September 30–October 3, 2009 Orlando, Florida, USA



Association for Computing Machinery

Advancing Computing as a Science & Profession

# UbiComp'09

Proceedings of the 11th ACM International Conference on

# **Ubiquitous Computing**

#### Sponsored by:

ACM SIGCHI & ACM SIGMOBILE

Supported by:

National Science Foundation, Hewlett-Packard, Microsoft Research, Intel, Nokia, University of Florida, & University of Central Florida



Association for Computing Machinery

Advancing Computing as a Science & Profession

#### The Association for Computing Machinery 2 Penn Plaza, Suite 701 New York, New York 10121-0701

Copyright © 2009 by the Association for Computing Machinery, Inc. (ACM). Permission to make digital or hard copies of portions of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyright for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permission to republish from: Publications Dept., ACM, Inc. Fax +1 (212) 869-0481 or cermissions@acm.org>.

For other copying of articles that carry a code at the bottom of the first or last page, copying is permitted provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

#### Notice to Past Authors of ACM-Published Articles

ACM intends to create a complete electronic archive of all articles and/or other material previously published by ACM. If you have written a work that has been previously published by ACM in any journal or conference proceedings prior to 1978, or any SIG Newsletter at any time, and you do NOT want this work to appear in the ACM Digital Library, please inform permissions@acm.org, stating the title of the work, the author(s), and where and when published.

ISBN: 978-1-60558-431-7

Additional copies may be ordered prepaid from:

#### **ACM Order Department**

PO Box 30777 New York, NY 10087-0777, USA

Phone: 1-800-342-6626 (US and Canada) +1-212-626-0500 (Global) Fax: +1-212-944-1318 E-mail: acmhelp@acm.org Hours of Operation: 8:30 am – 4:30 pm ET

#### ACM Order Number 608097

Printed in the USA

## Message from the General Chair

It is my great pleasure to welcome you to the 11<sup>th</sup> International Conference on Ubiquitous Computing. We come together this year in Orlando, Florida to continue the tradition of being the premier forum for multi-disciplinary research in Ubiquitous Computing and its applications. In Disney World, Ubicomp2009 celebrates 11 years of novel research findings and an impressive audience base carefully cross-pollinated from several key communities. This includes Human Computer Interaction, Pervasive Computing, Mobile Computing, Real World Modeling, Sensors and Devices, Middleware and Systems Research, Programming Models and Tools, Human Centric Validation and Experience Characterization.

Like every year, we have a strong program full of novel ideas and impressive applications. The main event is a single-track technical program offering a variety of sessions covering topics such as activity recognition, behavior monitoring and alteration, context awareness, security and access, and much more. A compelling program of Videos/Demos/Posters is also included in the first day of the conference. A Doctoral Colloquium and 6 Workshops on emerging areas of research make up UbiComp's two-days pre-conference program. Additionally, Henry Tirri (Nokia) will give the opening keynote titled "Poor Man's Ubicomp", and Alex Pentland (MIT) will give the closing keynote titled "Honest Signals from Reality Mining." Finally, two panels are planned. One will attempt to tell the future, discuss major achievements to date and predict the future landscape of UbiComp research. The other will attempt to summarize accomplishments of UbiComp 2009.

I hope you find this year's program interesting, useful and enjoyable. To assist you in managing your networking interest and interactions prior to, during and after the conference, UbiComp 2009 is providing each registrant with the *pathable* service. It is an on-line community and a social network to help UbiComp 2009 attendees meet and communicate with each other. The service will continue to exist for one full year and until UbiComp 2010 begins. We hope that you can make full use of this tool.

Many people contributed to the success of UbiComp 2009 organization. First of all, I would like to express my gratitude to Joe McCarthy, Chair of the Steering Committee for the tremendous help he gave us as we started the early planning phase. I am very thankful to Chao Chen, Web Publicity Chair for the countless hours he put managing the web site and its ever-changing content. Special thanks go to Jung Wook Park, Online Community Chair and Registration Co-Chair for his efforts in setting up the registration web site and configuring the *pathable* social network. Thanks also go to Michael Biebl who assisted in managing all 2009 mailing lists. Gregory Abowd helped in fund raising efforts and for that I am thankful. Julie Kientz and Andreas Bulling were very helpful and ran an effective publicity campaign. I would like to also thank our sponsors and supporters: the National Science Foundation for its generous DC travel grant, HP and Microsoft Research for their Silver level sponsorships, and Nokia and Intel for their Bronze level sponsorships.

Finally, I wish to thank all UbiComp 2009 attendees for supporting the conference and making it one of the most prestigious events in this field.

Sumi Helal University of Florida

## **Message from the Program Chairs**

Welcome to the proceedings of UbiComp 2009, the 11th International Conference on Ubiquitous Computing. We were honored to serve as program chairs in this conference series, which has become established as the premier forum for the presentation of research in all areas relating to the design, implementation, deployment and evaluation of ubiquitous computing technologies. The conference attracts research submissions of very high quality from all over the world, and from researchers representing a diversity of disciplines and perspectives. We thank everybody who submitted their work to UbiComp, demonstrating the extensive research going on in this field. We also thank the Program Committee and our external reviewers who spent countless hours providing feedback and guidance in order to create the final program.

This year we received 251 submissions – 181 full papers and 70 notes. By the end of the review process, we had 1028 reviews on file, as well as long email discussion threads for each paper. Each submission was initially reviewed and discussed online by two members of the Program Committee and two external reviewers. At the end of this phase, the top-rated papers as well as those that were most controversial were selected for further review and discussion in a two-day meeting of the Program Committee. After this rigorous process, 31 submissions – 25 full papers and 6 notes – were selected for inclusion in these proceedings, and presentation at the conference.

We hope that the review process we adopted resulted in all authors receiving detailed and constructive feedback on their submission whether or not it was accepted for publication. We believe the process enabled us to assemble the best possible program for delegates at the conference. If you submitted a paper, we hope that you benefited from the feedback that your peers provided, and if you attended UbiComp 2009 we hope that you enjoyed the program.

Our thanks go to all the authors who entrusted their work to us and to everyone who attended UbiComp 2009 and enjoyed the program we helped to assemble. None of this would have been possible, or worthwhile, if it were not for your research in ubiquitous computing. Your continued support of this conference is most gratifying.

Sunny Consolvo Intel Labs Hans Gellersen Lancaster University

## **Table of Contents**

U	biComp 2009 Conference Organization	viii
U	biComp 2009 Reviewers	xii
S	ession 1: Places & Location	
•	<b>From Spaces to Places: Emerging Contexts in Mobile Privacy</b> Clara Mancini, Keerthi Thomas, Yvonne Rogers, Blaine A. Price, Lukazs Jedrzejczyk, Arosha K. Bandara, Adam N. Joinson ( <i>University of Bath</i> ), Bashar Nuseibeh ( <i>The Open University</i> )	1
•	<b>The Commodification of Location: Dynamics of Power in Location-Based Systems</b> Irina Shklovski ( <i>IT University of Copenhagen</i> ), Janet Vertesi, Emily Troshynski, Paul Dourish ( <i>University of California, Irvine</i> )	11
•	<b>Discovering Semantically Meaningful Places from Pervasive RF-Beacons</b> Donnie H. Kim (University of California, Los Angeles), Jeffrey Hightower (Intel Labs Seattle), Ramesh Govindan (University of Southern California), Deborah Estrin (University of California, Los Angeles)	21
•	<b>Privately Querying Location-based Services with SybilQuery</b> Pravin Shankar, Vinod Ganapathy, Liviu Iftode ( <i>Rutgers University</i> )	31
S	ession 2: Activity Recognition	
•	<b>Eye Movement Analysis for Activity Recognition</b> Andreas Bulling ( <i>ETH Zurich</i> ), Jamie A. Ward, Hans Gellersen ( <i>Lancaster University</i> ), Gerhard Tröster ( <i>ETH Zurich</i> )	41
•	Recognizing Daily Activities with RFID-Based Sensors. Michael Buettner, Richa Prasad (University of Washington), Matthai Philipose (Intel Labs Seattle), David Wetherall (Intel Labs Seattle & University of Washington)	51
•	Cross-Domain Activity Recognition Vincent Wenchen Zheng, Derek Hao Hu, Qiang Yang (Hong Kong University of Science and Technology)	61
•	Recognizing Stereotypical Motor Movements in the Laboratory and Classroom: A Case Study with Children on the Autism Spectrum Fahd Albinali (Massachusetts Institute of Technology), Matthew S. Goodwin (Massachusetts Institute of Technology & The Groden Center, Inc.), Stephen S. Intille (Massachusetts Institute of Technology)	71
S	ession 3: Notes	
•	<i>inAir:</i> Measuring and Visualizing Indoor Air Quality Sunyoung Kim, Eric Paulos ( <i>Carnegie Mellon University</i> )	81
•	<b>Wearable Therapist: Sensing Garments for Supporting Children Improve Posture</b> Holger Harms, Oliver Amft, Gerhard Tröster, Mirjam Appert, Roland Müller <i>(ETH Zurich)</i> , Andreas Meyer-Heim <i>(University Children's Hospital Zurich)</i>	85
•	<b>Sonar-based Measurement of User Presence and Attention</b> Stephen P. Tarzia ( <i>Northwestern University</i> ), Robert P. Dick ( <i>University of Michigan</i> ), Peter A. Dinda, Gokhan Memik ( <i>Northwestern University</i> )	89
•	Simultaneous Localization and Mapping for Pedestrians Using Only Foot-Mounted Inertial Sensors Patrick Robertson, Michael Angermann, Bernhard Krach (German Aerospace Center)	93
•	BlueTone: A Framework for Interacting with Public Displays Using Dual-Tone Multi-Frequency through Bluetooth David Dearman, Khai N. Truong (University of Toronto)	97
•	Toward Emergent Technology for Blended Public Displays	101

### Session 4: Security & Access

•	A Spotlight on Security and Privacy Risks with Future Household Robots: Attacks and Lessons	.105
	Tamara Denning, Cynthia Matuszek, Karl Koscher, Joshua R. Smith, Tadayoshi Kohno (University of Washington)	
•	Authenticating Ubiquitous Services: A Study of Wireless Hotspot Access Tim Kindberg ( <i>Hewlett Packard Laboratories</i> ), Chris Bevan, Eamonn O'Neill, James Mitchell, Jim Grimmett, Dawn Woodgate ( <i>University of Bath</i> )	.115
•	SessionMagnifier: A Simple Approach to Secure and Convenient Kiosk Browsing Chuan Yue, Haining Wang (The College of William and Mary)	.125
•	Understanding File Access Mechanisms for Embedded Ubicomp Collaboration Interfaces. Anthony Collins (University of Sydney), Anastasia Bezerianos (National ICT Australia & École Centrale Paris), Gregor McEwan (National ICT Australia), Markus Rittenbruch (National ICT Australia & University of Sydney), Rainer Wasinger, Judy Kay (University of Sydney)	.135
Se	ession 5: UbiComp Worldwide	
•	Broadening UbiComp's Vision: An Exploratory Study of Charismatic Pentecostals and Technology Use in Brazil Susan P. Wyche ( <i>Georgia Institute of Technology</i> ), Camila M. Magnus ( <i>University of Barcelona</i> ), Rebecca E. Grinter ( <i>Georgia Institute of Technology</i> )	. 145
•	Ubicomp4D: Infrastructure and Interaction for International Development—the Case of Urban Indian Slums Nithya Sambasivan (University of California, Irvine), Nimmi Rangaswamy (Microsoft Research India), Ed Cutrell (Microsoft Research), Bonnie Nardi (University of California, Irvine)	.155
•	<b>Encountering SenseCam: Personal Recording Technologies in Everyday Life</b> David H. Nguyen, Gabriela Marcu, Gillian R. Hayes ( <i>University of California, Irvine</i> ), Khai N. Truong ( <i>University of Toronto</i> ), James Scott ( <i>Microsoft Research Cambridge</i> ), Marc Langheinrich, Christof Roduner ( <i>ETH Zurich</i> )	.165
Se	ession 6: Behavior Change	
•	Applying Pervasive Technologies to Create Economic Incentives that Alter Consumer Behavior Tetsuo Yamabe ( <i>Waseda University</i> ), Vili Lehdonvirta ( <i>Helsinki Institute for Information Technology</i> ), Hitoshi Ito, Hayuru Soma, Hiroaki Kimura, Tatsuo Nakajima ( <i>Waseda University</i> )	.175
•	Playful Bottle: A Mobile Social Persuasion System to Motivate Healthy Water Intake Meng-Chieh Chiu, Shih-Ping Chang, Yu-Chen Chang, Hao-Hua Chu, Cheryl Chia-Hui Chen, Fei-Hsiu Hsiao, Ju-Chun Ko ( <i>National Taiwan University</i> )	.185
Se	ession 7: Context-Aware & Wearable Systems	
•	Assessing Demand for Intelligibility in Context-Aware Applications. Brian Y. Lim, Anind K. Dey (Carnegie Mellon University)	. 195
•	Interactive Dirt: Increasing Mobile Work Performance with a Wearable Projector-Camera System Daniel C. McFarlane, Steven M. Wilder (Lockheed Martin Advanced Technology Laboratories)	.205
•	SwimMaster: A Wearable Assistant for Swimmer Marc Bächlin, Kilian Förster, Gerhard Tröster (ETH Zürich)	.215
•	Validated Caloric Expenditure Estimation using a Single Body-Worn Sensor Jonathan Lester, Carl Hartung, Laura Pina, Ryan Libby, Gaetano Borriello, Glen Duncan (University of Washington)	.225

### Session 8: Sensing & Sustainability

A	Author Index	
•	Experiences of Participatory Sensing in the Wild Mark Paxton, Steve Benford (The University of Nottingham)	265
•	It's Not All About "Green": Energy Use in Low-Income Communities Tawanna Dillahunt, Jennifer Mankoff, Eric Paulos ( <i>Carnegie Mellon University</i> ), Susan Fussell ( <i>Cornell University</i> )	255
•	ViridiScope: Design and Implementation of a Fine Grained Power Monitoring System for Homes Younghun Kim, Thomas Schmid, Zainul M. Charbiwala, Mani B. Srivastava (University of California, Los Angeles)	245
•	HydroSense: Infrastructure-Mediated Single-Point Sensing of Whole-Home Water Activity Jon E. Froehlich, Eric Larson, Tim Campbell, Conor Haggerty, James Fogarty, Shwetak N. Patel (University of Washington)	235

# UbiComp 2009 Conference Organization

General Chair:	Sumi Helal (University of Florida, USA)
Program Chairs:	Hans Gellersen (Lancaster University, UK) Sunny Consolvo (Intel Labs, USA)
Workshops Chair:	Jakob Bardram (IT University of Copenhagen, Denmark)
Demonstrations Chairs:	Pei Zhang (Carnegie Mellon University, USA) Tsutomu Terada (Kobe University, Japan)
Video Chairs:	Achilles Kameas (Hellenic Open University, Greece) Christian Kray (University of Newcastle, UK)
Posters Chairs:	Hani Hagras (University of Essex, UK) Kristof Van Laerhoven (TU Darmstadt, Germany)
Doctoral Colloquium Chairs:	Andreas Butz (Ludwig-Maximilians-Universität, Germany) Raja Bose (Nokia Research Center Palo Alto, USA)
Panels Chair:	Michael Weber (University of Ulm, Germany)
Publication Chairs:	Diane Cook (Washington State University, USA) Gu Tao (University of Southern Denmark, Denmark)
Student Volunteers Chairs:	Jennifer Rode (University College London, UK) Alireza Sahami (University of Duisburg-Essen, Germany) Erich Stuntebeck (Georgia Tech, USA)
Publicity Chairs:	Andreas Bulling (ETH Zurich, Switzerland) Julie Kientz (University of Washington, USA)
Web Publicity Chair:	Chao Chen (University of Florida, USA)
Online Community Chair:	Jung Wook Park (Ajou University, South Korea)
Local Arrangements Chairs:	Cliff Zou (University of Central Florida, USA) Steven Pickles (University of Florida, USA)
Registration Chairs:	Andres Mendez-Vazquez (University of Florida, USA) Jung Wook Park (University of Florida, USA)
Public Relations Chair:	Aaron Hoover (University of Florida, USA)
Steering Committee Chair:	Joe McCarthy (Interrelativity, USA)

**Program Committee:** Richard Beckwith (Intel, USA) A.J. Brush (Microsoft Research, USA) Tanzeem Choudhury (Dartmouth College, USA) Hao-Hua Chu (National Taiwan University, Taiwan) Nigel Davies (Lancaster University, UK) Anind Dey (Carnegie Mellon University, USA) Paul Dourish (University of California, Irvine, USA) Mike Hazas (Lancaster University, UK) Urs Hengartner (University of Waterloo, Canada) Steve Hodges (Microsoft Research, UK) Jadwiga Indulska (University of Queensland, Australia) Tim Kindberg (HP Labs, UK) Antonio Krüger (DFKI, Germany) John Krumm (Microsoft Research, USA) Paul Lukowicz (University of Passau, Germany) Jules Maitland (University of Glasgow, UK) Antti Oulasvirta (HIIT, Finland) Kurt Partridge (PARC, USA) Shwetak Patel (University of Washington, USA) Yvonne Rogers (Open University, UK) Albrecht Schmidt (University of Duisburg-Essen, Germany) James Scott (Microsoft Research, UK) Mirjana Spasojevic (Nokia Research, USA) Yoshito Tobe (Tokyo Denki University, Japan) Khai Truong (University of Toronto, Canada) Alexander Varshavsky (AT&T Labs, USA) Woontack Woo (GIST, Korea)

Sponsors:





Supporters:















## **UbiComp 2009 Additional Reviewers**

Michael Addlesee (Microsoft Research) Sang Chul Ahn (KIST) Fahd Albinali (MIT) Florian Alt (University of Duisburg-Essen) Oliver Amft (TU Eindhoven) Ken Anderson (Intel Labs) Paul Aoki (Intel Labs) Bert Arnrich (ETH Zurich) Richard Atterer (University of Munich) Rafael Ballagas (Nokia Research) Nilanjan Banerjee (University of Massachusetts at Amherst) Louise Barkhuus (University of California, San Diego) John Barton (IBM Almaden) James Begole (PARC) Michael Beigl (TU Braunschweig) Alastair Beresford (University of Cambridge) Xiaojun Bi (University of Toronto) Jacob Biehl (FX Palo Alto Laboratory) Oliver Bimber (Bauhaus-University Weimar) Kirsten Boehner (Cornell University) Sebastian Boring (University of Munich) Raja Bose (Nokia Research) Oliver Brdiczka (PARC) Margot Brereton (*Queensland Univ. of Technology*) Johanna Brewer (University of California, Irvine) Barry Brown (University of California, San Diego) Hung Bui (SRI International) Andrew Campbell (Dartmouth College) Scott Carter (FX Palo Alto Laboratory) Marco Casassa Mont (HP Labs) Keng-hao Chang (University of California, Berkeley) Yatin Chawathe (Google) Mike Chen (Ludic Labs) Yingying Chen (Stevens Institute of Technology) Karen Cheng (Charles Drew University) Marshini Chetty (Georgia Institute of Technology) Keith Cheverst (Lancaster University) Pei-Yu Chi (MIT Media Lab) Maurice Chu (PARC) Ben Clayton (Hewlett-Packard Labs)

Katherine Connelly (Indiana University) Landon Cox (Duke University) Ed Cutrell (Microsoft Research) George Danezis (Microsoft Research) Tim Dant (Lancaster University) Eyal de Lara (University of Toronto) Alexander De Luca (University of Munich) David Dearman (University of Toronto) Christian Decker (University of Karlsruhe) Pierre Dragicevic (INRIA) Matt Duckham (The University of Melbourne) Naranker Dulay (Imperial College London) Nathan Eagle (*The Santa Fe Institute*) Dean Eckles (Nokia Research Center) Christos Efstratiou (Lancaster University) Ylva Fernaeus (SICS) Brian Ferris (University of Washington) Alois Ferscha (University of Linz) Carl Fischer (Lancaster University) Christian Floerkemeier (MIT) Patrik Floreen (University of Helsinki) James Fogarty (University of Washington) Jodi Forlizzi (Carnegie Mellon University) Marcus Foth (*Queensland University of Technology*) Dieter Fox (University of Washington) Peter Fröhlich (Telecommunications Research Center) Adrian Friday (Lancaster University) Keith Frikken (Miami University) Jon Froehlich (University of Washington) Kaori Fujinami (Tokyo Univ. of Agriculture and Technology) Krzysztof Gajos (Harvard University) Cristina Gena (University of Torino) Hassan Ghasemzadeh (University of Texas at Dallas) Gabriel Ghinita (Purdue University) Saul Greenberg (University of Calgary) Ben Greenstein (Intel Labs Seattle) Beki Grinter (Georgia Tech) Martin Griss (Carnegie Mellon Silicon Valley) William Griswold (University of California, San Diego)

Tom Gross (Bauhaus-University Weimar) Jens Grossklags (University of California, Berkeley) Marco Gruteser (Rutgers University) Manu Gupta (Oracle) Jonna Häkkilä (Nokia Research Center) Kristina Höök (Stockholm University) Daniel Halperin (University of Washington) Robert Harle (University of Cambridge) Richard Harper (Microsoft Research) Rycharde Hawkes (HP Labs) Gillian Hayes (University of California, Irvine) William Hazlewood (Indiana University) Tad Hirsch (Intel Labs) Baik Hoh (Nokia Research) Paul Holleis (University of Duisburg-Essen) Dongpyo Hong (GIST) Eva Hornecker (University of Strathclyde) Elaine Huang (Motorola Labs) Polly Huang (National Taiwan University) Shi Hui (University of Bremen) Richard Hull (Hewlett-Packard Laboratories) Jae-In Hwang (KIST) Stephen Intille (MIT) Shamsi Iqbal (Microsoft Research) Shahram Izadi (Microsoft Research) Giulio Jacucci (HIIT) Markus Jakobsson (PARC) Anthony Jameson (DFKI) Janet Read (University of Central Lancashire) Seiie Jang (Nagova University) Chris Johnson (University of Glasgow) Matt Jones (Swansea University) Rui Jose (University of Minho) Deokwoo Jung (Yale University) Ashish Kapoor (Microsoft Research) Karrie Karahalios (University of Illinois at Urbana-Champaign) Amy Karlson (Microsoft Research) Yoshihiro Kawahara (The University of Tokyo) Fahim Kawsar (Lancaster University) Jofish Kaye (Nokia Research) Dagmar Kern (University of Duisburg-Essen) Florian Kerschbaum (SAP Research) Kristian Kersting (Fraunhofer IAIS)

Julie Kientz (University of Washington) Minkyong Kim (IBM) Sehwan Kim (University of California, Santa Barbara) Ig-Jae Kim (KIST) David Kirk (University of Nottingham) Mikkel Baun Kjærgaard (Aarhus University) Tadayoshi Kohno (University of Washington) Shinichi Konomi (University of Tokyo) Matthias Kranz (TU Munich) Shonali Krishnaswamy (Monash University) Kai Kunze (University Passau) Renee Kuriyan (Intel) Nicholas Lane (Dartmouth College) Marc Langheinrich (University of Lugano, USI) Dongman Lee (ICU) Youngho Lee (GIST) Matthew Lee (Carnegie Mellon University) Darren Leigh Jonathan Lester (University of Washington) Hong Li (Intel) Yang Li (Google Research) Ming Li (University of Massachusetts at Amherst) Youn-kyung Lim (KAIST) James Lin (Google) Silvia Lindtner (University of California, Irvine) Heather Lipford (University of North Carolina *at Charlotte*) Shih-Yen Liu (University of Washington) Alan Liu (University of Washington) Seng Loke (La Trobe University) Lu Luo (Nokia Research) Christian Müller (DFKI) Hans Jörg Müller (University of Münster) Clara Mancini (The Open University) Mohammad Mannan (Carleton University) Natalia Marmasse (Google) Paul Marshall (The Open University) Sergio Mascetti (University of Milan) Oscar Mayora (Create-Net) Rene Mayrhofer (eSYS) Joe McCarthy (Interrelativity) Tom Melamed (*Hewlett-Packard*) Brian Meyers (Microsoft Research) Florian Michahelles (ETH Zurich)

Kazuhiro Minami (University of Illinois at Urbana-Champaign) Masateru Minami (The University of Tokyo) James Mitchell (University of Bath) Takashi Miyaki (The University of Tokyo) Igbal Mohomed (University of Toronto) Henk Muller (Xmos) Kavitha Muthukrishnan (University of Twente) Dawn Nafus (Intel Labs) Carman Neustaedter (Kodak Research Labs) Mark Newman (University of Michigan) Jeff Nichols (IBM Almaden Research Center) Masashi Nishihata (University of Toronto) Petteri Nurmi (HIIT) Georg Ogris (University of Passau) Nuria Oliver (Telefonica Research) Patrick Olivier (Newcastle University) Joe Paradiso (MIT Media Lab) Tapan Parikh (University of California, Berkeley) Sangho Park (University of Rochester) Donald J. Patterson (University of California, Irvine) Neal Patwari (University of Utah) Trevor Pering (Intel Labs) Matthai Philipose (Intel Labs) Gerald Pirkl (University of Passau) Hayes Raffle (Nokia Research Center Palo Alto) Gonzalo Ramos (Microsoft) Tye Rattenbury (Intel Labs) Stuart Reeves (University of Glasgow) Josephine Reid (HP Labs) Derek Reilly (Georgia Institute of Technology) Jun Rekimoto (The University of Tokyo) Matt Reynolds (Duke University) Andrew Rice (University of Cambridge) Andreas Riener (Johannes Kepler University) Ricky Robinson (NICTA) Tom Rodden (Nottingham University) Jennifer Rode (University of California, Irvine) Daniel Roggen (ETH Zurich) Michael Rohs (Deutsche Telekom Laboratories) Mario Romero (Georgia Tech) Barbara Rosario (Intel) Enrico Rukzio (Lancaster University) Nick Ryan (University of Kent)

Alireza Sahami (University of Duisburg-Essen) Nithya Sambasivan (University of California, Irvine) Kumaresan Sanmugalingam (University of Cambridge) T. Scott Saponas (University of Washington) Risto Sarvas (HIIT) Adin Scannell (University of Toronto) Johannes Schöning (DFKI) Bernt Schiele (TU Darmstadt) Chris Schmandt (MIT Media Lab) Hedda Schmidtke (GIST) Michael Schneider (DFKI) Abigail Sellen (Microsoft Research) Steve Shafer (Microsoft) Sam Shah (University of Michigan) Bernhard Sick (University of Passau) Katie Siek (University of Colorado at Boulder) Itiro Siio (Ochanomizu University) Mike Sinclair (Microsoft) Joshua Smith (Intel Labs Seattle) Timothy Sohn (Nokia Research Palo Alto) Joao Sousa (George Mason University) Erich Stuntebeck (Georgia Institute of Technology) Jing Su (University of Toronto) Sriram Subramanian (University of Bristol) Ja-Young Sung (Georgia Institute of Technology) Anthony Tang (University of British Columbia) Ed Tate (GM) Alex Taylor (*Microsoft Research*) Jaime Teevan (Microsoft Research) Dan Teibel (Cassia Technology) Tsutomu Terada (Kobe University) Lucia Terrenghi (Vodafone) Georgios Theocharous (Intel) Andreas Timm-Giel (University of Bremen) Manfred Tscheligi (University of Salzburg) Joe Tullio (Motorola) Ersin Uzun (University of California, Irvine) Elise van den Hoven (TU Eindhoven) Kristof Van Laerhoven (TU Darmstadt) Martijn Vastenburg (Delft University of Technology) Chandra Venkatraman (Hewlett Packard Laboratories) Nicolas Villar (Microsoft Research) Stephen Viller (University of Queensland) Hao-Chuan Wang (Cornell University)

Jingtao Wang (University of California, Berkeley) Roy Want (Intel) Jamie Ward (Lancaster University) Ian Wassell (University of Cambridge) James Weatherall (RealVNC) Tracy Westeyn (Georgia Institute of Technology) Jonathan Westhues (Microsoft) Sean White (Columbia University) Daniel Wigdor (Microsoft) Amanda Williams (University of California, Irvine) Andy Wilson (Microsoft Research) Raphael Wimmer (University of Munich) Alec Wolman (Microsoft Research) Oliver Woodman (University of Cambridge) Mike Wu (University of Toronto) Danny Wyatt (University of Washington) Susan Wyche (Georgia Tech) Jaeyoung Yang (Carnegie Mellon University) Svetlana Yarosh (Georgia Institute of Technology) Koji Yatani (University of Toronto) Hyoseok Yoon (GIST) Adel Youssef (Google) Jaeseok Yun (Georgia Institute of Technology) Changqing Zhou (University of Minnesota) Feng Zhu (University of Alabama at Huntsville) Brian Ziebart (Carnegie Mellon University) John Zimmerman (Carnegie Mellon University)