# BIOMEDICAL ENGINEERING BIOMEDIZINISCHE TECHNIK

Joint journal of the German Society for Biomedical Engineering in VDE and the Austrian and Swiss Societies for Biomedical Engineering and the German Society of Biomaterials

#### **EDITOR-IN-CHIEF**

Jens Haueisen, Ilmenau, Germany

#### **ASSOCIATE EDITORS**

Peter Augat, Murnau, Germany Daniel Baumgarten, Hall, Austria Thomas Deserno, Braunschweig, Germany Frédéric Heim, Mulhouse, France Wilhelm Jahnen-Dechent, Aachen, Germany Steffen Leonhardt, Aachen, Germany Klaus Radermacher, Aachen, Germany Erik Schkommodau, Muttenz, Switzerland Thomas Stieglitz, Freiburg, Germany Gudrun Wagenknecht, Jülich, Germany

#### **EDITORIAL BOARD**

Olaf Dössel, Karlsruhe, Germany
Pamela Habibovic, Maastricht, Netherlands
Branislav Jaramaz, Pittsburgh
Marc Kraft, Berlin, Germany
Thomas Lenarz, Hannover, Germany
Harry van Lenthe, Leuven, Belgium
Benny Lo, London, UK
Luca Mainardi, Milano, Italy
Silvestro Micera, Lausanne, Switzerland

Thomas Penzel, Berlin, Germany
Andrea Robitzki, Karlsruhe, Germany
Klaus-Peter Schmitz, Rostock, Germany
Tobias Schaeffter, Berlin, Germany
Jess G. Snedeker, Zurich, Switzerland
Leif Sörnmo, Lund, Sweden
Nobuhiko Sugano, Osaka, Japan
Jürgen Werner, Bochum, Germany
Werner Wolf, Neubiberg, Germany

### **DE GRUYTER**

Please see the journal's homepage for Abstracting & Indexing Services information.

Joint Journal of the German Society for Biomedical Engineering in VDE and the Austrian and Swiss Societies for Biomedical Engineering and the German Society of Biomaterials.

The publisher, together with the authors and editors, has taken great pains to ensure that all information presented in this work (programs, applications, amounts, dosages, etc.) reflects the standard of knowledge at the time of publication. Despite careful manuscript preparation and proof correction, errors can nevertheless occur. Authors, editors and publisher disclaim all responsibility for any errors or omissions or liability for the results obtained from use of the information, or parts thereof, contained in this work.

The citation of registered names, trade names, trademarks, etc. in this work does not imply, even in the absence of a specific statement, that such names are exempt from laws and regulations protecting trademarks etc. and therefore free for general use.

ISSN 0013-5585 · e-ISSN 1862-278X · CODEN BMZTA7

All information regarding notes for contributors, subscriptions, Open access, back volumes and orders is available online at www. degruyter.com/bmt.

**RESPONSIBLE EDITOR** Prof. Dr. Jens Haueisen, Institut für Biomedizinische Technik und Informatik (BMTI), Technische Universität Ilmenau, Gustav-Kirchhoff-Str. 2, 98693 Ilmenau, Germany. E-mail: jens.haueisen@tu-ilmenau.de

PUBLISHER Walter de Gruyter GmbH, Berlin/Boston, Genthiner Straße 13, 10785 Berlin, Germany

**JOURNAL COORDINATOR** Torsten Krüger, De Gruyter, Genthiner Straße 13, 10785 Berlin, Germany, Tel.: +49 (0)30 260 05–176. Fax: +49 (0)30 260 05–352. E-mail: bmt.editorial@degruyter.com

ADVERTISEMENTS E-mail: anzeigen@degruyter.com

© 2025 Walter de Gruyter GmbH, Berlin/Boston

TYPESETTING TNQ Tech Private Limited, Chennai, India

PRINTING Franz X. Stückle Druck und Verlag e.K., Ettenheim

 $Questions\ about\ General\ Product\ Safety\ Regulation:\ products a fety @degruyter brill.com$ 



#### **Contents**

## **Research Articles**

Li Ji, Leiye Yi, Haiwei Li, Wenjie Han and Ningning Zhang An exploratory study of pilot EEG features during the climb and descent phases of flight —— 195

Ying Xiang, Wei Zheng, Jiajia Tang, You Dong and Yuhao Pang Gesture recognition from surface electromyography signals based on the SE-DenseNet network —— 207

Bhuvaneswari Sekar and Subashini Parthasarathy Empirical analysis on retinal segmentation using PSObased thresholding in diabetic retinopathy grading — 217

Spiros Kostopoulos, Dionisis Cavouras, Dimitris Glotsos and Constantinos Loukas

Prediction of remaining surgery duration based on machine learning methods and laparoscopic annotation data --- 229

Jayaraman Priya and Subramanian Kanaga Suba Raja Caries-segnet: multi-scale cascaded hybrid spatial channel attention encoder-decoder for semantic segmentation of dental caries — 241

Thomas Wendl, Brigitte Wendl and Peter Proff An analysis of initial force and moment delivery of different aligner materials ---- 259

Lijun Yang, Xuyuan Liang and Mingxuan Liu Influence of microstructure on metal-ceramic bonding in SLM-manufactured titanium alloy crowns and bridges — 269

Qingqing Wang, Ruyu Yuan, Yunjing Yi, Shizhen Du, Chen He and Ping Shi

Design and evaluation of powered lumbar exoskeleton based on human biomechanics — 277

Zinah N. Alabdali, Amar Al-Keisy and Sinan S. Hamdi Evaluation of mesoporous polyaniline for glucose sensor under different pH electrolyte conditions — 285