

Founding Editors

Gerhard Goos

Karlsruhe Institute of Technology, Karlsruhe, Germany

Juris Hartmanis

Cornell University, Ithaca, NY, USA

Editorial Board Members

Elisa Bertino

Purdue University, West Lafayette, IN, USA

Wen Gao

Peking University, Beijing, China

Bernhard Steffen 

TU Dortmund University, Dortmund, Germany

Gerhard Woeginger 

RWTH Aachen, Aachen, Germany

Moti Yung

Columbia University, New York, NY, USA


More information about this subseries at <http://www.springer.com/series/7409>

Carmelo Ardito · Rosa Lanzilotti ·
Alessio Malizia · Helen Petrie ·
Antonio Piccinno · Giuseppe Desolda ·
Kori Inkpen (Eds.)

Human-Computer Interaction – INTERACT 2021


18th IFIP TC 13 International Conference
Bari, Italy, August 30 – September 3, 2021
Proceedings, Part V

Editors

Carmelo Ardito 
Department of Electrical and Information
Engineering
Polytechnic University of Bari
Bari, Italy


Alessio Malizia 
Computer Science Department
University of Pisa
Pisa, Italy

University of Hertfordshire
Hatfield, United Kingdom

Antonio Piccinno 
Computer Science Department
University of Bari Aldo Moro
Bari, Italy

Kori Inkpen 
Microsoft Research
Redmond, WA, USA

Rosa Lanzilotti 
Computer Science Department
University of Bari Aldo Moro
Bari, Italy

Helen Petrie 
Department of Computer Science
University of York
York, UK

Giuseppe Desolda 
Computer Science Department
University of Bari Aldo Moro
Bari, Italy

ISSN 0302-9743

ISSN 1611-3349 (electronic)

Lecture Notes in Computer Science

ISBN 978-3-030-85606-9

ISBN 978-3-030-85607-6 (eBook)

<https://doi.org/10.1007/978-3-030-85607-6>

LNCS Sublibrary: SL3 – Information Systems and Applications, incl. Internet/Web, and HCI

© IFIP International Federation for Information Processing 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Welcome

It is our great pleasure to welcome you to the 18th IFIP TC13 International Conference on Human-Computer Interaction, INTERACT 2021, one of the most important conferences in the area of Human-Computer Interaction at a world-wide level. INTERACT 2021 was held in Bari (Italy) from August 30 – September 3, 2021, in cooperation with ACM and under the patronage of the University of Bari Aldo Moro. This is the second time that INTERACT was held in Italy, after the edition in Rome in September 2005. The Villa Romanazzi Carducci Hotel, which hosted INTERACT 2021, provided the right context for welcoming the participants, thanks to its liberty-period villa immersed in a beautiful park. Due to the COVID-19 pandemic, INTERACT 2021 was held in hybrid mode to allow attendees who could not travel to participate in the conference.

INTERACT is held every two years and is well appreciated by the international community, attracting experts with a broad range of backgrounds, coming from all over the world and sharing a common interest in HCI, to make technology effective and useful for all people in their daily life. The theme of INTERACT 2021, “Sense, Feel, Design,” highlighted the new interaction design challenges. Technology is today more and more widespread, pervasive and blended in the world we live in. On one side, devices that sense humans’ activities have the potential to provide an enriched interaction. On the other side, the user experience can be further enhanced by exploiting multisensorial technologies. The traditional human senses of vision and hearing and senses of touch, smell, taste, and emotions can be taken into account when designing for future interactions. The hot topic of this edition was Human-Centered Artificial Intelligence, which implies considering who AI systems are built for and evaluating how well these systems support people’s goals and activities. There was also considerable attention paid to the usable security theme. Not surprisingly, the COVID-19 pandemic and social distancing have also turned the attention of HCI researchers towards the difficulties in performing user-centered design activities and the modified social aspects of interaction.

With this, we welcome you all to INTERACT 2021. Several people worked hard to make this conference as pleasurable as possible, and we hope you will truly enjoy it.

Paolo Buono
Catherine Plaisant

Preface

The 18th IFIP TC13 International Conference on Human-Computer Interaction, INTERACT 2021 (Bari, August 30 – September 3, 2021) attracted a relevant collection of submissions on different topics.

Excellent research is the heart of a good conference. Like its predecessors, INTERACT 2021 aimed to foster high-quality research. As a multidisciplinary field, HCI requires interaction and discussion among diverse people with different interests and backgrounds. The beginners and the experienced theoreticians and practitioners, and people from various disciplines and different countries gathered, both in-person and virtually, to learn from each other and contribute to each other's growth.

We were especially honoured to welcome our invited speakers: Marianna Obrist (University College London), Ben Shneiderman (University of Maryland), Luca Viganò (King's College London), Geraldine Fitzpatrick (TU Wien) and Philippe Palanque (University Toulouse 3 "Paul Sabatier").

Marianna Obrist's talk focused on the multisensory world people live in and discussed the role touch, taste and smell can play in the future of computing. Ben Shneiderman envisioned a new synthesis of emerging disciplines in which AI-based intelligent algorithms are combined with human-centered design thinking. Luca Viganò used a cybersecurity show and tell approach to illustrate how to use films and other artworks to explain cybersecurity notions. Geraldine Fitzpatrick focused on skills required to use technologies as enablers for good technical design work. Philippe Palanque discussed the cases of system faults due to human errors and presented multiple examples of faults affecting socio-technical systems.

A total of 680 submissions, distributed in 2 peer-reviewed tracks, 4 curated tracks, and 3 juried tracks, were received. Of these, the following contributions were accepted:

- 105 Full Papers (peer-reviewed)
- 72 Short Papers (peer-reviewed)
- 36 Posters (juried)
- 5 Interactive Demos (curated)
- 9 Industrial Experiences (curated)
- 3 Panels (curated)
- 1 Course (curated)
- 11 Workshops (juried)
- 13 Doctoral Consortium (juried)

The acceptance rate for contributions received in the peer-reviewed tracks was 29% for full papers and 30% for short papers. In the spirit of inclusiveness of INTERACT, and IFIP in general, a substantial number of promising but borderline full papers, which had not received a direct acceptance decision, were screened for shepherding.

Interestingly, many of these papers eventually turned out to be excellent quality papers and were included in the final set of full papers. In addition to full papers and short papers, the present proceedings feature's contributions accepted in the shape of posters, interactive demonstrations, industrial experiences, panels, courses, and descriptions of accepted workshops.

Subcommittees managed the reviewing process of the full papers. Each subcommittee had a chair and a set of associated chairs who were in charge of coordinating the reviewing process with the help of expert reviewers. Two new sub-committees were introduced in this edition: "Human-AI Interaction" and "HCI in the Pandemic". Hereafter we list the sub-committees of INTERACT 2021:

- Accessibility and assistive technologies
- Design for business and safety-critical interactive systems
- Design of interactive entertainment systems
- HCI education and curriculum
- HCI in the pandemic
- Human-AI interaction
- Information visualization
- Interactive systems technologies and engineering
- Methodologies for HCI
- Social and ubiquitous interaction
- Understanding users and human behaviour

The final decision on acceptance or rejection of full papers was taken in a Programme Committee meeting held virtually, due to the COVID-19 pandemic, in March 2021. The technical program chairs, the full papers chairs, the subcommittee chairs, and the associate chairs participated in this meeting. The meeting discussed a consistent set of criteria to deal with inevitable differences among many reviewers. The corresponding track chairs and reviewers made the final decisions on other tracks, often after electronic meetings and discussions.

We would like to express our strong gratitude to all the people whose passionate and strenuous work ensured the quality of the INTERACT 2021 program: the 12 sub-committees chairs, 88 associated chairs, 34 track chairs, and 543 reviewers; the Keynote & Invited Talks Chair Maria Francesca Costabile; the Posters Chairs Maristella Matera, Kent Norman, Anna Spagnolli; the Interactive Demos Chairs Barbara Rita Barricelli and Nuno Jardim Nunes; the Workshops Chairs Marta Kristín Larusdóttir and Davide Spano; the Courses Chairs Nikolaos Avouris and Carmen Santoro; the Panels Chairs Effie Lai-Chong Law and Massimo Zancanaro; the Doctoral Consortium Chairs Daniela Fogli, David Lamas and John Stasko; the Industrial Experiences Chair Danilo Caivano; the Online Experience Chairs Fabrizio Balducci and Miguel Ceriani; the Advisors Fernando Loizides and Marco Winckler; the Student Volunteers Chairs Vita Santa Barletta and Grazia Ragone; the Publicity Chairs Ganesh D. Bhutkar and Veronica Rossano; the Local Organisation Chair Simona Sarti.

We would like to thank all the authors, who chose INTERACT 2021 as the venue to publish their research and enthusiastically shared their results with the INTERACT community. Last, but not least, we are also grateful to the sponsors for their financial support.

Carmelo Ardito
Rosa Lanzilotti
Alessio Malizia
Helen Petrie
Antonio Piccinno
Giuseppe Desolda
Kori Inkpen

IFIP TC13 – <http://ifip-tc13.org/>

Established in 1989, the Technical Committee on Human–Computer Interaction (IFIP TC 13) of the International Federation for Information Processing (IFIP) is an international committee of 34 member national societies and 10 Working Groups, representing specialists of the various disciplines contributing to the field of human–computer interaction. This includes (among others) human factors, ergonomics, cognitive science, and multiple areas of computer science and design.

IFIP TC 13 aims to develop the science, technology and societal aspects of human–computer interaction (HCI) by

- encouraging empirical, applied and theoretical research
- promoting the use of knowledge and methods from both human sciences and computer sciences in design, development, evaluation and exploitation of computing systems
- promoting the production of new knowledge in the area of interactive computing systems engineering
- promoting better understanding of the relation between formal design methods and system usability, user experience, accessibility and acceptability
- developing guidelines, models and methods by which designers may provide better human-oriented computing systems
- and, cooperating with other groups, inside and outside IFIP, to promote user-orientation and humanization in system design.

Thus, TC 13 seeks to improve interactions between people and computing systems, to encourage the growth of HCI research and its practice in industry and to disseminate these benefits worldwide.

The main orientation is to place the users at the center of the development process. Areas of study include:

- the problems people face when interacting with computing devices;
- the impact of technology deployment on people in individual and organizational contexts;
- the determinants of utility, usability, acceptability, accessibility, privacy, and user experience ...;
- the appropriate allocation of tasks between computing systems and users especially in the case of automation;
- engineering user interfaces, interactions and interactive computing systems;
- modelling the user, their tasks and the interactive system to aid better system design; and harmonizing the computing system to user characteristics and needs.

While the scope is thus set wide, with a tendency toward general principles rather than particular systems, it is recognized that progress will only be achieved through

both general studies to advance theoretical understandings and specific studies on practical issues (e.g., interface design standards, software system resilience, documentation, training material, appropriateness of alternative interaction technologies, guidelines, integrating computing systems to match user needs and organizational practices, etc.).

In 2015, TC13 approved the creation of a Steering Committee (SC) for the INTERACT conference series. The SC is now in place, chaired by Anirudha Joshi and is responsible for:

- promoting and maintaining the INTERACT conference as the premiere venue for researchers and practitioners interested in the topics of the conference (this requires a refinement of the topics above);
- ensuring the highest quality for the contents of the event;
- setting up the bidding process to handle the future INTERACT conferences (decision is made at TC 13 level);
- providing advice to the current and future chairs and organizers of the INTERACT conference;
- providing data, tools, and documents about previous conferences to the future conference organizers;
- selecting the reviewing system to be used throughout the conference (as this affects the entire set of reviewers, authors and committee members);
- resolving general issues involved with the INTERACT conference;
- capitalizing on history (good and bad practices).

In 1999, TC 13 initiated a special IFIP Award, the Brian Shackel Award, for the most outstanding contribution in the form of a refereed paper submitted to and delivered at each INTERACT. The award draws attention to the need for a comprehensive human-centered approach in the design and use of information technology in which the human and social implications have been taken into account. In 2007, IFIP TC 13 launched an Accessibility Award to recognize an outstanding contribution in HCI with international impact dedicated to the field of accessibility for disabled users. In 2013, IFIP TC 13 launched the Interaction Design for International Development (IDID) Award that recognizes the most outstanding contribution to the application of interactive systems for social and economic development of people in developing countries. Since the process to decide the award takes place after papers are sent to the publisher for publication, the awards are not identified in the proceedings. Since 2019 a special agreement has been made with the *International Journal of Behaviour & Information Technology* (published by Taylor & Francis) with Panos Markopoulos as editor in chief. In this agreement, authors of BIT whose papers are within the field of HCI are offered the opportunity to present their work at the INTERACT conference. Reciprocally, a selection of papers submitted and accepted for presentation at INTERACT are offered the opportunity to extend their contribution to be published in BIT.

IFIP TC 13 also recognizes pioneers in the area of HCI. An IFIP TC 13 pioneer is one who, through active participation in IFIP Technical Committees or related IFIP groups, has made outstanding contributions to the educational, theoretical, technical, commercial, or professional aspects of analysis, design, construction, evaluation, and

use of interactive systems. IFIP TC 13 pioneers are appointed annually and awards are handed over at the INTERACT conference.

IFIP TC 13 stimulates working events and activities through its Working Groups (WGs). Working Groups consist of HCI experts from multiple countries, who seek to expand knowledge and find solutions to HCI issues and concerns within a specific domain. The list of Working Groups and their domains is given below.

WG13.1 (Education in HCI and HCI Curricula) aims to improve HCI education at all levels of higher education, coordinate and unite efforts to develop HCI curricula and promote HCI teaching.

WG13.2 (Methodology for User-Centred System Design) aims to foster research, dissemination of information and good practice in the methodical application of HCI to software engineering.

WG13.3 (HCI, Disability and Aging) aims to make HCI designers aware of the needs of people with disabilities and encourage development of information systems and tools permitting adaptation of interfaces to specific users.

WG13.4 (also WG2.7) (User Interface Engineering) investigates the nature, concepts and construction of user interfaces for software systems, using a framework for reasoning about interactive systems and an engineering model for developing UIs.

WG 13.5 (Resilience, Reliability, Safety and Human Error in System Development) seeks a framework for studying human factors relating to systems failure, develops leading edge techniques in hazard analysis and safety engineering of computer-based systems, and guides international accreditation activities for safety-critical systems.

WG13.6 (Human-Work Interaction Design) aims at establishing relationships between extensive empirical work-domain studies and HCI design. It will promote the use of knowledge, concepts, methods and techniques that enable user studies to procure a better apprehension of the complex interplay between individual, social and organizational contexts and thereby a better understanding of how and why people work in the ways that they do.

WG13.7 (Human-Computer Interaction and Visualization) aims to establish a study and research program that will combine both scientific work and practical applications in the fields of human-computer interaction and visualization. It will integrate several additional aspects of further research areas, such as scientific visualization, data mining, information design, computer graphics, cognition sciences, perception theory, or psychology, into this approach.

WG13.8 (Interaction Design and International Development) is currently working to reformulate their aims and scope.

WG13.9 (Interaction Design and Children) aims to support practitioners, regulators and researchers to develop the study of interaction design and children across international contexts.

WG13.10 (Human-Centred Technology for Sustainability) aims to promote research, design, development, evaluation, and deployment of human-centered technology to encourage sustainable use of resources in various domains.

New Working Groups are formed as areas of significance in HCI arise. Further information is available at the IFIP TC13 website: <http://ifip-tc13.org/>.

IFIP TC13 Members

Officers

Chairperson

Philippe Palanque, France

Vice-chair for Awards

Paula Kotze, South Africa

Vice-chair for Communications

Helen Petrie, UK

Vice-chair for Growth and Reach out INTERACT Steering Committee Chair

Jan Gulliksen, Sweden

Vice-chair for Working Groups

Simone D. J. Barbosa, Brazil

Vice-chair for Development and Equity

Julio Abascal, Spain

Treasurer

Virpi Roto, Finland

Secretary

Marco Winckler, France

INTERACT Steering Committee Chair

Anirudha Joshi, India

Country Representatives

Australia

Henry B. L. Duh
Australian Computer Society

Austria

Geraldine Fitzpatrick
Austrian Computer Society

Belgium

Bruno Dumas
IMEC – Interuniversity
Micro-Electronics Center

Brazil

Lara S. G. Piccolo
Brazilian Computer Society (SBC)

Bulgaria

Stoyan Georgiev Dentchev
Bulgarian Academy of Sciences

Croatia

Andrina Granic
Croatian Information Technology
Association (CITA)

Cyprus

Panayiotis Zaphiris
Cyprus Computer Society

Czech Republic

Zdeněk Míkovec
Czech Society for Cybernetics
and Informatics

Finland

Virpi Roto
Finnish Information Processing
Association

France

Philippe Palanque and Marco Winckler
Société informatique de France (SIF)

Germany

Tom Gross
Gesellschaft für Informatik e.V.

Ireland

Liam J. Bannon
Irish Computer Society

Italy

Fabio Paternò
Italian Computer Society

Japan

Yoshifumi Kitamura
Information Processing Society of Japan

Netherlands

Regina Bernhaupt
Nederlands Genootschap
voor Informatica

New Zealand

Mark Apperley
New Zealand Computer Society

Norway

Frode Eika Sandnes
Norwegian Computer Society

Poland

Marcin Sikorski
Poland Academy of Sciences

Portugal

Pedro Campos
Associação Portuguesa para o
Desenvolvimento da Sociedade da
Informação (APDSI)

Serbia

Aleksandar Jevremovic
Informatics Association of Serbia

Singapore

Shengdong Zhao
Singapore Computer Society

Slovakia

Wanda Benešová
The Slovak Society for Computer
Science

Slovenia

Matjaž Debevc
The Slovenian Computer Society
INFORMATIKA

Sri Lanka

Thilina Halloluwa
The Computer Society of Sri Lanka

South Africa

Janet L. Wesson & Paula Kotze
The Computer Society of South Africa

Sweden

Jan Gulliksen
Swedish Interdisciplinary Society for
Human-Computer Interaction
Swedish Computer Society

Switzerland

Denis Lalanne
Swiss Federation for Information
Processing

Tunisia

Mona Laroussi
Ecole Supérieure des Communications de
Tunis (SUP'COM)

United Kingdom

José Abdelnour Nocera
British Computer Society (BCS)

United Arab Emirates

Ahmed Seffah
UAE Computer Society

ACM

Gerrit van der Veer
 Association for Computing
 Machinery

Expert Members

Julio Abascal, Spain
 Carmelo Ardito, Italy
 Nikolaos Avouris, Greece
 Kaveh Bazargan, Iran
 Ivan Burmistrov, Russia
 Torkil Torkil Clemmensen, Denmark
 Peter Forbrig, Germany
 Dorian Gorgan, Romania

Working Group Chairpersons**WG 13.1 (Education in HCI
and HCI Curricula)**

Konrad Baumann, Austria

**WG 13.2 (Methodologies
for User-Centered System Design)**

Regina Bernhaupt, Netherlands

WG 13.3 (HCI, Disability and Aging)

Helen Petrie, UK

**WG 13.4/2.7 (User Interface
Engineering)**

José Creissac Campos, Portugal

**WG 13.5 (Human Error, Resilience,
Reliability, Safety and System
Development)**

Chris Johnson, UK

CLEI

Jaime Sánchez
 Centro Latinoamericano de Estudios en
 Informatica

Anirudha Joshi, India
 David Lamas, Estonia
 Marta Kristin Larusdottir, Iceland
 Zhengjie Liu, China
 Fernando Loizides, UK/Cyprus
 Ochieng Daniel “Dan” Orwa, Kenya
 Eunice Sari, Australia/Indonesia

**WG13.6 (Human-Work
Interaction Design)**

Barbara Rita Barricelli, Italy

WG13.7 (HCI and Visualization)

Peter Dannenmann, Germany

**WG 13.8 (Interaction Design
and International Development)**

José Adbelnour Nocera, UK

**WG 13.9 (Interaction Design
and Children)**

Janet Read, UK

**WG 13.10 (Human-Centred
Technology for Sustainability)**

Masood Masoodian, Finland

Conference Organizing Committee

General Conference Co-chairs

Paolo Buono, Italy
Catherine Plaisant, USA and France

Advisors

Fernando Loizides, UK
Marco Winckler, France

Technical Program Co-chairs

Carmelo Ardito, Italy
Rosa Lanzilotti, Italy
Alessio Malizia, UK and Italy

Keynote and Invited Talks Chair

Maria Francesca Costabile, Italy

Full Papers Co-chairs

Helen Petrie, UK
Antonio Piccinno, Italy

Short Papers Co-chairs

Giuseppe Desolda, Italy
Kori Inkpen, USA

Posters Co-chairs

Maristella Matera, Italy
Kent Norman, USA
Anna Spagnolli, Italy

Interactive Demos Co-chairs

Barbara Rita Barricelli, Italy
Nuno Jardim Nunes, Portugal

Panels Co-chairs

Effie Lai-Chong Law, UK
Massimo Zancanaro, Italy

Courses Co-chairs

Carmen Santoro, Italy
Nikolaos Avouris, Greece

Industrial Experiences Chair

Danilo Caivano, Italy

Workshops Co-chairs

Marta Kristín Larusdottir, Iceland
Davide Spano, Italy

Doctoral Consortium Co-chairs

Daniela Fogli, Italy
David Lamas, Estonia
John Stasko, USA

Online Experience Co-chairs

Fabrizio Balducci, Italy
Miguel Ceriani, Italy

Student Volunteers Co-chairs

Vita Santa Barletta, Italy
Grazia Ragone, UK

Publicity Co-chairs

Ganesh D. Bhutkar, India
Veronica Rossano, Italy

Local Organisation Chair

Simona Sarti, Consulta Umbria, Italy

Programme Committee

Sub-committee Chairs

Nikolaos Avouris, Greece
 Regina Bernhaupt, Netherlands
 Carla Dal Sasso Freitas, Brazil
 Jan Gulliksen, Sweden
 Paula Kotzé, South Africa
 Effie Lai-Chong Law, UK

Philippe Palanque, France
 Fabio Paternò, Italy
 Thomas Pederson, Sweden
 Albrecht Schmidt, Germany
 Frank Steinicke, Germany
 Gerhard Weber, Germany

Associated Chairs

José Abdelnour Nocera, UK
 Raian Ali, Qatar
 Florian Alt, Germany
 Katrina Attwood, UK
 Simone Barbosa, Brazil
 Cristian Bogdan, Sweden
 Paolo Bottoni, Italy
 Judy Bowen, New Zealand
 Daniel Buschek, Germany
 Pedro Campos, Portugal
 José Creissac Campos, Portugal
 Luca Chittaro, Italy
 Sandy Claes, Belgium
 Christopher Clarke, UK
 Torkil Clemmensen, Denmark
 Vanessa Cobus, Germany
 Ashley Colley, Finland
 Aurora Constantin, UK
 Lynne Coventry, UK
 Yngve Dahl, Norway
 Maria De Marsico, Italy
 Luigi De Russis, Italy
 Paloma Diaz, Spain
 Monica Divitini, Norway
 Mateusz Dolata, Switzerland
 Bruno Dumas, Belgium
 Sophie Dupuy-Chessa, France
 Dan Fitton, UK
 Peter Forbrig, Germany
 Sandnes Frode Eika, Norway
 Vivian Genaro Motti, USA
 Rosella Gennari, Italy

Jens Gerken, Germany
 Mareike Glöss, Sweden
 Dorian Gorgan, Romania
 Tom Gross, Germany
 Uwe Gruenefeld, Germany
 Julie Haney, USA
 Ebba Þóra Hvannberg, Iceland
 Netta Iivari, Finland
 Nanna Inie, Denmark
 Anna Sigríður Islind, Iceland
 Anirudha Joshi, India
 Bridget Kane, Sweden
 Anne Marie Kanstrup, Denmark
 Mohamed Khamis, UK
 Kibum Kim, Korea
 Marion Koelle, Germany
 Kati Kuusinen, Denmark
 Matthias Laschke, Germany
 Fernando Loizides, UK
 Andrés Lucero, Finland
 Jo Lumsden, UK
 Charlotte Magnusson, Sweden
 Andrea Marrella, Italy
 Célia Martinie, France
 Timothy Merritt, Denmark
 Zdeněk Míkovec, Czech Republic
 Luciana Nedel, Brazil
 Laurence Nigay, France
 Valentina Nisi, Portugal
 Raquel O. Prates, Brazil
 Rakesh Patibanda, Australia
 Simon Perrault, Singapore

Lara Piccolo, UK
 Aparecido Fabiano Pinatti de Carvalho,
 Germany
 Janet Read, UK
 Karen Renaud, UK
 Antonio Rizzo, Italy
 Sayan Sarcar, Japan
 Valentin Schwind, Germany
 Gavin Sim, UK
 Fotios Spyridonis, UK
 Jan Stage, Denmark
 Simone Stumpf, UK
 Luis Teixeira, Portugal

Jakob Tholander, Sweden
 Daniela Trevisan, Brazil
 Stefano Valtolina, Italy
 Jan Van den Bergh, Belgium
 Nervo Verdezoto, UK
 Chi Vi, UK
 Giuliana Vitiello, Italy
 Sarah Völkel, Germany
 Marco Winckler, France
 Dhaval Vyas, Australia
 Janet Wesson, South Africa
 Paweł W. Woźniak, Netherlands

Reviewers

Bruno A. Chagas, Brazil
 Yasmeen Abdrabou, Germany
 Maher Abujelala, USA
 Jiban Adhikary, USA
 Kashif Ahmad, Qatar
 Muneeb Ahmad, UK
 Naveed Ahmed, United Arab Emirates
 Aino Ahtinen, Finland
 Wolfgang Aigner, Austria
 Deepak Akkil, Finland
 Aftab Alam, Republic of Korea
 Soraia Meneses Alarcão, Portugal
 Pedro Albuquerque Santos, Portugal
 Günter Alce, Sweden
 Iñigo Aldalur, Spain
 Alaa Alkhafaji, Iraq
 Aishat Aloba, USA
 Yosuef Alotaibi, UK
 Taghreed Alshehri, UK
 Ragaad Al-Tarawneh, USA
 Alejandro Alvarez-Marin, Chile
 Lucas Anastasiou, UK
 Ulf Andersson, Sweden
 Joseph Aneke, Italy
 Mark Apperley, New Zealand
 Renan Aranha, Brazil
 Pierre-Emmanuel Arduin, France
 Stephanie Arevalo Arboleda, Germany
 Jan Argasiński, Poland

Patricia Arias-Cabarcos, Germany
 Alexander Arntz, Germany
 Jonas Auda, Germany
 Andreas Auinger, Austria
 Iuliia Avgustis, Finland
 Cédric Bach, France
 Miroslav Bachinski, Germany
 Victor Bacu, Romania
 Jan Balata, Czech Republic
 Teresa Baldassarre, Italy
 Fabrizio Balducci, Italy
 Vijayanand Banahatti, India
 Karolina Baras, Portugal
 Simone Barbosa, Brazil
 Vita Santa Barletta, Italy
 Silvio Barra, Italy
 Barbara Rita Barricelli, Italy
 Ralph Barthel, UK
 Thomas Baudel, France
 Christine Bauer, Netherlands
 Fatma Ben Mesmia, Canada
 Marit Bentvelzen, Netherlands
 François Bérard, France
 Melanie Berger, Netherlands
 Gerd Berget, Norway
 Sergi Bermúdez i Badia, Portugal
 Dario Bertero, UK
 Guilherme Bertolaccini, Brazil
 Lonni Besançon, Australia

Laura-Bianca Bilius, Romania
Kerstin Blumenstein, Austria
Andreas Bollin, Austria
Judith Borghouts, UK
Nis Bornoe, Denmark
Gabriela Bosetti, UK
Hollie Bostock, Portugal
Paolo Bottoni, Italy
Magdalena Boucher, Austria
Amina Bouraoui, Tunisia
Elodie Bouzekri, France
Judy Bowen, New Zealand
Efe Bozkir, Germany
Danielle Bragg, USA
Diogo Branco, Portugal
Dawn Branley-Bell, UK
Stephen Brewster, UK
Giada Brianza, UK
Barry Brown, Sweden
Nick Bryan-Kinns, UK
Andreas Bucher, Switzerland
Elizabeth Buie, UK
Alexandru Bunde, Germany
Paolo Buono, Italy
Michael Burch, Switzerland
Matthew Butler, Australia
Fabio Buttussi, Italy
Andreas Butz, Germany
Maria Claudia Buzzi, Italy
Marina Buzzi, Italy
Zoya Bylinskii, USA
Diogo Cabral, Portugal
Åsa Cajander, Sweden
Francisco Maria Calisto, Portugal
Hector Caltenco, Sweden
José Creissac Campos, Portugal
Heloisa Candello, Brazil
Alberto Cannavò, Italy
Bruno Cardoso, Belgium
Jorge Cardoso, Portugal
Géry Casiez, France
Fabio Cassano, Italy
Brendan Cassidy, UK
Alejandro Catala, Spain
Miguel Ceriani, UK
Daniel Cermak-Sassenrath, Denmark
Vanessa Cesário, Portugal
Fred Charles, UK
Debaleena Chattopadhyay, USA
Alex Chen, Singapore
Thomas Chen, USA
Yuan Chen, Canada
Chola Chhetri, USA
Katherine Chiluiza, Ecuador
Nick Chozos, UK
Michael Chromik, Germany
Christopher Clarke, UK
Bárbara Cleto, Portugal
Antonio Coelho, Portugal
Ashley Colley, Finland
Nelly Condori-Fernandez, Spain
Marios Constantinides, UK
Cléber Corrêa, Brazil
Vinicius Costa de Souza, Brazil
Joëlle Coutaz, France
Céline Coutrix, France
Chris Creed, UK
Carlos Cunha, Portugal
Kamila Rios da Hora Rodrigues, Brazil
Damon Daylamani-Zad, UK
Sergio de Cesare, UK
Marco de Gemmis, Italy
Teis De Greve, Belgium
Victor Adriel de Jesus Oliveira, Austria
Helmut Degen, USA
Donald Degraen, Germany
William Delamare, France
Giuseppe Desolda, Italy
Henrik Detjen, Germany
Marianna Di Gregorio, Italy
Ines Di Loreto, France
Daniel Diethel, Germany
Tilman Dingler, Australia
Anke Dittmar, Germany
Monica Divitini, Norway
Janki Dodiya, Germany
Julia Dominiak, Poland
Ralf Dörner, Germany

Julie Doyle, Ireland
Philip Doyle, Ireland
Fiona Draxler, Germany
Emanuel Felipe Duarte, Brazil
Rui Duarte, Portugal
Bruno Dumas, Belgium
Mark Dunlop, UK
Sophie Dupuy-Chessa, France
Jason Dykes, UK
Chloe Eghtebas, Germany
Kevin El Haddad, Belgium
Don Samitha Elvitigala, New Zealand
Augusto Esteves, Portugal
Siri Fagernes, Norway
Katherine Fennedy, Singapore
Marta Ferreira, Portugal
Francesco Ferrise, Italy
Lauren Stacey Ferro, Italy
Christos Fidas, Greece
Daniel Finnegan, UK
Daniela Fogli, Italy
Manuel J. Fonseca, Portugal
Peter Forbrig, Germany
Rita Francese, Italy
André Freire, Brazil
Karin Fröhlich, Finland
Susanne Furman, USA
Henrique Galvan Debarba, Denmark
Sandra Gama, Portugal
Dilrukshi Gamage, Japan
Jérémie Garcia, France
Jose Garcia Estrada, Norway
David Geerts, Belgium
Denise Y. Geiskkovitch, Canada
Stefan Geisler, Germany
Mirko Gelsomini, Italy
Çağlar Genç, Finland
Rosella Gennari, Italy
Nina Gerber, Germany
Moojan Ghafurian, Canada
Maliheh Ghajargar, Sweden
Sabiha Ghellal, Germany
Debjyoti Ghosh, Germany
Michail Giannakos, Norway

Terje Gjøsæter, Norway
Marc Gonzalez Capdevila, Brazil
Julien Gori, Finland
Laurent Grisoni, France
Tor-Morten Gronli, Norway
Sebastian Günther, Germany
Li Guo, UK
Srishti Gupta, USA
Francisco Gutiérrez, Belgium
José Eder Guzman Mendoza, Mexico
Jonna Häkkinen, Finland
Lilit Hakobyan, UK
Thilina Halloluwa, Sri Lanka
Perttu Hämäläinen, Finland
Lane Harrison, USA
Michael Harrison, UK
Hanna Hasselqvist, Sweden
Tomi Heimonen, USA
Florian Heinrich, Germany
Florian Heller, Belgium
Karey Helms, Sweden
Nathalie Henry Riche, USA
Diana Hernandez-Bocanegra, Germany
Danula Hettiachchi, Australia
Wilko Heuten, Germany
Annika Hinze, New Zealand
Linda Hirsch, Germany
Sarah Hodge, UK
Sven Hoffmann, Germany
Catherine Holloway, UK
Leona Holloway, Australia
Lars Erik Holmquist, UK
Anca-Simona Horvath, Denmark
Simo Hosio, Finland
Sebastian Hubenschmid, Germany
Helena Vallo Hult, Sweden
Shah Rukh Humayoun, USA
Ebba Þóra Hvannberg, Iceland
Alon Ilisar, Australia
Md Athar Imtiaz, New Zealand
Oana Inel, Netherlands
Francisco Iniesto, UK
Andri Ioannou, Cyprus
Chyng-Yang Jang, USA

Gokul Jayakrishnan, India
Stine Johansen, Denmark
Tero Jokela, Finland
Rui José, Portugal
Anirudha Joshi, India
Manjiri Joshi, India
Jana Jost, Germany
Patrick Jost, Norway
Annika Kaltenhauser, Germany
Jin Kang, Canada
Younah Kang, Republic of Korea
Jari Kangas, Finland
Petko Karadechev, Denmark
Armağan Karahanoglu, Netherlands
Sukran Karaosmanoglu, Germany
Alexander Kempton, Norway
Rajiv Khadka, USA
Jayden Khakurel, Finland
Pramod Khambete, India
Neeta Khanuja, Portugal
Young-Ho Kim, USA
Reuben Kirkham, Australia
Ilan Kirsh, Israel
Maria Kjærup, Denmark
Kevin Koban, Austria
Frederik Kobbelgaard, Denmark
Martin Kocur, Germany
Marius Koller, Germany
Christophe Kolski, France
Takanori Komatsu, Japan
Jemma König, New Zealand
Monika Kornacka, Poland
Thomas Kosch, Germany
Panayiotis Koutsabasis, Greece
Lucie Kruse, Germany
Przemysław Kucharski, Poland
Johannes Kunkel, Germany
Bineeth Kuriakose, Norway
Anelia Kurteva, Austria
Marc Kurz, Austria
Florian Lang, Germany
Rosa Lanzilotti, Italy
Lars Bo Larsen, Denmark
Marta Larusdottir, Iceland
Effie Law, UK
Luis Leiva, Luxembourg
Barbara Leporini, Italy
Pascal Lessel, Germany
Hongyu Li, USA
Yuan Liang, USA
Yu-Tzu Lin, Denmark
Markus Löchtefeld, Denmark
Angela Locoro, Italy
Benedikt Loepf, Germany
Domenico Lofù, Italy
Fernando Loizides, UK
Arminda Lopes, Portugal
Feiyu Lu, USA
Jo Lumsden, UK
Anders Lundström, Sweden
Kris Luyten, Belgium
Granit Luzhnica, Austria
Marc Macé, France
Anderson Maciel, Brazil
Cristiano Maciel, Brazil
Miroslav Macík, Czech Republic
Scott MacKenzie, Canada
Hanuma Teja Maddali, USA
Rui Madeira, Portugal
Alexander Maedche, Germany
Charlotte Magnusson, Sweden
Jyotirmaya Mahapatra, India
Vanessa Maïke, USA
Maitreyee Maitreyee, Sweden
Ville Mäkelä, Germany
Sylvain Malacria, France
Sugandh Malhotra, India
Ivo Malý, Czech Republic
Marco Manca, Italy
Muhanad Manshad, USA
Isabel Manssour, Brazil
Panos Markopoulos, Netherlands
Karola Marky, Germany
Andrea Marrella, Italy
Andreas Martin, Switzerland
Célia Martinie, France
Nuno Martins, Portugal
Maristella Matera, Italy

Florian Mathis, UK
Andrii Matviienko, Germany
Peter Mayer, Germany
Sven Mayer, Germany
Mark McGill, UK
Donald McMillan, Sweden
Lukas Mecke, Germany
Elisa Mekler, Finland
Alessandra Melonio, Italy
Eleonora Mencarini, Italy
Maria Menendez Blanco, Italy
Aline Menin, France
Arjun Menon, Sweden
Nazmus Sakib Miazi, USA
Zdeněk Míkovec, Czech Republic
Tim Mittermeier, Germany
Emmanuel Mkpoojiogu, Nigeria
Jonas Moll, Sweden
Alberto Monge Roffarello, Italy
Troels Mønsted, Denmark
Diego Morra, Italy
Jaime Munoz Arteaga, Mexico
Sachith Muthukumarana, New Zealand
Vasiliki Mylonopoulou, Sweden
Frank Nack, Netherlands
Mohammad Naiseh, UK
Vania Neris, Brazil
Robin Neuhaus, Germany
Thao Ngo, Germany
Binh Vinh Duc Nguyen, Belgium
Vickie Nguyen, USA
James Nicholson, UK
Peter Axel Nielsen, Denmark
Jasmin Niess, Germany
Evangelos Niforatos, Netherlands
Kent Norman, USA
Fatima Nunes, Brazil
Carli Ochs, Switzerland
Joseph O'Hagan, UK
Takashi Ohta, Japan
Jonas Oppenlaender, Finland
Michael Ortega, France
Changkun Ou, Germany
Yun Suen Pai, New Zealand
Dominika Palivcová, Czech Republic
Viktoria Pammer-Schindler, Austria
Eleftherios Papachristos, Denmark
Sofia Papavlasopoulou, Norway
Leonado Parra, Colombia
Max Pascher, Germany
Ankit Patel, Portugal
Fabio Paternò, Italy
Maria Angela Pellegrino, Italy
Anthony Perritano, USA
Johanna Persson, Sweden
Ken Pfeuffer, Germany
Bastian Pfleging, Netherlands
Vung Pham, USA
Jayesh Pillai, India
Catherine Plaisant, USA
Henning Pohl, Denmark
Margit Pohl, Austria
Alessandro Pollini, Italy
Dorin-Mircea Popovici, Romania
Thiago Porcino, Brazil
Dominic Potts, UK
Sarah Prange, Germany
Marco Procaccini, Italy
Arnaud Prouzeau, France
Parinya Punpongsanon, Japan
Sónia Rafael, Portugal
Jessica Rahman, Australia
Mikko Rajanen, Finland
Nimmi Rangaswamy, India
Alberto Raposo, Brazil
George Raptis, Greece
Hanae Rateau, Canada
Sebastian Rauh, Germany
Hirak Ray, USA
Traian Rebedea, Romania
Yosra Rekik, France
Elizabeth Rendon-Velez, Colombia
Malte Ressin, UK
Tera Reynolds, USA
Miguel Ribeiro, Portugal
Maria Rigou, Greece
Sirpa Riihiaho, Finland
Michele Risi, Italy

Radiyah Rivu, Germany
Mehdi Rizvi, Italy
Judy Robertson, UK
Michael Rohs, Germany
Marco Romano, Italy
Anton Rosén, Sweden
Veronica Rossano, Italy
Virpi Roto, Finland
Debjani Roy, India
Matthew Rueben, USA
Vit Rusnak, Czech Republic
Philippa Ryan, UK
Thomas Ryberg, Denmark
Rufat Rzayev, Germany
Parisa Saadati, UK
Adrian Sabou, Romania
Ofir Sadka, Israel
Juan Pablo Saenz, Italy
Marco Saltarella, Italy
Sanjit Samaddar, UK
Ivan Sanchez Milara, Finland
Frode Eika Sandnes, Norway
Leonardo Sandoval, UK
Carmen Santoro, Italy
Pratiti Sarkar, India
Guilherme Schardong, Brazil
Christina Schmidbauer, Austria
Eike Schneiders, Denmark
Maximilian Schrapel, Germany
Sabrina Scuri, Portugal
Korok Sengupta, Germany
Marta Serafini, Italy
Marcos Serrano, France
Kshitij Sharma, Norway
Sumita Sharma, Finland
Akihisa Shitara, Japan
Mark Showman, Israel
Ludwig Sidenmark, UK
Carlos Silva, Portugal
Tiago Silva da Silva, Brazil
Milene Silveira, Brazil
James Simpson, Australia
Ashwin Singh, India
Laurianne Sitbon, Australia
Mikael B. Skov, Denmark
Pavel Slavik, Czech Republic
Aidan Slingsby, UK
K. Tara Smith, UK
Ellis Solaiman, UK
Andreas Sonderegger, Switzerland
Erik Sonnleitner, Austria
Keyur Sorathia, India
Emanuel Sousa, Portugal
Sonia Sousa, Estonia
Anna Spagnolli, Italy
Davide Spallazzo, Italy
Lucio Davide Spano, Italy
Katta Spiel, Austria
Priyanka Srivastava, India
Katarzyna Stawarz, UK
Teodor Stefanut, Romania
Mari-Klara Stein, Denmark
Jonathan Strahl, Finland
Tim Stratmann, Germany
Christian Sturm, Germany
Michael Svangren, Denmark
Aurélien Tabard, France
Benjamin Tag, Australia
Federico Tajariol, France
Aishwari Talhan, Republic of Korea
Maurizio Teli, Denmark
Subrata Tikadar, India
Helena Tobiasson, Sweden
Guy Toko, South Africa
Brianna Tomlinson, USA
Olof Torgersson, Sweden
Genoveffa Tortora, Italy
Zachary O. Toups, USA
Scott Trent, Japan
Philippe Truillet, France
Tommaso Turchi, UK
Fanny Vainionpää, Finland
Stefano Valtolina, Italy
Niels van Berkel, Denmark
Jan Van den Bergh, Belgium
Joey van der Bie, Netherlands
Bram van Deurzen, Belgium
Domenique van Gennip, Australia

Paul van Schauk, UK
Koen van Turnhout, Netherlands
Jean Vanderdonckt, Belgium
Eduardo Veas, Austria
Katia Vega, USA
Kellie Vella, Australia
Leena Ventä-Olkkonen, Finland
Nadine Vigouroux, France
Gabriela Villalobos-Zúñiga, Switzerland
Aku Visuri, Finland
Giuliana Vitiello, Italy
Pierpaolo Vittorini, Italy
Julius von Willich, Germany
Steven Vos, Netherlands
Nadine Wagener, Germany
Lun Wang, Italy
Ruijie Wang, Italy
Gerhard Weber, Germany
Thomas Weber, Germany
Rina Wehbe, Canada
Florian Weidner, Germany
Alexandra Weilenmann, Sweden
Sebastian Weiß, Germany
Yannick Weiss, Germany
Robin Welsch, Germany
Janet Wesson, South Africa
Benjamin Weyers, Germany
Stephanie Wilson, UK
Marco Winckler, France
Philipp Wintersberger, Austria
Katrin Wolf, Germany
Kim Wölfel, Germany
Julia Woodward, USA
Matthias Wunsch, Austria
Haijun Xia, USA
Asim Evren Yantac, Turkey
Enes Yigitbas, Germany
Yongjae Yoo, Canada
Johannes Zagermann, Germany
Massimo Zancanaro, Italy
André Zenner, Germany
Jingjie Zheng, Canada
Suwen Zhu, USA
Ying Zhu, USA
Jürgen Ziegler, Germany

Partners and Sponsors

Partners



International Federation for Information Processing



UNIVERSITÀ
DEGLI STUDI DI BARI
ALDO MORO



In-cooperation with ACM



In-cooperation with SIGCHI



Springer

Sponsors



Contents – Part V

User Studies

Effects of Personal Characteristics on Temporal Response Patterns in Ecological Momentary Assessments.	3
<i>Tomu Tominaga, Shuhei Yamamoto, Takeshi Kurashima, and Hiroyuki Toda</i>	
Jammify: Interactive Multi-sensory System for Digital Art Jamming	23
<i>Sachith Muthukumarana, Don Samitha Elvitigala, Qin Wu, Yun Suen Pai, and Suranga Nanayakkara</i>	
Opportunities and Challenges for Reflective Data-Objects in Long-Distance Relationships.	42
<i>Maria Karyda and Andrés Lucero</i>	
Supporting Sensor-Based Usability Studies Using a Mobile App in Remotely Piloted Aircraft System	63
<i>Antonio Esposito, Giusy Danila Valenti, Fabrizio Balducci, and Paolo Buono</i>	
Understanding the Stakeholders' Expectations About an Adherence App: A Case Study	73
<i>Anna Spagnolli, Luciano Gamberini, Enrico D'Agostini, and Giulia Cenzato</i>	
Welicit: A Wizard of Oz Tool for VR Elicitation Studies.	82
<i>Andrea Bellucci, Telmo Zarranonandia, Paloma Díaz, and Ignacio Aedo</i>	

Virtual Reality

A Proposal for Discreet Auxiliary Figures for Reducing VR Sickness and for Not Obstructing FOV	95
<i>Masaki Omata and Atsuki Shimizu</i>	
A Trajectory Model for Desktop-Scale Hand Redirection in Virtual Reality	105
<i>Flavien Lebrun, Sinan Haliyo, and Gilles Bailly</i>	
Complex Contexts and Subtle Actions: Design and Evaluation of a Virtual Coach for Utilitarian Cycling	125
<i>Matthias Wunsch and Geraldine Fitzpatrick</i>	

Exploring How Saliency Affects Attention in Virtual Reality	147
<i>Radiyah Rivu, Ville Mäkelä, Mariam Hassib, Yomna Abdelrahman, and Florian Alt</i>	
Global Scene Filtering, Exploration, and Pointing in Occluded Virtual Space	156
<i>Yuan Chen, Junwei Sun, Qiang Xu, Edward Lank, Pourang Irani, and Wei Li</i>	
Real vs Simulated Foveated Rendering to Reduce Visual Discomfort in Virtual Reality	177
<i>Ariel Caputo, Andrea Giachetti, Salwa Abkal, Chiara Marchesini, and Massimo Zancanaro</i>	
Using Technology to Visualize Gender Bias.	186
<i>Sara Tranquada, Nuno Correia, and Karolina Baras</i>	
VRSketch: Investigating 2D Sketching in Virtual Reality with Different Levels of Hand and Pen Transparency.	195
<i>Jonas Auda, Roman Heger, Uwe Gruenefeld, and Stefan Schneegass</i>	
VRTactileDraw: A Virtual Reality Tactile Pattern Designer for Complex Spatial Arrangements of Actuators	212
<i>Oliver Beren Kaul, Andreas Domin, Michael Rohs, Benjamin Simon, and Maximilian Schrapel</i>	
When Friends Become Strangers: Understanding the Influence of Avatar Gender on Interpersonal Distance in Virtual Reality	234
<i>Radiyah Rivu, Yumeng Zhou, Robin Welsch, Ville Mäkelä, and Florian Alt</i>	
Courses	
Introduction to User-Centred Design Sprint	253
<i>Marta Larusdottir, Virpi Roto, and Åsa Cajander</i>	
Industrial Experiences	
A Flexible and Adaptable Workflow to Develop and Visualise Industrial Digital Twins	259
<i>Antonella Guidazzoli, Silvano Imboden, Paolo Zuzolo, Daniele De Luca, Eleonora Peruch, Eric Pascolo, Federica Farroni, and Maria Chiara Liguori</i>	
Improving the User Experience and the Trustworthiness of Financial Services	264
<i>Giandomenico Cornacchia, Fedelucio Narducci, and Azzurra Ragone</i>	

ISCADA: Towards a Framework for Interpretable Fault Prediction in Smart Electrical Grids 270
Carmelo Ardito, Yashar Deldjoo, Eugenio Di Sciascio, Fatemeh Nazary, and Gianluca Sapienza

Let’s Dance: An Exergame to Lead the Way in Parkinson Rehabilitation 275
Pierpaolo Di Bitonto, Angela la Forgia, Giovanni Melone, Ada Potenza, Luca Rossetti, Antonio Ulloa Severino, and Felice Vitulano

S.A.M.I.R.: Supporting Tele-Maintenance with Integrated Interaction Using Natural Language and Augmented Reality 280
Fabio De Felice, Anna Rosa Cannito, Daniele Monte, and Felice Vitulano

Supporting the Analysis of Inner Areas of a Territory 285
Paolo Buono, Maria Francesca Costabile, Palmalisa Marra, Valentino Moretto, Antonio Piccinno, and Luca Tedesco

Use and Even Recommend? Acceptance Modeling of a Smartphone Launcher App for Elderly Users 290
Andreas Sackl, Raimund Schatz, and Manfred Tscheligi

User Feedback to Improve the Performance of a Cyberattack Detection Artificial Intelligence System in the e-Health Domain 295
Carmelo Ardito, Tommaso Di Noia, Eugenio Di Sciascio, Domenico Lofù, Andrea Pazienza, and Felice Vitulano

VRQUEST: Designing and Evaluating a Virtual Reality System for Factory Training. 300
Khanh-Duy Le, Saad Azhar, David Lindh, and Dawid Ziobro

Interactive Demos

A Biofeedback System to Compose Your Own Music While Dancing. 309
Carmelo Ardito, Tommaso Colafiglio, Tommaso Di Noia, and Eugenio Di Sciascio

A Personalised Interactive Mobile App for People with Autism Spectrum Disorder. 313
Federica Cena, Amon Rapp, Claudio Mattutino, Noemi Mauro, Liliana Ardissono, Simone Cuccurullo, Stefania Brighenti, Roberto Keller, and Maurizio Tirassa

Cooking in the Dark: Exploring Spatial Audio as MR Assistive Technology for the Visually Impaired	318
<i>Renan Guarese, Franklin Bastidas, João Becker, Mariane Giambastiani, Yhonatan Iquiapaza, Lennon Macedo, Luciana Nedel, Anderson Maciel, Fabio Zambetta, and Ron van Schyndel</i>	
Engagement is the Key: A New Journey for ADHD Treatment.	323
<i>Pierpaolo Di Bitonto, Ada Potenza, Annamaria Schena, and Antonio Ulloa Severino</i>	
Wearable Confidence — Concept and Prototype Design	328
<i>Yulia Zhiglova, Kristi Kuusk, David Lamas, Ilja Smorgun, and Paul Seitlinger</i>	
 Panels	
Artificial Intelligence for Humankind: A Panel on How to Create Truly Interactive and Human-Centered AI for the Benefit of Individuals and Society	335
<i>Albrecht Schmidt, Fosca Giannotti, Wendy Mackay, Ben Shneiderman, and Kaisa Väänänen</i>	
Artificial Intelligence versus End-User Development: A Panel on What Are the Tradeoffs in Daily Automations?	340
<i>Fabio Paternò, Margaret Burnett, Gerhard Fischer, Maristella Matera, Brad Myers, and Albrecht Schmidt</i>	
Experiencing Contemporary Art at a Distance.	344
<i>Barbara Rita Barricelli, Antonella Varesano, Giuliana Carbi, Torkil Clemmensen, Gian Luca Foresti, José Abdelnour Nocera, Maja Ćirić, Gerrit van der Veer, Fabio Pittarello, Nuno Jardim Nunes, Letizia Bollini, and Alexandra Verdeil</i>	
 Posters	
A Case Study of Navigation System Assistance with Safety Purposes in the Context of Covid-19 Pandemic	351
<i>Stefano Galantucci, Paolo Giglio, Vincenzo Dentamaro, and Giuseppe Pirlo</i>	
A Multi-planar Approach to Encoding Story Worlds for Dynamic Narrative Generation	355
<i>David John Tree and Alessio Malizia</i>	

A Systematic Review of Usefulness Design Goals of Occupational Mobile Health Apps for Healthcare Workers 359
Nurha Yingta, José Abdelnour Nocera, Obed Brew, and Ikram Ur Rehman

An Exploration of Potential Factors Influencing Trust in Automated Vehicles. 364
Hatice Şahin, Sarah Vöge, Benjamin Stahr, Nina Trilck, and Susanne Boll

Brain Computer Interface, Visual Tracker and Artificial Intelligence for a Music Polyphony Generation System. 368
Carmelo Ardito, Tommaso Colafiglio, Tommaso Di Noia, and Eugenio Di Sciascio

Charting Experience Categories for Museum Exhibitions 372
Siiri Paananen, Mari Suoheimo, and Jonna Häkkinä

Collecting Qualitative Data During COVID-19 377
Vanessa Cesário and Valentina Nisi

Contemporary Art Digitalization: An Opportunity for Designing New Experiences 382
Barbara Rita Barricelli, Antonella Varesano, Giuliana Carbi, Torkil Clemmensen, and Fabio Pittarello

Design Students’ Challenges in Individual Brainstorming Using a Design Fiction Method 386
Lu Liu, Tamara Hoveling, and Panos Markopoulos

Discreet Interactive Wallpaper Concepts Study 390
Damien Brun, Saara Lehtinen, and Jonna Häkkinä

Do Animation Direction and Position of Progress Bar Affect Selections? 395
Kota Yokoyama, Satoshi Nakamura, and Shota Yamanaka

Don’t Touch Me! A Comparison of Usability on Touch and Non-touch Inputs 400
Kieran Waugh and Judy Robertson

Effects of Audio-Visual Information on Interpersonal Distance in Real and Virtual Environments. 405
Azusa Yamazaki, Naoto Wakatsuki, Koichi Mizutani, Yukihiko Okada, and Keiichi Zempo

Exploring Button Design for Low Contrast User Interfaces. 411
Ashley Colley, Çağlar Genç, Markus Löchtefeld, Heiko Mueller, Walther Jensen, and Jonna Häkkinä

Factors Influencing Trust Assessment in Technology	416
<i>Sonia Sousa and Gabriela Beltrão</i>	
FGFlick: Augmenting Single-Finger Input Vocabulary for Smartphones with Simultaneous Finger and Gaze Flicks	421
<i>Yuki Yamato, Yutaro Suzuki, and Shin Takahashi</i>	
Field of View Limitation-Driven Design of a Mixed Reality Game for Heritage Sites	426
<i>Giuseppe Caggianese and Luigi Gallo</i>	
Human Olfactory Interface for Odor Modulation Utilizing Gas Adsorption and Desorption: Evaluation of Separation Performance of Odorous Substances in Adsorption Process	431
<i>Kento Honda, Haruka Matsukura, Daisuke Iwai, Hiroshi Ishida, and Kosuke Sato</i>	
Human-Centered Visual Interfaces for Image Retrieval: An Exploratory Study	436
<i>Diogo Cruz, Diogo Cabral, and Pedro F. Campos</i>	
InteractDiff: A 3D Sandbox Game for Online Teaching and Campus Life Experience	442
<i>Davy P. Y. Wong, Chia-Ming Hsu, Jie-Ke Pan, Man-Lin Huang, Yen Nee Chew, and Ju-Ting Chang</i>	
Interacting with More Than One Chart: What Is It All About?	447
<i>Angela Locoro, Paolo Buono, and Giacomo Buonanno</i>	
Introducing Gestural Interaction on the Shop Floor: Empirical Evaluations . . .	451
<i>Salvatore Andolina, Paolo Ariano, Davide Brunetti, Nicolò Celadon, Guido Coppo, Alain Favetto, Cristina Gena, Sebastiano Giordano, and Fabiana Vernerio</i>	
Making Warning Messages Personal: A Big 5 Personality Trait Persuasion Approach	456
<i>Joseph Aneke, Carmelo Ardito, and Giuseppe Desolda</i>	
Persona's Role in the Design of Future Technologies by Academics and Practitioners	462
<i>Parisa Saadati, José Abdelnour Nocera, and Torkil Clemmensen</i>	
Planning Smart Social Distancing - Mobile Application Concept Design and Evaluation	467
<i>Eveliina Heikkilä, Mari Suoheimo, and Jonna Häkkinen</i>	

Raya: A Tangible Exercise Buddy Reminding Oneself of the Commitment to Exercise	471
<i>Daphne Menheere, Alynne de Haan, Steven Vos, and Carine Lallemand</i>	
Regenerative Swiping: A Hybrid Vision for Improved Sustainability with “Free” Energy Harvesting	476
<i>José Luís Silva</i>	
Robotic Emotion Monitoring for Mental Health Applications: Preliminary Outcomes of a Survey	481
<i>Marat Rostov, Md Zakir Hossain, and Jessica Sharmin Rahman</i>	
Safe-to-Touch: Tracking Touched Areas in Public Transport	486
<i>Linda Hirsch, Yanhong Li, Hendrik Geiger, and Andreas Butz</i>	
Sign Language GIFs Exchange Communication System: A PECS-Based Computer-Mediated Communication Tool for the Deaf	490
<i>Celeste Zhilla, Giulio Galesi, and Barbara Leporini</i>	
Spatial Layout Versus List Layout: A Comparative Study	495
<i>Daniel Roßner, Claus Atzenbeck, and Tom Gross</i>	
The Impact of Culture on Visual Design Perception	499
<i>Ioana D. Visescu</i>	
Think-Aloud Surveys: A Method for Eliciting Enhanced Insights During User Studies	504
<i>Lene Nielsen, Joni Salminen, Soon-Gyo Jung, and Bernard J. Jansen</i>	
Towards a Design Space for Shadows as Ambient Displays	509
<i>Özge Raudanjoki and Jonna Häkkinä</i>	
Towards Identifying Augmented Reality Unique Attributes to Facilitate Chemistry Learning	513
<i>Sandra Câmara Olim, Valentina Nisi, and Teresa Romão</i>	
Usability Evaluation of a VibroTactile API for Web-Based Virtual Reality Experiences	517
<i>José Canelha, Jorge C. S. Cardoso, and André Perrotta</i>	
Workshops	
2 nd International Workshop on Empowering People in Dealing with Internet of Things Ecosystems (EMPATHY)	525
<i>Giuseppe Desolda, Vincenzo Deufemia, Maristella Matera, Fabio Paternò, Fabiana Venero, and Massimo Zancanaro</i>	

Control Rooms in Safety Critical Contexts: Design, Engineering and Evaluation Issues: IFIP WG 13.5 Workshop at INTERACT 2021	530
<i>Tilo Mentler, Philippe Palanque, Susanne Boll, Chris Johnson, and Kristof Van Laerhoven</i>	
Geopolitical Issues in Human Computer Interaction.	536
<i>José Abdelnour Nocera, Torkil Clemmensen, Anirudha Joshi, Zhengjie Liu, Judy van Biljon, Xiangang Qin, Isabela Gasparini, and Leonardo Parra-Agudelo</i>	
HCI-E²: HCI Engineering Education: For Developers, Designers and More.	542
<i>Konrad Baumann, José Creissac Campos, Alan Dix, Laurence Nigay, Philippe Palanque, Jean Vanderdonckt, Gerrit van der Veer, and Benjamin Weyers</i>	
Human-Centered Software Engineering for Changing Contexts of Use: IFIP WG 13.2 Workshop at INTERACT 2021	548
<i>Stefan Sauer, Regina Bernhaupt, and Carmelo Ardito</i>	
Human-Centred Technology for Sustainable Development Goals: Challenges and Opportunities	553
<i>Lara S. G. Piccolo, Vânia Neris, Kamila Rios Rodrigues, and Masood Masoodian</i>	
Multisensory Augmented Reality.	558
<i>Kasun Karunanayaka, Anton Nijholt, Thilina Halloluwa, Nimesha Ranasinghe, Manjusri Wickramasinghe, and Dhaval Vyas</i>	
Participatory Design Landscape for the Human-Machine Collaboration, Interaction and Automation at the Frontiers of HCI (PDL 2021)	564
<i>Wiesław Kopeć, Cezary Biele, Monika Kornacka, Grzegorz Pochwatko, Anna Jaskulska, Kinga Skorupska, Julia Paluch, Piotr Gago, Barbara Karpowicz, Marcin Niewiński, and Rafał Masłyk</i>	
Pilot Implementation: Testing Human-Work Interaction Designs	570
<i>Morten Hertzum, Torkil Clemmensen, Barbara Rita Barricelli, Pedro F. Campos, Frederica Gonçalves, José Abdelnour Nocera, Ganesh Bhutkar, and Arminda Guerra Lopes</i>	
Remote Conference in the Times of the Pandemic.	575
<i>Julio Abascal, Cezary Biele, Daniel Cnotkowski, Gabriela Górski, Jarosław Kowalski, Effie Lai-Chong Law, Bartosz Muczyński, Abiodun Afolayan Ogunyemi, Mariusz Wierzbowski, and Aldona Zdrodowska</i>	

Remote User Testing: - Experiences and Trends 579
Lars Bo Larsen, Tina Øvad, Lene Nielsen, and Marta Larusdottir

Author Index 585