THE COMPUTING COMMUNITY CONSORTIUM: CATALYZING AND ENABLING COMPUTING RESEARCH

April 3rd, 2017

Beth Mynatt, Chair
Mark Hill, Vice Chair
Ann Drobnis, Director
Greg Hager, Past Chair
Andy Bernat, CRA Executive Director
PRESENTATION OVERVIEW

- Goals and Outcomes
- Envisioning Future Computing Research
- Enhancing National Priorities
- Communication
- Cultivating Leadership
- Evaluation
- Outcome Assessment
GOALS AND OUTCOMES
FROM STARTUP TO SUSTAINABLE

• Established in 2006 as a standing committee of the Computing Research Association (CRA)
• Funded by NSF under a Cooperative Agreement
  – Second Award began in 2012, Completed last Reverse Site Visit (2014)
  – Submitted new proposal in February, 2017
• For the first five years the CCC was a startup initiative
  – Long-term research visioning
• For the next five years, the CCC transitioned from startup enterprise into a more sustainable organization
  – Greater focus on visioning activities for the computing community that set an agenda for national initiatives
CCC PAST GOALS

1. Establish the CCC as a widely accepted catalyst and voice for the computing research community.

2. Bring the computing research community together to envision our future research challenges, needs and thrusts.

3. Communicate these challenges, needs and thrusts to the broader national community.

4. Create within the computing research community more audacious thinking.

5. See the ideas developed in the second and fourth points above turned into funded research programs.

6. Increase the excitement within computing research and use that excitement to attract students.

7. Inculcate values of leadership and service.
<table>
<thead>
<tr>
<th>CCC Goals</th>
<th>Major CCC Activities</th>
</tr>
</thead>
</table>
| Establish the CCC as a widely accepted catalyst and voice for the computing research community. | • Engagement with Federal Agencies (NSF, NIH, DARPA, DoT, etc.) and OSTP  
• Biennial Symposium                                                                                     |
| Bring the computing research community together to envision our future research challenges, needs and thrusts. | • 22 Visioning Workshops  
• 8 Blue Sky Ideas Tracks                                                                                     |
| Communicate these challenges, needs and thrusts to the broader national community.                      | • 13 Workshop Reports + 20 White Papers + Numerous briefings  
• CCCBlog                                                                                                       |
| Create within the computing research community more audacious thinking.                                      | • Visioning Workshops  
• Blue Sky Ideas Conference Tracks                                                                                     |
| See the ideas developed in the second and fourth points provided input to funded research programs.       | CCC visioning activities and white papers have had a role in shaping many programs, including:  
• National Robotics Initiative  
• Big Data Research and Development (R&D) Initiative  
• Smart and Connected Health  
• Aging in Place (NIH)  
• BRAIN Initiative (CRCNS)  
• Algorithms in the Field  
• Exploiting Parallelism and Scalability  
• Mid-Scale Infrastructure  
• Secure, Trustworthy, Assured, Resilient Semiconductors and Systems |
| Increase the excitement within computing research and use that excitement to attract students.               | • CI Fellows Program  
• CI Fellows Workshop  
• Computing Symposium  
• Great Innovative Ideas                                                                                     |
| Inculcate values of leadership and service.                                                                | • Leadership in Science Policy Institute (LiSPI)  
• CI Fellows                                                                                                      |
GOING FORWARD

Foster proactive engagement
   – Increase the *scale and capacity* of the CCC by broadening the role and composition of CCC task forces
   – Increase outreach and interactions with industry and philanthropic stakeholders

Build more opportunities for junior faculty engagement
   – Increase participation in visioning workshops
   – Encourage opportunities to learn about science policy leadership

Expand our methods of communication
   – CACM and similar venues
   – Mainstream press; Social media and YouTube
   – Biennial symposium in DC to communicate role of computing research to address national priorities
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

<table>
<thead>
<tr>
<th></th>
<th>Goal 1: Research Challenges</th>
<th>Goal 2: Communicate Broadly</th>
<th>Goal 3: Research Investments</th>
<th>Goal 4: Leadership</th>
<th>Goal 5: Influence Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome 1: Agency Awareness</td>
<td>✔</td>
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<tr>
<td>Outcome 2: Community Engagement</td>
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<tr>
<td>Outcome 3: Tangible Resources</td>
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<td>✔</td>
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<td>Outcome 4: CCC Role</td>
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<td>Outcome 5: Leadership and Capacity</td>
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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
THE RAPIDLY EXPANDING WORLD OF COMPUTING

- Medicine and Global Health
- Energy and Sustainability
- Security and Privacy
- Technology for Development
- Interacting with the Physical World
- Graphic: Lazowska
CCC AND ITS STAKEHOLDERS

Computing Research Community

- National Priorities
- Agency Requests
- Blue Sky Ideas
- Open Visioning Calls

Council-Led Workshops

Community Visioning

Reports • White Papers
Roadmaps • New Leaders

Public

Funding Agencies

Science Policy Leadership
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 the participation of industry leadership and early career researchers at Visioning Workshops
- Expand the adoption of Blue Sky tracks at computing conferences
- Establish a biennial symposia series Computing Research: Addressing National Priorities and Societal Host on odd years and host in DC
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,....)

- Cyber Social Learning Systems
- Nanotechnology-inspired Information Processing Systems
- Smart Health
- Sociotechnical Cybersecurity
- Cybersecurity for Manufacturers
VISIONING ACTIVITIES

- Over 40 visioning activities in 10-year history
- Average of 6 activities per year in the last 4 years
- Research areas include:
  - Smart and Pervasive Health
  - Nanotechnology-inspired Information Processing Systems
  - Cyber Social Learning Systems
  - Privacy by Design
  - BRAIN Initiative
  - Inclusive Access
  - Personalized Education
- 13 workshop reports released in past 4 years
- 20 white papers released in past 4 years

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td>Privacy by Design – Catalyzing Privacy by Design</td>
<td>January 6-7, 2016</td>
</tr>
<tr>
<td>Robotics</td>
<td>March 5 and 11, 2016</td>
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<tr>
<td>Cyber-Social Learning Systems Workshop 1</td>
<td>August 29-30, 2016</td>
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<tr>
<td>Nanotechnology-Inspired Information Processing Systems of the Future</td>
<td>August 31-September 1, 2016</td>
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<tr>
<td>Discovery and Innovation in Smart and Pervasive Health</td>
<td>December 5-6, 2016</td>
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<tr>
<td>Sociotechnical Cybersecurity Workshop 1</td>
<td>December 12-13, 2016</td>
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<tr>
<td>Cyber-Social Learning Systems Workshop 3</td>
<td>January 24-25, 2017</td>
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<tr>
<td>Cyber Security for Manufacturers</td>
<td>March 14-15, 2017</td>
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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.”

- 8 different tracks at 6 different conferences in last 4 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
<table>
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<tr>
<th>BLUE SKY Conference Venues</th>
<th>Date</th>
<th>Location</th>
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<tbody>
<tr>
<td>International Symposium on Robotics Research 2017</td>
<td>December 2017</td>
<td>Puerto Varas, Chile</td>
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<tr>
<td>Sixteenth International Conference on Autonomous Agents and MultiAgent Systems (AAMAS)</td>
<td>May 2017</td>
<td>Sao Paulo, Brazil</td>
</tr>
<tr>
<td>24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2016)</td>
<td>November 2016</td>
<td>San Francisco, CA</td>
</tr>
<tr>
<td>38th International Conference on Software Engineering (ICSE)</td>
<td>May 2016</td>
<td>Austin, TX</td>
</tr>
<tr>
<td>Fifteenth International Conference on Autonomous Agents and MultiAgent Systems (AAMAS)</td>
<td>May 2016</td>
<td>Singapore</td>
</tr>
<tr>
<td>Thirtieth Association for the Advancement of Artificial Intelligence (AAAI) Conference on Artificial Intelligence (AAAI-16)</td>
<td>February 2016</td>
<td>Phoenix, AZ</td>
</tr>
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</table>
• Held first National Symposium to Highlight the Impact of Computing Research in 2016

• Establish 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
ENGAGING AND ALIGNING WITH NATIONAL AND COMPUTING RESEARCH PRIORITIES
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).
- Leverage network of CCC alumni.
CCC AND FEDERAL STAKEHOLDERS

OSTP: Office of Science Technology and Policy

PCAST: President’s Council of Advisors on Science and Technology

NITRD: Networking and Information Technology R&D

CSTB: Computer Science Telecommunications Board

Agencies: NSF, NIH, DoE, NIST, HHS / ONC, DARPA...
CCC TASK FORCES

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

- Computing in the Physical World
- Convergence of Data and Computing
- Artificial Intelligence and Robotics
- Healthcare
- Privacy and Fairness

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)
COMPUTING IN THE PHYSICAL WORLD
TASK FORCE

Chairs: Ben Zorn and Shwetak Patel

Ben Zorn
Microsoft Research

Shwetak Patel
University of Washington

Current Members:

Kevin Fu
University of Michigan

Daniel Lopresti
Lehigh University

Greg Morrisett
Cornell University

Beth Mynatt
Georgia Tech

Klara Nahrstedt
UIUC

Jennifer Rexford
Princeton University

Debra Richardson
UC - Irvine

White Papers:
• Safety, Security, and Privacy Threats Posed by Accelerating Trends in IoT
• Embedding Computing Innovations into our Cities and Communities (in process)

Recent Activities:
• When Everyday Objects Become Internet Devices: A Science Policy Agenda panel at AAAS 2017

Upcoming Activities:
• Response to NITRD Smart Cities and Community Strategic Plan
• White paper about key research investment in “Intelligent Infrastructure”
• Coordination with CRA Govt Affairs
CONVERGENCE OF DATA AND COMPUTING TASK FORCE

Chair: Vasant Honavar

Current Members:
- Tom Conte
  Georgia Tech
- Mark Hill
  Wisconsin, Madison
- Klara Nahrstedt
  Illinois, Urbana-Champaign
- Holly Rushmeier
  Yale
- Kathy Yelick
  UC - Berkeley

White Papers:
- Challenges to Keeping the Computer Industry Centered in the US
- Democratizing Design for Future Computing Platforms

Recent Activities:
- Accelerating Science: A Computing Research Agenda white paper
- Co-sponsor of the AAAI Symposium on Accelerating Science: A Grand Challenge for AI
- Discussions with DARPA
- White papers and coordination with PCAST

Upcoming Activities:
- Accelerating Science: A Grand Challenge for AI workshop report
AI AND ROBOTICS
TASK FORCE

**Chairs:** Greg Hager and Eric Horvitz

**Current Members:**
- Randy Bryant, Carnegie Mellon
- Vasant Honavar, Penn State
- Maja Matarić, USC
- Gregory Hager, Johns Hopkins
- Eric Horvitz, Microsoft Research

**Recent Activities:**
- Co-sponsorship of AAAI Symposium on *Artificial Intelligence for Social Good*
- *Advances in Artificial Intelligence Require Progress Across all of Computer Science* white paper
- Discussions with Partnership on AI
- AAAS Flash Talk and Panel on Socially-Assistive Robotics

**Upcoming Activities:**
- *Accelerating Science: A Grand Challenge for AI* workshop report

**White Papers In Process:**
- *An Actionable Agenda for AI*
- *Work Through Human Augmentation*
- *White Paper on Safe AI*
HEALTHCARE TASK FORCE

Chair: Beth Mynatt

Beth Mynatt
Georgia Tech

Current Members:

Kevin Fu
University of Michigan

Gregory Hager
Johns Hopkins

Maja Matarić
Penn State

Nina Mishra
Amazon

Shwetak Patel
University of Washington

Recent Activities:
• Workshop and Executive Summary: *Discovery and Innovation in Smart and Pervasive Health*

• Workshop series on Cyber Social Learning Systems

• Attended the AAAS meeting in Feb 2017 and held a press briefing on *Health in Your Pocket: Diagnosing and Treating Disease with Smart Phones*

Upcoming Activities:
• *Discovery and Innovation in Smart and Pervasive Health* December, 2016 Workshop Report

White Papers In Process
• *Population Health Surveillance and Response*
• *Transforming Aging*
PRIVACY AND FAIRNESS TASK FORCE

**Chairs:** Cynthia Dwork and Sampath Kannan

- **Cynthia Dwork**
  - Harvard University

- **Sampath Kannan**
  - University of Pennsylvania

**Current Members:**

- **Lorenzo Alvisi**
  - University of Texas, Austin

- **Elizabeth Bradley**
  - University of Colorado, Boulder

- **Vasant Honavar**
  - Penn State

**Recent Activities:**

- Published a white paper called *Privacy-Preserving Data Analysis for the Federal Statistical Agencies* (joint with the Census Bureau)

- Visioning Workshop on Sociotechnical Cybersecurity - December, 2016

**Upcoming Activities:**

- Writing a white paper to encourage NIST to create a Standards Body

- Organizing four Fairness Workshops for late 2017 and early 2018

**White Papers In Process**

- *An Ontology for Fairness*
ENGAGEMENT WITH SISTER ORGANIZATIONS

• Coordinate our actions with relevant organizations such as the CISE Advisory Council and CRA

• Tap into research networks such as the NSF Big Data Regional Innovation Hubs, the Metro Lab Smart City network

• Collaborate with other discipline consortia such as MForeSight: Alliance for Manufacturing Foresight and ECEDHA
  – Partnered with Mforesight in March, 2017 workshop on cybersecurity for manufacturers
INTELLIGENT INFRASTRUCTURE
WHITE PAPERS

• Inform potential legislative agenda
• Make the case for basic research
• Draw out relevance for multiple domains / agencies
• Partner with ECEDHA
• Rapid writing process (~2 weeks)
  – Discuss CCC exec (Mar 6)
  – Brief lead authors (Mar 14)
  – Publish (Mar 28)
  – First agency visits (Mar 30)
• More papers in the pipeline
  (Privacy, Rural Infrastructure, Health, Wireless)

Papers on:
• Research Agenda for Intelligent Infrastructure
• Transportation and Mobility
• Energy (Smart Grid)
• Disaster Management, Community Resilience and Public Safety
• City Scale Intelligent Systems and Platforms
• Food, Energy, and Water
• Safety and Security for II

• 37 authors
• 26 institutions
INDUSTRY: SOME OBSERVATIONS

• “Core” IT companies occupy 5 slots in top 10 companies by market cap; only 2 with identified research labs

• Non-IT companies are rapidly becoming IT companies
  – Automobile industry
  – Merchandising
  – Financial

• Increasing importance of public-private partnerships for research initiatives (NSF PAWR)

• Much of the growth is around areas that have direct consumer interaction/impact – mobile, social, entertainment, etc. with rapid cycle times

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<thead>
<tr>
<th>Rank</th>
<th>First quarter[8]</th>
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<tbody>
<tr>
<td>1</td>
<td>Apple Inc. 596,988.7</td>
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<td>2</td>
<td>Alphabet 511,445.1</td>
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<td>3</td>
<td>Microsoft 434,130.1</td>
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<td>4</td>
<td>Berkshire Hathaway 349,813.4</td>
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<td>5</td>
<td>Exxon Mobil 346,616.5</td>
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<tr>
<td>6</td>
<td>Facebook 326,357.8</td>
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<td>7</td>
<td>Johnson &amp; Johnson 300,604.4</td>
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<td>9</td>
<td>Amazon Inc. 280,095.8</td>
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<tr>
<td>10</td>
<td>Wells Fargo 246,035.0</td>
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Key Takeaways
One of the most important resources today (after financial funding) is access to data (academia) and people (industry)

Need to identify and disseminate best practices for collaboration

Recommendations:
• Establish a means of measuring and benchmarking industry/academic interactions.
• Create mechanisms that support alternative career paths
• Consider ways that advanced infrastructure can be made widely available to the research community.
• Convene a long-term forum or body around industry-academic interaction.
ENGAGING WITH INDUSTRY

• Working with industry leadership in the planning of CCC workshops

• Hosting CCC activities at industry events

• Working with federal-industry partnerships

• Engaging non profits and industry consortia

• Taking a broad view on computing industry
THE CCC COUNCIL — PAST MEMBERS

- Greg Andrews, Univ. Arizona
- Debra Crawford, Drexel
- Susan Davidson, Univ. PA
- Joseph Evans, Univ. KS
- Bill Feiereisen, LANL
- Limor Fix, Intel
- Stephanie Forrest, Univ. New Mexico
- Lance Fortnow, Georgia Tech
- Susan Graham, UC Berkeley
- 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
- Tal Rabin, IBM Research
- 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
ENGAGING WITH CCC ALUMNI

• The growing number of CCC alumni is an untapped resource

• Activate this network by more consistently communicating with our alumni and inviting them to relevant activities

• Host a dinner bringing together symposium speakers, CCC alumni, current council members and early-career faculty participating in the biennial symposium.
COMMUNICATIONS
COMMUNICATING FUTURE COMPUTING RESEARCH

• Create a consistent set of collateral for workshop reports and white papers including high-level summaries, presentation briefs, videos and blog posts.

• Place concrete outputs into traditional and non-traditional venues ranging from CACM and similar venues to mainstream press, social media and YouTube.

• Use the CCCBlog as our main communications channel for the computing research community

• Promote the CCC website and its resources

• Support council members and the CCC in general delivering presentations on visioning topics to broad audiences

• Post relevant information about events and announcements on Twitter and Facebook
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
- 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

Computing Research
2016

AI for Social Good
2016
CCC BLOG : LAST 10 BLOG POSTS

- Call for Proposals: Creating Visions for Computing Research – March 29th, 2017
- International Symposium on Robotics Research 2017 Call for Papers – March 28th, 2017
- U.S. Department of Transportation Webinar on Regional Intelligent Transportation Systems Data Sharing – March 27th, 2017
- NSF CISE Distinguished Lecture – Improving the Reproducibility of Computational Research – March 24th, 2017
- Artificial Intelligence (AI) For Social Good – March 23rd, 2017
- CCC Council Member Cynthia Dwork is One of the Recipients of the 2017 Godel Prize – March 23rd, 2017
- NSF Announces Big Data Spokes Solicitation for 2018 – March 22nd, 2017
- Past CCC Chair Gregory D. Hager Inducted to American Institute for Medical and Biological Engineering College of Fellows – March 21st, 2017
- WHISPER: A New Persistent Memory Benchmark Suite – March 20th, 2017
- University of Illinois at Urbana Champaign Computer Science Ties to Predict March Madness – March 16th, 2017
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 11th 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 (EHR) that predict when patients are at highest risk of developing a given adverse event. As a test case, we developed TREScore, 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, TREScore was able to identify patients with a median 24 hours prior to septic shock onset at a sensitivity of 0.86 and corresponding specificity of 0.87. Additionally, over two-thirds of patients were identified prior to any organ-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 TREScore has to be validated in a

Embedding Ethical Principles in Collective Decision Support Systems
April 8, 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 Testaizales (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-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 real-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 ethically-compliant systems will possibly impact all these application domains.

Other Research

I work on symbolic 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
CULTIVATING LEADERSHIP
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
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
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
EVALUATION
SUMMARY 2015 - 2016 WORKSHOPS

We asked all visioning workshop participants the same questions. Here is the summary:

• The discussions were active and engaging (Active Discussions)
• The workshop provided the opportunity for a discussion that would be hard to have without such a forum (Forum)
• A clear and compelling vision emerged (Clear Vision)
• There will be useful results from the work we did (Useful Results)
PARTICIPANT DATA

Demographic information from CCC attendees who have attended CCC events since September 2014.

Percentage of Women at Workshops

- Aging in Place
- BRAIN
- Extensible Distributed Systems
- 2025 Roundtable
- Privacy by Design - State of Research and Practice
- Leadership in Science Policy Institute
- Privacy by Design - Privacy Enabling Design
- Privacy by Design - Engineering Privacy
- Computer-Aided Personalized Education
- Catalyzing Privacy by Design
- Computing Research Symposium
- Artificial Intelligence for Social Good
- Cybersocial Learning Systems
- Cybersocial Learning Science: A Grand Challenge
- Symposium on Accelerating in Smart and Pervasive
- Nanotechnology
- Discovery and Innovation in Smart and Pervasive
- Sociotechnical Cybersecurity

- % of Women
- Average
PARTICIPANT DATA

Demographic information from CCC attendees who have attended CCC events since September 2014.

Percentage of Industry Participants at Workshops
EVALUATION SURVEYS - AUGUST 2016

Internal Survey

– Sent to 651 previous CCC Visioning Workshop participants (from 2014 - June 2016) and had a 15% response rate (100 responses).

– Respondents picked the following most often when asked what is the most important CCC activity in shaping new research directions:
  • Visioning workshops
  • Overall networking and community building
  • Workshop reports
EVALUATION SURVEYS - AUGUST 2016

External Survey

– Sent to 220 CRA members and had a 25% response rate (58 responses).

– Respondents picked the following most often when asked what is the most important CCC activity in shaping new research directions:
  • Visioning workshops
  • Workshop reports
  • Overall networking and community building
  • White papers
OUTCOME ASSESSMENT
OUTCOME 1: INCREASE AWARENESS OF COMPUTING RESEARCH

Increase federal agency awareness of the role computing research must play in addressing a broad spectrum of national priorities.
OUTCOME 2: ENGAGE THE COMMUNITY

Engage the computing research community in identifying new directions for computing research, in shaping priorities for those new directions, and in responding to existing opportunities in the computing research ecosystem.

• “It's a great community builder and reinforcer, giving voice broadly and representing the community's needs at the national level.”

• “As a workshop organizer, I wondered what impact the event would have. I was thrilled to learn that some participants have made major changes to their research in response to the event; one called it ‘life changing’. It doesn't get much better than that, so thank you!”

• “CCC has had remarkable success in catalyzing the computing research community and strengthening its relationship with federal agencies. It has become a role model and other communities (e.g., Am. Statistical Association) are trying to mimic its activities (e.g., whitepapers).”

• “My experience at the Computer Aided Personalized Education workshop revealed the increasingly valuable role of the CCC in our field and for the many fields that can benefit from drawing on computer science. Computer science is now heavily oriented toward small conferences, with much less emphasis on journals. The research literature is therefore very dispersed and difficult to engage with. The CAPE workshop brought together computer scientists, educators, and behavioral psychologists in a way that I haven’t seen, invaluable for all of us.”
OUTCOME 3: CREATE HIGH-IMPACT RESOURCES

Create high-impact tangible resources, such as white papers, workshop reports, and presentations that inform stakeholders (federal agencies, science policy experts, researchers, industry, and the general public) as to the current and potential impact of computing research.

In the past 4 years the CCC has created:
• 20 white papers
• 13 workshop reports
And presented in over 24 venues about the CCC

(Plus 2 workshops reports and 7 white papers for 2017 thus far)

According to the August 2016 evaluation survey, a majority of respondents (71%) have disseminated CCC materials to colleagues
OUTCOME 4: GROW AWARENESS OF CCC

Grow the awareness of CCC and the role it plays in shaping computing research in all stakeholder communities.

Federal agencies and other organizations have started calling on the CCC to co-host workshops and engage the community in various events.

- Co-hosted Robotics, Manufacturing, and Computing with NSF and OSTP 2013
- Co-hosted Aging in Place with NIH 2014
- Symposium on Accelerating Science: A Grand Challenge for AI with AAAI 2016
- Co-hosted AI for Social Good Symposium with OSTP 2016
- Co-hosted Cybersecurity for Manufacturers with MForesight 2016
OUTCOME 5: GROW LEADERSHIP AND COMMUNITY

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

- 33 CCC alumni over 24 universities and 4 research laboratories
- More than 100 computing researchers have organized CCC visioning workshops over the last 4 years
- 119 computing researchers have attended CRA LiSPI
LESSONS LEARNED

• Early lessons
  – Need for senior leadership; round out steering committee leadership
  – Bootstrap process (bi-weekly calls; participant invites; diversity); Workshop manual

• Human Computation Workshop (and a few earlier workshops)
  – Needed to be more community driven as opposed to one singular champion
  – More direct advising of workshop leadership; expand

• Post doc program
  – Difficult to engage the computing community on this topic
  – Not all one-off pilot projects will work (Compare CI Fellows to Postdocs)

• Privacy By Design (workshop series)
  – Difficult to keep steering committee engaged and integrate the results between workshops and post

• Partnering with Other Organizations
  – Flexibility, agility

• General workshop insights
  – Capture materials for writing reports; capture for collateral
ASSESSMENT PLAN

We propose to add the following assessment capabilities to the CCC:

• Send out a secondary post-workshop survey after the visioning workshop report has been finalized. Ask questions such as:
  – “Do you think your time spent at the workshop was valuable?”
  – “Where do you think the workshop report will have the most impact?”
  – “Do you think the workshop report will add value to the community?”

• Begin to survey the Blue Sky Idea awardees as a way to evaluate the program and its impact on the computer science research community.

• Create more systematic naming conventions to allow us to use web search tools to identify the use of CCC published materials.
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/](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