PROCEEDINGS OF SPIE

Automatic Target Recognition XXXI

Riad I. Hammoud Timothy L. Overman Abhijit Mahalanobis Editors

12–16 April 2021 Online Only, United States

Sponsored by SPIE

Published by SPIE

Volume 11729

Proceedings of SPIE 0277-786X, V. 11729

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 Automatic Target Recognition XXXI, edited by Riad I. Hammoud, Timothy L. Overman, Abhijit Mahalanobis, Proceedings of SPIE Vol. 11729 (SPIE, Bellingham, WA, 2021) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510642959

ISBN: 9781510642966 (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 © 2021, 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/21/\$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.



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

	KEYNOTE SESSION
11729 02	Intelligent photogrammetry for digital elevation model production (Keynote Paper) [11729-31]
SESSION 1	DEEP LEARNING FOR ATR I
11729 04	XATR with occlusion and super-resolution (Invited Paper) [11729-2]
11729 06	Optimizing deep learning classifier performance for low to medium resolution overhead imagery [11729-4]
SESSION 2	DEEP LEARNING FOR ATR II
11729 07	Improved ATR performance using boosting and transfer learning for adaptation of a target detection network [11729-5]
11729 09	Exploring characteristics of neural network architecture computation for enabling SAR ATR [11729-7]
SESSION 3	MACHINE LEARNING THEORY AND ANALYSIS I
11729 OB	t-SNE or not t-SNE, that is the question [11729-9]
11729 OC	Domain adaptation by topology regularization [11729-10]
11729 OD	Binary ensemble machine learning for confident decisions [11729-11]
11729 OE	Semi-supervised semantic segmentation via image-to-image translation [11729-12]
SESSION 4	MACHINE LEARNING THEORY AND ANALYSIS II
11729 OF	Comparison of distance metric learning methods against label noise for fine-grained recognition [11729-13]
11729 OG	Exploitation of data augmentation strategies for improved UAV detection [11729-14]

11729 OH	Human action recognition with 3D local binary patterns and dense micro-block difference description [11729-15]
11729 01	Augmentation methods for object detection in overhead infrared imagery [11729-16]
SESSION 5	AERIAL AND SPACE BASED APPLICATIONS
11729 OJ	Closely spaced object segmentation using a hybrid deep learning approach (Invited Paper) [11729-3]
11729 OK	A bare-earth extraction algorithm based on graph cut segmentation for electro-optically derived point clouds [11729-17]
11729 OL	Building height estimation via satellite metadata and shadow instance detection [11729-18]
11729 OM	Oil spill detection using sentinel 1 SAR data at Cyprus's coasts [11729-19]
11729 ON	Deep learning-based object level change detection in overhead imagery [11729-20]
11729 00	Deep learning based person search in aerial imagery [11729-21]
SESSION 6	SENSORS AND SYSTEMS ANALYSIS I
SESSION 6 11729 0Q	SENSORS AND SYSTEMS ANALYSIS I Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23]
	Validating the quality of millimeter-wave images input to deep-learning-based threat
11729 0Q	Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23]
11729 OQ 11729 OR	Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23] Synthetic AI training data generation enabling airfield damage assessment [11729-24]
11729 OQ 11729 OR	Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23] Synthetic AI training data generation enabling airfield damage assessment [11729-24]
11729 OQ 11729 OR 11729 OS	Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23] Synthetic Al training data generation enabling airfield damage assessment [11729-24] Effects of image degradation on algorithm training and performance [11729-25]
11729 OQ 11729 OR 11729 OS SESSION 7	Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23] Synthetic AI training data generation enabling airfield damage assessment [11729-24] Effects of image degradation on algorithm training and performance [11729-25] SENSORS AND SYSTEMS ANALYSIS II
11729 OQ 11729 OR 11729 OS SESSION 7	Validating the quality of millimeter-wave images input to deep-learning-based threat detection systems [11729-23] Synthetic AI training data generation enabling airfield damage assessment [11729-24] Effects of image degradation on algorithm training and performance [11729-25] SENSORS AND SYSTEMS ANALYSIS II Radar target classification using fusion of compressively sensed backscatter [11729-26]