Computing Visions 2025:
Interacting with the Computers All Around Us

WS Chair: Limor Fix, CCC Council member
WS Co-Chairs: Jennifer Rexford, Princeton; Daniela Rus, MIT
CCC/NSF support: Elizabeth Mynatt, Georgia Tech; Ann Drobnis, Director CCC

Computers are increasingly ubiquitous, from smart phones and sensors, to wearable electronics and embedded medical devices, to conventional tablets, laptops, and server racks. In this workshop, we will bring together researchers at the cutting edge of pervasive computing to look beyond the horizon at the technological innovations that could radically change how computers interact with people and the world around them.

In particular, the workshop will cover the growing challenges and promising technological trends in how people will interact with computing around them in efficient, correct and humanly pleasing manners. Many computing devices will be interacting with each other without humans in the loop, thus, the workshop will also explore interactions involving a swarm of machines. Finally, ubiquitous computing will open new frontiers in how people interact with people and will empower communities to accomplish bigger and more complex tasks.

We will develop a whitepaper reporting on the findings and the vision expressed in the workshop. This paper will then be presented to relevant government agencies and will be circulated widely.

J.W. Marriott
1331 Pennsylvania Avenue, NW
Washington, DC

May 12:
- 6:00-7:00 pm   Reception – State Foyer
- 7:00-8:10 pm   Interactive Introductions – State Room
- 8:10-10:00 pm   Working Dinner – State Room

May 13:
- 7:00-8:00 am   Breakfast – Russell Room
- 8:00-9:30 am   Session 1 – Hart and Cannon Room
- 9:30-10:00 am   Break – Hart and Cannon Foyer
- 10:00-11:30 am   Session 2 – Hart and Cannon Room
- 11:30-12:30 pm   Lunch – Russell Room
- 12:30-2:00 pm   Session 3 – Hart and Cannon Room
- 2:00-2:15 pm   Break – Hart and Cannon Foyer
- 2:15-3:45 pm   Session 4 – Hart and Cannon Room
- 3:45-4:30 pm   Wrap-Up / Next Steps – Hart and Cannon Room

Session 1: *Core Speech and Vision Technologies to Enable Better People-to-Machine Interactions*
Chair: Andrew Senior, Google
Panelists: Rama Chellappa, University of Maryland; Irfan Essa, Georgia Tech; David Nahamoo, IBM; Mari Ostendorf, University of Washington
Abstract: In this session we will explore some of the core perception technologies required to enable the person-computer interactions of the future. We will explore different aspects of the interface, from sensing and perception to understanding, across modalities such as speech and vision.

Session 2: *Core Technologies for a Networked World of Machines and People*
Chair: Vijay Kumar, University of Pennsylvania
Panelists: Volkan Isler, University of Minnesota; Jams Kuffner, Google; Edward Lee, UC Berkeley; Lynne Parker, University of Tennessee, Knoxville
Abstract: This session will address challenges in developing smart networked systems with embedded sensors, processors and actuators that are designed to sense and interact with the physical world (including human users) and their applications to different industry sectors including agriculture, healthcare, manufacturing and transportation. The panelists will articulate the fundamental principles for creating swarms of robots and sensors interacting with humans, paradigms for interactions between networked humans and networked machines, research and development challenges for the design and verification of software to provide guaranteed performance and reliability, development of standards, and operating systems and reference architectures for large scale networked embedded systems.

Session 3: *Human-Machine Interaction and Assistance in Future Systems - Physical Aspects*
Chair: Seth Teller, MIT
Panelists: Chris Harrison, Carnegie Mellon Univesity; Charlie Kemp, Georgia Tech; Shiri Azenkot, University of Washington, Stefanie Tellex, Brown University
Abstract: This session will cover challenges in the realization of embodied systems that perceive and model the state, goals, and physical context of both the system user and the system itself. Panelists will identify and elaborate the challenges of perceiving, representing, and operationalizing such information to the benefit of the user in a variety of task domains including social activities, employment, health and wellness including self-care, recreation including exercise, education, and other activities of daily living for both the general population and people with disabilities.

Session 4: *Human-Machine Interaction and Assistance in Future Systems - Social Aspects*
Chair: Maja Mataric, University of Southern California
Panelists: Henrik Christensen, Georgia Tech; Deborah Estrin, Cornell; Holly Yanco, University of Massachusetts, Lowell; Tanzeem Choudhury, Cornell
Abstract: This session will address the challenges of providing personalized assistance to users in everyday settings, through non-physical interaction. This includes screen-based interaction, remote presence, and embodied agents (robots), all of which interact through expressivity. The domains of relevance include therapeutic settings (e.g., for developmental disorders such as autism), rehabilitation (stroke, TBI), education (schools as well as informal learning settings), living with disability, and aging in place (homes of the elderly). In all cases, the technology aims to mitigate isolation, motivate proscribed wellness-promoting behaviors and practices, and improve health and/or learning outcomes and quality of life.