2022 IEEE 22nd International Conference on Bioinformatics and Bioengineering (BIBE 2022)

Virtual Conference 7-9 November 2022



IEEE Catalog Number: CFP22266-POD **ISBN:**

978-1-6654-8488-6

Copyright © 2022 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:	CFP22266-POD
ISBN (Print-On-Demand):	978-1-6654-8488-6
ISBN (Online):	978-1-6654-8487-9
ISSN:	2159-5410

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 Web: www.proceedings.com



2022 IEEE 22nd International Conference on Bioinformatics and Bioengineering (BIBE) **BIBE 2022**

Table of Contents

Message from the General Co-Chairs	xviii
Message from the Program Chairs	xix
Organizing Committee	xx
Program Committee	

S1-1: Noninvasive modalities for Lung and Diabetes

Wearable Ultrasound Assessment of Lung Sliding in M-Mode: A Phantom Simulation-Based Study 1 Khoa Tran (Carleton University, Canada), Sazedur Rahman (Carleton University, Canada), Yuu Ono (Carleton University, Canada), Sreeraman Rajan (Carleton University, Canada), and Robert Arntfield (Western University, Canada)
Proposal of Wireless Measurement of Albumin Excretion Rate at the THz Band
Interpretable Evaluation of Diabetic Retinopathy Grade Regarding Eye Color Fundus Images 11 Yuheng Li (Georgia Institute of Technology, USA), Jieh Sheng Hsu (Georgia Institute of Technology, USA), Noaima Bari (Georgia Institute of Technology, USA), Xu Qiu (Georgia Institute of Technology, USA), Malvika Viswanathan (Georgia Institute of Technology, USA), Wenqi Shi (Georgia Institute of Technology, USA), Felipe Giuste (Georgia Institute of Technology, USA), Yishan Zhong (Georgia Institute of Technology, USA), Jimin Sun (Georgia Institute of Technology, USA), and May Dongmei Wang (Georgia Institute of Technology, USA)

S1-2: Deep Learning and Radiomics

Automated Measurements of Leg Length on Radiographs by Deep Learning	17
Zelong Liu (Icahn School of Medicine at Mount Sinai, ÙSA), Arnold Yang	
(Westview High School, USA), Steven Liu (New York University, USA),	
Louisa Deyer (Dwight School, USA), Timothy Deyer (East River Medical	
Imaging/Čornell Medicine, USA), Hao-Chih Lee (İcahn School of Medicine	
at Mount Sinai, USA), Yang Yang (Icahn School of Medicine at Mount	
Sinai, USA), Justine Lee (Mount Šinai Hospital, USA), Zahi A. Fayad	
(Icahn School of Medicine at Mount Sinai, USA), Brett Hayden (Mount	
Sinai Hospital, USA), Valentin Fauveau (Icahn School of Medicine at	
Mount Sinai, USA), Mingqian Huang (Mount Sinai Hospital, USA), and	
Xueyan Mei (Icahn School of Medicine at Mount Sinai, ÚSA)	

Automated Machine Learning-Based Radiomics Analysis Versus Deep Learning-Based
Classification for Thyroid Nodule on Ultrasound Images: A Multi-center Study
Zelong Liu (Icahn School of Medicine at Mount Sinai, USA), Louisa
Deyer (Dwight School, USA), Arnold Yang (Westview High School, USA),
Steven Liu (New York University, USA), Jingqi Gong (Icahn School of
Medicine at Mount Sinai, USA), Yang Yang (Icahn School of Medicine at
Mount Sinai, USA), Mingqian Huang (Mount Sinai Hospital, USA), Amish
Doshi (Mount Sinai Hospital), Meng Lu (University of Massachusetts
Boston, USA), Denise Lee (Mount Sinai Hospital), Timothy Deyer (East
River Medical Imaging/Cornell Medicine), and Xueyan Mei (Icahn School
of Medicine at Mount Sinai, USA)

S1-3: Applications of mechanical and image analysis in biomedical study

H&E Stain Normalization using U-Net	29
Investigation of the Optic Nerve Head Morphology Influence to the Optic Nerve Head Biomechanics – Data Observation and Analysis	33
Biomechanical Investigation on the Corneal Symmetry Factors	37
A Deep Generative Multimodal Imaging Genomics Framework for Alzheimer's Disease Prediction. 4 Giorgio Dolci (TReNDS, Georgia State, Georgia Tech, Emory, USA), Md Abdur Rahaman (TReNDS, Georgia State, Georgia Tech, Emory USA), Jiayu Chen (TReNDS, Georgia State, Georgia Tech, Emory USA), Kuaikuai Duan (TReNDS, Georgia State, Georgia Tech, Emory USA), Zening Fu (TReNDS, Georgia State, Georgia Tech, Emory USA), Anees Abrol (TReNDS, Georgia State, Georgia Tech, Emory USA), Anees Abrol (TReNDS, Georgia State, Georgia Tech, Emory USA), Gloria Menegaz (Dept. of Computer Science University of Verona Verona, Italy), and Vince D. Calhoun (TReNDS, Georgia State, Georgia Tech, Emory USA)	11
Multi-modal Lung Ultrasound Image Classification by Fusing Image-Based Features and Probe Information	45

S1-4: Treatment and Monitoring platforms

Real-Time Auditory Feedback System for Bow-Tilt Correction While Aiming in Archery	51
Using 3D Technology to Facilitate Endovascular Thoracic Aortic Repair for Ascending Aorta Disease in Zone 0	55
Sample Entropy of Transient Evoked Otoacoustic Emission: A New Approach for Diagnosis of Meniere's Disease	51
A Wireless Quantitative dry Cupping System for Continuous Treatment Monitoring with a web Based Interface	65

S1-5A: Explainable Artificial Intelligence in Bioengineering (EAIB)

Machine Learning for Uterine Cervix Screening Francesco Mercaldo (University of Molise, Italy), Xiaoli Zhou (Chongqing University, China), Pan Huang (Chongqing University, China), Fabio Martinelli (IIT-CNR, Pisa, Italy), and Antonella Santone (University of Molise, Italy)	.71
Deep Learning for Heartbeat Phonocardiogram Signals Explainable Classification	. 75
Mario Cesarelli (Institute for Informatics and Telematics, National	
Research Council of Italy, Italy), Marcello Di Giammarco (University	
of Naples Federico II, Italy), Giacomo Iadarola (Institute for	
Informatics and Telematics, National Research Council of Italy,	
Italy), Francesco Mercaldo (Institute for Informatics and Telematics,	
National Research Council of Italy, Italy), Fabio Martinelli	
(University of Molise, Italy; Institute for Informatics and	
Telematics, National Research Council of Italy, Italy), and Antonella	
Santone (University of Molise, Italy)	

S1-5B: Deep Learning for Health Markers

Mortality Prediction and Safe Drug Recommendation for Critically-ill Patients	'9
Deep Reinforcement Learning for Medicine Recommendation	5
 Deep Multi-scale U-Net Architecture and Label-Noise Robust Training Strategies for Histopathological Image Segmentation	91
Histopathology Cross-Modal Retrieval Based on Dual-Transformer Network	17

S1-6A: Biomechanics

Motion Generation of Anticipatory Postural Adjustments in Gait Initiation	
Hitohiro Etoh (The University of Tokyo, Japan), Yuichiro Omura (The	
University of Tokyo, Japan), Kohei Kaminishi (The University of Tokyo,	
Japan), Ryosuke Chiba (Asahikawa Medical University, Japan), Kaoru	
Takakusaki (Asahikawa Medical University, Japan), and Jun Ota (The	
University of Tokyo, Japan)	

Effects of Increased Arm Muscle Tone on Postural Recovery from External Forces: A	
Simulation Study 1	107
Kohei Kaminishi (The University of Tokyo, Japan), Yuichiro Omura (The	
University of Tokyo, Japan), Ryosuke Chiba (Asahikawa Medical	
University, Japan), Kaoru Takakusaki (Asahikawa Medical University,	
Japan), and Jun Ota (The University of Tokyo, Japan)	
Video Surveillance for Near-Fall Detection at Home	111
Khac Chinh Tran (Information Technology Faculty Danang Uni. of Science	
& Technology Danang, Vietnam), Gassi Meryem (University of Montreal,	
Canada), Nehme Perla (University of Montreal, Canada), Rousseau	
Jacqueline (University of Montreal, Canada), and Meunier Jean	
(University of Montreal, Canada)	

S1-6B: Biomaterials

The Effect of Tensile Force and Periodontal Ligament Cell-Laden Calcium Silicate/Bioinks Auxetic Scaffolds for Tissue Engineering Ting-Ju Lin (China Medical University, Taiwan), Yen-Hong Lin (China Medical University Hospital, Taiwan), Yi-Wen Chen (China Medical University, Taiwan), and Ming-You Shie (China Medical University, Taiwan)	. 117
Biofabrication of Cell-laden Auxetic dECM Scaffold Regulated Chondrogenic Markers under	
Cyclic Tension Stimulation	121
Yen-Hong Lin (China Medical University Hospital, Taiwan), Yi-Wen Chen	
(China Medical University, Taiwan), and Ming-You Shie (China Medical	
University, Taiwan)	

S1-7: Bioinformatics and Biomedical Engineering in response to the COVID pandemic

DC	CPC: Drug Candidates for the Prevention of COVID-19 Database	124
	Ahmad Ăfif Supianto (Research Center for Data and Information	
	Sciences, National Research and Innovation Agency, Indonesia), Rizky	
	Nurdiansyah (Indonesia International Institute for Life Sciences,	
	Indonesia), Chia-Wei Weng (Institute of Medicine, Chung Shan Medical	
	University, Taiwan), Heni Dwi Windarwati (Universitas Brawijaya,	
	Indonesia), Raden Sandra Yuwana (Research Center for Data and	
	Information Sciences, National Research and Innovation Agency,	
	Indonesia), Andria Arisal (Research Center for Data and Information	
	Sciences, National Research and Innovation Agency, Indonesia), Vicky	
	Zilvan (Research Center for Data and Information Sciences, National	
	Research and Innovation Agency, Indonesia), Hilman Ferdinandus Pardede	
	(Research Center for Data and Information Sciences, National Research	
	and Innovation Agency, Indonesia), Chien-Hung Huang (National Formosa	
	University, Taiwan), Ana Heryana (Research Center for Data and	
	Information Sciences, National Research and Innovation Agency,	
	Indonesia), Dikdik Krisnandi (Research Center for Data and Information	
	Sciences, National Research and Innovation Agency, Indonesia), and	
	Ka-Lok Ng (Asia University, Taiwan)	

8
4

S1-8: 3D Printing

 3D Printing Di-ion doped Calcium Silicate Scaffolding Architecture for Promotion of Bifunctionality for Bone Tissue Regeneration	137
Preparation and Characterization of 3D-printed Lithium-doped Calcium Silicate Scaffold for Osteochondral Regeneration	39
3D Printing of Bioceramic/polycaprolactone Composite Scaffolds for Bone Tissue Engineering1 Ming-You Shie (China Medical University, Taiwan), Chun-Che Lai (China Medical University, Taiwan), Po-Han Chiang (Asia University, Taiwan), Han-Chi Chung (Asia University, Taiwan), and Chia-Che Ho (Asia University, Taiwan)	.42

S2-1: Pandemic effects

Theoretical Proposal of an Internet of Pandemic Things Network Based at the Sensing of Proteins and Emission of Radiation in Outdoor Spaces	146
Huber Nieto-Chaupis (Universidad Autónoma del Perú)	
Exploring Geographical Topologies and Diffusion of Monkeypox Infections at the Beginning	
Pandemic	152
Huber Nieto-Chaupis (Universidad Autónoma del Perú)	

Attention-Based Automated Chest CT Image Segmentation Method of COVID-19 Lung Infection .. 158 Beom J. Lee (Georgia Institute of Technology, USA), Sarkis T. Martirosyan (Georgia Institute of Technology, USA), Zaid Khan (Georgia Institute of Technology, USA), Han Y. Chiu (Georgia Institute of Technology, USA), Zun Wang (Georgia Institute of Technology, USA), Wenqi Shi (Georgia Institute of Technology, USA), Felipe Giuste (Georgia Institute of Technology, USA), Yishan Zhong (Georgia Institute of Technology, USA), Jimin Sun (Georgia Institute of Technology, USA), and May Dongmei Wang (Georgia Institute of Technology, USA)

S2-2: Deep learning on optical modalities

 A Practical AR-Based Surgical Navigation System using Optical See-Through Head Mounted Display	64
 Multi-modal Deep Learning Models for Alzheimer's Disease Prediction using MRI and EHR 16 Sathvik S. Prabhu (Georgia Institute of Technology, USA), John A. Berkebile (Georgia Institute of Technology, USA), Neha Rajagopalan (Georgia Institute of Technology, USA), Renjie Yao (Georgia Institute of Technology, USA), Wenqi Shi (Georgia Institute of Technology, USA), Felipe Giuste (Georgia Institute of Technology, USA), Yishan Zhong (Georgia Institute of Technology, USA), Jimin Sun (Georgia Institute of Technology, USA), and May D. Wang (Georgia Institute of Technology, USA) 	58
MobileNetV2 Based Diagnosis and Grading of Limbal Stem Cell Deficiency	74

S2-3: Biomaterials

The Preparation of High Performance Gelatin/Hyaluronic Acid Sponge Bone Scaffold Ming-Huang Lin (Feng Chia University, Taiwan), Jia-Horng Lin (Feng Chia University, Taiwan), Ching-Wen Lou (Asia University, Taiwan), and Yueh-Sheng Chen (China Medical University, Taiwan)	180
Development of a Three-Dimensional Sponge Dressing Containing Fucoidan for Skin Damage	
Repair	184
Yu-Hsiang Liao (Asia University, Taiwan), Ming-You Shie (China Medical	
University, Taiwan), Yi-Wen Chen (Graduate Institute of Biomedical	
Sciences, China Medical University, Taiwan), Wan-Ni Huang (China	
Medical University Hospital, Taiwan), and Yu-Fang Shen (Asia	
University, Taiwan)	

S2-4: Modeling of Cells and Pathways

Mathematical Model of Photobiomodulation on Cytochrome c Oxidase Huai-Ching Hsieh (National Taiwan University, Taiwan), Wen-Wei Tseng (National Taiwan University, Taiwan), and An-Chi Wei (National Taiwan University, Taiwan)	187
Modeling the Effects of SARS-CoV-2 Infection on the mTOR Signaling Pathway Yu-Yao Tseng (Shih Chien University, Taiwan)	193
Cell Cycle Phase Classification from Deep Learning-Predicted Images of Cell Organelles Chi-Jung Huang (National Taiwan University, Taiwan), Yi-Ju Lee (National Taiwan University, Taiwan), and An-Chi Wei (National Taiwan University, Taiwan)	199

S2-5: Applications of machine learning in drug predication and bioinformatics

 Prediction of Potential Natural Antibiotics Based on Jamu Formula using Machine Learning Approach
An Improved Model for Predicting Compound Retrosynthesizability using Machine Learning210 Mami Ozawa (Tokyo Institute of Technology, Japan), Nobuaki Yasuo (Academy for Convergence of Materials and Informatics (TAC-MI), Tokyo Institute of Technology, Japan), and Masakazu Sekijima (Tokyo Institute of Technology, Japan)
Sequence-Based Prediction of Antimicrobial Peptides with CatBoost Classifier
 TSSNet – A Deep Neural Network Model for Predicting Prokaryotic Transcription Start Sites 221 Chung-En Ni (National Yang Ming Chiao Tung University Taipei, Taiwan), Duy-Phuong Doan (National Yang Ming Chiao Tung University Taipei, Taiwan), Yen-Jung Chiu (National Yang Ming Chiao Tung University Taipei, Taiwan), and Yen-Hua Huang (National Yang Ming Chiao Tung University Taipei, Taiwan)
Proteotranscriptomics Analysis Reveals Signature Pathways Associated with Colorectal Cancer Progression: A Pilot Study
A Model-Based Prognostic Predictor for Urothelial Bladder Carcinoma Through the Integrated Bioinformatics Analysis

University, Taiwan), and Jeffrey J. P. Tsai (Asia University, Taiwan)

Microbiome Classification for Heart Disease Detection	237
Aisha Hodzic (New York University Abu Dhabi, UAE) and Mai Oudah (New	
York University Abu Dhabi, UAE)	

S2-6: Electrophysiological Signals and Augmented Reality

Electrical Impedance Tomography using a Weighted Bound-Optimization Block Sparse Bayesian Learning Approach
Hierarchical Feature Alignment for Transfer Learning on Neural Decoding Tasks
A Lightweight R peak Detection Algorithm for Noisy ECG Signals
 Benchmarking Network Performance of Augmented Reality Based Surgical Telementoring Systems 261 Dehlela Shabir (Hamad Medical Corporation, Qatar), Malik Anbatawi (Hamad Medical Corporation, Qatar), Nihal Abdurahiman (Hamad Medical Corporation, Qatar), May Trinh (University of Houston, USA), Jhasketan Padhan (Hamad Medical Corporation, Qatar), Abdulla Al-Ansari (Hamad Medical Corporation, Qatar), Julien Abinahed (Hamad Medical Corporation, Qatar), Zhigang Deng (University of Houston, USA), Elias Yaacoub (Qatar University, Qatar), Amr Mohammed (Qatar University, Qatar), and Nikhil V. Navkar (Hamad Medical Corporation, Qatar)
Dynamic Guidance Virtual Fixtures for Guiding Robotic Interventions: Intraoperative MRI-Guided Transapical Cardiac Intervention Paradigm
Assessing Virtual Reality Environment for Remote Telementoring During Open Surgeries

S2-7: Biosensors for Healthcare and Biomedical Applications (BHBA-1)

Utilizing a 3D-printed, Multi-sensor, Wearable Medical Equipment On-demand for Hemodialysis Patient Care Wei-Ling Chen (Taipei Medical University), Po-Lei Lee (National Central University, Taiwan), Chung-Dann Kan (National Cheng Kung University Tainan, Taiwan), and Tsung-Lung Yang (Kaohsiung Veterans General Hospital, Taiwan)	277
 Feasibility Study for Apnea Screening in Patients' Homes using Radar and Machine Learning Method Fu-Kuei Chen (National Taipei University of Technology, Taiwan), You-Kwang Wang (National Taiwan University of Science and Technology, Taiwan), Hsin-Piao Lin (National Taipei University of Technology, Taiwan), Chien-Yu Chen (National Taiwan University of Science and Technology, Taiwan), Shu-Ming Yeh (Lo-Hsu Medical Foundation Lotung Poh-Ai Hospital, Taiwan), and Ching-Yu Wang (Lo-Hsu Medical Foundation Lotung Poh-Ai Hospital, Taiwan) 	282
Association between Mitral Valve Prolapse and Panic Disorders: A Population-Based Retrospective Cohort Study in Taiwan	288

S3-1: Explainable Artificial Intelligence in Bioengineering (EAIB)

Exploring Relationships Between Functional Network Connectivity and Cognition with an
Explainable Clustering Approach
Charles A. Ellis (Tri-institutional Center for Translational Research
in Neuroimaging and Data Science, Georgia State University, Georgia
Institute of Technology, and Emory University, USA), Martina Lapera
Sancho (Tri-institutional Center for Translational Research in
Neuroimaging and Data Science, Georgia State University, Georgia
Institute of Technology, and Emory University, USA), Mohammad S.E.
Sendi (Harvard Medical School, USA), Robyn L. Miller
(Tri-institutional Center for Translational Research in Neuroimaging
and Data Science, Georgia State University, Georgia Institute of
Technology, and Emory University, USA), and Vince D. Calhoun
(Tri-institutional Center for Translational Research in Neuroimaging
and Data Science, Georgia State University, Georgia Institute of
Technology, and Emory University, USA)
An Approach for Estimating Explanation Uncertainty in fMRI dFNC Classification
Charles A. Ellis (Tri-institutional Center for Translational Research
in Neuroimaging and Data Science, Georgia State University, Georgia
Institute of Technology, and Emory University, USA), Robyn L. Miller
(Tri-institutional Center for Translational Research in Neuroimaging
and Data Science, Georgia State University, Georgia Institute of
Technology, and Emory University, USA), and Vince D. Calhoun
(Tri-institutional Center for Translational Research in Neuroimaging
and Data Science, Georgia State University, Georgia Institute of
Technology, and Emory University, USA)

 Examining Effects of Schizophrenia on EEG with Explainable Deep Learning Models)1
 Examining Reproducibility of EEG Schizophrenia Biomarkers Across Explainable Machine Learning Models)5
 Deep Learning Based Method for Segmentation, Tracking, and Analysis of Intracellular Proteins and Their Interactions)9

S3-2A: Network and complexity analysis in bioinformatics

A Method for Computing Attractor Fields in Coupled Boolean Networks Carlos R. P. Tovar (Federal University of ABC, Brazil), David C. Martins-Jr (Federal University of ABC, Brazil), Luiz C. S. Rozante (Federal University of ABC, Brazil), and Eloi Araujo (Federal University of Mato Grosso do Sul, Brazil)	315
Cellular Liberality is Measurable as Lempel-Ziv Complexity of Fastq Files	321
Norichika Ogata (Nihon BioData Corp., Japan; Tokyo University of	
Agriculture and Technology, Japan; Manufacturing Technology	
Association of Biologics, Japan) and Aoi Hosaka (Nihon BioData Corp.,	
Japan; Kihara Institute for Biological Research, Japan)	

S3-2B: EEG Modeling and Analysis

Comparison Between dry and wet EEG Electrodes in an SSVEP-Based BCI for Robot Navigation .. 333 Maria Samara (Foundation for Research and Technology-Hellas (FORTH), Greece), Cristina Farmaki (Foundation for Research and Technology-Hellas (FORTH), Greece), Nikolaos Zacharioudakis (Technical University of Crete, Greece), Matthew Pediaditis (Foundation for Research and Technology-Hellas (FORTH), Greece), Myrto Krana (Foundation for Research and Technology-Hellas (FORTH), Greece), and Vangelis Sakkalis (Foundation for Research and Technology-Hellas (FORTH), Greece)

S3-3: Quantum science and nanotechnology

Neurogenesis as a Probability Amplitude Governed by Charges-Dependent Hamiltonian	339
Modeling the Electrodynamics of Cellular Uptake of Nanoparticles at Drug Delivery Strategies	345
Classification of Tumor Metastasis Data by using Quantum Kernel-Based Algorithms	51
 A Novel Electrochemical Biosensor for the Detection of Cancer Biomarkers Based on Au@nanoflower/metal Oxide Nanocomposites	355

S3-4: Biosensors for Healthcare and Biomedical Applications (BHBA-2)

Breast Cancer Survival Analysis with Molecular Subtypes: An Initial Step	3
Lingli Zhang (Communication University of Zhejiang, China), Jiajun Wu	
(Communication University of Zhejiang, China), Youbing Zhao	
(Communication University of Zhejiang, China), Wenxian Hu (Run Run	
Shaw Hospital, Zhejiang University, China), Aihong Qin (Communication	
University of Zhejiang, China), Feng Dong (University of Strathclyde),	
Enjie Liu (University of Bedfordshire), Hao Zeng (Communication	
University of Zhejiang, China), Hao Xie (Communication University of	
Zhejiang, China), and Hui Du (Communication University of Zhejiang,	
China)	
Capactive EMG Measurement with Passive Capacitive Electrode	7
(Industrial Technology Reserarch Insitute (ITRI), Taiwan), Hsien Wei	
Chiu (Industrial Technology Reserarch Insitute (ITRI), Taiwan), and	
Yue-Der Lin (Feng Chia University, Taiwan)	