

PROCEEDINGS OF SPIE

International Conference on Image Processing and Artificial Intelligence (ICIPAI 2024)

**Chuan Qin
Huiyu Zhou**
Editors

**19–21 April 2024
Suzhou, China**

Organized by
University of Shanghai for Science and Technology (China)

Sponsored by
Ajeenkya DY Patil University (India)
AEIC—Academic Exchange Information Centre (China)

Published by
SPIE

Volume 13213
Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 13213

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.

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 *International Conference on Image Processing and Artificial Intelligence (ICIPAI 2024)*, edited by Chuan Qin, Huiyu Zhou, Proc. of SPIE 13213, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510681514

ISBN: 9781510681521 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2024 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. 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

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

xi *Conference Committee*

Part One

IMAGE PROCESSING AND KNOWLEDGE EXTRACTION AND ANALYSIS

- 13213 02 **A novel orthogonal spline moments and its application for image representation** [13213-136]
- 13213 03 **Optimization of color enhancement processing for flat images based on VR technology**
[13213-131]
- 13213 04 **Improved algorithm of TOF image fusion based on DTCWT** [13213-108]
- 13213 05 **Accurate retinal layer segmentation of optical coherence tomography images using dense
encoder and position attention** [13213-26]
- 13213 06 **Image generation method based on diversified feature learning attention mechanism**
[13213-84]
- 13213 07 **An image inpainting method based on the high-efficiency transformer** [13213-146]
- 13213 08 **End-to-end reference image-based coloring** [13213-165]
- 13213 09 **Decoupled multi-scale distillation for medical image segmentation** [13213-32]
- 13213 0A **Near-duplicate image fast detection based on annoy-SIFT algorithm** [13213-68]
- 13213 0B **Change detection based on optimized guided filtering in wide-field video image under low
illumination** [13213-5]
- 13213 0C **Local frequency analysis for diffusion-generated image detection** [13213-55]
- 13213 0D **An infrared thermal imaging method for abnormal temperature tracking and localization**
[13213-134]
- 13213 0E **A deep multi-layer image stitching framework for parallax scenes** [13213-122]
- 13213 0F **Video image change detection under a wide field of view in foggy weather** [13213-77]
- 13213 0G **Unsupervised wide field-of-view video image change detection** [13213-79]

- 13213 OH **An overview of traditional and deep-learning-based image segmentation methods** [13213-59]
- 13213 OI **A multi-feature image fusion method for rice weed segmentation** [13213-50]
- 13213 OJ **Large model-guided multimodal face image super-resolution** [13213-130]
- 13213 OK **Study of multilevel feature weighted fusion-based image classification method for silicon single crystal growth process** [13213-53]
- 13213 OL **Adaptive change detection in Hawk-Eye bi-temporal images** [13213-90]
- 13213 OM **Medical image segmentation technology based on the SC-UNet model** [13213-8]
- 13213 ON **A brain tumor MRI image classification method based on deep DenseNet network** [13213-14]
- 13213 OO **Optical remote sensing image caption research progress** [13213-163]
- 13213 OP **A lightweight unstructured device state image encryption and collection scheme** [13213-109]
- 13213 OQ **An image enhancement method of a SLFC-MSPCNN for Dunhuang Murals** [13213-38]
- 13213 OR **An image enhancement method of an AFC-MSPCNN for Dunhuang Murals** [13213-39]
- 13213 OS **Dim-light image processing strategy rooted in improved dual-branch generative adversarial network** [13213-11]
- 13213 OT **Medical image segmentation application based on OFC-MSPCNN** [13213-33]
- 13213 OU **Medical image processing applications based on PCFC-MSPCNN** [13213-22]
- 13213 OV **A medical image segmentation method based on SGFC-MSPCNN** [13213-28]
- 13213 OW **A medical image segmentation approach based on ULFC-MSPCNN** [13213-40]
- 13213 OX **Dual-encoder-based image-text fusion algorithm** [13213-52]
- 13213 OY **Research on image transmission technology in engineering site without public network based on BDS-3 short message channel** [13213-111]
- 13213 OZ **Research on GAN-based MII-Net spine x-ray image restoration model in medical images** [13213-150]
- 13213 IO **A medical image segmentation method for GFC-MSPCNN** [13213-37]
- 13213 II **CPKD: channel-wise and pixel-wise relational knowledge distillation for medical image segmentation** [13213-76]

- 13213 12 **Class-wise restructured knowledge distillation for medical image segmentation** [13213-89]
- 13213 13 **Single-image depth estimation based on multi-scale feature fusion** [13213-100]

DIGITAL SIGNAL PROCESSING AND PATTERN RECOGNITION

- 13213 14 **Blockchain illegal gambling identification based on community detection and network embedding** [13213-143]
- 13213 15 **Sdn load balancing scheme based on double population fruit fly optimization algorithm** [13213-87]
- 13213 16 **Time synchronization algorithm for high-dynamic environments** [13213-81]
- 13213 17 **Research on case classification algorithm based on BERT-CNN** [13213-74]
- 13213 18 **Research on improvement of fuzzy K-modes clustering algorithm for categorical data** [13213-17]
- 13213 19 **Digital twin model for load characteristics of photovoltaic transformer based on Hopfield-Lagrange algorithm** [13213-151]
- 13213 1A **Research on annual disaster probability risk assessment based on historical disaster big data** [13213-61]
- 13213 1B **Multi-dimensional user appeal topic identification method based on semantic analysis and PageRank algorithm** [13213-141]
- 13213 1C **Research on the construction method of fault association knowledge graph for power grid operation based on multivariate heterogeneous data fusion** [13213-69]
- 13213 1D **A text mining based fault diagnosis model for aircraft** [13213-2]
- 13213 1E **A method of long-tailed visual recognition via dynamic adjusting logit** [13213-99]
- 13213 1F **Research on multi-label classification method for terrorist news texts** [13213-73]
- 13213 1G **Indoor point cloud segmentation algorithm based on improved RepSurf** [13213-20]
- 13213 1H **Indoor laser point cloud registration method with enhanced geometric features of neighborhood point pairs** [13213-12]
- 13213 1I **Application of big data optimal selection algorithm in project bidding scheme selection** [13213-129]
- 13213 1J **DDCBlock: parallel lightweight modules that focus more on long-distance information** [13213-98]

- 13213 1K **Enhanced histogram of oriented lines for palmprint recognition** [13213-117]
- 13213 1L **Two-wheeler rider re-identification that combines attention mechanism and local feature fusion** [13213-128]
- 13213 1M **Classification of apple leaf diseases based on MobileViT transfer learning** [13213-64]
- 13213 1N **Learning multilevel representations for knowledge graph embedding using graph neural networks** [13213-3]
- 13213 1O **An adaptive fusion of RGB channel features U-Net for retinal vessel segmentation** [13213-101]
- 13213 1P **Transformer based fine-grained recognition algorithm via part selecting** [13213-126]
- 13213 1Q **Reverse self-knowledge distillation for skin lesion image classification** [13213-96]
- 13213 1R **On the licence plate recognition algorithm based on image correction and improvement SE-LPRNet** [13213-63]
- 13213 1S **Tor encrypted traffic recognition and classification technology based on flow information graph and deep learning** [13213-83]
- 13213 1T **Water body recognition method based on improved encoder-decoder structure** [13213-110]
- 13213 1U **Research and development of image homology identification technology based on fine registration** [13213-147]
- 13213 1V **EEG-based recognition of happiness** [13213-57]
- 13213 1W **A Blit block copy acceleration Qt graphics display method based on domestic GPU** [13213-67]
- 13213 1X **DCT with alternating least squares post-processing for variational defogging** [13213-102]
- 13213 1Y **AutoFace: a novel method of automatic high-resolution face manipulation** [13213-13]

Part Two

- 13213 1Z **Mixture-of-experts for semantic segmentation of remoting sensing image** [13213-7]
- 13213 20 **Behavior recognition based on enhanced human pose estimation** [13213-156]
- 13213 21 **Ore segmentation based on laser point clouds** [13213-116]

- 13213 22 **Prototype image library construction techniques for face recognition systems** [13213-65]
- 13213 23 **Deep-learning-based recognition of real and artificial images** [13213-41]

INTELLIGENT OBJECT DETECTION AND TARGET TRACKING

- 13213 24 **DAFD-net: a domain adaptive feature distillation network for dark object detection based on semi-supervised learning** [13213-24]
- 13213 25 **Key performance indicators anomaly detection method based on deep spatio-temporal fusion** [13213-133]
- 13213 26 **Research on pedestrian detection algorithm based on improved YOLOv5** [13213-113]
- 13213 27 **FETNet: frequency-enhanced transformer network for face forgery detection** [13213-145]
- 13213 28 **Research on face replacement detection based on deep learning** [13213-72]
- 13213 29 **Research on surface defect detection algorithm of steel pipe weld seam based on deep learning** [13213-25]
- 13213 2A **Research on PCB board surface defect detection algorithm model based on deep learning** [13213-21]
- 13213 2B **Research on fast pedestrian detection algorithm based on deep learning** [13213-70]
- 13213 2C **Graph anomaly detection framework based on feature enhancement and contrastive learning** [13213-161]
- 13213 2D **Application and research of trajectory prediction of table tennis robot based on LSTM** [13213-45]
- 13213 2E **The bird's nest detection of high voltage tower based on 3D vision technology** [13213-120]
- 13213 2F **Motorcycle driving violation detection based on improved YOLOv8 and DeepSORT** [13213-135]
- 13213 2G **An algorithm for detecting smoke and dust in open-pit coal mines based on YOLOv5** [13213-119]
- 13213 2H **Small object detection algorithm for UAV images based on YOLOv5** [13213-158]
- 13213 2I **Track-before-detect algorithm-based optimized interactive multiple model particle filtering for tracking maneuvering weak target** [13213-148]
- 13213 2J **Coarse-to-fine change detection in low-illumination video sequences via classifier trained on ResNet18** [13213-137]

- 13213 2K **Behavior detection of the elderly based on language model** [13213-157]
- 13213 2L **Citrus objects recognition in orchard scene using HSV methods** [13213-75]
- 13213 2M **Long time series monitoring method of soil and water loss based on Landsat 8 OLI satellite remote sensing data** [13213-144]
- 13213 2N **Heuristic optimization and deep learning models for multimodal pedestrian detection** [13213-44]
- 13213 2O **Dense crowd detection method based on improved YOLOv7** [13213-85]
- 13213 2P **Improved YOLOv5-based object detection model for UAV inspection images** [13213-43]
- 13213 2Q **Lightweight Lswin transformer fusion steel surface model defect detection method research** [13213-34]
- 13213 2R **A small object detection method based on the attention mechanism and multi-level feature fusion** [13213-66]
- 13213 2S **Document image forgery detection based on multiscale edge similarity** [13213-107]
- 13213 2T **Adaptive multi-maneuver target model tracking method based on digital images** [13213-114]
- 13213 2U **Fast wafer detection algorithm based on YOLOv5s** [13213-152]
- 13213 2V **Intelligent early warning of highway tunnel safety monitoring data based on Markov model** [13213-154]
- 13213 2W **Active tracking algorithm for personnel in power aerial work scene based on illumination weight distribution and attention** [13213-164]
- 13213 2X **Mobile phone detection in images based on improved YOLOv8** [13213-92]
- 13213 2Y **A review of pedestrian trajectory tracking based on deep learning** [13213-62]
- 13213 2Z **Fire detection based on MobileNetv3-YOLOv4** [13213-23]
- 13213 30 **An in-depth study of transformer fault diagnosis and prediction based on digital twin technology** [13213-162]
- 13213 31 **An advanced YOLOv8 method for IC logo detection** [13213-124]

INTELLIGENT NEURAL NETWORKS AND SYSTEM DESIGN

- 13213 32 **A dynamic load balancing algorithm for wireless mesh networks based on network calculus** [13213-10]
- 13213 33 **A government data supervision mechanism based on blockchain** [13213-82]
- 13213 34 **Blockchain-assisted multi-authority searchable encryption scheme in cloud environment** [13213-166]
- 13213 35 **Research on internet security behavior detection algorithm based on immune deep neural network** [13213-6]
- 13213 36 **Energy saving adaptive control algorithm for air conditioning in high heat density computer rooms** [13213-142]
- 13213 37 **TSSDN aviation prospect analysis** [13213-9]
- 13213 38 **Design of college students' innovation and entrepreneurship education quality evaluation model based on grey relational degree algorithm** [13213-160]
- 13213 39 **Man-machine chess game design based on minimum maximum algorithm** [13213-49]
- 13213 3A **Study on intelligent scoring system for practical examination of crane operation commanding personnel based on artificial intelligence** [13213-149]
- 13213 3B **Design and practice of automatic analysis system for economic operation mode of power grid** [13213-46]
- 13213 3C **YOLOv5 improved algorithm and its application in real-time inventory of corrugated paper** [13213-127]
- 13213 3D **Design and implementation of short video multi-labels generating based on content-aware dynamic graph convolutional networks** [13213-155]
- 13213 3E **Magnetic shape memory alloy driver mechanism and nonlinear hysteresis model** [13213-97]
- 13213 3F **ANIS: attention and noise fusion to improve adversarial attack** [13213-19]
- 13213 3G **Enhanced six-axis robotic arm intelligent scalpel sorting system based on YOLOv4-tiny** [13213-48]
- 13213 3H **Heavy snow removal in video based on tensor dimensionality reduction and simultaneous sparse coding** [13213-29]
- 13213 3I **Structurally reparameterized lightweight reseed for efficient classification of naked barley seeds** [13213-95]
- 13213 3J **Research on slam system for underwater vision based on improved image quality** [13213-93]

- 13213 3K **Blind color image watermarking algorithm in quaternion domain based on QR decomposition** [13213-103]
- 13213 3L **Adapting segment anything model for 3D pancreas tumor segmentation** [13213-31]
- 13213 3M **KPLitePose: fast and lightweight 3D human pose estimation** [13213-159]
- 13213 3N **A novel image encryption system based on chaotic system and index mapping** [13213-91]
- 13213 3O **A multimodal feature fusion model for depression diagnosis based on BiLSTM+ViT** [13213-60]
- 13213 3P **An improved dual intent graph neural network for session-based new item recommendation** [13213-16]
- 13213 3Q **Low-dose CT denoising network combined with attention mechanism** [13213-125]
- 13213 3R **Design and implementation of SLAM technology and navigation technology in smart mobile device based on ROS system** [13213-71]
- 13213 3S **OF3D: optical flow to 3D CNN for hoisting status classification** [13213-118]
- 13213 3T **Deep learning in person re-identification: a survey** [13213-36]
- 13213 3U **MANet: multi-attention classification network for left atrial appendage** [13213-78]
- 13213 3V **Erasing memories: implementing client unlearning in medical image analysis** [13213-140]
- 13213 3W **HR_BMNet: a boundary perception and multiresolution fusion network for semantic segmentation of remote sensing** [13213-121]