



Series Editor

Ratko Magjarević , *Faculty of Electrical Engineering and Computing, ZESOI, University of Zagreb, Zagreb, Croatia*

Associate Editors

Piotr Ładyżyński, *Warsaw, Poland*

Fatimah Ibrahim , *Department of Biomedical Engineering, Faculty of Engineering, Universiti Malaya, Kuala Lumpur, Malaysia*

Igor Lackovic, *Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb, Croatia*

Emilio Sacristan Rock, *Electrical Engineering Department, Universidad Autonoma Metropolitana, Mexico DF, Mexico*

The IFMBE Proceedings Book Series is an official publication of *the International Federation for Medical and Biological Engineering* (IFMBE). The series gathers the proceedings of various international conferences, which are either organized or endorsed by the Federation. Books published in this series report on cutting-edge findings and provide an informative survey on the most challenging topics and advances in the fields of medicine, biology, clinical engineering, and biophysics.

The series aims at disseminating high quality scientific information, encouraging both basic and applied research, and promoting world-wide collaboration between researchers and practitioners in the field of Medical and Biological Engineering.

Topics include, but are not limited to:

- Diagnostic Imaging, Image Processing, Biomedical Signal Processing
- Modeling and Simulation, Biomechanics
- Biomaterials, Cellular and Tissue Engineering
- Information and Communication in Medicine, Telemedicine and e-Health
- Instrumentation and Clinical Engineering
- Surgery, Minimal Invasive Interventions, Endoscopy and Image Guided Therapy
- Audiology, Ophthalmology, Emergency and Dental Medicine Applications
- Radiology, Radiation Oncology and Biological Effects of Radiation
- Drug Delivery and Pharmaceutical Engineering
- Neuroengineering, and Artificial Intelligence in Healthcare

IFMBE proceedings are indexed by SCOPUS, EI Compendex, Japanese Science and Technology Agency (JST), SCImago. They are also submitted for consideration by WoS.

Proposals can be submitted by contacting the Springer responsible editor shown on the series webpage (see “Contacts”), or by getting in touch with the series editor Ratko Magjarevic.


Hariton-Nicolae Costin · Ratko Magjarevic ·
Gladiola Gabriela Petroiu
Editors

Advances in Digital Health and Medical Bioengineering II


Volume 3: Telemedicine, Biomaterials,
Environmental Protection, Medical Imaging,
and Biomechanics

 Springer

Editors

Hariton-Nicolae Costin 
Institute for Computer Science
Romanian Academy-Iasi Branch
Iasi, Romania

Gladiola Gabriela Petroiu
Grigore T. Popa University of Medicine
Iasi, Romania

Ratko Magjarevic 
Faculty of Electrical Engineering
and Computing
University of Zagreb
Zagreb, Croatia

ISSN 1680-0737

ISSN 1433-9277 (electronic)

IFMBE Proceedings

ISBN 978-3-032-23951-8

ISBN 978-3-032-23952-5 (eBook)

<https://doi.org/10.1007/978-3-032-23952-5>

© The Editor(s) (if applicable) and The Author(s), under exclusive license
to Springer Nature Switzerland AG 2026

This work is subject to copyright. All rights are solely and exclusively licensed 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, expressed 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.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.

Preface

The three volumes of *Advances in Digital Health and Medical Bioengineering*, part II, gather all accepted and presented papers at the 13th International Conference on E-Health and Bioengineering, EHB-2025, November 13–14, 2025, Iași, Romania (www.ehbconference.ro).

This hybrid conference was organized by the Grigore T. Popa University of Medicine and Pharmacy of Iași/Faculty of Medical Bioengineering, International Society for Digital Health and Education, and co-organized by the Institute of Computer Science of Romanian Academy—Iasi Branch. The conference was mainly dedicated to the e-health systems, medical bioengineering and biomedical engineering, but also addresses related fields. Its specific aim and objectives are to promote concepts and advanced hardware and software technologies in the emerging domains of e-health, medical devices and instrumentation, biosignal and image processing, medical informatics, artificial intelligence in healthcare, biomechatronics, biomaterials, biotechnologies, medical physics, healthcare management, teaching and (e)learning, rehabilitative and assistive technologies, environmental protection, food technologies, as well as in some younger disciplines such as bioinformatics, and systems biology. Thus, EHB 2025 was an international forum for fundamental and applied research and applications in bioengineering and biomedical engineering. EHB 2025 brought together researchers from academic and research institutions, leading industrial companies, and government laboratories worldwide to promote and popularize the scientific fundamentals and applications of digital health and bioengineering.

The conference motto was *Innovation for a better healthcare*, and we have to stress that the ultimate goal of medical systems, we mean a better quality of life, from medical and social points of view, cannot be achieved without an efficient use of information and management systems and of biomedical technology.

The EHB Conference is the largest medical bioengineering conference in Romania and Eastern Europe. This year it received 478 submissions from 51 countries across six continents. Following a rigorous double-blind, two-round peer-review process, authors revised their papers based on reviewers' feedback, resulting in an acceptance rate of about 61%. We sincerely thank the authors, conference committee members, session chairs, and especially the reviewers—without their dedication, this conference and book would not be possible. Extended versions of selected best papers will be published in *Advances in Electrical and Computer Engineering*, *Revue Roumaine des Sciences Techniques*, *Série Électrotechnique et Énergétique*, and special issues of *Sensors and Applied Sciences* (MDPI). Special thanks are also due to our honorary chair, Prof. Constantinos Pattichis (University of Cyprus), and to all committee members and external reviewers for their expertise and support.

Also, thank you very much to the plenary speakers: Prof. Radu-Emil Precup (Politehnica University of Timișoara, Romania), Omneya Attallah (Arab Academy for Science, Technology, and Maritime Transport, Alexandria, Egypt), Martin Rožánek

(Czech Technical University in Prague, Czech Republic), and Carlo Ricciardi (University of Naples Federico II, Italy) for sharing their knowledge, expertise and experience. We appreciate very much the implication of the young researchers as authors, and the partnership with IFMBE, Springer Nature, EasyChair, iThenticate plagiarism verification, and with our sponsor (Applied Sciences journal, MDPI) for their essential support during the preparation of EHB 2025 and this book.

The book **Advances in Digital Health and Medical Bioengineering II**, published by Springer Nature, is structured in three volumes that cover the major scientific disciplines in digital health and medical bioengineering.

- **Volume 1: Medical Devices, Measurements, and Artificial Intelligence Applications** presents state-of-the-art research on medical devices and measurement technologies, together with advanced artificial intelligence methods for healthcare research and practice.
- **Volume 2: Health Technology Assessment, Biomedical Signal Processing, Medicine and Informatics** brings together contributions focused on the evaluation and optimization of health technologies, advanced biomedical signal processing methods, and modern medical informatics solutions.
- **Volume 3: Telemedicine, Biomaterials, Environmental Protection, Medical Imaging, and Biomechanics** presents interdisciplinary research spanning remote and technology-assisted health care, biomaterials, and biotechnologies for medical applications.

This volume, *Telemedicine, Biomaterials, Environmental Protection, Medical Imaging, and Biomechanics*, presents interdisciplinary research in remote and technology-assisted health care, biomaterials, and biotechnologies. It also covers medical imaging methods and analysis, biomechanics modeling and assessment, and health–environment applications related to monitoring, prevention, and protection. The third volume of this book contains 48 chapters and consists of six sections. The first section focuses on *Telemedicine* and includes six chapters addressing approaches to remote and technology-assisted health care. The contributions cover a broad spectrum of e-, m-, and p-health solutions, highlighting digital strategies for improving access and continuity of care. Remote monitoring for individuals with chronic diseases is also represented, illustrating practical frameworks for follow-up and long-term management outside traditional clinical settings. Beyond standard telehealth scenarios, the section expands toward predictive modeling for human health in extreme environments, including space-related contexts, and emphasizes wider societal applications such as disaster management, security, and ecosystem monitoring supported by telemedicine-related technologies.

The second section is dedicated to Biomaterials and includes six chapters covering material characterization, sensing applications, and modeling-based investigations. Several contributions address advanced biomaterials relevant to medical implants, including bioabsorbable vascular stents. A group of studies presents detectors for volatile organic compounds, highlighting the expanding role of sensing in biomedical and environmental contexts. The section is complemented by modeling and simulation approaches and interdisciplinary applications, linking fundamental material properties to applied biomedical solutions.

The third section addresses *Environmental Protection and Health* through four chapters that connect sustainable technologies with health-related outcomes and policy considerations. Topics include functionalization strategies for polymer-based materials such as PET fibers and investigations into the beneficial properties of functionalized marine algae biomass. Another contribution presents an efficient approach for removing mercury ions from aqueous solutions using low-cost adsorbents, emphasizing practical environmental remediation. The section also includes a broader systems-level perspective through an analysis of Romania's nuclear diplomacy, exploring the balance between technology and security in the context of green transition efforts and regional resilience.

The fourth section, the largest in this volume, focuses on *Medical Imaging and Image Processing* and includes nineteen chapters emphasizing clinically relevant applications supported by modern computational methods. A substantial set of contributions demonstrates how artificial intelligence can guide image analysis and medical decision support across multiple imaging modalities and diagnostic targets, including MRI-based evaluation of lumbar vertebrae, detection of endometrial abnormalities, retinal vessel extraction, skin lesion classification, thermal imaging approaches for breast cancer classification, automated cervical cell classification, and lung lesion segmentation in CT. Advanced methodologies are also presented for three-dimensional tumor segmentation, reflecting the increasing maturity of 3D learning and regularization strategies in medical imaging. The section further extends to diverse applications such as image-based animal behavior analysis for biomedical experiments, human-in-the-loop frameworks for improving 3D vascular segmentation completeness, multimodal video analytics for early autism detection, and AI-based food image recognition. Educational and translational directions are represented through the design and use of 3D-printed physical phantoms, while additional chapters address automated parasite detection in malaria screening, texture-based classification of colorectal tissue types, and structured approaches for calculating clinical indices such as the cardiothoracic index.

The 5th section of this volume is dedicated to *Biomechanics*, a salient domain of biomedical engineering and bioengineering, illustrated by six chapters. It includes an automated platform for kinematic assessment of hand motor deficits in neurological diseases and a study showing how gait analysis can help identify digital biomarkers in functional motor disorders. Another chapter reports neurofunctional and biomechanical adaptations to robotic-assisted gait therapy in cerebral palsy. The section also presents position identification for vision-based robot control, an analysis of how contact point errors affect the apparent mechanical properties of giant unilamellar vesicles, and an investigation of how additive manufacturing and CT scanning parameters influence anthropomorphic phantom fidelity.

The sixth section explores *Food Technologies for Health* through four chapters, presenting an emerging interdisciplinary direction at the intersection of nutrition, bioengineering, and digital technologies. Topics include oxidative stress and its implications for digestion in farmed fish species, as well as the transformation of sea algae via fermentation for animal and human health applications. The section also incorporates a data-driven informatics perspective through work on IoT integration and smart contract security in Dairy 4.0, highlighting the role of digitalization in food systems. A further contribution examines coriander as a natural antioxidant approach to reducing oxidative

stress in fish, complementing the section's broader emphasis on functional strategies to support health through food-related innovation.

January 2026

Hariton-Nicolae Costin
Ratko Magjarević
Gladiola Gabriela Petroiu

Organization

Steering Committee

General Chair

Hariton-Nicolae Costin
Institute of Computer Science, Romanian
Academy—Iași Branch, Romania

Honorary Chair

Constantinos S. Pattichis
University of Cyprus, Cyprus

Co-chairs

Liliana Vereștiuc
Faculty of Medical Bioengineering, Grigore T.
Popa University of Medicine and Pharmacy
Iasi, Romania

Anca-Irina Galaction
Dean of the Faculty of Medical Bioengineering,
Grigore T. Popa University of Medicine and
Pharmacy Iasi, Romania

Gabriela-Gladiola Petroiu
(Organizing Committee Chair)
Faculty of Medical Bioengineering, Grigore T.
Popa University of Medicine and Pharmacy
Iasi, Romania

Cristian Rotariu (Conference
Technical Chair)
Faculty of Medical Bioengineering, Grigore T.
Popa University of Medicine and Pharmacy
Iasi, Romania

Scientific Committee

Hariton Costin
Institute of Computer Science, Romanian
Academy, Iasi Branch, Romania

Viorel Scripcariu
Rector of the University of Medicine and
Pharmacy (UMF) Iași, Romania

Metin Akay
University of Houston, USA, IEEE EMBS
President, USA

Anca Galaction	UMF Iași, Dean of the Faculty of Medical Bioengineering, Romania
Liliana Vereștiuc	UMF Iași, Vice-dean, Faculty of Medical Bioengineering, Romania
Dan Zaharia	UMF Iași, President of the Romanian Society of Medical Bioengineering
Alexandru Morega	National University of Science and Technology POLITEHNICA Bucharest, Romania
Gladiola Petroiu	UMF Iași, Faculty of Medical Bioengineering, Romania
Cristian Rotariu	UMF Iași, Faculty of Medical Bioengineering, Romania
J. Amudhavel	VIT Bhopal University, India
Adrian Barbu	Florida State University, USA
Enrico G. Caiani	Polytechnic University of Milan, Italy
Fabrizio Clemente	National Research Council, Roma, Italy
Svetlana Cojocar	Academy of Sciences of Moldova, Kishinev, Rep. of Moldova
Maria Manuela Cruz-Cunha	Polytechnic Institute of Cávado and Ave, Portugal
Thomas Martin Deserno, né Lehmann	Peter L. Reichertz Inst. for Medical Informatics of TU Braunschweig and Hannover Medical School, Germany
Danilo De Rossi	University of Pisa, Italy
Valentin Drăgoi	University of Texas, USA
Carlo Frigo	Politecnico di Milano, Italy
Constantin Gaiandric	Academy of Sciences of Moldova, Kishinev
Enrique J. Gomez	Universidad Politècnica de Madrid, Spain
María S. Guillem	Universidad Politècnica de Valencia, Spain
Petra Hospodkova	Czech Technical University in Prague, Czech Republic
Peter Husar	Technische Universität Ilmenau, Germany
Helmut Hutten	University of Technology, Graz, Austria
Ákos Jobbágy	Budapest University of Technology and Economics, Hungary
Dipak Kumar Jana	Haldia Institute of Technology, India
Izzet Kale	University of Westminster, United Kingdom
Petr Kudrna	Czech Technical University in Prague, Czech Republic
Raymond Lee	London South Bank University, London, United Kingdom
Ratko Magjarević	University of Zagreb, Croatia
Winfried Mayr	Medical University of Vienna, Austria
Anand Nayyar	Duy Tan University, Da Nang, Vietnam

Konstantina Nikita	National Technical University of Athens, Greece
Ioan Opreș	Wake Forest Univ. (NC), USA
Nicolas Pallikarakis	University of Patras, Greece
Mihail Popescu	University of Missouri, USA
Octavian Postolache	Institute of Telecommunications, Lisbon, Portugal
Rangaraj M. Rangayyan	University of Calgary, Alberta, Canada
Jose J. Rieta	Universitat Politècnica de Valencia, Spain
Vladimir Rogalewicz	Czech Technical University in Prague, Czech Republic
Martin Rožánek	Czech Technical University in Prague, Czech Republic
Karel Roubik	Czech Technical University in Prague, Czech Republic
Abdel-Badeeh Salem	Ain Shams University, Cairo, Egypt
Saeid Sanei	Nottingham Trent University, United Kingdom
Ralf E.D. Seepold	University of Technology, Business and Design Konstanz, Germany
Francesco Sicurello	Bicocca University of Milan, IITM / AITIM, Italy
Maria Siebes	University of Amsterdam, The Netherlands
Adrian Stoica	JPL-NASA, USA
Vicente Traver Salcedo	Polytechnic University of Valencia, Spain
Luminița Aura Vese	University of California, Los Angeles (UCLA), USA
Andreas Voss	University of Applied Sciences Jena, Germany
Ioana Adochiei	Military Technical Academy, Bucharest, Romania
Felix Adochiei	National University of Science and Technology POLITEHNICA Bucharest, Romania
Adriana Albu	Polytechnic University of Timișoara, Romania
Ioana Dana Alexa	UMF Iași, Faculty of Medicine, Romania
Ana Anghel	National University of Science and Technology POLITEHNICA Bucharest, Romania
Vasile Apopei	Institute of Computer Science, Romanian Academy Iasi Branch, Romania
Florin Ciprian Argatu	National University of Science and Technology POLITEHNICA Bucharest, Romania
Dragoș Arotăriței	UMF Iași, Faculty of Medical Bioengineering, Romania
Tudor Barbu	Institute of Computer Science, Romanian Academy Iași Branch, Romania
Mihaela Baritz	Transilvania University of Brasov, Romania
Cosmin Bănică	National University of Science and Technology POLITEHNICA Bucharest, Romania

Silviu Bejinariu	Institute of Computer Science, Romanian Academy Iași Branch, Romania
Nicolae Botezatu	Gheorghe Asachi Technical University of Iasi, Romania
Radu Gabriel Bozomitu	Gheorghe Asachi Technical University of Iasi, Romania
Laura Bulgariu	Gheorghe Asachi Technical University of Iasi, Romania Emil Budescu Gheorghe Asachi Technical University Iasi, Romania
Maria Butnaru	UMF Iasi, Faculty of Medical Bioengineering, Romania
Sînziana Anca Butnaru Moldoveanu	UMF Iasi, Romania
Irina Gabriela Cara	Ion Ionescu de la Brad University of Life Sciences of Iași, Romania
Radu Ciorap	UMF Iași, Faculty of Medical Bioengineering, Romania
Radu Ciupa	Technical University of Cluj – Napoca, Romania
Călin Corciovă	UMF Iași, Faculty of Medical Bioengineering, Romania
Marcel Costuleanu	UMF Iași, Faculty of Medicine, Romania
Daniela Danciu	University of Craiova, Romania
Laura Darabant	Technical University of Cluj-Napoca, Romania
Cristina Dascalu	UMF, Faculty of Medicine, Romania Iasi
Valeriu David	Gheorghe Asachi Technical University of Iași, Romania
Gabriel Dimitriu	UMF Iași, Faculty of Pharmacy, Romania
Alin Alexandru Dobre	Politehnica University of Bucharest, Romania Dan Marius Dobre Gheorghe Asachi Technical University of Iasi, Romania
Radu Dobrescu	National University of Science and Technology POLITEHNICA Bucharest, Romania
Bogdan Adrian Enache	National University of Science and Technology POLITEHNICA Bucharest, Romania
Monica Fira	Institute of Computer Science of the Romanian Academy Iași Branch
Monica Feraru	Institute of Computer Science of Romanian Academy Iasi Branch, Romania
Adriana Florescu	Politehnica University, Faculty of Electronics, Bucharest, Romania
Norina Fornă	UMF Iasi, Faculty of Dental Medicine, Romania
Cristian Foșalău	Gheorghe Asachi Technical University of Iasi, Romania

Oana Geman	Ștefan cel Mare University of Suceava, Romania
Maria Gavrilescu	Gheorghe Asachi Technical University of Iasi, Romania, Romania
Irina Grădinaru	UMF Iași, Faculty of Dental Medicine, Romania
Liviu Gorăș	Gheorghe Asachi Technical University of Iasi, Romania
Mihaela Hnatiuc	Maritime University of Constanța, Romania
Mircea Hulea	Gheorghe Asachi Technical University of Iasi, Romania
Anca Ignat	Alexandru Ioan Cuza University of Iasi, Romania
Mihai Ilea	UMF Iasi, Faculty of Medical Bioengineering, Romania
Bogdan Ionescu	National University of Science and Technology POLITEHNICA Bucharest, Romania
Horia Iovu	National University of Science and Technology POLITEHNICA Bucharest, Romania
Adina Carmen Ilie	UMF Iași, Faculty of Medicine, Romania
Eugen Merticaru	Gheorghe Asachi Technical University of Iasi, Romania
Marcela Mihai	Petru Poni Institute of Macromolecular Chemistry, Iasi, Romania
Mihaela Morega	National University of Science and Technology POLITEHNICA Bucharest, Romania
Mihaela Moscalu	UMF Iași, Faculty of Medicine, Romania
Liana Moș	Vasile Goldis Western University of Arad, Romania
Corina Naforniță	Technical University of Timișoara, Romania
Gabriel Neagu	National Institute for Research & Development in Informatics, Romania
Mihaela Neagu	Politehnica University Bucharest, Romania
Cristian Negrescu	Politehnica University Bucharest, Romania
Loredana Niță	Petru Poni Institute of Macromolecular Chemistry, Iasi, Romania
Ruxandra Paraschiv	Titu Maiorescu University, Bucharest, Romania
Titu Paraschiv	Titu Maiorescu University, Bucharest, Romania
Cătălina Anisoara Peptu	Gheorghe Asachi Technical University of Iasi, Romania
Marian Poboroniuc	Gheorghe Asachi Technical University of Iasi, Romania
Nirvana Popescu	National University of Science and Technology POLITEHNICA Bucharest, Romania
Călin Popovici	Romanian Space Agency, Romania

Mădălina Poștaru	UMF Iasi, Faculty of Medical Bioengineering, Romania
Radu-Emil Precup	Polytechnic University of Timisoara, Romania
Sorin Pușcoci	National Institute for Research & Development in Informatics, Bucharest, Romania
Gabriel-Lucian Radu	National University of Science and Technology POLITEHNICA Bucharest, Romania
Marius-Nicolae Roman	Technical University of Cluj-Napoca, Romania
Virginia Săndulescu	National Institute for Research & Development in Informatics, Bucharest, Romania
Paul-Dan Sîrbu	Grigore T. Popa University of Medicine and Pharmacy Iasi, Romania
George Călin Serișan	National University of Science and Technology POLITEHNICA Bucharest, Romania
Sorin Soviany	National Institute for Research & Development in Informatics, Bucharest, Romania
Loredana Stanciu	Polytechnic University of Timișoara, Romania
Ruxandra Stoean	University of Craiova, Romania
Cătălin Stoean	University of Craiova, Romania
Lucian Toma	National University of Science and Technology POLITEHNICA Bucharest, Romania
Lacramioara Stoicu-Tivadar	Polytechnic University of Timișoara, Romania
Vasile Stoicu-Tivadar	Polytechnic University of Timișoara, Romania
Denisa Șteț	Technical University of Cluj – Napoca, Romania
Ramona-Gabriela Ursu	UMF Iași, Faculty of Medicine, Romania
Mircea-Florin Vaida	Technical University of Cluj-Napoca, Romania
Silvia Vasiliu	Petru Poni Institute of Macromolecular Chemistry, Iasi, Romania
Constantin Vertan	National University of Science and Technology POLITEHNICA Bucharest, Romania
Cristian Vizitiu	Institute of Space Science, Romania
Simona Vlad	Technical University of Cluj – Napoca, Romania
Carmen Zaharia	Gheorghe Asachi Technical University of Iasi, Romania
Daniela Zaharie	West University of Timisoara, Romania
Georgeta Zegan	UMF Iași, Faculty of Dental Medicine, Romania
Eugenia Zorila	Vasile Goldis Western University, Arad, Romania

Invited External Reviewers

Jayavel Amudhavel	VIT Bhopal University, India
Enrico G. Caiani	Polytechnic University of Milan, Italy

Fabrizio Clemente	National Research Council, Roma, Italy
Constantin Gaindric	Academy of Sciences of Moldova, Kishinev
Dipak Kumar Jana	Haldia Institute of Technology, India
Petr Kudrna	Czech Technical University in Prague, Czech Republic
Anand Nayyar	Duy Tan University, Da Nang, Vietnam
Mihail Popescu	University of Missouri, USA
Octavian Postolache	Institute of Telecommunications, Setubal, Portugal
Jose J. Rieta	Universitat Politècnica de Valencia, Spain
Vladimir Rogalewicz	Czech Technical University in Prague, Czech Republic
Martin Rožánek	Czech Technical University in Prague, Czech Republic
Abdel-Badeeh Salem	Ain Shams University, Cairo, Egypt
Saeid Sanei	Nottingham Trent University, United Kingdom
Ruxandra Țapu	Institute Mines-Telecom/Telecom SudParis

EHB 2025 Organizing Committee

Hariton Costin	President of the Int. Society for Digital Health and Education
Gladiola Petroiu	UMF Iasi, Faculty of Medical Bioengineering, Vice President of the Int. Society for Digital Health and Education Organizing Committee Chair
Cristian Rotariu	UMF Iasi, Faculty of Medical Bioengineering
Martin Rožánek	Czech Technical University in Prague, Czech Republic
Petr Kudrna	Czech Technical University in Prague, Czech Republic
Anca Galaction	UMF Iasi, Faculty of Medical Bioengineering, Iași, Romania
Liliana Vereștiuc	UMF Iasi, Faculty of Medical Bioengineering, Iași, Romania
Ioana Adochiei	Military Technical Academy, Bucharest, Romania
Marilena Ianculescu	National Institute for Research and Development in Informatics – ICI Bucharest, Romania
Mihaela Baritz	Transilvania University, Brașov, Romania
Angela Repanovici	Transilvania University, Brașov, Romania
Călin Corciovă	UMF, Faculty of Medical Bioengineering
Mihaela Hnatiuc	Maritime University of Constanța

Sînziana Butnaru Moldoveanu	UMF Iasi, Faculty of Medical Bioengineering
Diana Costin	UMF Iasi, Faculty of Medicine
Vera Bălan	UMF Iasi, Faculty of Medical Bioengineering
Oana Hrișcă-Eva	UMF Iasi, Faculty of Medical Bioengineering
Felix Adochiei	University Politehnica of Bucharest
Teofil Ursache	UMF Iasi, Faculty of Medical Bioengineering
Mihai Aron	UMF Iasi, Faculty of Medical Bioengineering, Romania
Betina Melinte	UMF Iasi, Faculty of Medical Bioengineering, Romania
Robert Fuior	UMF Iasi, Faculty of Medical Bioengineering, Romania

Association of Bioengineer Students UMF, Faculty of Medical Bioengineering
UMF = Grigore T. Popa University of Medicine and Pharmacy, Iași, Romania

Contents

Telemedicine

Design and Evaluation of a Mobile Health Platform for Improved Healthcare Delivery in Underserved Communities in Ghana	3
<i>Rose-Mary Owusuaa Mensah Gyening, Emmanuel Ahene, Michael Akoto Appiah, Dominic Agyili, Desmond Nani, Edmund Ilimoan Yamba, and Daniel Ansong</i>	
Human Digital Twin for Astronauts: Integrating Microgravity Stress Testing and AI-Driven Predictive Modeling for Human Health in Space	13
<i>Kevin Dominey, Alexandru Nistorescu, Mihaela Marin, Cristian Vizitiu, and Ciprian Dobre</i>	
From Search-and-Rescue to Nuclear Scenarios: AI-Enabled UAS for Disaster Management, Security, and Ecosystem Monitoring	21
<i>Alexandru Nistorescu, Mihaela Marin, Kevin Dominey, Adrian Cătălin Dinculescu, Cosmin Dugan, Cristian Vizitiu, and Petre Min</i>	
Navigating the Challenges of Sustainable Telehealth Implementation: An Intuitionistic Fuzzy VIKOR Approach	30
<i>Yagmur Arioç, Ahmet Suha Hancioglu, and Ibrahim Yilmaz</i>	
Priority-Aware Scheduling and Channel Allocation in WBANs: A MILP-Based Optimization Framework	45
<i>Melda Kevser Akgün</i>	
Bioengineering and Telemedicine Applications in Remote Monitoring of Patients with Chronic Diseases: A Systematic Review	53
<i>Paolo Pedraza-Choque and Michael Cabanillas-Carbonell</i>	

Biomaterials

Finite Element Analysis of Bioabsorbable Vascular Stents Fabricated from PLA/Graphene Nanocomposites	69
<i>Priyanka Kumari, Sonal Jaiswal, and Amit Prabhakar</i>	
Mixed Oxides as VOCs Detectors in Biomedical Applications	79
<i>Dinu Litra, Cristian Lupan, Nicolae Magariu, Adrian Birnaz, and Oleg Lupan</i>	

Hydrogen and UV Band Detectors Based on ZnO Coated with Divinylbenzene	87
<i>Mihai Brînză, Maxim Chiriac, Stefan Schroder, Lynn Schwake, Nicolai Ababii, Tayebah Ameri, and Oleg Lupan</i>	
Capacitive Sensing Properties of Metal–Paraelectric–Metal Heterostructure Towards Hydrogen Peroxide Vapor	94
<i>V. Buniatyan, A. Davtyan, D.. Martirosyan, A. Yeremyan, and N. Martirosyan</i>	
Drug Delivery System for Target Biomolecules Using Nanofibers Material	105
<i>Hana Vrbová, Simona Stuchlíková, and Romana Šíroková</i>	
Carbon Nanotube-Based Hydrogel Composites for Intra-Ear EEG Electrodes	114
<i>Alexandra-Ștefania Mihai, Liliana Vereștiuc, Isabella Nacu, and Oana Geman</i>	
A Brief Review on Using Cryogenic Scaffold Structures for Better Mimicry of the Breast Cancer Tumor Microenvironment	123
<i>Didem Demir and Mehmet Tarakçıoğlu</i>	
Development and Implementation of a Single-Cell Electroporation Simulator	131
<i>Kristina Bliznakova, Zhivko Bliznakov, Nikolay Dukov, Georgi Todorov, and Todorka Dimitrova</i>	
Oxide Based Nanomaterials for Biomedical Applications	138
<i>Mihai Brînză, Nicolai Ababii, Maxim Chiriac, Cristian Lupan, Ion Pocaznoi, and Oleg Lupan</i>	
Environmental Protection and Health	
Functionalization of PET Fibers with Alginate: Structural and Adsorptive Characteristics	147
<i>Elena Fasniuc Pereu, Gabriela Lisă, Adela-Marilena Buburuzan, and Laura Bulgariu</i>	
Case Study on Romania’s Nuclear Diplomacy: Balancing Technology and Security in the Context of the Green Transition and Regional Resilience ...	155
<i>Petre Cornel Min, Cristian Vizitiu, Cosmin Dugan, and Dan Serbanescu</i>	
The Influence of Algae Biomass Activation on the Efficiency of Dichromate Anion Retention	168
<i>Loredana Munteanu and Laura Bulgariu</i>	

Efficient Removal of Hg(II) Ions from Aqueous Solution Using Low-Cost Adsorbents 175
Bianca Azanfire, Laura Bulgariu, and Alexandra-Georgiana Apostica

Medical Imaging

Deep Learning-Based Lumbar Vertebrae Segmentation in MRI Scans 185
Maria Enache, Andreea-Nicola Moisoiu, and Otilia Zvorișteanu

Deep Learning Architectures for Endometrial Abnormality Detection via Hysteroscopic ROI Analysis 191
Andreas C. Anastasiou, Vasilios Tanos, Marios Neofytou, Ioannis Constantinou, Panayiotis Tanos, Eirini Schiza, Marios S. Pattichis, Constantinos S. Pattichis, and Andreas Panayides

Deep Learning-Based Framework for Retinal Vessel Extraction Using Fractal Analysis and Nonlinear Diffusion 204
Lucian Murgu and Tudor Barbu

Animal Behavior Analysis in Biomedical Experiments 213
Florin Rotaru, Silviu-Ioan Bejinariu, Hariton Nicolae Costin, Mihaela Luca, Ramona Luca, Cristina Diana Niță, Diana Costin, Bogdan-Ionel Tamba, Ivona Costăchescu, and Gabriela-Dumitrița Stanciu

A Comparison of Several MCU-Oriented TinyML Models for Skin Lesions Classification 226
Radu Dogaru, Ioana Dogaru, and Robert-Cristian Tecaru

Explainable Transfer Learning Models for Thermal Imaging-Based Breast Cancer Classification 234
Samuele Salvati, Daniele Sacripante, Daniela Cardone, David Perpetuini, and Arcangelo Merla

A Human-in-the-Loop Framework for Topological Completion of 3D Vascular Segmentations 241
Codruț-Georgian Artene, Nicolae-Alexandru Botezatu, and Paul-Corneliu Herghelegiu

Automated Cervical Cell Classification on Public and Proprietary Datasets 251
Ștefana Duță, Cristina Cotruță, Andrei Marin, Alina Elena Sultana, Tiberiu Rădulescu, and Mirela Grosu

Automated Lung Lesion Segmentation in CT Scans Using Improved Attention U-Net Architectures	258
<i>Khadija Khan, Abdallah Kulumba Sserujja, and Calin Corciova</i>	
Multi-Modal Video Analysis System for Early Autism Detection Using Computer Vision	266
<i>Ioan Cătălin, Evelin Henrietta, and Alexandru-George Berciu</i>	
A Tool for Accelerating Breast Phantom Creation via MRI Segmentation: Initial Results	274
<i>Ivan Kanev, Nikolay Dukov, Zhivko Bliznakov, and Kristina Bliznakova</i>	
Detection of Squamous and Glandular Cervical Cells Using Concurrent Convolutional Neural Networks	281
<i>Dumitru-Viorel Zăbavă, Rareș Ștefan Teodorescu, Cătălina Neghină, Mihai Neghină, and Florian Vintilă Armășescu</i>	
Food Image Recognition: From CNNs to Transformers and Multimodal Learning	290
<i>Onisim Constantin, Ruxandra Tapu, Bogdan Mocanu, and Mirela Grosu</i>	
Improved STL Export for 3D Printing of Physical Phantoms	298
<i>Ivan Buliev, Nikolay Dukov, Zhivko Bliznakov, and Kristina Bliznakova</i>	
3D Tumor Segmentation Scheme with Learnable 3D Reaction-Diffusion Regularization	305
<i>Dimitriana Apetrei and Tudor Barbu</i>	
Mask R-CNN for Automated Multi-Species Malaria Parasite Detection	312
<i>Eugenia Mawuenya Akpo, N'guessan Yves-Roland Douha, and Carine Pierrette Mukamakuza</i>	
Estimating True Labels from Highly Noisy Real-World Data in Cervical Cytology	321
<i>Yasuhiro Iida, Yasuo Ishigure, Tasuku Mariya, Ikuma Sato, and Ayahiko Niimi</i>	
Evaluating Convolutional and Transformer-Based Deep Learning Models for Colorectal Cancer Tissue Recognition	329
<i>Marina Adriana Mercioni, Andreea-Luiza Crețu, Nina Ivanovic, and Raluca Dumache</i>	
Proof of Concept: Dataset for the Calculation of Cardiothoracic Index Using a Structured Level Detection	338
<i>Jose Luis Ordoñez-Avila, Douglas Aguilar, and Carlos Monchez</i>	

Biomechanics

- Automated Platform for the Kinematic Assessment of Hand Motor Deficit
in Patients with Neurological Diseases 349
*Ainhoa Ruiz-Vitte, Elena Navarro, Álvaro Gutiérrez-Martín,
María Alonso de Leciñana, and Blanca Larraga-García*
- Gait Analysis May Contribute to Identify Digital Biomarkers in Functional
Motor Disorders 355
*M. Russo, C. Riccardi, M. Tinazzi, M. Gandolfi, A. Sandri, E. Sarasso,
A. Gardoni, S. Basaia, P. Barone, R. Erro, S. Cuoco, I. Carotenuto,
C. Vinciguerra, A. Botto, M. Amboni, I. A. Di Vico, M. Fiorio,
G. Pedrotti, A. Paolicelli, G. Mansueto, F. B. Pizzini, M. Barillari,
M. F. Lauriola, M. C. Tozzi, F. Rusciano, C. Geroin, M. Fasoli,
A. Marotta, E. Pizzolla, F. Salaorni, I. Lozzi, G. M. Squintani,
S. Mariotto, S. Tamburin, F. Paio, G. De Biasi, G. Piscosquito,
L. Zenere, E. Sibilla, E. Canu, M. Filippi, F. Agosta, F. Amato,
and M. T. Pellicchia*
- Neurofunctional and Biomechanical Adaptations to Robotic-Assisted Gait
Therapy in Cerebral Palsy: A Double Case Study 363
*Francesco Romano, Elena Campilii, David Perpetuini,
Emanuele Francesco Russo, Maria Teresa Gatta, Marta Di Nicola,
Arcangelo Merla, Antimo Moretti, Francesca Gimigliano,
Giovanni Morone, Irene Ciancarelli, Teresa Paolucci,
and Daniela Cardone*
- Software for Position Identification Used for Vision Control of a Robot
Used for Material Treatment at Low Temperatures 373
*Corina-Ioana Crăciun, Mircea-Iulian Nistor, Edgar Moraru,
Andreea-Dana Alionte, and Cristian Gabriel Alionte*
- Quantifying the Impact of Contact Point Error on the Apparent Mechanical
Properties of Giant Unilamellar Vesicles 380
Martin Otáhal, Katarína Mendová, and Matej Daniel
- Influence of Additive Manufacturing and CT Scanning Parameters
on Anthropomorphic Phantom Fidelity 387
*Kristina Bliznakova, Nikolay Dukov, Zhivko Bliznakov,
Vencislav Nastev, and Ivan Buliev*

Food Technologies for Health

The Oxidative Stress and Its Implication in Digestion of Farmed Fish Species	397
<i>Isabelle Metaxa, Aurelia Nica, Alina Antache, Ira-Adeline Simionov, and Ștefan-Mihai Petrea</i>	
Transforming Sea Algae via Fermentation: Current Evidence for Animal and Human Health Applications	405
<i>Dediu Lorena, Grecu Iulia, Docan Angelica, and Rîmniceanu Cristian</i>	
Data-Driven Approach to IoT Integration and Smart Contract Security in Dairy 4.0	420
<i>Roxana Elena Vasiliu, Iuliana Marin, Diana-Alexandra Ciungan, and Dănuț-Nicolae Enea</i>	
Using Coriander as a Natural Antioxidant to Reduce Oxidative Stress in Fish ..	432
<i>Aurelia Nica, Isabelle Metaxa, Alina Antache, Ira-Adeline Simionov, and Ștefan-Mihai Petrea</i>	
Author Index	439