PROCEEDINGS OF SPIE

Applications of Machine Learning 2022

Michael E. Zelinski Tarek M. Taha Jonathan Howe Editors

23–24 August 2022 San Diego, California, United States

Sponsored and Published by SPIE

Volume 12227

Proceedings of SPIE 0277-786X, V. 12227

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 2022*, edited by Michael E. Zelinski, Tarek M. Taha, Jonathan Howe, Proc. of SPIE 12227, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510654389 ISBN: 9781510654396 (electronic)

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

REMOTE SENSING

12227 03	Synthetic aperture radar inverse scattering reconstruction using convolutional neural networks [12227-3]
12227 04	Refining polarimetric classification methods for deriving sea ice labels from synthetic aperture radar data [12227-4]
	INDUSTRY
12227 05	Automated melt pool characterization for defect detection in additive manufacturing [12227-5]
12227 06	SAFE: a deep-learning-based software for catch-control of small-scale fishing boats in Chile [12227-7]
12227 07	Unsupervised domain adaptation using feature aligned maximum classifier discrepancy [12227-37]
	OPTICS I
12227 08	OPTICS I Machine learning of transient structural-thermal-optical-performance (STOP) models [12227-8]
12227 08 12227 09	
	Machine learning of transient structural-thermal-optical-performance (STOP) models [12227-8]
12227 09	Machine learning of transient structural-thermal-optical-performance (STOP) models [12227-8] Reinforcement learning for guiding optimization processes in optical design [12227-9] A beta-variational autoencoder (beta-VAE) to retrieve relevant degrees of freedom in a

	OPTICS II
12227 0D	Deep learning neural network solution for predicting the refractive index structure constant [12227-13]
12227 OE	Impact of optical aberrations on image classification with deep neural networks [12227-14]
12227 0G	CNN-based binary classification of 3D optical microscopic images [12227-16]
	PHYSICS
12227 OH	Fast emulation of density functional theory simulations using approximate Gaussian processe [12227-21]
12227 OJ	A hierarchical sparse Gaussian process for in situ inference in expensive physics simulations [12227-23]
12227 OK	Automation of submicron resolution x-ray spectroscopy measurements and analysis using supervised and unsupervised machine learning algorithms [12227-24]
12227 OL	Naïve data mining and machine learning for high resolution, sparse x-ray spectra [12227-25]
12227 OL	Naïve data mining and machine learning for high resolution, sparse x-ray spectra [12227-25] MEDICAL IMAGING AND BIOLOGY
12227 OL 12227 ON	
	MEDICAL IMAGING AND BIOLOGY Assessment of unsupervised clustering of label-free x-ray fluorescence microscopy data
12227 ON	MEDICAL IMAGING AND BIOLOGY Assessment of unsupervised clustering of label-free x-ray fluorescence microscopy data [12227-17]
12227 ON 12227 OO	MEDICAL IMAGING AND BIOLOGY Assessment of unsupervised clustering of label-free x-ray fluorescence microscopy data [12227-17] Early detection of Alzheimer's via machine learning with multi-modal data [12227-33] Facial landmark feature fusion in transfer learning of child facial expressions [12227-34]
12227 ON 12227 OO 12227 OP	MEDICAL IMAGING AND BIOLOGY Assessment of unsupervised clustering of label-free x-ray fluorescence microscopy data [12227-17] Early detection of Alzheimer's via machine learning with multi-modal data [12227-33]
12227 ON 12227 OO 12227 OP	MEDICAL IMAGING AND BIOLOGY Assessment of unsupervised clustering of label-free x-ray fluorescence microscopy data [12227-17] Early detection of Alzheimer's via machine learning with multi-modal data [12227-33] Facial landmark feature fusion in transfer learning of child facial expressions [12227-34] An empirical study of digital signal filtering to improve Alzheimer's disease detection [12227-34]

- 12227 0T Image classification and training with severe data loss [12227-29]
- 12227 0U Optimization of image recognition for the identification of psoriasis and eczema [12227-32]
- 12227 0V Quantum machine learning prediction model for retinal conditions: performance analysis [12227-19]