

PROCEEDINGS OF SPIE

# ***4th International Conference on Informatics Engineering and Information Science (ICIEIS2021)***

**Yimin Zhou  
Lianghong Wu  
Zhile Yang  
Zuguo Chen**  
*Editors*

**19–21 November 2021  
Tianjin, China**

*Organized by*  
Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences (SIAT-CAS) (China)

*Sponsored by*  
Tianjin University (China)  
Dalian Maritime University (China)  
Civil Aviation University of China (China)  
AEIC Academic Exchange Information Centre (China)

*Published by*  
SPIE

**Volume 12161**

Proceedings of SPIE 0277-786X, V. 12161

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 *4th International Conference on Informatics Engineering and Information Science (ICIEIS2021)*, edited by Yimin Zhou, Lianghong Wu, Zhile Yang, Zuguo Chen, Proc. of SPIE 12161, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510651982

ISBN: 9781510651999 (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

## ARTIFICIAL INTELLIGENCE TECHNOLOGY AND ALGORITHM DEEP LEARNING

---

- 12161 02 **An improved algorithm of point cloud extraction for automotive radar [12161-17]**
- 12161 03 **Research on software defect prediction method based on machine learning oriented to large-scale complex information system [12161-65]**
- 12161 04 **Multi-objective discrete harmony search algorithm for disassembly line balance problems considering human body posture change [12161-19]**
- 12161 05 **Research on navigation spoofing for UAV and UAV group [12161-23]**
- 12161 06 **A RRT path planning algorithm based on A\* for UAV [12161-70]**
- 12161 07 **An improved virtual beamforming algorithm for distributed arrays [12161-9]**
- 12161 08 **Transfer learning and gated recurrent unit based epileptic seizure detection method [12161-43]**
- 12161 09 **An improved adaptive navigation algorithm based on adjustable student-t distribution in an urban environment [12161-71]**
- 12161 0A **Robust distributed estimation based on adaptive punishment under malicious attacks [12161-39]**
- 12161 0B **The scheme of mine search multifunctional robot based on the inertial navigation [12161-38]**
- 12161 0C **Burst bubble recognition based on depth feature [12161-72]**
- 12161 0D **Multi-objective shuffled frog leading algorithm for human-robot collaborative disassembly line balancing problems [12161-15]**
- 12161 0E **Research on the development of time-sensitive networks and their security technologies [12161-49]**
- 12161 0F **Auto-commissioning technology of engineering equipment driven by machine learning [12161-42]**
- 12161 0G **AIoT-based drum transcription robot using convolutional neural networks [12161-55]**
- 12161 0H **Method of consensus evolution for wisdom of crowd based on social network [12161-48]**
- 12161 0I **Researches on crane scheduling based on improved dragonfly algorithm considering customer satisfaction [12161-63]**

12161 OJ **Large-scale heterogeneous terminal management technology for power Internet of Things platform** [12161-64]

---

**BIG DATA ANALYSIS AND IMAGE SIGNAL MODEL RECOGNITION**

---

12161 OK **The application of Internet of Things in the context of the big data era** [12161-1]

12161 OL **Application of data analysis in autonomous driving technology acceptance studies** [12161-3]

12161 OM **The research and application of electronic signature in measurement management platform** [12161-29]

12161 ON **Wi-Res: a human motion recognition method based on CSI signal** [12161-11]

12161 OO **Bronze inscription recognition with distribution calibration based on few-shot learning** [12161-36]

12161 OP **Comprehensive analysis of different types of feature selection** [12161-59]

12161 OQ **Remote sensing image denoising technology based on FFDNet model** [12161-21]

12161 OR **Identification of fragile lines based on improved electrical betweenness** [12161-51]

12161 OS **Structure-behavior coalescence ontology for state analysis in model-based systems engineering** [12161-33]

12161 OT **Self-attention networks for motion posture recognition based on data fusion** [12161-28]

12161 OU **Centralized information fusion with limited multi-view for multi-object tracking** [12161-12]

12161 OV **Dynamic route planning for scenic spots in wisdom tourisms** [12161-30]

12161 OW **Feature analysis and classification of typical mineral images based on Fourier transform** [12161-25]

12161 OX **The feature extracting method via partitioning the feature subspace and data fusion** [12161-46]

12161 OY **Based on improved unsuperpoint image stitching method** [12161-57]

12161 OZ **A lightweight model based on YOLOv5 for helmet wearing detection** [12161-69]

12161 10 **Magnetic tile image classification based on PCA preprocessing broad learning** [12161-47]

12161 11 **Instance segmentation of low contrast and high density cell images using mask R-CNN**  
[12161-54]

---

#### **ELECTRONIC CIRCUIT CONTROL AND SENSOR DEVICE DESIGN**

---

12161 12 **Problems and solutions in the process of global positioning system receiver verification**  
[12161-2]

12161 13 **Ionospheric total electron content anomalies in Guangdong and Guangxi under the influence of super typhoon Mangkhut 2018** [12161-6]

12161 14 **Research on the development and integration of key technologies of ship radar** [12161-20]

12161 15 **Distributed economic dispatch strategy of power system based on step by-step V2G technology** [12161-37]

12161 16 **IC design of optimal four-bit absolute value detector based on CMOS process** [12161-53]

12161 17 **Optical frequency domain reflectometer based on digital frequency sweep of fixed wavelength laser source** [12161-18]

12161 18 **Recognition of material status in workshop and logistics automatic scheduling technology based on ResNet** [12161-50]

12161 19 **Dynamic event-triggered integral sliding mode control for consensus tracking of multi-agent systems with disturbances** [12161-45]

12161 1A **Optimization of a three-bit absolute value detector with domino logic and gate sizing**  
[12161-67]

12161 1B **A research of comparator design** [12161-66]

12161 1C **An optimal design of soldering transition section between SMT RF connector and PCB**  
[12161-27]

12161 1D **Investigation on energy optimization of neural electrical stimulation based on circuit probability theory** [12161-68]

12161 1E **Dither enhances PWM transmitter resolution for 5G UHF bands** [12161-16]

12161 1F **Location of electric vehicle charging stations based on INSGA2** [12161-31]

12161 1G **Indoor location methods of fire personnel based on GPS and sensor network** [12161-56]

12161 1H **SRM DITC based on adaptive fuzzy terminal sliding mode control** [12161-41]

12161 1I **Multi-decision pressure compensation robot massage control system based on stereo vision imaging** [12161-32]

- 12161 1J **Five optimized designs of comparator** [12161-60]
- 12161 1K **Method for detecting semi-solid lubricating grease content by plate capacitance sensor based on differential technology** [12161-26]
- 12161 1L **An authentication scheme of devices in cryogenic propellant loading process control system** [12161-35]
- 12161 1M **Bat optimizer for stochastic multiple-objective disassembly line balancing problem subject to disassembly failure cost** [12161-22]
- 12161 1N **Research on the relationship between gas-solid two-phase flow pattern and induced charge based on rod electrostatic sensor** [12161-24]
- 12161 1O **A generalized architecture of intelligent sensing system** [12161-10]
- 12161 1P **Discussion on human factor control of sensor manufacturing process in computer information acquisition system based on total process management** [12161-5]
- 12161 1Q **Large-scale heterogeneous terminal multi-domain joint fault diagnosis direction** [12161-61]
- 12161 1R **Fault diagnosis for nuclear power equipment based on a recursive principal component analysis approach** [12161-52]