

PROCEEDINGS OF SPIE

# ***Big Data IV: Learning, Analytics, and Applications***

**Fauzia Ahmad**  
**Panos P. Markopoulos**  
**Bing Ouyang**  
*Editors*

**3–7 April 2022**  
**Orlando, Florida, United States**

**6–12 June 2022**  
**ONLINE**

*Sponsored and Published by*  
SPIE

**Volume**  
**12097**

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 *Big Data IV: Learning, Analytics, and Applications*, edited by Fauzia Ahmad, Panos P. Markopoulos, Bing Ouyang, Proc. of SPIE 12097, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510650701

ISBN: 9781510650718 (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](http://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](http://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*

---

## MACHINE LEARNING METHODS

---

- 12097 02 **An expansion on prioritized experience replay with round robin scheduling [12097-1]**
- 12097 03 **Leveraging tensor methods in neural architecture search for the automatic development of lightweight convolutional neural networks [12097-2]**
- 12097 04 **Efficient utilization of big data using distributed storage, parallel processing, and blockchain technology [12097-3]**
- 12097 05 **Novel neural network architecture for energy prediction [12097-5]**

---

## DATA ANALYSIS AND MACHINE LEARNING FOR WIRELESS COMMUNICATIONS AND NETWORKING I

---

- 12097 06 **On the source-to-target gap of robust double deep Q-learning in digital twin-enabled wireless networks [12097-7]**
- 12097 07 **RF signal transformation and classification using deep neural networks [12097-9]**

---

## DATA ANALYSIS AND MACHINE LEARNING FOR WIRELESS COMMUNICATIONS AND NETWORKING II

---

- 12097 08 **Deep neural network goes lighter: a case study of deep compression techniques on automatic RF modulation recognition for beyond 5G networks [12097-10]**
- 12097 09 **Learning secure modulation using complex neural networks [12097-11]**
- 12097 0A **Distributed transmission control for wireless networks using multi-agent reinforcement learning [12097-12]**
- 12097 0B **Time-series analysis with small and faulty data: L1-norm decompositions of Hankel matrices [12097-13]**
- 12097 0C **A holistic machine learning approach to identify performance anomalies in enterprise WiFi deployments [12097-14]**

---

#### MACHINE LEARNING IN IMAGE AND VIDEO PROCESSING I

---

- 12097 0D     **An optimized volumetric approach to unsupervised image registration** [12097-15]
- 12097 0E     **A generative adversarial network for video compression** [12097-16]
- 12097 0F     **Convolutional denoising of underwater laser line scan images via transfer learning** [12097-17]
- 12097 0G     **Memory-efficient single-image super-resolution** [12097-18]

---

#### MACHINE LEARNING IN IMAGE AND VIDEO PROCESSING II

---

- 12097 0H     **Novel  $L_1$  PCA informed K-means color quantization** [12097-20]
- 12097 0I     **Stride forward from compressed sensing** [12097-23]

---

#### BIG DATA, SENSING, AND THE INTERNET-OF-THINGS

---

- 12097 0J     **Pseudorandom encoded-light for evaluating biomass (PEEB): a robust COTS macroalgal biomass sensor for the integrated multi-trophic aquaculture (IMTA) system** [12097-25]
- 12097 0K     **Path planning algorithms for robotic aquaculture monitoring** [12097-26]
- 12097 0L     **3D battlespace visualization and defense applications on commercial and use-case-dedicated light field displays** [12097-27]
- 12097 0M     **Towards reconstructing HDR light fields by combining 2D and 3D CNN architectures** [12097-28]

---

#### MACHINE LEARNING FOR HEALTHCARE, MEDICINE, AND SOCIAL GOOD I

---

- 12097 0N     **Multi antenna radar system for American Sign Language (ASL) recognition using deep learning** [12097-29]
- 12097 0O     **Building superior heartbeat classification datasets** [12097-31]

MACHINE LEARNING FOR HEALTHCARE, MEDICINE, AND SOCIAL GOOD II

---

- 12097 0P **Through a different lens: the perceived quality of light field visualization assessed by test participants with imperfect visual acuity and color blindness [12097-33]**
- 12097 0Q **Multi-class cell line classification using digital holographic microscopy and machine learning [12097-35]**