

PROCEEDINGS OF SPIE

# ***Thirteenth International Conference on Graphics and Image Processing (ICGIP 2021)***

**Liang Xiao**  
**Dan Xu**  
*Editors*

**18–20 August 2021**  
**Kunming, China**

*Hosted by*  
Yunnan University (China)

*Organized by*  
School of Information Science & Engineering, Yunnan University (China)

*Co-sponsored by*  
Foshan University (China)  
Chang'an University (China)  
Xi'an University of Technology (China)  
Northwest A&F University (China)  
Sichuan University (China)  
Ocean University of China (China)  
University of Portsmouth (China)  
China Society of Image and Graphics (China)  
China Graphics Society (China)

*Published by*  
SPIE

**Volume 12083**  
Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 12083

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 [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 Graphics and Image Processing (ICGIP 2021)*, edited by Liang Xiao, Dan Xu, Proc. of SPIE 12083, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510650428

ISBN: 9781510650435 (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 © 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**

[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

## Part One

---

### COMPUTER AND IMAGE PROCESSING

---

- 12083 02     **Development of fault tree analysis and calculation software based on VC** [12083-23]
- 12083 03     **Optimized firefly algorithm based on levy flight and Gaussian inertial weight** [12083-40]
- 12083 04     **Robust adaptive graph learning with manifold constraints for subspace clustering** [12083-51]
- 12083 05     **Application of XGBoost and traditional interpolation methods on wind fields in offshore areas of China** [12083-54]
- 12083 06     **Stacked multi-modal refining and fusion network for visual entailment** [12083-57]
- 12083 07     **Aggregating region context information for semantic segmentation** [12083-100]
- 12083 08     **Design of depression assessment and early warning system for college students based on machine learning and daily health data** [12083-131]
- 12083 09     **Learning class predication distributions with noisy labels** [12083-152]

---

### COMPUTER PHOTOGRAPHY AND OPTICAL IMAGING TECHNOLOGY

---

- 12083 0A     **The real-time measurement of the length of long line based on epipolar constraint** [12083-46]
- 12083 0B     **Robust speckle-autocorrelation non-line-of-sight imaging with generative adversarial networks** [12083-99]
- 12083 0C     **Learning structure-aware transformations for arbitrary image style transfer** [12083-108]
- 12083 0D     **Binary optical time measurement based on image processing** [12083-124]
- 12083 0E     **Hyperspectral pansharpening via deep detail injection network** [12083-139]
- 12083 0F     **Fast external calibration of camera based on point set matching** [12083-53]
- 12083 0G     **Hyperspectral image super-resolution via deep image gradient guided residual dense network** [12083-148]

---

## COMPUTER VISION AND VISUALIZATION

---

- 12083 OH **Joint learning of latent representation and global similarity for multi-view image clustering** [12083-20]
- 12083 OI **Human pose estimation based on manifold Gaussian process with depth images** [12083-14]
- 12083 OJ **Detail preserving depth prediction from a single image based on multi-scale deep network and gradient network** [12083-34]
- 12083 OK **Adaptive pixelwise inference multi-view stereo** [12083-77]
- 12083 OL **Visual knowledge mapping analysis of research of digital image processing** [12083-122]

---

## DIGITAL IMAGE PROCESSING AND APPLICATION

---

- 12083 OM **Unsupervised generative adversarial network for style transfer using multiple discriminators** [12083-36]
- 12083 ON **Siamese dual path aggregation network for object tracking** [12083-86]
- 12083 OO **A feature attention dehazing network based on U-net and dense connection** [12083-87]
- 12083 OP **Matrix completion via local density loss optimization** [12083-112]
- 12083 OQ **Implementation of star centroid extraction based on FPGA** [12083-130]
- 12083 OR **A real-time detection network for surface defects of mobile phone lens** [12083-138]

---

## FEATURE ENHANCEMENT AND FEATURE FUSION

---

- 12083 OS **Dual-station stepped-frequency continuous waves MIMO radar for through-wall life detection using image fusion** [12083-22]
- 12083 OT **Multi-scale features enhanced sentiment region discovery for visual sentiment analysis** [12083-47]
- 12083 OU **Long-term correlation filter tracking algorithm based on adaptive feature fusion** [12083-52]
- 12083 OV **A lightweight road defect detection method based on multi-scale hybrid feature fusion** [12083-104]

- 12083 OW **Siamese network tracker with channel attention mechanism** [12083-143]
- 12083 OX **Convolutional neural network based on feature enhancement and attention mechanism for Alzheimer's disease prediction using MRI images** [12083-145]
- 12083 OY **Multi-channel image fusion in ultraviolet dynamic detection on electric railways** [12083-74]

---

#### IMAGE ANALYSIS AND TRANSFORMATION

---

- 12083 OZ **An effective color correction method for underwater image** [12083-6]
- 12083 10 **Texture image retrieval based on statistical modeling of all subbands in the complex transform domain** [12083-30]
- 12083 11 **Sand-dust image enhancement based on color correction and haze removal** [12083-33]
- 12083 12 **Multi-channel image inpainting algorithm based on edge prediction** [12083-41]
- 12083 13 **Encoder-decoder network with self-attention module for image restoration** [12083-76]
- 12083 14 **Blind restoration of vertical motion blurred image based on point spread function estimation** [12083-102]
- 12083 15 **Uneven illumination image matching algorithm combined with single-parameter homomorphic filtering** [12083-115]
- 12083 16 **A multi-scale threshold spiking mechanism based on spike camera** [12083-120]
- 12083 17 **An adaptive median filtering denoising algorithm for pepper and salt noised image** [12083-123]

---

#### IMAGE CLASSIFICATION

---

- 12083 18 **Subspace representation based on pairwise linear regression for large scale image set classification** [12083-19]
- 12083 19 **Potato skin defect detection and classification through image processing** [12083-21]
- 12083 1A **Efficient 3D residual network on MRI data for neurodegenerative disease classification** [12083-42]
- 12083 1B **Fine-grained object classification based on block diagonal feature and ensemble learning** [12083-45]
- 12083 1C **HA-GCN: an ALS point cloud classification method based on height-aware graph convolution network** [12083-75]

12083 1D **Spatially bound categorical attention network for semantic segmentation** [12083-89]

## Part Two

---

### IMAGE RECONSTRUCTION AND POINT CLOUD DATA PROCESSING

---

12083 1E **Road extraction from 3D point clouds based on the difference of normal vector** [12083-24]

12083 1F **Scattered point cloud simplification algorithm based on FPFH and FPS** [12083-13]

12083 1G **3D mesh reconstruction of indoor scenes from a single image in-the-wild** [12083-93]

12083 1H **Deep learning radiomics model based on contrast-enhanced T1-weighted image multi-plane reconstruction for prediction of glioma grading** [12083-97]

12083 1I **3D reconstruction of cross-scale narrow space with thin structure** [12083-101]

12083 1J **A single image super-resolution reconstruction based on fusion** [12083-150]

12083 1K **1-point sample consensus on correspondence set for 3D point cloud registration** [12083-32]

12083 1L **Divide-and-conquer for holistic and expressive 3D human body reconstruction from a single RGB image** [12083-94]

---

### IMAGE SEGMENTATION AND CLASSIFICATION

---

12083 1M **Multiple GANs guided by self-attention mechanism for automatic cardiac image segmentation** [12083-15]

12083 1N **Research on parallel technology of sea and land segmentation based on deep learning** [12083-106]

12083 1O **DFM-Net: a contextual inference network for T2-weighted image segmentation of the pelvis** [12083-121]

12083 1P **Image segmentation application combining moving grid method and level set method** [12083-125]

12083 1Q **3D U-Net with trans-coder for brain tumor segmentation** [12083-133]

---

### IMAGE TRANSMISSION AND IMAGE SECURITY

---

12083 1R **SA-UNet for face anti-spoofing with depth estimation** [12083-9]

- 12083 1S **Efficient multi-step reasoning attention network for visual question answering** [12083-38]
- 12083 1T **An effective image encryption algorithm based on a novel chaotic map** [12083-63]
- 12083 1U **A graph convolutional neural network model for trajectory prediction** [12083-70]
- 12083 1V **Chaotic image encryption algorithm based on R-order Chebyshev composite map** [12083-83]
- 12083 1W **Layout-aware bidirectional transfer network for fashion landmark detection** [12083-105]
- 12083 1X **A remote sensing image processing method based on color restoration and enhancement** [12083-128]

---

#### INTELLIGENT RECOGNITION TECHNOLOGY AND APPLICATION

---

- 12083 1Y **Using multi-feature fusion and XGBoost to recognize the pedestrian with multiple angles in different videos** [12083-17]
- 12083 1Z **An overview of traffic sign detection and recognition algorithms** [12083-37]
- 12083 20 **A multi-scale deformable convolution network model for text recognition** [12083-56]
- 12083 21 **Learning multi-level representations for image emotion recognition in the deep convolutional network** [12083-91]
- 12083 22 **A no reference image quality assessment method based on RepVGG** [12083-110]
- 12083 23 **Replacing speaker-independent recognition task with speaker-dependent task for lip-reading using First Order Motion Model** [12083-154]
- 12083 24 **Video-based multimodal personality analysis** [12083-156]

---

#### MEDICAL IMAGING AND VIRTUAL TECHNOLOGY

---

- 12083 25 **Measurement of endometrial thickness using deep neural network with multi-task learning** [12083-3]
- 12083 26 **Noise reduction in dental CT images based on generative adversarial network** [12083-4]
- 12083 27 **A virtual experimental platform based on MR glasses guided by Kano's Theory** [12083-12]
- 12083 28 **Adaptive weighted PET/SPECT and MR medical image fusion based on nonsubsampling shearlet transform** [12083-111]

- 12083 29 **The application of virtual reality technology in the middle school research travel course: taking Suzhou Shantang Street as an example** [12083-79]
- 12083 2A **An automatic matching interactive and visualization system for virtual martial arts** [12083-82]
- 12083 2B **PANN: an efficient parallel neural network based on the attentional mechanism for predicting Alzheimer's disease** [12083-114]
- 12083 2C **Distributed management of virtual reality digital assets for online experimental education** [12083-147]

---

#### **PATTERN RECOGNITION**

---

- 12083 2D **A gesture recognition smart media interactive application** [12083-16]
- 12083 2E **Review of human action recognition based on improved deep learning methods** [12083-18]
- 12083 2F **Image recognition of sandstone slice based on a lightweight network** [12083-43]
- 12083 2G **Mini-TKAGCN: a lightweight graph convolutional network via temporal kernel attention for skeleton-based action recognition** [12083-132]
- 12083 2H **3DCNN-based mouth shape recognition for patient with intractable neurological diseases** [12083-155]
- 12083 2I **A review of action recognition methods based on skeleton data** [12083-31]
- 12083 2J **Summary of fine-grained image recognition based on attention mechanism** [12083-68]

---

#### **TARGET DETECTION AND METHOD**

---

- 12083 2K **A weakly supervised object detection method based on attention mechanism** [12083-7]
- 12083 2L **Research on detection methods of high beam in night driving vehicles** [12083-35]
- 12083 2M **An aggregation context network for detecting small ships in remote sensing images** [12083-61]
- 12083 2N **Small infrared maritime target detection based on gradient amplitude difference and multidimensional dissimilarity measure** [12083-64]
- 12083 2O **Small-scale pedestrian detection based on multi-level feature fusion** [12083-119]
- 12083 2P **Image edge detection based on Krisch operator and gray correlation analysis** [12083-149]



## VIDEO TECHNOLOGY AND IMAGE QUALITY EVALUATION

---

- 12083 2Q **A semantic simultaneous localization and mapping system based on DeeplabV3+** [12083-10]
- 12083 2R **A fourth derivative based tool for pulse signal special point identification** [12083-25]
- 12083 2S **Application of spatiotemporal convolution network for precipitation nowcasting** [12083-65]
- 12083 2T **Research on fast motion estimation in H264 coding** [12083-96]
- 12083 2U **An assessment and grading method of ultra-HD TVs based on subjective and objective evaluation** [12083-98]
- 12083 2V **Assessment of image sharpness evaluation methods and image sharpness changes in GF-4 satellite time-series data** [12083-127]