

电子与信息学报

DIANZI YU XINXI XUEBAO

第 48 卷 第 3 期

2026 年 3 月

目 次

卓越领军专栏

低空物联网架构、安全与优化关键技术 王云涛, 苏 洲, 高 源, 巴建乐 (889)

智慧医疗与工程创新专题

视觉诱发响应研究中EEG与fMRI联合应用方法综述 危志伟, 肖晓琳, 许敏鹏, 明 东 (914)

利用智能手机采集心音分析的肥厚型心肌病合并射血分数保留心衰的辅助筛查
... 董先鹏, 孟祥彬, 张 阔, 房冠辰, 盖威嵩, 王文尧, 汪京嘉, 高 峻, 潘俊君, 唐振超, 宋 震 (925)

整合血浆蛋白质组与全基因组关联研究鉴定呼吸系统疾病新型药物靶标 马昕茜, 倪文涛 (936)

面向稀疏辐射观测的无监督三维医学图像分割方法
..... 俞晓帆, 邹兰兰, 顾文琦, 蔡 君, 康 彬, 丁 康 (947)

融合客户端动态筛选的联邦半监督影像分割 刘振丙, 李焕兰, 王报源, 路皓翔, 潘细朋 (960)

融合表示学习和知识图谱推理的糖尿病及并发症预测方法
..... 王宇翔, 黄叶琪, 李青远, 刘 云, 景慎旗, 单 涛, 郭永安 (971)

Wave-MambaCT: 基于小波Mamba的低剂量CT伪影抑制方法
..... 崔学英, 王宇航, 刘 斌, 上官宏, 张 雄 (982)

联合掩码引导与多频域双重注意力机制的急性缺血性脑卒中CT到DWI影像生成模型
..... 张泽华, 赵 宁, 王 帅, 王 璇, 郑 强 (994)

动态小波多向感知与几何轴解引导三维CT骨折图像分割
..... 张印辉, 刘 凯, 何自芬, 张金凯, 陈光晨, 马志坚 (1005)

融合记忆力和自注意力机制的脑电图情绪识别模型 刘善锐, 闭应洲, 霍雷刚, 甘秋静, 周淑姮 (1017)

智能辅助诊断系统云边大模型协同推理框架与算法研究
..... 何 倩, 朱 磊, 李 功, 游正朋, 袁 磊, 贾 斐 (1027)

隐私保护的联邦弱监督组织病理学亚型分类方法 王钰萌, 刘振丙, 刘再毅 (1036)

DeepSeek-V3.1和ChatGPT-5在结直肠癌肝转移多学科团队诊疗中的应用比较
..... 张扬子, 许 婷, 高兆亚, 司振铎, 徐蔚然 (1047)

因果推理引导的KAN注意力脑肿瘤分类框架 樊亚文, 王 翔, 岳 震, 俞晓帆 (1056)

原发性肺非霍奇金淋巴瘤的新型预后模型建立与疗效分析
..... 李 辉, 李建成, 刘 锋, 吴 迪, 陈传本, 李金奎 (1067)

面向中医结构化大模型的记忆约束剪枝方法 陆家发, 唐 凯, 张国明, 俞晓帆, 顾文琦, 李 卓 (1077)

雷诺定受体建模: 从心肌钙循环到心律失常机制 高 颖, 张宇澄, 王文尧, 苏焯怡, 宋 震 (1087)

基于多源遗传信息的临床疾病风险评估系统 宁开达, 余正阳, 赵 鑫, 李梓妍, 代 菊, 夏 立 (1105)

面向病理图像弱监督分类的层级融合多实例学习方法
... 陈晓禾, 张甲昂, 李玲芝, 李桂秀, 欧紫蓉, 鲍月华, 刘欣欣, 虞秋辰, 马雨涵, 赵可喻, 白 华 (1116)

基于注意力机制的轻量级双卷积手指静脉识别网络 赵冰艳, 梁义怀, 张中霞, 张文政 (1128)

国内大型语言模型作为癌症患者教育工具的效果评价 张俊丽, 徐蔚然, 王 钊 (1139)

分体式架构的心脏磁共振成像非接触光学心振触发系统设计	高钱楠, 张佳宇, 朱银根, 王文锦, 纪建松, 纪晓悦 (1146)
扩散生成式数据赋能ECG病理信号分类研究	葛贝宁, 陈 诺, 金 鹏, 苏 新, 陆晓春 (1157)
面向大语言模型的医学图像语义挖掘跨模态哈希	刘青海, 吴钱林, 罗 佳, 唐 伦, 徐黎明 (1167)
综述评论	
加密流量智能化分析技术: 现状、进展与挑战	龚 碧, 刘 建, 唐小妹, 于美婷, 龚 航, 黄美根 (1180)
图像与智能信息处理	
面向掌纹识别的多尺度感兴趣区域特征融合机制	马宇轩, 张飞飞, 李光辉, 唐 鑫, 董正阳 (1198)
CaRS-Align: 通道关系谱对齐的跨模态车辆再辨识方法	萨百慧, 庄靖怡, 郑锦杰, 朱建清 (1208)
一种多尺度时空相关注意力与状态空间建模的降水临近预报方法	郑 辉, 陈 富, 何舒平, 邱学兴, 朱红芳, 王少华 (1219)
多无人机射频信号CNN Triplet-DNN异构网络特征提取与机型识别	赵 慎, 李广选, 周鲜成, 黄雯蒂, 杨玲玲, 高丽萍 (1230)
电路与系统设计	
完全可编程阀门阵列生物芯片下考虑单元复用中试剂种类差异的组件布局算法	许彦博, 朱予涵, 黄 兴, 刘耿耿 (1241)
面向多节串联电池组的低漏电流电压采样方法研究	郭仲杰, 高宇洋, 董建锋, 白若楷 (1252)
面向电池防伪的混合型PUF标签生成技术	贺章擎, 罗思雨, 张军明, 张 寅, 万美琳 (1262)
基于单磁体的双路强流相对论电子束的产生与优化研究	安晨翔, 霍少飞, 史彦超, 翟永贵, 肖仁珍, 陈昌华, 陈 坤, 黄慧杰, 申留洋, 罗凯文, 王洪广, 李雨晴 (1271)
脉动阵列协同层融合的卷积神经网络加速器设计	卢 迪, 王振发 (1280)
加载人工磁导体的三频可穿戴天线	靳 彬, 张佳琳, 杜成珠, 褚 君 (1292)
小型化宽阻带折叠基片集成波导滤波器研究	柯榕杰, 王洪斌, 程钰间 (1301)
密码学与网络信息安全	
改进的全轮HALFLOOP-48相关调柄攻击	孙晓萌, 张文英, 苑兆忠 (1311)
一类双阶扭曲广义里德-所罗门码及其扩展码	程鸿丽, 朱士信 (1322)
嵌套多芒星的全着色	苏榕进, 方 刚, 朱恩强, 许 进 (1333)
无线通信与物联网	
智能反射面通信近邻互耦模型与可调阻抗优化方法	吴 炜, 王文鼎 (1343)
高效侧信道分析: 从协同去噪到自适应B样条降维 ...	罗玉玲, 徐海洋, 欧阳雪, 付 强, 秦 圣, 刘俊秀 (1354)
时空约束下优选近邻指纹定位算法	王逸帆, 孙顺远, 秦宁宁 (1366)
雷达、水声、导航、阵列信号处理	
基于非均匀四线性自相关函数的二次调频信号检测与参数估计	杨宇超, 方 刚 (1377)
地磁背景下磁异常空间延拓的优化多层等效源方法	管 宇, 张慧强 (1390)

JOURNAL OF ELECTRONICS & INFORMATION TECHNOLOGY

Vol.48 No.3 March 2026

CONTENTS

Excellence Action Plan Leading Column

- Key Technologies for Low-Altitude Intelligent Networks: Architecture, Security, and Optimization (889)
..... WANG Yuntao, SU Zhou, GAO Yuan, BA Jianle

Special Topic on Smart Healthcare and Engineering Innovation

- A Review of Joint EEG-fMRI Methods for Visual Evoked Response Studies (914)
..... WEI Zhiwei, XIAO Xiaolin, XU Minpeng, MING Dong
- Auxiliary Screening for Hypertrophic Cardiomyopathy With Heart Failure with Preserved Ejection Fraction Utilizing Smartphone-Acquired Heart Sound Analysis (925)
..... DONG Xianpeng, MENG Xiangbin, ZHANG Kuo, FANG Guanchen, GAI Weihao, WANG Wenyao, WANG Jingjia, GAO Jun, PAN Junjun, TANG Zhenchao, SONG Zhen
- Identification of Novel Protein Drug Targets for Respiratory Diseases by Integrating Human Plasma Proteome with Genome (936)
..... MA Xinqian, NI Wentao
- Unsupervised 3D Medical Image Segmentation With Sparse Radiation Measurement (947)
..... YU Xiaofan, ZOU Lanlan, GU Wenqi, CAI Jun, KANG Bin, DING Kang
- Federated Semi-Supervised Image Segmentation with Dynamic Client Selection (960)
..... LIU Zhenbing, LI Huanlan, WANG Baoyuan, LU Haoxiang, PAN Xipeng
- Integrating Representation Learning and Knowledge Graph Reasoning for Diabetes and Complications Prediction (971)
..... WANG Yuao, HUANG Yeqi, LI Qingyuan, LIU Yun, JING Shenqi, SHAN Tao, GUO Yongan
- Wave-MambaCT: Low-dose CT Artifact Suppression Method Based on Wavelet Mamba (982)
..... CUI Xueying, WANG Yuhang, LIU Bin, SHANGGUAN Hong, ZHANG Xiong
- Joint Mask and Multi-Frequency Dual Attention GAN Network for CT-to-DWI Image Synthesis in Acute Ischemic Stroke (994)
..... ZHANG Zehua, ZHAO Ning, WANG Shuai, WANG Xuan, ZHENG Qiang
- Dynamic Wavelet Multi-Directional Perception and Geometry Axis-Solution Guided 3D CT Fracture Image Segmentation (1005)
..... ZHANG Yinhui, LIU Kai, HE Zifen, ZHANG Jinkai, CHEN Guangchen, MA Zhijian
- An EEG Emotion Recognition Model Integrating Memory and Self-attention Mechanisms (1017)
..... LIU Shanrui, BI Yingzhou, HUO Leigang, GAN Qiuqing, ZHOU shuheng
- Research on Collaborative Reasoning Framework and Algorithms of Cloud-Edge Large Models for Intelligent Auxiliary Diagnosis Systems (1027)
..... HE Qian, ZHU Lei, LI Gong, YOU Zhengpeng, YUAN Lei, JIA Fei
- Privacy-Preserving Federated Weakly-Supervised Learning for Cancer Subtyping on Histopathology Images (1036)
..... WANG Yumeng, LIU Zhenbing, LIU Zaiyi
- Comparison of DeepSeek-V3.1 and ChatGPT-5 in Multidisciplinary Team Decision-making for Colorectal Liver Metastases (1047)
..... ZHANG Yangzi, XU Ting, GAO Zhaoya, SI Zhenduo, XU Weiran
- A Causality-Guided KAN Attention Framework for Brain Tumor Classification (1056)
..... FAN Yawen, WANG Xiang, YUE Zhen, YU Xiaofan
- A Novel Prognostic Model Establishment and Treatment Efficacy Analysis for Primary Pulmonary Non-Hodgkin's Lymphoma (1067)
..... LI Hui, LI Jiancheng, LIU Feng, WU Di, CHEN Chuanben, LI Jinluan
- A Study on Lightweight Method of TCM Structured Large Model Based on Memory-Constrained Pruning (1077)
..... LU Jiafa, TANG Kai, ZHANG Guoming, YU Xiaofan, GU Wenqi, LI Zhuo
- Progress in Modeling Cardiac Myocyte Calcium Cycling and Investigating Arrhythmia Mechanisms: A Study Focused on the Ryanodine Receptor (1087)
..... GAO Ying, ZHANG Yucheng, WANG Wenyao, SU Xuanyi, SONG Zhen
- Clinical Disease Risk Assessment System Based on Multi-source Genetic Information (1105)
..... NING Kaida, YU Zhengyang, ZHAO Xin, LI Ziyuan, DAI Ju, XIA Li
- Hierarchical Fusion Multi-Instance Learning for Weakly Supervised Pathological Image Classification (1116)
..... CHEN Xiaohe, ZHANG Jiaang, LI Lingzhi, LI Guixiu, OU Zirong, BAO Yuehua, LIU Xinxin, YU Qiuchen, MA Yuhan, ZHAO Keyu, BAI Hua

(To be continued on inside back cover)

(Continued)

Lightweight Dual Convolutional Finger Vein Recognition Network Based on Attention Mechanism	(1128)
..... ZHAO Bingyan, LIANG Yihuai, ZHANG Zhongxia, ZHANG Wenzheng	
Evaluation of Domestic Large Language Models as Educational Tools for Cancer Patients	(1139)
..... ZHANG Junli, XU Weiran, WANG Zhao	
Split-architecture Non-contact Optical Seismocardiography Triggering System for Cardiac Magnetic Resonance Imaging	(1146)
..... GAO Qiannan, ZHANG Jiayu, ZHU Yingen, WANG Wenjin, JI Jiansong, JI Xiaoyue	
Research on ECG Pathological Signal Classification Empowered by Diffusion Generative Data	(1157)
..... GE Beining, CHEN Nuo, JIN Peng, SU Xin, LU Xiaochun	
Cross Modal Hashing of Medical Image Semantic Mining for Large Language Model	(1167)
..... LIU Qinghai, WU Qianlin, LUO Jia, TANG Lun, XU Liming	

Overviews

Intelligent Analysis Technologies for Encrypted Traffic: Current Status, Advances, and Challenges	(1180)
..... GONG Bi, LIU Jian, TANG Xiaomei, YU Meiting, GONG Hang, HUANG Meigen	

Image and Intelligent Information Processing

Multi-Scale Region of Interest Feature Fusion for Palmprint Recognition	(1198)
..... MA Yuxuan, ZHANG Feifei, LI Guanghui, TANG Xin, DONG Zhengyang	
CaRS-Align: Channel Relation Spectra Alignment for Cross-Modal Vehicle Re-identification	(1208)
..... SA Baihui, ZHUANG Jingyi, ZHENG Jinjie, ZHU Jianqing	
A Multi-scale Spatiotemporal Correlation Attention and State Space Modeling-based Approach for Precipitation Nowcasting	(1219)
..... ZHENG Hui, CHEN Fu, HE Shuping, QIU Xuexing, ZHU Hongfang, WANG Shaohua	
Multi-UAV RF Signals CNN/Triplet-DNN Heterogeneous Network Feature Extraction and Type Recognition	(1230)
..... ZHAO Shen, LI Guangxuan, ZHOU Xiancheng, HUANG Wendi, YANG Lingling, GAO Liping	

Circuit and System Design

Component Placement Algorithm Considering Reagent Type Differences in Cell Reuse for FPVA Biochips	(1241)
..... XU Yanbo, ZHU Yuhan, HUANG Xing, LIU Gengeng	
Research on Low Leakage Current Voltage Sampling Method for Multi-cell Series Battery Packs	(1252)
..... GUO Zhongjie, GAO Yuyang, DONG Jianfeng, BAI Ruokai	
Hybrid PUF Tag Generation Technology for Battery Anti-counterfeiting	(1262)
..... HE Zhangqing, LUO Siyu, ZHANG Junming, ZHANG Yin, WAN Meilin	
Research on Generation and Optimization of Dual-channel High-current Relativistic Electron Beams Based on a Single Magnet	(1271)
..... AN Chenxiang, HUO Shaofei, SHI Yanchao, ZHAI Yonggui, XIAO Renzhen, CHEN Changhua, CHEN Kun, HUANG Huijie, SHEN Liuyang, LUO Kaiwen, WANG HongGuang, LI YuQing	
Design of a CNN Accelerator Based on Systolic Array Collaboration with Inter-Layer Fusion ...	(1280)
..... LU Di, WANG Zhen Fa	
Tri-Frequency Wearable Antenna Loaded with Artificial Magnetic Conductors	(1292)
..... JIN Bin, ZHANG Jialin, DU Chengzhu, CHU Jun	
Research on a Miniaturized Wide Stopband Folded Substrate Integrated Waveguide Filter	(1301)
..... KE Rongjie, WANG Hongbin, CHENG Yujian	

Cryption and Network Information Security

Improved Related-tweak Attack on Full-round HALFLOOP-48 ...	(1311)
..... SUN Xiaomeng, ZHANG Wenyong, YUAN Zhaozhong	
A Class of Double-twisted Generalized Reed-Solomon Codes and Their Extended Codes ...	(1322)
..... CHENG Hongli, ZHU Shixin	
Total Coloring on Planar Graphs of Nested n -Pointed Stars	(1333)
..... SU Rongjin, FANG Gang, ZHU Enqiang, XU Jin	

Wireless Communication and Internet of Things

Neighboring Mutual-Coupling Channel Model and Tunable-Impedance Optimization Method for Reconfigurable-Intelligent-Surface Aided Communications	(1343)
..... WU Wei, WANG Wennai	
High-Efficiency Side-Channel Analysis: From Collaborative Denoising to Adaptive B-Spline Dimension Reduction	(1354)
..... LUO Yuling, XU Haiyang, OUYANG Xue, FU Qiang, QIN Sheng, LIU Junxin	
Spatio-Temporal Constrained Refined Nearest Neighbor Fingerprinting Localization	(1366)
..... WANG Yifan, SUN Shunyu, QIN Ningning	

Radar, Sonar, Navigation and Array Signal Processing

Detection and Parameter Estimation of Quadratic Frequency Modulated Signal Based on Non-uniform Quadrilinear Autocorrelation Function	(1377)
..... YANG Yuchao, FANG Gang	
An Optimized Multi-Layer Equivalent Source Method for Spatial Continuation of Magnetic Anomalies in the Geomagnetic Background	(1390)
..... GUAN Yu, ZHANG Huiqiang	