

Medical Imaging 2015

PACS and Imaging Informatics: Next Generation and Innovations

Tessa S. Cook
Jianguo Zhang
Editors

22–23 February 2015
Orlando, Florida, United States

Sponsored by
SPIE

Cosponsored by
Alpinion Medical Systems (United States)
Modus Medical Devices Inc. (Canada)
Bruker (United States)
ALIO Industries (United States)

Cooperating Organizations
AAPM—American Association of Physicists in Medicine (United States) • APS—American Physiological Society (United States) • CARS—Computer Assisted Radiology and Surgery (Germany) • Medical Image Perception Society (United States) • Radiological Society of North America (United States) • Society for Imaging Informatics in Medicine (United States) • World Molecular Imaging Society • The DICOM Standards Committee

Volume 9418

Proceedings of SPIE, 1605-7422, V. 9418

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

Medical Imaging 2015: PACS and Imaging Informatics: Next Generation and Innovations,
edited by Tessa S. Cook, Jianguo Zhang, Proc. of SPIE Vol. 9418, 941801
© 2015 SPIE · CCC code: 1605-7422/15/\$18 · doi: 10.1117/12.2193789

The papers included 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. The papers published in these proceedings 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 this book:

Author(s), "Title of Paper," in *Medical Imaging 2015: PACS and Imaging Informatics: Next Generation and Innovations*, edited by Tessa S. Cook, Jianguo Zhang, Proceedings of SPIE Vol. 9418 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 1605-7422

ISBN: 9781628415087

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 © 2015, 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 1605-7422/15/\$18.00.

Printed in the United States of America.

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



SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first 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, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four 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. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

Contents

- vii *Authors*
- ix *Conference Committee*
- xi *2015 Medical Imaging Award Recipients*

SESSION 1 KEYNOTE AND BIG DATA

- 9418 03 **Big data issues in medical imaging informatics [9418-2]**

SESSION 2 BIG DATA IN MEDICAL IMAGING AND INFORMATICS

- 9418 05 **What makes 'big data' different from 'regular data' within radiology? The easiest answer: when it no longer fits into Excel! [9418-4]**
- 9418 06 **Interactive analysis of geographically distributed population imaging data collections over light-path data networks [9418-5]**
- 9418 07 **Towards secondary use of heterogeneous radio-oncological data for retrospective clinical trials: service-oriented connection of a central research database with image analysis tools [9418-6]**
- 9418 08 **Imaging medical imaging [9418-7]**
- 9418 09 **Big data in multiple sclerosis: development of a web-based longitudinal study viewer in an imaging informatics-based eFolder system for complex data analysis and management [9418-40]**

SESSION 3 ADVANCED PACS-BASED RADIOLOGY WORKFLOW AND IMAGE SHARING

- 9418 0A **Web-based PACS and EHR system [9418-8]**
- 9418 0B **Web-based platform for collaborative medical imaging research [9418-9]**
- 9418 0C **On-line scalable image access for medical remote collaborative meetings [9418-10]**
- 9418 0D **Integrating research and clinical neuroimaging for the evaluation of traumatic brain injury recovery [9418-11]**
- 9418 0E **Characterizing stroke lesions using digital templates and lesion quantification tools in a web-based imaging informatics system for a large-scale stroke rehabilitation clinical trial [9418-12]**

SESSION 4 NEW TECHNOLOGIES AND CONCEPTS FOR PACS AND IMAGING INFORMATICS

- 9418 0F **PACS on mobile devices** [9418-13]
- 9418 0G **PACS: next generation** [9418-14]
- 9418 0H **Web-based 3D digital pathology framework for large-mapping data scanned by FF-OCT** [9418-15]
- 9418 0I **MRI visualisation by digitally reconstructed radiographs** [9418-16]
- 9418 0J **OpenID connect as a security service in Cloud-based diagnostic imaging systems** [9418-17]

SESSION 5 INFORMATION MANAGEMENT, SYSTEMS INTEGRATION AND STANDARDS

- 9418 0K **Future trends in picture archiving and communication system (PACS)** [9418-43]
- 9418 0L **DICOM index tracker enterprise: advanced system for enterprise-wide quality assurance and patient safety monitoring** [9418-19]
- 9418 0M **Design challenges and gaps in standards in developing an interoperable zero footprint DI thin client for use in image-enabled electronic health record solutions** [9418-20]
- 9418 0N **Investigation into the need for ingesting foreign imaging exams into local systems and evaluation of the design challenges of Foreign Exam Management (FEM)** [9418-21]
- 9418 0O **Evaluation of DICOM viewer software for workflow integration in clinical trials** [9418-22]

SESSION 6 QUANTITATIVE ANALYSIS, DATA MINING AND IMAGE-BASED PATIENT-SPECIFIC DATA MODELING

- 9418 0P **Extraction of endoscopic images for biomedical figure classification** [9418-23]
- 9418 0Q **Lung boundary detection in pediatric chest x-rays** [9418-24]
- 9418 0R **Sampling probability distributions of lesions in mammograms** [9418-25]
- 9418 0S **Medical case-based retrieval: integrating query MeSH terms for query-adaptive multi-modal fusion** [9418-26]
- 9418 0T **Clinical evaluation of using semantic searching engine for radiological imaging services in RIS-integrated PACS** [9418-27]

SESSION 7 IMAGING INFORMATICS FOR DIAGNOSTIC AND THERAPEUTIC APPLICATIONS

- 9418 0U **A concept-based interactive biomedical image retrieval approach using visualness and spatial information** [9418-28]
- 9418 0X **Automated identification of retained surgical items in radiological images** [9418-31]
- 9418 0Y **Design and evaluation of an imaging informatics system for analytics-based decision support in radiation therapy** [9418-32]

POSTER SESSION

- 9418 0Z **The standardization of super resolution optical microscopic images based on DICOM** [9418-18]
- 9418 10 **A web-based solution for 3D medical image visualization** [9418-33]
- 9418 11 **An imaging informatics-based system to support animal studies for treating pain in spinal cord injury utilizing proton-beam radiotherapy** [9418-34]
- 9418 12 **Quantitative imaging features: extension of the oncology medical image database (Cum Laude Poster Award)** [9418-35]
- 9418 13 **Open-source radiation exposure extraction engine (RE3) for dose monitoring** [9418-36]
- 9418 15 **e-Science platform for translational biomedical imaging research: running, statistics, and analysis** [9418-39]
- 9418 16 **DTI - DKI fitting: a graphical toolbox for estimation and visualization of diffusion tensor and diffusion kurtosis imaging** [9418-41]

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four 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.

Agam, Gady, 0X
Agarawal, Arun, 0M, 0N
Al-Hajeri, Mona, 0K
Alvfeldt, G., 05
Amezcuca, Lilyana, 09
Antani, Sameer K., 0P, 0Q, 0U
Bak, Peter, 0J, 0M, 0N
Bender, Duane, 0M, 0N
Bendl, Rolf, 07
Bento, Mariana P., 0B
Bönsch, Andrea, 0I
Botha, Charl P., 06
Bougatf, Nina, 07
Browning, Renee, 0Q
Candemir, Sema, 0Q
Castelli, Jane, 0M
Chachra, Suchet, 0P
Chang, Chia-Kai, 0H
Chien, Meng-Ting, 0H
Clarke, Malcolm, 0K
Costa, André L., 0B
Dance, D. R., 0R
Debus, Jürgen, 07
DeMarco, John, 0Y
Demner-Fushman, Dina, 0P, 0U
Derderian, Vana, 13
Deserno, Thomas M., 0I, 0O
Deshpande, Ruchi, 0Y
Dromerick, Alexander, 0E
Edwardson, Matthew, 0E
Fetita, Catalin, 0C
Fetterly, Kenneth A., 0L
Folio, Les, 13
Foncubierta-Rodríguez, Antonio, 0S
Gan, Lin, 0X
Gao, Xin, 0Z
Gluncic, Vicko, 0X
Graner, John, 0D
Grenier, Philippe, 0C
Gridley, Daila S., 11
Haak, Daniel, 0O
Halling-Brown, M. D., 12
Hanson, James, 0L
Hou, Xiaoshuai, 10
Hua, Yanqing, 0T
Huang, Sheng-Lung, 0H
Jaeger, Stefan, 0Q
Journeau, P., 0B
Kabino, Klaus, 0O
Koff, David, 0J, 0M, 0N
Kotha, Nikhil, 11
Langer, Steve G., 0L
Lau, Robert, 0I
Lelieveldt, Boudewijn P. F., 06
Lerner, Alex, 09
Li, Yu-I, 0H
Lindsköld, L., 05
Ling, Tonghui, 0T
Liu, Brent J., 09, 0E, 0Y, 11
Long, L. Rodney, 0P
Looney, P. T., 0R, 12
Lotufo, Roberto A., 0B
Lucidarme, Olivier, 0C
Lui, Wei, 0D
Ma, Kevin, 09
Ma, Weina, 0J
Machado, Rubens C., 0B
Mao, Xiao W., 11
Mehta, Nihal, 0A, 0F, 0G
Milles, Julien R., 06
Milovanovic, Lazar, 0N
Moric, Mario, 0X
Morin, Richard, 0L
Müller, Henning, 0S
Oakes, Terry, 0D
Ollinger, John, 0D
Paden, Robert, 0L
Page, Charles-E., 0O
Panda, Anshuman, 0L
Parikh, Ashesh, 0A, 0F, 0G
Patel, M. N., 12
Pavlicek, William, 0L
Rahman, Md Mahmudur, 0U
Raja, Rajikha, 16
Riedy, Gerard, 0D
Rittner, Leticia, 0B
Saini, Jitender, 16
Sartipi, Kamran, 0J
Seco de Herrera, Alba G., 0S
Sensenev, Justin, 0D
Serrurier, Antoine, 0I
Sharghi, Hassan, 0J
Shiroishi, Mark, 09
Shun, Chia-Tung, 0H
Sinha, Neelam, 16
Souza, Roberto M., 0B
Summers, Ronald M., 13
Sun, Jianyong, 10

Tarando, Sebastian Roberto, 0C
Thoma, George R., 0P, 0Q, 0U
Tsai, Chien-Chung, 0H
van de Giessen, Martijn, 06
van Lew, Baldur, 06
Verma, Sneha K., 11
Vrooman, Henri A., 06
Wang, Jing, 0E
Wang, Mingqing, 15
Wang, Tusheng, 15
Wang, Ximing, 09, 0E
Warren, L. M., 0R
Weisenthal, Samuel, 13
Winstein, Carolee, 0E
Wintell, M., 05
Wu, Lin-Wei, 0L
Wu, Teresa, 0L
Xia, Wei, 0Z
Xu, Lisa, 15
Xue, Zhiyun, 0P
Yang, Yuanyuan, 0T, 15
Yao, Jianhua, 13
You, Daekeun, 0P
Young, K. C., 0R, 12
Zhang, Jianguo, 03, 0T, 10, 15
Zhang, Kai, 0T, 15
Zhang, Min, 0L
Zhao, Jun, 15

Conference Committee

Symposium Chairs

David Manning, Lancaster University (United Kingdom)
Steven C. Horii, The University of Pennsylvania Health System
(United States)

Conference Chairs

Tessa S. Cook, The University of Pennsylvania Health System
(United States)
Jianguo Zhang, Shanghai Institute of Technical Physics (China)

Conference Program Committee

William W. Boonn, The University of Pennsylvania Health System
(United States)
Thomas M. Deserno, RWTH Aachen (Germany)
Steven C. Horii, The University of Pennsylvania Health System
(United States)
Maria Y. Law, Hong Kong Sanatorium and Hospital
(Hong Kong, China)
Heinz U. Lemke, Computer Assisted Radiology and Surgery
(Germany)
Brent J. Liu, The University of Southern California (United States)
Eliot L. Siegel, University of Maryland Medical Center (United States)
Wyatt Tellis, University of California, San Francisco (United States)

Session Chairs

- 1 Keynote and Big Data
Tessa S. Cook, The University of Pennsylvania Health System
(United States)
- 2 Big Data in Medical Imaging and Informatics
Jianguo Zhang, Shanghai Institute of Technical Physics (China)
- 3 Advanced PACS-Based Radiology Workflow and Image Sharing
Brent J. Liu, The University of Southern California (United States)
- 4 New Technologies and Concepts for PACS and Imaging Informatics
Thomas M. Deserno, RWTH Aachen (Germany)

- 5 Information Management, Systems Integration and Standards
Maria Y. Law, Hong Kong Sanatorium and Hospital
(Hong Kong, China)
- 6 Quantitative Analysis, Data Mining and Image-Based Patient-Specific
Data Modeling
Heinz U. Lemke, Computer Assisted Radiology and Surgery
(Germany)
- 7 Imaging Informatics for Diagnostic and Therapeutic Applications
Peter R. Bak, McMaster University (Canada)

2015 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 cosponsored by:



The Medical Image Perception Society



2015 Recipients:

First Place: **Automatic discrimination of color retinal images using the bag of words approach** (9414-54)

I. Sadek, D. Sidibé, F. Meriaudeau, Univ. of Burgundy (France)

Second Place: **Automated pulmonary lobar ventilation measurements using volume-matched thoracic CT and MRI** (9417-42)

F. Guo, S. Svenningsen, E. Bluemke, M. Rajchl, J. Yuan, A. Fenster, G. Parraga, The Univ. of Western Ontario (Canada)

Conference Awards

2015 Recipients:

Cum Laude Poster Award: **Quantitative imaging features: extension of the oncology medical image database** [9418-35]

M. N. Patel, P. T. Looney, K. C. Young, M. D. Halling-Brown, Royal Surrey County Hospital (United Kingdom)

