PROCEEDINGS OF SPIE

Emerging Topics in Artificial Intelligence (ETAI) 2023

Giovanni Volpe Joana B. Pereira Daniel Brunner Aydogan Ozcan Editors

20–24 August 2023 San Diego, California, United States

Sponsored and Published by SPIE

Volume 12655

Proceedings of SPIE 0277-786X, V. 12655

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 *Emerging Topics in Artificial Intelligence (ETAI) 2023*, edited by Giovanni Volpe, Joana B. Pereira, Daniel Brunner, Aydogan Ozcan, Proc. of SPIE 12655, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X ISSN: 1996-756X (electronic)

ISBN: 9781510665248 ISBN: 9781510665255 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org Copyright © 2023 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.



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

v Conference Committee

BIOMEDICAL APPLICATIONS I

- 12655 02 U-Net-based segmentation of Escherichia coli cells in the absence and presence of ciprofloxacin exposure [12655-12]
- 12655 03 Phenotype-preserving metric design for high-content image reconstruction by generative inpainting [12655-40]

BIOMEDICAL APPLICATIONS II

12655 04 Using Monte Carlo simulated PPGs signals to train a deep learning model to predict hemoglobin levels [12655-18]

BRAIN IMAGING

- 12655 05 Photonic decision making using optical spatiotemporal chaos generated from spatial light modulator [12655-2]
- 12655 06 Cascaded convolutional networks for unsupervised brain tissue segmentation and bias field estimation [12655-22]
- 12655 07 Leveraging large-scale Granger causality and neural networks to measure the level of consciousness in DoC patients [12655-23]
- 12655 08 Detecting landmarks in anatomical medical images using transformer-based networks [12655-26]
- 12655 09 Multi-level subspace analysis with applications to neuroimaging (Invited Paper) [12655-27]

MICROSCOPY AND PHOTONICS WITH AI I

12655 0A Chromatic aberration correction using reinforcement learning [12655-35]

MICROSCOPY AND PHOTONICS WITH AI II

12655 0B Brain-inspired nanophotonic spike-based devices for neuromorphic light-emitting and sensing Al applications (Invited Paper) [12655-3]

AI AND NANOPHOTONIC MACHINES: JOINT SESSION WITH CONFERENCES 12655 AND 12663

12655 0C Machine learning meets photonics (Invited Paper) [12655-50]

PHYSICS-INFORMED AND INTERPRETABLE AI I

12655 OF Physics-aware-trained diffractive deep neural networks [12655-56]

POSTER SESSION

12655 0G Cell classification framework using U-Net: convolutional networks for cervix cell segmentation [12655-64]