

PROCEEDINGS OF SPIE

# ***Applications of Machine Learning 2020***

**Michael E. Zelinski**  
**Tarek M. Taha**  
**Jonathan Howe**  
**Abdul A. Awwal**  
**Khan M. Iftekharuddin**  
*Editors*

**24 August – 4 September 2020**  
**Online Only, United States**

*Sponsored and Published by*  
SPIE

**Volume 11511**

Proceedings of SPIE 0277-786X, V. 11511

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Applications of Machine Learning 2020, edited by Michael E. Zelinski, Tarek M. Taha, Jonathan Howe, Abdul A. S. Awwal, Khan M. Iftekharuddin, Proc. of SPIE Vol. 11511, 1151101 · © 2020 SPIE · CCC code: 0277-786X/20/\$21 · doi: 10.1117/12.2581659

Proc. of SPIE Vol. 11511 1151101-1

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 2020*, edited by Michael E. Zelinski, Tarek M. Taha, Jonathan Howe, Abdul A. Awwal, Khan M. Iftekharruddin, Proceedings of SPIE Vol. 11511 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

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

ISBN: 9781510638280  
ISBN: 9781510638297 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445  
SPIE.org

Copyright © 2020, Society of Photo-Optical Instrumentation Engineers.

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 copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online 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. The CCC fee code is 0277-786X/20/\$21.00.

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:** *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article 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

---

**SESSION 1 AI-ENHANCED MICROSCOPY: JOINT SESSION WITH CONFERENCES 11469 AND 11511**

---

11511 03 **DeepFocus: a deep learning model for focusing microscope systems** [11511-2]

---

**SESSION 3 COMPUTER VISION**

---

11511 06 **Video captioning using weakly supervised convolutional neural networks** [11511-5]

11511 07 **DeepDenoise: a deep learning model for noise reduction in low SNR imaging conditions** [11511-6]

11511 08 **Object detection in conditional GAN transferred sensor images** [11511-7]

---

**SESSION 4 MEDICAL IMAGING AND HEALTHCARE I**

---

11511 0A **Interpretation of deep learning using attributions: application to ophthalmic diagnosis** [11511-9]

11511 0C **PColorSeg\_Net: investigating the impact of different color spaces for pathological image segmentation** [11511-11]

11511 0D **Gastric polyps detection based on endoscopic video using modified dense micro-block difference descriptor** [11511-12]

11511 0E **Learning latent expression labels of child facial expression images through data-limited domain adaptation and transfer learning** [11511-13]

11511 0F **Fast and accurate Magnetic Resonance Image (MRI) reconstruction with NABLA-N network** [11511-14]

11511 0H **Automated corneal endothelium image segmentation in the presence of cornea guttata via convolutional neural networks** [11511-16]

---

**SESSION 5 MEDICAL IMAGING AND HEALTHCARE II**

---

11511 0I **Can we make a more efficient U-Net for blood vessel segmentation?** [11511-17]

11511 0J **Electrocorticographic signals classification for brain computer interfaces using stacked-autoencoders** [11511-18]

---

**SESSION 6      SCIENTIFIC, INDUSTRIAL, AND COMMERCIAL APPLICATIONS**

---

- 11511 OK      **Visualization transforms of non-spatial data for convolutional neural networks** [11511-19]
- 11511 OL      **On learning particle distributions in the 1D implicit Monte Carlo simulations of radiation transport** [11511-20]
- 11511 OM      **Spatial optical mode decomposition using deep learning** [11511-22]
- 11511 ON      **Robust neural network for wavefront reconstruction using Zernike coefficients** [11511-23]
- 11511 OO      **Automatic detection of defects in high reliability as-built parts using x-ray CT** [11511-24]
- 11511 OP      **Automated material identification and segmentation using deep learning for laser powder bed fusion** [11511-25]

---

**SESSION 7      REMOTE SENSING**

---

- 11511 OS      **Machine learning for forward and inverse scattering in synthetic aperture radar** [11511-28]
- 11511 OT      **Physics-based simulated SAR imagery generation of vehicles for deep learning applications** [11511-29]
- 11511 OU      **Transfer learning from simulated SAR imagery using multi-output convolutional neural networks** [11511-30]
- 11511 OV      **Advanced automated target recognition (ATR) and multi-target tracker (MTT) with electro-optical (EO) sensors** [11511-31]
- 11511 OW      **Super-resolution infrared spectroscopy for gas analysis using convolutional neural networks** [11511-32]

---

**POSTER SESSION**

---

- 11511 OZ      **Automatic classification of retinal OCT images based on convolutional neural network** [11511-34]
- 11511 11      **Fovea localization neural network for multimodal retinal imaging** [11511-36]
- 11511 12      **Application of deep learning model (DeepCOVID-19) for detecting COVID-19 cases using chest x-ray images** [11511-37]
- 11511 13      **A strategy for training 3D object recognition models with limited training data using transfer learning** [11511-38]