

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zurich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

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

Miroslav Bursa · Andreas Holzinger
M. Elena Renda · Sami Khuri (Eds.)

Information Technology in Bio- and Medical Informatics

8th International Conference, ITBAM 2017
Lyon, France, August 28–31, 2017
Proceedings

Editors

Miroslav Bursa
Czech Technical University
Prague
Czech Republic

Andreas Holzinger
Medical University Graz
Graz
Austria

M. Elena Renda
Institute of Informatics and Telematics
Pisa
Italy

Sami Khuri
San José State University
San José, CA
USA

ISSN 0302-9743

ISSN 1611-3349 (electronic)

Lecture Notes in Computer Science

ISBN 978-3-319-64264-2

ISBN 978-3-319-64265-9 (eBook)

DOI 10.1007/978-3-319-64265-9

Library of Congress Control Number: 2017947507

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

© Springer International Publishing AG 2017

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

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

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

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

Biomedical engineering and medical informatics represent challenging and rapidly growing areas. Applications of information technology in these areas are of paramount importance. Building on the success of ITBAM 2010, ITBAM 2011, ITBAM 2012, ITBAM 2013, ITBAM 2014, ITBAM 2015, and ITBAM 2016, the aim of the 8th International Conference on Information Technology in Bio- and Medical Informatics (ITBAM) conference was to continue bringing together scientists, researchers, and practitioners from different disciplines, namely, from mathematics, computer science, bioinformatics, biomedical engineering, medicine, biology, and different fields of life sciences, to present and discuss their research results in bioinformatics and medical informatics.

We hope that ITBAM will continue to serve as a platform for fruitful discussions between all attendees, where participants can exchange their recent results, identify future directions and challenges, initiate possible collaborative research and develop common languages for solving problems in the realm of biomedical engineering, bioinformatics, and medical informatics. The importance of computer-aided diagnosis and therapy continues to draw attention worldwide and has laid the foundations for modern medicine with excellent potential for promising applications in a variety of fields, such as telemedicine, Web-based health care, analysis of genetic information, and personalized medicine.

Following a thorough peer-review process, we finally selected three long papers for oral presentation and six short papers for poster session for the eighth annual ITBAM conference (from a total of 15 contributions). The Organizing Committee would like to thank the reviewers for their excellent job. The articles can be found in the proceedings. The papers show how broad the spectrum of topics in applications of information technology to biomedical engineering and medical informatics is.

The editors would like to thank all the participants for their high-quality contributions and Springer for publishing the proceedings of this conference. Once again, our special thanks go to Gabriela Wagner for her hard work on various aspects of this event.

June 2017

M. Elena Renda
Miroslav Bursa
Andreas Holzinger
Sami Khuri

Organization

General Chair

Christian Böhm University of Munich, Germany

Program Committee Co-chairs

Miroslav Bursa	Czech Technical University, Czech Republic
Andreas Holzinger	Medical University Graz, Austria
Sami Khuri	San José State University, USA
M. Elena Renda	IIT, CNR, Pisa, Italy

Program Committee

Akutsu, Tatsuya	Kyoto University, Japan, Japan
Albrecht, Andreas	Middlesex University London, UK
Baumann, Peter	Jacobs University Bremen, Germany
Bursa, Miroslav	Czech Technical University in Prague, Czech Republic
Böhm, Christian	University of Munich, Germany
Casadio, Rita	University of Bologna, Italy
Casillas, Sònia	Universitat Autònoma de Barcelona, Spain
Ehrich, Hans-Dieter	Technical University of Braunschweig, Germany
Friedrich, Christoph M.	University of Applied Sciences Dortmund, Germany
Havlik, Jan	Czech Technical University in Prague, Czech Republic
Heun, Volker	Ludwig-Maximilians-Universität München, Germany
Holzinger, Andreas	Technical University Graz and Medical Informatics, Medical University Graz, Austria
Ismailova, Larisa	NRNU MEPhI, Moscow, Russian Federation
Kerr, Alastair	University of Edinburgh, UK
Khuri, Sami	San Jose State University, USA
Kuzilek, Jakub	Czech Technical University, Czech Republic
Lhotska, Lenka	Czech Technical University, Czech Republic
Marshall, Roger	Plymouth State University, USA
Masciari, Elio	ICAR-CNR, Università della Calabria, Italy
Pisanti, Nadia	University of Pisa, Italy
Pizzi, Cinzia	University of Padova, Italy
Pizzuti, Clara	Institute for High Performance Computing and Networking, National Research Council, Italy
Renda, Maria Elena	CNR-IIT, Italy
Rovetta, Stefano	University of Genoa, Italy
Santana, Roberto	University of the Basque Country, Spain
Seker, Huseyin	University of Northumbria at Newcastle, UK

Spilka, Jiri	Czech Technical University in Prague, Czech Republic
Steinhofel, Kathleen	King's College London, UK
Zhang, Songmao	Chinese Academy of Sciences, China
Zhu, Qiang	University of Michigan, USA

Additional Reviewer

Corrado Pecori	Università e-Campus, Italy
----------------	----------------------------

Contents

Editorial

IT in Biology & Medical Informatics: On the Challenge of Understanding the Data Ecosystem	3
<i>Andreas Holzinger, Miroslav Bursa, Sami Khuri, and M. Elena Renda</i>	

General Track

A Hybrid Feature Selection Method to Classification and Its Application in Hypertension Diagnosis	11
<i>Hyun Woo Park, Dingkun Li, Yongjun Piao, and Keun Ho Ryu</i>	
Statistical Analysis of Perinatal Risk Factors for Emergency Caesarean Section	20
<i>Ibrahim Abou Khashabh, Václav Chudáček, and Michal Huptych</i>	
Modelling of Cancer Patient Records: A Structured Approach to Data Mining and Visual Analytics	30
<i>Jing Lu, Alan Hales, and David Rew</i>	

Poster Session

Contextual Decision Making for Cancer Diagnosis	55
<i>Samia Sbissi and Said Gattoufi</i>	
A Review of Model Prediction in Diabetes and of Designing Glucose Regulators Based on Model Predictive Control for the Artificial Pancreas . . .	66
<i>Kyriaki Saiti, Martin Macaš, Kateřina Štechová, Pavlína Pithová, and Lenka Lhotská</i>	
Audit Trails in OpenSLEX: Paving the Road for Process Mining in Healthcare	82
<i>Eduardo González López de Murillas, Emmanuel Helm, Hajo A. Reijers, and Josef Küng</i>	
Riemannian Geometry in Sleep Stage Classification	92
<i>Elizaveta Saifutdinova, Václav Gerla, and Lenka Lhotská</i>	
The Use of Convolutional Neural Networks in Biomedical Data Processing	100
<i>Miroslav Bursa and Lenka Lhotska</i>	

Reducing Red Blood Cell Transfusions	120
<i>James P. McGlothlin, Evan Crawford, Hari Srinivasan, Carissa Cianci, Brenda Bruneau, and Ihab Dorotta</i>	
Author Index	135