PROGRESS IN BIOMEDICAL OPTICS AND IMAGING
Vol. 20 No. 47

Medical Imaging 2019

Image Processing

Elsa D. Angelini
Bennett A. Landman
Editors

19–21 February 2019
San Diego, California, United States

Sponsored by
SPIE

Cooperating Organizations
AAPM—American Association of Physicists in Medicine (United States)
IFCARS—International Foundation for Computer Assisted Radiology and Surgery (Germany)
MIPS—Medical Image Perception Society (United States)
SIIM—Society for Imaging Informatics in Medicine (United States)
WMIS—World Molecular Imaging Society

Published by
SPIE

Volume 10949

Part One of Two Parts

Proceedings of SPIE, 1605-7422, V. 10949

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

Medical Imaging 2019: Image Processing, edited by Elsa D. Angelini, Bennett A. Landman, Proc. of SPIE
Vol. 10949, 1094901 · © 2019 SPIE · CCC code: 1605-7422/19/$18 · doi: 10.1117/12.2532364

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 2019: Image Processing*, edited by Elsa D. Angelini, Bennett A. Landman, Proceedings of SPIE Vol. 10949 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510625457
ISBN: 9781510625464 (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 © 2019, 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 $18.00 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 1605-7422/19/$18.00.

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.

SPIE. DIGITAL LIBRARY
SPIEDigitalLibrary.org

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

xi *Authors*

xvii *Conference Committee*

xxi *2019 Medical Imaging Award Recipients*

Part One

IMAGE RECONSTRUCTION AND SYNTHESIS

10949 02 **Self-consistent deep learning-based boosting of 4D cone-beam computed tomography reconstruction** [10949-1]

10949 03 **Image-domain multi-material decomposition for dual-energy CT with non-convex sparsity regularization** [10949-2]

10949 04 **Non-learning based deep parallel MRI reconstruction (NLDpMRI)** [10949-3]

10949 05 **Unpaired whole-body MR to CT synthesis with correlation coefficient constrained adversarial learning** [10949-4]

10949 06 **Iterative reconstruction for low dose CT using Plug-and-Play alternating direction method of multipliers (ADMM) framework** [10949-5]

DEEP LEARNING: SEGMENTATION

10949 07 **Two-level training of a 3D U-Net for accurate segmentation of the intra-cochlear anatomy in head CTs with limited ground truth training data** [10949-6]

10949 08 **Improving splenomegaly segmentation by learning from heterogeneous multi-source labels** [10949-7]

10949 09 **Simultaneous MR knee image segmentation and bias field correction using deep learning and partial convolution** [10949-8]

10949 0A **Distributed deep learning for robust multi-site segmentation of CT imaging after traumatic brain injury** [10949-9]

10949 0B **Improving V-Nets for multi-class abdominal organ segmentation** [10949-10]

10949 0C **A fully automated CT-based airway segmentation algorithm using deep learning and topological leakage detection and branch augmentation approaches** [10949-11]

IMAGE ENHANCEMENT AND MODELING

10949 0D **Multi-modal image fusion for multispectral super-resolution in microscopy** [10949-12]

10949 0E **Sharpness preserved sinogram synthesis using convolutional neural network for sparse-view CT imaging** [10949-13]

10949 0F **Deep residual dense U-Net for resolution enhancement in accelerated MRI acquisition** [10949-14]

10949 0G **Artificial neural network filters for enhancing 3D optical microscopy images of neurites** [10949-15]

10949 0H **Volumetric texture modeling using dominant and discriminative binary patterns** [10949-16]

BRAIN: SHAPES AND BIOMARKERS

10949 0I **Regularized topological data analysis for extraction of coherent brain regions** [10949-17]

10949 0J **Automatic quality control using hierarchical shape analysis for cerebellum parcellation** [10949-18]

10949 0K **Cerebellum parcellation with convolutional neural networks** [10949-19]

10949 0L **Model selection for spatiotemporal modeling of early childhood sub-cortical development** [10949-20]

FMRI AND DTI

10949 0M **Detecting connectivity changes in autism spectrum disorder using large-scale Granger causality** [10949-21]

10949 0N **Brain network identification in asynchronous task fMRI data using robust and scalable tensor decomposition** [10949-22]

10949 0O **Harmonizing 1.5T/3T diffusion weighted MRI through development of deep learning stabilized microarchitecture estimators** [10949-23]

10949 0P **Improved estimation of dynamic connectivity from resting-state fMRI data** [10949-24]

10949 0Q **Longitudinal structural connectivity in the developing brain with projective non-negative matrix factorization** [10949-25]

KEYNOTE AND HIGHLIGHTS

10949 0S **PADDIT: Probabilistic Augmentation of Data using Diffeomorphic Image Transformation** [10949-27]

10949 0T **Effect of statistical mismatch between training and test images for CNN-based deformable registration** [10949-28]

10949 0U **Segmentation of corneal optical coherence tomography images using randomized Hough transform** [10949-29]

MACHINE LEARNING FOR CLINICAL PREDICTION

10949 0V **Reproducible evaluation of methods for predicting progression to Alzheimer's disease from clinical and neuroimaging data** [10949-30]

10949 0W **Reduction of unnecessary thyroid biopsies using deep learning** [10949-31]

10949 0X **Direct prediction of cardiovascular mortality from low-dose chest CT using deep learning** [10949-32]

10949 0Y **Spatial integration of radiology and pathology images to characterize breast cancer aggressiveness on pre-surgical MRI** [10949-33]

10949 0Z **A computational method to aid the detection and annotation of pleural lesions in CT images of the thorax** [10949-34]

CLASSIFICATION

10949 10 **Body part and imaging modality classification for a general radiology cognitive assistant** [10949-35]

10949 11 **Interpretable explanations of black box classifiers applied on medical images by meaningful perturbations using variational autoencoders** [10949-36]

10949 12 **Fourier decomposition free-breathing ^{1}H MRI perfusion maps in asthma** [10949-37]

10949 13 **Localization and labeling of cervical vertebral bones in the micro-CT images of rabbit fetuses using a 3D deep convolutional neural network** [10949-38]

10949 14 **Quantitative and qualitative methods for efficient evaluation of multiple 3D organ segmentations** [10949-39]

CARDIAC IMAGING

10949 16 **Automatic cardiac landmark localization by a recurrent neural network** [10949-41]

10949 17 **Coronary calcium detection using 3D attention identical dual deep network based on weakly supervised learning** [10949-42]

10949 18 **Semi-automatic aortic valve tract segmentation in 3D cardiac magnetic resonance images using shape-based B-spline explicit active surfaces** [10949-43]

10949 19 **Towards increased trustworthiness of deep learning segmentation methods on cardiac MRI** [10949-44]

REGISTRATION AND MOTION

10949 1B **Unsupervised learning for large motion thoracic CT follow-up registration** [10949-47]

10949 1C **Progressively growing convolutional networks for end-to-end deformable image registration** [10949-48]

10949 1D **Accurate registration of in vivo time-lapse images** [10949-49]

10949 1E **Analysis of the kinematic motion of the wrist from 4D magnetic resonance imaging** [10949-50]

10949 1F **Automatic left ventricular segmentation in 4D interventional ultrasound data using a patient-specific temporal synchronized shape prior** [10949-51]

10949 1G **Lung cancer detection using co-learning from chest CT images and clinical demographics** [10949-122]

DEEP LEARNING: LESIONS AND PATHOLOGIES

10949 1H **Unsupervised brain lesion segmentation from MRI using a convolutional autoencoder** [10949-52]

10949 1I **Fully automated unruptured intracranial aneurysm detection and segmentation from digital subtraction angiography series using an end-to-end spatiotemporal deep neural network** [10949-53]

10949 1J **CT synthesis from MR images for orthopedic applications in the lower arm using a conditional generative adversarial network** [10949-54]

10949 1K **Weakly supervised fully convolutional network for PET lesion segmentation** [10949-55]

10949 1L **Lesion focused super-resolution** [10949-56]

OCT AND MICROSCOPY

10949 1M **Variational autoencoding tissue response to microenvironment perturbation** [10949-57]

10949 1N **Approximation of a pipeline of unsupervised retina image analysis methods with a CNN** [10949-58]

10949 1O **Segmentation of corneal optical coherence tomography images using Graph Search and Radon transform** [10949-59]

10949 1P **Framework for the co-registration of MRI and histology images in prostate cancer patients with radical prostatectomy** [10949-60]

10949 1Q **Predicting histopathological findings of gastric cancer via deep generalized multi-instance learning** [10949-61]

10949 1R **Objects characterization-based approach to enhance detection of degree of malignancy in breast cancer histopathology** [10949-62]

Part Two

POSTER SESSION

10949 1S **Bayesian inference for uncertainty quantification in point-based deformable image registration** [10949-46]

10949 1T **3D bifurcations characterization for intra-cranial aneurysms prediction** [10949-63]

10949 1U **Shape-based three-dimensional body composition extrapolation using multimodality registration** [10949-64]

10949 1V **Optimal input configuration of dynamic contrast enhanced MRI in convolutional neural networks for liver segmentation** [10949-65]

10949 1W **Incorporating CT prior information in the robust fuzzy C-means algorithm for QSPECT image segmentation** [10949-66]

10949 1X **Automatic two-chamber segmentation in cardiac CTA using 3D fully convolutional neural networks** [10949-67]

10949 1Y **Multiscale deep desmoking for laparoscopic surgery** [10949-68]

10949 1Z **Subvoxel vessel wall thickness measurements from vessel wall MR images** [10949-69]

10949 21 **Choroid segmentation in OCT images based on improved U-net** [10949-71]

10949 22 **Towards machine learning prediction of deep brain stimulation (DBS) intra-operative efficacy maps (Best Student Paper Award)** [10949-72]

10949 23 **Automated segmentation of the optic disc using the deep learning** [10949-73]

10949 24 **Generation of retinal OCT images with diseases based on cGAN** [10949-74]

10949 25 **A probabilistic approach for the registration of images with missing correspondences** [10949-75]

10949 26 **Active shape dictionary for automatic segmentation of pathological lung in low-dose CT image** [10949-76]

10949 27 **A generative-predictive framework to capture altered brain activity in fMRI and its association with genetic risk: application to Schizophrenia** [10949-77]

10949 28 **Stack-U-Net: refinement network for improved optic disc and cup image segmentation** [10949-78]

10949 29 **Left ventricle segmentation in LGE-MRI using multiclass learning** [10949-79]

10949 2A **A CNN based retinal regression model for Bruch's membrane opening detection** [10949-80]

10949 2B **Robust harmonic field based tooth segmentation in real-life noisy scanned mesh** [10949-81]

10949 2C **Bioresorbable scaffold visualization in IVOCT images using CNNs and weakly supervised localization** [10949-82]

10949 2D **Simultaneous and automatic two surface detection of renal cortex in 3D CT images by enhanced sparse shape composition** [10949-83]

10949 2E **Predicting cognitive scores from resting fMRI data and geometric features of the brain** [10949-84]

10949 2F **The segmentation of bladder cancer using the voxel-features-based method** [10949-85]

10949 2G **Multi-coil magnetic resonance imaging reconstruction with a Markov random field prior** [10949-86]

10949 2J **Tissue segmentation in volumetric laser endomicroscopy data using FusionNet and a domain-specific loss function** [10949-89]

10949 2K **Projection image-to-image translation in hybrid x-ray/MR imaging** [10949-90]

10949 2L **Deep learning based classification for metastasis of hepatocellular carcinoma with microscopic images** [10949-91]

10949 2M **Improving myocardium segmentation in cardiac CT angiography using spectral information** [10949-92]

10949 2N **Automatic dental root CBCT image segmentation based on CNN and level set method** [10949-94]

10949 2O **Automatic rat brain segmentation from MRI using statistical shape models and random forest** [10949-95]

10949 2P **Semantic segmentation of computed tomography for radiotherapy with deep learning: compensating insufficient annotation quality using contour augmentation** [10949-96]

10949 2Q **An automatic end-to-end pipeline for CT image-based EGFR mutation status classification** [10949-97]

10949 2R **Sparse low-dimensional causal modeling for the analysis of brain function** [10949-98]

10949 2S **Automated prostate segmentation of volumetric CT images using 3D deeply supervised dilated FCN** [10949-99]

10949 2T **MRI-based synthetic CT generation using deep convolutional neural network** [10949-100]

10949 2U **Montage based 3D medical image retrieval from traumatic brain injury cohort using deep convolutional neural network** [10949-101]

10949 2V **Reproducibility evaluation of SLANT whole brain segmentation across clinical magnetic resonance imaging protocols** [10949-102]

10949 2W **Group-wise alignment of resting fMRI in space and time** [10949-103]

10949 2X **A robust index for global tissue deformation analysis in ultrasound images** [10949-104]

10949 2Y **Nuclei counting in microscopy images with three dimensional generative adversarial networks** [10949-105]

10949 2Z **Cycle-consistent 3D-generative adversarial network for virtual bowel cleansing in CT colonography** [10949-106]

10949 30 **Robust discomfort detection for infants using an unsupervised roll estimation** [10949-107]

10949 31 **Automatic detection of the region of interest in corneal endothelium images using dense convolutional neural networks** [10949-108]

10949 32 **Pulmonary lobar segmentation from computed tomography scans based on a statistical finite element analysis of lobe shape** [10949-109]

10949 33 **Fully automated detection and quantification of multiple retinal lesions in OCT volumes based on deep learning and improved DRLSE** [10949-110]

10949 35 **Is hippocampus getting bumpier with age: a quantitative analysis of fine-scale dentational feature under the hippocampus on 552 healthy subjects** [10949-112]

10949 36 **Local and global transformations to improve learning of medical images applied to chest radiographs** [10949-114]

10949 37 **Region-guided adversarial learning for anatomical landmark detection in uterus ultrasound image** [10949-115]

10949 38 **The impact of MRI-CT registration errors on deep learning-based synthetic CT generation** [10949-116]

10949 39 **Evolutionary multi-objective meta-optimization of deformation and tissue removal parameters improves the performance of deformable image registration of pre- and post-surgery images (Cum Laude Poster Award)** [10949-117]

10949 3A **Renal parenchyma segmentation from abdominal CT images using multi-atlas method with intensity and shape constraints** [10949-118]

10949 3B **Discrimination of benign and malignant pulmonary tumors in computed tomography: effective priori information of fast learning network architecture** [10949-119]

10949 3C **Constructing an average geometry and diffusion tensor magnetic resonance field from freshly explanted porcine hearts** [10949-120]

10949 3D **Orbital bone segmentation in head and neck CT images using multi-gray level fully convolutional networks** [10949-121]

10949 3E **Semi-automatic segmentation of JIA-induced inflammation in MRI images of ankle joints** [10949-123]

10949 3G **Obtaining the potential number of models/atlases needed for capturing anatomic variations in population images** [10949-125]

10949 3H **Evaluating the impact of intensity normalization on MR image synthesis** [10949-126]

10949 3J **The utility of deep learning: evaluation of a convolutional neural network for detection of intracranial bleeds on non-contrast head computed tomography studies** [10949-128]

10949 3K **Offset regression networks for view plane estimation in 3D fetal ultrasound** [10949-129]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Abbas, Batool, 1E
Abdel-Mottaleb, Mohamed, 0U, 1O
Abdelwahed, Youssef S., 2C
Abidin, Anas Z., 0M
Abou Shousha, Mohamed, 0U, 1O
Abramson, Richard, 08
Ach, Thomas, 0D
Aelterman, Jan, 2G
Afacan, Onur, 04
Afshari, S., 1K
Agunwa, Chinyere, 10
Akkus, Zeynettin, 0W
Akrami, Haleh, 2E, 2W
Alderliesten, Tanja, 39
Anderson, Adam W., 0O
Andersson, Leif, 2O
Antic, Sanja L., 1G
Assad, Albert, 08
Atlason, Hans E., 1H
Autrusseau, Florent, 1T
Bagatin, Ericson, 0Z
Banalagay, Rueben, 07
Bao, Shunxing, 17, 1G, 2U
Baptista, Maria J., 1F
Barbosa, Daniel, 1F
Batta, Ishaan, 0I
Bayrak, Roza G., 0O
Beason-Held, Lori, 0O
Beghdadi, Azeddine, 1Y
Bendazzoli, Simone, 2O
BenTaieb, A., 1K
Berendschot, Tos T. J. M., 1N
Bergman, Jacques J. G. H. M., 2J
Berman, Karen F., 27
Bermond, Katharina, 0D
Bermudez, Camilo, 0A, 0O, 17, 22
Bhatia, Parmeet S., 0H
Blaber, Justin A., 0A, 0O
Boonrod, Arunnit, 0W
Bosman, Peter A. N., 39
Bottani, Simona, 0V
Bourcier, Romain, 1T
Breininger, Katharina, 29, 2K
Brignol, Arnaud, 2X
Brooks, James, 1P
Bruns, Steffen, 2M
Brusini, Irene, 2O
Burgos, Ninon, 0V
Butman, John A., 0A
Cai, Biao, 0P
Cai, Shuxiu, 35
Calhoun, Vince D., 0P
Callstrom, Matthew R., 0W
Canfield, Earl, 3K
Cao, Tuoyu, 05
Capaldi, Dante P. I., 12
Carass, Aaron, 0J, 0K, 3H
Cardoso, Jorge, 0S
Carr, J. Jeffery, 17
Castro, Regina M., 0W
Chaganti, Shikha, 2U
Chang, Joseph, 3B
Chang, Kidon, 3A
Chang, Yeun-Chung, 3B
Chang, Young Hwan, 1M
Cheikh, Faouzi Alaya, 1Y
Chen, Antong, 13
Chen, Chung-Ming, 3B
Chen, Geng, 26, 2D
Chen, Hang, 23
Chen, Jin-Shing, 3B
Chen, Junyu, 1W
Chen, Leng-Rong, 3B
Chen, Li-Wei, 3B
Chen, Qiang, 27
Chen, Xinjian, 21, 24, 26, 2A, 2D, 33
Chen, Yi-Chang, 3B
Cheng, Xuena, 21
Cheriet, Farida, 2X
Clark, Alys R., 32
Colliot, Olivier, 0V
Coradi, Thomas, 14
Crnojević, Vladimir, 2G
Curcio, Christine A., 0D
Curran, Walter J., 2S, 2T
Curvers, Wouter, 2J
Damberg, Peter, 2O
Dane, Mark A., 1M
Daniel, Bruce, 0Y
Dashtbozorg, Behdad, 1N
Dasnoy, Damien, 2P
Davatzikos, Christos, 0I, 2R
Davis, L. Taylor, 2V
Dawant, Benoit M., 07, 22
de Groof, Jeroen, 2J
de Jong, Pim A., 0X
Delp, Edward J., 2Y
de Melo e Sousa, Azael, 0Z

Desai, Hubert, 1T
De Silva, T., 0T
de Vos, Bob D., 19
Dewey, Blake E., 3H
de With, Peter H. N., 2J, 30
Dey, Neel, 0D
D'Haese, Pierre D., 22
D'hooge, Jan, 18, 1F
Dicken, Volker, 14
Ding, Pak Lun Kevin, 0F
Dogdas, Belma, 13
Dong, Di, 1Q
Dong, Xue, 2S
Dörfler, Arnd, 2K
Drapak, Stepan, 28
Dsouza, Adora M., 0M
Dunn, Kenneth W., 2Y
Ebrahimi, Mehran, 3C
Eddy, Rachel L., 12
Ehrhardt, Jan, 11, 1S, 25
Elle, Ole Jacob, 1Y
Ellingsen, Lotta M., 1H
Elsawy, Amr, 0U, 1O
Epelbaum, Stéphane, 0V
Eppenhof, Koen A. J., 1C
Erickson, Bradley J., 0W
Erickson, Dana, 0W
Evgeniou, Theodoros, 0V
Fahrig, Rebecca, 29
Falcão, Alexandre Xavier, 0Z
Fan, Richard, 1P
Fan, Ying, 21
Fang, Mengjie, 1Q
Fishbaugh, James, 0L, 1E
Florkow, Mateusz C., 1J, 38
Fonseca, Jaime C., 18
Franke, Andreas, 3E
Frey, Eric C., 1W
Fu, Chichen, 2Y
Furtado, Pedro, 1R
G., Anirudh, 36
Gaignard, Alban, 1T
Gao, Riqiang, 1G
Gao, Yi, 35
Gao, Yongfeng, 0E
Gao, Yuan, 2L
Gao, Yurui, 0O
Gauer, Tobias, 02
Ge, Yunhao, 05
Georgievskaya, Anastasia, 28
Gerig, Guido, 0D, 0L, 0Q, 1E
Gessert, Nils, 2C
Ghanouni, Pejman, 1P
Ghosal, Sayan, 27
Gilmore, John, 0L
Gleason, Alexa, 13
Goldman, Aaron L., 27
Gray, Joe W., 1M
Guan, Liling, 2A, 33
Gudnason, Vilmundur, 1H
Guo, Fumin, 12
Haas, Benjamin, 14
Habert, Marie-Odile, 0V
Hahn, James K., 1U
Hainline, Allison E., 22
Hamarneh, G., 1K
Han, R., 0T
Han, Shuo, 0J, 0K, 2Y
Handels, Heinz, 11, 1S, 25
Hänsch, Annika, 14
Hansen, Colin B., 0O
Hayashi, Yuichiro, 0B
Haynor, D., 3J
He, Yufan, 0K
Heintzmann, Rainer, 0D
Heiser, Laura M., 1M
Heldmann, Stefan, 1B
Hendrikse, J., 1Z
Henry, Ronald M. A., 1N
Hering, Alessa, 1B
Heslinga, Friso G., 1N
Higgins, Kristin, 2T
Hines, Catherine D. G., 13
Hoffman, Eric A., 0C, 32
Hoffman, John, 06
Hong, Helen, 3A, 3D
Honnorat, Nicolas, 0I, 2R
Houben, A. J. H. M., 1N
Hu, Minghui, 1I
Huang, Chuan, 35
Huo, Yuankai, 08, 0O, 17, 1G, 22, 2U, 2V
Huo, Yumei, 0E
Hwang, Jaedong, 2B
Igel, Christian, 0S
Išgum, Ivana, 0X, 19, 2M
J., Vijayananda, 36
Jani, Ashesh B., 2S
Jansen, Mariëlle J. A., 1V
Janve, Vaibhav A., 0O
Javaid, Umair, 2P
Jha, Abhinav K., 1W
Jiang, Xiaojun, 2S
Jin, Hailan, 1I
Jin, Ze, 3G
Joshi, Anand A., 0N, 2E, 2W
Kahaki, Seyed M. M., 0G, 1D
Kale, Amit, 0H
Keenan, Jeremy D., 28
Kepp, Timo, 1I
Kerkmeijer, Linda G. W., 38
Kerley, Cailey I., 2U
Ketcha, M. D., 0T
Kim, Hak Gu, 37
Kim, Heejong, 0Q
Kim, Hyeonjin, 3A
King, Clair, 32
Kiselev, Konstantin, 28
Klein, Jan, 14
Kleinszig, G., 0T
Klinder, Tobias, 3K

Konrad, Peter E., 22
Krüger, Julia, 1S, 25
Kuijf, Hugo J., 1V, 1Z
Kumar, Hari, 32
Kunder, Christian, 1P
Kundeti, Srinivasa Rao, 36
Kurzendorfer, Tanja, 29
Lafarge, Maxime W., 1C
L'Allinec, Vincent, 1T
Landman, Bennett A., 08, 0A, 0O, 17, 1G, 22, 2U, 2V
Laporte, Catherine, 2X
Lattanzi, Riccardo, 1E
Latus, Sarah, 2C
Leahy, Richard M., 0N, 2E, 2W
Lee, Chia-Yen, 3B
Lee, Hongjoo, 37
Lee, John A., 2P
Lee, Min Jin, 3D
Lee, Seokjin, 2B
Lee, Soonam, 2Y
Lei, Yang, 2S, 2T
Leiner, Tim, 2M
Leistner, David M., 2C
Lemij, Hans G., 31
Lenga, Matthias, 3K
Lessmann, Nikolas, 0X
Li, Baoxin, 0F
Li, Cheng, 30
Li, Chia-Chen, 3B
Li, Jian, 0N, 2E, 2W
Li, Lihong, 0E
Li, Rui, 22
Li, Shijie, 0D
Li, Shuo, 16
Li, Zhiqiang, 0F
Liang, Ji-min, 2F
Liang, Zhengrong, 0E
Liao, Shu, 05
Lin, Mong-Wei, 3B
Lio, Pietro, 1L
Liu, Han, 23
Liu, Tian, 2S, 2T
Liu, Yang, 2F
Liu, Yingzi, 2T
Loirand, Gervaise, 1T
Lommen, Jonathan M., 2K
Lorenz, Cristian, 3K
Love, Askell, 1H
Lu, Hong-bing, 2F
Lu, Yao, 1U
Lutz, Matthias, 2C
Lyu, Ilwoo, 0O
Lyu, Qihui, 03, 06
M. S., Vidya, 36
Ma, Jun, 2N
Ma, Yuhui, 21, 24
Madesta, Frederic, 02
Maier, Andreas, 29, 2K
Mao, Hui, 2T
Masoud, Osama, 1X
Maspero, Matteo, 38
Massion, Pierre P., 1G
Matheson, Alexander M., 12
Mattay, Venkata S., 27
Mattson, Britta, 13
McCormack, David G., 12
McHugo, Maureen, 2V
McNitt-Gray, Michael, 06
Meng, Hui, 2L
Menguy, Celine, 1T
Milletari, Fausto, 0B
Milne, David G., 32
MiriKharaji, Z., 1K
Misawa, Kazunari, 0B
Modat, Marc, 0S
Mohammed, Ahmed Kedir, 1Y
Mojica, Mia, 3C
Moltz, Jan, 14
Moon, Hyeonsoo, 08
Moradi, Mehdi, 10
Morais, Pedro, 18, 1F
Moreira, António H. J., 1F
Morgas, Tomasz, 14
Mori, Kensaku, 0B
Mossa-Basha, M., 3J
Mostapha, Mahmoud, 0L
Moyo, Tamara K., 08
Murphy, Veronica, 0L
Nadeem, Syed Ahmed, 0C
Näppi, Janne J., 2Z
Nath, Vishwesh, 0A, 0O, 17
Neph, Ryan, 06
Nielsen, Mads, 0S
Niu, Tianye, 03
Noble, Jack H., 07
Nouri, Anass, 1T
O'Connor, Daniel, 03
Oda, Hirohisa, 0B
Oda, Masahiro, 0B
Ojeda, P., 3J
Onyike, Chiadikaobi U., 0J
Orbes-Arteaga, Mauricio, 0S
Osanlouy, Mahyar, 32
Osterman, Travis J., 1G
Ourselin, Sebastien, 0S
Pai, Akshay, 0S
Paniagua, Beatriz, 0L
Panić, Marko, 2G
Park, Hyenok, 37
Park, Sanghyeok, 2B
Park, Seongeun, 3D
Parraga, Grace, 12
Parvathaneni, Prasanna, 0O, 17
Patel, Manishkumar, 13
Patel, Mayur B., 0A, 2U
Patel, Pretesh, 2S
Peng, Zhigang, 0H
Pereira, Carla, 1F
Petchprapa, Catherine, 1E

Pham, Dzung L., 0A
Philbrick, Kenneth A., 0W
Pirpinia, Kleopatra, 39
Piven, Joseph, 0Q
Pižurica, Aleksandra, 2G
Pluim, Josien P. W., 1C, 1N, 1V
Pop, Mihaela, 3C
Pour Yazdanpanah, Ali, 04
Pourtaherian, Arash, 30
Prince, Jerry L., 0J, 0K, 3H
Pu, Jiantao, 23
Qin, Lan, 1I
Queirós, Sandro, 18, 1F
Redon, Richard, 1T
Reinhold, Jacob C., 3H
Remedios, Samuel, 0A, 0O
Resnick, Susan, 0O
Rha, Koon Ho, 3A
Ro, Yong Man, 37
Robinson, Barbara, 13
Rodrigues, Nuno F., 1F
Rodriguez, William, 22
Rogers, Baxter P., 0O
Roth, Holger R., 0B
Roundhill, David, 3K
Roy, Snehashis, 0A
Ruan, Dan, 06
Rusu, Mirabela, 0Y, 1P
Saha, Punam K., 0C
Sahoo, Dushyant, 2R
Sakkers, R. J. B., 1J
Salama, Paul, 2Y
Samper-Gonzalez, Jorge, 0V
Sander, Jörg, 19
Savona, Michael R., 08
Schadewaldt, Nicole, 3K
Schau, Geoffrey F., 1M
Schilling, Kurt G., 0O
Schlaefer, Alexander, 2C
Schmidt-Richberg, Alexander, 3K
Schoon, Erik, 2J
Schultz, Sandra, 1S, 25
Seevinck, Peter R., 1J, 38
Sentker, Thilo, 02
Sermesant, Maxime, 3C
Sevastopolsky, Artem, 28
Shah, Tosha, 13
Shen, Chen, 0B
Shen, Yuhe, 2A
Sheng, Ke, 03, 06
Shi, Fei, 21, 24, 26
Shim, Hyunsuk, 2T
Shim, Kyu Won, 3D
Shin, Dongkuk, 37
Shin, Yeong-Gil, 2B
Shu, Hui-Kuo, 2T
Shults, Robert, 22
Siddiquee, Mahfuzur R., 0W
Siewerdsen, J. H., 0T
Sigurdsson, Sigurdur, 1H
Smedby, Örjan, 09, 2O
Snyder, Blake M., 28
Sommer, Stefan, 0S
Sonke, Jan-Jakob, 39
Sonn, Geoffrey, 1P
Sørensen, Lauge, 0S
Souza Meirelles, Gustavo, 0Z
Stan, Marius N., 0W
Steidl, Stefan, 29
Stepanyants, Armen, 0G, 1D
Stephen, Julia M., 0P
Stepniewska, Iwona, 0O
Stimpel, Bernhard, 2K
Struyvenberg, Maarten, 2J
Styner, Martin, 0L
Syben, Christopher, 2K
Syeda-Mahmood, Tanveer, 10
Tan, Jiaxing, 0E
Tang, Yucheng, 08
Tawhai, Merryn H., 32
Terry, James G., 17
Thibault, Guillaume, 1M
Tian, Haihong, 26, 2D
Tian, Jie, 1Q, 2L
Tian, Lin, 2Q
Tian, Sibo, 2S, 2T
Tjon A Ten, W. E., 30
Torigian, Drew A., 3G
Trahms, Robert, 3K
Udupa, Jayaram K., 3G
Ulrich, William, 27
Uneri, A., 0T
Uzunova, Hristina, 11
V., Manikanda Krishnan, 36
van den Berg, Cornelis A. T., 38
van der Putten, Joost, 2J
van der Sommen, Fons, 2J
van der Wal, B. C. H., 1J
van Hamersvelt, Robbert W., 2M
van Herk, Marcel, 39
van Hespen, K. M., 1Z
van Rooij, Jeroen, 31
van Stralen, Marijn, 1J, 38
van Velzen, Sanne G. M., 0X
van Vliet, Lucas J., 31
van Zon, Mike, 16
Venkataraman, Archana, 27
Verkooijen, Helena M., 0X
Vermeer, Koenraad A., 31
Veta, Mitko, 16, 1N
Veziers, Joëlle, 1T
Viergever, Max A., 0X
Vigueras-Guillén, Juan P., 31
Vilaça, João L., 18, 1F
Vogt, S., 0T
Wan, Fengkai, 09
Wang, Anqi, 3E
Wang, Bo, 2S
Wang, Chunliang, 09, 2O
Wang, Congcong, 1Y

Wang, Hao-Jen, 3B
Wang, Jiachen, 17, 1G, 2V
Wang, Jianing, 07
Wang, Kun, 2L
Wang, Lei, 23
Wang, Shih-Luen, 0G, 1D
Wang, Tonghe, 2S, 2T
Wang, Yu-Ping, 0P
Warfield, Simon K., 04
Weinans, H. H., 1J
Weinberger, Daniel R., 27
Werner, René, 02
Wesarg, Stefan, 3E
West, Robert, 0Y, 1P
Willemsen, K., 1J
Williams, Owen, 0O
Wilsher, Margaret L., 32
Wilson, Tony W., 0P
Wismüller, Axel, 0M
Wisnowski, Jessica L., 0N
Wolterink, Jelmer M., 19, 2M
Wong, Ken C. L., 10
Würfl, Tobias, 2K
Xiang, Dehui, 26, 2D
Xiong, Yunxi, 08, 1G, 2V
Xu, Xiao-pan, 2F
Xue, Dahai, 13
Xue, Zhong, 05
Yang, Guang, 1L
Yang, Guangming, 1I
Yang, Shun-Mao, 3B
Yang, Xiaofeng, 2S, 2T
Yang, Xiaoping, 2N
Yang, Yan, 1X
Yin, Yin, 1I
Ying, Sarah H., 0J, 0K
Yoshida, Hiroyuki, 2Z
Yu, Kai, 2A, 33
Yu, Xiaxia, 35
Yuan, Rong, 2Q
Zawaideh, M., 3J
Zha, Xuewei, 24
Zhang, Bin, 26
Zhang, Dongqing, 07
Zhang, Jian, 23
Zhang, Qiaochu, 35
Zhang, Wenjuan, 1Q
Zhang, Xi, 2F
Zhang, Yuwen, 32
Zhao, Yiyuan, 07
Zheng, Hao-jie, 2F
Zhou, Junlin, 1Q
Zhou, Yuxiang, 0F
Zhu, Jin, 1L
Zhu, Weifang, 21, 24, 26
Zijlstra, Frank, 1J, 38
Zreik, Majd, 0X, 2M
Zuo, Lianrui, 0J
Zwanenburg, J. J. M., 1Z

Conference Committee

Symposium Chairs

Ronald M. Summers, National Institutes of Health Clinical Center (United States)
Georgia D. Tourassi, Oak Ridge National Laboratory (United States)

Conference Chairs

Elsa D. Angelini, Imperial College London (United Kingdom) and Columbia University (United States) and Télécom ParisTech (France)
Bennett A. Landman, Vanderbilt University (United States)

Conference Program Committee

Mostafa Analoui, Livingston Securities LLC (United States)
Brian B. Avants, University of Pennsylvania (United States)
Meritxell Bach-Cuadra, Université de Lausanne (Switzerland)
Ulas Bagci, University of Central Florida (United States)
Olivier Colliot, ICM Brain & Spine Institute (France)
Benoit M. Dawant, Vanderbilt University (United States)
Marleen de Bruijne, Erasmus MC (Netherlands)
Alexandre X. Falcão, Universidade Estadual de Campinas (Brazil)
Aaron Fenster, Robarts Research Institute (Canada)
James Fishbaugh, NYU Tandon School of Engineering (United States)
Alejandro F. Frangi, University of Leeds (United Kingdom)
Mona K. Garvin, The University of Iowa (United States)
James C. Gee, University of Pennsylvania (United States)
Benjamin Glocker, Imperial College London (United Kingdom)
Miguel Angel González Ballester, Universitat Pompeu Fabra (Spain)
Hayit Greenspan, Tel Aviv University (Israel)
David R. Haynor, University of Washington (United States)
Tobias Heimann, Siemens AG (Germany)
Christine P. Hendon, Columbia University (United States)
Ivana Išgum, University Medical Center Utrecht (Netherlands)
Stefan Klein, Erasmus MC (Netherlands)
Ender Konukoglu, ETH Zürich (Switzerland)
Tianhu Lei, MD Imaging Research (United States)
Karim Lekadir, Universitat Pompeu Fabra (Spain)
Boudewijn P. F. Lelieveldt, Leiden University Medical Center (Netherlands)
Natasha Lepore, The University of Southern California (United States)

Marius George Linguraru, Children's National Medical Center (United States)
Murray H. Loew, The George Washington University (United States)
Cristian Lorenz, Philips Research (Germany)
Frederik Maes, Katholieke Universiteit Leuven (Belgium)
Vincent A. Magnotta, The University of Iowa Hospitals and Clinics (United States)
Rashindra Manniesing, Radboud University Medical Center (Netherlands)
Diana Mateus, Ecole Centrale de Nantes (France)
Sunanda D. Mitra, Texas Tech University (United States)
Marc Modat, King's College London (United Kingdom)
Albert Montillo, University of Texas Southwestern Medical Center (United States)
Kensaku Mori, Nagoya University (Japan)
Nassir Navab, Technische Universität München (Germany) and Johns Hopkins University (United States)
Mads Nielsen, Niels Bohr Institute (Denmark)
Brian Nutter, Texas Tech University (United States)
Dzung L. Pham, Henry Jackson Foundation/USU (United States) and National Institutes of Health (United States) and Johns Hopkins University (United States)
Jerry L. Prince, Johns Hopkins University (United States)
Xin Qi, Rutgers, The State University of New Jersey (United States)
Punam K. Saha, The University of Iowa (United States)
Olivier Salvado, Commonwealth Scientific and Industrial Research Organisation (Australia)
Emine Saritas, Bilkent University (Turkey)
Lin Shi, The Chinese University of Hong Kong (China)
Marius Staring, Leiden University Medical Center (Netherlands)
Martin A. Styner, The University of North Carolina at Chapel Hill (United States)
Kenji Suzuki, Illinois Institute of Technology (United States)
Raphael Sznitman, Universität Bern (Switzerland)
Jayaram K. Udupa, University of Pennsylvania (United States)
Koen Van Leemput, Harvard Medical School (United States) and Massachusetts General Hospital (United States)
Tom K. Vercauteren, King's College London (United Kingdom)
Tomaž Vrtovec, University of Ljubljana (Slovenia)
Wolfgang Wein, ImFusion GmbH (Germany)

Session Chairs

1 Image Reconstruction and Synthesis
Marius Staring, Leiden University Medical Center (Netherlands)
Bennett A. Landman, Vanderbilt University (United States)

2 Deep Learning: Segmentation
Tomaž Vrtovec, University of Ljubljana (Slovenia)
Punam Kumar Saha, The University of Iowa (United States)

3 Image Enhancement and Modeling
Murray H. Loew, The George Washington University (United States)
Alexandre X. Falcão, Universidade Estadual de Campinas (Brazil)

4 Brain: Shapes and Biomarkers
James C. Gee, University of Pennsylvania (United States)
Antong Chen, Merch & Co., Inc. (United States)

5 fMRI and DTI
Martin A. Styner, The University of North Carolina at Chapel Hill (United States)
David R. Haynor, University of Washington (United States)

6 Keynote and Highlights
Tomaž Vrtovec, University of Ljubljana (Slovenia)
Ivana Išgum, University Medical Center Utrecht (Netherlands)

7 Machine Learning for Clinical Prediction
Marius Staring, Leiden University Medical Center (Netherlands)
Olivier Colliot, Centre National de la Recherche Scientifique (France)

8 Classification
Alexandre X. Falcão, Universidade Estadual de Campinas (Brazil)
Murray H. Loew, The George Washington University (United States)

9 Cardiac Imaging
Ivana Išgum, University Medical Center Utrecht (Netherlands)
Bennett A. Landman, Vanderbilt University (United States)

10 Registration and Motion
Olivier Colliot, Centre National de la Recherche Scientifique (France)
Bennett A. Landman, Vanderbilt University (United States)

11 Deep Learning: Lesions and Pathologies
Martin A. Styner, The University of North Carolina at Chapel Hill (United States)
Bas H.M. Van Der Velden, Univ. Medical Ctr. Utrecht (Netherlands)

12 OCT and Microscopy
Mads Nielsen, Niels Bohr Institute (Denmark)
Albert Montillo, The University of Texas Southwestern Medical Center at Dallas (United States)

2019 Medical Imaging Award Recipients

Robert F. Wagner Best Student Paper Award

Robert F. Wagner was an active scientist in the SPIE Medical Imaging meeting, starting with the first meeting in 1972 and continuing throughout his career. He ensured that the BRH, and subsequently the CDRH, was a sponsor for the early and subsequent Medical Imaging meetings, helping to launch and ensure the historical success of the meeting. The Robert F. Wagner All-Conference Best Student Paper Award (established 2014) is acknowledgment of his many important contributions to the Medical Imaging meeting and his many important advances to the field of medical imaging.

This award is co-sponsored by:

The Medical Image Perception Society

SPIE.

2019 Recipients:

First Place: **Volume-of-interest imaging using multiple aperture devices** (10948-74)
Wenying Wang, Grace J. Gang, Jeffrey H. Siewerdsen, Joseph W. Stayman, Johns Hopkins University (United States)

Second Place: **Surgical aid visualization system for glioblastoma tumor identification based on deep learning and in-vivo hyperspectral images of human patients** (10951-35)
Himar Fabelo, The University of Texas at Dallas (USA) and Universidad of Las Palmas de Gran Canaria (Spain); Martin Halicek, The University of Texas at Dallas (United States) and Georgia Institute of Technology & Emory University School of Medicine (United States); Samuel Ortega, Universidad de Las Palmas de Gran Canaria (Spain); Adam Szolna, Jesus Morera, Hospital Universidad de Gran Canaria Doctor Negrin (Spain); Roberto Sarmiento, Universidad of Las Palmas de Gran Canaria (Spain); Gustavo M. Callicó, Universidad de Las Palmas de Gran Canaria (Spain); Baowei Fei, The University of Texas at Dallas (United States) and The University of Texas Southwestern Medical Center (United States)