

PROCEEDINGS OF SPIE

Image and Signal Processing for Remote Sensing XXVI

**Lorenzo Bruzzone
Francesca Bovolo
Emanuele Santi**
Editors

**21–25 September 2020
Online Only, United Kingdom**

Sponsored by
SPIE

Cooperating Organisations
European Optical Society
KTN—Knowledge Transfer Network (United Kingdom)
Technology Scotland (United Kingdom)
Visit Scotland (United Kingdom)
BARSC—British Association of Remote Sensing (United Kingdom)
EARSeL—European Association of Remote Sensing Laboratories (Germany)
ISPRS—International Society for Photogrammetry and Remote Sensing

Published by
SPIE

Volume 11533

Proceedings of SPIE 0277-786X, V. 11533

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

Image and Signal Processing for Remote Sensing XXVI, edited by Lorenzo Bruzzone, Francesca Bovolo
Emanuele Santi, Proc. of SPIE Vol. 11533, 1153301 · © 2020 SPIE
CCC code: 0277-786X/20/\$21 · doi: 10.1117/12.2584540

Proc. of SPIE Vol. 11533 1153301-1

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 SPIDigitalLibrary.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 *Image and Signal Processing for Remote Sensing XXVI*, edited by Lorenzo Bruzzone, Francesca Bovolo, Emanuele Santi, Proceedings of SPIE Vol. 11533 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

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

ISBN: 9781510638792
ISBN: 9781510638808 (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**

SPIDigitalLibrary.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

ATMOSPHERIC CORRECTIONS, CALIBRATION, AND IMAGE ENHANCEMENT

- 11533 03 **Comparison of learning-based and maximum likelihood estimators of image noise variance for real-life and synthetic anisotropic textures** [11533-1]
- 11533 04 **Next updates of atmospheric correction processor Sen2Cor** [11533-2]
- 11533 06 **Efficient destriping of remote sensing images using an oriented super-Gaussian filter** [11533-4]

CHANGE DETECTION AND MULTITEMPORAL ANALYSIS I

- 11533 08 **Exploring BFAST to detect forest changes in Portugal** [11533-6]
- 11533 09 **A land cover-driven approach for fitting satellite image time series in a change detection context** [11533-7]
- 11533 0A **Automatic extraction and change monitoring of fire disaster event based on high-resolution nighttime light remote sensing images** [11533-8]
- 11533 0B **Infrastructure monitoring using SAR and multispectral multitemporal images** [11533-9]

CHANGE DETECTION AND MULTITEMPORAL ANALYSIS II

- 11533 0D **Unsupervised change detection using hierarchical convolutional autoencoder** [11533-11]
- 11533 0E **Exploring the MSER-based hyperspectral remote sensing image registration** [11533-12]
- 11533 0G **Change detection in UWB VHF SAR images exploiting flight heading diversity through robust principal component analysis** [11533-14]

DEEP LEARNING FOR THE ANALYSIS OF MULTISPECTRAL IMAGES

- 11533 0I **An approach to improve detection in scenes with varying object densities in remote sensing** [11533-16]
- 11533 0J **Detection of oil wells based on faster R-CNN in optical satellite remote sensing images** [11533-17]

- 11533 OK **Monitoring of agricultural areas by using Sentinel 2 image time series and deep learning techniques** [11533-18]
- 11533 OL **GAN generation of synthetic multispectral satellite images** [11533-19]
- 11533 OM **Fire segmentation using a DeepLabv3+ architecture** [11533-20]

DEEP LEARNING FOR THE ANALYSIS OF MULTI-/HYPER SPECTRAL IMAGES

- 11533 ON **A novel deep learning data structure for multispectral remote sensing images** [11533-21]
- 11533 OP **Object recognition for UAV navigation in complex environment** [11533-23]
- 11533 OQ **Spatial-aware probabilistic collaborative representation for hyperspectral image classification** [11533-25]

DEEP LEARNING FOR THE ANALYSIS OF HYPER SPECTRAL IMAGES

- 11533 OR **Minimal learning machine in hyperspectral imaging classification** [11533-26]
- 11533 OS **Unsupervised hyperspectral classification based on similarity graphs** [11533-27]
- 11533 OU **Adversarially regularized autoencoder for hyperspectral image unmixing** [11533-29]
- 11533 OV **CNN-based augmentation strategy for spectral unmixing datasets considering spectral variability** [11533-30]

DEEP LEARNING FOR THE ANALYSIS OF SAR, LIDAR, AND MULTISENSOR DATA

- 11533 10 **Virtual LiDAR: self-driving scenes classification** [11533-35]

COMPRESSION, SUPER-RESOLUTION, AND REGRESSION

- 11533 11 **An approach to near-lossless hyperspectral data compression using deep autoencoder** [11533-36]
- 11533 12 **Selective encryption in the CCSDS standard for lossless and near-lossless multispectral and hyperspectral image compression** [11533-37]
- 11533 13 **Atomic wavelets in lossy and near-lossless image compression** [11533-38]

- 11533 14 **Single infrared remote sensing image super-resolution via supervised deep learning** [11533-39]
- 11533 15 **A comparison on the use of different satellite multispectral data for the prediction of aboveground biomass** [11533-40]

MICROWAVE REMOTE SENSING: DATA PROCESSING AND APPLICATIONS

- 11533 18 **Oil, water, and ice detection on road surfaces with a millimeter-wave radiometer** [11533-43]
- 11533 19 **Studying the slope deformations in a Bulgarian mountain by multitemporal DInSAR data processing** [11533-44]

POSTER SESSION

- 11533 1D **Remote sensing image and video fusion method based on digital twin** [11533-48]
- 11533 1F **Study of the hidden ancient anthropogenic landscapes using digital models of microtopography** [11533-50]
- 11533 1G **Semantic stereo using semi-global matching and convolutional neural networks** [11533-51]
- 11533 1J **Super-resolution of satellite imagery using a wavelet multiscale-based deep convolutional neural network model** [11533-54]
- 11533 1K **Analysis of the underlying surface of waste disposal facilities using remote sensing technologies** [11533-55]
- 11533 1L **Research and analysis of methods for generating and processing new code structures for the problems of detection, synchronization, and noise-resistant coding** [11533-56]
- 11533 1M **Evaluation of radar contrasts in film slicks at high winds** [11533-57]
- 11533 1O **A study of the robustness of the long short-term memory classifier to cloudy time series of multispectral images** [11533-59]
- 11533 1Q **Vehicle target detection in SAR image based on complex data statistics and superpixel characteristics** [11533-61]
- 11533 1R **Integrating GEOBIA and multisource remote sensing images to lithological mapping: case study of Skhour Rehamna, Morocco** [11533-62]
- 11533 1S **Determination of the degree of soil pollution by heavy metals by electromagnetic response in microwave range** [11533-64]

11533 1U **Comparison between two radiometric calibration methods applied to UAV multispectral images [11533-66]**