PROCEEDINGS OF SPIE

# *Applications of Machine Learning 2023*

**Michael E. Zelinski**
**Tarek M. Taha**
**Barath Narayanan Narayanan**
*Editors*

**23–24 August 2023**
**San Diego, California, United States**

*Sponsored and Published by*
SPIE

**Volume 12675**

Proceedings of SPIE 0277-786X, V. 12675

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 *Applications of Machine Learning 2023*, edited by Michael E. Zelinski, Tarek M. Taha, Barath Narayanan Narayanan, Proc. of SPIE 12675, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510665644
ISBN: 9781510665651 (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.

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*

**REMOTE SENSING**

12675 03 **Physics-guided neural networks for hyperspectral target identification (Invited Paper)** [12675-1]

12675 04 **Maintaining original color when applying super-resolution to individual bands** [12675-2]

12675 05 **Estimating a seal population using automated counts of drone photographs** [12675-3]

12675 06 **Ensemble segmentation for improved background estimation and gas plume identification in hyperspectral images** [12675-4]

12675 07 **AI-powered automated landscape monitoring at global scale** [12675-5]

**IMAGE QUALITY**

12675 08 **Impact of optical scatter on image classification with deep neural networks** [12675-6]

12675 09 **Convolutional neural networks and the modulation transfer function** [12675-7]

12675 0A **Enhancing the quality of gauge images captured in haze and smoke scenes through deep learning** [12675-9]

**OPTICS, PHOTONICS, PHYSICS**

12675 0B **Attention mechanisms for broadband feature prediction for electromagnetic and photonic applications** [12675-10]

12675 0C **Reduction of cosmic-ray induced background in astronomical x-ray imaging detectors via image segmentation methods** [12675-12]

12675 0D **Searching for rare Ca II quasar absorption lines using deep learning** [12675-14]

**IMAGE, SIGNAL, AND TEXT PROCESSING**

12675 0E **Reduction in sensor response time using long short-term memory network forecasting** [12675-15]

12675 0H **Parking spot classification based on surround view camera system** [12675-19]

12675 0I **Comparison of deep learning-based compressive imaging from a practitioner's viewpoint** [12675-20]

**BIO AND HEALTH APPLICATIONS**

12675 0L **An automated retinal hemorrhages and exudates detection in a Mexican image set** [12675-24]

12675 0M **A novel model of primary visual cortex based on biologically plausible sparse coding** [12675-25]

12675 0P **Comparison of machine learning methods for classification of alexithymia in individuals with and without autism from eye-tracking data** [12675-28]

**INDUSTRY**

12675 0R **Preliminary analysis of drone propeller signals using wingbeat-modulation lidar** [12675-29]

12675 0S **Incorporating hardware metrics to model cards to evaluate utilization of machine learning models on IoT devices** [12675-31]

**POSTER SESSION**

12675 0V **The path to carbon neutrality: a time series approach** [12675-33]

12675 0Y **Accelerating sparse convolutional neural networks with systolic arrays on FPGA** [12675-36]

12675 0Z **Model-based machine learning for computational reconstruction of opacity and missing information** [12675-37]

12675 10 **Building a smarter surveillance system: real-time animal identification using deep learning** [12675-38]

12675 12 **LoLi-IEA: low-light image enhancement algorithm** [12675-40]

12675 13 **Comparison between histogram of oriented gradients and convolutional features for keratoconus detection using corneal curvature maps** [12675-41]

12675 14 **In-flight testing of wide-angle low-light for UAS automated navigation** [12675-42]

12675 15 **Explainable machine learning approaches for understanding fire outcomes** [12675-43]

12675 16 **Chicken weight estimation using deep learning** [12675-45]

12675 17 **A frequency-driven deep learning technique for bird segmentation and detection from RGB video** [12675-46]