National Science Foundation
Directorate for Computer and Information Science and Engineering Advisory
Committee (CISE AC)

December 3-4, 2015

National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Meeting Summary

The winter meeting of the National Science Foundation's (NSF) Directorate for
Computer and Information Science and Engineering's (CISE) Advisory Committee (AC)
was held at NSF on December 3-4, 2015.

Thursday, December 3, 2015

Welcome, Introductions, Review of Agenda, and Approval of Minutes
Drs. David Culler (University of California, Berkeley) and Fran Berman (Rensselaer
Polytechnic Institute), CISE AC co-chairs, opened the meeting at 12:10 p.m., and
welcomed all in attendance, including three new members: Drs. Margaret Martonosi, Bob
Sproull, and Padma Raghavan (the full list of attendees is in Appendix I). Following AC
member introductions, Drs. Culler and Berman reviewed the meeting agenda, and the
CISE AC unanimously approved the minutes from the July 2015 meeting.

NSF and CISE Update
Dr. Jim Kurose, Assistant Director of NSF for CISE, welcomed the AC and provided an
update on NSF and CISE (slides are posted on the CISE AC website). He highlighted the
new members of the CISE AC as well as recent CISE staff changes. Dr. Kurose focused
his discussion on looking forward and examining key opportunities available to the CISE
community, particularly relating to the scale and scope of awards. Dr. Kurose
summarized recent NSF and CISE budgets, core programs and priorities, cross-
directorate initiatives, and cross-agency and cross-sector partnerships. Five key
opportunities for the future of the field were identified and deemed of particular
relevance because of time, circumstance, and readiness: cyberinfrastructure, smart and
connected communities, CS undergraduate education, data science, and partnerships. Dr
Kurose closed by stating what a great time it is for computing and information science
and engineering, and thanking the CISE AC members, CISE community, and CISE
directorate staff for all their efforts.

Program Updates
NSF Advanced Cyberinfrastructure & National Strategic Computing Initiative (NSCI)
Ms. Irene Qualters, the Division Director for the CISE Division of Advanced
Cyberinfrastructure (ACI), provided updates on NSF's advanced cyberinfrastructure
activities. She noted two new cyberinfrastructure (CI) systems deployed in 2015 – Comet

at the University of California, San Diego, and Wrangler at the University of Texas, Austin – and described how these systems add to the diversity of resources available to the Nation and the research cyberinfrastructure ecosystem supported by NSF. She provided an overview of the NSCI, noting that NSF will be providing co-leadership in establishing a viable path forward for future high-performance computing (HPC) systems in the post-Moore's Law era, in increasing the synergy between the technology base used for modeling and simulation and that used for data analytic computing, and in increasing the capacity and capability of the national HPC ecosystem. Ms. Qualters concluded by emphasizing the importance of continued community engagement and mentioned the ongoing National Academies of Sciences, Engineering, and Medicine study on advanced computational infrastructure for the future.

Smart & Connected Communities
Dr. Erwin Gianchandani, Acting Deputy Assistant Director for CISE, reported on NSF's initial efforts to support fundamental research and education for Smart & Connected Communities (S&CC). He provided the context, including the recent White House "Smart Cities" Initiative announcement for which NSF and CISE provided substantive leadership. Dr. Gianchandani noted that S&CC builds on NSF's long history of investments in advanced networking capabilities and embedding computation into physical systems and infrastructure; there is a growing multi-disciplinary community for S&CC, including those working on US Ignite and cyber-physical systems. He also noted that NSF is actively encouraging supplements to existing NSF awards and EArly-concept Grants for Exploratory Research (EAGERs) to accelerate research to enable the S&CC of the future. Following the presentation, Dr. Berman noted the need for social and economic research collaborations in support of S&CC.

CS Education Update
Dr. Jan Cuny, CISE Program Director for Computer Science Education, reported on the CS10K effort, the STEM+C Partnerships program in partnership with the Education and Human Resources (EHR) directorate, and the Broadening Participation in Computing (BPC) Alliances. She noted interagency collaborations and a large focus on CS education from the White House, including a recent blog calling for new commitments in support of computer science (CS) education and remarkable CS champions. Dr. Cuny also reported that a National Academies of Sciences, Engineering, and Medicine study is underway to understand undergraduate CS enrollment patterns and the impact on diversity, noting that the committee is aiming for a report-out at the 2016 Snowbird Conference. Dr. Cuny also mentioned the REvolutionizing engineering and computer science Departments (RED) program before, noting that creative solutions will be needed to change undergraduate education that can be scaled and adopted by a large number of computer science and computer engineering departments.

Overview of PCAST Report on NITRD
Dr. Greg Hager, Co-Chair of the President's Council of Advisors on Science and Technology (PCAST) Working Group that conducted a review of the federal Networking and Information Technology Research and Development (NITRD) program, provided a summary of the report to the President and Congress on *Ensuring Leadership in*

Federally Funded Research and Development in Information Technology. The report includes general observations on the state of computing and information science and engineering, and notes that the field is under stress due to rapid growth and increasing opportunities for multi- and trans-disciplinary collaborations. The report includes recommendations in critical areas of computing and information science and engineering, including: cybersecurity and privacy; information technology (IT) and health; big data and data-intensive computing; IT and the physical world; cyber-human systems; high-capability computing; and foundational IT research. Dr. Hager concluded by emphasizing the importance of modernizing the Nation's R&D investment portfolio and associated cross-agency coordination mechanisms in order to sustain the Nation's IT innovation ecosystem and ensure continued U.S. leadership in IT.

CISE Vision 2025
Drs. James Landay and Beth Mynatt, co-chairs of the Steering Committee for Computing Visions 2025, provided a summary of their activities and recommendations, including:
- Pursue cyber-human systems that integrate technologies in a physical "post-mobile/web" world, and that balance systems-oriented research with human-centric research;
- Break down silos by encouraging the necessary "intra-disciplinary" computing research;
- Build collaborations between cyber-human systems and cyber-physical systems research activities;
- Create testbeds to explore the merging of the computing-social-physical world; and
- Develop new education experiences for graduate and undergraduate students.

Following the presentation and discussion, Dr. Kurose encouraged the AC members to translate the recommendations into actionable items.

Discussion with Tom Kalil
Mr. Tom Kalil, Deputy Director for Policy for the White House Office of Science and Technology Policy and Senior Advisor for Science, Technology and Innovation for the National Economic Council, thanked the CISE AC for their time and service. He noted ongoing Administration priorities such as training more high school CS teachers, increasing undergraduate cybersecurity offerings, finding technological approaches to policy concerns, supporting mid-scale architectures, examining the wireless spectrum, and providing "smart city" testbeds to address societal challenges.

Friday, December 4, 2015

Subcommittee Report-Outs and Discussion
New Partnership Models for CISE among NSF, Industry, and Academia
The Partnership Models Subcommittee reported that its primary focus is on how partnerships can create new and lasting research capacity. Among the potential partnerships discussed by the group include those among industry, federal agencies, and individual consortia. The group noted that partnership models could serve as mechanisms for large-scale co-investors; technology transfer; and enhanced diversity. The group also

emphasized that it is seeking to amplify and facilitate, and not to impede, the rich and varied engagements that already exist.

The Fourth Paradigm: Data Science
The Data Science Subcommittee reported that its focus is on envisioning data science in 15 years. The group intends to generate a report by breaking into smaller focus groups to strategize recommendations that address the fundamental understanding of data science, preparing a workforce for data science-enabled jobs, accelerating state-of-the-art data science, and supporting infrastructure for data science.

Meeting with NSF Director and Chief Operating Officer
Dr. Culler welcomed Drs. France Córdova, Director of NSF, and Richard Buckius, NSF's Chief Operating Officer, and outlined the major themes of the AC conversations during this meeting. Dr. Córdova expressed enthusiasm about what CISE is doing and the work of ACI for the broader science and engineering community, noting that computing and information science and engineering is aligned with many Administration priorities. Dr. Córdova acknowledged that she wishes to see more interplay between CISE and the entire agency, and noted the importance of advancing support for the creativity and innovative research that she has witnessed across universities. Members of the AC emphasized that the booms in CS education and data science will create fundamental changes to universities, which may need help adjusting to these changes. Dr. Córdova recommended continuing conversations with universities and suggested that the AC members pursue approaches for raising visibility of these challenges and opporutnities.

Closing Remarks and Wrap-up
The meeting concluded with Drs. Culler and Berman thanking Dr. Kurose, CISE staff, and CISE AC members for a successful meeting. The upcoming spring AC meeting will be scheduled for May 2016.

The meeting adjourned at 12:10 p.m.

Appendix I: Attendance for December 3-4, 2015, CISE AC Meeting

AC Members Present:
Francine Berman, Rensselaer Polytechnic Institute
Thomas Cortina, Carnegie Mellon University
David Culler, University of California, Berkeley
Susan Davidson, University of Pennsylvania
Deborah Estrin, Cornell Tech
Michael Franklin, University of California, Berkeley
Brent Hailpern, IBM Research – Almaden
Charles Isbell, Jr., Georgia Institute of Technology
James Landay, University of Washington
Peter Lee, Microsoft Research (*participated via teleconference 12/3*)
Margaret Martonosi, Princeton University
Craig Partridge, Raytheon BBN Technologies
Padma Raghavan, Pennsylvania State University
Ronitt Rubinfeld, Massachusetts Institute of Technology
Rob Rutenbar, University of Illinois at Urbana-Champaign
Robert Schnabel, Indiana University
Bob Sproull, University of Massachusetts, Amherst
Victoria Stodden, Columbia University
Alex Szalay, The Johns Hopkins University

AC Members Absent:
Henrik Christensen, Georgia Institute of Technology
Vijay Kumar, University of Pennsylvania
Jeffrey Vitter, University of Kansas