# 2022 IEEE International Conferences on Internet of Things (iThings 2022) and IEEE Green Computing & Communications (GreenCom 2022) and IEEE Cyber, Physical & Social Computing (CPSCom 2022) and IEEE Smart Data (SmartData 2022) and IEEE Congress on Cybermatics (Cybermatics 2022)

## Espoo, Finland
## 22 – 25 August 2022

**IEEE Catalog Number:** CFP22GCC-POD
**ISBN:** 978-1-6654-5418-6

**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: | CFP22GCC-POD |
| ISBN (Print-On-Demand): | 978-1-6654-5418-6 |
| ISBN (Online): | 978-1-6654-5417-9 |

**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
Web: www.proceedings.com

# 2022 IEEE International Conferences on Internet of Things (iThings) and IEEE Green Computing & Communications (GreenCom) and IEEE Cyber, Physical & Social Computing (CPSCom) and IEEE Smart Data (SmartData) and IEEE Congress on Cybermatics (Cybermatics)

# iThings-GreenCom-CPSCom-SmartData-Cybermatics 2022

## Table of Contents


**iThings 2022 Message from the General Chairs** ..... **xix**
**iThings 2022 Message from the Program Chairs** ..... **xx**
**iThings 2022 Organizing Committee** ..... **xxi**
**iThings 2022 Program Committee** ..... **xxii**
**iThings 2022 Steering Committee** ..... **xxiv**
**iThings 2022 Reviewers** ..... **xxv**
**GreenCom 2022 Message from the General and Program Chairs** ..... **xxvii**
**GreenCom 2022 Organizing Committee** ..... **xxix**
**CPSCom 2022 Message from the General Chairs** ..... **xxxi**
**CPSCom 2022 Message from the Program Chairs** ..... **xxxiii**
**CPSCom 2022 Organizing Committee** ..... **xxxiv**
**CPSCom 2022 Program Committee** ..... **xxxv**
**SmartData 2022 Message from the General Chairs** ..... **xxxvii**
**SmartData 2022 Message from the Program Chairs** ..... **xxxviii**
**SmartData 2022 Organizing Committee** ..... **xxxix**
**SmartData 2022 Program Committee** ..... **xl**
**SmartData 2022 Reviewers** ..... **xlii**

# The 15th IEEE International Conference on Internet of Things (iThings 2022)

## iThings 2022 Regular Papers

CleverTrash: an IoT System for Waste Sorting with Deep Learning ..... 1
*Swann Puig (University of Applied Sciences HES-SO, Switzerland) and Noria Foukia (University of Applied Sciences HES-SO, Switzerland)*

Privacy-Aware Data Fusion and Prediction for Smart City Services in Edge Computing Environment ..... 9
*Lianyong Qi (Qufu Normal University, China), Xiaoxiao Chi (Qufu Normal University, China), Xiaokang Zhou (Shiga University, Japan; RIKEN Center for Advanced Intelligence Project, Japan), Qi Liu (Nanjing University of Information Science and Technology, China), Fei Dai (Southwest Forestry University, China), Xiaolong Xu (Nanjing University of Information Science and Technology, China), and Xuyun Zhang (Macquarie University, Australia)*

Distributed MQTT Brokers at Network Edges: A Study on Message Dissemination ..... 17
*Luoyao Hao (Columbia University, USA), Xiao Yu (Columbia University, USA), Tingrui Zhang (Columbia University, USA), and Henning Schulzrinne (Columbia University, USA)*

Multi-Stage Low Error Localization Based on Krill Herd Optimization Algorithm in WSNs ..... 25
*Chang Huang (University of South China, China) and Minghua Wang (University of South China, China)*

A Decentralized Framework with Dynamic and Event-Driven Container Orchestration at the Edge ..... 33
*Umut Can Özyar (Bogazici University, Turkey) and Arda Yurdakul (Bogazici University, Turkey)*

A Novel Harmony Search Cat Swarm Optimization Algorithm for Optimal Bridge Sensor Placement ..... 41
*Bin Luo (University of South China, China), Lingzhi Yi (Zhongnan University of Economics and Law, China), Hengshan Wu (University of South China, China), Yun Qiu (Foshan Highway and Bridge Engineering Monitoring Station Co., Ltd., China), Xiangguang Li (Railway Branch of Zhejiang Jiaogong Group Co., Ltd., China), Feilong Tang (East China Normal University, China), and Yuan Zhang (University of South China, China)*

Reinforcement Learning Based Full Duplex Multi-user MIMO MAC Protocol (RL-MUFD) ..... 48
*Zheng Guan (Yunnan University, China), Shengqian Yu (Yunnan University, China), Ya Li (Yunnan University, China), and Min He (Yunnan University, China)*

On-Ramp Merging for Connected Autonomous Vehicles Using Deep Reinforcement Learning ..... 56
*Chinmay Mahabal (University of Massachusetts Dartmouth), Hua Fang (University of Massachusetts Dartmouth), and Honggang Wang (University of Massachusetts Dartmouth)*

On-Device Training of Deep Learning Models on Edge Microcontrollers ..... 62
*Fabrizio De Vita (University of Messina, Italy), Giorgio Nocera (University of Messina, Italy), Dario Bruneo (University of Messina, Italy), Valeria Tomaselli (STMicroelectronics, Italy), and Mirko Falchetto (STMicroelectronics, Italy)*

User Position-Based Wireless Sensor Network Deployment Algorithm ..... 70
*Fan Liang (Sam Houston State University, USA), Fang Yuan (University of Baltimore, USA), and Xing Liu (Towson University, USA)*

Edge-Cloud Cooperation for DNN Inference via Reinforcement Learning and Supervised Learning ..... 77
*Tinghao Zhang (Nanyang Technological University, Singapore), Zhijun Li (Harbin Institute of Technology, China), Yongrui Chen (University of Chinese academy of sciences, China), Kwok Yan Lam (Nanyang Technological University, Singapore), and Jun Zhao (Harbin Institute of Technology, China)*

Visual Cybersecurity Collaboration and Incident Exchange in Multi-Stakeholder IoT Environments ..... 85
*Hanning Zhao (Tampere University, Finland) and Bilhanan Silverajan (Tampere University, Finland)*

## iThings 2022 Short Papers

Reinforcement Learning-Based IoT Sensor Scheduling Strategy for Bridge Structure Health Monitoring ..... 93
*Yuan Zhang (University of South China, China), Hengshan Wu (University of South China, China), Lingzhi Yi (University of South China, China), Bin Luo (University of South China, China), Yun Qiu (Foshan Highway and Bridge Engineering Monitoring Station Co., China), and Feilong Tang (East China Normal University, China)*

Node Deployment and Confident Information Coverage for WSN-Based Air Quality Monitoring .. 101
*Yuan Tian (University of South China, China), Yihui Sun (University of South China, China), and Yong Tang (University of South China, China)*

IoT Droplocks: Wireless Fingerprint Theft Using Hacked Smart Locks ..... 107
*Steve Kerrison (James Cook University, Singapore)*

Identifying Channel Related Vulnerabilities in Zephyr Firmware ..... 113
*Devansh Rajgarhia (Indian Institute of Technology Kharagpur, India), Peng Liu (Pennsylvania State University, USA), and Shamik Sural (Indian Institute of Technology Kharagpur, India)*

Things Data Interoperability Through Annotating oneM2M Resources for NGSI-LD Entities ..... 119
*Sunil Kumar (Autonomous IoT Research Center, Korea Electronics Technology Institute (KETI), Korea), SeungMyeong Jeong (Autonomous IoT Research Center, Korea Electronics Technology Institute (KETI), Korea), Il Yeup Ahn (Autonomous IoT Research Center, Korea Electronics Technology Institute (KETI), Korea), and Muhammad Aslam Jarwar (Sheffield Hallam University, UK)*

## iThings 2022 Workshop Papers

Demand-Oriented Allocation with Fairness in Multi-Operator Dynamic Spectrum Sharing Systems ..... 125
*Mengying Wang (Nanjing University of Aeronautics and Astronautics, China), Wei Wang (Nanjing University of Aeronautics and Astronautics, China), Wenjing Xu (Nanjing University of Aeronautics and Astronautics, China), JiaMeng Bi (Nanjing University of Aeronautics and Astronautics, China), and Qiang Ye (Memorial University of Newfoundland, Canada)*

Edge-Assisted Puncturable Fine-Grained Task Distribution for the IoT-Oriented Crowdsensing..... 131
*Liquan Jiang (University of Electronic Science and Technology of China, China) and Zhiguang Qin (University of Electronic Science and Technology of China, China)*

Achieving Privacy-Preserving Data Sharing for Dual Clouds ..... 139
*Xingqi Luo (Beijing Institute of Technology, China), Haotian Wang (University of Pennsylvania), Jinyang Dong (Defense Innovation Institute, China), Chuan Zhang (Beijing Institute of Technology, China), and Tong Wu (Beijing Institute of Technology, China)*

## The First International Workshop on Deep Learning-Based Mobile Sensing (DeepSensing 2022)

Research on Ultra-Wideband (UWB) Indoor Accurate Positioning Technology Under Signal Interference ..... 147
*Mingming Gong (Inner Mongolia University, China), Zhiyang Li (Inner Mongolia University, China), and Wuyungerile Li (Inner Mongolia University, China)*

## The First International Workshop on Integrating Metaverse with Blockchain and 6G for Next-Generation IoT (Meta-IoT 2022)

Efficient and Secure Collaborative Processing in Mobile Edge Computing via Blockchain ..... 155
*Yuwei Le (Southeast University, China; Purple Mountain Laboratories, China), Yiheng Jiang (Southeast University, China), Xintong Ling (Southeast University, China; Purple Mountain Laboratories, China), and Jiaheng Wang (Southeast University, China; Purple Mountain Laboratories, China)*

# The 18th IEEE International Conference on Green Computing and Communications (IEEE GreenCom 2022)

## GreenCom 2022: Green Computing and Communication

Energy Consumption Models for UAV Communications: A Brief Survey ..... 161
*Hua Yan (Shenzhen Key Laboratory of Safety and Security for Next Generation of Industrial Internet, China; Southern University of Science and Technology, China; The University of Warwick, UK), Shuang-Hua Yang (Shenzhen Key Laboratory of Safety and Security for Next Generation of Industrial Internet, China; Southern University of Science and Technology, China), Yulong Ding (Shenzhen Key Laboratory of Safety and Security for Next Generation of Industrial Internet, China; Southern University of Science and Technology, China), and Yunfei Chen (The University of Warwick, UK)*

Adaptive Federated Learning via Mean Field Approach ..... 168
*Kaifei Tu (Sun Yat-sen University, China), Shensheng Zheng (Sun Yat-sen University, China), Xuehe Wang (Sun Yat-sen University, China), and Xiping Hu (Sun Yat-sen University, China)*

Adaptive Sampling for Efficient Acoustic Noise Monitoring: An Incremental Learning Approach ..... 176
*Faiga Alawad (Norwegian University of Science and Technology, Norway)*

## GreenCom 2022: Smart Energy and Smart Grids

Energy Analysts need a Standard that Interprets the Metro Area Global Information Infrastructure ..... 185
*Etienne-Victor Depasquale (University of Malta, Malta), Saviour Zammit (University of Malta, Malta), Franco Davoli (University of Genoa, Italy), and Raffaele Bolla (University of Genoa, Italy)*

On the Benefits of Transfer Learning and Reinforcement Learning for Electric Short-term Load Forecasting ..... 195
*Yuwei Fu (McGill University, Quebec), Di Wu (McGill University, Quebec), and Benoit Boulet (McGill University, Quebec)*

A Blockchain-Based Cloud Edge Fusion Computing Platform for the Smart Grid ..... 204
*Ying Gao (South China University of Technology, China), Sijie Su (South China University of Technology, China), Yandan Chen (South China University of Technology, China), Qiaofeng Pan (South China University of Technology, China), and Xiping Hu (Sun Yat-sen University, China)*

Influence of Communication Technologies in Smart Grid Power Congestion Management ..... 212
*Adrien Gougeon (ENS Rennes, France), François Lemercier (ENS Rennes, France), Anne Blavette (Univ. Rennes, ENS Rennes, CNRS, SATIE lab, France), and Anne-Cécile Orgerie (ENS Rennes, France)*

## GreenCom 2022: AI and Green Society Applications

Energy-Efficient Monitoring of Potential Side Effects from COVID-19 Vaccines ..... 222
*Weipeng Deng (The University of Hong Kong, China), Edith C. H. Ngai (The University of Hong Kong, China), and Vera van Zoest (Uppsala University, Sweden)*

Making Smart Contract Classification Easier and More Effective ..... 228
*Zhirong Zhu (Sun Yat-sen University, China), Jianzhong Su (Sun Yat-sen University, China), Zigui Jiang (Sun Yat-sen University, China), Mingxi Ye (Sun Yat-sen University, China), and Zibin Zheng (Sun Yat-sen University, China)*

## The 15th IEEE International Conference on Cyber Physical and Social Computing (CPSCom 2022)

## CPSCom 2022: Session A: Edge-Fog-Cloud Computing

Delay-Outage Probability of Capacity Achieving-Based Task Offloading for Mobile Edge Computing ..... 236
*Aigerim Ospanova (Nazarbayev University, Kazakhstan) and Behrouz Maham (Nazarbayev University, Kazakhstan)*

Effective Task Offloading Heuristics for Minimizing Energy Consumption in edge Computing ..... 243
*Guichang Yin (Nanjing University of Science and Technology, China), Runze Chen (Nanjing University of Science and Technology, China), and Yi Zhang (Nanjing University of Science and Technology, China)*

A Distributed Privacy-Preserving Framework for Deep Learning with Edge-Cloud Computing ..... 250
*Fei Dai (Southwest Forestry University, China), Guozhi Liu (Southwest Forestry University, China), Bi Huang (Southwest Forestry University, China), Xiaolong Xu (Nanjing University of Information Science and Technology, China), Chaochao Chen (Zhejiang University, China), Zhangbing Zhou (China University of Geosciences, China), and Xiaokang Zhou (Shiga University, Japan)*

Edge Computing with Relaying for Task Offloading Under Nakagami-m Fading Channels ..... 258
*Aigerim Ospanova (Nazarbayev University, Kazakhstan) and Behrouz Maham (Nazarbayev University, Kazakhstan)*

## CPSCom 2022: Session B: Networks and Communications for CPSS

Securing uRLLC in UAV-Assisted NOMA Wireless Network ..... 264
*Shanchao Zheng (Qufu Normal University, China), Kan Yu (Beijing University of Posts and Telecommunications, China), Guangshun Li (Qufu Normal University, China), and Xiaowu Liu (Qufu Normal University, China)*

Investigating Low-Battery Anxiety of Mobile Users ..... 272
*Yu Zhang (The Chinese University of Hong Kong, China), Guoming Tang (Peng Cheng Laboratory, China), Qianyi Huang (Peng Cheng Laboratory, China; Southern University of Science and Technology, China), Kui Wu (University of Victoria, Canada), Yangjing Wu (The Chinese University of Hong Kong, China), and Yi Wang (Peng Cheng Laboratory, China; Southern University of Science and Technology, China)*

A Multipath Source Location Privacy Protection Scheme in Wireless Sensor Networks via Proxy Node ..... 280
*Jing Sun (Guizhou University, China, Guilin University of Electronic Technology, China), Yuling Chen (Guizhou University, China, Weifang University of Science and Technology, China), Xiao Lv (Guizhou Shuanhui Big Data Industry Development Co., Ltd, China), and Xiaobin Qian (Guizhou CoVision Science &Technology Co., Ltd, China)*

A Density-Based Controller Placement Algorithm for Software Defined Networks ..... 287
*Jue Chen (Shanghai University of Engineering Science, China), Yujie Xiong (Shanghai University of Engineering Science, China), and Dun He (Shanghai University of Engineering Science, China)*

## CPSCom 2022: Session C: Smart City and Smart World

More Behind Your Electricity Bill: A Dual-DNN Approach to Non-Intrusive Load Monitoring ..... 292
*Yu Zhang (The Chinese University of Hong Kong, China), Guoming Tang (Peng Cheng Laboratory, China), Qianyi Huang (Peng Cheng Laboratory, China; Southern University of Science and Technology, China), Yi Wang (Peng Cheng Laboratory, China; Southern University of Science and Technology, China), Hong Xu (The Chinese University of Hong Kong, China), and Xudong Wang (The Chinese University of Hong Kong, China)*

Construct Digital Twin Models in Cyber Space for Physical Objects of Intelligent Optical Network ..... 300
*Liwei Kuang (Network Business Unit FiberHome Company, China), Jun Wu (Technology Management FiberHome Company, China), and Shan Yin (Network Business Unit FiberHome Company, China)*

Prediction of Water Quality Factors for sea Cucumber Farming Based on Dual-Assisted Prediction Model ..... 306
*Xiaomei Li (Dalian University, China), Huan Liu (Dalian University, China), Rongli Gai (Dalian University, China), and Zumin Wang (Dalian University, China)*

A Combined Model for Cherry Greenhouse Temperature Prediction Based on LMD and Attention Mechanism ..... 314
*Zu-Min Wang (Dalian University, China), Tian-Yu Li (Dalian University, China), Min Xu (Dalian University, China), Wei Xu (Dalian University, China), Yan Liu (Dalian University, China), Ling-Yan Hu (Dalian University, China), and Rong-Li Gai (Dalian University, China)*

## CPSCom 2022: Session D: Security and Privacy Preserving

A Survey on Data Security in Network Storage Systems ..... 320
*Hongke Zhang (Xidian University, China), Zheng Yan (Xidian University, China), and Xueqin Liang (Xidian University, China)*

A Security Transaction Model Based on HTLC ..... 328
*Xiaochuan He (Guizhou University, China, Guilin University of Electronic Technology, China), Chaoyue Tan (Guizhou University, China), Yongtang Wu (Weifang University of Science and Technology, China), and Yuling Chen (Guizhou University, China, Weifang University of Science and Technology, China)*

A Secure Comparison Protocol in the Malicious Model ..... 332
*Junhong Tao (Guizhou University, China, Guilin University of Electronic Technology, China), Yongtang Wu (University of Science and Technology, China, Weifang University of Science and Technology, China), and Yuling Chen (Guizhou University, China, University of Science and Technology, China)*

A Secure Multiparty Computation Round Optimization Scheme Based on Standard Assumption .. 338
*Yun Luo (Guizhou University, China, Guilin University Of Electronic Technology, China), Yuling Chen (Guizhou University, China, Weifang University of Science and Technology, China), Tao Li (Guizhou University, China), and Yilei Wang (Qufu Normal University, China)*

## CPSCom 2022: Session E: System-Level Design Methodology

A Blockchain-Based Scalable Electronic Contract Signing System ..... 343
*Kaicheng Yang (Guizhou University, China, Guilin University of Electronic Technology, China), Yongtang Wu (Weifang University of Science and Technology, China), and Yuling Chen (Guizhou University, China, Weifang University of Science and Technology, China)*

Data Availability Optimization for Cyber-Physical Systems ..... 349
*Liying Li (Nanjing University of Science and Technology, China), Peijin Cong (Nanjing University of Science and Technology, China), Junlong Zhou (Nanjing University of Science and Technology, China; Institute of Computing Technology, China), Zonghua Gu (Umea University, Sweden), and Keqin Li (State University of New York, USA)*

A K-Anonymity Optimization Algorithm Under Attack Model ..... 357
*Manxiang Yang (GuiZhou University, China), Yongtang Wu (Weifang University of Science and Technology, China), and Yuling Chen (Guizhou University, China; Weifang University, China)*

The Optimal Attack-Defense Scheme for Secret Sharing ..... 363
*Juan Ma (Guizhou University, China, Security, Guilin University of Electronic Technology, China), Yuling Chen (Guizhou University, China, Weifang University of Science and Technology, China), Xiao Lv (Guizhou Shuanhui Big Data Industry Development Co., Ltd, China), and Xiaobin Qian (Guizhou CoVision Science &Technology Co., Ltd, China)*

## CPSCom 2022: Session F: Knowledge Systems for CPSS

Embedded Fault Diagnosis Expert System: Framework, Development Platform, Algorithms and Experiments ..... 368
*Dapeng Tan (Zhejiang University of Technology, China), Tong Wang (Zhejiang University of Technology, China), and Chengyan Wang (Zhejiang University of Technology, China)*

An Effective Model-free Gaussian Process Based Online Social Media Recommendation ..... 374
*Jiawei Xu (Nanjing University of Posts and Telecomm, China), Yufeng Wang (Nanjing University of Posts and Telecomm, China), Jianhua Ma (Hosei University, Japan), and Qun Jin (Waseda University, Japan)*

Fruit and Vegetable Picking Robot Movement Planning: A Review ..... 379
*Rongli Gai (Dalian University, China), Xiaohong Wang (Dalian University, China), Zhiyuan Chang (Dalian University, China), and Yitong Guo (Dalian University, China)*

Bayesian Network Based on Dynamic Risk Assessment for Petrochemical Sites—A Case Study of oil Tank ..... 385
*Yanzhi Li (Tianjin University &Tianjin Fire Science and Technology Research Institute of MEM, China), Yuqiao Li (Tianjin Fire Science and Technology Research Institute of MEM, China), Kaifeng Wang (Dalian University, China), Yan Zhang (Tianjin Fire Science and Technology Research Institute of MEM, China), Zumin Wang (Dalian University, China), and Shuxue Zhao (Fire and Rescue Corps of Hainan Province, China)*

## CPSCom 2022: Session G: Deep Learning in CPSS

Incremental Prediction Method of Optical Performance Degradation Trend Based on Deep Learning ..... 391
*Shan Yin (Network Business Unit FiberHome Company, China), Liwei Kuang (Fiberhome Ocean network equipment Company, China), and Fei Zou (Fiberhome Ocean network equipment Company, China)*

A Combined Network for Tomato Leaf Disease Recognization Based on the Improved EfficientNet ..... 395
*Xiaomei Li (Dalian University, China), Min Xu (Dalian University, China), Tianyu Li (Dalian University, China), Wei Xu (Dalian University, China), Rongli Gai (Dalian University, China), Lingyan Hu (Dalian University, China), and Zumin Wang (Dalian University, China)*

TSHML: Token Shuffling Under Haircut Policy Based on Machine Learning ..... 401
*Yilei Wang (Guizhou University, China, Qufu Normal University, China, Guilin University of Electronic Technology, China), Ming Liu (Qufu Normal University, China), Tao Li (Guizhou University, China), Chunmei Li (Qufu Normal University, China), and Hui Wang (Ulsan University, Korea)*

Research on Rolling Bearing Fault Diagnosis Method Based on Hybrid Deep Learning Network Model ..... 406
*Zhihao Zhang (Dalian University, China) and Zumin Wang (Dalian University, China)*

## CPSCom 2022: Session H: Adaptive and Intelligent Systems

Contactless Elevator Button Action Recognition Based on Passive RFID ..... 412
*Chengtian Wang (Anhui Normal University, China), Taochun Wang (Anhui Normal University, China), Peng Hu (Anhui Normal University, China), Qing Qiu (Anhui Normal University, China), Chuanxin Zhao (Anhui Normal University, China), and Fulong Chen (Anhui Normal University, China)*

Beyond 100 Ethical Concerns in the Development of Robot-to-Robot Cooperation ..... 420
*Rebekah Rousi (University of Vaasa, Finland), Ville Vakkuri (University of Jyväskylä, Finland), Paulius Daubaris (University of Helsinki, Finland), Simo Linkola (University of Helsinki, Finland), Hooman Samani (University of Plymouth, United Kingdom), Niko Mäkitalo (University of Helsinki, Finland), Erika Halme (University of Jyväskylä, Finland), Mamia Agbese (University of Jyväskylä, Finland), Rahul Mohanani (University of Jyväskylä, Finland), Tommi Mikkonen (University of Jyväskylä, Finland), and Pekka Abrahamsson (University of Jyväskylä, Finland)*

Investigation on Application of Target Detection in Agriculture ..... 427
*Rongli Gai (Dalian University, China), Kai Wei (Dalian University, China), Huatian Zhang (Dalian University, China), and Xiangzhou Kong (Dalian University, China)*

Safety Helmet Wearing Detection Based on A Lightweight YOLOv4 Algorithm ..... 433
*Junhua Chen (Chongqing University of Posts and Telecommunications, China), Sihao Deng (Chongqing University of Posts and Telecommunications, China), Xueda Huang (Chongqing University of Posts and Telecommunications, China), Xinrui Yang (Chongqing University of Posts and Telecommunications, China), and Dong Yan (Chongqing University of Posts and Telecommunications, China)*

## CPSCom 2022: Session I: Data-Driven Services in CPSS

Data Confirmation Scheme Based on Auditable CP-ABE ..... 439
*Lingyun Zhang (Guizhou University, China), Yuling Chen (Guizhou University, China), and Xiaobin Qian (Guizhou CoVision Science Technology Co., Ltd., China)*

Mining Composite Spatio-Temporal Lifestyle Patterns from Geotagged Social Data ..... 444
*Suparna De (University of Surrey, UK), Usamah Jassat (University of Surrey, UK), Alex Grace (University of Surrey, UK), Wei Wang (Xian Jiaotong Liverpool University, China), and Klaus Moessner (Chemnitz University of Technology, Germanny)*

Fixed-Time Control for Liquid-Filled Flexible Spacecraft ..... 452
*Zhihao Zhu (Yancheng Institute of Technology, China), Zhi Gao (Yancheng Institute of Technology, China), Yu Guo (Nanjing University of Science and Technology, China), Hanli Zhou (Yancheng Institute of Technology, China), Zhixu Lu (Yancheng Institute of Technology, China), and Wei Li (Yancheng Institute of Technology, China)*

Improved Secure Provable Data Possession Scheme for Cloud Storage ..... 456
*Xu An Wang (Chinese People's Armed Police Force Engineering University, China) and Ruifeng Li (Chinese People's Armed Police Force Engineering University, China)*

## CPSCom 2022: Session J: Efficient Architectures for CPSS

Cyber-Physical Contracts in Offline Regions ..... 461
*Lars Creutz (Trier University of Applied Sciences, Germany), Kevin Wagner (Trier University of Applied Sciences, Germany), and Guido Dartmann (Trier University of Applied Sciences, Germany)*

Overview of Interactive Visualization Methods ..... 470
*Rongli Gai (Dalian university, China), Zhibin Guo (Dalian university, China), and Mengke Li (Dalian university, China)*

Practical Implementation of an OPC UA Multi-Server Aggregation and Management Architecture for IIoT ..... 476
*Chenggen Pu (Chongqing University of Posts and Telecommunications, China), Xiwu Ding (Chongqing University of Posts and Telecommunications, China), Ping Wang (Chongqing University of Posts and Telecommunications, China), and Yifu Yang (Chongqing University of Posts and Telecommunications, China)*

Image Augmentation Based on Cross Domain Image Style Transfer ..... 482
*Wenshu Li (Zhejiang Sci-Tech University, China), Haijun Mao (China Jiliang University, China), and Hao Wang (Zhejiang Sci-Tech University, China)*

## The Eighth IEEE International Conference on Smart Data (IEEE SmartData 2022)

## SmartData 2022: Data Science and Its Foundations

Agricultural Few-Shot Selection by Model Confidences for Multimedia Internet of Things Acquisition Dataset ..... 488
*Jiachen Yang (Tianjin University, China), Zhuo Zhang (Tianjin University, China), and Yang Li (Tianjin University, China)*

UA-HGAT: Uncertainty-Aware Heterogeneous Graph Attention Network for Short Text Classification ..... 495
*Deyan Kong (Beijing Jiaotong University, China), Zhenyan Ji (Beijing Jiaotong University, China), Yanjuan Sang (Blueintelligence Technology Co., Ltd., China), Wei Dong (Institute of Software, Chinese Academy of Sciences, China), and Yanyan Yang (Beijing Jiaotong University, China)*

## SmartData 2022: Smart/Big Data Processing and Analytics

A Self-Supervised Purification Mechanism for Adversarial Samples ..... 501
*Bingyi Xie (Georgia State University, United States of America), Honghui Xu (Georgia State University, United States of America), Zuobin Xiong (Georgia State University, United States of America), Yingshu Li (Georgia State University, United States of America), and Zhipeng Cai (Georgia State University, United States of America)*

Performance Assessment of Deep Neural Network on Activity Recognition in WiFi Sensing ..... 510
*Jianchao Song (Towson University, USA), Cheng Qian (Towson University, USA), Xing Liu (Towson University, USA), Hengshuo Liang (Towson University, USA), Chao Lu (Towson University, USA), and Wei Yu (Towson University, USA)*

Information Extraction and Analysis of Chinese Traffic News ..... 518
*Xiaoxian Dong (South China University of Technology, China), Xiaoxiong Weng (South China University of Technology, China), and Yancheng Ling (South China University of Technology, China)*

IoT Device Friendly Leveled Homomorphic Encryption Protocols ..... 525
*Marin Matsumoto (Ochanomizu University, Japan) and Masato Oguchi (Ochanomizu University, Japan)*

High Precision Method of Federated Learning Based on Cosine Similarity and Differential Privacy ..... 533
*Jia Wang (Shenzhen University, China), Yazheng Li (Zhengzhou University of Industrial Technology, China), Ronghang Ye (Shenzhen University, China), and Jianqiang Li (Shenzhen University, China)*

Theoretical Analysis of QBER for Quantum Key Distribution in 5G Multi-Site Networks ..... 541
*Jordi Mongay Batalla (Warsaw University of Technology, Poland), Sławomir Sujecki (Military University of Technology, Poland), Houbing Song (Embry-Riddle Aeronautical University, USA), Constandinos Mavromoustakis (University of Nicosia, Cyprus), and Tomasz Wichary (Warsaw University of Technology, Poland)*

CNN-Based Emotional Stress Classification Using Smart Learning Dataset ..... 549
*Andreas Andreou (University of Nicosia and University of Nicosia Research Foundation, Cyprus), Constandinos X. Mavromoustakis (University of Nicosia and University of Nicosia Research Foundation, Cyprus), Houbing Song (Embry-Riddle Aeronautical University Daytona Beach, USA), and Jordi Mongay Batalla (Warsaw University of Technology and National Institute of Telecommunications, Poland)*

Semi-Supervised Algorithms in Resource-Constrained Edge Devices: An Overview and Experimental Comparison ..... 555
*Mahdi Barhoush (INDA, RWTH University, Germany), Ahmed Ayad (INDA, RWTH University, Germany), and Anke Schmeink (INDA, RWTH University, Germany)*

Business Process Modeling and Structure Optimization of Resource Coupling in edge Computing ..... 560
*Xiao-Bo Cai (Big Data College of Yunnan Agricultural University), Li-Jiao Chen (Tea College of Yunnan Agricultural University), Xiao-Jing Shen (Party Committee of Yunnan Agricultural University), Qi Wu (Science College of Yunnan Agricultural University), Wen-Dou Wu (Big Data College of Yunnan Agricultural University), and Bai-Juan Wang (Tea College of Yunnan Agricultural University)*

Smart Detection of Social Distance Violations Using Gaussian Lens Model and Deep Learning ..... 566
*Jenny Liu (Spruce Creek High School, USA)*

## SmartData 2022: Smart/Big Data Applications

The Data Mining Between the Asphalt Properties and Asphalt Mixtures Properties ..... 570
*Xing Long (Crcc Xinjiang Jin Xin Expressway Cp, Ltd, China)*

QoS-Aware Joint User Scheduling and Power Allocation for Energy Harvesting Wireless Networks ..... 576
*Jun Li (Xi'an Jiaotong University, China; Shaanxi Smart Networks and Ubiquitous Access Research Center, China) and Qinghe Du (Xi'an Jiaotong University, China; Shaanxi Smart Networks and Ubiquitous Access Research Center, China)*

A Survey of Machine Learning Algorithms and Techniques for Air Mobility Under Emergency Situations ..... 582
*Yujing Zhou (Embry-Riddle Aeronautical University, USA), Dahai Liu (Embry-Riddle Aeronautical University, USA), and Houbing Song (Embry-Riddle Aeronautical University, USA)*

EvoSense: Towards Self-Evolving WiFi-Based User Gait Recognition ..... 589
*Yao Yao (Shenzhen University, China), Chengwen Luo (Shenzhen University, China), Xingyu Feng (Shenzhen University, China), Yijing Huang (Shenzhen University, China), Jin Zhang (Shenzhen University, China), and Jianqiang Li (Shenzhen University, China)*

A Taxonomy of Security and Defense Mechanisms in Digital Twins-Based Cyber-Physical Systems ..... 597
*Adamu Hussaini (Towson University, USA), Cheng Qian (Towson University, USA), Weixian Liao (Towson University, USA), and Wei Yu (Towson University, USA)*

How do Programmers Use the Internet? Discovering Domain Knowledge from Browsing and Coding Behaviors ..... 605
*Ko Watanabe (University of Kaiserslautern & DFKI GmbH), Yuki Matsuda (Nara Institute of Science and Technology), Yugo Nakamura (Kyushu University), Yutaka Arakawa (Kyushu University), and Shoya Ishimaru (University of Kaiserslautern & DFKI GmbH)*

## Digital Twin and Edge Computing for Cyber Physical System: Communication, Modeling, and Learning (DTEC 2022)

Reliability Analysis and Optimization for Sensing Data Collection and Processing in New Energy Internet Systems ..... 611
*Huanjun Hu (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Jie Wang (Wuhan University, China; Energy Internet Laboratory, China), Jing Wang (Wuhan University, China; Energy Internet Laboratory, China), Shengwei Wang (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Yixi Wang (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Yuxuan Ye (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), and Rongtao Liao (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China)*

3D Human Pose and Shape Estimation from Video ..... 617
*Xun-Yu Liu (Shenzhen University, China), Lei Wang (Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences (CAS), China), Xiao-Liang Ma (Shenzhen University, China), Gong-Bin Chen (Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences (CAS), China), Cheng He (Shenzhen University, China), and Jun Cheng (Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences (CAS), China)*

Resource Allocation and Computation Offloading in Ultra-Reliable Low-Latency Communication Systems via Deep Reinforcement Learning ..... 625
*Jiahui Li (Southwest University of Science and Technology, China), Jiaxin Yan (Southwest University of Science and Technology, China), Baolin Yin (Southwest University of Science and Technology, China), Liang Zhao (Southwest University of Science and Technology, China), and Ran Wei (Hangzhou Terminus Network Technology Co., Ltd., China)*

MMC Online Thermal Simulation and Life Prediction Based on Digital Twin Technology ..... 631
*Tianlong Xiong (Tsinghua University, China), Min Luo (Plexim GmbH, Switzerland), Chao Yang (Tsinghua University, China), Qing Cheng (Tsinghua University, China), and Yawen Liu (Tsinghua University, China)*

LigNet: Lightweight Hand Tracking for Edge Intelligence ..... 636
*Yijing Huang (Shenzhen University, China), Chengwen Luo (Shenzhen University, China), Xingyu Feng (Shenzhen University, China), Zhongru Yang (Shenzhen University, China), Jin Zhang (Shenzhen University, China), and Jianqiang Li (Shenzhen University, China)*

## Emerging Smart Data Applications in New Power Systems (ESDPS 2022)

Age Upon Decisions for Low-Latency Services in Internet of Energy Systems ..... 643
*Weiqing Yao (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Zhiwei Bao (WuHan University, China; State Grid Hubei Electric Power Company, China), Xian Luo (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Jing Wang (WuHan University, China; State Grid Hubei Electric Power Company, China), and Jie Wang (WuHan University, China; State Grid Hubei Electric Power Company, China)*

Short-Dataset-Driven Prediction on Area Electricity Consumption with Adaptive Training Window Selection ..... 648
*Jie Wang (Wuhan University, China; State Grid Hubei Electric Power Company, China), Shengwei Wang (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Jing Wang (Wuhan University, China; State Grid Hubei Electric Power Company, China), Huanjun Hu (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Yixi Wang (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), Yuxuan Ye (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China), and Rongtao Liao (Energy Internet Laboratory, China; State Grid Hubei Electric Power Company, China)*

**Author Index** ..... **655**