## PROCEEDINGS OF SPIE

# Al and Optical Data Sciences III

Bahram Jalali Ken-ichi Kitayama Editors

22–27 January 2022 San Francisco, California, United States

20–24 February 2022 ONLINE

Sponsored and Published by SPIE

**Volume 12019** 

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 *AI and Optical Data Sciences III*, edited by Bahram Jalali, Ken-ichi Kitayama, Proc. of SPIE 12019, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510649095

ISBN: 9781510649101 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time)

SPIE.ora

Copyright © 2022 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**

vii Conference Committee

### AI IN IMAGING II 12019 02 Damage segmentation using small convolutional neuronal networks and adversarial training methods on low-quality RGB video data [12019-12] 12019 03 Snapshot-to-video autoencoder for compressed ultra-high-speed imaging [12019-14] 12019 04 Real time eye gaze tracking for human machine interaction in the cockpit [12019-15] AR/VR 12019 05 Beaming displays: towards displayless augmented reality near-eye displays (Invited Paper) [12019-3] 12019 06 Metasurface for imaging and AR/VR devices (Invited Paper) [12019-4] QUANTUM COMPUTING AND ENCRYPTION 12019 07 648-Hilbert space dimensionality in biphoton frequency combs for quantum-secure communications and networks (Invited Paper) [12019-18] 12019 08 Assessing machine learning solutions for high-speed data analysis and imaging for a single photon timing detector with 60 ps single photon timing per channel [12019-19] **BRAIN-INSPIRED PHOTONIC AI** 12019 09 Phase change materials: the 'silicon' for analog photonic computing? (Invited Paper) [12019-24] 12019 0A Non-normality in neural networks (Invited Paper) [12019-25]

	PHOTONIC HARDWARE ACCELERATORS AND OPTICAL COMPUTING I
12019 OB	4F optical neural network acceleration: an architecture perspective (Invited Paper) [12019-27]
12019 OC	Photonic accelerator based on optical chaos (Invited Paper) [12019-28]
12019 OD	Design of asymptotically perfect linear photonic circuits [12019-32]
	OPTICAL SENSING AND COMMUNICATION I
12019 OE	Cooperative self-localization and wayfinding services through visible light communication [12019-42]
12019 OF	Particle detection using closed-loop active model diagnosis [12019-43]
	OPTICAL SENSING AND COMMUNICATION II
12019 OH	Machine learning for deep space network antenna motions detection [12019-48]
12019 OJ	Use of machine learning in a speckle-based optical fiber sensor for temperature detection [12019-49]
	PHYSICS-AI CONVERGENCE I
12019 0G	Filter-based photonic reservoir computing as a key-enabling platform for all-optical, high-speed processing of time-stretched images and telecomm data (Invited Paper) [12019-50]
12019 OK	Silicon photonic neural network applications and prospects (Invited Paper) [12019-52]
12019 OL	Neural networks to solve forward and inverse problems in diffuse reflectance spectroscopy [12019-54]
12019 OM	The artificial intelligent Pixel (aiPixel) [12019-55]
	PHYSICS-AI CONVERGENCE II
12019 ON	Broadband radio-frequency signal processing with neuromorphic photonics (Invited Paper) [12019-60]
12019 00	A physics-inspired approach to overcome oscillatory loss landscapes in the inverse design of optical components [12019-64]

#### POSTER SESSION

12019 OP	Quality inspection of translucent and micro-structured functional surfaces [12019-66]
12019 0Q	Efficient training for the hybrid optical diffractive deep neural network [12019-68]
12019 OS	Depth image super resolution method for time-of-flight camera based on machine learning [12019-70]