

Photons Plus Ultrasound: Imaging and Sensing 2024

Alexander A. Oraevsky

Lihong V. Wang

Editors

28–31 January 2024

San Francisco, California, United States

Sponsored by

SPIE

Cosponsored by

Seno Medical Instruments, Inc. (United States)

TomoWave Laboratories, Inc. (United States)

Published by

SPIE

Volume 12842

Proceedings of SPIE, 1605-7422, V. 12842

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.

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 *Photons Plus Ultrasound: Imaging and Sensing 2024*, edited by Alexander A. Oraevsky, Lihong V. Wang, Proc. of SPIE 12842, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 1605-7422

ISSN: 2410-9045 (electronic)

ISBN: 9781510669437

ISBN: 9781510669444 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2024 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

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

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE 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

| | |
|----|-----------------------------|
| ix | <i>Conference Committee</i> |
| xi | <i>Introduction</i> |

CLINICAL IMAGING

| | |
|----------|---|
| 12842 02 | Multispectral optoacoustic imaging of peripheral nerve vascularization and morphology [12842-179] |
|----------|---|

ADVANCES IN ULTRASOUND DETECTION

| | |
|----------|---|
| 12842 03 | A highly sensitive and wideband transparent ultrasound transducer designed for advanced in vivo ultrasound and photoacoustic imaging [12842-7] |
| 12842 04 | A high-frequency surface-micromachined optical ultrasound transducer (SMOUT) array for 3D micro photoacoustic computed tomography (μPACT) [12842-9] |
| 12842 05 | High-resolution label-free ultraviolet photoacoustic microscopy via an ultraviolet-transparent ultrasound transducer [12842-10] |

BEST PAPER COMPETITION I

| | |
|----------|---|
| 12842 06 | Using denoising diffusion probabilistic models to enhance quality of limited-view photoacoustic tomography [12842-13] |
| 12842 07 | The development of ionizing radiation acoustic imaging (iRAI) for mapping the dose deep in the patient body during radiation therapy (Best Paper Award) [12842-15] |

BEST PAPER COMPETITION II

| | |
|----------|---|
| 12842 08 | Comparative evaluation of photoacoustic finder as an alternative method for sentinel lymph node detection in breast cancer patients [12842-24] |
|----------|---|

SMALL-ANIMAL IMAGING

| | |
|----------|---|
| 12842 09 | Multiparametric tumor analysis through photoacoustic tomography system using a hemispherical transducer array [12842-26] |
|----------|---|

- 12842 0A **Acute vasculature disruption in orthotopic kidney tumors based on vascular disrupting agent (OXi8007) examined by multispectral photoacoustic tomography (MSOT)** [12842-32]
- 12842 0B **Rapid rotary-scanning photoacoustic computed tomography for pharmacokinetic monitoring in small animals** [12842-34]

MACHINE LEARNING: DEVELOPMENTS AND APPLICATIONS

- 12842 0C **A learning-based image reconstruction method for skull-induced aberration compensation in transcranial photoacoustic computed tomography** [12842-39]
- 12842 0D **Deep model-based photoacoustic image reconstruction (DeepMB)** [12842-40]
- 12842 0E **Learning to compensate spectral coloring in a LED-based photoacoustic/ultrasound imaging system** [12842-41]
- 12842 0F **Enhancement of signal-to-noise ratio for real-time LED-based photoacoustic imaging systems using denoising cycle-consistent generative adversarial networks** [12842-45]

NOVEL SYSTEMS INCLUDING WAVEFRONT SHAPING

- 12842 0G **Full-view low-cost LED-based photoacoustic tomography** [12842-47]
- 12842 0H **Hybrid spherical array for clinical photoacoustic ultrasound (OPUS) imaging** [12842-49]
- 12842 0I **High-throughput photoacoustic tomography by integrated robotics and automation** [12842-51]

PHANTOMS AND CONTRAST AGENTS I

- 12842 0J **Development of a novel photoacoustic calcium-sensitive probe for functional neuroimaging** [12842-52]

SIGNAL AND IMAGE PROCESSING

- 12842 0K **Preliminary study on characterizing brain-ablation-induced necrosis through spectroscopic photoacoustic imaging** [12842-63]
- 12842 0L **Ultrafast 3-D photoacoustic system development using a matrix array transducer** [12842-148]

QUANTITATIVE IMAGING

12842 0M **Investigation of a learned image reconstruction method for three-dimensional quantitative photoacoustic tomography of the breast** [12842-68]

ADVANCES IN MICROSCOPY

12842 0N **X-ray-induced acoustic effect-based microscopic imaging** [12842-76]

SUNDAY POSTER SESSION

12842 0O **Near-surface excitation and spectrum analysis of photoacoustic waves and image reconstruction** [12842-79]

12842 0P **Dual-modal all-optical photoacoustic microscopy and viscoelasticity testing of soft tissues** [12842-82]

12842 0Q **Investigation of skin cancer through photoacoustic analysis and photothermal therapy utilizing modified Au-platinum nanoparticles** [12842-83]

12842 0R **Volumetric photoacoustic imaging using low-cost and easily fabricated planar array ultrasound transducers** [12842-89]

12842 0S **Development of a thermoacoustic imaging system to image blood in the brain: preliminary ex vivo results** [12842-96]

12842 0T **Photoacoustic signal enhancement of heterogeneously distributed optical absorbers by using speckle illumination** [12842-101]

12842 0U **Learning a semi-analytic reconstruction method for photoacoustic computed tomography with hemispherical measurement geometries** [12842-102]

MONDAY POSTER SESSION

12842 0V **Photoacoustic frequency analysis of the ablation-induced necrosis lesion** [12842-109]

12842 0W **Nanoparticle release and sorting from a soft surface by using an opto-thermal-mechanical approach** [12842-117]

12842 0X **LED-based photoacoustic imaging: a point-of-care solution for microvascular health assessment** [12842-121]

12842 0Y **Applications and challenges for isolation of ultrasound signals from swept source optical coherent tomography** [12842-123]

- 12842 0Z **Signal denoising for thermal acoustic imaging** [12842-127]
- 12842 10 **Multiscale photoacoustic imaging of lymphatic vessels in rabbit ears with lymphedema** [12842-130]
- 12842 11 **Virtual acoustic detector arrays for all-optical ultrasound sensing** [12842-158]

TUESDAY POSTER SESSION

- 12842 12 **Analysis of characteristics and photoacoustic imaging performance of exogenous contrast agents** [12842-133]
- 12842 13 **Advancing ultrasound-guided needle visibility: deep learning empowered by photoacoustic imaging** [12842-134]
- 12842 14 **Photoacoustic imaging of colorectal cancer in ex vivo samples: a preliminary study** [12842-140]
- 12842 15 **Determining total hemoglobin in blood irrespective of hemolysis status using a high-power LED-based low-cost photoacoustic system** [12842-142]
- 12842 16 **Improved performance of piezoelectric transparent ultrasound transducers using electrical impedance matching circuit** [12842-144]
- 12842 17 **Fourier transform acousto-optic imaging: toward real-time imaging of thick biological media** [12842-145]
- 12842 18 **Laser scanning photoacoustic microscopy system for oxy/deoxy hemoglobin imaging** [12842-149]
- 12842 19 **Tumor assessment system using high frequency ultrasound and photoacoustic imaging: system development** [12842-150]
- 12842 1A **Photoacoustic computed tomography with improved quality** [12842-151]
- 12842 1B **Photoacoustic imaging for detection of blood clot with different sizes in the brain** [12842-152]
- 12842 1C **Evaluation of multispectral unmixing algorithm for HbO₂ and HbR** [12842-153]
- 12842 1D **Flexible array curvature and sound speed estimations with a maximum spatial lag-one coherence metric** [12842-156]
- 12842 1E **Portable laser ultrasound system by using high power diode lasers for endoscopic biomedical applications** [12842-157]

DIGITAL POSTER SESSION

- 12842 1F **Quantitative photoacoustic microscopy for methylene blue concentration mapping in agar phantoms at multiple wavelengths** [12842-99]
- 12842 1G **Simulation of photoacoustic signal detection using fiber Bragg gratings** [12842-155]