

PROCEEDINGS OF SPIE

***International Conference on  
Electronic Information  
Engineering and Computer  
Science (EIECS 2022)***

**Yang Yue**  
*Editor*

**16–18 September 2022**  
**Changchun, China**

*Organized by*  
Changchun University of Science and Technology (China)

*Sponsored by*  
AEIC Academic Exchange Information Centre (China)

*Published by*  
SPIE

**Volume 12602**

**Part One of Two Parts**

Proceedings of SPIE 0277-786X, V. 12602

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 *International Conference on Electronic Information Engineering and Computer Science (IECS 2022)*, edited by Yang Yue, Proc. of SPIE 12602, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510663312

ISBN: 9781510663329 (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 © 2023 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

xi *Conference Committee*

## Part One

### ELECTRONIC INFORMATION PROCESSING AND RADAR COMMUNICATION TECHNOLOGY

---

- 12602 02 **Reflections on defense systems in the background of high-speed flight** [12602-90]
- 12602 03 **Comprehensive evaluation for power grid physical asset management based on game theory combination weighting** [12602-45]
- 12602 04 **Research on standardization of non-standardized format data in power system** [12602-53]
- 12602 05 **Design and research of an enterprise working hours management information system based on cloud environment data technology** [12602-2]
- 12602 06 **Research on three-dimensional monitoring system of algae concentration based on the unmanned ship** [12602-16]
- 12602 07 **A new parameters estimation method for near-field cyclostationary sources** [12602-14]
- 12602 08 **Characteristics of battlefield situation using 3D volume rendering technology** [12602-84]
- 12602 09 **Principle research of word vector representation in natural language processing** [12602-133]
- 12602 0A **A stacked auto-encoder and SVDD-based detection method for radar signal** [12602-135]
- 12602 0B **Analysis of ECG signal in open heart surgery patients based on EEMD and Poincaré plot** [12602-117]
- 12602 0C **BADIL: accurate device-free indoor localization based on CSI spatial awareness** [12602-30]
- 12602 0D **The signal-to-noise ratio improvement of solid-state nanopore sensors** [12602-50]
- 12602 0E **Urban-scale point cloud semantic segmentation with transformer** [12602-134]
- 12602 0F **Research on short-term weather forecast model based on transformer combined with Seq2Seq model** [12602-115]
- 12602 0G **Low imbalanced fully matched active baluns design for 21GHz upconversion mixer** [12602-88]

- 12602 0H **Research on vital sign monitoring technology based on signals with interferences of non-contact radar** [12602-149]
- 12602 0I **Optimization strategy of wind-flywheel hybrid energy storage system considering auto-coupling PID control and triple full-bridge bidirectional method** [12602-59]
- 12602 0J **Improving test efficiency based on sparse sampling and reconstruction for target's radar cross section** [12602-138]
- 12602 0K **An interactive method with gestures oriented toward the augmented reality electronic sand table** [12602-121]
- 12602 0L **Joint SAR and communications: interrupted SAR signal processing** [12602-108]
- 12602 0M **Development of the evaluation software system for maintenance support capability of a certain equipment** [12602-80]
- 12602 0N **Signal parallel processing in high frequency surface wave radar based on CUDA** [12602-125]
- 12602 0O **A new FDFD-SIBC hybrid method for half-space ground electromagnetic scattering** [12602-105]
- 12602 0P **A smart construction site reactive power compensation device system** [12602-58]
- 12602 0Q **Spark distributed system and GPU parallel computing** [12602-64]
- 12602 0R **Multi-event recognition for  $\phi$ -OTDR system based on CNN-SVM method** [12602-51]
- 12602 0S **Channel equalization based on time domain spreading of Gaussian optical pulse turbulence channel transmission** [12602-87]
- 12602 0T **Civil aviation customer satisfaction automatic evaluation system** [12602-131]
- 12602 0U **Design of intelligent test system for multi-way valve** [12602-66]
- 12602 0V **Research on BIM + GIS full element 3D model processing technology** [12602-68]
- 12602 0W **Research on data mining and the short video platforms users' personalized information needs** [12602-70]
- 12602 0X **Stability and improvement of axisymmetric LADI-FDTD method** [12602-148]
- 12602 0Y **Auxiliary diagnosis method for congenital heart disease based on multi-modality and double-branch dense residual network** [12602-62]
- 12602 0Z **Abstractive summarization based on pre-trained model and knowledge enhancement** [12602-91]
- 12602 10 **A local optimization algorithm based on eliminating the inclusion and intersection relations between sub tours for multi-traveling salesman problem** [12602-74]

- 12602 11 **Ship track classification method based on LSTM-ResNet model** [12602-19]
- 12602 12 **Optimization method for thermal instability of silicon-carbide-based vertical double diffused metal-oxide field effect transistor** [12602-92]

---

#### ELECTRONIC AUTOMATION AND ADVANCED CONTROL TECHNOLOGY

---

- 12602 13 **Design of a beam reconfigurable liquid crystal array antenna** [12602-65]
- 12602 14 **Salient object detection via high-frequency edge detail enhancement** [12602-93]
- 12602 15 **Research on all-optical wavelength conversion technology based on dual-pumped FWM** [12602-4]
- 12602 16 **Detection of ship targets in remote sensing image based on improved YOLOv5** [12602-44]
- 12602 17 **How to make use of pretrained models in few-shot classification** [12602-79]
- 12602 18 **Threat analysis and risk assessment for applying cybersecurity engineering** [12602-34]
- 12602 19 **Named entity recognition of military equipment based on BERT-BILSTM-CRF model** [12602-116]
- 12602 1A **Study on the user model construction for substation trainees based on behavior analysis** [12602-114]
- 12602 1B **Research on target recognition technology of road surveillance radar** [12602-6]
- 12602 1C **Few-shot HRRP recognition with distance-based distribution calibration and dynamic pseudo-label fine-tuning** [12602-123]
- 12602 1D **Study of deflection-slip steering control strategy for electric wheel vehicles** [12602-11]
- 12602 1E **Research on DDoS detection method based on XGB-Trans** [12602-36]
- 12602 1F **A detection method for small target in remote sensing image based on improved SSD** [12602-60]
- 12602 1G **Research on dynamic obstacle avoidance technology of mobile robot** [12602-128]
- 12602 1H **Finite control set model-free predictive current control of PMSM drives based on extended sliding mode observer** [12602-8]
- 12602 1I **Aero-engine compressor blades point cloud hole repairing method** [12602-25]

- 12602 1J **A cross-domain weakly supervised method based on imprecise labels for person RE-ID** [12602-137]
- 12602 1K **Research on optical fiber online real-time detection equipment based on ZYNQ** [12602-113]
- 12602 1L **Toward selective transfer of CVD monolayer WS<sub>2</sub> based on laser-cutting dedicated FET applications** [12602-46]
- 12602 1M **Application of new enhanced plasma detector in detection of sulfur hexafluoride decomposition products** [12602-147]
- 12602 1N **Robust feature matching for VSLAM in non-rigid scenes** [12602-118]
- 12602 1O **Multi-MAV cooperative search technology based on model predictive control** [12602-28]
- 12602 1P **Development of coal mine power monitoring substation based on uCOS** [12602-130]
- 12602 1Q **Improved YOLOv5 for breast mass detection based on attention mechanism** [12602-144]
- 12602 1R **Psychological stress detection based on heart rate variability** [12602-150]
- 12602 1S **Optimization of WFR strategy for ultra-supercritical units with high heating load** [12602-145]
- 12602 1T **Prompt fine-tuning-based efficient federated foreign object detection of electric transmission line** [12602-96]
- 12602 1U **Component quality management system based on digital twin** [12602-77]
- 12602 1V **Research on the underwater interference technology based on the plasma acoustic source** [12602-85]
- 12602 1W **Research on key techniques of path planning algorithm for liver tumor ablation** [12602-136]

## Part Two

---

### COMPUTER SIMULATION AND IMAGE DATA ANALYSIS

- 12602 1X **Surrogate-based auxiliary slot optimization for a fractional slot IPM machine used in the public transportation** [12602-5]
- 12602 1Y **An efficient recognition method for turbulence intensity via random matrix theory** [12602-56]
- 12602 1Z **Segmentation of skin lesions image based on gated axial transformer and triple attention mechanism** [12602-142]

- 12602 20 **Pattern synthesis of nonuniform linear arrays Including mutual coupling effects based on GPR and GA** [12602-43]
- 12602 21 **Study on the location of straw storage site based on remote sensing image** [12602-35]
- 12602 22 **Modeling and simulation of digital closed-loop fiber optic gyroscope based on sigma-delta modulation** [12602-106]
- 12602 23 **A malware analysis method based on behavioral knowledge graph** [12602-71]
- 12602 24 **LLDSNet: Limited Labeled Data Segmentation Network for COVID-19 CT lesion segmentation** [12602-99]
- 12602 25 **Aggregated privacy preserving auditing scheme with a designated auditor in cloud storage** [12602-107]
- 12602 26 **Frequency diverse arc array dot-shaped beam pattern using amplitude weighting** [12602-76]
- 12602 27 **Aerial tracking based on vision transformer** [12602-146]
- 12602 28 **Research on fractional digital delay filter based on Farrow structure** [12602-24]
- 12602 29 **Research on parametric visualization modeling technology of ship digital model** [12602-57]
- 12602 2A **Research and optimization of meteorological big data storage technology** [12602-15]
- 12602 2B **Short text similarity calculation method based on word vector attention mechanism and CNN-BiPLSTM** [12602-111]
- 12602 2C **A study of a pattern matching performance scheme using q-gram index with next byte range** [12602-55]
- 12602 2D **Urban building dis-occlusion in 3D graph visualization** [12602-81]
- 12602 2E **Fusion with temporal and spatial attention for video human pose estimation** [12602-17]
- 12602 2F **Research on the improvement of EdgeCloudSim's task scheduling framework** [12602-13]
- 12602 2G **Image stitching method based on improved optimal seam** [12602-67]
- 12602 2H **Research on authorization verification method of API gateway in grid microservice architecture** [12602-63]
- 12602 2I **An improved restricted isometry constant bound of multipath matching pursuit** [12602-120]
- 12602 2J **Hyperparameter tuning of GDBT models for prediction of heart disease** [12602-127]

- 12602 2K **Research on the classification of CT images of COVID-19 by pre-training model based on self-attention mechanism** [12602-54]
- 12602 2L **Applied research on BIM + GIS + IoT multi-source heterogenous data fusion** [12602-52]
- 12602 2M **Development and construction of auxiliary tools for Chinese-Kazakh bilingual term translation in the IT field** [12602-110]
- 12602 2N **Multisequences with high joint nonlinear complexity from function fields** [12602-9]
- 12602 2O **Hybrid weighted mean of vectors with multiply strategies and its application** [12602-39]
- 12602 2P **Study on fire simulation of Bai folk houses on PyroSim** [12602-78]

---

#### NEURAL NETWORK AND INTELLIGENT ALGORITHM MODELLING

---

- 12602 2Q **VB-FLChain: a voting-based blockchain-enabled federated learning platform** [12602-95]
- 12602 2R **Research on error correction coding technology based on adaptive network transmission** [12602-122]
- 12602 2S **Design of ultra-wideband gradient line coupler based on optimization algorithm** [12602-3]
- 12602 2T **Research on damage level evaluation model of military airport based on Dynamic Bayesian network** [12602-38]
- 12602 2U **Lightweight Siamese network-based single-target tracking algorithm for pedestrians** [12602-132]
- 12602 2V **Design of a bionic diagonal gait algorithm** [12602-27]
- 12602 2W **Deep-learning-based digital signal modulation mode identification** [12602-12]
- 12602 2X **Modelling on resource management and allocation for location-based IoT network** [12602-119]
- 12602 2Y **Micro lens fluorescence imaging system for cell detection and panoramic image reconstruction algorithm** [12602-139]
- 12602 2Z **Research on image recognition technology and application based on artificial intelligence algorithm** [12602-101]
- 12602 30 **Second order relation graph embedding neural network for rational drug use prediction** [12602-89]
- 12602 31 **Deep neural network-based security awareness research for private data cloud storage** [12602-49]

- 12602 32 **Expression recognition based on convolutional difference contextual feature fusion** [12602-129]
- 12602 33 **A privacy-preserving energy trading scheme in blockchain-based V2G networks** [12602-61]
- 12602 34 **Application of K-means clustering algorithm for academic performance analysis in students' college Japanese course** [12602-94]
- 12602 35 **An improved pedestrian detection algorithm based on YOLOv3** [12602-48]
- 12602 36 **Surface segmentation on countersink using point cloud** [12602-126]
- 12602 37 **An adaptive density spatial clustering algorithm based on tuna swarm optimization for image segmentation** [12602-26]
- 12602 38 **User service perception evaluation and analysis in 5G co-construction and sharing network** [12602-97]
- 12602 39 **Application of fish swarm algorithm in space-based dynamic multicast routing** [12602-73]
- 12602 3A **Research on C-V2X short-range communication security authentication technology based on domestic commercial cryptography algorithm** [12602-42]
- 12602 3B **MSRPPnet: an automatic ICD coding method for clinical records based on a deep neural network** [12602-112]
- 12602 3C **A piecewise SSB fast detection algorithm for  $\phi$ -OTDR system disturbance signal** [12602-100]
- 12602 3D **Using machine learning to predict the band gap of semiconductors** [12602-103]
- 12602 3E **TDLAS gas concentration calibration curve fitting based on improved LS algorithm** [12602-98]
- 12602 3F **Improve light weight convolutional neural networks for face recognition with multi-style recalibration module** [12602-102]
- 12602 3G **Diabetes risk prediction model based on random forest and Xgboost** [12602-22]
- 12602 3H **An Spodoptera Frugiperda pest detection algorithm based on improved feature fusion** [12602-18]
- 12602 3I **Markov-GWNN: Markov graph wavelet neural network for semi-supervised node classification** [12602-83]
- 12602 3J **Classification and identification of communication jamming signals of intelligent connected vehicle based on CNN** [12602-33]
- 12602 3K **An information security protection strategy in vehicle based on domestic commercial cipher algorithm** [12602-41]
- 12602 3L **Fall detection algorithm based on lightweight 3D residual network** [12602-86]