

# **2024 6th International Conference on Industrial Artificial Intelligence (IAI 2024)**

**Shenyang, China  
21-24 August 2024**



**IEEE Catalog Number: CFP24T69-POD  
ISBN: 979-8-3503-5662-5**

**Copyright © 2024 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:	CFP24T69-POD
ISBN (Print-On-Demand):	979-8-3503-5662-5
ISBN (Online):	979-8-3503-5661-8

**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)

## TABLE OF CONTENTS

Spatial-Temporal Graph Fusion Transformer for Long-term Water Quality Prediction.....	1
<i>Ziqi Wang, Xiangxi Wu, Xingyang Chang, Renren Wu, Jing Bi, Junfei Qiao</i>	
Networked Control System: Development and Prospect.....	7
<i>Yu Xiyan, Tian Zhongda</i>	
Task Allocation and Path Planning for Multiple Destinations Oriented Towards Task Updates .....	13
<i>Yong Yang, Dingxin He, Huantao Mao, Hong Chen, Hongtao Wu, Zhi-Wei Liu</i>	
DRL-Based Resource Scheduling for Control System in Heterogeneous Environment .....	19
<i>Yuhao Liu, Yuqing Ni, Jun Chen, Fei Liu</i>	
Global Prescribed Performance Control of MIMO Nonlinear Systems .....	25
<i>Yun-Qi Liu, Jin-Xi Zhang</i>	
Penetration-Free Collision Detection and Response Algorithm Based on Extended Position-Based Dynamics.....	30
<i>Minghui Wang, Fan Ding, Chengye Liao, Yangyang Pan, Tao Yang, Jianping He</i>	
A Motion Intent Recognition Method Based on Dynamic Feature Fusion and Multi-Stream TCN.....	36
<i>Jianfeng Chen, Xing Li, Fujie Wang, Yuxuan Zhu</i>	
The Experimental Research on Off-Axis Digital Holography Recording and Reconstruction Based on MATLAB Simulation .....	42
<i>Yucheng Li, Yang Zhang</i>	
Energy-Saving Control of Air Conditioning Water System Based on Improved NSGA-II Algorithm.....	48
<i>Yangrui Gong, Xiangshun Li, Xu Zhang, Yi Liu, Boya Qin, Huibin Li, Qijing Kong</i>	
Multitarget Robust Deep Stochastic Configuration Network Parameter Modeling Method .....	54
<i>Kaicheng Hu, Aijun Yan</i>	
A New Robust Learning Algorithm for Ordinary Differential Equation Network .....	59
<i>Chao Gao, Dasong Wang, Yiping Wang, Kai Sun, Peng Ji</i>	
Sensor Fault Estimation Based on Dynamic Event-Triggered Mechanism and Interval Observer .....	65
<i>Guangyu Sheng, Chao Sun</i>	
Mixup Enhanced Linear Robust Explainable Model for Identifying Key Factors of Surface Defects in Strip Steel Manufacturing.....	71
<i>Jinchuan Qian, Xuerui Zhang, Songyan Pi, Zhihuan Song, Xinmin Zhang</i>	
Fuzzy Neural Networks-Based Intelligent Tracking Control for Flexible-Joint Industry Robotic Manipulator .....	77
<i>Hejia Gao, Yuanyuan Zhao, Zele Yu, Jiakuo Gao, Junjie Ma</i>	
Research Progress and Key Technology Analysis in Cooperative Control of Dual Robots .....	83
<i>Luwei Xu, Wenduan Yan, Yifang Sun, Quanjie Kang, Yue Fu</i>	
HSV Color Space Based Automated Chemical Titrator .....	89
<i>Zhang Bingjie, Song Qing, Xu Lujian, Li Meng, Zhang Juan</i>	

Priors-Informed Machine Learning for Dynamic System Modelling: Mecanum Wheel as an Example.....	95
<i>Jia Chen, Jinya Su, Xisong Chen, Kun Gu, Fuyou Wang, Shihua Li</i>	
Genetic Algorithm for Scheduling of Steelmaking and Continuous Casting Processes Considering Earliness/Tardiness Penalty* .....	101
<i>Weiping Sun, Shixin Liu</i>	
Variable Neighborhood Search for Scheduling of Cold Rolling Annealing Process of Silicon Steel*.....	106
<i>Ying Huang, Shixin Liu</i>	
Incremental Learning Based Broad Canonical Correlation Analysis Network for Industrial Process Monitoring.....	111
<i>Tingting Liu, Jiang Wang, Yangquan Chen, Yanzhu Zhang</i>	
Multi-Objective Optimization of Wastewater Treatment Process Based on Improved Fast Non-Dominated Sorting Algorithm with Hybrid Crossover Operator.....	117
<i>Yuzhen Yang, Yu Hong</i>	
Unsupervised Domain Adaptation for Vision Transformers Based on Prompt Learning .....	123
<i>Yu Hong</i>	
LSTM Parameter Optimization Based on Improved Sparrow Search Algorithm and NSGAII .....	128
<i>Ziwen Zhang, Ruiyao Zhang, P. Zhou</i>	
Wearable Dual-Channel Transcutaneous Acupoint Electrical Stimulator Design .....	134
<i>Mingqian Li, Meng Li, Qing Song, Zhen Li</i>	
Robust UDE-Based Saturated Control for Quadrotors in Waypoint Tracking Flights .....	139
<i>Yanting Li, Yang Zhu, Fei Yan</i>	
Large-Scale Pre-Training Improves Anomaly Detection in Fused Magnesium Smelting Process .....	145
<i>Yapeng Zhang, Gaochang Wu, Tianyou Chai</i>	
Residual Multi-Attention U-Net for Image Segmentation in Heavy Plate Hot Rolling Process .....	151
<i>Geng Zheng, Yulin Ma, Jie Huang, Gaochang Wu</i>	
Batch Process Monitoring with Attention-Based Two-Dimensional Stacked Graph Convolutional Autoencoder .....	157
<i>Xingke Gao, Zheng Zhang, Furong Gao, Jinlin Zhu</i>	
Multi-Level Knowledge Inheritance Graph Neural Network for Tobacco Pest Time-Series Forecasting .....	163
<i>Liming Zhu, Xu Kong, Mingxing Li, Shubiao Li, Youli Wang, Junyu Chang, Xu Chen</i>	
AI-Orchestrated Data-Driven Modelling and Control in Battery Management Systems: A Review.....	169
<i>Xiaofei Han, Kang Li</i>	
Neural Network-Based Adaptive Command Filtered Backstepping Design for Uncertain Second-Order Strict-Feedback Systems .....	176
<i>Yifan Pei, Shuo Wang, Fei Yan</i>	
An Integrated Adversarial Fine-Tuning Method for Improving the Safety of Fault Diagnosis .....	182
<i>Juanru Zhao, Ning Li</i>	

Classification of Steel Strip Surface Defects Based on Depthwise-Separable Convolution and Cross-Scale Feature Fusion .....	188
<i>Xinyu Cao, Benyi Jiang</i>	
Robotic Arm Target Grasping Algorithm Based on Obstacle Removal in Space-Constrained Scenes.....	193
<i>Xinhui Bai, Yuzhe Li</i>	
Research on Joint Optimization of Single Train's Delay Reduction and Energy-Saving Operation Trajectory .....	199
<i>Yunjia Zhang, Dongliang Cui, Jianming Li, Feng Gao, Haijun Zang, Xuewu Dai</i>	
Detection Method for Flotation Tailings Ash Content Based on Regularized Stochastic Configuration Networks Dynamic Compensation.....	205
<i>Zongyang Kou, Qinshan Liu, Lanhai Wang, Xiahui Gui, Wei Dai</i>	
An Alternative Dual Control Approach for Auto-Optimization in Uncertain Environments.....	211
<i>Guoqiang Tan, Wen-Hua Chen, Jun Yang</i>	
Real-Time Caustic Ratio Control in Alumina Digestion Using Deep Reinforcement Learning .....	217
<i>Liyi Yu, Wen Yu, Siyu Cheng, Yao Jia, Tianyou Chai</i>	
Adaptive Control for Uncertain Nonlinear Vehicular Systems and Platoons .....	225
<i>Baorui Wang, Guoxiang Gu</i>	
A Triangular Six-Line Oversampling Method for Unbalanced Datasets .....	231
<i>Jing Jing Liu, Yefeng Liu, Shuai Wang</i>	
Interpretation of ADRC in \$Q\\$-\$Structure .....	237
<i>Jiapeng Xu, Xiang Chen, Ying Tan, Kemin Zhou</i>	
Wind Turbine Blade Positioning and Defect Recognition Via SCNs and YOLOv5.....	243
<i>Yanbo Wang, Aohan Wang, Yangzi Yu, Xin Li, Xinfu Pang, Wei Liu</i>	
Application of GA-PSO-LSTM Model in Membrane Fouling Prediction in Wastewater Treatment Process.....	247
<i>Xiaoying Wang, Lei Zhang, Xueyong Tian</i>	
Numerical Simulation of Particulate Matter Generation Inside Furnace of Municipal Solid Waste Incineration on Benchmark Condition.....	252
<i>Yongqi Liang, Jian Tang, Heng Xia</i>	
CO Emission Prediction Model of MSWI Process Combined Sample Output and Feature Space Semi-Supervised Drift Detection.....	256
<i>Runyu Zhang, Jian Tang, Tianzheng Wang, Heng Xia</i>	
CO <sub>2</sub> Emission Concentration Modeling Method Based on LSTM in Municipal Solid Waste Incineration Process.....	260
<i>Zi Wang, Jian Tang, Heng Xia, Runyu Zhang, Tianzheng Wang</i>	
Conservative Q-Learning Based Furnace Temperature Control in Municipal Solid Waste Incineration Process.....	264
<i>Hao Tian, Jian Tang, Heng Xia, Jian Zhang, Tianzheng Wang, Wen Yu</i>	
A Insulator Defect Detection Method Based on YOLO and ChatGPT.....	268
<i>Wei Guo, Haoyang Chen, Jingcheng Guo</i>	

Flue Gas Oxygen Content Modeling Approach Based on BPNN and LRDT in Municipal Solid Waste Incineration Process .....	274
Weiwei Yang, Jian Tang, Heng Xia	
Temperature Feedforward Model Based on Improved Stochastic Configuration Network for Coal Mill .....	279
Xiaodi Huang, Yanchen Jiang, Qiansheng Li, Yongfu Wang	
Deployment of Whole-Body Locomotion and Manipulation Algorithm Based on NMPC onto Unitree Go2Quadruped Robot .....	285
Minmin Liu, Jichun Xiao, Zhi Li	
Detachment Force Modeling of Micro Suction Tape Based on a Three-Layer Trajectory Filtering Strategy .....	291
Jichun Xiao, Jiawei Nie, Minmin Liu, Ying Zhang, Lina Hao, Zhi Li	
Decentralized Adaptive Pseudo-Inverse Control for Output Constrained Systems on Giant Magnetostrictive Actuators .....	297
Yuehang Liu, Xinkai Chen, Xiuyu Zhang, Huan He, Yong Liu	
Fractional-Order Control for Composite Silicone Dielectric Elastomer Actuated Motion System .....	303
Kaixuan Zhu, Xiuyu Zhang, Lei Chen, Fusheng Yuan, Aiguo Liu	
A 3D Spiral-Zigzag Gas Leakage Source Search Algorithm Based on Olfaction and Vision .....	309
Ze-Rong Han, Ji-Gong Li, Jing Yang	
Temporal Graph Convolutional Network-Based Fault Detection Method for the Two-Wheeled Self-Balancing Robot .....	315
Yuxiang Hu, Peng Yue, Hui Liu, Jiajun Kang, Dongliang Cui, Xuewu Dai	
An Integrated MPC Decision-Making Method Based on MDP for Autonomous Driving in Urban Traffic .....	319
Siyuan Li, Chengyuan Liu, Wen-Hua Chen	
Design and Modeling of a Stick-Slip Type Dielectric Elastomer Motor .....	325
Chen Yu, Hongzhi Xu, Zhi Li	
Plume Finding with Frontier-Based Planner .....	331
Xin-Kai Zhang, Ji-Gong Li, Jing Yang	
An Anti-Overlap Object Feature Weighted Fusion Detector for X-Ray Prohibited Item Detection .....	336
Tong Jia, Wanying Jia, Yixin Tian, Bowen Ma, Hao Wang, Shiyi Guo	
Odor Source Search with a Wolf Pack Algorithm Via Multi-UAV in Outdoor Environment .....	342
Wen-Qiang Wu, Ji-Gong Li, Jing Yang	
Cloud Manufacturing Dynamic Composition Reconfiguration Method Under Resource Exception .....	348
Junjie Zhu, Ziquan Yu, Ting Wang, Youmin Zhang, Bin Jiang	
Image Recognition Empowers Intelligent Analysis of Industrial Drawings .....	354
Boyan Wang, Yiyun Cui, Chengrui Zhang, Mingzhao Xie, Dongqi Wang, Dongming Chen	
A Deep Learning-Based Multi-Layer Dynamic Multivariate Prediction Model for Power System Time Series Data Prediction Model .....	360
Hangyuan Du, Hui Dong, Dazhong Ma, Xuguang Hu	

CNN-Based Breast Cancer Ultrasound Medical Image Recognition .....	366
<i>Zexiong Jin, Qichun Zhang, Jinhui Zhao</i>	
A Novel Detection Scheme for Generalized Spatial Modulation System Based on Sparse Reconstruction.....	371
<i>Xiteng Liu, Yang Zhang, Chunsheng Qin</i>	
On Efficient Multi-Agent Reinforcement Learning for Large Scale Supply Demand Matching .....	377
<i>Qing-Shan Jia, Ruicheng Jiang</i>	
Prediction of Powder Delivery Amount with Polyethylene Belt-Loaded Powder.....	383
<i>Xiliang Chen, Aihua Zhang, Yue Bi, Yingfang Wei, Xiangyang He, Zhen Wang</i>	
Skeleton-Based Action Recognition with Adaptive Connections and Motion Modeling.....	387
<i>Qizhao Geng, Chao Zheng, Ziao Li, Junyi Wang</i>	
Enhancing Soil Carbon Content Classification Using Transfer Learning and FrFT on Millimeter Wave Radar Array Signals with Varied Backgrounds .....	392
<i>Di An, Patrick Zhang, Yangquan Chen</i>	
Diagnostic Study of the Effect of Nitrogen and Oxygen Content on Membrane Fouling Based on MSCA-Fused-MBConv.....	398
<i>Hongyu Dong, Zhiwen Wang, Jingxiao Zeng, Yaoke Shi, Guobi Ling, Jindou Zhang</i>	
Gradient-Free High-Order Accelerated Self Optimizing Control of Processes with Time Delay .....	403
<i>Justus Nwoke, Jairo Viola, Yangquan Chen</i>	
Rapid Simulation Method for Electro-Pneumatic Composite Braking System Based on Equivalent Modeling .....	408
<i>Chongpan Yang, Zhiwen Chen, Jiuhe Wang, Zhiyong Chen</i>	
Identification of Superheat Degree for Aluminum Electrolysis Based on Feature-Guide Deep Variational Autoencoder .....	414
<i>Shiwen Xie, Yongfang Xie, Tingwen Huang</i>	
Predictive Analytics of Industrial Quality KPIs Using Scalable Gaussian Mixture Modeling.....	420
<i>Xuanming Zhai, Keye Tang, Ru Chen, Siyuan Tang, Bingbing Shen, Xiaoyu Jiang, Chihang Wei, Le Yao</i>	
Trajectory Tracking Control Based on Fuzzy-MPC for Autonomous Vehicles .....	426
<i>Juqi Hu, Hao Peng, Heiya Gao</i>	
Remote Fault Diagnosis Method for Traction Drive Systems Based on Domain-Adapted Knowledge Graphs .....	432
<i>Zhiwen Chen, Siwen Mo, Jiamin Xu, Zixuan Xu</i>	
Distributed Finite-Time Consensus Control of Multi-Agent Systems with Communication Topology Switching*.....	434
<i>Wang Guoliang, Lyu Yaqiang</i>	
Numerical Simulation Model of NO <sub>x</sub> Emission Concentration in Municipal Solid Waste Incineration Process.....	440
<i>Wenbo Ma, Jian Tang, Heng Xia</i>	
Can We Characterize Variabilities of Variabilities in Real Time?.....	445
<i>Daniel Duhe Chen</i>	

Improved TCN-Vine Copula Method for Wind Speed Prediction Using 5G+ Technology Data Transmission.....	451
<i>Jin Zhan, Shaowei He, Chunyu Wang, Yafeng Zheng</i>	
IGDT Robustness Analysis of Integrated Energy System with Uncertain Wind Power Access .....	457
<i>Chunyu Wang, Yafeng Zheng, Jiatong Li, Xinxin Shi</i>	
MPC-Based Path Tracking Control for Autonomous Vehicles on Varying Friction Roads .....	463
<i>Juqi Hu, Wenlong Liu, Hejia Gao</i>	
Research on Automatic Active Disturbance Rejection Control Method for Hydrogen Production by Alkaline Electrolysis of Green Electricity .....	469
<i>Yanfu Cai, Xinxin Shi, Guojun Niu, Shaoyi Ye, Jun Li, Yue Chen, Jiqing Yu, Jian Wang, Guinan Wang, Chunyu Wang</i>	
Optimizing Fractional Order PID Control for Green Hydrogen Ammonia Synthesis Tower Temperature.....	475
<i>Bin Li, Mingyu Song, Wei Song, Xiandong Zhao, Jianxin Zhang, Chunyu Wang</i>	
A Powerful Object Detection Network for Industrial Anomaly Detection .....	481
<i>Yifei Ge, Lin Meng</i>	
ViT-Based Hybrid Segmentation for Leftover Food Detection .....	487
<i>Ryuto Ishibashi, Haruhiro Takahashi, Lin Meng</i>	
YOLO-FG: YOLO-Based Visual Inspection for Fruits Grading.....	493
<i>Atsuki Matsui, Ryoto Ishibashi, Lin Meng</i>	
Analysis Towards Deployment and Acceleration for ViT on a Lightweight RISC- V Processor .....	499
<i>Hayata Kaneko, Lin Meng</i>	
Grid-Connected Inverter DC Voltage Self-Immunity Control Strategy Based on 5G+Photovoltaic Power Prediction Feedforward .....	505
<i>Jin Zhan, He Shaowei, Yafeng Zheng, Chunyu Wang</i>	
Parameter Identification of Nonlinear Systems Using Generalized Associated Linear Equations (GALES) .....	511
<i>Wenbo Zhang, Xiaoyue Guo, Bo Zhang, Yunpeng Zhu, Liangliang Cheng, Zhike Peng</i>	
Ultrasonic Frequency-Mixing Nonlinear Detection of Microcracks in Metal Plates .....	517
<i>Wenqiang Zhu, Bo Zhang, Linfeng Zhang, Xiaoyue Guo, Wenbo Zhang, Haoda Meng</i>	
Early Damage Detection Based on FRF-CNN-BiLSTM Model and NOFRF .....	523
<i>Linfeng Zhang, Yunhe Zhang, Wenqiang Zhu, Wenbo Zhang, Zhengjun Yang, Bo Zhang</i>	
Effect of Voltage Waveform on the Drop Formation Dynamics in a Drop-On-Demand Inkjet Printing .....	529
<i>Anping Jing, Bo Zhang, Yinfang Qin, Jingya Xu, Penglong Duan, Gonghao Chi</i>	
Study of the Dynamics of Manipulated Droplet Based on Concave Spherical Phased Array Acoustic Levitator .....	535
<i>Yinfang Qin, Bo Zhang, Anping Jing, Al-Hajj Abdulatef, Penglong Duan, Gonghao Chi</i>	
Characterisation of Complex System Dynamics from Data: A Probing Excitation Method .....	540
<i>Yangming Xu, Zhong Luo, Zhiao Wang, Mingyang Yang, Yunpeng Zhu</i>	

Infrared and Visible Image Fusion with Deformable Cross-Attention .....	546
<i>Qiuman Zeng, Tao Lu, Gaochang Wu</i>	
Camera-Based Dynamic Vibration Measurement Using CoTracker Model.....	552
<i>Liangliang Cheng, Justin De Groot, Kun Xie, Yumpeng Zhu</i>	
Lithium-Ion Battery Health State Estimation Based on Hierarchical Feature Construction and Adaptive Gated Sequence Network.....	556
<i>Changfeng Luan, Fang Xu, Jun Teng, Xinfu Pang, Minglei Jia, Zhiwei Yu</i>	
Distributed Nash Equilibrium Seeking of Second-Order Multi-Agent Systems Under Unknown False Data Injection Attacks.....	561
<i>Zhi Feng, Guoqiang Hu, Xiwang Dong, Jinhua Lu</i>	
A Review of Similarity-Based Few-Shot Learning Methods for Time Series Classification in Manufacturing .....	565
<i>Shuyi Pan, Haiming Luo, Matthew C. H. Chua, Karkulali Pugalenth, Edward K Y. Yapp</i>	
Design of Recursive Filtering Scheme Via an Improved Weighted Try-Once Discard Protocol.....	571
<i>Kaiwen Zheng, Jun Hu, Junhua Du, Hui Yu</i>	
Hybrid Classification Method for Anomaly Detection in Injection Moulding Process.....	577
<i>Ng Yao Xuan, Hailin Ge, Lu Wen Feng, Doan Ngoc Chi Nam, Xiang Li</i>	
Dominant Feature Selection Methods for Root Cause Identification in Injection Moulding Process .....	583
<i>Doan Ngoc Chi Nam, Jeremy Choy Jun Wei, Junhong Zhou, Xiang Li</i>	
PIGWN: Physics-Informed Graph WaveNet for Airport Flight Traffic Flow Prediction .....	589
<i>Zhichao Yang, Yinghao Zhu, Ziyue Niu, Yanru Huang, Chengwei Pan, Xiwang Dong</i>	
Fuzzy-Cycle: Visible to Infrared Ship Image Translation Based on CycleGAN .....	595
<i>Long He, Yue Yu, Chang Liu, Yangyang Sun, Feng Jiang, Xiaoning Hu, Chengwei Pan, Xiwang Dong</i>	
Skip-CBAM Based Unsupervised Anomaly Detection of Fused Magnesia Furnace .....	601
<i>Yuxin Wang, Qiang Liu</i>	
Finite-Time Adaptive Event-Triggered Control for Stochastic Nonlinear Systems with Output Constraint and Input Saturation.....	607
<i>Jia Liu, Yujie Chen, Bin Liu</i>	
Learning and Operator Based Control System Design for Soft Robotic Finger with Denial of Service Attack and Input Hysteresis Using Right Coprime Factorization.....	613
<i>Zizhen An, Mingcong Deng</i>	
Network Based Control System Design Optimization for Buck Circuits Using Genetic Algorithm.....	619
<i>Ziwei Wang, Xudong Gao, Wenjie Cao</i>	

## Author Index