

The Intel Science and Technology Center for Pervasive Computing

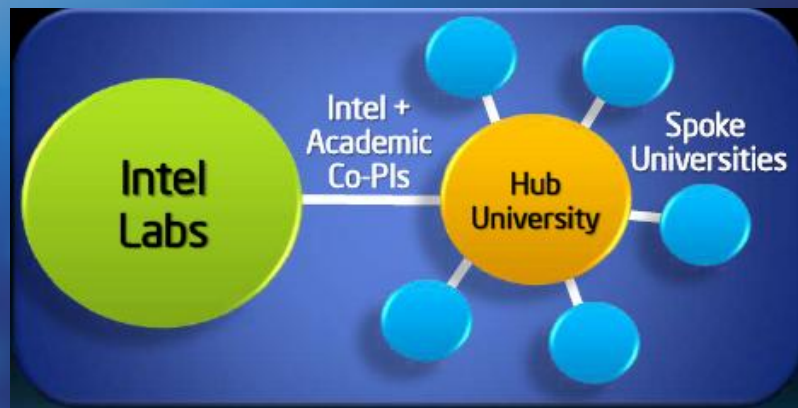
Investing in New Levels of Academic Collaboration

Rajiv Mathur, Program Director ISTC-PC

Anthony LaMarca, Intel Principal Investigator

Professor Dieter Fox, UW Academic Principal Investigator

The Intel Science and Technology (ISTC) Program



- ISTCs funded for 3+2 years and span multiple institutions
- Encourage collaboration among the best researchers in the field
- Four Intel researchers per center work on-campus
- Encourage collaboration between Intel and academia
- Public domain IP and open source software increase impact

The Intel Science and Technology Centers

Previously announced ISTCs:

ISTC – Visual Computing

Hub: Stanford

Spoke Universities: UC Berkeley, Cornell, Princeton, University of Washington, Harvard, UC Davis, and UC Irvine.

ISTC – Secure Computing

Hub: UC Berkeley

Spoke Universities: Carnegie Mellon University, Drexel, Duke and University of Illinois.

ISTC – Cloud Computing

Hub: Carnegie Mellon University

Spoke Universities: Princeton, Georgia Tech, and UC Berkeley.

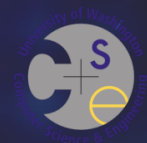
ISTC – Embedded Computing

Hub: Carnegie Mellon University

Spoke Universities: Cornell, University of Illinois-Urbana-Champaign, University of Pennsylvania, Penn State University, Georgia Tech, and UC Berkeley.

Introducing...

The Intel Science and Technology Center for Pervasive Computing



Anthony LaMarca

Intel Co-Principal Investigator
Research: Context Awareness
At Intel since 2001

Intel Lab Seattle Assoc Director 2005-2011
University of Washington alumnus
Previously at Xerox PARC and Yahoo!

Dieter Fox

University of Washington Co-Principal Investigator
Research: Artificial Intelligence, Robotics
At UW since 2000

Intel Labs Seattle Director, 2009-2011
Fellow of the Association for the Advancement of
Artificial Intelligence



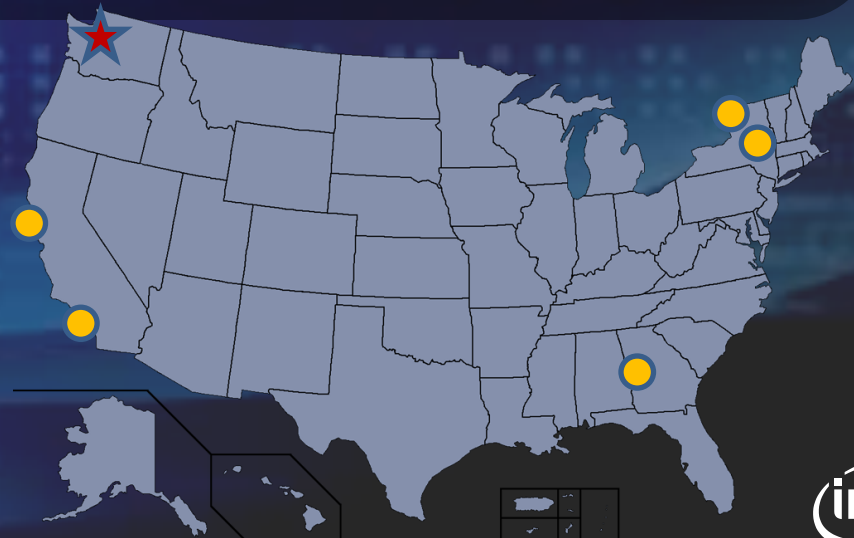
Distributed Collaboration Center

Faculty + Graduate students + Intel

- University of Washington is the hub of the ISTC-PC, coordinating:
 - Cornell University
 - Georgia Institute of Technology
 - University of California, Los Angeles
 - University of Rochester
 - Stanford University

Leading experts in:

- Pervasive computing
- Wireless sensing & communication
- Human computer interaction
- Artificial intelligence & machine learning
- Computer vision
- Security and privacy



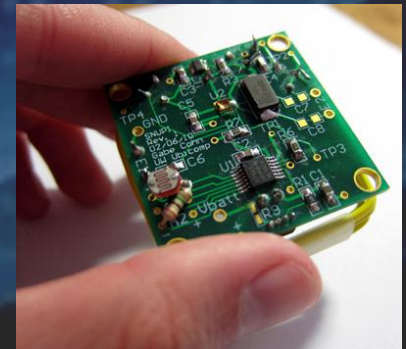
Research Mission

“Designing pervasive computing systems that are richly aware of their users and their activities, and continuously learning and adapting.”

- Key research themes:
 - Low-power sensing and communication
 - Understanding human state and activities
 - Personalization and adaption

Theme: Low-Power Sensing and Communication

- Goal: Enable continuous, unobtrusive awareness of people for long periods of time
- Harvest energy from ambient sources
 - Solar, radio, vibration, thermal, etc.
- Minimizing power usage
 - Sensing at minimal power levels
 - Using energy-efficient network protocols
- Coordinate components to build “perpetual systems”



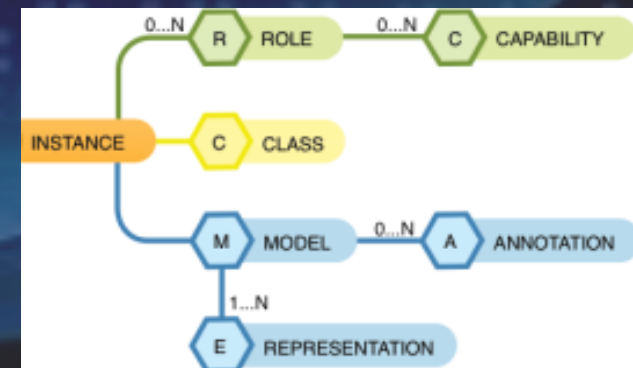
Theme: Understanding Human State and Activities

- Goal: Recognize a user's fine-grained context and interactions with people, objects, and environments
- Dense heterogeneous sensors
 - Integrated into mobile devices and embedded in environment
- Statistical machine learning algorithms to extract complex human context
- Real-time and efficient
 - Partition algorithms between mobile device and the cloud for performance



Theme: Personalization and Adaptation

- **Goal:** Interactive, continuous learning of user's preferences, environments, tasks, etc.
- Continually improving performance comes from the system refining its models
- System can be taught new activities by example and demonstration
- Deeply personalized models for seamless user interaction



Application:

The Smart Cooking Assistant

Goal: Build a kitchen-oriented task space that

- has knowledge of recipes and keeps track of cooking progress
- provides reminders and guidance
- interacts seamlessly via audio, gesture, projected imagery
- can be taught new recipes by demonstration



Application:

In the Home Family Coordination

Goal: Help families coordinate their busy lives through monitoring, tracking and reflecting on their activities

- combines infrastructure mediated sensing with rich sensors
- jointly reasons about all members of a household
- new labeling methods encourage people to provide ground truth data
- ensure that sensing systems are secure and only sense necessary private information



Application: Mitigating Stress in Everyday Situations

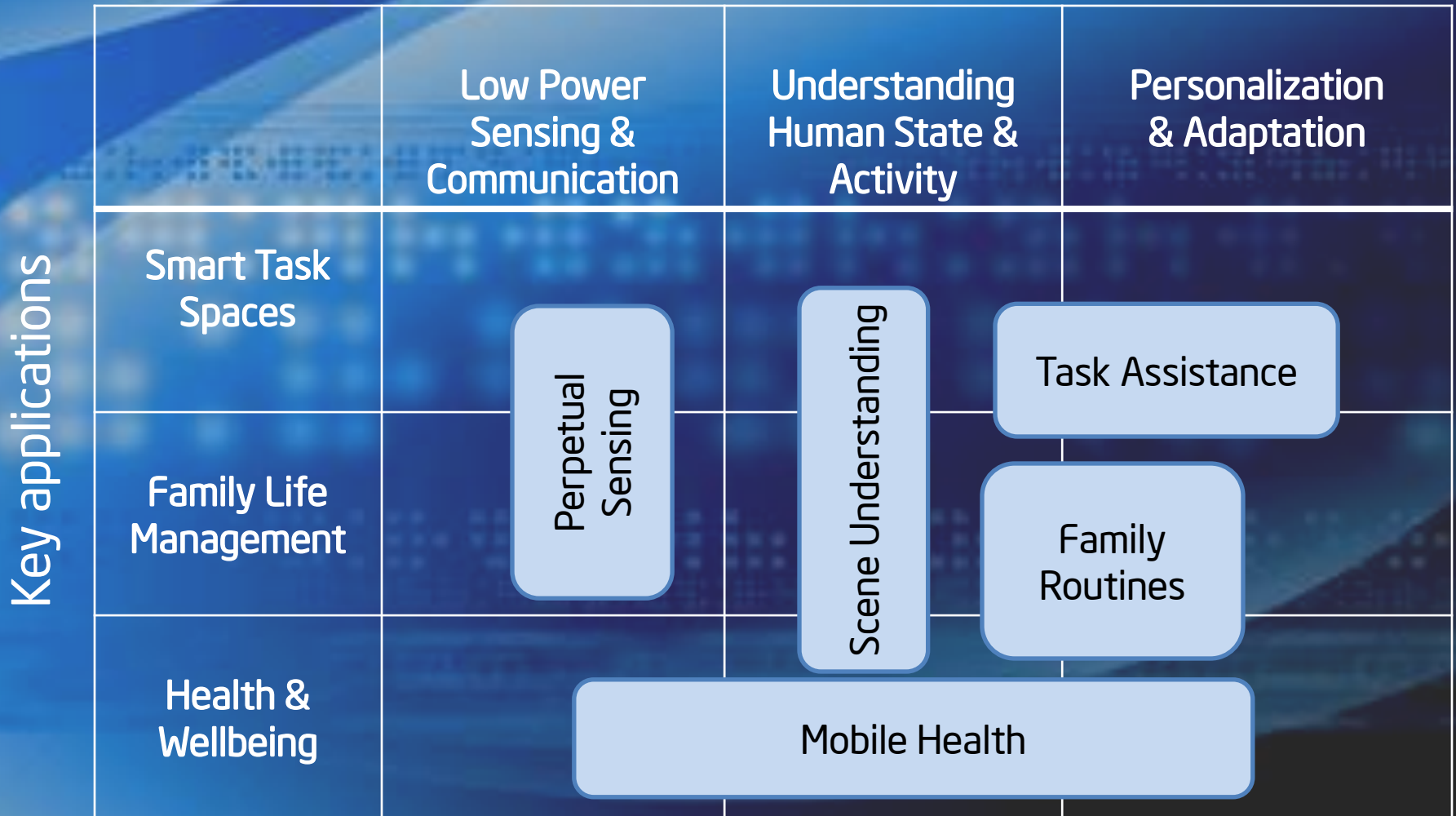
Goal: Help users identify, manage, and reduce stress and anxiety in their daily lives

- learns a user's routines and everyday stressors using mobile device
- measures a user's stress level
- gives feedback to help users manage stress
- leverages crowd sourcing data



ISTC-PC Themes, Applications & Projects

Themes



Long-Term Impact

- Next generation of smart pervasive computing systems
 - Natural interaction, personalization, deep understanding of context
- Inter-disciplinary research community
- Application-driven research
- Fundamental advances in sensing and communication, systems, AI, computer vision, HCI, and machine learning
 - New sensing technologies
 - Vision-based context awareness
 - Complex task understanding and learning
 - Interaction with pervasive computing systems
 - Privacy and security for pervasive computing systems

Thank you