

PROCEEDINGS OF SPIE

# ***The Thirteenth International Conference on Digital Image Processing (ICDIP 2021)***

**Xudong Jiang  
Hiroshi Fujita**  
*Editors*

**20-23 May, 2021  
Singapore, Singapore**

*Sponsored by*  
International Association of Computer Science & Information Technology (Singapore)

*Technical Support by*  
Gifu University (Japan)  
Univ. of Poitiers (France)  
Univ. of New Hampshire (United States)

*Published by*  
SPIE

**Volume 11878**

Proceedings of SPIE 0277-786X, V. 11878

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

Thirteenth International Conference on Digital Image Processing (ICDIP 2021), edited by Xudong Jiang, Hiroshi Fujita  
Proc. of SPIE Vol. 11878, 1187801 · © 2021 SPIE · CCC code: 0277-786X/21/\$21 · doi: 10.1117/12.2603859

Proc. of SPIE Vol. 11878 1187801-1

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](http://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 *Thirteenth International Conference on Digital Image Processing (ICDIP 2021)*, edited by Xudong Jiang, Hiroshi Fujita, Proc. of SPIE 11878, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510646001  
ISBN: 9781510646018 (electronic)

Published by  
**SPIE**  
P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time)  
[SPIE.org](http://SPIE.org)  
Copyright © 2021 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**  
[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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

---

## PATTERN RECOGNITION

---

- 11878 02 **ReSPeCT: privacy respecting thermal-based specific person recognition** [11878-3]
- 11878 03 **Efficient sign language recognition system and dataset creation method based on deep learning and image processing** [11878-56]
- 11878 04 **A hybrid CNN-LSTM network for hand gesture recognition with surface EMG signals** [11878-74]
- 11878 05 **A preliminary study on attitude recognition from speaker's orofacial motions using random forest classifier** [11878-6]
- 11878 06 **Data augmentation for ancient characters via Blend-Font Net** [11878-10]
- 11878 07 **Person recognition across multi-session and multi-exemplar images using ensemble of classifiers** [11878-47]
- 11878 08 **A generic approach for automatic crack recognition in buildings glass facade and concrete structures** [11878-70]

---

## FEATURE ANALYSIS AND EXTRACTION

---

- 11878 09 **Improving reliability of Manipuri offline signature verification using writer independent paradigms** [11878-21]
- 11878 0A **Deep facial features for personalized attractiveness prediction** [11878-28]
- 11878 0B **Bidirectional LSTM approach to image captioning with scene features** [11878-39]
- 11878 0C **Ceramic image retrieval method based on HSH-SIFT fusion features** [11878-76]
- 11878 0D **Video captioning based on multi-feature fusion with object awareness** [11878-80]

---

## TARGET DETECTION AND TRACKING

---

- 11878 0E **Object detection using improved YOLOv3-tiny based on pyramid pooling** [11878-8]
- 11878 0F **Pulmonary nodule detection using improved faster R-CNN and 3D Resnet** [11878-35]

- 11878 OG **Improvement on detection performance for the angle of steady arm based on triggered image acquisition and deep learning** [11878-49]
- 11878 OH **Object detection approaches in images: a survey** [11878-85]
- 11878 OI **Multi object tracking: a survey** [11878-96]
- 11878 OJ **A survey on face forgery detection of Deepfake** [11878-46]
- 11878 OK **XSepConv: extremely separated convolution for efficient deep networks with large kernels** [11878-64]
- 11878 OL **Automatic detection and counting of small yellow thrips on lotus leaf back based on YOLO combined with VDSR and DPSR network** [11878-86]

---

#### IMAGE SEGMENTATION

---

- 11878 OM **Experiments with loss function for improvement of multi-class segmentation of diabetic retinopathy lesions** [11878-17]
- 11878 ON **LightSeg: a light-weight network for real-time semantic segmentation** [11878-58]
- 11878 OO **Class-related graph convolution for weakly supervised semantic segmentation** [11878-59]
- 11878 OP **SAR image segmentation based on different gradients with nonlocal mean filter** [11878-91]
- 11878 OQ **Spatial information using CRF for brain tumor segmentation** [11878-29]
- 11878 OR **Semantic feature refine module for nucleus segmentation using Mask R-CNN** [11878-41]
- 11878 OS **A road segmentation method based on reorganized LiDAR points and line scanning** [11878-72]

---

#### IMAGE CLASSIFICATION AND ALGORITHMS

---

- 11878 OT **Texture classification using improved ResNet based on multi-scale attention mechanism** [11878-57]
- 11878 OU **Label hierarchy constraint network for fine-grained classification** [11878-22]
- 11878 OV **Comparison of MLP and RBF neural models on the example graphical classification** [11878-40]
- 11878 OW **Task-relevant graph to propagate labels for few-shot classification** [11878-42]

- 11878 0X     **Angular joint loss for image classification** [11878-54]
- 11878 0Y     **Fully automatic CNN design with inception blocks** [11878-81]

---

#### IMAGE DENOISING AND DIGITAL WATERMARKING

---

- 11878 0Z     **Convolutional neural network combined with wavelet denoising for multi-category analysis on heart sound** [11878-14]
- 11878 10     **A tampering detection algorithm based on multi-scrambling coding** [11878-27]
- 11878 11     **An improved generative adversarial network for remote sensing image denoising** [11878-30]
- 11878 12     **An efficient image tamper detection and self-recovery scheme using rehashing model based digital watermarking** [11878-51]
- 11878 13     **Image denoising based on edge enhancement and convolutional neural network** [11878-31]
- 11878 14     **Robust image watermarking against JPEG recompression for websites** [11878-44]

---

#### IMAGE RECONSTRUCTION AND IMAGING TECHNOLOGY

---

- 11878 15     **A robust and accurate structured light pattern for dynamic 3D reconstruction** [11878-26]
- 11878 16     **CoviNet: Covid-19 diagnosis using machine learning analyses for computerized tomography images** [11878-71]
- 11878 17     **Beam hardening artifact removal by the fusion of FBP and deep neural networks** [11878-73]
- 11878 18     **Development of dual camera system for technical photography** [11878-75]
- 11878 19     **Self-supervised 3D face reconstruction based on multi-view UV fusion** [11878-84]

---

#### SUPER RESOLUTION IMAGE AND INFRARED IMAGING

---

- 11878 1A     **Image super resolution algorithm based on multi-directional features** [11878-4]
- 11878 1B     **Tropical cyclone intensity estimation using infrared images via support vector regression** [11878-15]
- 11878 1C     **Curvelet-based image super-resolution via Res2Net multi-scale network** [11878-25]

- 11878 1D **Multi-scale super-resolution reconstruction of a single image** [11878-38]
- 11878 1E **Medoid-shift based separation of occluded persons in thermal infrared images** [11878-48]
- 11878 1F **Research on retrieval of chlorophyll-a concentration in Danjiangkou-Fancheng reach of Han River based on Sentinel-2 satellite data** [11878-61]
- 11878 1G **A dual-scale convolutional neural network for super-resolution** [11878-5]
- 11878 1H **An improved fusion method of infrared and visible images based on FusionGAN** [11878-20]

---

#### COMPUTER VISION AND VISUALIZATION

---

- 11878 1I **Cross-layer channel attention mechanism for convolutional neural networks** [11878-11]
- 11878 1J **Hand disambiguation using attention neural networks in the egocentric perspective** [11878-24]
- 11878 1K **Recursively adaptive perceptual non-local means for video coding** [11878-88]
- 11878 1L **Comparison of methods of obtaining visual data in the shape of obstacles in wastelands and forest areas for the purpose of automatic control of the stability of self-propelled machines** [11878-94]
- 11878 1M **Facial expression video synthesis from the StyleGAN latent space** [11878-7]
- 11878 1N **Multi-view stereo using cross-view depth map completion and row-column depth refinement** [11878-82]
- 11878 1O **Robotic grasping method based on 3D vision for stacked rectangular objects** [11878-83]
- 11878 1P **Deep neural network joint multi-scale attention for remote sensing image colorization** [11878-33]

---

#### DIGITAL IMAGE PROCESSING AND METHODS

---

- 11878 1Q **A combined informative and representative active learning approach for plankton taxa labeling** [11878-78]
- 11878 1R **Neural networks in classification of dried vegetables** [11878-92]
- 11878 1S **Makeup removal for face verification based upon contrastive learning** [11878-18]
- 11878 1T **Review on applications of quantum image processing** [11878-60]

- 11878 1U **A non-contacted measurement method for the aggregate gradation** [11878-77]
- 11878 1V **Research on fusion method of SAR and RGB image based on wavelet transform** [11878-90]
- 11878 1W **Nutritional properties and quality assessment of breaded deep-frozen pollock fish cutlets using neural image analysis** [11878-95]

---

#### IMAGE PROCESSING AND APPLICATION

---

- 11878 1X **Novel air quality measure method based on image blur metric** [11878-69]
- 11878 1Y **Classification-based self-supervised learning for anomaly detection** [11878-9]
- 11878 1Z **Bi-window based stereo matching using combined Siamese convolutional neural network** [11878-19]
- 11878 20 **Morph targets for 3D facial animation with webcam using Facemesh, Jeeliz-transfer APIs, and Three.js** [11878-45]
- 11878 21 **Development of bulk peanuts maturity predictive model using hyperspectral imaging system** [11878-62]
- 11878 22 **Pain detection from facial landmarks using spatial-temporal deep neural network** [11878-68]
- 11878 23 **Reference selection for offline writer-dependent signature verification using a Siamese convolutional neural network** [11878-89]
- 11878 24 **An MLP artificial neural network for detection of the degree of saccharification of Arabic gum used as a carrier agent of raspberry powders** [11878-93]

---

#### MODERN INFORMATION TECHNOLOGY AND APPLICATION

---

- 11878 25 **Find it if you can: end-to-end adversarial erasing for weakly-supervised semantic segmentation** [11878-12]
- 11878 26 **A specific emitter identification method based on full bispectrum and deep residual shrinkage network** [11878-55]
- 11878 27 **Design of aquaculture monitoring system based on LoRa and 4G network of Internet of Things** [11878-63]
- 11878 28 **Rounding of improved DCT transform coding for H.266/VVC** [11878-65]
- 11878 29 **Signal-to-noise ratio enhancement in compact intensity-modulated FMCW laser range sensor using synchronized dual-laser sources** [11878-37]

- 11878 2A **Semantic attention-based network for inshore SAR ship detection** [11878-43]
- 11878 2B **Estimation of soil moisture with SAR data in large area based on support vector regression**  
[11878-50]
- 11878 2C **Optimization of reservoir operation scheme based on fuzzy optimization and convolutional neural network** [11878-67]