

*Medical Imaging 2019*

---

# **Image Perception, Observer Performance, and Technology Assessment**

**Robert M. Nishikawa**  
**Frank W. Samuelson**  
*Editors*

**20–21 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 10952**

Proceedings of SPIE, 1605-7422, V. 10952

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 [SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 Perception, Observer Performance, and Technology Assessment*, edited by Robert M. Nishikawa, Frank W. Samuelson, Proceedings of SPIE Vol. 10952 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510625518  
ISBN: 9781510625525 (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](http://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](http://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**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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

vii *Authors*  
ix *Conference Committee*

---

## **SESSION 1 IMAGE PERCEPTION**

---

- 10952 03 **Does the strength of the gist signal predict the difficulty of breast cancer detection in usual presentation and reporting mechanisms?** [10952-2]
- 10952 04 **Oculomotor behavior of radiologists reading digital breast tomosynthesis (DBT)** [10952-3]

---

## **SESSION 2 MODEL OBSERVERS I**

---

- 10952 05 **Automatic strategy for CHO channel reduction in x-ray angiography systems** [10952-4]
- 10952 06 **Template models for forced-localization tasks** [10952-5]
- 10952 07 **Autoencoder embedding of task-specific information** [10952-6]
- 10952 08 **Learning the Hotelling observer for SKE detection tasks by use of supervised learning methods** [10952-7]
- 10952 09 **Learning the ideal observer for joint detection and localization tasks by use of convolutional neural networks** [10952-8]

---

## **SESSION 3 MODEL OBSERVERS II**

---

- 10952 0A **Laguerre-Gauss and sparse difference-of-Gaussians observer models for signal detection using constrained reconstruction in magnetic resonance imaging** [10952-9]
- 10952 0B **Tests of projection and reconstruction domain equivalence for a feature-driven model observer** [10952-10]
- 10952 0C **New difference of Gaussian channel-sets for the channelized Hotelling observer?** [10952-11]
- 10952 0D **A foveated channelized Hotelling search model predicts dissociations in human performance in 2D and 3D images** [10952-12]
- 10952 0E **Using transfer learning for a deep learning model observer** [10952-13]

---

**SESSION 4      TECHNOLOGY IMPACT AND ASSESSMENT**

---

- 10952 0F      **Estimating latent reader-performance variability using the Obuchowski-Rockette method**  
[10952-14]
- 10952 0G      **Adaptive sample size re-estimation in MRMC studies** [10952-15]
- 10952 0H      **Radiation-therapy-induced erythema: comparison of spectroscopic diffuse reflectance  
measurements and visual assessment** [10952-16]
- 10952 0I      **Impact of patient photos on detection accuracy, decision confidence, and eye-tracking  
parameters in chest and abdomen images with tubes and lines** [10952-17]
- 10952 0J      **Is there a safety-net effect with computer-aided detection (CAD)?** [10952-18]

---

**SESSION 5      DEEP LEARNING APPLICATIONS**

---

- 10952 0K      **Correlation between a deep-learning-based model observer and human observer for a  
realistic lung nodule localization task in chest CT** [10952-19]
- 10952 0L      **Implementation of an ideal observer model using convolutional neural network for breast CT  
images** [10952-20]
- 10952 0M      **Learning stochastic object model from noisy imaging measurements using AmbientGANs**  
[10952-21]
- 10952 0N      **BI-RADS density categorization using deep neural networks** [10952-22]
- 10952 0O      **Mammographic breast density classification using a deep neural network: assessment based  
on inter-observer variability** [10952-23]

---

**SESSION 6      OBSERVER PERFORMANCE**

---

- 10952 0P      **Development of methods to evaluate probability of reviewer's assessment bias in Blinded  
Independent Central Review (BICR) imaging studies** [10952-24]
- 10952 0Q      **Reader disagreement index: a better measure of overall review quality monitoring in an  
oncology trial compared to adjudication rate** [10952-25]
- 10952 0R      **A 2-AFC study to validate artificially inserted microcalcification clusters in digital  
mammography** [10952-26]
- 10952 0T      **Blinding of the second reader in mammography screening: impact on behaviour and cancer  
detection** [10952-29]

---

**SESSION 7      OBSERVER PERFORMANCE IN BREAST IMAGING**

---

- 10952 0U      **An observer study to assess the detection of calcification clusters using 2D mammography, digital breast tomosynthesis, and synthetic 2D imaging** [10952-30]
- 10952 0V      **2D single-slice vs. 3D viewing of simulated tomosynthesis images of a small-scale breast tissue model** [10952-31]
- 10952 0W      **Changes in breast density** [10952-32]
- 10952 0X      **Assessment of a quantitative mammographic imaging marker for breast cancer risk prediction** [10952-33]

---

**POSTER SESSION**

---

- 10952 0Y      **Comparing senior residents performance to radiologists in lung cancer detection** [10952-28]
- 10952 0Z      **Data transformations for variance stabilization in the statistical assessment of quantitative imaging biomarkers** [10952-34]
- 10952 10      **A case study regarding clinical performance evaluation method of medical device software for approval** [10952-35]
- 10952 11      **In-vitro and in-vivo comparison of radiation dose estimates between state-of-the-art interventional fluoroscopy systems** [10952-36]
- 10952 12      **Prostate Imaging Self-assessment and Mentoring (PRISM): a prototype self-assessment scheme** [10952-37]
- 10952 14      **Deep residual-network-based quality assessment for SD-OCT retinal images: preliminary study** [10952-39]
- 10952 15      **A statistical analysis of oral tagging in CT colonography and its impact on flat polyp detection and characterization** [10952-40]
- 10952 16      **Missed cancer and visual search of mammograms: what feature-based machine-learning can tell us that deep-convolution learning cannot (Cum Laude Poster Award)** [10952-41]