PROGRESS IN BIOMEDICAL OPTICS AND IMAGING Vol. 22 No. 6

Medical Imaging 2021

Biomedical Applications in Molecular, Structural, and Functional Imaging

Barjor S. Gimi Andrzej Krol Editors

15–19 February 2021 Online Only, United States

Sponsored by SPIE

Cooperating Organizations AAPM—American Association of Physicists in Medicine (United States) MIPS—Medical Image Perception Society (United States) SIIM—Society for Imaging Informatics in Medicine (United States) WMIS—World Molecular Imaging Society (United States)

Published by SPIE

Volume 11600

Proceedings of SPIE, 1605-7422, V. 11600

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in Medical Imaging 2021: Biomedical Applications in Molecular, Structural, and Functional Imaging, edited by Barjor S. Gimi, Andrzej Krol, Proceedings of SPIE Vol. 11600 (SPIE, Bellingham, WA, 2021) Seven-digit Article CID Number.

ISSN: 1605-7422 ISSN: 2410-9045 (electronic)

ISBN: 9781510640290 ISBN: 9781510640306 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time)· Fax +1 360 647 1445 SPIE.org Copyright © 2021, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 1605-7422/21/\$21.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.



Paper Numbering: Proceedings of SPIE follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

Contents

NEUROLOGICAL IMAGING I

11600 04	Extra axial cerebrospinal fluid volume and a diagnosis of Alzheimer's disease [11600-1]
11600 05	An interactive computer-aided detection software tool for quantitative estimation of intracerebral hemorrhage [11600-2]
11600 06	Deep learning-based denoising for magnetic resonance spectroscopy signals [11600-3]
11600 07	Peak-clearance-rate as index for detection of Alzheimer's disease using ¹¹ C-PiB PET imaging [11600-4]
11600 08	Network connectivity analysis in complex systems using large-scale non-linear Granger causality (IsNGC) [11600-5]
11600 09	Large-scale augmented Granger causality (IsAGC) for connectivity analysis in complex systems: from computer simulations to functional MRI (fMRI) [11600-6]
11600 0A	Identifying the diffusion source of dementia spreading in structural brain networks [11600-7]
11600 OB	Photopeak detection efficiency of thin LSO scintillators for positron emission tomography [11600-8]
11600 OC	Open-source toolbox for analysis and spectra quality control of magnetic resonance spectroscopic imaging [11600-9]
11600 0D	Large-scale extended Granger causality for classification of marijuana users from functional MRI [11600-10]
	VASCULAR AND PULMONARY IMAGING
11600 OE	Hyperpolarized gas magnetic resonance imaging texture analysis and machine learning to explain accelerated lung function decline in ex-smokers with and without COPD [11600-11]
11600 OF	Evaluation of a non-contact Photo-Plethysmographic Imaging (iPPG) system for peripheral arterial disease assessment [11600-12]
11600 0G	Representation of texture structures with topological data analysis for stage IA lung adenocarcinoma in three-dimensional thoracic CT images [11600-13]

11600 OH	A linear systems description of multi-compartment pulmonary ¹²⁹ Xe magnetic resonance imaging methods [11600-14]
11600 01	Towards deep learning detection of lung nodules using micro-CT [11600-15]
11600 OJ	Automatic upper airway segmentation in static and dynamic MRI via deep convolutional neural networks [11600-16]
	INNOVATIONS IN IMAGE PROCESSING I
11600 OK	An open-source solution for shape modeling and analysis of objects of challenging topologies [11600-17]
11600 OL	A multi-modality radiomics-based model for predicting recurrence in non-small cell lung cancer [11600-61]

- 11600 0M Mask R-CNN-based tumor localization and segmentation in 4D Lung CT [11600-19]
- 11600 0N Non-destructive fibroblast NIH-3T3 spheroid classification using convolutional neural network [11600-20]
- 11600 00 Deep learning-based detection of COVID-19 from chest x-ray images [11600-21]

INNOVATIONS IN IMAGE PROCESSING II

Standard-dose PET reconstruction from low-dose preclinical images using an adopted all convolutional U-Net [11600-22]
Automatic deep learning-based segmentation of neonatal cerebral ventricles from 3D ultrasound images [11600-24]
Prostate and tumor segmentation on PET/CT using Dual Mask R-CNN [11600-25]
Investigating Covid-19 pandemic-induced effects on detection of emergent clinical imaging findings by large-scale tracking of utilization and reading results for AI-based image analysis services [11600-26]
Direct image-based attenuation correction using conditional generative adversarial network for SPECT myocardial perfusion imaging [11600-27]
_

11600 0V Improved reproducibility of CT calcium score using blind deconvolution [11600-28]

11600 0W	Machine learned versus analytical models for estimation of fractional flow reserve from CT-derived information [11600-29]
11600 OX	Cardiac motion estimation using pyramid, warping, and cost volume neural network [11600-30]
11600 OY	A 1D encoder-decoder deep network for pressure estimation from 4D flow MRI: in-vitro experiments [11600-31]
11600 OZ	Challenges in hemodynamics assessment in complex neurovascular geometries using computational fluid dynamics and benchtop flow simulation in 3D printed patient-specific phantoms [11600-32]

11600 10 A patch-based approach for aortic landmarking [11600-33]

NOVEL IMAGING METHODS

- 11600 13 A deblurring/denoising corrected scintigraphic planar image reconstruction model for targeted alpha therapy [11600-36]
- 11600 14 **Toward development of automated grading system for carious lesions classification using deep learning and OCT imaging** [11600-37]
- 11600 15 Benchtop x-ray fluorescence computed tomography (XFCT) imaging [11600-38]

OCULAR AND OPTICAL IMAGING

11600 16 Inner limiting membrane segmentation and surface visualization method on retinal OCT images [11600-39] 11600 17 Automated detection of optical phantom layer thickness using image analysis [11600-40] 11600 18 Differential imaging of dynamic scattering from laser speckle images for applications in perfusion monitoring [11600-41] Simulation platform of large volumetric photoacoustic microscopy based on k-space 11600 19 pseudospectral method [11600-42] 11600 1A Gaussian weighted block sparse Bayesian learning strategy based on K-means clustering algorithm for accurate bioluminescence tomography in glioma [11600-43] 11600 1B Fast three-dimensional focused x-ray luminescence computed tomography [11600-44]

BONE AND SKELETAL IMAGING, SEGMENTATION, REGISTRATION, DECISION-MAKING

- 11600 1C Finite element modelling of trabecular bone microstructure using emerging CT images [11600-45]
- 11600 1D Automated radiographic bone suppression with deep convolutional neural networks [11600-46]
- 11600 1E Automated femur segmentation from computed tomography images using a deep neural network [11600-47]
- 11600 1F Unsupervised GAN-CIRCLE for high-resolution reconstruction of bone microstructure from low-resolution CT scans [11600-48]

CARDIAC IMAGING II AND NANOPARTICLE IMAGING

- 11600 1G Characterization of velocity patterns produced by pulsatile and constant flows using 1000 fps high-speed angiography (HSA) [11600-49]
- 11600 1H **4D** flow MRI and CFD simulations of pulsatile flow in a phantom model of arterial stenosis: visualizing the vortex dynamics [11600-51]
- 11600 11 Machine learned approach for estimating myocardial blood flow from dynamic CT and coronary artery disease risk factors [11600-52]

POSTER SESSION

- 11600 1J A learning-based nonrigid MRI-CBCT image registration method for MRI-guided prostate cancer radiotherapy [11600-53]
- 11600 1K4D cone-beam CT deformable registration using unsupervised spatial transformation network
[11600-54]
- 11600 1L Contrast-enhanced MRI synthesis from non-contrast MRI using attention CycleGAN [11600-55]
- 11600 1M Residual mask scoring regional convolutional neural network for multi-organ segmentation in head-and-neck CT (Cum Laude Poster Award) [11600-56]
- 11600 1N Web infrastructure for data management, storage and computation [11600-57]
- 11600 10 Multimodal weighted network for 3D brain tumor segmentation in MRI images [11600-58]
- 11600 1P Blood vessel segmentation in narrow band imaging bronchoscopic video [11600-59]
- 11600 1Q Prediction of posttraumatic epilepsy using machine learning [11600-60]

- 11600 1RPost-op brain tumor bed detection and segmentation using 3D Mask R-CNN for dynamic
magnetic resonance perfusion imaging [11600-62]
- 11600 1S Simulation and evaluation of imaging for electrical impedance tomography using artificial intelligence methods [11600-63]
- 11600 1U Alveolar sac analysis of 3D human lung microstructure using synchrotron radiation micro-CT [11600-65]
- 11600 1W Deep learning and particle filter-based aortic dissection vessel tree segmentation [11600-68]