

Lecture Notes in Artificial Intelligence

6780

Edited by R. Goebel, J. Siekmann, and W. Wahlster

Subseries of Lecture Notes in Computer Science

Dylan D. Schmorrow Cali M. Fidopiastis (Eds.)

# Foundations of Augmented Cognition

Directing the Future of Adaptive Systems

6th International Conference, FAC 2011  
Held as Part of HCI International 2011  
Orlando, FL, USA, July 9-14, 2011  
Proceedings

## Series Editors

Randy Goebel, University of Alberta, Edmonton, Canada  
Jörg Siekmann, University of Saarland, Saarbrücken, Germany  
Wolfgang Wahlster, DFKI and University of Saarland, Saarbrücken, Germany

## Volume Editors

Dylan D. Schmorrow  
United States Navy  
1777 N Kent Street, Arlington, VA 22209, USA  
E-mail: schmorrow@yahoo.com

Cali M. Fidopiastis  
University of Alabama at Birmingham  
336 SHPB, 1530 3rd Avenue South, Birmingham, AL 35294, USA  
E-mail: cfidopia@uab.edu

ISSN 0302-9743 e-ISSN 1611-3349  
ISBN 978-3-642-21851-4 e-ISBN 978-3-642-21852-1  
DOI 10.1007/978-3-642-21852-1  
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2011929349

CR Subject Classification (1998): I.2, I.4, J.3, H.2.8, H.3-5, C.2

LNCS Sublibrary: SL 7 – Artificial Intelligence

© Springer-Verlag Berlin Heidelberg 2011

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, 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.

*Typesetting:* Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Foreword

The 14th International Conference on Human–Computer Interaction, HCI International 2011, was held in Orlando, Florida, USA, July 9–14, 2011, jointly with the Symposium on Human Interface (Japan) 2011, the 9th International Conference on Engineering Psychology and Cognitive Ergonomics, the 6th International Conference on Universal Access in Human–Computer Interaction, the 4th International Conference on Virtual and Mixed Reality, the 4th International Conference on Internationalization, Design and Global Development, the 4th International Conference on Online Communities and Social Computing, the 6th International Conference on Augmented Cognition, the Third International Conference on Digital Human Modeling, the Second International Conference on Human-Centered Design, and the First International Conference on Design, User Experience, and Usability.

A total of 4,039 individuals from academia, research institutes, industry and governmental agencies from 67 countries submitted contributions, and 1,318 papers that were judged to be of high scientific quality were included in the program. These papers address the latest research and development efforts and highlight the human aspects of design and use of computing systems. The papers accepted for presentation thoroughly cover the entire field of human–computer interaction, addressing major advances in knowledge and effective use of computers in a variety of application areas.

This volume, edited by Dylan D. Schmorrow and Cali M. Fidopiastis, contains papers in the thematic area of augmented cognition (AC), addressing the following major topics:

- Theories, models, and technologies for augmented cognition
- Applied neuroscience and brain monitoring
- Augmented cognition, social computing, and collaboration
- Augmented cognition for learning
- Augmented cognition and interaction
- Augmented cognition in complex operational environments

The remaining volumes of the HCI International 2011 Proceedings are:

- Volume 1, LNCS 6761, Human–Computer Interaction—Design and Development Approaches (Part I), edited by Julie A. Jacko
- Volume 2, LNCS 6762, Human–Computer Interaction—Interaction Techniques and Environments (Part II), edited by Julie A. Jacko
- Volume 3, LNCS 6763, Human–Computer Interaction—Towards Mobile and Intelligent Interaction Environments (Part III), edited by Julie A. Jacko
- Volume 4, LNCS 6764, Human–Computer Interaction—Users and Applications (Part IV), edited by Julie A. Jacko
- Volume 5, LNCS 6765, Universal Access in Human–Computer Interaction—Design for All and eInclusion (Part I), edited by Constantine Stephanidis

- Volume 6, LNCS 6766, Universal Access in Human–Computer Interaction—Users Diversity (Part II), edited by Constantine Stephanidis
- Volume 7, LNCS 6767, Universal Access in Human–Computer Interaction—Context Diversity (Part III), edited by Constantine Stephanidis
- Volume 8, LNCS 6768, Universal Access in Human–Computer Interaction—Applications and Services (Part IV), edited by Constantine Stephanidis
- Volume 9, LNCS 6769, Design, User Experience, and Usability—Theory, Methods, Tools and Practice (Part I), edited by Aaron Marcus
- Volume 10, LNCS 6770, Design, User Experience, and Usability—Understanding the User Experience (Part II), edited by Aaron Marcus
- Volume 11, LNCS 6771, Human Interface and the Management of Information—Design and Interaction (Part I), edited by Michael J. Smith and Gavriel Salvendy
- Volume 12, LNCS 6772, Human Interface and the Management of Information—Interacting with Information (Part II), edited by Gavriel Salvendy and Michael J. Smith
- Volume 13, LNCS 6773, Virtual and Mixed Reality—New Trends (Part I), edited by Randall Shumaker
- Volume 14, LNCS 6774, Virtual and Mixed Reality—Systems and Applications (Part II), edited by Randall Shumaker
- Volume 15, LNCS 6775, Internationalization, Design and Global Development, edited by P.L. Patrick Rau
- Volume 16, LNCS 6776, Human-Centered Design, edited by Masaaki Kurosu
- Volume 17, LNCS 6777, Digital Human Modeling, edited by Vincent G. Duffy
- Volume 18, LNCS 6778, Online Communities and Social Computing, edited by A. Ant Ozok and Panayiotis Zaphiris
- Volume 19, LNCS 6779, Ergonomics and Health Aspects of Work with Computers, edited by Michelle M. Robertson
- Volume 21, LNAI 6781, Engineering Psychology and Cognitive Ergonomics, edited by Don Harris
- Volume 22, CCIS 173, HCI International 2011 Posters Proceedings (Part I), edited by Constantine Stephanidis
- Volume 23, CCIS 174, HCI International 2011 Posters Proceedings (Part II), edited by Constantine Stephanidis

I would like to thank the Program Chairs and the members of the Program Boards of all Thematic Areas, listed herein, for their contribution to the highest scientific quality and the overall success of the HCI International 2011 Conference.

In addition to the members of the Program Boards, I also wish to thank the following volunteer external reviewers: Roman Vilimek from Germany, Ramalingam Ponnusamy from India, Si Jung “Jun” Kim from the USA, and Ilia Adami, Iosif Klironomos, Vassilis Kouroumalis, George Margetis, and Stavroula Ntoa from Greece.

This conference would not have been possible without the continuous support and advice of the Conference Scientific Advisor, Gavriel Salvendy, as well as the dedicated work and outstanding efforts of the Communications and Exhibition Chair and Editor of HCI International News, Abbas Moallem.

I would also like to thank for their contribution toward the organization of the HCI International 2011 Conference the members of the Human-Computer Interaction Laboratory of ICS-FORTH, and in particular Margherita Antona, George Paparoulis, Maria Pitsoulaki, Stavroula Ntoa, Maria Bouhli and George Kapnas.

July 2011

Constantine Stephanidis

# Organization

## Ergonomics and Health Aspects of Work with Computers

**Program Chair: Michelle M. Robertson**

Arne Aarås, Norway

Pascale Carayon, USA

Jason Devereux, UK

Wolfgang Friesdorf, Germany

Martin Helander, Singapore

Ed Israelski, USA

Ben-Tzion Karsh, USA

Waldemar Karwowski, USA

Peter Kern, Germany

Danuta Koradecka, Poland

Nancy Larson, USA

Kari Lindström, Finland

Brenda Lobb, New Zealand

Holger Luczak, Germany

William S. Marras, USA

Aura C. Matias, Philippines

Matthias Rötting, Germany

Michelle L. Rogers, USA

Dominique L. Scapin, France

Lawrence M. Schleifer, USA

Michael J. Smith, USA

Naomi Swanson, USA

Peter Vink, The Netherlands

John Wilson, UK

## Human Interface and the Management of Information

**Program Chair: Michael J. Smith**

Hans-Jörg Bullinger, Germany

Alan Chan, Hong Kong

Shin'ichi Fukuzumi, Japan

Jon R. Gunderson, USA

Michitaka Hirose, Japan

Jhilmil Jain, USA

Yasufumi Kume, Japan

Mark Lehto, USA

Hirohiko Mori, Japan

Fiona Fui-Hoon Nah, USA

Shogo Nishida, Japan

Robert Proctor, USA

Youngho Rhee, Korea

Anxo Cereijo Roibás, UK

Katsunori Shimohara, Japan

Dieter Spath, Germany

Tsutomu Tabe, Japan

Alvaro D. Taveira, USA

Kim-Phuong L. Vu, USA

Tomio Watanabe, Japan

Sakae Yamamoto, Japan

Hidekazu Yoshikawa, Japan

Li Zheng, P. R. China

## Human–Computer Interaction

### Program Chair: Julie A. Jacko

Sebastiano Bagnara, Italy	Gitte Lindgaard, Canada
Sherry Y. Chen, UK	Chen Ling, USA
Marvin J. Dainoff, USA	Yan Liu, USA
Jianming Dong, USA	Chang S. Nam, USA
John Eklund, Australia	Celestine A. Ntuen, USA
Xiaowen Fang, USA	Philippe Palanque, France
Ayse Gurses, USA	P.L. Patrick Rau, P.R. China
Vicki L. Hanson, UK	Ling Rothrock, USA
Sheue-Ling Hwang, Taiwan	Guangfeng Song, USA
Wonil Hwang, Korea	Steffen Staab, Germany
Yong Gu Ji, Korea	Wan Chul Yoon, Korea
Steven A. Landry, USA	Wenli Zhu, P.R. China

## Engineering Psychology and Cognitive Ergonomics

### Program Chair: Don Harris

Guy A. Boy, USA	Jan M. Noyes, UK
Pietro Carlo Cacciabue, Italy	Kjell Ohlsson, Sweden
John Huddleston, UK	Axel Schulte, Germany
Kenji Itoh, Japan	Sarah C. Sharples, UK
Hung-Sying Jing, Taiwan	Neville A. Stanton, UK
Wen-Chin Li, Taiwan	Xianghong Sun, P.R. China
James T. Luxhøj, USA	Andrew Thatcher, South Africa
Nicolas Marmaras, Greece	Matthew J.W. Thomas, Australia
Sundaram Narayanan, USA	Mark Young, UK
Mark A. Neerincx, The Netherlands	Rolf Zon, The Netherlands

## Universal Access in Human–Computer Interaction

### Program Chair: Constantine Stephanidis

Julio Abascal, Spain	Michael Fairhurst, UK
Ray Adams, UK	Dimitris Grammenos, Greece
Elisabeth André, Germany	Andreas Holzinger, Austria
Margherita Antona, Greece	Simeon Keates, Denmark
Chieko Asakawa, Japan	Georgios Kouroupetroglou, Greece
Christian Bühler, Germany	Sri Kurniawan, USA
Jerzy Charytonowicz, Poland	Patrick M. Langdon, UK
Pier Luigi Emiliani, Italy	Seongil Lee, Korea



Zhengjie Liu, P.R. China  
 Klaus Miesenberger, Austria  
 Helen Petrie, UK  
 Michael Pieper, Germany  
 Anthony Savidis, Greece  
 Andrew Sears, USA  
 Christian Stary, Austria

Hirotsada Ueda, Japan  
 Jean Vanderdonckt, Belgium  
 Gregg C. Vanderheiden, USA  
 Gerhard Weber, Germany  
 Harald Weber, Germany  
 Panayiotis Zaphiris, Cyprus

## Virtual and Mixed Reality

### Program Chair: Randall Shumaker

Pat Banerjee, USA  
 Mark Billinghurst, New Zealand  
 Charles E. Hughes, USA  
 Simon Julier, UK  
 David Kaber, USA  
 Hirokazu Kato, Japan  
 Robert S. Kennedy, USA  
 Young J. Kim, Korea  
 Ben Lawson, USA  
 Gordon McK Mair, UK

David Pratt, UK  
 Albert “Skip” Rizzo, USA  
 Lawrence Rosenblum, USA  
 Jose San Martin, Spain  
 Dieter Schmalstieg, Austria  
 Dylan Schmorrow, USA  
 Kay Stanney, USA  
 Janet Weisenford, USA  
 Mark Wiederhold, USA

## Internationalization, Design and Global Development

### Program Chair: P.L. Patrick Rau

Michael L. Best, USA  
 Alan Chan, Hong Kong  
 Lin-Lin Chen, Taiwan  
 Andy M. Dearden, UK  
 Susan M. Dray, USA  
 Henry Been-Lirn Duh, Singapore  
 Vanessa Evers, The Netherlands  
 Paul Fu, USA  
 Emilie Gould, USA  
 Sung H. Han, Korea  
 Veikko Ikonen, Finland  
 Toshikazu Kato, Japan  
 Esin Kiris, USA  
 Apala Lahiri Chavan, India

James R. Lewis, USA  
 James J.W. Lin, USA  
 Rungtai Lin, Taiwan  
 Zhengjie Liu, P.R. China  
 Aaron Marcus, USA  
 Allen E. Milewski, USA  
 Katsuhiko Ogawa, Japan  
 Oguzhan Ozcan, Turkey  
 Girish Prabhu, India  
 Kerstin Röse, Germany  
 Supriya Singh, Australia  
 Alvin W. Yeo, Malaysia  
 Hsiu-Ping Yueh, Taiwan

## Online Communities and Social Computing

### Program Chairs: A. Ant Ozok, Panayiotis Zaphiris

Chadia N. Abras, USA	Anthony F. Norcio, USA
Chee Siang Ang, UK	Ulrike Pfeil, UK
Peter Day, UK	Elaine M. Raybourn, USA
Fiorella De Cindio, Italy	Douglas Schuler, USA
Heidi Feng, USA	Gilson Schwartz, Brazil
Anita Komlodi, USA	Laura Slaughter, Norway
Piet A.M. Kommers, The Netherlands	Sergei Stafeev, Russia
Andrew Laghos, Cyprus	Asimina Vasalou, UK
Stefanie Lindstaedt, Austria	June Wei, USA
Gabriele Meiselwitz, USA	Haibin Zhu, Canada
Hideyuki Nakanishi, Japan	

## Augmented Cognition

### Program Chairs: Dylan D. Schmorow, Cali M. Fidopiastis

Monique Beaudoin, USA	Rob Matthews, Australia
Chris Berka, USA	Dennis McBride, USA
Joseph Cohn, USA	Eric Muth, USA
Martha E. Crosby, USA	Mark A. Neerincx, The Netherlands
Julie Drexler, USA	Denise Nicholson, USA
Ivy Estabrooke, USA	Banu Onaral, USA
Chris Forsythe, USA	Kay Stanney, USA
Wai Tat Fu, USA	Roy Stripling, USA
Marc Grootjen, The Netherlands	Rob Taylor, UK
Jefferson Grubb, USA	Karl van Orden, USA
Santosh Mathan, USA	

## Digital Human Modeling

### Program Chair: Vincent G. Duffy

Karim Abdel-Malek, USA	Yaobin Chen, USA
Giuseppe Andreoni, Italy	Kathryn Cormican, Ireland
Thomas J. Armstrong, USA	Daniel A. DeLaurentis, USA
Norman I. Badler, USA	Yingzi Du, USA
Fethi Calisir, Turkey	Okan Ersoy, USA
Daniel Carruth, USA	Enda Fallon, Ireland
Keith Case, UK	Yan Fu, P.R. China
Julie Charland, Canada	Afzal Godil, USA

Ravindra Goonetilleke, Hong Kong  
 Anand Gramopadhye, USA  
 Lars Hanson, Sweden  
 Pheng Ann Heng, Hong Kong  
 Bo Hoege, Germany  
 Hongwei Hsiao, USA  
 Tianzi Jiang, P.R. China  
 Nan Kong, USA  
 Steven A. Landry, USA  
 Kang Li, USA  
 Zhizhong Li, P.R. China  
 Tim Marler, USA

Ahmet F. Ozok, Turkey  
 Srinivas Peeta, USA  
 Sudhakar Rajulu, USA  
 Matthias Rötting, Germany  
 Matthew Reed, USA  
 Johan Stahre, Sweden  
 Mao-Jiun Wang, Taiwan  
 Xuguang Wang, France  
 Jingzhou (James) Yang, USA  
 Gulcin Yucel, Turkey  
 Tingshao Zhu, P.R. China

## Human-Centered Design

### Program Chair: Masaaki Kurosu

Julio Abascal, Spain  
 Simone Barbosa, Brazil  
 Tomas Berns, Sweden  
 Nigel Bevan, UK  
 Torkil Clemmensen, Denmark  
 Susan M. Dray, USA  
 Vanessa Evers, The Netherlands  
 Xiaolan Fu, P.R. China  
 Yasuhiro Horibe, Japan  
 Jason Huang, P.R. China  
 Minna Isomursu, Finland  
 Timo Jokela, Finland  
 Mitsuhiko Karashima, Japan  
 Tadashi Kobayashi, Japan  
 Seongil Lee, Korea  
 Kee Yong Lim, Singapore

Zhengjie Liu, P.R. China  
 Loïc Martínez-Normand, Spain  
 Monique Noirhomme-Fraiture,  
 Belgium  
 Philippe Palanque, France  
 Annelise Mark Pejtersen, Denmark  
 Kerstin Röse, Germany  
 Dominique L. Scapin, France  
 Haruhiko Urokohara, Japan  
 Gerrit C. van der Veer,  
 The Netherlands  
 Janet Wesson, South Africa  
 Toshiki Yamaoka, Japan  
 Kazuhiko Yamazaki, Japan  
 Silvia Zimmermann, Switzerland

## Design, User Experience, and Usability

### Program Chair: Aaron Marcus

Ronald Baecker, Canada  
 Barbara Ballard, USA  
 Konrad Baumann, Austria  
 Arne Berger, Germany  
 Randolph Bias, USA  
 Jamie Blustein, Canada

Ana Boa-Ventura, USA  
 Lorenzo Cantoni, Switzerland  
 Sameer Chavan, Korea  
 Wei Ding, USA  
 Maximilian Eibl, Germany  
 Zelda Harrison, USA

XIV Organization

Rüdiger Heimgärtner, Germany

Brigitte Herrmann, Germany

Sabine Kabel-Eckes, USA

Kaleem Khan, Canada

Jonathan Kies, USA

Jon Kolko, USA

Helga Letowt-Vorbek, South Africa

James Lin, USA

Frazer McKimm, Ireland

Michael Renner, Switzerland

Christine Ronnewinkel, Germany

Elizabeth Rosenzweig, USA

Paul Sherman, USA

Ben Shneiderman, USA

Christian Sturm, Germany

Brian Sullivan, USA

Jaakko Villa, Finland

Michele Visciola, Italy

Susan Weinschenk, USA

# HCI International 2013

The 15th International Conference on Human–Computer Interaction, HCI International 2013, will be held jointly with the affiliated conferences in the summer of 2013. It will cover a broad spectrum of themes related to human–computer interaction (HCI), including theoretical issues, methods, tools, processes and case studies in HCI design, as well as novel interaction techniques, interfaces and applications. The proceedings will be published by Springer. More information about the topics, as well as the venue and dates of the conference, will be announced through the HCI International Conference series website: <http://www.hci-international.org/>

General Chair

Professor Constantine Stephanidis  
University of Crete and ICS-FORTH  
Heraklion, Crete, Greece  
Email: [cs@ics.forth.gr](mailto:cs@ics.forth.gr)

# Table of Contents

## Part I: Theories, Models and Technologies for Augmented Cognition

The Brain as Target Image Detector: The Role of Image Category and Presentation Time .....	3
<i>Anne-Marie Brouwer, Jan B.F. van Erp, Bart Kappé, and Anne E. Urai</i>	
Implementation of fNIRS for Monitoring Levels of Expertise and Mental Workload .....	13
<i>Scott C. Bunce, Kurtulus Izzetoglu, Hasan Ayaz, Patricia Shewokis, Meltem Izzetoglu, Kambiz Pourrezaei, and Banu Onaral</i>	
Challenges and Solutions with Augmented Cognition Technologies: Precursor Issues to Successful Integration .....	23
<i>Joseph Cohn</i>	
Augmenting Brain and Cognition by Aerobic Exercise .....	30
<i>Kirk I. Erickson</i>	
Neurological Advances and Ethical/Legal Conundrums: Lessons from History .....	39
<i>Cheryl Erwin</i>	
Individual Differences and the Science of Human Performance .....	46
<i>Michael Trumbo, Susan Stevens-Adams, Stacey M.L. Hendrickson, Robert Abbott, Michael Haass, and Chris Forsythe</i>	
Cognition: What Does It Have to Do with the Brain? .....	55
<i>Alexandra Geyer</i>	
The Evolution of Human Systems: A Brief Overview .....	60
<i>Jeff Grubb and Joseph Cohn</i>	
The Influence of Culture on Memory .....	67
<i>Angela H. Gutchess, Aliza J. Schwartz, and Ayşecan Boduroğlu</i>	
Using Computational Modeling to Assess Use of Cognitive Strategies ...	77
<i>Michael J. Haass and Laura E. Matzen</i>	
Advances and Challenges in Signal Analysis for Single Trial P300-BCI .....	87
<i>Kun Li, Vanitha Narayan Raju, Ravi Sankar, Yael Arbel, and Emanuel Donchin</i>	

Characterizing the Performance Limits of High Speed Image Triage Using Bayesian Search Theory . . . . .	95
<i>Santosh Mathan, Kenneth Hild, Yonghong Huang, and Misha Pavel</i>	
Facial Recognition: An Enabling Technology for Augmented Cognition Applications . . . . .	104
<i>Denise Nicholson, Christine Podilchuk, and Kathleen Bartlett</i>	
Analysis of Multiple Physiological Sensor Data . . . . .	112
<i>Lauren Reinerman-Jones, Grant Taylor, Keryl Cosenzo, and Stephanie Lackey</i>	
Exploring New Methodologies for the Analysis of Functional Magnetic Resonance Imaging (fMRI) Following Closed-Head Injuries . . . . .	120
<i>Peter B. Walker and Ian N. Davidson</i>	

**Part II: Neuroscience and Brain Monitoring**

EEG Knows Best: Predicting Future Performance Problems for Targeted Training . . . . .	131
<i>Gwendolyn E. Campbell, Christine L. Belz, Charles P.R. Scott, and Phan Luu</i>	
Computational Cultural Neuroscience: Implications for Augmented Cognition . . . . .	137
<i>Joan Y. Chiao</i>	
Enhancing Team Performance Using Neurophysiologic Synchronies in a Virtual Training Environment . . . . .	143
<i>Marianne Clark, Kimberly Cellucci, Chris Berka, Daniel J. Levendowski, Jonny Trejo, Amy Kruse, and Ron Stevens</i>	
Theoretical Transpositions in Brain Function and the Underpinnings of Augmented Cognition . . . . .	153
<i>Cali M. Fidopiastis</i>	
Non-invasive Functional Brain Biomarkers for Cognitive-Motor Performance Assessment: Towards New Brain Monitoring Applications . . . . .	159
<i>Rodolphe J. Gentili</i>	
Estimating the Level of Motion Sickness Based on EEG Spectra . . . . .	169
<i>Li-Wei Ko, Chun-Shu Wei, Tzyy-Ping Jung, and Chin-Teng Lin</i>	
Combining fNIRS and EEG to Improve Motor Cortex Activity Classification during an Imagined Movement-Based Task . . . . .	177
<i>Darren J. Leamy, Rónán Collins, and Tomas E. Ward</i>	

The Frustration Status and Noise Proof Feature during Perception of the Auditory Images .....	186
<i>Sergey Lytaev and Yuliaj Surovitskaj</i>	
Cultural Neuroscience and Individual Differences: Implications for Augmented Cognition .....	194
<i>Laura E. Matzen</i>	
Towards a Software Toolkit for Neurophysiological Data Collection and Analysis .....	199
<i>James Niehaus and Peter Weyhrauch</i>	
From Sound to Meaning: Changes in EEG Source-Localized Brain Activity with Foreign-Language Training.....	203
<i>Catherine Poulsen, Phan Luu, Colin Davey, Don Tucker, and Joey Nelson</i>	
Analyzing Neural Correlates of Attentional Changes during the Exposure to Virtual Environments: Application of Transcranial Doppler Monitoring .....	212
<i>Beatriz Rey, Vera Parkhutik, José Tembl, and Mariano Alcañiz</i>	
Neuroergonomic Assessment of Simulator Fidelity in an Aviation Centric Live Virtual Constructive (LVC) Application .....	221
<i>Tom Schnell, Alex Postnikov, and Nancy Hamel</i>	
Brain Activity of Young and Adult Hebrew Speakers during Lexical Decision Task: fNIR Application to Language.....	231
<i>Itamar Sela, Tzipi Horowitz-Kraus, Meltem Izzetoglu, Patricia A. Shewokis, Kurtulus Izzetoglu, Banu Onaral, and Zvia Breznitz</i>	
Brain in the Loop: Assessing Learning Using fNIR in Cognitive and Motor Tasks.....	240
<i>Patricia A. Shewokis, Hasan Ayaz, Meltem Izzetoglu, Scott Bunce, Rodolphe J. Gentili, Itamar Sela, Kurtulus Izzetoglu, and Banu Onaral</i>	
Neurocognitive Patterns: Using Brain, Behavior, and Context to Infer User Intent .....	250
<i>Webb Stacy</i>	
Behavioral and Brain Dynamics of Team Coordination Part I: Task Design .....	257
<i>E. Tognoli, A.J. Kovacs, B. Suutari, D. Afegan, J. Coyne, G. Gibson, R. Stripling, and J.A.S. Kelso</i>	
Using Neurophysiological Data to Inform Feedback Timing: A Pilot Study .....	265
<i>Jennifer Vogel-Walcutt and Julian Abich</i>	



**Part III: Augmented Cognition, Social Computing  
and Collaboration**

Modelling User Behaviour and Interactions: Augmented Cognition on  
the Social Web ..... 277  
*Ching-man Au Yeung and Tomoharu Iwata*

Brain Signatures of Team Performance ..... 288  
*Silke Dodel, Joseph Cohn, Jochen Mersmann, Phan Luu,  
Chris Forsythe, and Viktor Jirsa*

Team Coordination Dynamics and the Interactive Approach:  
Emerging Evidence and Future Work ..... 298  
*Jamie C. Gorman*

Performance-Based Metrics for Evaluating Submarine Command Team  
Decision-Making ..... 308  
*Eric Jones, Ronald Steed, Frederick Diedrich,  
Robert Armbruster, and Cullen Jackson*

Multi-modal Measurement Approach to Team Cohesion ..... 318  
*Camilla C. Knott, Alexandra Geyer, Jason Sidman, and Emily Wiese*

Communications-Based Automated Assessment of Team Cognitive  
Performance ..... 325  
*Kiran Lakkaraju, Susan Stevens-Adams, Robert G. Abbott, and  
Chris Forsythe*

Visual Analytics of Social Networks: Mining and Visualizing  
Co-authorship Networks ..... 335  
*Carson Kai-Sang Leung, Christopher L. Carmichael, and  
Eu Wern Teh*

The Crowdsourcing Design Space ..... 346  
*Yasuaki Sakamoto, Yuko Tanaka, Lixiu Yu, and Jeffrey V. Nickerson*

Developing Systems for the Rapid Modeling of Team Neurodynamics ... 356  
*Ronald H. Stevens, Trysha Galloway, Chris Berka, and Peter Wang*

Mapping Cognitive Attractors onto the Dynamic Landscapes of  
Teamwork ..... 366  
*Ronald H. Stevens and Jamie C. Gorman*

Behavioral and Brain Dynamics of Team Coordination Part II:  
Neurobehavioral Performance ..... 376  
*E. Tognoli, A.J. Kovacs, B. Suutari, D. Afegan, J. Coyne,  
G. Gibson, R. Stripling, and J.A.S. Kelso*

Feature Selection in Crowd Creativity ..... 383  
*Lixiu Yu and Yasuaki Sakamoto*

## Part IV: Augmented Cognition for Learning

Augmented Cognition Methods for Evaluating Serious Game Based Insider Cyber Threat Detection Training . . . . .	395
<i>Terence S. Andre, Cali M. Fidopiastis, Tiffany R. Ripley, Anna L. Oskorus, Ryan E. Meyer, and Robert A. Snyder</i>	
Ongoing Efforts towards Developing a Physiologically Driven Training System . . . . .	404
<i>Joseph Coyne, Ciara Sibley, and Carryl Baldwin</i>	
A Hierarchical Adaptation Framework for Adaptive Training Systems . . . . .	413
<i>Sven Fuchs, Angela Carpenter, Meredith Carroll, and Kelly Hale</i>	
Developing and Automating a Prototype for Assessing Levels of Student Involvement . . . . .	422
<i>Curtis Ikehara and Martha Crosby</i>	
Considering Cognitive Traits of University Students with Dyslexia in the Context of a Learning Management System . . . . .	432
<i>Carolina Mejía, Alicia Díaz, Juan E. Jiménez, and Ramón Fabregat</i>	
Improving Students' Meta-cognitive Skills within Intelligent Educational Systems: A Review . . . . .	442
<i>Alejandro Peña, Michiko Kayashima, Riiichiro Mizoguchi, and Rafael Dominguez</i>	
Interactive Neuro-Educational Technologies (I-NET): Development of a Novel Platform for Neurogaming . . . . .	452
<i>Giby Raphael, Adrienne Behneman, Veasna Tan, Nicholas Pojman, and Chris Berka</i>	
Learning in Virtual Worlds: A New Path for Supporting Cognitive Impaired Children . . . . .	462
<i>Laura A. Ripamonti and Dario Maggiorini</i>	

## Part V: Augmented Cognition and Interaction

A Longitudinal Study of P300 Brain-Computer Interface and Progression of Amyotrophic Lateral Sclerosis . . . . .	475
<i>Nathan A. Gates, Christopher K. Hauser, and Eric W. Sellers</i>	
Discovering Context: Classifying Tweets through a Semantic Transform Based on Wikipedia . . . . .	484
<i>Yegin Genc, Yasuaki Sakamoto, and Jeffrey V. Nickerson</i>	

Toward a Wearable, Neurally-Enhanced Augmented Reality System . . . .	493
<i>David H. Goldberg, R. Jacob Vogelstein, Diego A. Socolinsky, and Lawrence B. Wolff</i>	
Interface Design Challenge for Brain-Computer Interaction . . . . .	500
<i>Jeremy Hill, Peter Brunner, and Theresa Vaughan</i>	
Trust in Human-Computer Interactions as Measured by Frustration, Surprise, and Workload . . . . .	507
<i>Leanne M. Hirshfield, Stuart H. Hirshfield, Samuel Hincks, Matthew Russell, Rachel Ward, and Tom Williams</i>	
Idea Visibility, Information Diversity, and Idea Integration in Electronic Brainstorming . . . . .	517
<i>Elahe Javadi and Wai-Tat Fu</i>	
The Challenges of Using Scalp-EEG Input Signals for Continuous Device Control . . . . .	525
<i>Garrett Johnson, Nicholas Waytowich, and Dean J. Krusienski</i>	
Modeling Pharmacokinetics and Pharmacodynamics on a Mobile Device to Help Caffeine Users . . . . .	528
<i>Frank E. Ritter and Kuo-Chuan (Martin) Yeh</i>	
Designing Consumer Health Information Systems: What Do User-Generated Questions Tell Us? . . . . .	536
<i>Yan Zhang and Wai-Tat Fu</i>	

**Part VI: Augmented Cognition in Complex Environments**

Estimation of Cognitive Workload during Simulated Air Traffic Control Using Optical Brain Imaging Sensors . . . . .	549
<i>Hasan Ayaz, Ben Willems, Scott Bunce, Patricia A. Shewokis, Kurtulus Izzetoglu, Sehchang Hah, Atul Deshmukh, and Banu Onaral</i>	
Distributed Logging and Synchronization of Physiological and Performance Measures to Support Adaptive Automation Strategies . . . .	559
<i>Daniel Barber and Irwin Hudson</i>	
Augmenting Robot Behaviors Using Physiological Measures . . . . .	567
<i>Daniel Barber, Lauren Reinerman-Jones, Stephanie Lackey, and Irwin Hudson</i>	
Operational Neuroscience: Neuroscience Research and Tool Development to Support the Warfighter . . . . .	573
<i>Monique E. Beaudoin and Dylan D. Schmorow</i>	

Performance Measures to Enable Agent-Based Support in Demanding Circumstances . . . . .	578
<i>Fiemke Both, Mark Hoogendoorn, Rianne M. van Lambalgen, Rogier Oorburg, and Michael de Vos</i>	
Cognitive Adaptive Man Machine Interfaces for the Firefighter Commander: Design Framework and Research Methodology . . . . .	588
<i>Maurits de Graaf, Michel Varkevisser, Masja Kempen, and Nicolas Jourden</i>	
An Intelligent Infrastructure for In-Flight Situation Awareness of Aviation Pilots . . . . .	598
<i>Alessandro G. Di Nuovo, Rosario Bruno Cannavò, and Santo Di Nuovo</i>	
Applications of Functional Near Infrared Imaging: Case Study on UAV Ground Controller . . . . .	608
<i>Kurtulus Izzetoglu, Hasan Ayaz, Justin Menda, Meltem Izzetoglu, Anna Merzagora, Patricia A. Shewokis, Kambiz Pourrezaei, and Banu Onaral</i>	
Augmented Phonocardiogram Acquisition and Analysis . . . . .	618
<i>Nancy E. Reed and Todd R. Reed</i>	
Today's Competitive Objective: Augmenting Human Performance . . . . .	628
<i>Kay M. Stanney and Kelly S. Hale</i>	
Measuring the Effectiveness of Stress Prevention Programs in Military Personnel . . . . .	636
<i>Andrea H. Taylor and Sae Schatz</i>	
Adaptive Attention Allocation Support: Effects of System Conservativeness and Human Competence . . . . .	647
<i>Peter-Paul van Maanen, Teun Lucassen, and Kees van Dongen</i>	
A Dynamic Approach to the Physiological-Based Assessment of Resilience to Stressful Conditions . . . . .	657
<i>Mikhail Zotov, Chris Forsythe, Alexey Voyt, Inga Akhmedova, and Vladimir Petrukovich</i>	
<b>Author Index</b> . . . . .	667