

# **2021 IEEE Biomedical Circuits and Systems Conference (BioCAS 2021)**

**Virtual Conference  
6 – 9 October 2021**



**IEEE Catalog Number: CFP21837-POD**  
**ISBN: 978-1-7281-7205-7**

**Copyright © 2021 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:	CFP21837-POD
ISBN (Print-On-Demand):	978-1-7281-7205-7
ISBN (Online):	978-1-7281-7204-0
ISSN:	2163-4025

**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

# TABLE OF CONTENTS

AN EMG-BASED, REAL-TIME PERSONAL IDENTIFICATION METHOD USING AN GESTURE-DETECTION 1D CONVOLUTIONAL NEURAL NETWORKS .....	1
<i>Lijing Lu, Jingna Mao, Wuqi Wang, Zhiwei Zhang</i>	
ULTRA-LOW POWER AND AREA-EFFICIENT HARDWARE ACCELERATOR FOR ADAPTIVE NEURAL SIGNAL COMPRESSION.....	5
<i>Qier Ma, Liyuan Guo, Seyed Mohammad Ali Zeinolabedin, Christian Mayr</i>	
NEUROMORPHIC ADAPTIVE BODY LEVELING IN A BIOINSPIRED HEXAPOD WALKING ROBOT .....	9
<i>Michael Ehrlich, Elishai Ezra Tsur</i>	
AI-ASSISTED STANFORD CLASSIFICATION OF AORTIC DISSECTION IN CT IMAGING USING VOLUMETRIC 3D CNN WITH EXTERNAL GUIDED ATTENTION .....	13
<i>Cheng-Fu Liou, Li-Ting Huang, Paul Kuo, Chien-Kuo Wang, Jiun-In Guo</i>	
3D OBJECT TRACKING WITH NEUROMORPHIC EVENT CAMERAS VIA IMAGE RECONSTRUCTION .....	18
<i>Hadar Cohen Duwek, Avinoam Bitton, Elishai Ezra Tsur</i>	
NEUROMORPHIC SPIKE TIMING DEPENDENT PLASTICITY WITH ADAPTIVE OZ SPIKING NEURONS .....	22
<i>Avi Hazan, Elishai Ezra Tsur</i>	
AUTOMATED REAL-TIME TRACKING SYSTEM FOR SOCIALLY-HOUSED PHYSICALLY IDENTICAL MICE.....	26
<i>Yanbo Wang, Alena V. Savonenko, Ralph Etienne-Cummings</i>	
ASSESSMENT OF OVER-PRONATED/OVER-SUPINATED FOOT USING FOOT-MOTION MEASURED BY AN IN-SHOE MOTION SENSOR.....	32
<i>Chenhui Huang, Zhenwei Wang, Kenichiro Fukushi, Fumivuki Nihey, Hiroshi Kajitani, Kentaro Nakahara</i>	
LOW-POWER 256-CHANNEL NANOWIRE ELECTRODE-ON-CHIP NEURAL INTERFACE FOR INTRACELLULAR ELECTROPHYSIOLOGY .....	38
<i>Jun Wang, Ren Liu, Youngbin Tchoe, Alessio Paolo Buccino, Akshay Paul, Agnieszka D'Antonio-Chronowska, Kelly A. Frazer, Chul Kim, Shadi Dayeh, Gert Cauwenberghs</i>	
MINIMIZATION OF ROUTING AREA IN MEDA BIOCHIPS.....	42
<i>Chiharu Shiro, Hiroki Nishikawa, Xiangbo Kong, Hiroyuki Tomiyama, Shigeru Yamashita</i>	
ENERGY-EFFICIENT MODULAR RF INTERFACE FOR FULLY IMPLANTABLE ELECTRICAL DEVICES IN SMALL RODENTS.....	47
<i>Franz Plocksties, Obaid Ullah Shah, Felix Uster, Munawar Ali, Maximilian Koschay, Maria Kober, Alexander Storch, Dirk Timmermann</i>	
REGISTRATION AND FUSION OF VISIBLE LIGHT AND IRT IMAGES IN NEUROSURGERY .....	53
<i>Yahya Moshaei-Nezhad, Juliane Müller, Martin Oelschlägel, Matthias Kirsch, Ronald Tetzlaff</i>	

THE IMPACT OF THE AFE BPF IN ULTRASOUND HARMONIC IMAGING: AN IN-VITRO PHANTOM STUDY .....	57
<i>Meiyi Zhou, Peiran Chen, Andreas M. A. O. Pollet, Sotir Ouzounov, Simona Turco, Jaap M. J. Den Toonder, Massimo Mischi, Eugenio Cantatore, Pieter Harpe</i>	
A MODULATED TEMPLATE-MATCHING APPROACH TO IMPROVE SPIKE SORTING OF BURSTING NEURONS .....	61
<i>Payam S. Shabestari, Alessio P. Buccino, Sreedhar S. Kumar, Alessandra Pedrocchi, Andreas Hierlemann</i>	
SUPERPIXEL-BASED SEGMENTATION AND CLASSIFICATION OF GASTROINTESTINAL LANDMARKS AND DISEASES.....	65
<i>Hika Barki Dalju, Muhammad Ali Rushdi, Ahmed Morsy</i>	
BENEFITS OF STOCHASTIC COMPUTING IN HEARING AID FILTERBANK DESIGN.....	70
<i>Timothy J. Baker, Yiqiu Sun, John P. Hayes</i>	
IMPROVEMENTS TO A BIOMECHANICAL MODEL OF THE CARDIOVASCULAR AND RESPIRATORY SYSTEM.....	75
<i>Andreas Kitzig, Edwin Naroska, Gudrun Stockmanns, Reinhard Viga, Anton Grabmaier</i>	
AN ULTRASOUND IMAGING FRONT-END SYSTEM-ON-A-CHIP WITH ELEMENT-LEVEL IMPEDANCE MATCHING FOR ACOUSTIC REFLECTIVITY REDUCTION .....	79
<i>Ahmad Rezvanitabar, M. Sait Kilinc, Coskun Tekes, Evren F. Arkan, Maysam Ghovanloo, F. Levent Degertekin</i>	
FAST CALCIUM TRACE EXTRACTION FOR LARGE-FIELD-OF-VIEW MINISCOPE.....	83
<i>Zhe Chen, Garrett J. Blair, Hugh T. Blair, Jason Cong</i>	
A HIGHLY ENERGY-EFFICIENT HYPERDIMENSIONAL COMPUTING PROCESSOR FOR WEARABLE MULTI-MODAL CLASSIFICATION .....	88
<i>Alisha Menon, Daniel Sun, Melvin Aristio, Harrison Liew, Kyoungtae Lee, Jan M. Rabaey</i>	
A SWITCHED-CAPACITOR CLOSED-LOOP INTEGRATION SAMPLING FRONT-END FOR PERIPHERAL NERVE RECORDING .....	92
<i>Jialin Liu, David J. Allstot</i>	
ORIENTATION-INSENSITIVE MULTI-ANTENNA READER FOR WIRELESS BIOMEDICAL APPLICATIONS.....	96
<i>Nilan Udayanga, Yubin Lin, Manuel Monge</i>	
A 405NW/4.8 $\mu$ W EVENT-DRIVEN MULTI-MODAL (V/I/R/C) SENSOR INTERFACE FOR PHYSIOLOGICAL AND ENVIRONMENTAL CO-MONITORING.....	101
<i>Rishika Agarwala, Peng Wang, Benton H. Calhoun</i>	
ESTIMATION OF POSITIONS AND ORIENTATIONS OF ACTIVATED MUSCLE FIBERS WITH ELECTRODE ARRAY .....	105
<i>Mian Wang, Shihan Ma, Zihang Geng, Chen Chen, Xinjun Sheng, Xiangyang Zhu</i>	
A 4-CHANNEL NMES IC FOR WEARABLE APPLICATIONS.....	111
<i>Yu-Kai Huang, Ana Rusu, Saul Rodriguez</i>	
DESIGN AND IMPLEMENTATION OF 0.23 NJ/BIT REFERENCE-SPUR-FREE FSK/OOK TRANSMITTER AT 400 MHZ FOR WEARABLE HEALTH MONITORING.....	116
<i>Abhishek Srivastava, Devarshi Das, Maryam Shojaei Baghini</i>	

ACTIVE CAPACITIVE ECG SYSTEM WITH ALL-DIGITAL “DRIVEN RIGHT LEG” COMMON MODE SUPPRESSION .....	121
<i>Tom Torfs, Aakash Patel, Ivan D. Castro</i>	
A NEW LIGHT-TO-FREQUENCY ANALOG FRONT-END CIRCUIT FOR OPTICAL SENSING IN BIOMEDICAL APPLICATIONS .....	125
<i>Guido Di Patrizio Stanchieri, Andrea De Marcelli, Marco Faccio, Elia Palange, Ulkuhan Guler</i>	
A NEW MULTILEVEL PULSED MODULATION TECHNIQUE FOR LOW POWER HIGH DATA RATE OPTICAL BIOTELEMETRY .....	130
<i>Guido Di Patrizio Stanchieri, Graziano Battisti, Andrea De Marcelli, Marco Faccio, Elia Palange, Timothy G. Constandinout</i>	
CORONA VIRUS DISEASE 2019 RESPIRATORY CYCLE DETECTION BASED ON CONVOLUTIONAL NEURAL NETWORK.....	135
<i>Jing Wang, Ping Chen, Cheng Zhang, Yi Kang</i>	
IMPLANTABLE CMOS IMAGE SENSOR WITH A NEURAL AMPLIFIER FOR SIMULTANEOUS RECORDING OF OPTICAL AND ELECTROPHYSIOLOGICAL SIGNALS .....	139
<i>Kenji Sugie, Kiyotaka Sasagawa, Yasumi Ohta, Hironari Takehara, Makito Haruta, Hiroyuki Tashiro, Jun Ohta</i>	
AN ELECTRONIC OSTEOSYNTHESIS IMPLANT FOR CONTINUOUS LOAD MONITORING USING A STRAIN GAUGE .....	143
<i>Christian Adam, Tobias Barth, Matthias Münch, Klaus Seide, Wolfgang H. Krautschncider</i>	
RESEARCH ON CLASSIFICATION OF PATIENT-VENTILATOR ASYNCHRONY USING PERMUTATION DISALIGNMENT INDEX .....	149
<i>Xiaohao Qiao, Huihui Li, Bo Wang, Fuhai Xiong, Yan Yan, Lei Wang</i>	
COUPLING SINAPS HIGH-DENSITY NEURAL RECORDING CMOS-PROBES WITH OPTOGENETIC LIGHT STIMULATION .....	154
<i>Fabio Boi, Andrea Locarno, Joao F. Ribeiro, Raffaella Tonini, Gian Nicola Angotzi, Luca Berdondini</i>	
RESIDUAL LEARNING ATTENTION CNN FOR MOTION INTENTION RECOGNITION BASED ON EEG DATA .....	158
<i>Ting Wang, Jingna Mao, Ruozhou Xiao, Wuqi Wang, Guangxin Ding, Zhiwei Zhang</i>	
DESIGN OF SCALABLE NEUROTRANSMITTER-MEDIATED BIOHYBRID SYNAPSE.....	164
<i>Kevin A. White, Mingjie Lin, Brian N. Kim</i>	
FILTERLESS TRF READER WITH CMOS SENSOR ASIC FOR LATERAL FLOW IMMUNOASSAYS.....	168
<i>Alexander Hofmann, Peggy Reich, Martin Grabmann, Georg Glaser, Alexander Rolapp, Marco Reinhard, Eric Schäfer, Max Trübenbach, Friedrich Scholz</i>	
HARDWARE-ORIENTED PRUNING AND QUANTIZATION OF DEEP LEARNING MODELS TO DETECT LIFE-THREATENING ARRHYTHMIAS .....	174
<i>Lizeth Gonzalez-Carabarin, Alexandre Schmid, Ruud J. G. Van Sloun</i>	
SECURING BIOCHEMICAL SAMPLES USING MOLECULAR BARCODING ON DIGITAL MICROFLUIDIC BIOCHIPS .....	180
<i>Tung-Che Liang, Krishnendu Chakrabarty, Tatjana Abaffy, Hiroaki Matsunami, Ramesh Karri</i>	

LOW LATENCY PROTOCOLS INVESTIGATION FOR EVENT-DRIVEN WIRELESS BODY AREA NETWORKS .....	186
<i>Andrea Mongardi, Fabio Rossi, Elia Pellegrino, Paolo Motto Ros, Massimo Ruo Roch, Maurizio Martina</i>	
ADAPTIVE FEW-SHOT LEARNING POC ULTRASOUND COVID-19 DIAGNOSTIC SYSTEM .....	192
<i>Michael Karnes, Shehan Perera, Srikar Adhikari, Alper Yilmaz</i>	
AN AUTOMATIC DELINEATOR FOR ARTERIAL BLOOD PRESSURE WAVEFORMS USING U-NET ARCHITECTURE.....	198
<i>Jianzhong Chen, Yi Sun, Ke Sun, Xinxin Li</i>	
A LOAD-INSENSITIVE HYBRID BACK TELEMETRY SYSTEM FOR WIRELESSLY-POWERED IMPLANTABLE DEVICES.....	202
<i>Hyun-Su Lee, Minjae Kim, Jisan Ahn, Hyung-Min Lee</i>	
A LOW-COST AMBU-BAG BASED VENTILATOR FOR COVID-19 PANDEMIC .....	206
<i>Mohit Kumar, Ravinder Kumar, Vishal Kumar, Amanpreet Chander, Vivek Gupta, Ashish Kumar Sahani</i>	
ULTRASONIC BACKSCATTER COMMUNICATION FOR BRAIN IMPLANTS: MATHEMATICAL MODEL, SIMULATION, AND MEASUREMENT .....	211
<i>Magnus N. Christensen, Milad Zamani, Amin Rashidi, Farshad Moradi</i>	
EVALUATION METHOD OF SUBJECTIVE SLEEP SATISFACTION BY MEASUREMENT OF BODY MOVEMENT.....	216
<i>Takeshi Muto, Yu Akitaya, Ayumi Nishimura, Aya Orikasa, Kazuma Kurita, Yuki Miyasaka, Joji Ishiwata, Yumiko Muto</i>	
A 0.4 NJ EXCITATION ENERGY BRIDGE-TO-DIGITAL CONVERTER FOR IMPLANTABLE PULMONARY ARTERY PRESSURE MONITORING.....	220
<i>Mustafa Besirli, Kerim Ture, Diego Barrettino, Maurice Beghetti, Marco Mattavelli, Catherine Dehollain, Franco Maloberti</i>	
NON-PARAMETRIC GENOMIC FOURIER POWER SPECTRA FILTER DESIGNS .....	224
<i>Micah Thornton, Monnie McGee</i>	
A WIRELESS IMPLANTABLE POTENTIostat FOR PROGRAMMABLE ELECTROCHEMICAL DRUG DELIVERY .....	230
<i>Max L. Wang, Pyungwoo Yeon, Christian F. Chamberlayne, Mohammad Mofidfar, Haixia Xu, Justin P. Annes, Richard N. Zare, Amin Arbabian</i>	
PRACTICAL MEASUREMENT OF VOLTAGE-CONTROLLED CURRENT SOURCE OUTPUT IMPEDANCE FOR APPLICATIONS IN TRANSCRANIAL ELECTRICAL STIMULATION.....	234
<i>Charl Linssen, Pieter Harpe</i>	
COMPRESSED SENSING INSPIRED NEURAL DECODER FOR UNDERSAMPLED MRI WITH SELF-ASSESSMENT.....	240
<i>Filippo Martinini, Mauro Mangia, Fabio Pareschi, Riccardo Rovatti, Gianluca Setti</i>	
A HARDWARE IMPLEMENTATION OF A QEEG-BASED DISCRIMINANT FUNCTION FOR BRAIN INJURY DETECTION .....	246
<i>Fotios Kostarelos, Ciaran Macnamee, Brendan Mullane</i>	

SLOPE-BASED EVENT-DRIVEN FEATURE EXTRACTION FOR CARDIAC ARRHYTHMIA CLASSIFICATION.....	252
<i>Julien Duforest, Benoît Larras, Deepu John, Olev Martens, Antoine Frappé</i>	
AUTOMATED MULTIPLEXED POTENTIOSTAT SYSTEM (AMPS) FOR HIGH-THROUGHPUT CHARACTERIZATION OF NEURAL INTERFACES.....	256
<i>Travis L. Massey, Jeremy R. Gleick, Razi-ul M. Haque</i>	
FINITE ELEMENT SIMULATION OF A MICRODROPLET GENERATION SYSTEM FOR AN IMPLANTABLE LIQUID SAMPLING PROBE .....	261
<i>Dominic Gauvreau, Gabriel P. Lachance, Hamza Landari, Élodie Boisselier, Mounir Boukadoum, Younès Messaddeq, Amine Miled</i>	
A SYSTEM TO FACILITATE EARLY AND PROGRESSIVE AMBULATION USING FIDUCIAL MARKERS .....	265
<i>Alec M. Steele, Mehrdad Nourani, Melinda M. Bopp, Dennis H. Sullivan</i>	
EMG SIGNAL CLASSIFICATION USING REFLECTION COEFFICIENTS AND EXTREME VALUE MACHINE.....	271
<i>Reza Bagherian Azhiri, Mohammad Esmaeili, Mohsen Jafarzadeh, Mehrdad Nourani</i>	
SINGLE-BATTERY COOPERATIVE SENSORS FOR MULTI-LEAD LONG TERM AMBULATORY ECG MEASUREMENT.....	277
<i>K. Badami, M. Pons-Sole, E. Azarkhish, A. Fivaz, M. Rapin, O. Chételat, S. Emery</i>	
TOWARDS MAGNETIC FIELD GRADIENT-BASED IMAGING AND CONTROL OF IN-BODY DEVICES.....	281
<i>Hongxiang Gao, Yubin Lin, Manuel Monge</i>	
MULTI-TASK LEARNING MIXED-SIGNAL CLASSIFIER FOR IN-SITU DETECTION OF ATRIAL FIBRILLATION AND SEPSIS.....	285
<i>Sudarsan Sadasivuni, Sumukh Prashant Bhanushali, Sai Srinivasa Singamsetti, Imon Banerjee, Arindam Sanyal</i>	
CMOS NEURAL PROBE WITH MULTI-TURN MICRO-COIL MAGNETIC STIMULATION.....	289
<i>Edward C. Szoka, Jesse C. Werth, Thomas A. Cleland, Shelley Fried, Alyosha Molnar</i>	
DEMYSTIFYING DRUG REPURPOSING DOMAIN COMPREHENSION WITH KNOWLEDGE GRAPH EMBEDDING .....	293
<i>Edoardo Ramalli, Alberto Parravicini, Guido W. Di Donato, Mirko Salaris, Céline Hudelot, Marco D. Santambrogio</i>	
INJECTABLE TEMPERATURE SENSORS BASED ON PASSIVE RECTIFICATION OF VOLUME-CONDUCTED CURRENTS .....	298
<i>Laura Becerra-Fajardo, Aracelys García-Moreno, Nerea Alvarez De Eulate Llano, Antoni Ivorra</i>	
AN MCU IMPLEMENTATION OF PCA/PSA STREAMING ALGORITHMS FOR EEG FEATURES EXTRACTION .....	304
<i>Luciano Prono, Alex Marchioni, Mauro Mangia, Fabio Pareschi, Riccardo Rovatti, Gianluca Setti</i>	
NOVEL WEARABLE TACTILE FEEDBACK SYSTEM FOR POST-STROKE REHABILITATION.....	309
<i>Yahya Abbass, Lucia Seminara, Moustafa Saleh, Maurizio Valle</i>	

UNSUPERVISED CONTINUOUS TIME DOMAIN SPIKE SORTING FOR LARGE SCALE NEURAL PROCESSING SYSTEMS.....	315
<i>Changyun Fu, Tongtong Guo, Yongfu Li, Yan Liu</i>	
SUPER-RESOLUTION ELECTROCHEMICAL IMPEDANCE IMAGING WITH A 100 × 100 CMOS SENSOR ARRAY .....	321
<i>Kangping Hu, Christopher E. Arcadia, Jacob K. Rosenstein</i>	
A BLUETOOTH LOW ENERGY (BLE)-ENABLED MICRODEVICE FOR ACTIVITY-DEPENDENT STIMULATION IN NONHUMAN PRIMATES .....	325
<i>Nicholas H. Vitale, Christopher A. Delianides, David J. Guggenmos, Meysam Azin, Heather Hudson, Randolph J. Nudo, Pedram Mohseni</i>	
DESIGN AND EVALUATION OF ELECTRONIC-MICROSACCADE WITH BALANCED STIMULATION FOR ARTIFICIAL VISION SYSTEM.....	329
<i>Yaogan Liana, Zhengyang Qian, Bang Du, Jinming Ye, Kohei Nakamura, Shengwei Wang, Hisashi Kino, Takafumi Fukushima, Koji Kiyoyama, Tetsu Tanaka</i>	
IMPROVING FULL-FORCE WITH DYNAMICAL DATA COUPLING AND MULTILAYER ARCHITECTURE.....	333
<i>Yue Yin, Emre Neftci</i>	
WIRELESSLY POWERED, BATTERYLESS CLOSED-LOOP BIOPOTENTIAL RECORDING IC FOR IMPLANTABLE LEADLESS CARDIAC MONITORING APPLICATIONS.....	339
<i>Jaeun Jang, Iman Habibagahi, Hamed Rahmani, Aydin Babakhani</i>	
MODELING AND ANALYSIS OF THE ELECTROLYTE VOLTAGE DROP IN DIELECTROPHORESIS ACTUATORS .....	343
<i>Alexander Frey, Niklas Boldt, Arohi Barai, Mario Birkholz, Ingo Kuehne, Roland Thewes</i>	
A FILTERLESS FLUORESCENCE DETECTOR BASED ON A TIME-GATED SIPM.....	347
<i>Luca Buonanno, Chiara Putelli, Davide Di Vita, Carlo Fiorini, Marco Carminati</i>	
EXPLOITING HETEROGENEOUS ARCHITECTURES FOR RIGID IMAGE REGISTRATION .....	351
<i>Eleonora D'Arnese, Emanuele Del Sozzo, Davide Conficconi, Marco D. Santambrogio</i>	
STIFFNESS CHARACTERIZATION OF HEALTHY AND DEFICIENT TRACHEAL CARTILAGE SEGMENTS USING MICROMACHINED PIEZORESISTIVE FORCE SENSOR.....	356
<i>Alekya B, V S N Sitaramgupta V, Hardik J. Pandva</i>	
SUBJECT-INDEPENDENT FREEZING OF GAIT (FOG) PREDICTION IN PARKINSON'S DISEASE PATIENTS.....	361
<i>Toygun Basaklar, Yigit Tuncel, Umit Y. Ogras</i>	
MULTIPLE ION-CHANNEL ISFET NEURON FOR LAB-ON-CHIP APPLICATIONS .....	367
<i>Prateek Tripathi, Nicolas Moser, Pantelis Georgiou</i>	
A NEUROMORPHIC PROCESSING SYSTEM FOR LOW-POWER WEARABLE ECG CLASSIFICATION.....	372
<i>Haoming Chu, Hao Jia, Yulong Yan, Yi Jin, Liyu Qian, Leijing Gan, Yuxiang Huan, Lirong Zheng, Zhuo Zou</i>	
IMPEDANCE MATCHING IN DIELECTROPHORESIS EXPERIMENTS .....	377
<i>Niklas P. Boldt, Danai E. Malti, Sebastian Damm, Arohi Barai, Mario Birkholz, Roland Thewes</i>	



A 6 P <sub>ARMS</sub> 50 KHZ-40 MHZ IMPEDANCE SENSOR FOR SOURCE-DIFFERENTIAL FLOW CYTOMETRY .....	382
<i>Boyu Shen, Jacob Dawes, Matthew L. Johnston</i>	
LOW-HARDWARE-COST SNN EMPLOYING FEFET-BASED NEURONS WITH TUNABLE LEAKY EFFECT .....	387
<i>Hongyi Liu, Xiangao Qi, Yuqing Lou, Liang Qi, Zuo-Wei Yeh, Kea-Tiong Tang, Jian Zhao</i>	
TOWARDS LONG-TERM NON-INVASIVE MONITORING FOR EPILEPSY VIA WEARABLE EEG DEVICES .....	391
<i>Thorir Mar Ingolfsson, Andrea Cossettini, Xiaying Wang, Enrico Tabanelli, Giuseppe Tagliavini, Philippe Ryvlin, Luca Benini, Simone Benatti</i>	
SILICON NEURON WITH PROGRAMMABLE ION CHANNEL KINEMATICS FOR BIOELECTRONIC APPLICATIONS .....	395
<i>Elisa Donati, Giacomo Indiveri</i>	
A 1-V NANOPOWER HIGHLY TUNABLE BIQUADRATIC G <sub>M</sub> - C BANDPASS FILTER FOR FULLY IMPLANTABLE COCHLEAR IMPLANTS.....	400
<i>Berkay Özbek, Haluk Külah</i>	
DIGITAL COUNT OF ANTIBODIES THROUGH DIFFERENTIAL IMPEDANCE FOR HIGH- RESOLUTION IMMUNOSENSING .....	405
<i>Paola Piedimonte, Francesco Zanetto, Fabio Toso, Vittorio Grimaldi, Giorgio Ferrari, Marco Sampietro, Laura Sola, Marina Cretich, Alessandro Gori, Marcella Chiari</i>	
MODELING ENERGY-AWARE PHOTOPLETHYSMOGRAPHY HARDWARE FOR PERSONALIZED HEALTH CARE APPLICATIONS ACROSS SKIN PHOTOTYPES.....	409
<i>Katheryn A. Flynn, Natalie B. Ownby, Peng Wang, Benton H. Calhoun</i>	
DENOISING FOR ENHANCING SIGNAL-TO-NOISE RATIO IN PROTON SOUND DETECTORS.....	415
<i>Elia A. Vallicelli, Matteo Corona, Marco Dell'acqua, Andrea Baschiroto, Marcello De Matteis</i>	
A 10-HIT, 771 NW TIME-MODE ADC WITH A 2-STEP TDC FOR BIO-SIGNAL ACQUISITION .....	419
<i>Emmanouil Kandilakis, Wouter A. Serdijn, Omer Can Akgun</i>	
WIRELESS MULTIMODAL NEURAL INTERFACE DEVICE FOR NEURAL CONTROL STUDIES .....	425
<i>Linran Zhao, Yan Gong, Wen Li, Yaoyao Jia</i>	
A TEMPERATURE-AWARE FULLY-WIRELESS MM-SCALE OPTICALLY-ENHANCED OPTOGENETIC NEURO-STIMULATOR.....	429
<i>Tayebeh Yousefi, Ksenia Timonina, Georg Zoidl, Hossein Kassiri</i>	
AN IOT-ENABLED AUTOMATED TIGHT-GLYCEMIC-CONTROL SYSTEM FOR INTENSIVE CARE.....	434
<i>Muhammad Rizwan Khan, Farasat Munir, Cheng Huang</i>	
PORTABLE IMAGING SYSTEM FOR REAL-TIME CAVITATION MONITORING .....	440
<i>Yujin Kim, Euisuk Chung, Minsung Cho, Tai-kyong Song</i>	
A FLUORESCENT THIN FILM-BASED MINIATURIZED TRANSCUTANEOUS CARBON DIOXIDE MONITOR.....	444
<i>Tuna B. Tufan, Ulkuhan Guler</i>	

A 3.75 NW ANALOG ELECTROCARDIOGRAM PROCESSOR FACILITATING STOCHASTIC RESONANCE FOR REAL-TIME R-WAVE DETECTION .....	449
<i>Cihan Berk Güngör, Patrick P. Mercier, Hakan Töreyn</i>	
IMPEDANCE MONITORING FOR NERVE REGENERATION USING AN IMPLANTABLE CUFF.....	455
<i>Adan Isaac Acosta Calvillo, Tak-Ho Chu, Daniel Umansky, Alec Lamb, Rajiv Midha, Colin Dalton, Kartikeya Murari</i>	
ATTENTION STATE CLASSIFICATION WITH IN-EAR EEG .....	460
<i>Akshay Paul, Gopabandhu Hota, Behnam Khaleghi, Yuchen Xu, Tajana Rosing, Gert Cauwenberghs</i>	
CONTINUOUS WAVE DENTAL DOPPLER ULTRASOUND SYSTEM FOR MEASURING PULP BLOOD FLOW .....	465
<i>Jaebum Park, Yeongdae Kim, Junyeon Kim, Tai-Kyong Song</i>	
A BIOLOGICALLY-INFORMED COMPUTATIONAL FRAMEWORK FOR PATHWAY-SPECIFIC SPIKING PATTERNS GENERATION AND EFFICACY EVALUATION IN RETINAL NEUROSTIMULATORS .....	470
<i>Tayebeh Yousefi, Hossein Kassiri</i>	
AN ACTIVE ELECTRODE IC WITH EMBEDDED ANALOG CMRR ENHANCEMENT FOR INTERFERENCE- AND GAIN-MISMATCH-RESILIENT EEG RECORDING.....	475
<i>Alireza Dabbaghian, Hossein Kassiri</i>	
MOTION ROBUST REMOTE PHOTOPLETHYSMOGRAPHY VIA FREQUENCY DOMAIN MOTION ARTIFACT REDUCTION.....	480
<i>Suraj Hebbar, Takashi Sato</i>	
A CNN-BASED CARDIAC ARRHYTHMIA CLASSIFICATION ALGORITHM WITH WAVELET TRANSFORM AND TRAINING SAMPLE BALANCING RULE .....	484
<i>Qinxin Zhou, Yang Zhao, Yong Lian</i>	
VIDEO BASED HEART RATE EXTRACTION USING SKIN ROI SEGMENTATION AND ATTENTION CNN .....	488
<i>Hongbo Guo, Yang Zhao, Yong Lian</i>	
LIVE DEMONSTRATION: AN IOT WEARABLE DEVICE FOR REAL-TIME BLOOD GLUCOSE PREDICTION WITH EDGE AI.....	492
<i>Lei Kuang, Taiyu Zhu, Kezhi Li, John Daniels, Pau Herrero, Pantelis Georgiou</i>	
LIVE DEMONSTRATION: REAL-TIME AND HIGH-SPEED ION IMAGING USING CMOS ISFET ARRAYS .....	493
<i>Lei Kuang, Junming Zeng, Pantelis Georgiou</i>	
LIVE DEMONSTRATION: EVENT-DRIVEN HAND GESTURE RECOGNITION FOR WEARABLE HUMAN-MACHINE INTERFACE .....	494
<i>Martina Becchio, Niccoló Voster, Andrea Prestia, Andrea Mongardi, Fabio Rossi, Paolo Motto Ros, Massimo Ruo Roch, Maurizio Martina, Danilo Demarchi</i>	
LIVE DEMONSTRATION: REAL-TIME EEG-BASED AFFECTIVE COMPUTING USING ON-CHIP LEARNING LONG-TERM RECURRENT CONVOLUTIONAL NETWORK .....	495
<i>Cheng-Jie Yang, Wei-Chih Li, Meng-Ting Wan, Wai-Chi Fang</i>	

LIVE DEMONSTRATION: REAL-TIME CALCIUM TRACE EXTRACTION FROM LARGE-  
FIELD-OF-VIEW MINISCOPE ..... 496  
*Zhe Chen, Garrett J. Blair, Changliang Guo, Daniel Aharoni, Hugh T. Blair, Jason Cong*

**Author Index**