

# **2017 IEEE 30th International Symposium on Computer-Based Medical Systems (CBMS 2017)**

**Thessaloniki, Greece  
22 – 24 June 2017**



**IEEE Catalog Number: CFP17CBM-POD  
ISBN: 978-1-5386-1711-3**

**Copyright © 2017 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP17CBM-POD
ISBN (Print-On-Demand):	978-1-5386-1711-3
ISBN (Online):	978-1-5386-1710-6
ISSN:	2372-918X

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2017 IEEE 30th International Symposium on Computer-Based Medical Systems

## CBMS 2017

### Table of Contents

Preface.....	xxi
Conference Organization.....	xxiii
Program Committee.....	xxvi
Reviewers.....	xxxii
Sub-reviewers.....	xxxv
Sponsors.....	xxxvi
Keynotes.....	xxxvii

---

#### General Track

Simulation for Training Cochlear Implant Electrode Insertion .....	1
<i>Xingjun Ma, Sudanthi Wijewickrema, Yun Zhou, Bridget Copson, James Bailey, Gregor Kennedy, and Stephen O'Leary</i>	
Design and Evaluation of a Virtual Reality Simulation Module for Training Advanced Temporal Bone Surgery .....	7
<i>Sudanthi Wijewickrema, Bridget Copson, Yun Zhou, Xingjun Ma, Robert Briggs, James Bailey, Gregor Kennedy, and Stephen O'Leary</i>	
Towards an Effective and Efficient Learning for Biomedical Data Classification .....	13
<i>Guilherme Camargo, Rafael Staiger Bressan, Pedro Henrique Bugatti, and Priscila Tiemi Maeda Saito</i>	
Predicting Sepsis Biomarker Progression under Therapy .....	19
<i>Ivan Stojkovic and Zoran Obradovic</i>	
Dynamical Modelling of Pulmonary Compartment Response Using Differential Approach .....	25
<i>Jan Kubicek, Martin Augustynek, and Marek Penhaker</i>	

Automated Collagen Proportional Area Extraction in Liver Biopsy Images Using a Novel Classification via Clustering Algorithm .....	30
<i>Dimosthenis C. Tsouros, Panagiotis N. Smyrlis, Markos G. Tsipouras, Dimitrios G. Tsalikakis, Nikolaos Giannakeas, Alexandros T. Tzallas, and Pinelopi Manousou</i>	
Wavelet Based Classification of Epileptic Seizures in EEG Signals .....	35
<i>Katerina D. Tzimourta, Loukas G. Astrakas, Markos G. Tsipouras, Nikolaos Giannakeas, Alexandros T. Tzallas, and Spyridon Konitsiotis</i>	
Measuring Steatosis in Liver Biopsies Using Machine Learning and Morphological Imaging .....	40
<i>Nikolaos Giannakeas, Markos G. Tsipouras, Alexandros T. Tzallas, Maria G. Vavva, Maria Tsimplakidou, Evaggelos C. Karvounis, Roberta Forlano, and Pinelopi Manousou</i>	
Longitudinal Monitoring and Detection of Alzheimer's Type Dementia from Spontaneous Speech Data .....	45
<i>Saturnino Luz</i>	
LiveBook: Competence Assessment with Virtual-Patient Simulations .....	47
<i>Sina Jalali, Eleni Stroulia, Sarah Foster, Amit Persad, Diya Shi, and Sarah Forgie</i>	
Differential Diagnosis Listing as Relevance Feedback: An Essential User Interface for Clinical Decision Support Systems .....	53
<i>Takashi Okumura, Tomoko Kajiyama, and Noboru Sonehara</i>	
Using Affective Computing to Automatically Adapt Serious Games for Rehabilitation .....	55
<i>Renan Vinicius Aranha, Leonardo Souza Silva, Marcos Lordello Chaim, and Fátima de Lourdes dos Santos Nunes</i>	
A Comparative Study of Cell Nuclei Attributed Relational Graphs for Knowledge Description and Categorization in Histopathological Gastric Cancer Whole Slide Images .....	61
<i>Harshita Sharma, Norman Zerbe, Christine Böger, Stephan Wienert, Olaf Hellwich, and Peter Hufnagl</i>	
Design and Development of a Mobile Decision Support System: Guiding Clinicians Regarding Law in the Practice of Psychiatry in Emergency Department .....	67
<i>Soudabeh Khodambashi, Jon Atle Gulla, Pekka Abrahamsson, and Florentin Moser</i>	
EEG Signal Analysis of Real-Word Reading and Nonsense-Word Reading between Adults with Dyslexia and without Dyslexia .....	73
<i>Harshani Perera, Mohd Fairuz Shiratuddin, Kok Wai Wong, and Kelly Fullarton</i>	
Multi-label Modality Classification for Figures in Biomedical Literature .....	79
<i>Athanasios Lagopoulos, Anestis Fachantidis, and Grigorios Tsooumakas</i>	

A Differential Geometry Approach for Change Detection in Medical Images .....	85
<i>Alexander Naitzat, Emil Saucan, and Yehoshua Zeevi</i>	
Application of Evolutionary Algorithms on Unsupervised Segmentation of Lymphoma Histological Images .....	89
<i>Thaína Aparecida Azevedo Tosta, Marcelo Zanchetta do Nascimento, Paulo Rogério de Faria, and Leandro Alves Neves</i>	
Integrated Decision Support by Combining Textual Information Extraction, Facetted Search and Information Visualisation .....	95
<i>Daniel Sonntag and Hans-Jürgen Profitlich</i>	
Towards Patterns for Defining and Changing Data Collection Instruments in Mobile Healthcare Scenarios .....	101
<i>Johannes Schobel, Rüdiger Pryss, Marc Schickler, and Manfred Reichert</i>	
A Deconstructed Replication of a Time of Test Study Using the AGIS Metric .....	103
<i>Steve Counsell, Stephen Swift, and Allan Tucker</i>	
On the Ontological Modelling of Co-medication and Drug Interactions in Medical Cancer Therapy Regimens for a Clinical Decision Support System .....	105
<i>Christoph Beierle, Bettina Sader, Christian Eichhorn, Gabriele Kern-Isberner, Ralf Georg Meyer, and Mathias Nietzsche</i>	
An IT Platform Enabling Remote Therapeutic Interventions .....	111
<i>Marc Schickler, Rüdiger Pryss, Michael Stach, Johannes Schobel, Winfried Schlee, Thomas Probst, Berthold Langguth, and Manfred Reichert</i>	
Pattern-Based Statechart Modeling Approach for Medical Best Practice Guidelines - A Case Study .....	117
<i>Chunhui Guo, Zhicheng Fu, Shangping Ren, Yu Jiang, Maryam Rahmaniheris, and Lui Sha</i>	
Laugh and Crying Perception in Patients with Severe and Moderate TBI Using FFT Analysis .....	123
<i>Portnova G.V. and Gladun K.V.</i>	
Novel Method for Storyboarding Biomedical Videos for Medical Informatics .....	127
<i>Sema Candemir, Sameer Antani, Zhiyun Xue, and George Thoma</i>	
Neural Networks Modelling after Myocardial Infarction in Rats .....	133
<i>Ioanna Iliopoulou, Iordanis Mourouzis, George I. Lambrou, Constantinos Pantos, Dimitra Iliopoulou, and Demetrios-Dionysios Koutsouris</i>	
Computational Analysis of BRCA1 Mutations in Pediatric Patients with Malignancies and Their Mothers .....	138
<i>George I. Lambrou, Ioanna Barbounaki, Fotini Tzortzatou-Stathopoulou, Ourania Petropoulou, Panagiotis Katrakazas, Dimitra Iliopoulou, and Dimitrios-Dionysios Koutsouris</i>	

A Pilot Medical Curriculum Analysis and Visualization According to Medbiqitous Standards .....	144
<i>Martin Komenda, Matěj Karolyi, Christos Vaitsis, Dimitris Spachos, and Luke Woodham</i>	
Automatic Segmentation of Melanoma in Dermoscopy Images Using Fuzzy Numbers .....	150
<i>Jessica Barbosa Diniz and Filipe Rolim Cordeiro</i>	
Random Walker with Fuzzy Initialization Applied to Segment Masses in Mammography Images .....	156
<i>Filipe Rolim Cordeiro, Kallebe Felipe Pereira Bezerra, and Wellington Pinheiro dos Santos</i>	
Self-Adaptive Multi-objective Evolutionary Algorithm for Molecular Design .....	162
<i>Christos C. Kannas and Constantinos S. Pattichis</i>	
Towards a Conceptual Framework Fostering Process Comprehension in Healthcare .....	167
<i>Michael Zimoch, Rüdiger Pryss, Thomas Probst, Winfried Schlee, and Manfred Reichert</i>	
A Tool for Optimizing De-identified Health Data for Use in Statistical Classification .....	169
<i>Fabian Prasser, Johanna Eicher, Raffael Bild, Helmut Spengler, and Klaus A. Kuhn</i>	
Implementation of Process-Oriented Feedback in a Clinical Reasoning Tool for Virtual Patients .....	175
<i>Inga Hege, Andrzej A Kononowicz, Michal Nowakowski, and Martin Adler</i>	
Travelers' Perceptions about m-Health Technology .....	177
<i>Parisis Gallos and John Mantas</i>	
Detection of Alcoholism Based on EEG Signals and Functional Brain Network Features Extraction .....	179
<i>Negar Ahmadi, Yulong Pei, and Mykola Pechenizkiy</i>	
A Low Bit Rate Wearable Motion Sensing Platform for Gesture Classification .....	185
<i>Fahad Moiz, Walter D. Leon-Salas, Yugyung Lee, and Reza Derakhshani</i>	
An Innovative Gaming Approach to Prevent Anxiety Disorders & Promote Youth Resilience .....	191
<i>Vassilia Costarides, Ioannis Kouris, Athanasios Anastasiou, and Dimitrios-Dionisios Koutsouris</i>	
Ecoepidemiological Simulation as a Serious Game Engine Module .....	193
<i>Masood Masoodian and Saturnino Luz</i>	

A Non-Invasive Medical Decision Support Prototype System for Dermatology Based on Electrical Impedance Spectroscopy (Dermasense) .....	195
<i>Alexander Zogkas, Sotiria Gilou, Inessa Kirsanidou, Chrysovalantis Korfitis, Christina Kemanetzi, Elizabeth Lazaridou, Bamidis Panagiotis, and Alexander Astaras</i>	
Automatic Lymphocyte Detection on Gastric Cancer IHC Images Using Deep Learning .....	200
<i>Emilio Garcia, Renato Hermoza, Cesar Beltran Castanon, Luis Cano, Miluska Castillo, and Carlos Castañeda</i>	
Predicting Comorbidities Using Resampling and Dynamic Bayesian Networks with Latent Variables .....	205
<i>Leila Yousefi, Lucia Saachi, Riccardo Bellazzi, Luca Chiovato, and Allan Tucker</i>	
The Effect of Mammogram Preprocessing on Microcalcification Detection with Convolutional Neural Networks .....	207
<i>Agnese Marchesi, Alessandro Bria, Claudio Marrocco, Mario Molinara, Jan-Jurre Mordang, Francesco Tortorella, and Nico Karssemeijer</i>	
Automatic Extraction of Breast Cancer Information from Clinical Reports .....	213
<i>Claudia Breischneider, Sonja Zillner, Matthias Hammon, Paul Gass, and Daniel Sonntag</i>	
Illumination Correction by Dehazing for Retinal Vessel Segmentation .....	219
<i>Benedetta Savelli, Alessandro Bria, Adrian Galdran, Claudio Marrocco, Mario Molinara, Aurélio Campilho, and Francesco Tortorella</i>	
Toward a Network-Based Approach to Modeling Epistatic Interactions in Genome-Wide Association Studies .....	225
<i>Camilo Palazuelos, Marta Zorrilla, and Javier Llorca</i>	
Estimation of Heart Failure Patients Medication Adherence through the Utilization of Saliva and Breath Biomarkers and Data Mining Techniques .....	231
<i>Evanthia E. Tripoliti, Theofilos G. Papadopoulos, Georgia S. Karanasiou, Fanis G. Kalatzis, Yorgos Goletsis, Aris Bechlioulis, Silvia Ghimenti, Tommaso Lomonaco, Francesca Bellagambi, Roger Fuoco, Mario Marzilli, Maria Chiara Scali, Katerina K. Naka, Abdelhamid Errachid, and Dimitrios I. Fotiadis</i>	
Relevant Lifelong Nutrition Information for the Prevention and Treatment of Childhood Obesity - Design and Creation of New openEHR Archetype Set .....	236
<i>Priscila Alves Maranhão, Gustavo Marísio Bacelar-Silva, Duarte Nuno Gonçalves-Ferreira, Pedro Vieira-Marques, and Ricardo João Cruz-Correia</i>	
An Intermixed Color Paradigm for P300 Spellers: A Comparison with Gray-Scale Spellers .....	242
<i>Mina R. Meshriky, Seif Eldawlatly, and Gamal M. Aly</i>	

BREATH: Heat Maps Assisting the Detection of Abnormal Lung Regions in CT Scans .....	248
<i>Mirela Teixeira Cazzolato, Lucas de Carvalho Scabora, Alceu Ferraz Costa, Marcos Roberto Nesso Junior, Luis Fernando Milano Oliveira, Daniel dos Santos Kaster, Caetano Traina Junior, and Agma Juci Machado Traina</i>	
Method for Intra-Surgical Phase Detection by Using Real-Time Medical Device Data .....	254
<i>Norman Spangenberg, Christoph Augenstein, Bogdan Franczyk, Martin Wagner, Martin Apitz, and Hannes Kenngott</i>	
Towards Flexible Remote Therapeutic Interventions .....	260
<i>Marc Schickler, Rüdiger Prysss, Johannes Schobel, Winfried Schlee, Thomas Probst, and Manfred Reichert</i>	
Commercial BCI Control and Functional Brain Networks in Spinal Cord Injury: A Proof-of-Concept .....	262
<i>Alkinoos Athanasiou, George Arfaras, Ioannis Xygonakis, Panagiotis Kartsidis, Niki Pandria, Kyriaki Rafailia Kavazidi, Alexander Astaras, Nicolas Foroglou, Konstantinos Polyzoidis, and Panagiotis D. Bamidis</i>	
A Reworked SOBI Algorithm Based on SCHUR Decomposition for EEG Data Processing .....	268
<i>Kalogiannis Gregory, Karampelas Nikolaos, and Hassapis George</i>	
Relation between Fetal HRV and Value of Umbilical Cord Artery pH in Labor, a Study with Entropy Measures .....	272
<i>George Manis and Roberto Sassi</i>	
A Recall Analysis of Core Word Lists over Children's Utterances for Augmentative and Alternative Communication .....	278
<i>Natalia de Melo Franco, Augusto Lazzarotto de Lima, Thiago Pinheiro Lima, Edson Alves da Silva, Rinaldo José de Lima, and Robson do Nascimento Fidalgo</i>	
Meeting Technology and Methodology into Health Big Data Analytics Scenarios .....	284
<i>P. Gonzalez-Alonso, R. Vilar, and F. Lupiañez-Villanueva</i>	
Efficiently Indexing Multiple Repositories of Medical Image Databases .....	286
<i>Paulo H. Oliveira, Lucas C. Scabora, Mirela T. Cazzolato, Willian D. Oliveira, Agma J. M. Traina, and Caetano Traina-Jr.</i>	
Inductive Learning of the Surgical Workflow Model through Video Annotations .....	292
<i>Hirenkumar Nakawala, Elena de Momi, Laura Erica Pescatori, Anna Morelli, and Giancarlo Ferrigno</i>	
Is a Decision Support System Based on Robson's Classification Enough to Reduce Cesarean Section Rates? .....	298
<i>Juliano de Souza Gaspar, Zilma Silveira Nogueira Reis, and Juliana Silva Barra</i>	



Overlap Detection for a Genome Assembly Based on Genomic Signal Processing .....	300
<i>Robin Jugas, Karel Sedlar, Martin Vitek, and Helena Skutkova</i>	
Versatile Cloud Collaboration Services for Device-Transparent Medical Imaging Teleconsultations .....	306
<i>Georgios Rassias, Christos O. Andrikos, Panayiotis Tsanakas, and Ilias Maglogiannis</i>	
Z-Box Merging: Ultra-Fast Computation of Fractal Dimension and Lacunarity .....	312
<i>John Nikolaidis and Elias Aifantis</i>	
Discrimination of Preictal and Interictal Brain States from Long-Term EEG Data .....	318
<i>Kostas M. Tsiouris, Vasileios C. Pezoulas, Dimitrios D. Koutsouris, Michalis Zervakis, and Dimitrios I. Fotiadis</i>	
Using Prevalence Patterns to Discover Un-mapped Flowsheet Data in an Electronic Health Record Data Warehouse .....	324
<i>Alex F. Bokov, Angela B. Bos, Laura S. Manuel, Alfredo Tirado-Ramos, Pamela Kittrell, Carlyne Jackson, and Gail P. Olin</i>	
Non-invasive Assessment of Coronary Stenoses and Comparison to Invasive Techniques: A Proof-of-Concept Study .....	328
<i>Panagiota I. Tsompou, Panagiotis K. Siogkas, Antonis I. Sakellarios, Pedro A. Lemos, Lampros K. Michalis, and Dimitrios I. Fotiadis</i>	
ACESO: Analysis of Cervical Cancer: An Evidence-Based Treatments Optimization .....	332
<i>Panagiotis Katrakazas, Marilena Tarousi, Kostas Giokas, and Dimitrios-Dionysios Koutsouris</i>	
Emotional State Recognition Using Advanced Machine Learning Techniques on EEG Data .....	337
<i>Katerina Giannakaki, Giorgos Giannakakis, Christina Farmaki, and Vangelis Sakkalis</i>	
Automatic Pigment Network Classification Using a Combination of Classical Texture Descriptors and CNN Features .....	343
<i>Melinda Pap, Balázs Harangi, and András Hajdu</i>	
EEG Classification and Short-Term Epilepsy Prognosis Using Brain Computer Interface Software .....	349
<i>Alexandros T. Tzallas, Nikolaos Giannakeas, Kostantinos N. Zoulis, Markos G. Tspouras, Euripidis Glavas, Katerina D. Tzimourta, Loukas G. Astrakas, and Spyridon Konitsiotis</i>	

Anomaly Detection Through Temporal Abstractions on Intensive Care Data: Position Paper .....	354
<i>Giovana Jaskulski Gelatti, André Carlos Ponce de Leon Ferreira de Carvalho, and Pedro Pereira Rodrigues</i>	
Integrating a PACS Network to a Statewide Telemedicine System: A Case Study of the Santa Catarina State Integrated Telemedicine and Telehealth System .....	356
<i>Alexandre Savaris, Alexandre Augusto Gimenes Marquez Filho, Rodrigo Rodrigues Pires de Mello, Gabriela Bussolo Colonetti, Aldo von Wangenheim, and Dirk Krechel</i>	
Extracting Disease-Phenotype Relations from Text with Disease-Phenotype Concept Recognisers and Association Rule Mining .....	358
<i>Simon Kocbek and Tudor Groza</i>	
An Object Oriented Approach to Model Reusability .....	364
<i>Laura Manuel, Alfredo Tirado-Ramos, and Manuel Castañón Puga</i>	
Bringing Bayesian Networks to Bedside: A Web-Based Framework .....	369
<i>Raphael Oliveira, Joana Ferreira, Diogo Libânio, Cláudia Camila Dias, and Pedro Pereira Rodrigues</i>	
Modeling and Integrating Human Interaction Assumptions in Medical Cyber-Physical System Design .....	373
<i>Zhicheng Fu, Chunhui Guo, Shangping Ren, Yizong Ou, and Lui Sha</i>	
Simulation of Spiral Waves and Point Sources in Atrial Fibrillation with Application to Rotor Localization .....	379
<i>Prasanth Ganesan, Kristina E. Shillieto, and Behnaz Ghoraani</i>	
A Cloud Based Big Data Based Online Health Analytics for Rural NICUs and PICUs in India: Opportunities and Challenges .....	385
<i>S. Balaji, Meghana Patil, and Carolyn McGregor</i>	
Level Set Based on Brain Radiological Densities for Stroke Segmentation in CT Images .....	391
<i>Elizângela de S. Rebouças, Alan M. Braga, Róger Moura Sarmiento, Regis C. P. Marques, and Pedro P. Rebouças Filho</i>	
Segmentation and Visualization of the Lungs in Three Dimensions Using 3D Region Growing and Visualization Toolkit in CT Examinations of the Chest .....	397
<i>Raul Victor Medeiros da Nóbrega, Murillo Barata Rodrigues, and Pedro Pedrosa Rebouças Filho</i>	
Application of Affinity Analysis Techniques on Diagnosis and Prescription Data .....	403
<i>Sanida Theodora and Varlamis Iraklis</i>	
An Automatic EEG Based System for the Recognition of Math Anxiety .....	409
<i>Manousos A. Klados, Niki Pandria, Alkinoos Athanasiou, and Panagiotis D. Bamidis</i>	

Predicting Cognitive Recovery of Stroke Patients from the Structural MRI Connectome Using a Naïve Bayesian Tree Classifier .....	413
<i>Rosalía Dacosta-Aguayo, Christian Stephan-Otto, Tibor Auer, IC Clemente, Antoni Dávalos, Núria Bargalló, Maria Mataró, and Manousos A. Klados</i>	
Brain Image and Lesions Registration and 3D Reconstruction in Dicom MRI Images .....	419
<i>Christos P. Loizou, Christos Papacharalambous, Giorgos Samaras, Efthymoulos Kyriacou, Takis Kasparis, Marios Pantziaris, Eleni Eracleous, and Constantinos S. Pattichis</i>	
Comparing the Quality of Numeracy Assessment Methods in Healthcare .....	423
<i>Mandana Omidbakhsh and Olga Ormanjjeva</i>	
A Proposed Learner Activity Taxonomy and a Framework for Analysing Learner Engagement versus Performance Using Big Educational Data .....	429
<i>Stathis Th. Konstantinidis, Aaron Fecowycz, Kirstie Coolin, Heather Wharrad, George Konstantinidis, and Panagiotis D. Bamidis</i>	
Automatic Sleep Stage Classification Applying Machine Learning Algorithms on EEG Recordings .....	435
<i>Panteleimon Chriskos, Dimitra S. Kaitalidou, Georgios Karakasis, Christos Frantzidis, Polyxeni T. Gkivogkli, Panagiotis Bamidis, and Chrysoula Kourtidou-Papadeli</i>	
Visual Versus Kinesthetic Motor Imagery for BCI Control of Robotic Arms (Mercury 2.0) .....	440
<i>Arfaras George , Athanasiou Alkinoos, Pandria Niki, Kavazidi Kyriaki Rafailia, Kartsidis Panagiotis, Astaras Alexander, and Bamidis Panagiotis D.</i>	
Visual Role in the Dynamic Postural Balance Due to Aging-Assessment by Using an Augmented Reality Perturbation System .....	446
<i>Chun-Ju Chang, Sai-Wei Yang, Jen-Suh Chern, and Tsui-Fen Yang</i>	
Towards Multi-parametric Hub Scoring of Functional Cortical Brain Networks: An Electroencephalographic (EEG) Study Across Lifespan .....	452
<i>Vasiliki I. Zilidou, Christos A. Frantzidis, Ana B. Vivas, Maria Karagianni, and Panagiotis D. Bamidis</i>	
Exploiting Active MicroRNA Interactions for Diagnosis from Expression Profiling Experiments .....	458
<i>Erdem Çorapçiolu and Hasan Oul</i>	

Prognosis of Abdominal Aortic Aneurysms: A Machine Learning-Enabled Approach Merging Clinical, Morphometric, Biomechanical and Texture Information .....	463
<i>Fernando García-García, Eleni Metaxa, Stergios Christodoulidis, Marios Anthimopoulos, Nikolaos Kontopodis, Martina Correa-Londoño, Thomas R. Wyss, Yannis Papaharilaou, Christos V. Ioannou, Hendrik von Tengg-Kobligk, and Stavroula Mougialakou</i>	
Are Elderly Less Responsive to Emotional Stimuli? An EEG-based Study across Pleasant, Unpleasant and Neutral Greek Words .....	469
<i>Ioanna Tepelena, Christos Frantzidis, Vasiliki Salvari, Leontios Hadjileontiadis, and Panagiotis Bamidis</i>	
Rehabilitation Biofeedback Using EMG Signal Based on Android Platform .....	475
<i>Mazen Yassin, Hussein Abdallah, Amr Anwer, Abubakr Mustafa, and Ashraf Mahroos</i>	
Evaluating the AffectLecture Mobile App within an Elementary School Class Teaching Process .....	481
<i>Styliani Siouli, Ioanna Dratsiou, Melpomeni Tsitouridou, Panagiotis Kartsidis, Dimitris Spachos, and Panagiotis D. Bamidis</i>	
Assessing Emotional Impact of Biofeedback and Neurofeedback Training in Smokers During a Smoking Cessation Project .....	486
<i>Niki Pandria, Dimitris Spachos, Alkinoos Athanasiou, and Panagiotis D. Bamidis</i>	
Provisioning and Delivering Sepsis Data Supported by an Enhanced SDN Environment .....	492
<i>Felipe Volpato, Madalena Pereira da Silva, Alexandre Leopoldo Gonçalves, Márcio Castro, and Mario Antonio Ribeiro Dantas</i>	
Memorandum: A Mobile App for Efficient Note Keeping in Concurrent Multi-participant Human Subject Studies .....	498
<i>Leandros Stefanopoulos, Christos Maramis, Ioannis Moulos, Ioannis Ioakimidis, and Nicos Maglaveras</i>	
A Versatile Architecture for Building IoT Quantified-Self Applications .....	500
<i>Andreas Menychtas, Charalampos Doukas, Panayiotis Tsanakas, and Ilias Maglogiannis</i>	
Methods for Enhancing the Reproducibility of Observational Research Using Electronic Health Records: Preliminary Findings from the CALIBER Resource .....	506
<i>Spiros Denaxas, Arturo Gonzalez-Izquierdo, Maria Pikoula, Kenan Direk, Natalie Fitzpatrick, Harry Hemingway, and Llam Smeeth</i>	
Evaluating OpenEHR for Storing Computable Representations of Electronic Health Record Phenotyping Algorithms .....	509
<i>Václav Papež, Spiros Denaxas, and Harry Hemingway</i>	

Probabilistic Integration of Large Brazilian Socioeconomic and Clinical Databases .....	515
<i>Clicia Pinto, Robespierre Pita, George Barbosa, Bruno Araújo, Juracy Bertoldo, Samila Sena, Sandra Reis, Rosemeire Fiaccone, Leila Amorim, Maria Yuri Ichihara, Mauricio Barreto, Marcos Barreto, and Spiros Denaxas</i>	
On Supporting Parkinson's Disease Patients: The i-Prognosis Personalized Game Suite Design Approach .....	521
<i>S. B. Dias, E. Konstantinidis, J. A. Diniz, P. Bamidis, V. Charisis, S. Hadjidimitriou, M. Stadtschnitzer, P. Fagerberg, I. Ioakeimidis, K. Dimitropoulos, N. Grammalidis, and L. J. Hadjileontiadis</i>	
Trust, Ethics and Access: Challenges in Studying the Work of Multi-disciplinary Medical Teams .....	527
<i>Bridget Kane and Saturnino Luz</i>	
Carotid Bifurcation Plaque Stability Estimation Based on Motion Analysis .....	529
<i>Efthymoulos Kyriacou, Andrew Nicolaides, Alexandra Constantinou, Maura Griffin, Christos Loizou, Marios S. Pattichis, Hamed Nasrabadi, and Constantinos S. Pattichis</i>	
A Three-Phase Motor Relearning: Error-Potentials, Motor Correction and Neurofeedback for Memory-Consolidation .....	N/A
<i>Miriam Reiner</i>	
An Eye Tracker based Computer System to Support Oculomotor and Attention Deficit Investigations .....	538
<i>Daniela Giordano, Carmelo Pino, Isaak Kavasidis, Concetto Spampinato, Massimo Di Pietro, Renata Rizzo, Anna Scuderi, and Rita Barone</i>	

## **Special Track: Ambient Assisted Living Based on IoT Technologies**

Applied Technologies and Smart Home Applications in the Health Sector .....	544
<i>N. Katsivelis, A. Anastasiou, O. Petropoulou, G. Lambrou, K. Giokas, and D. Koutsouris</i>	
A Fall Prevention System for the Elderly: Preliminary Results .....	550
<i>Giuseppe Palestra, Mohamed Rebiai, Estelle Courtial, Kostas Giokas, and Dimitrios Koutsouris</i>	
Indoor Localization: A Cost-Effectiveness vs. Accuracy Study .....	552
<i>Parisa Mohebbi, Eleni Stroulia, and Ioanis Nikolaidis</i>	
Quality of Context Evaluating Approach in AAL Environment Using IoT Technology .....	558
<i>Débora Cabral Nazário, Pedro J. Campos, Eduardo C. Inacio, and Mario A. R. Dantas</i>	

Robotic Applications Towards an Interactive Alerting System for Medical Purposes .....	564
<i>Konstantinos L. Panayiotou, Sofia E. Reppou, George G. Karagiannis, Emmanouil G. Tsardoulis, Aristeidis G. Thallas, and Andreas L. Symeonidis</i>	
HEAR?INFO: A Modern Mobile-Web Platform Addressed to Hard-of-Hearing Elderly Individuals .....	570
<i>Penelope Ioannidou, Panagiotis Katrakazas, Stefanos Kollias, Michail Sarafidis, and Dimitrios Koutsouris</i>	
Conditional Entropy Based Retrieval Model in Patient-Carer Conversational Cases .....	576
<i>Pavlidou Meropi, Antonis S. Billis, Nicolas D. Hasanagas, Charalambos Bratsas, Ioannis Antoniou, and Panagiotis D. Bamidis</i>	

## **Special Track: Social Data and Medical Data Analytics**

Combining Subgroup Discovery and Clustering to Identify Diverse Subpopulations in Cohort Study Data .....	582
<i>Uli Niemann, Myra Spiliopoulou, Bernhard Preim, Till Ittermann, and Henry Völzke</i>	
Mining Facebook Data of People with Rare Diseases .....	588
<i>Natalia Reguera, Laia Subirats, and Manuel Armayones</i>	
Personalization of Infectious Disease Risk Prediction: Towards Automatic Generation of a Bayesian Network .....	594
<i>Retno Aulia Vinarti and Lucy Hederman</i>	
Discovering Data Source Stability Patterns in Biomedical Repositories Based on Simplicial Projections from Probability Distribution Distances .....	600
<i>Pablo Ferri Borredà, Carlos Sáez, and Juan Miguel García Gómez</i>	
ICE: Interactive Classification Rule Exploration on Epidemiological Data .....	606
<i>Miro Schleicher, Till Ittermann, Uli Niemann, Henry Völzke, and Myra Spiliopoulou</i>	
Improving Diagnosis in Obstructive Sleep Apnea with Clinical Data: A Bayesian Network Approach .....	612
<i>Daniela Ferreira-Santos and Pedro Pereira Rodrigues</i>	
Reciprocity and its Association with Treatment Adherence in an Online Breast Cancer Forum .....	618
<i>Zhijun Yin, Lijun Song, and Bradley Malin</i>	
OncoCall: Analyzing the Outcomes of the Oncology Telephone Patient Assistance .....	624
<i>Ernestina Menasalvas-Ruiz, Consuelo Gonzalo, Juan Manuel Tuñas, Alejandro Rodríguez-González, Mariano Provencio, Cristina González de Pedro, Marta Méndez, Olga Zaretskaia, Juan Luis Cruz, Jesús Rey, and Consuelo Parejo</i>	

Studying the Potential of Multi-target Classification to Characterize Combinations of Classes with Skewed Distribution .....	630
<i>Arne Schneck, Sven Kalle, Rüdiger Pryss, Winfried Schlee, Thomas Probst, Berthold Langguth, Michael Landgrebe, Manfred Reichert, and Myra Spiliopoulou</i>	
Disease-Based Clustering of Hospital Admission: Disease Network of Hospital Networks Approach .....	636
<i>Nouf Albarakati and Zoran Obradovic</i>	
Mobile Crowdsensing for the Juxtaposition of Realtime Assessments and Retrospective Reporting for Neuropsychiatric Symptoms .....	642
<i>Rüdiger Pryss, Thomas Probst, Winfried Schlee, Johannes Schobel, Berthold Langguth, Patrick Neff, Myra Spiliopoulou, and Manfred Reichert</i>	
Visual Scanning Behaviour during a Visual Search Task: An Objective Indicator of White Matter Integrity in Patients with Post-Concussion Syndrome .....	648
<i>Jonathan Chung, Foad Taghdiri, Samantha Irwin, Namita Multani, Apameh Tarazi, Ahmed Ebraheem, Mozghan Khodadadi, Ruma Goswami, Richard Wennberg, Robin Green, David Mikulis, Karen Davis, Charles Tator, Maria Carmela Tartaglia, and Moshe Eizenman</i>	

## **Special Track: Immersive Personalized Patient Engagement: Computer Based Medical Intervention Systems**

Detecting Gamification in Breast Cancer Apps: An Automatic Methodology for Screening Purposes .....	654
<i>Guido Giunti, Diego H. Giunta, Santiago Hors-Fraile, Minna Isomursu, and Diana Karosevičiūtė</i>	
Connected Health in Multiple Sclerosis: A Mobile Applications Review .....	660
<i>Guido Giunti, Estefania Guisado-Fernandez, and Brian Caulfield</i>	
A Framework for Morphological Feature Extraction of Organs from MR Images for Detection and Classification of Abnormalities .....	666
<i>Barbara Villarini, Hykoush Asaturyan, E. Louise Thomas, Rhys Mould, and Jimmy D. Bell</i>	
Weightbit: An Advancement in Wearable Technology .....	672
<i>Dario Guida, Artie Basukoski, and Performance Database</i>	
Visualization of Wearable Data and Biometrics for Analysis and Recommendations in Childhood Obesity .....	678
<i>Michael Aupetit, Luis Fernandez-Luque, Meghna Singh, and Jaideep Srivastava</i>	
The 360QS Toolkit for Sleep and Physical Activity Analysis Based on Wearables .....	680
<i>Meghna Singh, Luis Fernandez-Luque, and Jaideep Srivastava</i>	

User and Stakeholder Requirements of eHealth Support Tool Viewed In a Self-Determination Theory Lens .....	682
<i>Stian Jessen, Jelena Mirkovic, and Cornelia Ruland</i>	
PhytoCloud: A Gamified Mobile Web Application to Modulate Diet and Physical Activity of Women with Breast Cancer .....	684
<i>Daphne Economou, Miriam Dwek, Claire Roberston, Bradley Elliott, Thanos Kounenis, Tayebah Azimi, Mohammad Ramezani, and Nathan Bell</i>	
Towards Evidence Based M-Health Application Design in Cancer Patient Healthy Lifestyle Interventions .....	690
<i>Panagiotis E. Antoniou, Octavio Rivera-Romero, Maria Karagianni, and Panagiotis D. Bamidis</i>	
Virtual Scenarios for Stealth Assessment of the Elderly: Perceptions and Acceptance of Technology-Based Health and Wellness Interventions .....	696
<i>Panagiotis E. Antoniou, Anastasios Siountas, Vasiliki I. Zilidou, and Panagiotis D. Bamidis</i>	

## **Special Track: Computer-Aided and Robotic Endoscopy Systems**

Dissimilarity Measure of Consecutive Frames in Wireless Capsule Endoscopy Videos: A Way of Searching for Abnormalities .....	702
<i>Isabel N. Figueiredo, Carlos Leal, Luís Pinto, Pedro N. Figueiredo, and Richard Tsai</i>	
Improved Barrett's Cancer Detection in Volumetric Laser Endomicroscopy Scans Using Multiple-Frame Voting .....	708
<i>Alexandros Rikos, Fons van der Sommen, Anne-fré Swager, Svitlana Zinger, Erik J. Schoon, Wouter L. Curvers, Jacques J. Bergman, and Peter H.N. de With</i>	
A Simulation Environment for Active Endoscopic Capsules .....	714
<i>Yasmeen Abu-Kheil, Lakmal Seneviratne, and Jorge Dias</i>	
Real-Time Instrument Scene Detection in Screening GI Endoscopic Procedures .....	720
<i>Chuanhai Zhang, Wallapak Tavanapong, Johnny Wong, Piet C. de Groen, and JungHwan Oh</i>	
Recognizing Ureter and Uterine Artery in Endoscopic Images Using a Convolutional Neural Network .....	726
<i>Balazs Harangi, Andras Hajdu, Rudolf Lampe, and Peter Torok</i>	
Sparse Coded Handcrafted and Deep Features for Colon Capsule Video Summarization .....	728
<i>Ahmed Mohammed, Sule Yildirim, Marius Pedersen, Øistein Hovde, and Faouzi Cheikh</i>	



Visual Localization of Wireless Capsule Endoscopes Aided by Artificial Neural Networks .....	734
<i>George Dimas, Dimitris K. Iakovidis, Gastone Ciuti, Alexandros Karargyris, and Anastasios Koulaouzidis</i>	
Lesion Segmentation in Dermoscopy Images Using Particle Swarm Optimization and Markov Random Field .....	739
<i>Khalid Eltayef, Yongmin Li, and Xiaohui Liu</i>	
Retinal OCT Image Segmentation Using Fuzzy Histogram Hyperbolization and Continuous Max-Flow .....	745
<i>Bashir I. Dodo, Yongmin Li, and Xiaohui Liu</i>	

## **Special Track: Empowering Patients with Cancer through Connected Health**

Detection and Management of Depression in Cancer Patients Using Augmented Reality Technologies, Multimodal Signal Processing and Persuasive Interfaces .....	751
<i>Alexandros Roniotis, Haridimos Kondylakis, and Manolis Tsiknakis</i>	
Quality of Information About Physical Activity in Breast Cancer Facebook Pages: A Preliminary Content Review .....	753
<i>Gabriel R. Signorelli, Matilde M. Fernandez, Francisco M.M. Guerra, Luis Fernandez-Luque, and Brian Caulfield</i>	
iManageCancer: Developing a Platform for Empowering Patients and Strengthening Self-Management in Cancer Diseases .....	755
<i>Haridimos Kondylakis, Anca Bucur, Feng Dong, Chiara Renzi, Andrea Manfrinati, Norbert Graf, Stefan Hoffman, Lefteris Koumakis, Gabriella Pravettoni, Kostas Marias, Manolis Tsiknakis, and Stephan Kiefer</i>	
The Design of a Mobile App for Promotion of Physical Activity and Self-Management in Prostate Cancer Survivors: Personas, Feature Ideation and Low-Fidelity Prototyping .....	761
<i>Francisco Monteiro-Guerra, Octavio Rivera-Romero, Vasiliki Mylonopoulou, Gabriel R. Signorelli, Francisco Zambrana, and Luis Fernandez-Luque</i>	
Developing a Collaborative Knowledge System for Cancer Diseases .....	767
<i>Mihalis Giannoulis, Emmanouil Marakakis, and Haridimos Kondylakis</i>	
The Application of Neuromuscular Electrical Stimulation (NMES) Technologies in Cancer Care .....	769
<i>Dominic O'Connor and Brian Caulfield</i>	
Conceptualising a Targeted Rehabilitation Exercise Biofeedback System for a Cancer Survivorship Population .....	771
<i>Louise Brennan, Ailish Daly, and Brian Caulfield</i>	

## **Special Track: Multimodal Interfaces for Natural Human Computer Interaction: Theory and Applications**

A Digital Pen Based Tool for Instant Digitisation and Digitalisation of Biopsy Protocols .....	773
<i>Alexander Prange, Danilo Schmidt, and Daniel Sonntag</i>	
An Error Aware SSVEP-based BCI .....	775
<i>Fotis Kalaganis, Elisavet Chatzilari, Kostas Georgiadis, Spiros Nikolopoulos, Nikos Laskaris, and Yiannis Kompatsiaris</i>	
A Comparison Study on EEG Signal Processing Techniques Using Motor Imagery EEG Data .....	781
<i>Vangelis P. Oikonomou, Kostas Georgiadis, George Liaros, Spiros Nikolopoulos, and Ioannis Kompatsiaris</i>	
Analyzing the Impact of Cognitive Load in Evaluating Gaze-Based Typing .....	787
<i>Korok Sengupta, Jun Sun, Raphael Menges, Chandan Kumar, and Steffen Staab</i>	
Assessing the Usability of Gaze-Adapted Interface against Conventional Eye-Based Input Emulation .....	793
<i>Chandan Kumar, Raphael Menges, and Steffen Staab</i>	

## **Special Track: Cloud Security and Data Privacy by Design**

Secure Database Outsourcing to the Cloud: Side-Channels, Counter-Measures and Trusted Execution .....	799
<i>Matthias Gabel and Jeremias Mechler</i>	
Ontological Templates for Regulating Access to Sensitive Medical Data in the Cloud .....	805
<i>Simeon Veloudis, Iraklis Paraskakis, Yiannis Verginadis, Ioannis Patiniotakis, and Gregoris Mentzas</i>	
HealthShare: Using Attribute-Based Encryption for Secure Data Sharing between Multiple Clouds .....	811
<i>Antonis Michalas and Noam Weingarten</i>	
Security in a Distributed Key Management Approach .....	816
<i>Gunther Schiefer, Matthias Gabel, Jeremias Mechler, Andreas Schoknecht, and Murat Citak</i>	
<b>Author Index</b> .....	<b>822</b>