

# **2022 14th International Conference on Signal Processing Systems (ICSPS 2022)**

**Jiangsu, China  
18 – 20 November 2022**



**IEEE Catalog Number: CFP2285G-POD  
ISBN: 979-8-3503-3632-0**

**Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2285G-POD
ISBN (Print-On-Demand):	979-8-3503-3632-0
ISBN (Online):	979-8-3503-3631-3

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2022 14th International Conference on Signal Processing Systems (ICSPS) **ICSPS 2022**

## Table of Contents

Preface .....	xxv
Conference Committee .....	xxvi
Sponsors .....	xxix

### Radar Waveform Design and Method

Integrated Waveform Design of Radar and Communication Systems for the Single Transmitter Multiple Receivers System .....	1
<i>Xianxin Zhou (Nanjing University of Aeronautics and Astronautics, China), Jun Chen (Nanjing University of Information Science and Technology, China), and Fei Wang (Nanjing University of Aeronautics and Astronautics, China)</i>	
Waveform Design for MIMO Radar Based on Riemannian Trust Region Method .....	8
<i>Youting Yin (Nanjing Marine Radar Institute, China), Weijian Zhang (Nanjing Marine Radar Institute, China), Fan Shen (Nanjing Marine Radar Institute, China), Run Zhu (Nanjing Marine Radar Institute, China), Lin Fu (Nanjing Marine Radar Institute, China), and Ying Tang (Nanjing Marine Radar Institute, China)</i>	
Collaborative Power Allocation and Waveform Selection Strategy for Multi-Target Tracking in Airborne Radar System .....	13
<i>Lintao Ding (Nanjing Univ. Aeronaut. Astronaut, China), Chenguang Shi (Nanjing Univ. Aeronaut. Astronaut, China), Yi Yang (Wuhan Maritime Communication Research Institute, China), and Jianjiang Zhou (Nanjing Univ. Aeronaut. Astronaut, China)</i>	
Amplitude Mutual Information-Based Radar Waveform Design for Integrated Radar and Communication Systems .....	18
<i>Hao Luo (Jiangsu University of Science and Technology, China; Hohai University, China; Jiangsu Zaqi Technology Co., Ltd, China), Xiaolong Tang (Jiangsu University of Science and Technology, China; Nanjing University of Aeronautics and Astronautics, China), and Xiaofei Zhang (Jiangsu University of Science and Technology, China)</i>	
Transmit Beampattern Synthesis for RIS-Aided Radar via Sidelobe Level Minimization .....	25
<i>Longyao Ran (Nanjing University of Science and Technology, China), Biao Sun (Nanjing University of Science and Technology, China), Shengyao Chen (Nanjing University of Science and Technology, China), and Feng Xi (Nanjing University of Science and Technology, China)</i>	

Information Theory-Based Waveform Design for Rician Target Detection with Dual-Function Radar Communication Systems .....	31
<i>Xuyang Wang (National University of Defense Technology, China), Bo Tang (National University of Defense Technology, China), Fuhua Fan (National University of Defense Technology, China), and Guisheng Wang (National University of Defense Technology, China)</i>	
Transmit Beamforming for Dual-Function Radar-Communication System based on FDA .....	37
<i>Haozheng Wu (Jiangsu University of Science and Technology, China), Biao Jin (Jiangsu University of Science and Technology, China), Zhaoyang Xu (China Shipbuilding Industry Corporation, 723th Research Institute, China), and Xiaohua Zhu (Nanjing University of Science and Technology, China)</i>	
Fully Adaptive Constant Module Sequence Set Design for Waveform-Agile Coherent Radar System in the Presence of Signal-Dependent Clutter .....	43
<i>Shiyi Li (Nanjing University of Aeronautics and Astronautics, China), Jindong Zhang (Nanjing University of Aeronautics and Astronautics, China), and Daiyin Zhu (Nanjing University of Aeronautics and Astronautics, China)</i>	
Arbitrary-Order Superdirective Beamforming for Three-Layer Concentric Circular Sensor Arrays .....	56
<i>Xiaoyuan Li (Northwestern Polytechnical University, China), Yong Wang (Northwestern Polytechnical University, China), and Yixin Yang (Northwestern Polytechnical University, China)</i>	

## **Radar Signal Analysis and Processing**

Research on Optimization Algorithm of Low-Resolution Radar Target Recognition Based on Neural Network .....	64
<i>Xiaoyan Liu (Nanjing University of Science and Technology, P. R. China), Renhong Xie (Nanjing University of Science and Technology, P. R. China), Yongnan Zhou (Nanjing University of Science and Technology, P. R. China), Zongmin Liu (Nanjing University of Science and Technology, P. R. China), Weilin Wang (Nanjing University of Science and Technology, P. R. China), Ziye Wang (Nanjing University of Science and Technology, P. R. China), Peng Li (Nanjing University of Science and Technology, P. R. China), and Yibin Rui (Nanjing University of Science and Technology, P. R. China)</i>	
A Method of Virtual Array Aperture Extension for FMCW MIMO Phase-Coded Radar .....	72
<i>Cheng Zhang (Nanjing University of Aeronautics and Astronautics, China) and Gong Zhang (Nanjing University of Aeronautics and Astronautics, China)</i>	
Radar-Based Human Behavior Model Construction and Modulation Pattern Analysis .....	76
<i>Tengfei Song (Shijiazhuang Tiedao University, China) and Yongze Liu (Shijiazhuang Tiedao University, China)</i>	

Multimodal Semantic Fusion for Vehicle Driving Based on Residual Connections and Attention Mechanism .....	82
<i>Xiaohang Li (Key Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education, Nanjing University of Aeronautics and Astronautics, China) and Jianjiang Zhou (Key Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education, Nanjing University of Aeronautics and Astronautics, China)</i>	
Deployment Optimization for Search Task in Netted Radar System under Region Constraints .....	86
<i>Tong Zhang (Xidian University, China), Junkun Yan (Xidian University, China), Lan Du (Xidian University, China), Heng Xu (Shanghai Aerospace Electronic Technology Institute, China), and Hongwei Liu (Xidian University, China)</i>	
Continuous Gesture Segmentation Method Based on Micro-Doppler Feature Via Millimeter Wave Radar .....	91
<i>Fuyang Liu (University of Chinese Academy of Sciences, China), Zhaoyang Wang (University of Chinese Academy of Sciences, China), Yifan Yao (University of Chinese Academy of Sciences, China), Jingbo Wang (University of Chinese Academy of Sciences, China), Xiangwei Dang (Chinese Academy of Sciences, China), Zhiyuan Zeng (Chinese Academy of Sciences, China), Xingdong Liang (Chinese Academy of Sciences, China), and Yanlei Li (Chinese Academy of Sciences, China)</i>	
Power Line Detection Method Based on Broadband Characteristics of FMCW Radar .....	97
<i>Chunfeng Chen (Nanjing University of Aeronautics and Astronautics, China; Leihua Electronic Technology Research Institute, China), Jianjiang Zhou (Nanjing University of Aeronautics and Astronautics, China), and Fan Yang (Leihua Electronic Technology Research Institute, China)</i>	
Ambiguity Resolution for Ground-based Pulse Doppler Radars Using Multiple Medium PRF .....	102
<i>Khue Nguyen Dinh (Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Loi Nguyen Van (Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Thanh Nguyen Nhu (Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Hop Tran Vu (Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Viet Nguyen Hong (Viettel High Technology Industries Corporation, Viettel Group, Vietnam), and Duc Le Trung (Viettel High Technology Industries Corporation, Viettel Group, Vietnam)</i>	
Improved CFAR Method Based on Sea Clutter Scene Discrimination .....	109
<i>Yan Liu (Yantai University, China), Ningbo Liu (Naval Aviation University, China), Yong Huang (Naval Aviation University, China), and Zhongxun Wang (Yantai University, China)</i>	
SAR-GMTI Simulation of T72 Based on DPCA .....	115
<i>Junchi Liu (Xidian University, China)</i>	

# Radar Signal Detection Technology and Application

Enhanced Truncated Statistic CFAR based on Median Absolute Deviation and Weighted Log-Likelihood Estimation .....	123
<i>Yongnan Zhou (Nanjing University of Science and Technology, China), Renhong Xie (Nanjing University of Science and Technology, China), Xiaoyan Liu (Nanjing University of Science and Technology, China), Weilin Wang (Nanjing University of Science and Technology, China), Zongmin Liu (Nanjing University of Science and Technology, China), Ziye Wang (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), and Yibin Rui (Nanjing University of Science and Technology, China)</i>	
Detection of Human Breathing behind L-Shaped Corner by Using mmWave FMCW Radar .....	131
<i>Gen Li (University of Science and Technology of China, China), Yun Ge (University of Science and Technology of China, China), Yiyu Wang (University of Science and Technology of China, China), Qingwu Chen (Zhongshan ERangel Technologies Co. Ltd, China), and Gang Wang (University of Science and Technology of China, China)</i>	
A Method for Processing Unwanted Target Caused by Reflection in Secondary Surveillance Radar .....	135
<i>Khanh D. Do (Radar center, Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Loi V. Nguyen (Radar center, Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Thanh N. Nguyen (Radar center, Viettel High Technology Industries Corporation, Viettel Group, Vietnam), Thang M. Nguyen (Radar center, Viettel High Technology Industries Corporation, Viettel Group, Vietnam), and Vu T. Tran (Radar center, Viettel High Technology Industries Corporation, Viettel Group, Vietnam)</i>	
LPI Radar Signals Intra-Pulse Modulation Recognition Based on CA-ShuffleNet .....	144
<i>Ying Wen (Nanjing University of Aeronautics and Astronautics, China), Xudong Wang (Nanjing University of Aeronautics and Astronautics, China), Guiguang Xu (Nanjing University of Aeronautics and Astronautics, China), and Fei Wang (Nanjing University of Aeronautics and Astronautics, China)</i>	
Ground Surveillance Radar Target Classification based on 2D Selective CA CNN .....	150
<i>Chengwei Yu (Nanjing University of Science and Technology, China), Yibin Rui (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), Yufeng Yuan (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), and Renhong Xie (Nanjing University of Science and Technology, China)</i>	
Research on Detection Performance of Distributed PA-MIMO Radar .....	156
<i>Cheng Qi (Air Force Engineering University, China), Jun-wei Xie (Air Force Engineering University, China), Hao-wei Zhang (Air Force Engineering University, China), Tai-yong Fei (Air Force Early Warning Academy, China), Xiao Yang (Air Force Engineering University, China), and Zi-hang Ding (Air Force Engineering University, China)</i>	

Improved Near-Field ISAR Imaging Algorithm for Far-Field Radar Cross Section Measurement ....	162
<i>Deng Yao (Nanjing University of Aeronautics and Astronautics, China), Zhou Jianjiang (Nanjing University of Aeronautics and Astronautics, China), Huang Jinhai (Nanjing University of Aeronautics and Astronautics, China), and Peng Yiling (Nanjing University of Aeronautics and Astronautics, China)</i>	
Mechanism Analysis of Coherent Detectors for Radar Targets in Compound-Gaussian Sea Clutter .....	167
<i>Meiyan Pan (Xi'an Electronic Engineering Research Institute, China), Xingyu Cai (Xi'an Electronic Engineering Research Institute, China), and Jian Xue (Xi'an University of Posts and Telecommunications, China)</i>	
Improved Minimum Description Length CFAR based on Weighted Log-Likelihood Estimation .....	172
<i>Zongmin Liu (Nanjing University of Science and Technology, China), Renhong Xie (Nanjing University of Science and Technology, China), Weilin Wang (Nanjing University of Science and Technology, China), Ziye Wang (Nanjing University of Science and Technology, China), Yongnan Zhou (Nanjing University of Science and Technology, China), Xiaoyan Liu (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), and Yibin Rui (Nanjing University of Science and Technology, China)</i>	

## Acoustics and Acoustic Signal Analysis

Combined MS and MMSE-Based Noise Power Spectral Density Estimation of Noisy Multi-Component Underwater Acoustic Pulse Signal .....	178
<i>Shuai Yao (Key Laboratory of Underwater Acoustic Signal Processing of Ministry of Education, China), Qiwei Liu (Southeast University, China), QingYun Kuang (Southeast University, China), and Yixuan Zhang (Southeast University, China)</i>	
An Underwater Non-Free Field Sound Radiation Prediction Technology Based on Sound Field Separation .....	185
<i>Haohao Hu (Jiangsu University of Science and Technology, China), Yaxin Ren (Jiangsu University of Science and Technology, China), Yifan Huang (Jiangsu University of Science and Technology, China), Ao Zhao (Jiangsu University of Science and Technology, China), and Zhelun Jiang (Jiangsu University of Science and Technology, China)</i>	
The Analysis of Vibro-Acoustic Coupling Theory of a Complex Plate-Cavity Model .....	191
<i>Dongsen Hu (China Ship Scientific Research Center, China), Dongshen Li (China Ship Scientific Research Center, China), Zhenguo Bai (China Ship Scientific Research Center, China), and Zhanyang Zhang (China Ship Scientific Research Center, China)</i>	
Non-Linear Filtering with Multivariable Skew T Noises .....	197
<i>Wei Wang (Wuhan Institute of Technology, China) and Jun Zhang (Wuhan Institute of Technology, China)</i>	

Coherent Integration of High-Speed Maneuvering Targets Based on KT-SWVD .....	204
<i>Wang Weilin (Nanjing University of Science and Technology, China), Xie Renhong (Nanjing University of Science and Technology, China), Wang Ziye (Nanjing University of Science and Technology, China), Liu Zongmin (Nanjing University of Science and Technology, China), Liu Xiaoyan (Nanjing University of Science and Technology, China), Zhou Yongnan (Nanjing University of Science and Technology, China), Li Peng (Nanjing University of Science and Technology, China), and Rui Yibin (Nanjing University of Science and Technology, China)</i>	
A Research on Acoustic Hear-Through Technology Based on an Active Noise Cancellation Headphone System .....	210
<i>Mengyao Jia (Southeast University, China), Ning Han (Southeast University, China), and Lingchen Zhou (Southeast University, China)</i>	
Underwater Acoustic Communication Based on OTFS-IM .....	216
<i>Xiaopeng Guo (Jiangsu University of Science and Technology, China), Biao Wang (Jiangsu University of Science and Technology, China), Yunan Zhu (Jiangsu University of Science and Technology, China), Zide Fang (Jiangsu University of Science and Technology, China), and Shizhen Zhang (Jiangsu University of Science and Technology, China)</i>	

## Signal Acquisition and Analysis

Aperture Resource Optimization Method for Low Sidelobe Linear Opportunistic Array Based on PSO-CVX Algorithm .....	220
<i>Yanwei Zhang (Nanjing University of Aeronautics and Astronautics, China), Hailin Li (Nanjing University of Aeronautics and Astronautics, China), Yuanjin Tian (Nanjing University of Aeronautics and Astronautics, China), Xiao Dong (Nanjing University of Aeronautics and Astronautics, China), and Ke Wang (Nanjing University of Aeronautics and Astronautics, China)</i>	
Fault Diagnosis of Rolling Bearing based on Improved Twin Neural Network with Small Samples .....	224
<i>Yifei Yang (Jiangsu University of Science and Technology, China) and Jiacheng Fang (Jiangsu University of Science and Technology, China)</i>	
A Stereovision EEG Channel Selection Method Based on Cross Increment Entropy Maximization ..	229
<i>Wei Zhou (Hohai University, P.R. China), Tingting Zhang (Hohai University, P.R. China), Ling Xia (Hohai University, P.R. China), and Xiaofeng Liu (Hohai University, P.R. China)</i>	
A Synchroextracting Transform based on a Modified S-Transform .....	234
<i>Yufeng Yuan (Nanjing University of Science and Technology, China), Yibin Rui (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), Chengwei Yu (Nanjing University of Science and Technology, China), Renhong Xie (Nanjing University of Science and Technology, China), and Peng Li (Nanjing University of Science and Technology, China)</i>	
Improvements on Robustness of Feedback Active Noise Reduction Earphone .....	239
<i>Lingchen Zhou (Key Laboratory of Underwater Acoustic Signal Processing, Southeast University, China) and Ning Han (Key Laboratory of Underwater Acoustic Signal Processing, Southeast University, China)</i>	



Graph Diffusion Kernel Minimum Error Entropy with Fiducial Points .....	244
<i>Xinyan Hou (Southwest Jiaotong University, China) and Haiquan Zhao (Southwest Jiaotong University, China)</i>	
$\delta$ -GLMB Filter Based on Multiple Model Multiple Hypothesis Tracking .....	249
<i>Zewei Liu (Air Force Early Warning Academy, China), Daikun Zheng (Air Force Early Warning Academy, China), Junquan Yuan (Air Force Early Warning Academy, China), Alei Chen (Air Force Early Warning Academy, China), Hui Li (Air Force Early Warning Academy, China), Chang Zhou (Air Force Early Warning Academy, China), Wenfeng Chen (Air Force Early Warning Academy, China), and Qi Liu (Air Force Early Warning Academy, China)</i>	
DNN Audio Classification Based on Extracted Spectral Attributes .....	259
<i>Pei-Chen Lo (National Yang Ming Chiao Tung University, Taiwan), Chuan-Yi Liu (Novatek Microelectronics Corp, Taiwan), and Tsung-Hsien Chou (National Yang Ming Chiao Tung University, Taiwan)</i>	
Application of BBPSO-ABC Optimization Algorithm in Estimation of Dredging Volume of Trailing Suction Hopper Dredger .....	263
<i>Yao Yao (Jiangsu University of Science and Technology, China), Su Zhen (Jiangsu University of Science and Technology, China), Wei Wang (Jiangsu University of Science and Technology, China), and GuangFeng Zhu (Jiangsu University of Science and Technology, China)</i>	
An Improved Interpolation Algorithm for the Damped Signal Based on Hann Window .....	269
<i>Haitao Xu (Northwestern Polytechnical University, China), Shengxi Zhou (Northwestern Polytechnical University, China), Weiyang Qin (Northwestern Polytechnical University, China), and Grzegorz Litak (Lublin University of Technology, Poland)</i>	

## Signal Estimation

A Sparse Array DOA Estimation Approach Based on Matrix Completion .....	278
<i>Peng Li (Nanjing University of Science and Technology, China), Yibin Rui (Nanjing University of Science and Technology, China), Yufeng Yuan (Nanjing University of Science and Technology, China), Chengwei Yu (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), and Renhong Xie (Nanjing University of Science and Technology, China)</i>	
Median Value Filtering Method for Non-Circular Signal DOA Estimation with Nested Arrays in the Presence of Impulsive Noise Scenarios .....	285
<i>Xudong Dong (Nanjing University of Aeronautics and Astronautics, China), Jun Zhao (Tongji University, China), Meng Sun (Nanjing University of Aeronautics and Astronautics, China), and Xiaofei Zhang (Nanjing University of Aeronautics and Astronautics, China)</i>	
An Underwater Wideband Multi-Highlight Active Target Velocity Estimation Method Based on Cepstrum and Matched Filter .....	291
<i>Zhiling Xiao (Key Laboratory of Underwater Acoustic Signal Processing, Southeast University, China) and Ning Han (Key Laboratory of Underwater Acoustic Signal Processing, Southeast University, China)</i>	

Attention Mechanism-Based DOA Estimation of Closely Spaced Sources for Conformal Array .....	295
<i>Xiaoyu Lan (Shenyang Aerospace University, China), Huichao Zhai (Shenyang Aerospace University, China), and Yupeng Wang (Shenyang Aerospace University, China)</i>	
OPASTd Based DOA Tracking Algorithm for Unfolded Coprime Linear Arrays .....	300
<i>Yiling Peng (Nanjing University of Aeronautics and Astronautics, China), Liwei Mu (Marine Design and Research Institute of China, China), Xumin Liu (Marine Design and Research Institute of China, China), Jianjiang Zhou (Nanjing University of Aeronautics and Astronautics, China), and Yao Deng (Nanjing University of Aeronautics and Astronautics, China)</i>	
Novel Forward/Backward Signal Space for DOA Estimation of Coherent RF Signals .....	304
<i>Ahmed A Hussain (Prince Mohammad University, KSA), Nizar Tayem (Texas A and M University Commerce, USA), Abdel-Hamid Soliman (Staffordshire University, UK), and Redha Radaideh (Texas A and M University Commerce, USA)</i>	
Improved DFT Based DOA Estimation for Wideband Signals .....	310
<i>Yawei Tang (Nanjing University of Aeronautics and Astronautics, China), Weiming Deng (Nanjing University of Aeronautics and Astronautics, China), Jianfeng Li (Nanjing University of Aeronautics and Astronautics, China), and Xiaofei Zhang (Nanjing University of Aeronautics and Astronautics, China)</i>	

## Signal Coding and Modulation

Cooperative Spectrum Sensing Based on Riemann Distance of Subband Signals .....	315
<i>Yaqian Wu (Nanjing University, China), Sunhu Zhang (National Center for Quality Test of Urban Rail Transit Construction Engineering, China), and Yechao Bai (Nanjing University, China)</i>	
EVM based HF Adaptive Modulation .....	321
<i>Yizhe Wang (Beijing Jiaotong University, China), Yinsheng Liu (Beijing Jiaotong University, China), Xia Chen (Beijing Jiaotong University, China), Rong Li (State Radio Monitoring Center, China), and Hongtao Duan (State Radio Monitoring Center, China)</i>	
Pattern Synthesis of High-Order Sideband Suppression for Time-Modulated Conformal Array Based on Sequential Convex Optimization Algorithm .....	326
<i>Xiao Dong (Nanjing University of Aeronautics and Astronautics, China), Hailin Li (Nanjing University of Aeronautics and Astronautics, China), Jing Tan (Nanjing University of Aeronautics and Astronautics, China), Ke Wang (Nanjing University of Aeronautics and Astronautics, China), Yanwei Zhang (Nanjing University of Aeronautics and Astronautics, China), and Yuanjin Tian (Nanjing University of Aeronautics and Astronautics, China)</i>	
A LoRa Modulation-Based System Capacity Enhancement Method .....	331
<i>Xiao Yu (Jiangsu University of Science and Technology, China), Zhenkai Zhang (Jiangsu University of Science and Technology, China), and Xiaowen Hu (Wuhan Maritime Communication Research Institute, China)</i>	

Wideband Beamforming Method for Uniform Circular Array Based on Empirical Mode Decomposition .....	335
<i>Bingjie Yin (Kunming Shipborne Equipment Research and Test Center, China), Qu Liu (Kunming Shipborne Equipment Research and Test Center, China), and Junjie Zhao (Kunming Shipborne Equipment Research and Test Center, China)</i>	

Robust Pattern Synthesis Algorithm in Time-Modulated Linear Array with Position Errors .....	340
<i>Yuanjin Tian (Nanjing University of Aeronautics and Astronautics, China), Hailin Li (Nanjing University of Aeronautics and Astronautics, China), Yanwei Zhang (Nanjing University of Aeronautics and Astronautics, China), Ke Wang (Nanjing University of Aeronautics and Astronautics, China), and Xiao Dong (Nanjing University of Aeronautics and Astronautics, China)</i>	

## Feature Extraction and Fusion

Deep Multi-Feature Fusion CNNs with Gemstone Image Classification Algorithm .....	344
<i>Haoyuan Huang (Shanghai JianQiao University, China) and Rongcheng Cui (Shanghai University of Electric Power, China)</i>	

Improved UCT Algorithm for WTN-EinStein Würfelt Nicht! Game Combining Domain Knowledge ....	350
<i>Xiali Li (Minzu University of China, China), Bo Liu (Minzu University of China, China), Zhaoqi Wang (Minzu University of China, China), Yingying Cai (Minzu University of China, China), Luyao Yu (Minzu University of China, China), and Licheng Wu (Minzu University of China, China)</i>	

Farm Parcel Extraction in Remote-Sensing Images Based on Semantic Segmentation .....	359
<i>Yirong Wang (Jiangsu University of Science and Technology, China), Liang Qi (Jiangsu University of Science and Technology, China), and Bangyu Li (Chinese Academic Sciences, China)</i>	

Control Point Compression and Optimization Algorithm Based on Improved Particle Swarm Optimization in Non-Uniform Rational B-Spline Fitting .....	363
<i>Mingxia Li (University of Chinese Academy of Sciences, China; Shenyang Institute of Computing Technology, Chinese Academy of Sciences, China; Dalian Polytechnic University, China), Wenjiang Wu (Shenyang Institute of Computing Technology, Chinese Academy of Sciences, China; Golding NC Intelligence Tech. Co., Ltd., China), Na Liu (Dalian Polytechnic University, China), Rongli Gai (Dalian University, China), and Yitong Guo (Dalian University, China)</i>	

Signatures of Moving Target in Spotlight SAR Imagery .....	369
<i>Yuhan Wang (Nanjing University of Aeronautics and Astronautics, China), Tianyue Shi (Nanjing University of Aeronautics and Astronautics, China), Yanqi Liu (Nanjing University of Aeronautics and Astronautics, China), and Xinhua Mao (Nanjing University of Aeronautics and Astronautics, China)</i>	

# Intelligent Image Recognition and Application

Design and Implementation of Fish Image Recognition System Based on Transfer Learning .....	373
<i>Wanghua Li (Jiangsu University of Science and Technology, China), Zhenkai Zhang (Jiangsu University of Science and Technology, China), Yuhao Wang (Jiangsu University of Science and Technology, China), and Wangyang Yu (Wuhan Maritime Communication Research Institute, China)</i>	
VMD and Attention Mechanism Based Bi-LSTM Model for Malfunction Identification of Optical Fiber Composite Submarine Cables .....	380
<i>Yuxiang Lv (Anhui Jiyuan Software Co., Ltd, China), Hui Wu (Anhui Jiyuan Software Co., Ltd, China), Jie Lu (Chongqing University, China), Yawen Dong (Anhui Jiyuan Software Co., Ltd, China), Xuekun Qi (State Grid Information and Telecommunication Group, China), Lu Sun (State Grid Zhejiang Electric Power Co., Ltd, China), Hao Wu (Anhui Jiyuan Software Co., Ltd, China), and Wenjiang Feng (Chongqing University, China)</i>	
Visual Garment Collar Style Identification using Deep Neural Networks .....	387
<i>Zhenxing Li (Jiangsu University of Science and Technology, China), Diming Zhang (Jiangsu University of Science and Technology, China), Yuanjiang Li (Jiangsu University of Science and Technology, China), and Luohan Wang (Jiangsu University of Science and Technology, China)</i>	
A VQ-VAE Based Recognition Algorithm for Terahertz Security Inspection Images .....	397
<i>Xinyu Zha (Nanjing University, China) and Yechao Bai (Nanjing University, China)</i>	
Across-Scale Local Difference L1-Norm Principal Component Analysis Network for Facial Expression Recognition .....	403
<i>Zhengyan Zhang (Nanjing University of Posts and Telecommunications, China; Jiangsu University of Science and Technology, China), Jingyu Hui (Jiangsu University of Science and Technology, China), Guanming Lu (Nanjing University of Posts and Telecommunications, China), Weijia Huang (Jiangsu University of Science and Technology, China), and Xia Li (Nanjing University of Posts and Telecommunication, China; Anhui University of Technology, china)</i>	
Multi-View SAR Target Recognition Using Bidirectional Conv-LSTM Network .....	410
<i>Zhe Hu (Nanjing University of Aeronautics and Astronautics, China), Gong Zhang (Nanjing University of Aeronautics and Astronautics, China), and Daiyin Zhu (Nanjing University of Aeronautics and Astronautics, China)</i>	
Single Image Clothing Style Recognition using Mask RCNN .....	414
<i>Luohan Wang (Jiangsu University of Science and Technology, China), Diming Zhang (Jiangsu University of Science and Technology, China), Yuanjiang Li (Jiangsu University of Science and Technology, China), and Zhenxing Li (Jiangsu University of Science and Technology, China)</i>	
Traffic Sign Recognition Based on YOLOv5 Network Structure .....	420
<i>Tong Hu (Nanjing Forestry University, China) and Jun Song (Nanjing Forestry University, China)</i>	

## Target Detection and Algorithm

Oriented Object Detection in Remote Sensing Image Based on YOLOV5 .....	424
<i>Dan Pan (Beijing University of Technology, China) and Lifang Wu (Beijing University of Technology, China)</i>	
Design of Modified VI-CFAR and Implementation on Zynq .....	431
<i>Haoxuan Wei (Yantai University, China), Zhongxun Wang (Yantai University, China), Hao Ding (Naval Aviation University, China), Yong Huang (Naval Aviation University, China), and Ningbo Liu (Naval Aviation University, China)</i>	
Low-Flying Moving Target Detection and Imaging Algorithm of Spaceborne SAR Based on Two-Dimensional Velocity Search .....	437
<i>Ruian Li (Nanjing University of Aeronautics and Astronautics, China), He Yan (Nanjing University of Aeronautics and Astronautics, China), Chen Wu (Nanjing University of Aeronautics and Astronautics, China), Rui Zhao (Nanjing University of Aeronautics and Astronautics, China), Jindong Zhang (Nanjing University of Aeronautics and Astronautics, China), and Daiyin Zhu (Nanjing University of Aeronautics and Astronautics, China)</i>	
Automatic Classification of Textile Fibers and Content Detection Based on Image Processing.....	444
<i>Chongguang Zhong (Jiangsu University of Science and Technology, China), Guojun Ma (Jiangsu University of Science and Technology, China), and Xiumei Feng (Jiangsu Chengxin Inspection Testing and Certification Co., Ltd, China)</i>	
Marine Target Detection by Exploiting Multi-Circle Features with Convolutional Neural Network .....	449
<i>Zhifei Wang (Nanjing Research Institute of Electronics Technology; Key Laboratory of IntelliSense Technology, CETC; Jiangsu Provincial Key Laboratory of Detection and Perception Technology, China), Junpeng Yu (Nanjing Research Institute of Electronics Technology; Key Laboratory of IntelliSense Technology, CETC; Jiangsu Provincial Key Laboratory of Detection and Perception Technology, China), Yuhao Yang (Nanjing Research Institute of Electronics Technology; Key Laboratory of IntelliSense Technology, CETC; Jiangsu Provincial Key Laboratory of Detection and Perception Technology, China), and Lin Jin (Nanjing Research Institute of Electronics Technology; Key Laboratory of IntelliSense Technology, CETC; Jiangsu Provincial Key Laboratory of Detection and Perception Technology, China)</i>	
Change Detection Using Unsupervised Sensitivity Disparity Networks .....	455
<i>Xiaochen Yuan (Macao Polytechnic University, China) and Jinlong Li (Macao University of Science and Technology, China)</i>	
Multi-Target Detection Based on Improved CA-CFAR Algorithm .....	461
<i>Ruiguang Lv (Nanjing University of Aeronautics and Astronautics, China), Jianjiang Zhou (Nanjing University of Aeronautics and Astronautics, China), Zhe Xu (Nanjing University of Aeronautics and Astronautics, China), Kai Jiang (Nanjing University of Aeronautics and Astronautics, China), and Yiling Peng (Nanjing University of Aeronautics and Astronautics, China)</i>	

Detection and Recognition of Dynamic Human Postures in Non-Line-of-Sight Environment .....	467
<i>Yun Ge (University of Science and Technology of China, China), Yiyu Wang (University of Science and Technology of China, China), Gen Li (University of Science and Technology of China, China), Qingwu Chen (Zhongshan ERangel Technologies Co. Ltd, China), and Gang Wang (University of Science and Technology of China, China)</i>	

## Optical Imaging and Image Reconstruction

Sub-Aperture Mosaic Imaging Approach for Automotive Millimeter Wave SAR Imaging .....	471
<i>Jiahui Wang (Key Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education, Nanjing University of Aeronautics and Astronautics, China), Yanqi Liu (Key Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education, Nanjing University of Aeronautics and Astronautics, China), Tianyue Shi (Key Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education, Nanjing University of Aeronautics and Astronautics, China), and Xinhua Mao (Key Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education, Nanjing University of Aeronautics and Astronautics, China)</i>	
Model Compression Based on SAR-Optical Image Mapping Task .....	476
<i>Sijie Wang (Nanjing University of Aeronautics and Astronautics, China), Jianjiang Zhou (Nanjing University of Aeronautics and Astronautics, China), and Tianzhu Yu (Nanjing University of Aeronautics and Astronautics, China)</i>	
Adaptive Resolution Imaging Algorithm for Helicopter-Borne Arc Antenna Array Based on Grid Layout Optimization .....	486
<i>Zhiqi Gao (Inner Mongolia University of Technology, China; Inner Mongolia Key Laboratory of Radar Technology and Application, China), Shumeng Liu (Inner Mongolia University of Technology, China; Inner Mongolia Key Laboratory of Radar Technology and Application, China), Ping-ping Huang (Inner Mongolia University of Technology, China; Inner Mongolia Key Laboratory of Radar Technology and Application, China), and Yun Su (Inner Mongolia University of Technology, China; Inner Mongolia Key Laboratory of Radar Technology and Application, China)</i>	
Automotive Millimeter Wave SAR Imaging in Curved Trajectory .....	493
<i>Yanqi Liu (Nanjing University of Aeronautics and Astronautics, China), Jiahui Wang (Nanjing University of Aeronautics and Astronautics, China), Yue Bao (Marine Design and Research Institute of China, China), and Xinhua Mao (Nanjing University of Aeronautics and Astronautics, China)</i>	

## Digital Image Processing and Application

Diagnosis of COVID-19 from Chest CT Images Based on Deep Learning .....	496
<i>Yue Zhang (Nanjing University of Science and Technology, China), Peng Li (Nanjing University of Science and Technology, China), Renhong Xie (Nanjing University of Science and Technology, China), and Yibin Rui (Nanjing University of Science and Technology, China)</i>	

Registration for SAR Image Based on Phase Congruency .....	500
<i>Kaikai Xu (Xi'an Electronic Engineering Research Institute, China), Pengcheng Guo (Xi'an Electronic Engineering Research Institute, China), and Jingjing Wang (Xi'an Electronic Engineering Research Institute, China)</i>	
Structural Tensor Nonlinear Complex Diffusion-Based Method for Sonar Image Denoising .....	507
<i>Minjia Tan (Nanjing University of Science and Technology, China) and Yifei Yang (Jiangsu University of Science and Technology, China)</i>	
PolSAR Image Classification Via a Novel Selective Kernel Encoder-Decoder Fully Convolutional Network .....	513
<i>Zheng Fang (Nanjing University of Aeronautics and Astronautics, China), Gong Zhang (Nanjing University of Aeronautics and Astronautics, China), Qijun Dai (Nanjing University of Aeronautics and Astronautics, China), and Biao Xue (Nanjing University of Aeronautics and Astronautics, China)</i>	
Multiple Watermarking Based on DCT Coefficients Selection .....	518
<i>Xiaochen Yuan (Macao Polytechnic University, China) and Xingrun Wang (Macao University of Science and Technology, China)</i>	
Implementation of A Real-Time Lossless JPEG-LS Compression Algorithm Based on FPGA .....	523
<i>Xinyi Dong (Nanjing University of Science And Technology, China) and Peng Li (Nanjing University of Science And Technology, China)</i>	
Phase Error Analysis of Moving Target in Bistatic SAR FBP Imagery .....	529
<i>Guo Yang (Nanjing University of Aeronautics and Astronautics, China), Tianyue Shi (Nanjing University of Aeronautics and Astronautics, China), Yue Bao (Marine Design and Research Institute of China, China), and Xinhua Mao (Nanjing University of Aeronautics and Astronautics, China)</i>	
A Multi-Scale Network Based on Compound Extended Coding UNet++ for Polyp Segmentation ...	533
<i>Mengwen Wang (Nanjing University of Science and Technolgy, China), Min Li (Nanjing University of Science and Technolgy, China), and Salman Muhammad (Nanjing University of Science and Technology, China)</i>	

## **Control System and Reliability Assessment**

Research on Fault Diagnosis Method of Ship Equipment Based on Deep Convolutional Neural Network .....	537
<i>Baoqing Wang (Marine Design &amp; Research Institute of China, China), Bofeng Cui (Marine Design &amp; Research Institute of China, China), Yifei Yang (Jiangsu University of Science and Technology, China), Shijie Liu (Jiangsu University of Science and Technology, China), and Maohui Zhang (Jiangsu University of Science and Technology, China)</i>	
LSTM-Based Learning Control for Biomimetic Robotic Fish Swimming .....	542
<i>Ming Wang (Shandong Jianzhu University, China), Kunlun Wang (Shandong Jianzhu University, China), Yanlu Zhang (Shandong Jianzhu University, China), and Junzhi Yu (Peking University, China)</i>	

Nonlinear Disturbance Observer-Based Sliding Mode Controller for Underwater Vehicles .....	547
<i>Shihan Kong (Peking University, China), Ranran Zhang (PLA92942, China), Mingxin Liu (Guangdong Ocean University, China), and Junzhi Yu (Peking University, China)</i>	
Reliability Evaluation of Ship Equipment Multifactor Coupling System Based on the Enhanced Dematel-ANP Method .....	551
<i>Shijie Liu (Jiangsu University of Science and Technology, China) and Yifei Yang (Jiangsu University of Science and Technology, China)</i>	
Software Safety Level Comprehensive Assessment Approach Based on the Multidimensional System Risk Index .....	556
<i>Kunming Wang (Beijing Institute of Mechanical and Electrical Engineering, China), Qiaoxuan Zhang (Beijing Institute of Mechanical and Electrical Engineering, China), and Haifeng Li (Beihang University, China)</i>	
Time-Constrained Multi-UAVs Mission Planning Method .....	562
<i>Su Jian (Systems Engineering Research Institute of China State Shipbuilding Corporation, China), Zhang Pengyi (Systems Engineering Research Institute of China State Shipbuilding Corporation, China), and Li Xing (Systems Engineering Research Institute of China State Shipbuilding Corporation, China)</i>	

## Communication Awareness and Computing

A Method for Reducing PAPR of OTFS Radar Communication Integrated Signal .....	567
<i>Xiaoke Shang (Jiangsu University of Science and Technology, China), Zhenkai Zhang (Jiangsu University of Science and Technology, China), Yue Xiao (Jiangsu University of Science and Technology, China), and Yi Yang (Wuhan Maritime Communication Research Institute, China)</i>	
Design and Implementation of Signal Processing System for Two-Dimensional Electric Scanning Radar .....	573
<i>Ziye Wang (Nanjing University of Science and Technology, P. R. China), Renhong Xie (Nanjing University of Science and Technology, P. R. China), Zongmin Liu (Nanjing University of Science and Technology, P. R. China), Weilin Wang (Nanjing University of Science and Technology, P. R. China), Yongnan Zhou (Nanjing University of Science and Technology, P. R. China), Xiaoyan Liu (Nanjing University of Science and Technology, P. R. China), Peng Li (Nanjing University of Science and Technology, P. R. China), and Yibin Rui (Nanjing University of Science and Technology, P. R. China)</i>	
Joint Radar Node Scheduling and Resource Assignment in Radar Network for Multi-Target Tracking under Spectrum Coexistence .....	579
<i>Jing Dong (Nanjing Univ. Aeronaut. Astronaut, China), Chenguang Shi (Nanjing Univ. Aeronaut. Astronaut Nanjing, China), Wangyang Yu (Wuhan Maritime Communication Research Institute, China), Jianjiang Zhou (Nanjing Univ. Aeronaut. Astronaut, China), and Junkun Yan (Xidian University, China)</i>	



Improved Tensor-Based Near-Field Target Localization Method in Bistatic MIMO Radar .....	585
<i>Ningbo Xie (Guilin University of Electronic Technology, China), Shan Ouyang (Guilin University of Electronic Technology, China), Kefei Liao (Guilin University of Electronic Technology, China), and Junzheng Jiang (Guilin University of Electronic Technology, China)</i>	
Root-Music Harmonic Analysis Joint Multiple Regression: DOA Estimation Applied to Millimeter Wave FMCW Radar .....	591
<i>Yuqian Mao (Nanjing University of Aeronautics and Astronautics, China), Gong Zhang (Nanjing University of Aeronautics and Astronautics, China), Cenyang Xu (Nanjing University of Aeronautics and Astronautics, China), and Ziyi Xiao (Nanjing University of Aeronautics and Astronautics, China)</i>	
PAPR Suppression for OFDM Integrated Radar and Communication System Based on PTS—Improved Clipping .....	595
<i>Yao Song (Jiangsu University of Science and Technology, China) and Biao Jin (Jiangsu University of Science and Technology, China)</i>	
Angle Estimation for Bistatic MIMO Radar with Prior Range-Sum Information .....	599
<i>Ben Niu (Xidian University, China) and Yongbo Zhao (Xidian University, China)</i>	

## Communication System and Network Resource Management

Block Space-Time coding for Underwater Optical Massive MIMO System .....	605
<i>Jielin Fu (Guilin University of Electronic Technology, China), Kongliang Zhu (Guilin University of Electronic Technology, China), Yanlong Li (Guilin University of Electronic Technology, China), Yvtong Jiang (Guilin University of Electronic Technology, China), and Xiao Chen (Guilin University of Electronic Technology, China)</i>	
A Low Complexity Algorithm of Beamforming Optimization for IRS-Assisted MIMO Systems .....	611
<i>Chuangqi Shi (Jiangsu University of Science and Technology, China), Yajun Wang (Jiangsu University of Science and Technology, China), Shuang Liu (Jiangsu University of Science and Technology, China), and Shanjie Cai (Jiangsu University of Science and Technology, China)</i>	
Power Allocation for Non-Coherent Multi-Carrier FSK Underwater Acoustic Communication Systems with Uneven Transmission Source Level .....	616
<i>Yunfei Zhao (Xiamen University, China), Lei Wan (Xiamen University, China), Yougan Chen (Xiamen University, China), En Cheng (Xiamen University, China), Feng Xu (Wuhan Second Ship Design and Research Institute, China), and Lei Liang (Xiamen University, China)</i>	
A Frequency Invariant Broadband Beamformer Based on Directional Microphone Array .....	623
<i>Ruidong Fang (Zhejiang Dahua Technology CO. LTD, China), Han Xue (Zhejiang Dahua Technology CO. LTD, China), Jingbiao Huang (Zhejiang Dahua Technology CO. LTD, China), Jucai Lin (Zhejiang Dahua Technology CO. LTD, China), Tingwei Chen (Zhejiang Dahua Technology CO. LTD, China), Jun Yin (Zhejiang Dahua Technology CO. LTD, China), Yapeng Mao (Zhejiang Dahua Technology CO. LTD, China), and Weizhen Huang (Zhejiang Dahua Technology CO. LTD, China)</i>	

Power Allocation Algorithm Considering Qos and Max-min Fairness in Single-Beam UVLC System.... 628

*Jianzhao Wang (Ministry of Education Key Laboratory of Cognitive Radio and Information Processing, China), Junyi Wang (Ministry of Education Key Laboratory of Cognitive Radio and Information Processing, China), Yanlong Li (Ministry of Education Key Laboratory of Cognitive Radio and Information Processing, China), Yvtong Jiang (Ministry of Education Key Laboratory of Cognitive Radio and Information Processing, China), and Xiao Chen (Ministry of Education Key Laboratory of Cognitive Radio and Information Processing, China)*

Electromagnetic Exposure Aware RSMA for Multiuser Massive MIMO Uplink ..... 634

*Hanyu Jiang (Southeast University, China), Li You (Southeast University, China), Ahmed Elzanaty (University of Surrey, United Kingdom), Jue Wang (Nantong University, China), Wenjin Wang (Southeast University, China), Xiqi Gao (Southeast University, China), and Mohamed-Slim Alouini (King Abdullah University of Science and Technology, Saudi Arabia)*

Study on Hybrid Encryption Technology of Power Gateway Based on AES and RSA Algorithm .... 640

*Bowen Zhang (Jiangsu University of Science and Technology, China), Guojun Ma (Jiangsu University of Science and Technology, China), XiaoCheng Lu (Jiangsu Sferic Electric Co, Ltd, China), and Wenzhuan Xu (Jiangsu Sferic Electric Co, Ltd, China)*

Research on Power Allocation of MIMO-NOMA in Multi-Beam Space Division Multiple Access for Underwater Optical Communication ..... 645

*Yanlong Li (Zhejiang University, China), Yutong Jiang (Guilin University of Electronic Technology, China), and Jianzhao Wang (Guilin University of Electronic Technology, China)*

Research on Variance-Based FCME Anti-Jaming Algorithm in Spaceborne OFDM System ..... 651

*Wei Wang (Beijing Institute of Technology, China), Yin Huang (Beijing Institute of Remote Sensing Equipment, China), Zhijie Wu (Beijing Institute of Remote Sensing Equipment, China), Yongqing Liu (China Institute of Sport Science, China), and Hangcheng Han (Beijing Institute of Technology, China)*

A LEACH Energy Consumption Equilibrium Optimization Method Based on Multiple Influencing Factors ..... 657

*Hao Wu (Jiangsu University of Science and Technology, China) and Jin Zhu (Jiangsu University of Science and Technology, China)*

## **Channel Estimation and Coding**

Measurements and Analysis of Fading Characteristics for Narrow-Beam Channel in Vehicle-to-Infrastructure Scenarios ..... 662

*Wenliang Zhang (Beijing Jiaotong University, China), Tao Zhou (Beijing Jiaotong University, China), and Liu Liu (Beijing Jiaotong University, China)*

Impact of UAV Wobbling on the Air-to-Terrestrial Wireless Communication Channels in Various Frequency Bands .....	667
<i>Hongjie Shen (Jiangsu University of Sci. and Tech., China), Qi Wang (Jiangsu University of Sci. and Tech., China), Shang Gao (Jiangsu University of Sci. and Tech., China), and Hualong Yu (Jiangsu University of Sci. and Tech., China)</i>	
The Computational Complexity Reduced Effectively in the Channel Estimation Process .....	674
<i>Mingxing Zhou (Panda Electronics Group Co., Ltd, China), Wei Jian (Panda Electronics Group Co., Ltd, China), and Fengzhi Wang (Panda Electronics Group Co., Ltd, China)</i>	
Research on Adaptive Key Generation Method based on Phase Characteristics of Wireless Channel .....	679
<i>Qiliang Zhang (Jiangsu University of Science and Technology, China), You Wu (Jiangsu University of Science and Technology, China), Songping Wang (Jiangsu University of Science and Technology, China), Weishun Tang (Jiangsu University of Science and Technology, China), and Xiaoyang Zhu (Jiangsu University of Science and Technology, China)</i>	
Joint Source Channel Symbol Level En/Decoding Based on Space Computational Intelligence Policy Trellis .....	683
<i>Guofang Tu (The High Technology Research Institute of Binzhou Wei Qiao Guoke, China), Can Zhang (University of Chinese Academy of Sciences, China), Shaoshuai Gao (University of Chinese Academy of Sciences, China), and Peng Gao (The High Technology Research Institute of Binzhou Wei Qiao Guoke, China)</i>	

## Track Tracking and Positioning Technology

Precise method for U-Array orientation based on split beam .....	688
<i>Ya-nan Xu (Hangzhou Applied Acoustic Research Institute, China), Cong Yu (Hangzhou Applied Acoustic Research Institute, China), Yaqin Liu (Hangzhou Applied Acoustic Research Institute, China), Yan Liu (Hangzhou Applied Acoustic Research Institute, China), and Hengguang Li (Hangzhou Applied Acoustic Research Institute, China)</i>	
Algorithm for Optimal Receiver Placement of External Radiation Source UAV Detection System....	695
<i>Qi Dong (Nanjing University, China), Mengye Qiang (State grid wuxi electric power supply company, China), and Yechao Bai (Nanjing University, China)</i>	
UAV Formation Trajectory Planning for Reconnaissance and Positioning Missions .....	700
<i>Yixi Ji (Xidian University, China), Yufei Chen (Xidian University, China), Junkun Yan (Xidian University, China), and Yongkun Wang (AVIC LEIHUA Electronic Technology Institute, China)</i>	

# AI Based Computing Model and Algorithm

ABCМ: A Patent Classification Model Based on Pretrained Language Models with Imbalanced Data .....	706
<i>Liang Deng (University of Chinese Academy of Sciences, China National Intellectual Property Administration, China), Zhenlong Liu (Institute of Computing Technology, Chinese Academy of Sciences, China), Luchen Zhang (National Computer Network Emergency Response Technical Team/Coordination Center of China, China), Panhu Qi (Institute of Computing Technology, Chinese Academy of Sciences, China), and Jingxin Li (Institute of Computing Technology, Chinese Academy of Sciences, China)</i>	
Impact of Extreme Class-Imbalance on Landslide-Risk Prediction and Mitigation Using Two-Stage Deep Neural Network .....	712
<i>N. Tengtrairat (Payap University, Thailand), W. L. Woo (Northumbria University, UK), P. Parathai (Payap University, Thailand), C. Sundaranaga (Chiang Mai University, Thailand), T. Kridakorn Na Ayutthaya (Chiang Mai University, Thailand), and D. Rinchumphu (Chiang Mai University, Thailand)</i>	
OPTICS-Based Passive Tracking Algorithm for High Maneuvering Targets .....	720
<i>Jun Chen (Nanjing University of Information Science and Technology, China), Fei Wang (Nanjing University of Aeronautics and Astronautics, China), Yi Ding (Nanjing University of Information Science and Technology, China), and Lei Wei (Nanjing University of Information Science and Technology, China)</i>	
MCQG: Multitask Approach for Chinese Question Generation and Question Answering .....	726
<i>Liang Deng (University of Chinese Academy of Science, China), Jingxin Li (Chinese Academy of Sciences, China), Panhu Qi (Chinese Academy of Sciences, China), Zhenlong Liu (Chinese Academy of Sciences, China), and Luchen Zhang (National Computer Network Emergency Response Technical Team/Coordination Center of China, China)</i>	
Ship Trajectory Prediction Based on ST-LSTM .....	730
<i>Guo Qiang (Jiangsu University of Science and Technology, China) and Wu You (Jiangsu University of Science and Technology, China)</i>	
Hydrometeor Classification for Dual Polarization Weather Radar Based on SE-ResNeXt Combined with SVM .....	736
<i>Zehu Luo (Nanjing University of Aeronautics and Astronautics, China), Xudong Wang (Nanjing University of Aeronautics and Astronautics, China), Guiguang Xu (Nanjing University of Aeronautics and Astronautics, China), and Yongxing Gao (Nanjing University of Aeronautics and Astronautics, China)</i>	
Robust Dual Target Range Estimation Method of Vertical Array Using Residual Convolution Neural Network .....	742
<i>Qihai Yao (Northwestern Polytechnical University, China), Yong Wang (Northwestern Polytechnical University, China), and Yixin Yang (Northwestern Polytechnical University, China)</i>	

Digital Twin-Driven Approach for Marine Transformer State Predication .....	748
<i>Jun Li (Marine Design &amp; Research Institute of China, China), Minjia Tan (Nanjing University of Science and Technology, China), Yifei Yang (Jiangsu University of Science and Technology, China), Yue Pan (Jiangsu University of Science and Technology, China), and Wenjie Zuo (Lianyungang branch of China Mobile Communications Group Jiangsu Co, Ltd, China)</i>	
An Improved Convolution Algorithm of Cylinder String Based on Unified Coordinate System .....	754
<i>Ziting Fan (Beijing Institute of Technology, China), Yuxin Lei (Beijing Institute of Technology, China), Jun Zhang (Beijing Institute of Technology, China), Ruijie Yang (Peking University Third Hospital, China), and Junhai Wen (Beijing Institute of Technology, China)</i>	

## Computer Vision and Signal Processing

A Feedback Learning Segmentation Algorithm for Medical Images of Breast Cancer Incorporating Attention Mechanism .....	760
<i>Lu Qiu (Guilin University of Technology, China), Zhang Yunlei (Guilin University of Technology, China), Shao Huaze (Guilin University of Technology, China), and Huang Lin (Guilin University of Technology, China)</i>	
SSIGAN: Semantic Segmentation via Improved Generative Adversarial Network .....	768
<i>Mengxu Lu (Shandong University, China), Zhenxue Chen (Shandong University, China), Hao Qin (Shandong University, China), Yujiao Zhang (Shandong University, China), and Jingjing Ji (Huazhong University of Science and Technology, China)</i>	
Research on State Recognition of Rubik's Cube Based on Monocular Vision .....	777
<i>Mihang Wang (Hangzhou Dianzi University, China), Yigang Wang (Hangzhou Dianzi University, China), Qing Shi (Hangzhou Dianzi University, China), and Shi Li (Hangzhou Dianzi University, China)</i>	
A Fusion Location Method for Unmanned Vehicle (UMV) Based on Unscented Kalman Filter .....	781
<i>De Kun Tan (Nanchang Institute of Technology, China) and Zhe Yang (Nanchang Institute of Technology, China)</i>	
Satellite Video Stabilization Method Based on Global Motion Consistency .....	787
<i>Ming Li (Information Engineering University, China), Dazhao Fan (Information Engineering University, China), and Guanghan Chu (Information Engineering University, China)</i>	
Lightweight YOLOv4 Algorithm for Remote Sensing Image Detection .....	793
<i>Li Ma (Liaoning University, China), Tong He (Liaoning University, China), Yong Sun (Liaoning University, China), and Bin-Bin Hu (Liaoning University, China)</i>	
Single Image Super-Resolution Based on Enhanced Residual Neural Network .....	798
<i>Jie Zhao (Shandong University, China; China Mobile (Hangzhou) Information Tech Co Ltd China Mobile Comm Corp, China), Zhenxue Chen (Shandong University, China; Shenzhen Research Institute of Shandong University, China), Chengyun Liu (Shandong University, China), Yue Yang (Shandong University, China), Mengting Ye (Shandong University, China), and Yujiao Zhang (Shandong University, China)</i>	

Research on the Decision-Making Method of Civil Aviation Airport Safety Risk Early Warning Based on Data Mining Technology .....	804
<i>Diange Sun (China University of Labor Relations, China) and Yang Zhuang (Ministry of Emergency Management, China)</i>	

## **Application of Virtual Technology in Information System Development**

Evaluating Immersive Animation Authoring in an Industrial VR Training Context .....	809
<i>Jesper Gaarsdal (SynergyXR ApS, Denmark), Sune Wolff (SynergyXR ApS, Denmark), and Claus B. Madsen (Aalborg University, Denmark)</i>	

Human 3D Avatar Modeling with Implicit Neural Representation: A Brief Survey .....	818
<i>Mingyang Sun (Fudan University, China), Ding kang Yang (Fudan University, China), Dongliang Kou (Fudan University, China), Yang Jiang (Fudan University, China), Weihua Shan (Huawei Cloud Computing Technologies Co., Ltd, China), Zhe Yan (Huawei Cloud Computing Technologies Co., Ltd, China), and Lihua Zhang (Fudan University, China)</i>	

DTMR: Industrial Digital Twin Architecture for New Production Line Design in Mixed Reality Environment .....	828
<i>Jinjun Xia (Chongqing University, China), Ting Jin (Chongqing University, China), and Lingjie Fan (Sichuan University, China)</i>	

Development and Implementation of Changchun University Virtual History Museum Roaming Interactive System .....	837
<i>He Yu (Changchun University, China), Jiexi Chen (Changchun University, China), Reika Sato (Osaka Electro-Communication University, Japan), Rong Cui (Changchun University, China), Xiaorui Cao (Changchun University, China), and Shengyu Liu (Changchun University, China)</i>	

Functional-Penetrated Interactive System towards Virtual-Real Fusion Environments .....	842
<i>Dongdong Weng (Beijing Institute of Technology, China), Wenjie He (Beijing Institute of Technology, China), Shushan Guo (Beijing Near Space Airship Technology Development Co., LTD, China), and Dong Li (Beijing Institute of Technology, China)</i>	

User Experience Analysis and Research of Virtual Reality Digital Museum .....	851
<i>Youwen Wu (Xi'an Jiaotong-Liverpool University, China)</i>	

<b>Author Index</b> .....	<b>857</b>
---------------------------	------------