

PROGRESS IN BIOMEDICAL OPTICS AND IMAGING

Vol. 27 No. 16

# ***Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XXIV***

**Caroline Boudoux**

**James W. Tunnell**

*Editors*

**17–19 January 2026**

**San Francisco, California, United States**

*Sponsored and Published by*

SPIE

**Volume 13838**

Proceedings of SPIE, 1605-7422, V. 13838

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 *Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XXIV*, edited by Caroline Boudoux, James W. Tunnell, Proc. of SPIE 13838, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 1605-7422

ISSN: 2410-9045 (electronic)

ISBN: 9781510695894

ISBN: 9781510695900 (electronic)

Published by

**SPIE**

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

Telephone +1 360 676 3290 (Pacific Time)

[SPIE.org](http://SPIE.org)

Copyright © 2026 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](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.

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:** 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

vii *Conference Committee*

---

## MACHINE LEARNING

---

- 13838 02 **Symmetry-aware Mod-Seg-SE(2) framework for MRI brain tumor segmentation** [13838-2]
- 13838 03 **Weakly-supervised breast cancer classification on MUSE fluorescence images with attention-based deep learning** [13838-5]

---

## ENDOSCOPY

---

- 13838 04 **Towards distal lung imaging: a miniaturised optical platform for bronchoscopy** [13838-7]
- 13838 05 **Towards smart scoring: a Mod-CIs-SE(2) network with feedback agent for Mayo Endoscopic Subscore grading** [13838-9]
- 13838 06 **Real-time 3D reconstruction and display of synchronized Fourier lightfield video for novel microsurgical applications** [13838-60]

---

## SURGICAL GUIDANCE I

---

- 13838 07 **Line-scan fluorescence and Raman confocal microscope for skin cancer surgical guidance** [13838-11]

---

## SURGICAL GUIDANCE II

---

- 13838 08 **Handheld NIR Raman system for intraoperative use in gastroenterological surgery (Invited Paper)** [13838-15]
- 13838 09 **Raman and FIBI-based slide-free imaging for rapid margin assessment in skin cancer surgery** [13838-16]

---

## OPTICAL COHERENCE TOMOGRAPHY

---

- 13838 0A **Real-time topology-aware M-mode OCT segmentation method for robotic deep interior lamellar keratoplasty (DALK) guidance** [13838-20]
- 13838 0B **Physics-based generation of multilayer corneal OCT data via Gaussian modeling and MCML for AI-driven diagnostic and surgical guidance applications** [13838-21]

---

#### CLINICAL DIAGNOSTIC SYSTEMS I

---

- 13838 0C **Determination of the inner vessel diameter in fluorescence angiography: an optical model study** [13838-27]

#### SPECTROSCOPY

---

- 13838 0D **Fast terahertz corneal imaging system with automatic motion compensation: application to in vivo mapping of hydration gradients (Invited Paper)** [13838-30]
- 13838 0E **Development of a Raman probe for non-invasive molecular assessment of alveolar bone graft integration** [13838-31]
- 13838 0F **Characterization of in vivo frostbite injury depth using a portable handheld terahertz spectroscopic scanner** [13838-33]

#### CLINICAL DIAGNOSTIC SYSTEMS II

---

- 13838 0G **Surface enhanced Raman spectroscopy and machine learning as an accurate and rapid diagnostic tool for hydrocephalus** [13838-36]
- 13838 0H **Towards complete characterization of the female reproductive tract using quantitative oblique back-illumination microscopy** [13838-39]

#### POSTER SESSION

---

- 13838 0I **Digital twin augmented reality for image-guided trochleoplasty** [13838-40]
- 13838 0J **Investigating the therapeutic effects of high and low concentrations of atropine on myopia using multimodal imaging** [13838-42]
- 13838 0K **Acquiring method of the distance between two points on a 3D image by combining an autostereoscopic display and a 3D pointer** [13838-43]
- 13838 0L **Binary pattern-based single-shot fringe projection profilometry for real-time laparoscopic surgical guidance** [13838-45]
- 13838 0M **Measurement system of surgical instrument operation by assistants in robot-assisted surgery** [13838-46]
- 13838 0N **Spectral reflectance estimation-based feature enhancement for monocular endoscope position estimation** [13838-48]