13th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2020)

Volume 5: HEALTHINF

Valletta, Malta
24 – 26 February 2020

Editors:

Federico Cabitza
Ana Fred
Hugo Gamboa

ISBN: 978-1-7138-4031-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2020) by SCITEPRESS – Science and Technology Publications, Lda.
All rights reserved.

Printed with permission by Curran Associates, Inc. (2021)

For permission requests, please contact SCITEPRESS – Science and Technology Publications, Lda.
at the address below.

SCITEPRESS – Science and Technology Publications, Lda.
Avenida de S. Francisco Xavier, Lote 7 Cv. C,
2900-616 Setúbal, Portugal

Phone: +351 265 520 185
Fax: +351 265520 186

info@scitepress.org

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
Email: curran@proceedings.com
Web: www.proceedings.com

CONTENTS

INVITED SPEAKERS

KEYNOTE SPEAKERS

Visualizing Health Data – From Fundamental Research to Successful Applications 5
Roy Ruddle

Patient Innovation - When Patients Innovate and Improve Their Lives 7
Helena Canhão

Uncertainty Modeling and Deep Learning Applied to Food Image Analysis 9
Eduardo Aguilar, Bhalaji Nagarajan, Rupali Khatun, Marc Bolaños and Petia Radeva

Towards Robust Machine Learning in the Medical Domain 17
Andreas Holzinger

PAPERS

FULL PAPERS

A Hybrid Visual Analytics Framework to Evaluate Trauma Incidences and Enhance Patient Care 23
Waqar Haque, Jordan Oliver, Sonal Bajaj and Navjot Kaur

A Feature-based Approach for Identifying Soccer Moves using an Accelerometer Sensor 34
Omar Alobaid and Lakshmish Ramaswamy

Deep Learning from Heterogeneous Sequences of Sparse Medical Data for Early Prediction of Sepsis 45
Mahbub Ul Alam, Aron Henriksson, John Karlsson Valik, Logan Ward, Pontus Naucler and Hercules Dalianis

The Development and Psychometric Assessment of Medication Literacy Scale for Hypertensive Patients 56
Zhuqing Zhong, Aijing Luo, Wenzhao Xie, Siqing Ding, Shuangjiao Shi, Yinglong Duan and Feng Zheng

Resolving Differences of Opinion between Medical Experts: A Case Study with the IS-DELPHI System 66
Derek Sleeman, Kiril Kostadinov, Laura Moss and Malcolm Sim

Extracting Behavioral Determinants of Health from Electronic Health Records: Classifying Yoga Mentions in the Clinic 77
Nadia M. Penrod, Selah Lynch and Jason H. Moore

Data Mining in Clinical Trial Text: Transformers for Classification and Question Answering Tasks 83
Lena Schmidt, Julie Weeds and Julian P. T. Higgins

Adaptative Clinical Decision Support System using Machine Learning and Authoring Tools 95
Jon Kerexeta, Jordi Torres, Naiara Muro, Kristin Rebescher and Nekane Larburu

SugarArray: A User-centred-designed Platform for the Analysis of Lectin and Glycan Microarrays 106
Aurora Sucre, Raquel Pazos, Niels-Christian Reichardt and Alba Garín-Muga

Applying Machine Learning on Patient-Reported Data to Model the Selection of Appropriate Treatments for Low Back Pain: A Pilot Study 117
Wendy Oude Nijeweme – d'Hollosy, Lex van Velsen, Mannes Poel, Catharina G. M. Groothuis-Oudshoorn, Remko Soer, Patrick Stegeman and Hermie Hermens

Health Information Systems for Clients with Mild Intellectual and Developmental Disability: A Framework 125
Muneef Alshammari, Owen Doody and Ita Richardson

Explain Yourself: A Semantic Annotation Framework to Facilitate Tagging of Semantic Information in Health Smart Homes 133
Bastian Wollschlaeger, Elke Eichenberg and Klaus Kabitzsch

Evaluating Cross-lingual Semantic Annotation for Medical Forms 145
Ying-Chi Lin, Victor Christen, Anika Groß, Toralf Kirsten, Silvio Domingos Cardoso, Cédric Pruski, Marcos Da Silveira and Erhard Rahm

Combining Rhythmic and Morphological ECG Features for Automatic Detection of Atrial Fibrillation 156
Gennaro Laudato, Franco Boldi, Angela Rita Colavita, Giovanni Rosa, Simone Scalabrino, Paolo Torchitti, Aldo Lazich and Rocco Oliveto

Privacy-preserving Metrics for an mHealth App in the Context of Neuropsychological Studies 166
Alexander Gabel, Funda Ertas, Michael Pleger, Ina Schiering and Sandra Verena Müller

Receptivity of an AI Cognitive Assistant by the Radiology Community: A Report on Data Collected at RSNA 178
Karina Kanjaria, Anup Pillai, Chaitanya Shivade, Marina Bendersky, Vandana Mukherjee and Tanveer Syeda-Mahmood

Improving Mental Health using Machine Learning to Assist Humans in the Moderation of Forum Posts 187
Dong Wang, Julie Weeds and Ian Comley

MIPHAS: Military Performances and Health Analysis System 198
Gennaro Laudato, Giovanni Rosa, Simone Scalabrino, Jonathan Simeone, Francesco Picariello, Ioan Tudosa, Luca De Vito, Franco Boldi, Paolo Torchitti, Riccardo Ceccarelli, Fabrizio Picariello, Luca Torricelli, Aldo Lazich and Rocco Oliveto

Food Data Integration by using Heuristics based on Lexical and Semantic Similarities 208
Gorjan Popovski, Gordana Ispirova, Nina Hadzi-Kotarova, Eva Valenčič, Tome Eftimov and Barbara Koroušić Seljak

Fast and Realistic Approach to Virtual Muscle Deformation 217
Martin Cervenka and Josef Kohout

Air Quality and Cause-specific Mortality in the United States: Association Analysis by Regression and CCA for 1980-2014 228
Erin Teeple, Caitlin Kuhlman, Brandon Werner, Randy Paffenroth and Elke Rundensteiner

Secure Audit in Support of an Adrenal Cancer Registry 237
Anthony Stell, Vedant Chauhan and Richard Sinnott

Using a Self-Assessment Tool (SAT) to Review National Health Information Systems in Ireland 249
Sarah Craig

Enhancing Decision-making Systems with Relevant Patient Information by Leveraging Clinical Notes
João Rafael Almeida, João Figueira Silva, Alejandro Pazos Sierra, Sergio Matos and José Luís Oliveira 254

A User Centred Approach in the Implementation of Mobile Marketing in Health Applications
Tiago Filipe Bravo Fernandes and André Vasconcelos 263

Mining Patient Flow Patterns in a Surgical Ward
Christoffer O. Back, Areti Manataki and Ewen Harrison 273

Detailed Classification of Meal-related Activities from Eating Sound Collected in Free Living Conditions
Archit Jain, Takumi Kondo, Haruka Kamachi, Anna Yokokubo and Guillaume Lopez 284

SHORT PAPERS

Advanced Analytics to Predict Survivability of Breast Cancer Patients
Sonal Bajaj and Waqar Haque 295

A Novel Blockchain based Platform to Support Chronic Care Model Information Management
Luigi Lella and Sergio Piersantelli 303

Examination of Interpersonal Attachment with the Help of a Digital Tablet Application: A Proof of Concept Study
Sebastian Unger, Cony Theis and Thomas Ostermann 310

Analysis of the Use of Colour for Early Detection of Dementia
Thomas Ostermann, Sibylle Robens, Petra Heymann, Sebastian Unger, Stephan Müller, Christoph Laske and Ulrich Elbing 316

A Responsive Web Application for the Improvement of Healthy Habits in the Child Population
José Alberto Benítez-Andrades, Marta Martínez-Martínez, Isaías García-Rodríguez, Carmen Benavides, Carlos Fernández-San-Juan and Pilar Marqués-Sánchez 321

Challenges and Opportunities for Caregiving through Information and Communication Technology
Jane Moloney, Raja Manzar Abbas, Sarah Beecham, Bilal Ahmad and Ita Richardson 329

Strategies of Multi-Step-ahead Forecasting for Blood Glucose Level using LSTM Neural Networks: A Comparative Study
Touria El Idrissi, Ali Idri, Ilham Kadi and Zohra Bakkoury 337

Interrelations between Drug Prescriptions and Diagnoses for SHI Diabetes Patients using Graph Theoretic Methods and a Markov Model
Reinhard Schuster, Marc Heidbreder, Timo Emcke and Martin Schuster 345

IT-structures and Algorithms for Quality Assurance in the Health Insurance Medical Advisory Service Institutions in Germany
Vera Ries, Klaus-Peter Thiele, Martin Schuster and Reinhard Schuster 353

Operationalizing Healthcare Big Data in the Electronic Health Records using a Heatmap Visualization Technique
Don Roosan, Mazharul Karim, Jay Chok and Moom R. Roosan 361

Med2Meta: Learning Representations of Medical Concepts with Meta-embeddings
Shaika Chowdhury, Chenwei Zhang, Philip S. Yu and Yuan Luo 369

Architecture of a Learning Surveillance System for Malaria Elimination in India 377
S D Sreeganga, Susanna G. Mitra and Arkalgud Ramaprasad

Towards an On-line Handwriting Recognition Interface for Health Service Providers using Electronic Medical Records 383
Viktor Mikhael M. Dela Cruz, Christian E. Pulmano and Ma. Regina Justina E. Estuar

Impact of Threshold Values for Filter-based Univariate Feature Selection in Heart Disease Classification 391
Houda Benhar, Ali Idri and Mohamed Hosni

Language Identification for Short Medical Texts 399
Erick Velazquez Godinez, Zoltán Szlávik, Selene Baez Santamaría and Robert-Jan Sips

Creating Patient Decision Aid Tools 407
Andrea Corradini, Constantin Alexandru Gheoghiasa and Jesper Nordentoft

VisualMLTCGA: An Easy-to-Use Web Tool for the Visualization, Processing and Classification of Clinical and Genomic TCGA Data 413
Alba Garin-Muga, Aurora María Sucre, Jordi Torres and Jon Kerexeta

Multimodal Fusion Strategies for Outcome Prediction in Stroke
Esra Zihni, Vince Madai, Ahmed Khalil, Ivana Galinovic, Jochen Fiebach, John D. Kelleher, 421
Dietmar Frey and Michelle Livne

Music Recommendation System for Old People with Dementia and Other Age-related Conditions
Miriam Allalouf, Avi Cohen, Lea Cohen Sabban, Ayelet Dassa, Sagi Marciano and 429
Stella Melnitzer Beris

Towards an Ambient Support System for Continence Management in Nursing Homes: An Exploratory Study 438
Hannelore Strauven, Ine D'Haeseleer, Kristof T'Jonck, Hans Hallez, Vero Vanden Abeele, Pieter Crombez and Bart Vanrumste

A Patient's Perspective on Decision-making for the Adoption of Digital Care Pathways 447
Raja Manzar Abbas, Noel Carroll and Ita Richardson

Data and Sessions Management in a Telepathology Platform 455
Pedro Nunes, Rui Jesus, Rui Lebre and Carlos Costa

Status of Resources for Information Technology to Support Health Information Exchange in Resource-constrained Settings 463
Andrew Alunyu Egwar, Richard Ssekibuule and Josephine Nabukenya

Interpretation of Patients' Location Data to Support the Application of Process Mining Notations 472
Sina Namaki Araghi, Franck Fontanili, Elyes Lamine, Nicolas Salatge and Frederick Benaben

Blue Light and Melanopsin Contribution to the Pupil Constriction in the Blind-spot, Parafovea and Periphery 482
Tim Schilling, Mojtaba Soltanlou, Yeshwanth Seshadri, Hans-Christoph Nuerk and Hamed Bahmani

Developing a Machine Learning Model for Predicting Postnatal Growth in Very Low Birth Weight Infants 490
Andrea Seveso, Valentina Bozzetti, Paolo Tagliabue, Maria Luisa Ventura and Federico Cabitza

AdoBPRIM: Towards a New Healthcare Risk-aware Business Process Management Tool 498
Rafika Thabet, Amine Boufaied, Elyes Lamine, Dominik Bork, Ouajdi Korbaa and Hervé Pingaud

Applying Agile Principles to Collaborative Healthcare Teams 506
Rubina Lakhani, Benjamin Eze and Liam Peyton

A Framework for System-level Health Data Sharing 514
Mana Azarm, Craig Kuziemsky and Liam Peyton

A Rule-based Content Management Framework for Effective Development of Intelligent Mobile Apps in Healthcare 522
Mohammad Raahemi, Benjamin Eze, Cléo Mavriplis and Liam Peyton

Dietitians and Nutritionists Behaviour on Social Media: A Scoping Literature Review 530
Inga Saboia, Ana Margarida Pisco Almeida, Pedro Sousa and Cláudia Pernencar

Illegitimate HIS Access by Healthcare Professionals Detection System Applying an Audit Trail-based Model 539
Liliana Sá-Correia, Manuel E. Correia and Ricardo Cruz-Correia

A Process Reference Model for Enhanced Medication Management 547
Bonnie Urquhart and Waqar Haque

Are the Healthcare Institutions Ready to Comply with Data Traceability Required by GDPR? A Case Study in a Portuguese Healthcare Organization 555
Cátia Santos-Pereira, Alexandre B. Augusto, José Castanheira, Tiago Morais and Ricardo Correia

Analyzing Privacy Practices of Existing mHealth Apps 563
Aarathi Prasad, Matthew Clark, Ha Linh Nguyen, Ruben Ruiz and Emily Xiao

A Case Study of Conformance Checking for Diagnosis and Treatment of Ischemic Stroke based on Clinical Guidelines 571
Haifeng Xu, Jianfei Pang, Xi Yang, Jinghui Yu, Huajian Mao and Dongsheng Zhao

Activity Scores of Older Adults based on Inertial Measurement Unit Data in Everyday Life 579
Sandra Hellmers, Lianying Peng, Sandra Lau, Rebecca Diekmann, Lena Elgert, Jürgen M. Bauer, Andreas Hein and Sebastian Fudickar

Data Collection via Wearable Medical Devices for Mobile Health 586
Vincenza Carchiolo, Alessandro Longheu, Simone Tinella, Salvo Ferrara and Nicolò Savalli

Sensor-based Solutions for Mental Healthcare: A Systematic Literature Review 593
Nidal Drissi, Sofia Ouhbi, José Alberto García-Berná, Mohammed Abdou Janati Idrissi and Mounir Ghogho

A Computational Platform for Heart Failure Cases Research 601
João Rafael Almeida, Pedro Freire, Olga Fajarda and José Luís Oliveira

The Need to Optimize the Electronic Health Record: Usability Issues in Legacy Systems Can Compromise Patient Safety 609
Rebecca A. Meehan

Smart Community Health: A Comprehensive Community Resource Recommendation Platform 614
Mehdi Mekni and David Haynes

A Mobile Application for Physical Activity Recognition using Acceleration Data from Wearable Sensors for Cardiac Rehabilitation 625
M. Chaari, M. Abid, Y. Ouakrim, M. Lahami and N. Mezghani

A Two-stage Imbalanced Learning Method for Sleep Stages Classification using Consumer Activity Trackers 633
Zilu Liang and Mario Alberto Chapa-Martell

The Myth of 10,000 Steps: A New Approach to Smartphone-based Health Apps for Supporting Physical Activity 641
Tom Ulmer, Edith Maier and Ulrich Reimer

Methods for Preclinical Validation of Software as a Medical Device 648
Alice Ravizza, Federico Sternini, Alice Giannini and Filippo Molinari

Clinical Performance Evaluation of a Machine Learning System for Predicting Hospital-Acquired Clostridium Difficile Infection 656
Erin Teeple, Thomas Hartvigsen, Cansu Sen, Kajal Claypool and Elke Rundensteiner

Individualized Computer-based Training for Elderly in Nursing Homes: A Pilot Study 664
Katja Orlowski, Gina Maria Gräfe, Laura Tetzlaff, Thomas Schrader and Eberhard Beck

Adopting the Mediterranean Diet Score in a Diet Management System 670
Luca Anselma, Mirko Di Lascio, Antonio Lieto and Alessandro Mazzei

SalivaPrint as a Non-invasive Diagnostic Tool 677
Eduardo Esteves, Igor Cruz, Ana Cristina Esteves, Marlene Barros and Nuno Rosa

Prototypical Implementation of a Decision-supporting System for Operative Breast Cancer Therapy 683
Michael Dück and Eberhard Beck

Analysis of Gaze Trajectory and Skin Extension Pressure Data in Blood Collection Technology 687
Kazuma Mihara, Takeshi Matsuda, Yukie Majima, Seiko Masuda, Masanori Akiyoshi, Kenji Adachi and Naoki Taira

The Effects of a Nursing Care Plan Incorporated with a Decision Support System on Ventilator Associated Pneumonia: A Case Study 693
Ozgur Bolat, Nalan Gulenc, Elife Ozkan, Nuran Aydin and Ilker Kose

Differences in Brain Activity of Skilled and Novice Nurses during Blood Collection 699
Naoki Taira, Yukie Majima, Seiko Masuda, Tsuneo Kawano, Masanori Akiyoshi, Kenji Adachi, Kazuma Mihara and Ryoma Namba

Process Mining of Disease Trajectories: A Feasibility Study 705
Guntur P. Kusuma, Samantha Sykes, Ciarán McInerney and Owen Johnson

Classification of Hand Movement in EEG using ERD/ERS and Multilayer Perceptron 713
Pavel Mochura and Pavel Mautner

Comparison of Models for Predicting the Risk of Falling in the Non-hospitalized Elderly and Evaluation of Their Performances on an Italian Population 718
Elisa Salvi, Irma Sterpi, Antonio Caronni, Peppino Tropea, Michela Picardi, Massimo Corbo, Giordano Lanzola, Silvana Quaglini and Lucia Sacchi

Self-service Data Science for Healthcare Professionals: A Data Preparation Approach 724
Marco Spruit, Thomas Dedding and Daniel Vijlbrief

Towards Adoption of Standards for Communication Infrastructure/Technologies in Healthcare Systems in LMICs: Theories, Practice and Evaluation 735
Andrew Alunyu Egwar, Richard Ssekibuule and Josephine Nabukenya

Informatics as Support for Changes in Health Policy: A Case in Obstetrics 745
Giovana Jaskulski Gelatti, Pedro Pereira Rodrigues and Ricardo João Cruz Correia

Impact of Music on Human Brain Activity during Mental Stress 750
Roman Mouček and Klára Beránková

"The Algorithm Will See You Now": Exploring the Implications of Algorithmic Decision-making in Connected Health 758
Noel Carroll, Ita Richardson and Raja Manzar Abbas

Human Factors Standards and the Hard Human Factor Problems: Observations on Medical Usability Standards 766
Lorenzo Strigini and Marwa Gadala

A Hybrid Approach to Develop and Integrate Chatbot in Health Informatics Systems 774
Abhijat Chaturvedi, Siddharth Srivastava, Astha Rai and A. S. Cheema

WORKSHOP ON BEST PRACTICES FOR SCALING-UP DIGITAL INNOVATIONS IN HEALTHCARE

FULL PAPERS

The Nature of Digital Innovation and What Can Be Learned for Information Systems Management 787
Stefanie Kaczmarek, Martin Benedict and Marcel Susky

The Doctor Will See Yourself Now: Review and Discussion of a Mass-market Self-service Technology for Medical Advice 798
Joseph Ollier and Tobias Kowatsch

IT-Governance in Integrated Care: A Risk-centred Examination in Germany 808
Lena Otto

SHORT PAPERS

Digital Innovation in Outpatient Healthcare Delivery Services: A Common Methodology to Introduce IoT Technologies in Two Use-cases 821
Salomé Azevedo and Ana Rita Londral

Swiss Francs Seem to Make Insured Move: Comparing Daily and Monthly Financial Incentives of a Scalable Digital Health Intervention 827
Gisbert W. Teepe and Tobias Kowatsch

SPECIAL SESSION ON MACHINE LEARNING AND DEEP LEARNING IMPROVE PREVENTIVE AND PERSONALIZED HEALTHCARE

FULL PAPERS

Automated Rheumatic Heart Disease Detection from Phonocardiogram in Cardiology Ward 839
Melkamu Hunegnaw Asmare, Frehiwot Woldehanna, Luc Janssens and Bart Vanrumste

AI-Rehab: A Framework for AI Driven Neurorehabilitation Training - The Profiling Challenge 845
Yuri Almeida, Manisha Sanjay Sirsat, Sergi Bermúdez i Badia and Eduardo Fermé

Using BERT and Semantic Patterns to Analyze Disease Outbreak Context over Social Network Data 854
Neelesh Rastogi and Fazel Keshtkar

Predicting 30-days All-cause Hospital Readmissions Considering Discharge-to-alternate-care-facilities 864
Tahir Hameed and Syed Ahmad Chan Bukhari

AUTHOR INDEX 875