PROGRESS IN BIOMEDICAL OPTICS AND IMAGING
Vol. 25 No. 57

Medical Imaging 2024

Digital and Computational Pathology

John E. Tomaszewski
Aaron D. Ward
Editors

19–21 February 2024
San Diego, California, United States

Sponsored by
SPIE

Cosponsored by
Carnegie Hill Partners (United States)

Cooperating Organizations
American Association of Physicists in Medicine (United States)
Radiological Society of North America
World Molecular Imaging Society
Society for Imaging Informatics in Medicine (United States)
International Foundation for Computer Assisted Radiology and Surgery
Medical Image Perception Society (United States)

P*ublished by*
SPIE

Volume 12933

Proceedings of SPIE, 1605-7422, V. 12933

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 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 2024: Digital and Computational Pathology*, edited by John E. Tomaszewski, Aaron D. Ward, Proc. of SPIE 12933, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510671706
ISBN: 9781510671713 (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
SPIEDigitalLibrary.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*

GRADING AND CLASSIFICATION OF PATHOLOGY IMAGES I

12933 03 **A full pipeline to analyze lung histopathology images** [12933-2]

12933 04 **Towards embedding stain-invariance in convolutional neural networks for H&E-stained histopathology** [12933-3]

12933 05 **Efficient grading of prostate cancer WSI with deep learning** [12933-4]

COMPUTER-AIDED DIAGNOSIS, PROGNOSIS, AND PREDICTIVE ANALYSIS I

12933 06 **CA-fuse-MIL: cross-attention fusion of handcrafted and deep features for whole slide image classification** [12933-5]

12933 07 **Deep-ODX: an efficient deep learning tool to risk stratify breast cancer patients from histopathology images** [12933-6]

12933 08 **Survival prediction in pancreatic cancer by attention-driven feature extraction on histopathology whole slide images: a multi-cohort validation** [12933-7]

12933 09 **Cross-modality attention-based multimodal fusion for non-small cell lung cancer (NSCLC) patient survival prediction** [12933-8]

SEGMENTATION OF CELLULAR AND TISSUE STRUCTURES I

12933 0A **Few-shot tumor bud segmentation using generative model in colorectal carcinoma** [12933-9]

12933 0B **Tissue cross-section and pen marking segmentation in whole slide images** [12933-10]

12933 0C **Adapting SAM to histopathology images for tumor bud segmentation in colorectal cancer** [12933-11]

12933 0D **Automatic segmentation of histological images from mouse brain** [12933-12]

12933 0E **Advancing in vitro virtual nuclei staining of stem cells through a cross-structure, artifact-free U-Net approach** [12933-13]

12933 0F **Nucleus subtype classification using inter-modality learning** [12933-14]

SEGMENTATION OF CELLULAR AND TISSUE STRUCTURES II

12933 0H **Synthesis of annotated colon cancer tissue images from gland layout** [12933-15]

12933 0I **Eosinophils instance object segmentation on whole slide imaging using multi-label circle representation** [12933-16]

12933 0K **Leverage weekly annotation to pixel-wise annotation via zero-shot segment anything model for molecular-empowered learning** [12933-18]

12933 0L **Leveraging weakly labeled datasets with target adaptive loss for cell segmentation in immunofluorescence images** [12933-19]

12933 0M **Efficient semantic segmentation for computational pathology** [12933-20]

GRADING AND CLASSIFICATION OF PATHOLOGY IMAGES II

12933 0N **Automated anomaly detection in histology images using deep learning** [12933-21]

12933 0O **Automatic segmentation and scoring of 3D in vitro skin models using deep learning methods** [12933-22]

12933 0P **An ensemble learning method for detection of head and neck squamous cell carcinoma using polarized hyperspectral microscopic imaging** [12933-23]

12933 0Q **Malignant and benign classification using supervised contrastive learning based on distance metric in embedding spaces for rapid on-site cytologic evaluation** [12933-24]

12933 0R **HER2 prediction from breast H&E-stained whole slide images: a comparison between ROI-based supervised learning and multiple-instance learning approaches** [12933-25]

COMPUTER-AIDED DIAGNOSIS, PROGNOSIS, AND PREDICTIVE ANALYSIS II

12933 0S **Deep learning-based ROI detection of AEH and EC on histopathology WSIs for predicting hormonal treatment response** [12933-26]

12933 0T **Enhancing colorectal cancer tumor bud detection using deep learning from routine H&E-stained slides** [12933-27]

12933 0U **Federated learning in computational pathology: classification of tall cell patterns in papillary thyroid carcinoma** [12933-28]

12933 0V **Using integrated radiomic and pathomic-based models to predict progression-free survival in early-stage lung adenocarcinoma** [12933-29]

EMERGING TOOLS

12933 0W **CODEX and H&E imaging: cell type mapping, analysis, and visualization pipeline** [12933-31]

12933 0X **Deep learning-based open source toolkit for eosinophil detection in pediatric eosinophilic esophagitis** [12933-33]

12933 0Y **High-performance data management for whole slide image analysis in digital pathology** [12933-34]

12933 0Z **ComPRePS: an automated cloud-based image analysis tool to democratize AI in digital pathology** [12933-35]

12933 10 **Spatial pathomics toolkit for quantitative analysis of podocyte nuclei with histology and spatial transcriptomics data in renal pathology** [12933-36]

FROM IMAGING TO OBSERVER STUDIES

12933 12 **Investigating staining variance effects on deep learning-based semantic segmentation in digital pathology** [12933-38]

12933 13 **Pixel-level analysis of protein markers in highly multiplexed immunofluorescence images of kidney biopsies** [12933-39]

12933 14 **Cell spatial analysis in Crohn's disease: unveiling local cell arrangement pattern with graph-based signatures** [12933-40]

12933 15 **Assessment of machine learning algorithms for TILs scoring using whole slide images: comparison with pathologists** [12933-41]

POSTER SESSION

12933 16 **An unsupervised workflow for explainable biomarker identification based on multiplex data** [12933-42]

12933 17 **Automated eosinophilic segmentation and counting: a comprehensive evaluation** [12933-43]

12933 18 **A generative AI approach for interference study on chromogenic triplex images** [12933-44]

12933 19 **Multi-scale multi-site renal microvascular structures segmentation for whole slide imaging in renal pathology** [12933-46]

12933 1A **Evaluating diffusion model generated synthetic histopathology image data against authentic digital pathology images** [12933-47]

12933 1B **Patch stitching data augmentation for cancer classification in pathology images** [12933-48]

12933 1C **Weakly supervised medulloblastoma tumor classification using domain specific patch-level feature extraction** [12933-49]

12933 1D **Evaluation kidney layer segmentation on whole slide imaging using convolutional neural networks and transformers** [12933-50]

12933 1E **Segmenting cardiac muscle Z-disks with deep neural networks** [12933-51]

12933 1F **Computational integration of CODEX and brightfield histology for cell annotation using deep learning** [12933-52]

12933 1G **Correlation of glomerular histomorphometry changes with spatially resolved transcriptomic profiles in diabetic nephropathy** [12933-53]

12933 1H **Renal cell classification in highly multiplexed microscopy imaging using a biology-based decision tree classifier (Digital and Computational Pathology Poster Award)** [12933-54]

12933 1I **Multi-class instance segmentation of renal structures in highly multiplexed immunofluorescence microscopy images** [12933-55]

DIGITAL POSTER SESSION

12933 1J **Multiple instance learning with random sampling for whole slide image classification** [12933-30]