CaptureMyEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors

Peter Leijdekkers, Valerie Gay and Frederick Wong
Faculty of Engineering and Information Technology, University of Technology, Sydney,
PO Box 123, Broadway 2007, NSW, Australia.
Peter.Leijdekkers@uts.edu.au

Abstract

Autism Spectrum Disorder (ASD) is estimated to affect one in eighty-eight children and many mobile apps are available from Google Play or Apple store to help these children and their care providers. Our research into apps for autistic children identified that none of the apps use the full potential offered by mobile technology and sensors to overcome one of autistic children’s main difficulties: the identification and expression of emotions. This paper describes a mobile app called CaptureMyEmotion that enables autistic children to take photos, videos or sounds, and at the same time senses their arousal level using a wireless sensor. It also allows the child to comment on their emotion at the time of capture. The app has the potential to help autistic children improve their emotions learning based on their own pictures, videos or sounds. It gives the carer a means to discuss the identification and expression of emotions.

1. Introduction

The Autism Spectrum Disorder (ASD) describes a range of conditions typically characterized by social deficits, communication difficulties, stereotyped or repetitive behaviours and interests, and in some cases, cognitive delays [1]. The prevalence of ASD is estimated to be up to 1 in 88 children [2]. Understanding and managing emotions is very challenging for the majority of autistic children and it is of major importance for their integration in classrooms and other social groups.

Autistic children, like other children of their generation, embrace mobile technology and enjoy using smart phones and tablets to learn and play. Most autistic children are visual learners and mobile technology appeals to them [3]. In our research at the University of Technology, Sydney we investigate how mobile technology and sensors can help autistic children and their carer understand and manage emotions.

It is increasingly recognised that autistic children respond well to personalised technology [4-6]. Autistic associations such as FaHCSIA [7] in Australia or Autism Speaks [8] in the USA have identified the potential of mobile technology on the child’s progress and are subsidising or giving tablets away to families with autistic children.

Mobile technology has several advantages for the autistic child and carer:
- Access to tools to play and communicate ubiquitously.
- Easy access to games, music, education tools on the go.
- The carer can easily identify what the child likes to play with and track progress.
- Multimodal input/output with an intuitive interface.
- Easy use of camera and video.
- Easy integration of external sensors that wirelessly transmit data to the device providing additional feedback.
- An action (e.g. taking a picture) can be positioned in context using GPS, time and other data, which can be used at a later stage.
- Using one of the many apps available, the carer can help manage social/emotional skills and behaviour management.
- Mobile devices include features to provide better accessibility for autistic children (e.g. extra large font size, disabling buttons) [9].

Hundreds of Apps exist to help autistic children and their carers or teachers. At the time of writing (January 2013) a search on ‘autistic app’ returned 1000+ results in Google Play [10]. However, none of these apps use sensor input to measure the emotion of the user. Many autistics have difficulties in expressing or communicating their emotions/feelings in a similar way to how non-autistic people would normally do [11]. Many apps for people with autism or other
special needs have been developed for the iPhone and Android platform. A good overview can be found in [12] and [13].

This paper presents CaptureMyEmotion, an App for smartphones and tablets, which uses Affectiva’s Q sensor to help autistic children gauge the intensity of their emotions. CaptureMyEmotion enables children to take photos, videos or sounds and, at the same time, sense and self-report their emotion. The collected data gives the carer insight into the child’s emotions and offers a means to discuss the identification and expression of emotions. What sets CaptureMyEmotion apart is that we combine personally recorded photos, videos or sounds together with contextual information (date, time, location) and emotion data measured by a sensor. This creates a very personalised tool for a child to learn and discuss their feelings. Sensor data is used when the child takes a picture, as well as, when the child discusses the picture with a carer at a later stage. The use of an emotion sensor adds a new dimension to emotion learning by providing additional feedback based on physiological data.

2. Emotions and sensors

According to Schlosberg [14], emotion can be described by two dimensions i.e. arousal (high versus low) and valence (positive versus negative). Based on these two dimensions, 6 basic emotions (disgust, sadness, happiness, fear, anger, surprise) can be identified which exist for all human beings. For example, anger can be classified as high arousal and negative valence.

There is no perfect measure of arousal or valence. However, good approximations can be obtained by measuring arousal from the sympathetic nervous system (SNS) and valence from facial expressions [15].

Nervousness, fear, anger, protectiveness, and lust are enhanced by the sympathetic nervous system and can be measured through physiological changes in the body. Typically, physiological signals such as electrocardiogram (ECG), electromyography (EMG), blood volume pulse, skin temperature, skin conductance or respiration are used to measure arousal [16].

Using physiological signals to recognize emotion has several advantages compared to other methods such as speech and face recognition. Sensors capturing physiological signals are nowadays compact and often allow wireless transmission of the data to other devices such as smartphones or tablets. The sensors are comfortable to wear and are less obtrusive than, for example, being observed by a camera to be able to do facial expression recognition.

Skin temperature measures the temperature on the surface of the skin. When muscles are tense under strain, the blood vessels will be contracted and therefore the temperature will decrease. It is a relatively slow indicator of changes in emotional state.

Skin conductance or electrodermal activity (EDA) is an important signal to measure arousal. Electrodermal activity refers to changes in the skin’s ability to conduct electricity. If a person experiences emotional arousal, increased cognitive workload or physical exertion, the brain sends signals to the skin to increase the level of sweating. Skin conductance usually increases when a person is more aroused (engaged, stressed, or excited) and it tends to stay low or drop when a person is less aroused (disengaged, bored, or calm). To detect changes in emotional state using skin conductance, it is important to obtain a baseline indicating the truly lowest tonic skin conductance level. The best way to get a baseline is to measure long-term, and look for the lowest smooth period of skin conductance where there is no physical movement, and where the temperature is clearly body temperature [15].

CaptureMyEmotion uses a wrist worn sensor called the Q sensor from Affectiva (www.affectiva.com). The Q Sensor measures changes in skin temperature, motion, and skin conductivity, and is able to give an indication about the wearer’s emotional state. The sensor is easy to wear and is able to transmit the data in real time to a mobile phone. The Q sensor can be worn for a long period of time to obtain a reliable baseline.

A challenging issue is to measure valence. Traditionally, people would rate their feelings along the valence-arousal dimensions. However, self-rating can be highly inaccurate for many autistics so a more objective way needs to be found. Detecting the facial expression automatically can be the solution and one idea is to take a picture of the child when he rates a picture just taken. However, many autistics do not show a particular facial expression so this can be unreliable.

4. CaptureMyEmotion

The app is used to assign emotions to pictures, videos or sounds taken by the child. Our target group is children from 7 years and older who are able to use a smartphone to take pictures. CaptureMyEmotion is different from many existing apps since it allows the user to take their own pictures (When we refer to pictures this also includes videos or sounds) and not based on a fixed set of pictures. This will increase the
chance that a picture generates a genuine emotion. Additionally, the app can be useful to obtain visual evidence that correlates to a particular emotion as measured by the sensor or self-reporting. For example, the user can be asked to take pictures of objects that make him happy. The app will provide a history of pictures categorized by a particular emotion and this gives the carer an insight into the child’s emotions.

Our extensive experience with wireless sensors in health related mobile apps such as myFitnessCompanion® (myFitnessCompanion.com) has shown that most users want to have the option to use a sensor or not. The reasons can be diverse and range from cost (too expensive!) to practicality (sensor not at hand). Therefore, the sensor is optional and the app asks the child to manually select the emotion felt just after the picture has been taken. This is useful information, which can lead to valuable discussions with the carer even if the sensor is not used.

If the user wears the Q sensor, the sensor collects in real time accelerometer, skin temperature and skin conductive data associated with the picture taken. Based on the physiological data, the app calculates the arousal level and stores it together with the picture and contextual information (date, time and GPS coordinates). The Q sensor is also used during the discussion with the carer, and it keeps track of the child’s arousal level while discussing the picture.

CaptureMyEmotion is developed for both Android smartphones and tablets. The child would typically use the smartphone to take pictures and the carer would use the tablet for evaluation together with the child. Tablets are more suitable for this due to the amount of data displayed. CaptureMyEmotion uses Dropbox to share the data between several devices. When the child takes a picture, it is automatically uploaded to a Dropbox account via 3G or WiFi. If the carer deals with several children (e.g. in a classroom situation), the carer can synchronize the data for the various children using Dropbox on the tablet.

The child can select camera, video or sound to capture the object that is in the viewer. The app automatically connects to the Q sensor (if present) and a gauge icon displays, in real-time, the arousal level experienced by the child. The arousal range is stored after a picture has been taken.

After a picture is taken, a screen is shown where the child can select a basic emotion using personalised pictures to represent the various emotions. When an emotion is selected, a sound mimicking the selected emotion is played (e.g. a laughing sound for ‘happy’). Sound can be disabled in the settings. When the done button is tapped, the selected emotion is stored together with the Q sensor data and automatically uploaded to the Dropbox account if activated.

CaptureMyEmotion allows the child or carer to set the language, as well as, the images for the emotions. Some children prefer icons (smiley type of images) to real pictures [17].

Pictures, contextual and sensor data are automatically downloaded to the tablet when Dropbox sharing is activated. By default, the pictures are organised in chronological order for each day. This might help reinforce the learning of narrative, which has been observed as difficult for autistic children [18]. Pictures, videos and sounds can also be organised based on date, carer-rating and self reported emotion.

Figure 1. Review screens

Figure 1 (right) shows pictures filtered on ‘happy’. Under each picture, it shows the carer rating (thumbs), the number of views and the arousal level (gauge) around the time the picture was taken.

When a picture is selected for review, the child can assign an emotion to the picture again and the next screen shows a summary (Figure 1 right). The summary shows the current emotion coupled with a real-time feed of the arousal level of the user. It also shows the emotion selected by the child at the time the picture was taken together with the arousal range detected then.

When reviewing the pictures, the child has the opportunity to express their feelings towards a certain picture in the company of a carer. The use of the picture, selected emotion and arousal gauge helps the child to overcome the difficulty of communicating with another person. This works in a similar way to the picture card method for children who might not be able to fully verbalise their emotions [19]. Therefore, the review gives ample opportunity to discuss the difference in the emotion felt during review compared to the emotion felt immediately after the picture was taken. This discussion could allow the child to delve
into the reasons behind why he felt a certain way at a certain time.

If the child wears the sensor, the real-time arousal level is shown as detected by the Q sensor. This gives the carer insight into what emotion the picture evokes, or can highlight that the child is getting tired of doing the review or being distracted by other external factors. This can be used in the discussion with the child, or as an indicator that the carer should switch to another activity.

The carer can comment and rate the picture as seen fit. The carer rating (number of thumbs-up) allows the carer to express the review result of a picture with the child (e.g.: 0—no review, 1—very poor, 5—very good).

Data accumulated from the carer and user can be presented in progress reports. For example, a graph detailing the total number of thumbs accumulated against time. The child/carer is also able to see how many times a certain rating (i.e. number of thumbs) has been awarded over a certain period of time. Furthermore, the user is able to view the number of thumbs received filtered on a particular emotion, location or comments.

4. Conclusion

This paper presented an overview of CaptureMyEmotion, an app for smartphones and tablets. It aims to help autistic children understand their emotions with the support of a mobile device and sensors. Since every child is different, the frequency of use of the app, and the number of feedback sessions highly depends on the child’s interest and capabilities, as well as, on the carer’s objectives. CaptureMyEmotion is a tool and (by choice) it allows the carer choose what they want to do with the collected information. For example, discuss what the child did during the day, understand emotions and identify what makes the child react.

Understanding and managing emotions is important for autistic children since it has an impact on how well they integrate into society.

We plan to trial CaptureMyEmotion on autistic and no autistic children to compare the autistic children’s reaction to the app against a baseline from non-autistic children. Based on feedback received we will improve the app and then make it available on Google Play.

5. References
All websites have been viewed on the 15th of May 2013.


to me

Dear Valerie,

Thank you for submitting your work to CBMS 2013.

After careful review and meta-review by the conference chairs, it is our great pleasure to inform you that your paper entitled

CaptureMyEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors

has been accepted for presentation in CBMS 2013.

Tomorrow you will be receiving the reviews of your paper, which we expect you to adhere to when preparing the camera-ready copy.

Instructions and deadlines for camera-ready preparation and registration will also be sent tomorrow.

Looking forward to seeing you in Porto in June!

The Conference Chairs

Pedro Pereira Rodrigues
Mykola Pechenizkiy
Joao Gama
Agma Traina
Ricardo Cruz-Correia
Jiming Liu
Peter Lucas
Paolo Soda
CBMS 2013

26th IEEE INTERNATIONAL SYMPOSIUM ON COMPUTER-BASED MEDICAL SYSTEMS

PORTUGAL

20-22 JUNE UNIVERSITY OF PORTO
FRIDAY 21 June 2013

DATA ANALYSIS 3: Image Data
CHAIR Agma Traina
Auditorium

16h30
Reducing the Complexity of k-Nearest Diverse Neighbor Queries in Medical Image Datasets through Fractal Analysis
Rafael Dias, Renato Bueno and Marcela Ribeiro

17h00
Can we Distinguish Between Benign and Malignant Breast Tumors in DCE-MRI by Studying a Tumor’s Most Suspect Region Only?
Sylvie Glasser, Ulf Niemann, Barnhard Preim and Myra Spiliopoulou

17h30
Fully-Automatic Tool for Morphometric Analysis of Myelinated Fibers
Rômulo Novas, Valéria Fazen and Joaquim Felipe

18h00
Graph-Based Retrieval of PET-CT Images using Vector Space Embedding
Ashnil Kumar, Jinman Kim, Michael Faturam and Dagan Fang

18h15
Parallel Multi-Material Decomposition of Dual-Energy CT Datasets
Rafael Simões Meia, Christian Jacob, J. Ross Mitchell, Amy K. Hara, Alvin C. Silva and William Pawlick

INDIVIDUALISED CARE 3: Smart Technology II
CHAIR Peter Lucas
Room 1

16h30
Smart-phone Application Design for Lasting Behavioral Changes
Elani Stouilla, Shaye Leibnitz, Berline Bocelli, Dylan Gibbs, Robert Laderer, Robert Faulkner, Janet Ferguson-Roberts and Brad Mullen

17h00
CaptureEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors
Peter Leijdekkers, Valerie Gay and Frederick Wong

17h15
A Prognosis System for Colorectal Cancer
Tiago Oliveira, Ernesto Barboza, Sandra Martins, André Ocolart, Paulo Novais and João Novais

17h30
A Multi-Functional Mobile Information System for Hospital Assistance
Crista Cavada, Manfred Mitterer, Omar Wolng, Francesco Rocci and Fiorenzo Zini

IT ISSUES IN HEALTHCARE 3: Systems Integrating

16h30
HL7 FHIR: An Agile and RESTful Approach to Healthcare Information
Duane Bender and Kamran Sarathi

17h00
Towards Organ-centric Compositional Development of Safe Networked Supervisory Medical Systems
Woohul Kang, Pofang Wu, Meryem Ranenheir, Lui Sha, Richard J. Giumri

17h15
Survey of openEHR Storage Implementations
Samuel Frade, Sergio M. Freire, Erik Sundvall, José Hilário Patrício-Albuquerque and Ricardo Cruz-Correia

18h00
Integrating Echocardiogram Reports with Medical Imaging
Luís António Bastião Silva, Samuel Campos, Carlos Costa and José L

18h15
Using a Clinical Document Importance Estimator to Optimize an Electronic Clinical Report Retrieval System
José Hilário Patrício-Albuquerque, Bruno Santos and Ricardo João Cruz-
ORGANIZATION COMMITTEE

General Chairs
Pedro Pereira Rodrigues: University of Porto & LIAD / INESC TEC, Portugal
Mykola Pechenizkyi: Eindhoven University of Technology, the Netherlands
João Gama: University of Porto & LIAD / INESC TEC, Portugal

Program Chairs
Ricardo Cruz Correia: University of Porto & CINTESS, Portugal
Jiming Liu: Hong Kong Baptist University, Hong Kong
Aírton Tavares: University of São Paulo, Brazil

Publication Chair
Paolo Sode: Università Campus Bio-Medico di Roma, Italy

Special Track Chairs
Peter Lucas: Radboud University Nijmegen, the Netherlands
Paolo Sode: Università Campus Bio-Medico di Roma, Italy

Publicity Chair
Daniel Pereira: IT & CINTESS, Portugal
Call for Papers

The 26th IEEE International Symposium on Computer-Based Medical Systems (CBMS 2013) will be held at the University of Porto, Porto, Portugal, from June 20th to 22th, 2013. The scientific program of CBMS 2013 will consist of regular and special track sessions with technical contributions reviewed and selected by an international programme committee, as well as keynote talks and tutorials given by leading experts in their fields.

The symposium is the premier conference for computational medicine, providing a mechanism for the exchange of ideas and technologies between academics and industrial scientists, and attracts a worldwide audience. Regular and special track presentations will cover a broad range of issues in (but not limited to) the following areas:

- Software Systems in Medicine
CBMS 2013 invites original previously unpublished contributions that are not submitted concurrently to a journal or another conference. Many of the topics listed on the home page will be represented by corresponding special tracks, while others are solely covered by the general (main) CBMS track. Prospective authors are expected to submit their contributions to one of the corresponding special tracks or to the general track if none of the special tracks are relevant.

Each contribution must be prepared following the IEEE two-column format, and should not exceed the length of 6 (six) Letter-sized pages; the authors may use LaTeX or Microsoft Word templates when preparing their drafts. The papers should be submitted electronically before the paper submission deadline using the EasyChair online submission system. Papers must be submitted in PDF format, with fonts embedded. All submissions will be peer-reviewed by at least three reviewers. Each program committee of the corresponding special track or general track will be responsible for the final decision about acceptance of papers submitted to that track.

All accepted papers will be included in the conference proceedings, and will be submitted for inclusion into IEEE Xplore. At least one author must pay the registration fee before April 24, 2013 for each accepted paper.

Please refer to the IEEE IPR guidelines concerning copyright. Authors of accepted papers must include a completed IEEE Copyright Form with the submission of their final camera-ready paper.

Best papers will be invited to submit extended versions for special issues of journal of the area.

**Important Dates**

**Paper submission:** 31st January 2013 21st February 2013 **EXTENDED**

**Notification:** 10th March 2013 7th April 2013 **EXTENDED**

**Registration for authors:** 10th April 2013 24th April 2013 **EXTENDED**

**Camera-ready paper submission:** 10th April 2013 1st May 2013 **EXTENDED**

**CBMS symposium:** 20th - 22nd June 2013
Emerging Smart Technologies for Individualised Healthcare (CBMS 2013 Special Track)

26th International Symposium on Computer-Based Medical Systems (CBMS)
University of Porto, Portugal, 20-22 June 2013

Special Track

EMERGING SMART TECHNOLOGIES FOR INDIVIDUALISED HEALTHCARE

Program chairs

- Marina Velikova (Radboud University Nijmegen, The Netherlands)
- Peter Lucas (Radboud University Nijmegen, The Netherlands)
- Feminca Gaviary-Seznar (Lawson Health Research Institute, Canada)
- Inês Dutra (University of Porto, Portugal)

Program committee

- Isabelle Bichindaritz, University of Washington, USA
- Linda Dawson, University of Wollongong, Australia
- Kerstin Denecke, IDS Research Center Hannover, Germany
- Flora Musgrove, Imperial College London, UK
- Jussi Huov, University of Waterloo, Canada
- Val Jones, University of Twente, The Netherlands
- Michel Klein, Free University Amsterdam, The Netherlands
- Patty Kostkova, City University, London, UK
- Helena Lindgren, Umeå University, Sweden
- Rogue Marín Morales, University of Murcia, Spain
- Felipe Ortuño-Elías, Computational Sciences Coordination at INAOE, Mexico
- Cecile Paris, CSIRO ICT Centre, New South Wales, Australia
- Nils Peuck, Academic Medical Center - University of Amsterdam, The Netherlands
- Jose Pella, Linköping University, Sweden
- Domenico Pisandri, Institute of Cognitive Sciences and Technologies, Italy
- Jan Rasm, KU Leuven, Belgium
- David Riano Ramos, Rovira I Virgili University, Spain
- Günther Schreier, Austrian Institute Of Technology, Austria
- Danielle Sert, AMC University of Amsterdam, The Netherlands
- Andrei Vasilias, Politehnica University of Bucharest, Romania
- Miriam Voitenbroek, Roessingh Research and Development, The Netherlands
- Miguel A. Zamora, University of Murcia, Spain

Last updated on 8 April 2013
Emerging Smart Technologies for Individualised Healthcare (CBMS 2013 Special Track)

26th International Symposium on Computer-Based Medical Systems (CBMS)
University of Porto, Portugal, 20-22 June 2013

Special Track

EMERGING SMART TECHNOLOGIES FOR INDIVIDUALISED HEALTHCARE

The submission deadline is EXTENDED: February 21, 2013

The current technological developments and the increasing willingness of people to be involved in making decisions about their health or disease, have been paving the way for advances in the area of individualised healthcare.

The uncertainty and complexity within this area require smart solutions and systems, which are capable to interpret context-specific information concerning the patient and his/her environment.

In this special track, we seek high quality contributions and innovations in the interdisciplinary area of smart healthcare technologies. The track is an integral part of the 26th International Symposium on Computer-Based Medical Systems (CBMS 2013), held at the University of Porto, Portugal on 20-22 June 2013.

For more information about this track, please contact one of the organisers.

Marina Vetelino & Peter Lucas
Faculty of Science
Radboud University Nijmegen
P.O. Box 9010
6500 GL Nijmegen
The Netherlands
Telephone: +31 24 3652 104/611
Fax: +31 24 3853096
marinav@cs.ru.nl
peterl@cs.ru.nl

Femida Gwadry-Sridhar
Health Informatics
Lawson Health Research Institute
901 Commissioners Rd., Suite 83041
London, Ontario N6C 5C1
Canada
Telephone: +1 519 667 8600
Fax: +1 519 667 8629
Femida.GwadrySridhar@hsc.on.ca

Info Dutra
Dept. of Computer Science
University of Porto
Rua Campo Alegre 1021/1055
Porto 4169-007
Portugal
Telephone: ++351 220 402 947
Fax: +351 220 402 950
lines@dcc.fc.up.pt

Last updated on 6 April 2013
EMERGING SMART TECHNOLOGIES FOR INDIVIDUALISED HEALTHCARE

Topics of Interest

This special track seeks papers that describe original and unpublished contributions covering not only a broad range of current topics of interest but also innovative and future trends in the development of the emerging field of individualised healthcare:

- Intelligent care assistants with embedded individualised decision-support
- Context-aware monitoring devices, sensors and networking
- Home-based diagnosis and treatment support
- Utilisation of workflows for remote chronic disease management
- Advanced healthcare services
- Smart mobile health
- Intelligent approaches to healthcare delivery process
- Preventive and health screening services at distance
- Cloud-based/SOA technologies for individualised healthcare
- Individualised user interfaces, visualisation and patient-device interaction models
- Quality evaluation criteria and evidence-based frameworks

Last Updated on 8 April 2013
EMERGING SMART TECHNOLOGIES FOR INDIVIDUALISED HEALTHCARE

Scope

The latest demographic changes worldwide and advances in information and communication technologies have motivated the development of healthcare systems moving the point of care closer to the patients allowing them more active involvement. To guarantee maximum health benefits to patients, and reduce the amount of effort and costs for the care givers, these systems should be smarter than the former telemedicine solutions lacking support for individualised disease management due to the intrinsic complexity and uncertainty in the medical domain.

Here smart implies that the system is capable of interpreting information within context, which can be broadly considered as patient-, disease-, or environment-specific, and attempts to solve problems at a level equivalent to or even better than human experts. The intelligence can be embedded in various ways, for example, by designing and implementing decision-support models, which can run in a stand-alone computing device such as a smartphone, by enabling system’s adaptation through user parameters, by embedding alerting modules into sensors or medical devices that can process measurements and warn of changes in a patient’s condition.

Deploying such smart technologies is expected to highly support individualisation—an emerging dimension of healthcare—by providing services and solutions that are tailored to the individual’s needs and preferences. Any development in this direction, of course, faces challenges and requires enhanced efforts with respect to knowledge acquisition and representation, secure and user-tailored system design, evaluation and affordable deployment.

The aim of this special track is to provide a dedicated platform specifically designed for computer scientists, clinical informaticists, researchers, engineers and practitioners to present and discuss their recent work and innovations in the interdisciplinary area of smart healthcare technologies for individualised healthcare, and to consider potential collaborations and future directions for development.

Last updated on 8 April 2013
Welcome

Info for Authors
General Track
Special Tracks
Invited Speakers
Big Data Analysis
Important Dates
Registration
Program
Organization
Contacts
Program Committee
Steering Committee
Venue
Travel
Accommodation
Midsummer in Porto
Partners

Search

Useful Links

CBMS 2012

Special Tracks

Important Dates

Paper submission: 31st January 2013 - 21st February 2013 ** EXTENDED **
Notification: 10th March 2013 - 7th April 2013 ** EXTENDED **
Registration for authors: 10th April 2013 - 24th April 2013 ** EXTENDED **
**ST01: Teamwork, collaboration and patient-centered care**

Bridget Kane : NTNU, Trondheim, Norway & The University of Dublin, Ireland  
Saturnino Luz : The University of Dublin, Ireland  
Pieter Toussaint : NTNU, Trondheim, Norway

**ST02: Learning-based biomedical information systems**

Mykola Pechenizkiy : Eindhoven University of Technology, The Netherlands  
Seppo Puuronen : University of Jyvaskyla, Finland  
Paolo Soda : Universita Campus Bio-Medico di Roma, Italy  
Francesco Tortorella : Universita degli Studi di Cassino, Italy  
Alexey Tsymbal : Siemens AG, Germany

**ST03: Ontologies, terminologies and language processing**

Tony Solomonides : NorthShore University HealthSystem, Illinois, USA

**ST04: Grid and cloud computing in biomedicine and life sciences**

Giovanni Aloísio : University of Salento & CMCC, Italy  
Maria Mirto : University of Salento & CMCC, Italy  
Víctor Maojo : Universidad Politécnica de Madrid, Spain  
Nikos Karacapilidis : University of Patras & CTI, Greece  
Tony Solomonides : NorthShore University HealthSystem, Illinois, USA  
Alfredo Tirado-Ramos : Emory University, Atlanta, USA

**ST05: Intelligent patient management**

Sally Mclean : Queen's University Belfast, UK  
Adele Marshall : University of Ulster, UK

**ST06: Endoscopic image processing and analysis**

Andreas Vécei : St. Anna Children's Hospital, Austria
ST07: **Processing and managing medical data streams**

Pedro Pereira Rodrigues: University of Porto, Portugal
Mohamed Medhat Gaber: University of Portsmouth, United Kingdom
Carolyn McGregor: University of Ontario Institute of Technology, Canada
Mykola Pechenizkiy: Eindhoven University of Technology, The Netherlands

ST08: **Emerging smart technologies for individualised healthcare**

Marina Velikova: Radboud University Nijmegen, The Netherlands
Peter Lucas: Radboud University Nijmegen, The Netherlands
Femida Gwadry-Sridhar: Lawson Health Research Institute, Canada
Ines Dutra: University of Porto, Portugal

ST09: **Computer-assisted analysis of capillaroscopic images**

Cesare Valenti: Universita degli Studi di Palermo, Italy
Giuseppe Scardina: Universita degli Studi di Palermo, Italy
Alessio Adamo: Adamo S.r.l, Italy
Paolo Soda: Universita Campus Bio-Medico di Roma, Italy

ST10: **Bioinformatics: towards personalized medicine from omics data**

Pietro Hiram Guzzi: University Magna Graecia of Catanzaro, Italy
Giovanni Cuda: University Magna Graecia of Catanzaro, Italy
Marco Gaspari: University Magna Graecia of Catanzaro, Italy
Pierangelo Veltri: University Magna Graecia of Catanzaro, Italy
Mario Cannataro: University Magna Graecia of Catanzaro, Italy

ST11: **Image processing for ophthalmology: challenges in retinal analysis and related fields**

Alfredo Ruggeri: University of Padova, Italy
Domenico Tegolo: University of Palermo, Italy
Emanuele Trucco: University of Dundee, UK

ST12: **Security and privacy in healthcare IT**
ST13: Data and information quality in healthcare management

Alberto Freitas: University of Porto, Portugal
Ismael Caballero: University of Castilla La Mancha, Spain
Paulo Oliveira: Politechnic Institute of Porto, Portugal
Cesar Guerra: University of Castilla La Mancha, Spain

ST14: Fetal monitoring signal analysis

Cristina Costa Santos: University of Porto, Portugal
Hernani Gonçalves: University of Porto, Portugal
Luis Antunes: University of Porto, Portugal

ST15: Informatics challenges of patient centric health and social care

Claudia Pagliari: University of Edinburgh, UK
Jacob Hofdijk: Casemix, The Netherlands

ST16: Medical education enhanced by technology and computer driven simulators

Statthia Konstantinidis: Northern Research Institute of Tromso, Norway
Panagiotis Bamidis: Aristotle University of Thessaloniki, Greece
Luis Fernandez-Luque: Northern Research Institute of Tromso, Norway
Adam I. Levine: Mount Sinai School of Medicine, New York, USA
Marina Krol: Mount Sinai School of Medicine, New York, USA
Samuel DeMaria: Mount Sinai School of Medicine, New York, USA
Invited Speakers

Jeremy Wyatt

University of Leeds, UK
Why engineers and clinicians don’t talk the same language - and what to do about it

Abstract: In my experience, many presentations at AIME, IEEE or EFMI conferences describe work by engineers using patients as a source of data to explore new modelling methods, with few papers addressing real world clinical problems, let alone demonstrating convincing solutions to them. At a superficial level, this arises because it is hard to engage doctors in such projects and healthcare and medical work are very complex, so it takes years of exposure to clinicians and their world for an engineer to understand real-world patient management problems in sufficient detail to help solve them. To put it another way, while an engineer might believe they have solved the problem, to a clinician, they have only explored an irrelevant simplification of it. Cynics might be less fair, observing that medical research is well funded, so there is a tendency for engineers to apply any novel engineering method to a simplified health problem. This is more likely to attract funding than applying it to, say, linguistics.

However, I believe the deeper reason that so few bioengineering projects seem to bear clinically digestible fruit is big differences in motivation, perspective and the research methods used in the engineering and healthcare research domains, and in the kind of problems they addressed.

This talk is an attempt to explore the similarities and differences between engineering and healthcare as research disciplines, their respective approaches to problem solving and to build bridges between these two very different worlds. For example, the engineering approaches used in the influential Virtual Physiological Human programme mainly involve data mining and modelling, while clinicians emphasise using psychological, social or other theories to understand and formalise a complex problem first, then use empirical testing to find out whether a theory-based solution works – the evidence based approach.

It is unhelpful for doctors to criticise engineers – and for engineers to criticise doctors – as being poor collaborators in multidisciplinary projects. The aim of this talk is to move beyond name calling and explore common ground constructively and provoke useful reflection and discussion, both within and across these disciplines.

In conclusion, unless we explore this uneasy stand-off between engineers and clinicians, confront it head on and provoke debate, it looks set to continue. This will reduce productivity on both sides and limit the enormous scientific and patient benefits that innovative, well-engineered clinical systems can undoubtedly generate.

Pedro Larrañaga and Concha Bielza
Universidad Politécnica de Madrid, Spain

Bayesian networks to answer challenging neuroscience questions

Abstract: In this keynote lecture we will show how Bayesian networks can address important neuroscience problems. These problems include: (a) neuroanatomy issues, like modeling and simulation of dendritic trees, inferring electrophysiological behavior from morphological neuron characteristics, and classifying neuron and spine types based on morphological features; (b) neurodegenerative diseases, like predicting health-related quality of life in Parkinson’s disease, classification of dementia stages in Parkinson’s disease and searching for genetic biomarkers in Alzheimer’s disease.

Bharat Rao
Deloitte, USA
Big Data Analysis

Big Data Systems and Services for Healthcare

Abstract: The discussion involved in this panel aims to contribute to improving healthcare through better data utilization. The escalating demand for integrating distributed data, data streamed from body sensors, other medical episodes, and genetic conditions has influenced both the public and private health sectors demanding results and ideas of how to provide such data infrastructures from which each type of stakeholder can build smart healthcare
applications. Truly effective healthcare needs to make use of all sources of information dealing with highly distributed data at different 'speeds' and levels of openness, frequently crossing organisational borders. Every aspect of medical practice, research and policy ideally needs to make optimal use of information to deliver the best possible healthcare services. There is growing recognition of 'data' being a valuable digital asset providing opportunity for platforms to maximise data exploitation, i.e. "turning data into gold". Healthcare IT systems increasingly do not exist in vacuum, and require an information lingua franca to enable globalisation effects. Other sub-topics that could be potentially covered include the following:

- Systems or services managing healthcare data
- Implications of intersecting social media and Healthcare
- Applied research on utilizing Big Data for releasing medical applications
- Methods or systems for optimizing data utilization
- Challenges for identity management, security authorisation, access delegation, policy, and audit
- Data-oriented architectures for interconnectivity and interoperability
- Systems integrating streaming healthcare data (i.e. from sensors)
- Data mining over large volumes of archived medical data
- Methods for incorporating information exchange standards in medical systems
Program Committee

Adele Marshall: Queen's University of Belfast, UK
Agma Traina: University of Sao Paulo, Brazil
Alberto Freitas: Faculty of Medicine of the University of Porto, Portugal
Alexander Hörbst: UMIT, Austria
Aleksandra Tesanovic: Philips Research
Alexandros Karargyris: National Library of Medicine
Alfredo Petrosino: University of Naples "Parthenope", Italy
Alvaro Rocha: LIACC, University of Porto, Portugal
Ana Lucas: ISEG, Technical University of Lisbon, Portugal
Benyun Shi: Hong Kong Baptist University, China
Bo Yang: Jilin University, China
Bridget Kane: Trinity College and St. James's Hospital, Dublin, Ireland
Carlo Sansone: University of Naples "Federico II", Italy
Cesare Fabio Valenti: Università' di Palermo, Italy
Chandan Reddy: University of Washington, USA
Chaoyi Pang: The Australian e-Health Research Centre, CSIRO
Chongsheng Zhang: Norwegian University of Science and Technology, Norway
Chris Nugent: University of Ulster, UK
Courtney Corley: Pacific Northwest National Laboratory
David Riaño: Universitat Rovira i Virgili, Spain
D. J. Lee: Brigham Young University, USA
Dmitry Goldgof: University of South Florida, USA
Francesco Tortorella: Università di Cassino, Italy
Gang Luo: IBM T.J. Watson Research Center
Gennaro Percannella: Università di Salerno, Italy
Giulio Iannello: Università Campus Bio-Medico di Roma, Italy
Henning Müller: HES-SO
Hiromasa Horiguchi: University of Tokyo, Japan
Huseyin Seker: De Montfort University, UK
Ilidio Oliveira: University of Aveiro, Portugal
Isabelle Bichindaritz: State University of New York at Oswego, USA
Jiming Liu: Hong Kong Baptist University, China
João Bernardes: Faculty of Medicine of the University of Porto, Portugal
Joao Eduardo Ferreira: University of Sao Paulo, Brazil
Joaquim Cezar Felipe: University of Sao Paulo, Brazil
Joon Lee: Harvard-MIT Division of Health Sciences and Technology, USA
José Alberto Maldonado: Universidad Politécnica de Valencia, Spain
Josipa Kern: Zagreb University Medical School, Croatia
Kevin Butterworth: Cardiff University, UK
Kerstin Denecke: University of Hannover, Germany
Luis Filipe Antunes : University of Porto, Portugal

Marcela Ribeiro : Federal University of Sao Carlos, Brazil

Maria Mirto : National Nanotechnology Laboratory and the University of Lecce, Italy

Martin Dugas : University of Munster, Germany

Maryati Mohd Yusof : UKM

Michael Zhang : Winnipeg Regional Health Authority, Canada

Michael A. Shifrin : N.N.Burdenko Neurosurgical Institute

Michel Barlaud : I3S lab., Nice Sophia-Antipolis univ./CNRS, France

Miguel Coimbra : University of Porto, Portugal

Miria Koshy : Warwick Business School, UK

Mykola Pechenizkiy : Eindhoven University of Technology, Netherlands

Paolo Soda : Università Campus Bio-Medico di Roma, Italy

Pasquale Foggia : University of Naples "Federico II", Italy

Pedro Pereira Rodrigues : Faculty of Medicine of the University of Porto, Portugal

Peter Lucas : Radboud University Nijmegen, Netherlands

Petra Perner : Institute of Computer Vision and Applied Computer Sciences

Pierangela Samarati : University of Milan, Italy

Pierangelo Veltri : Laboratory of Bioinformatics, University of Catanzaro, Italy

Ranadip Pal : Texas Tech University, USA

Ricardo Correia : Faculty of Medicine of the University of Porto, Portugal

Riccardo Bellazzi : Università di Pavia, Italy

Rong Chen : Karolinska Institutet, Sweden

Sandra Geisler : RWTH Aachen University, Germany

Sebastián Ventura : Shusaku Tsumoto Shimane University, Japan

Sergi Robles : Autonomus University of Barcelona, Spain

Shusaku Tsumoto : Shimane University, Japan

Tapio Seppänen : University of Oulu, Sweden

Victor Manuel Maojo-Garcia : Universidad Politécnica de Madrid, Spain

Vincent S. Tseng : National Cheng Kung University, Taiwan

Vlado Stankovski : University of Ljubljana, Slovenia

Wei Jin : North Dakota State University, USA

William K. Cheung : Hong Kong Baptist University, China

Xuning Tang : Drexel University, USA

Yuanyuan Wang : Fudan University, China

Zilma Reis : Federal University of Minas Gerais, Brazil
CBMS 2013

welcome

Info for Authors
General Track
Special Tracks
Invited Speakers
Big Data Analysis
Important Dates
Registration
Program
Organization
Contacts
Program Committee
Steering Committee
Venue
Travel
Accommodation
Midsummer in Porto
Partners

Search

Useful Links

CBMS 2012

Partners

U. PORTO

CINTESIS

INESCTEC
opportunity
city
welcome

- Accepted Papers
- Papers by Session
- Special Tracks
- Invited Speakers
- Big Data Analysis
- Program Overview
- Organization
- Program Committee
- Steering Committee
- Partners

Papers by Session

Data Analysis 1: Clinical Data

20 Costing Mixed Coxian Phase-type Systems in a given time interval
  Sally McLean, Lalit Garg and Ken Fullerton

85 Using Probabilistic Logic and the Principle of Maximum Entropy for the Analysis of Clinical Brain
  Tumor Data
  Julian Varghese, Christoph Boerle, Nico Potyka and Gabriele Kern-Isberner

135 Application of Different Classification Techniques on Brain Morphological Data
  Alessia Sarica, Claudia Critelli, Pietro Hiram Guzzi, Antonio Cerasa, Aldo Quattrone and Mario Cannataro

158 Predicting visualization of hospital clinical reports using survival analysis of access logs from a virtual
  patient record
  Pedro Pereira Rodrigues, Claudia Camila Dias, Diana Rocha, Isabel Boldt, Armando Telles-Pinto and Ricardo
Knowledge on Heart Condition of Children based on Demographic and Physiological Features
Pedro Ferreira, Tiago Vinhoza, Ana Castro, Felipe Mourato, Thiago Tavares, Sandra Mattos, Inês Dutra and Miguel Coimbra

Data Analysis 2: Fetal Monitoring

Hurst Exponent and Intrapartum Fetal Heart Rate: Impact of Decelerations
Patrice Abry, Stephan G. Roux, Václav Chudáček, Pierre Borgnat, Paulo Gonçalves and Muriel Doret

Prenatal observation of heart rate sequences presenting entropic analogies with Sudden Infant Death Syndrome: preliminary report
Patrick Zemb, Hernâni Gonçalves, Jean-Yves Bellec and João Bernardes

A system for the automatic measurement of the nuchal translucency thickness from ultrasound video stream of the foetus
Anna Anzalone, Giovanni Fusco, Francesco Isisro, Emanuela Orlandi, Roberto Prevete, Giuseppina Sciortino, Domenico Tegolo and Cesare Valenti

An adaptive method for the recovery of missing samples from PHR time series
Vangelis Oikonomou, Jirka Spilka, Chrysostomos Stylios and Lenka Lhotska

Data Analysis 3: Image Data

Can we Distinguish Between Benign and Malignant Breast Tumors in DCE-MRI by Studying a Tumor’s Most Suspect Region Only?
Sylvia Glasser, Uli Niemann, Bernhard Preim and Myra Spilipoulou

Reducing the Complexity of k-Nearest Diverse Neighbor Queries in Medical Image Datasets through Fractal Analysis
Rafael Dias, Renato Bueno and Marcela Ribeiro

Graph-Based Retrieval of PET-CT Images using Vector Space Embedding
Ashnil Kumar, Jinman Kim, Michael Fulham and Dagan Feng

Fully-Automatic Tool for Morphometric Analysis of Myelinated Fibers
Rômulo Novas, Valéria Fazan and Joaquim Felipe

Computer-aided Capsule Endoscopy Images Evaluation based on Color Rotation and Texture Features: An educational tool to physicians
Vasileios Charisis, Christina Katsimerou, Leonios Hadjileontiadis, Christos Liatsos and George Sergiadis

Data Analysis 4: Signal Data

Towards Medical Device behavioural validation using Petri nets
Paulo Barbosa, Luis Gomes, Jorge Figueiredo, Misael Morais, Kátia Galdino, Filipe Moutinho and Melquisedec Andrade

Anisotropy Correction of Medical Image Data Employing Patch Similarity
Mohammad H. Keyhani, Wissam El Hakimi and Stefan Wesarg

Accurate Super-Resolution Reconstruction for CT and MR Images
Wissam El Hakimi and Stefan Wesarg

Cardiovascular variability and nociception/anti-nociception balance during anesthesia
Ana Castro, Pedro Amorim and Miguel T. Coimbra

An Intelligent Adaptive filter for fast tracking and elimination of Power Line Interference from ECG Signal
Nauman Razzaq, Maryam Butt, Rahat Ali, Muhammad Salman, Ismail Sadiq, Khalid Munawar and Tahir Zaidi

Education Enhanced by Simulation 1

A virtual reality simulator combining a learning environment and clinical case database for image-guided prostate biopsy
Sonia-Yuki Selmi, Gaëlle Fiard, Emmanuel Promayon, Lucile Vadcard and Jocelyne Troccaz

Learner’s satisfaction within a breast imaging eLearning course for radiographers
Inès C. Moreira, Sandra Rua Ventura, Isabel Ramos and Pedro Pereira Rodrigues

Agent Based Simulation for Training and Assessing Students in the Field of Anesthesiology
Jason H. Epstein, Matthew Levin, and Mark S. Jowell

Education Enhanced by Simulation 2

Minimally invasive surgical skills evaluation in the field of otolaryngology
Alejandro Cuevas Jacobo, Daniel Loria Espinoza, Arturo Minor Martínez, José Antonio Gutiérrez Gncechi and Rigo Martínez Mendez

Taking the next step in computer-based full-body patient simulation: The Münze® Advantage
Daniel Katz and Hugo Azevedo

E-learning in Teaching Pharmacology and Toxicology - the Halle Experience
Joachim Neumann, Katja Ruf and Ulrich Gergs

A Health Information Recommender System: enriching YouTube Health Videos with Medline Plus Information by the use of SNOMEDCT terms
Alejandro Rivero Rodriguez, Stathis Konstantinidis, Carlos Luis Sánchez Bocanegra and Luis Fernández Luque

Endoscopic Image Analysis

On the Effects of De-Interlacing on the Classification Accuracy of Interlaced Endoscopic Videos with Indication for Celiac Disease
Sebastian Hegenbart, Andreas Uhl, Andreas Vécsei and Georg Wimmer

Impact of SVM Multiclass Decomposition Rules for Recognition of Cancer in Gastroenterology Images
Ricardo Sousa, Mário Dinis Ribeiro, Pedro Pimentel Nunes and Miguel Tavares Coimbra

POCS-based Super-Resolution for HD Endoscopy Video Frames
Michael Hafner, Michael Liedlgruber and Andreas Uhl

A Curvelet-based Lacunarity Approach for Ulcer Detection from Wireless Capsule Endoscopy Images
Alexis Eid, Vasileios Charisis, Leontios Hadjileontiadis and George Sergiadis
Grid & Cloud Computing

66 A Multi-Domain Platform for Medical Imaging
Carlos Viana-Ferreira, Carlos Costa and José Luís Oliveira

89 Implementing Public Health Analytical Services: Grid Enabling of MetaMap
Kailah Davis, Ronald Price and Julio Facelli

153 Identifying gaps in health research and training in Africa: designing online surveys for Cloud-oriented training
Ana Jimenez-Castellanos, Maximo Ramirez-Robles, Aly Khalifa, Caroline Perrin and Victor Maojo

194 A Comprehensive Cloud-based Remote Hearing Diagnosis System
Jianchu Yao, Daoyuan Yao, Sunghan Kim and Gregg Givens

Image Retrieval & Simulation

30 Simulation of Soft Tissue Deformation: a New Approach
Ana C. M. T. G. Oliveira, Wyllian Brito, Jéssica Santos, Romero Tori, Helton H. Biscaro and Fátima L. S. Nunes

35 Adaptation of Marching Cubes for the Simulation of Material Removal from Segmented Volume Data
Sudanthi Wijewickrema, Ioanna Ioannou and Gregor Kennedy

43 Does a CBIR system really impact decisions of physicians in a clinical environment?

178 A Medical Content Based Image Retrieval System with Eye Tracking Relevance Feedback
Francesco Maiorana

Image Segmentation

52 Region-based active contours for computer-aided analysis of carotid Phase Contrast MRI
Guillaume Trébuchet, Jean-Baptiste Fasquel, Aldéric Lecluse, Christine Cavaro Ménard and Serge Willoteaux

123 Cost sensitive adaptive random subspace ensemble for computer-aided nodule detection
Peng Cao, Dazhe Zhao and Osmar Zaíane

161 Parallel Multi-Material Decomposition of Dual-Energy CT Data

162 Autopilot Spatially-Adaptive Active Contour Parameterization for Medical Image Segmentation
Eleftheria Mylona, Michalis Savelonas, Dimitris Maroulis and Athanassios Skodras

Individualised Care 1: Teamwork

57 Remote supported trauma care: Understanding the situation from afar
Marcus Nilsson, Kristina Groth, Alexander Nygling, Folke Hammarquist and Christoffer Jernling

73 Community Pharmacies and eHealth Services: Barriers and Opportunities for Real Primary Healthcare Integration
João Gregório, Tiago Lopes Ferreira, Afonso Cavaco, Miguel Mira Da Silva, Christian Lovis and Luis Velez
Lapão

142 In-class use of the nu-case Mobile Telehealth System in a Medical School
   Marcelo Ballaben Carloni, Manuel Cesario, Raquel Rangel Cesario, Saturnino Luz, Edson Margarido, Masood Masoodian and Daniel Facciolo Pires

160 Telenursing in colorectal cancer patient follow-up and treatment assessment: an ethnographic evaluation study
   Maria José Dias, Maria Fragoso, Lúcio Lara-Santos and Pedro Pereira Rodrigues

211 A Framework to Evaluate Technology to Support Collaboration in Healthcare
   Bridget Kane, Saturnino Luz and Pieter Toussaint

Individualised Care 2: Smart Technology I

55 Smart Technologies for Long-Term Stress Monitoring at Work
   Rafał Kocielnik, Fabrizio Maria Maggi, Natalia Sidorova, Joyce H.D.M. Westerink and Martin Ouwerkerk

122 AudioSense: Enabling Real-time Evaluation of Hearing Aid Technology In-Situ
   Syed Shabih Hasan, Farley Lai, Octav Chipara and Yu-Hsiang Wu

132 A Web-Based Medical Multimedia Visualisation Interface for Personal Health Records
   Michael de Ridder, Liviu Constantinescu, Lei Bi, Youn Hyun Jung, Ashnil Kumar, Jinman Kim, Michael Fulham and David Feng

Individualised Care 3: Smart Technology II

13 A Multi-Functional Mobile Information System for Hospital Assistance
   Dario Cavada, Manfred Mitterer, Omar Molling, Francesco Ricci and Floriano Zini

36 CaptureMyEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors
   Peter Leijddekers, Valerie Gay and Frederick Wong

172 Smart-phone Application Design for Lasting Behavioral Changes
   Eleni Strouilia, Shayna Fairbairn, Blerina Bazelli, Dylan Gibbs, Robert Lederer, Robert Faulkner, Janet Ferguson-Roberts and Brad Mullen

185 A Prognosis System for Colorectal Cancer
   Tiago Oliveira, Ernesto Barbosa, Sandra Martins, André Goulart, Paulo Novais and João Neves

IT Issues in Healthcare 1: Information Security

27 Data Reliability in Home Healthcare Services
   Sokratis Vavilis, Nicola Zannone and Milan Petkovic

108 An Extended Conceptual Model of Consent for Information Systems
   Christian Bonnici

114 Personal Health Information Detection in Unstructured Web Documents
   Amir Razavi and Kambiz Ghazinour

190 Physician’s awareness of e-prescribing security risks
   Hugo Rodrigues, Luis Antunes, Cristina Santos, Manuel Correia, Tiago Pinho and Hilário Gil Magalhães
IT Issues in Healthcare 2: Data Access

150 A Prototype for Solving Conflicts in XACML-based e-Health Policies
   Alessio Lunardelli, Ilaria Matteucci, Paolo Mori and Marinella Petrocchi

201 A cryptographic approach for monitoring patients with mild cognitive impairment and dementia
   Constantin Patsalidis

206 Peer-to-Peer Resource Discovery in Health Centers
   Maria Mirto, Massimo Cafaro and Giovanni Aloisio

207 A secure RBAC mobile agent access control model for Healthcare Institutions
   Cáitia Santos-Pereira, Alexandre B. Augusto, Ricardo Cruz-Correia and Manuel E. Correia

IT Issues in Healthcare 3: Systems Integration

22 Integrating echocardiogram reports with medical imaging
   Luis Antonio Bastiao Silva, Samuel Campos, Carlos Costa and José Luis Oliveira

106 Towards Organ-Centric Compositional Development of Safe Networked Supervisory Medical Systems
   Woohul Kang, Pailang Wu, Maryam Rahmaniheris, Lui Sha, Richard Berlin and Julian Goldman

170 Using a Clinical Document Importance Estimator to Optimize an Agent-Based Clinical Report Retrieval System
   José Hilário Patriarca-Almeida, Bruno Santos and Ricardo João Cruz-Correia

180 Survey of openEHR storage implementations
   Samuel Frade, Sergio M. Freire, Erik Sundvall, José Hilário Patriarca-Almeida and Ricardo Cruz-Correia

197 HL7 FHIR: An Agile and RESTful Approach to Healthcare Information Exchange
   Duane Bender and Kamran Sartipi

Learning-based Systems 1: Data streams

64 A Statistical Decision Tree Algorithm for Medical Data Stream Mining
   Miriel Teixeira Cazzolato and Marcela Xavier Ribeiro

140 Stress Detection from Speech and Galvanic Skin Response Signals
   Hindra Kurniawan, Alexandr Maslov and Mykola Pechenizkiy

167 ACLAC: An adaptive closed-loop anesthesia control
   Ayoze Marrero, Juan Mendez, Alexandr Maslov and Mykola Pechenizkiy

177 Cloud Framework for Real-time Synchronous Physiological Streams to Support Rural and Remote Critical Care
   Rishikesan Kamaleswaran, Anirudh Thommandram, Qi Zhou, Mikael Eldund, Yun Cao, W.P. Wong and Carolyn McGregor
Learning-based Systems 2: Data Sets

31 Evaluation of the Use of Computational Intelligence Techniques in Medical Claim Processes of a Health Insurance Company
  Flávio Henrique Duarte de Araújo, Lailson B. Moraes, Andre Santana, Pedro Santos Neto, Paulo Adeodato and Érico Meneses Leão

72 Challenges in Predicting Community Periodontal Index from Hospital Dental Care Records
  Daniel Vieira, Jaako Hollmén, Jari Linden and Jorma Suni

141 Biomedical classification tasks by softmax reconstruction in ECOC framework
  Roberto D'Ambrosio, Giulio Iannello and Paolo Soda

148 Examining the Learning Effects of a Low-Cost Haptic-Based Virtual Reality Simulator on Laparoscopic Cholecystectomy
  Chung Hyuk Park, Kenneth L. Wilson and Ayanna M. Howard

209 Automatic segmentation of the pectoral muscle in mediolateral oblique mammograms
  Claudio Marrocco, Mario Molinara and Francesco Tortorella

Ontologies & Language Processing

8 Creating openEHR Content to Different Moments of Care: Obstetrics Emergency Scenario
  Gustavo M. Bacelar-Silva, Ricardo Filipe Sousa-Santos and Ricardo Cruz-Correia

37 SemLink – Dynamic Generation of Hyperlinks to Enhance Patient Readability of Discharge Summaries
  Mehnaz Adnan, Jim Warren and Martin Orr

112 Automatic Mapping Tool of Local Laboratory Terminologies to LOINC
  Estibaliz Parcero, Jose Alberto Maldonado, Luis Marco, Montserrat Robles, Victoria Bérez, Toni Más and Mireia Rodríguez

133 Interpretation of laboratory examination results and their simple representation
  Takashi Okumura and Yuka Tateisi

144 A scalable ontology reasoner via incremental materialization
  Fazle Rabbi, Wendy MacCaull and Rokan Uddin Faruqui

Ophthalmologic & Capillaroscopic Image Analysis 1

58 Evaluation of SIRIUS retinal vessel width measurement in REVIEW dataset
  Sonia González Vázquez, Noella Barreira Rodríguez, Manuel González Penedo, Marta Pena Seijo and Francisco Gómez Ulla

69 Automatic No-Reference Quality Assessment for Retinal Fundus Images Using Vessel Segmentation
  Thomas Köhler, Attila Budai, Martin Kraus, Jan Odstrčilík, Georg Michelson and Joachim Hornegger

181 Automatic Detection of Microaneurysm Based on the Slant Stacking
  Jorge Oliveira, Graça Minas and Carlos Silva

Ophthalmologic & Capillaroscopic Image Analysis 2
19 Classification of Volumetric Retinal Images Using Overlapping Decomposition and Tree Analysis
  Abdulrahman Albarrak, Frans Coenen and Yalin Zheng

56 Optic Disk Localization using Fast Radial Symmetry Transform
  Attila Budai, Andre Aichert, Bronislav Vymazal, Joachim Hornegger and Georg Michelson

147 Segmentation of nailfold capillaries from microscopy video sequences
  Francesco Isgro, Francesco Pane, Giuseppe Porzio, Libero Cavaliere, Raffaele Pennarola and Elena Pennarola

164 Perceptually Adapted Method for Optic Disc Detection on Retinal Fundus Images
  Irene Fonon, Mark van Grinsven, Clarisa Sanchez and Aurora Saez

Ophtalmologic & Capillaroscopic Image Analysis 3

96 Automatic Nerve Tracking in Confocal Images of Corneal Subbasal Epithelium
  Enea Poletti and Alfredo Ruggeri

97 Validation of Microaneurysm-based Diabetic Retinopathy Screening across Retina Fundus Datasets
  Luca Giancardo, Fabrice Meriaudeau, Thomas Kornowski, Kenneth Tobin and Edward Chaum

145 Investigating Post-processing of Scanning Laser Ophthalmoscope Images for Unsupervised Retinal Blood Vessel Detection
  Gavin Robertson, Enrico Pellegrini, Calum Gray, Emanuele Trucco and Tom MacGillivray

187 A Manually-Labeled, Artery/Vein Classified Benchmark for the DRIVE Dataset
  Touseef Qureshi, Maged Habib and Bashir Al-Diri

Ophtalmologic & Capillaroscopic Image Analysis 4

78 Automatic Cyst Detection in OCT Retinal Images Combining Region Flooding and Texture Analysis
  Ana Gonzalez, Beatriz Remeseiro, Marcos Ortega, Manuel F. G. Penedo and Pablo Charlón

152 Semi-automatic registration of retinal images based on line matching approach
  Carmen Alina Lupascu, Domenico Tegolo, Fabio Bellavia and Cesare Valentí

182 Flow evaluation of red blood cells in capillaroscopic videos
  Cesare Fabio Valentí, Domenico Tegolo, Fabio Bellavia and Carmen Alina Lupascu

200 Reconstruction and error detection of blood vessel network from ultrasound volume data
  Kohji Masuda, Antoine Bossard, Yuki Sugano, Toshikazu Kato and Shinya Onogi

Poster

3 Utility of Privacy Preservation for Health Data Publishing
  Lengdong Wu, Hua He and Osman R. Zaiane

11 An Automatic Method for the Estimation of Arteriolar-to-Venular Ratio in Retinal Images
  Behdad Dashtbozorg, Ana Maria Mendonça and Aurélio Campilho

28 Modeling and Architecture Design of an MDPnP Acute Care Monitoring System
  Maryam Rahmanineris, Woohul Kang, Lue-Jane Lee, Lui Sha, Richard B. Berlin and Julian M. Goldman

39 ECG Delineation and Morphological Analysis for Firefighters Tasks Differentiation
  Susana Brás, José M. Fernandes and João P.S. Cunha
A Framework for Validation of Vessel Segmentation Algorithms
Klaus Drechsler, Steven Meixner, Cristina Oyarzun Laura and Stefan Wesarg

Quality Evaluation of Websites with Information on Oral Cancer in Portuguese Language
Gonçalo Monteiro, André Correia and João Leite-Moreira

Efficient Textural Model-Based Mammogram Enhancement
Michal Haindl and Václav Remes

Machine Learning Methods for In Vivo Skin Parameter Estimation
Saurabh Vyas, Amit Banerjee and Philippe Burlina

ALI: an Assisted Living System for Persons with Mild Cognitive Impairment
Esteban Guerrero, Juan Carlos Nieves and Helena Lindgren

Unified methodology for evaluating vessel tree tortuosity metrics in eye fundus images
Maria Luisa Sánchez Brea, Jorge Novo, Alba Fernandez and Jose María Barja

Design and Development of a Serious Game for Central Line Placement
Prabal Khanal, Daniel Katz, Samuel Demaria, Marina Krol and Kanav Kahol

Detection of Laser Marks in Retinal Images
João Miguel Pires Dias, Carlos Manta Oliveira and Luís A. Silva Cruz

Detection of Circular Content Area in Endoscopic Videos
Bernd Muenzer, Klaus Schoeffmann and Laszlo Boeszömerenyi

An automatic clinical document importance estimator for an existing electronic patient record architecture and implementation
Bruno Santos, Pedro Pereira Rodrigues and Ricardo Cruz Correia

Bridging the Gaps with KI2NA-LHC: Linking the Scientific and Clinical Data
Vit Novacek and Aisha Naseer

Combination of Engineering and Medical Education Using an Active Mechanical Lung Simulator
Sabine Krueger-Ziolek, Christian Knoebel, Christoph Schranz and Knut Moeller

Contextual Anomalies in Medical Data
Daniela Vasco, Pedro Pereira Rodrigues and João Gama

Opportunities for Smart & Tailored Activity Coaching
Harm Op Den Akker, Randy Klaassen, Rieks Op Den Akker, Valerie Jones and Hermie Hermens

Attributes for Causal Inference in Electronic Healthcare Databases
Jenna Reps, Jonathan M Garibaldi, Uwe Ackelin, Daniele Soria, Jack Gibson and Richard Hubbard

Segmentation of gastroenterology images: A comparison between clustering and fitting models approaches
Farhan Riaz, Mario Dinis Ribeiro, Pedro Pimentel-Nunes and Miguel Coimbra

Heart rate and ventricular repolarization variabilities interactions modification by microgravity simulation during head-down bed rest test
Juan Bolea, Pablo Laguna, Enrico G. Caiani and Rute Almeida

A Process Mining Analysis on a Virtual Electronic Patient Record System
Alvaro Rebuge, Luís Velez Lapão, Alberto Freitas and Ricardo Cruz-Correia

A Short Review of Computerized Monitoring Systems for ADHD
Manousos A. Klados, Maria Nikolaidou, Evdokimos Konstantinidis, Antonella Chifari and Panagiotis Bamidis

Turning Datasets into Patient-centered Knowledge Utilities
Raphael Bahati and Femida Gwadry-Sridhar

Content Based Image Retrieval of Diabetic Macular Edema Images
Aya Naguib, Ahmed Fahmy and Ahmed Ghanem
168 Lightweight Navigation in the Hospital with Portable Devices
Francesco Ricci, Guoda Taraskeviciute and Floriano Zini

179 Computational Approach for Screening Dyslexia
Macário Costa, Jorge Zavaleta and Sergio Cruz

192 Communication Between Agents For Interoperability In Area Health Service Platform Using Jade
Eduardo Rodrigues de Camargo Junior, Tarcio Roberto Carvalho de Lima, Leandro Ramos Da Silva and Marcia Ito

212 OpenEHR-based pervasive health information system for primary care: First Brazilian Experience for Public Care
Hilton César, Gustavo Bacelar Silva, Patrícia Braga and Rodney Guimarães

Organization

PORTO  
IEEE computer society  
IEEE PORTUGAL SECTION  
UNIDO  
CINTESU  

Portuguese Society for Medicine, Computer Science and Information Engineering
Dear Valerie,

Please find attached the reviews for your paper.

Apologies for the late notification.

Hope you find the reviews useful.

Best regards,

Pedro Pereira Rodrigues

--- REVIEW 1 ---

**PAPER: 36**
**TITLE:** CaptureMyEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors
**AUTHORS:** Peter Leijdekkers, Valerie Gay and Frederick Wong

**OVERALL EVALUATION:** 1 (weak accept)
- Appropriateness for CBMS track: 4 (good)
- Overall organization: 3 (fair)
- Appropriate title, abstract, introduction and conclusion: 3 (fair)
- Style and clarity of the paper: 4 (good)
- Technical Content and Accuracy: 2 (poor)
- Significance of the work: 4 (good)
- Referee's confidence in the paper's subject: 3 (fair)
- Should this paper be considered for an award as "CBMS 2013 Best Paper"?: 1 (No)

---

This work describes the interface of an application for smartphones that can help autistic children to recognize emotions and behave socially. The paper is well written and describes the interface discussing situations where the application could be applied. The application is quite nice and may help autistic children and their carers to better understand emotions and how to behave socially.

I felt a bit disappointed for not seeing in this paper:

- a description of the architecture of the system from a computational standpoint
- an evaluation of the application in real or simulated situations

For many of the questions raised in the paper there is no answer for: how was the software implemented, which were the architectural design decisions, which were the user interface design decisions, how was performed the synchronization between the time of the interaction with the sensor data etc. Maybe an organization like the one suggested below could help:

- Computational architecture of the system
- Comparison with other software (user interface, functions, objectives)

Specific questions:

- In Section 4, you say "the user can be asked to take pictures of objects that make him happy". According to what I understood from your text, it is very difficult to an autistic child to recognize and feel emotions. How are they expected to know what is the meaning of happiness?

- One of your objectives, according to my understanding, is to "teach" a child about different emotions. From the point of view of machine learning, it would be useful to have something like a "ground-truth" to uncover patterns of supposedly "happiness" or "sadness" or any other emotion in a child. How could you obtain "ground-truth" data with your application?
- How do you synchronize the moment of taking a picture with the sensor data in order to store both information together?

- How do you customize the arousal gauge meter for each individual?

- You say "When the Q sensor is used, the app has a learning mode feature that collects..." What do you mean? (maybe if you described the architecture of your system, this could be clearer).

- I think your idea of automatically taking a picture of the child’s face while he/she is playing with the app would be very helpful, specially for the carer.

- It would be very interesting and helpful to have some preliminary evaluation of your app.

-------------------- REVIEW 2 ---------------------
PAPER: 36
TITLE: CaptureMyEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors
AUTHORS: Peter Leijddekkers, Valerie Gay and Frederick Wong

OVERALL EVALUATION: 2 (accept)
Appropriateness for CBMS track: 5 (excellent)
Overall organization: 4 (good)
Appropriate title, abstract, introduction and conclusion: 5 (excellent)
Style and clarity of the paper: 4 (good)
Technical Content and Accuracy: 4 (good)
Significance of the work: 3 (fair)
Referee's confidence in the paper’s subject: 4 (good)
Should this paper be considered for an award as “CBMS 2013 Best Paper”? 1 (No)

------------------ REVIEW ------------------
The paper presents a mobile application to help Autistic children and their caregivers to reflect on and help express the child’s emotion. The interesting thing about this app is that it connects to an Affectiva sensor for measuring one dimension of emotion (arousal), and this can be used in the app to help the child record their emotion, and can be reported in summary to the caregiver and child later for review.

The application looks very interesting, and is definitely of relevance for the track. There are no experimental results yet - the system is yet to be trialled. It would help the paper to show at least a use case or a sequence of things that would happen during a specific interaction between child/carer/app/emoion sensor.

-------------------- REVIEW 3 ---------------------
PAPER: 36
TITLE: CaptureMyEmotion: a Mobile App to Improve Emotion Learning for Autistic Children Using Sensors
AUTHORS: Peter Leijddekkers, Valerie Gay and Frederick Wong

OVERALL EVALUATION: 1 (weak accept)
Appropriateness for CBMS track: 3 (fair)
Overall organization: 2 (poor)
Appropriate title, abstract, introduction and conclusion: 4 (good)
Style and clarity of the paper: 3 (fair)
Technical Content and Accuracy: 3 (fair)
Significance of the work: 3 (fair)
Referee’s confidence in the paper’s subject: 4 (good)
Should this paper be considered for an award as “CBMS 2013 Best Paper”? 1 (No)

----------- REVIEW -----------
The paper describes the design of an app meant for recording situations and the relevant emotions for autistic children. The system itself seems to be a useful tool for patients and their care-givers.
The main problems that I have with the paper are 1) the fact that it is just a system description without evaluation, and 2) the not so clear structure with quite some repetitions and redundancies, and a mix of motivation and system description.

To give an example of the latter: in the introduction a number of advantages of technology for autistic children are claimed, but some of these seems to be biased already towards the functionality of the system. My advice would be to make a clear distinction between the advantages according to the literature (with concrete references) and the design choices behind the system. Related to this, also the related work focuses explicitly on "the type of apps related closely to /CaptureMyEmotion/".

Some small remarks:
* Please explain why you distinguish between "emotion capturing" and "behavioral data collection" apps, since examples of the latter category also do emotion / mood collection.
* Many references occur several times in the paper. Please cite papers only once, or make it explicit if you really need to refer to it for a second time (e.g. "also in [22]").
* The second and third sentences of Section 4 are a repetition of what is said before.
* Does the app only ask the child to manually select his emotion of the sensor is not used? Please explain.
* The system itself does not contain any coaching or intelligent feedback, so it is not really "smart" (see title of track).
* Section 4.3 describes how the system can be used in interaction with the care-giver, and this foreseen interaction has clearly influenced the design of the system. However, I would like to see an explicit description of what has been proven to be a good therapeutic intervention and how this intervention has been translated into the design of the app. This is again a matter of presentation / structure. Part of this is now the Discussion.
* Sentence below Figure 5 doesn't give new information.
* Please explain the thumbs-up rating: what do you mean with "the review result of a picture with the child"?
* Section Discussion should be number as 5.
* In future work you discuss the option to use facial expression detection, while earlier and just after this, you point out that this will not be very useful for autistic children.