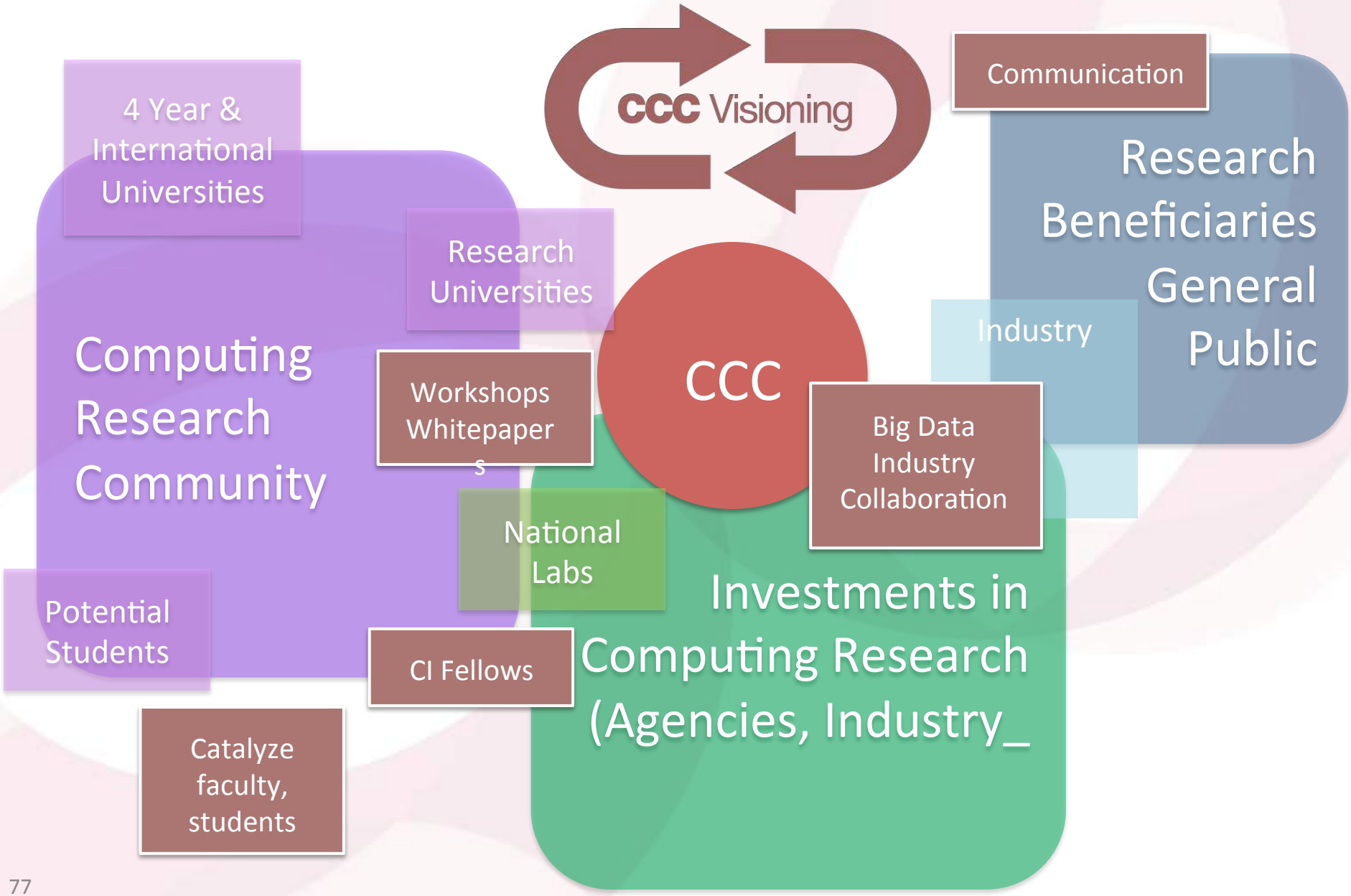
With Big Data Regional Innovation Hubs

- *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

RESEARCH "ECOSYSTEM"



RESEARCH "ECOSYSTEM"



YOUR IDEAS?

- What are we doing we might do better/differently?
- What aren't we doing that we should?
- Are we missing big pieces of the picture entirely?

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QUESTIONS?

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