

**2021 IEEE International Conferences on
Internet of Things (iThings 2021) and
IEEE Green Computing &
Communications (GreenCom 2021) and
IEEE Cyber, Physical & Social Computing
(CPSCom 2021) and IEEE Smart Data
(SmartData 2021) and IEEE Congress on
Cybermatics (Cybermatics 2021)**

**Melbourne, Australia
6 – 8 December 2021**



**IEEE Catalog Number: CFP21GCC-POD
ISBN: 978-1-6654-1763-1**

**Copyright © 2021 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:	CFP21GCC-POD
ISBN (Print-On-Demand):	978-1-6654-1763-1
ISBN (Online):	978-1-6654-1762-4

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

CURRAN ASSOCIATES INC.
proceedings
.com

**2021 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 2021**

Table of Contents

iThings 2021 Message from the General Chairs	xiii
iThings 2021 Message from the Program Chairs	xiv
iThings 2021 Program Committees	xv
CPSCom 2021 Message from the General Chairs	xvii
CPSCom 2021 Message from the Program Chairs	xviii
CPSCom 2021 Program Committees	xix
SmartData 2021 Message from the General Chairs	xxi
SmartData 2021 Message from the Program Chairs	xxii
SmartData 2021 Program Committees	xxiii
GreenCom 2021 Message from General Chairs and Program Chairs	xxiv
GreenCom 2021 Program Committees	xxv

2021 IEEE International Conferences on Internet of Things (iThings)

uTimer: A Uniform Low-Level Timer API for RIOT OS	1
<i>Niels Gandraß (HAW Hamburg, Germany), Michel Rottleuthner (HAW Hamburg, Germany), and Thomas C. Schmidt (HAW Hamburg, Germany)</i>	

Vehicular Grouping Protocol: Towards Cyber Physical Network Intelligence	9
<i>Duaa Zuhair Al-Hamid (Auckland University of Technology, New Zealand)</i> <i>and Adnan Al-Anbuky (Auckland University of Technology, New Zealand)</i>	
Low-Cost Internet of Things Based Real-Time Pavement Monitoring System	17
<i>Korkut Bekiroglu (SUNY Polytechnic Institute, USA), Ali Tekeoglu</i> <i>(Johns Hopkins University), Jiayue Shen (SUNY Polytechnic Institute,</i> <i>USA), and Ilker Boz (Research Scientist, Virginia Transportation</i> <i>Research Council, USA)</i>	
Integrating 6LoWPAN Security with RPL using The Chained Secure Mode Framework	23
<i>Ahmed Raoof (Carleton University, Canada), Chung-Hornng Lung (Carleton</i> <i>University, Canada), and Ashraf Matrawy (Carleton University, Canada)</i>	
A Machine Learning Regression Approach for Throughput Estimation in an IoT Environment	29
<i>Aroosa Hameed (Ecole de technologie supérieure, Canada), John Violos</i> <i>(École de technologie supérieure, Canada), Nina Santi (Inria</i> <i>Lille-Nord, France), Aris Leivadreas (École de technologie supérieure,</i> <i>Canada), and Nathalie Mitton (Inria Lille-Nord, France)</i>	
A Lightweight Central Learning Approach for Arrhythmia Detection from ECG Signals	37
<i>Abdulla Aboumadi (Qatar University, Qatar), Elias Yaacoub (Qatar</i> <i>University, Qatar), and Khalid Abualsaud (Qatar University, Qatar)</i>	
LDoS Attacker Detection Algorithms in Zigbee Network	43
<i>Satoshi Okada (The University of Tokyo, Japan), Daisuke Miyamoto (The</i> <i>University of Tokyo, Japan), Yuji Sekiya (The University of Tokyo,</i> <i>Japan), Hideki Takase (The University of Tokyo, Japan), and Hiroshi</i> <i>Nakamura (The University of Tokyo, Japan)</i>	
MobileDLSearch: Ontology-Based Mobile Platform for Effective Sharing and Reuse of Deep Learning Models	51
<i>Zhangcheng Qiang (Monash University, Australia; Australian National</i> <i>University, Australia), Yuxin Zhang (Monash University, Australia),</i> <i>Pari Delir Haghighi (Monash University, Australia), Abdur Rahim</i> <i>Mohammad Forkan (Swinburne University of Technology, Australia), Prem</i> <i>Prakash Jayaraman (Swinburne University of Technology, Australia), and</i> <i>Junyao Deng (Monash University, Australia)</i>	
Tremble: TRansparent Emission Monitoring with BLockchain Endorsement	59
<i>Alexander Nußbaum (Bundeswehr University Munich, Germany), Johannes</i> <i>Schütte (Bundeswehr University Munich, Germany), Luoyao Hao (Columbia</i> <i>University, USA), Henning Schulzrinne (Columbia University, USA), and</i> <i>Florian Alt (Bundeswehr University Munich, Germany)</i>	
An Effective Approach to Protecting Low-Power and Lossy IoT Networks Against Blackhole Attacks	65
<i>Kent Sanders (Arizona State University, USA) and Stephen S. Yau</i> <i>(Arizona State University, USA)</i>	
Towards Group Activity Recognition and Analysis for Improving the Safety of Automated Vehicles	73
<i>Amin Abken (Deakin University, Australia), Seng W. Loke (Deakin</i> <i>University, Australia), and Arkady Zaslavsky (Deakin University,</i> <i>Australia)</i>	

Real-Time Sound Event Classification for Human Activity of Daily Living using Deep Neural Network	83
<i>Ah Hyun Yuh (Kyungpook National University, Republic of Korea) and Soon Ju Kang (Kyungpook National University, Republic of Korea)</i>	
Quality and Cost Aware Service Selection in IoT-Context Management Platforms	89
<i>Kanaka Sai Jagarlamudi (Deakin University, Australia), Arkady Zaslavsky (Deakin University, Australia), Seng W Loke (Deakin University, Australia), Alireza Hassani (Deakin University, Australia), and Alexey Medvedev (Deakin University, Australia)</i>	
Protecting LoRaWAN Data Against Untrusted Network Servers	99
<i>Poliana de Moraes (Federal University of São Paulo, Brazil) and Arlindo Flavio da Conceição (Federal University of São Paulo, Brazil)</i>	
Multi-UAVs for Bushfire Situational Awareness: A Comparison of Environment Traversal Algorithms	107
<i>Reza Bairam Zadeh (Deakin University, Australia), Arkady Zaslavsky (Deakin University, Australia), Seng W. Loke (Deakin University, Australia), and Somaiyeh MahmoudZadeh (Deakin University, Australia)</i>	
Low Rate DoS Attack Detection in IoT - SDN using Deep Learning	115
<i>Harun Surej Ilango (Nanyang Technological University, Singapore), Maode Ma (Qatar University, Qatar), and Rong Su (Nanyang Technological University, Singapore)</i>	
MUDirect: Protecting P2P IoT Devices with MUD	121
<i>Yehuda Afek (Tel Aviv Univ., Israel), Anat Bremler-Barr (Reichman Univ., Israel), David Hay (Hebrew Univ., Israel), and Avraham Shalev (Reichman Univ., Israel)</i>	
A Development Method for Safe Node-RED Systems using Discrete Controller Synthesis	130
<i>Takuto Yamauchi (Waseda University, Japan), Takanori Hirano (Waseda University, Japan), Jialong Li (Waseda University, Japan), Takafumi Kawasaki (Keio University, Japan), Yin Chen (Keio University, Japan), Akira Tsuge (Keio University, Japan), Tadashi Okoshi (Keio University, Japan), Jin Nakazawa (Keio University, Japan), Nobukazu Yoshioka (National Institute of Informatics, Japan), Georgios Palaiokrassas (National Technical University of Athens, Greece), Antonios Litke (National Technical University of Athens, Greece), and Kenji Tei (Waseda University, Japan)</i>	
Extracting Threat Intelligence Related IoT Botnet From Latest Dark Web Data Collection	138
<i>Keisuke Furumoto (National Institute of Information and Communications Technology, Japan), Mitsuhiro Umizaki (National Institute of Information and Communications Technology, Japan), Akira Fujita (National Institute of Information and Communications Technology, Japan), Takahiko Nagata (Infours Inc., Japan), Takeshi Takahashi (National Institute of Information and Communications Technology, Japan), and Daisuke Inoue (National Institute of Information and Communications Technology, Japan)</i>	

2021 IEEE Green Computing and Communications (GreenCom)

Flow Anomaly Telemetry Driven by Programmable Data Plane	146
<i>Xinyue Jiang (Zhejiang University, China), Risheng Deng (Zhejiang University, China), Dong Zhang (Fuzhou University, China), and Chunming Wu (Zhejiang University, China)</i>	
Energy Consumption Modelling of Next Generation Mobile Crosshaul Networks	153
<i>Line M.P. Larsen (Technical University of Denmark, Denmark), Sarah Ruepp (Technical University of Denmark, Denmark), Michael S. Berger (Technical University of Denmark, Denmark), and Henrik Christiansen (Copenhagen, Denmark)</i>	
Advanced Energy Model and Spectral Efficiency Optimization in Short-Range Wireless Sensor Networks	161
<i>Marie-Anne Lacroix (Univ Rennes, CNRS, Irista), Romuald Rocher (Univ Rennes, CNRS, Irista), and Pascal Scalart (Univ Rennes, CNRS, Irista)</i>	
Power Allocation & MRC Analysis for Single Input Multi Output Non-Orthogonal Multiple Access System	168
<i>Mohamed Gaballa (Brunel University London, UK), Maysam Abbod (Brunel University London, UK), and Muna Albasman (Kuwait university, Kuwait)</i>	

2021 IEEE Cyber, Physical and Social Computing (CPSCom)

A Hybrid Spatiotemporal Attack in Continuous LBS Queries	174
<i>Yongjie Zhan (Nanjing University of Science and Technology, China), Le Li (Nanjing University of Science and Technology, China), Yuwen Qian (Nanjing University of Science and Technology, China), Chuan Ma (Nanjing University of Science and Technology, China), Ming Ding (CSIRO, Australia), and Bo Liu (University of Technology Sydney, Australia)</i>	
Generating High-Quality Movie Tags from Social Reviews: A Learning-Driven Approach	182
<i>Zhenxiao Luo (Sun Yat-sen University, China; Guangdong Key Laboratory of Big Data Analysis and Processing, China), Guopin Tang (Sun Yat-sen University, China; Guangdong Key Laboratory of Big Data Analysis and Processing, China), Chen Wang (Sun Yat-sen University, China), Yipeng Zhou (Macquarie University, Australia), Xi Zheng (Macquarie University, Australia), Jessie Hui Wang (Tsinghua University, China), Gang Liu (Shenzhen University, China), and Di Wu (Sun Yat-sen University, China; Guangdong Key Laboratory of Big Data Analysis and Processing, China)</i>	
Device Placement for Autonomous Vehicles using Reinforcement Learning	190
<i>Jinkai Zheng (Xidian University, China), Phil K. Mu (University of Michigan, USA), Ziqian Man (Xidian University, China), Tom H. Luan (Xidian University, China), Lin X. Cai (Illinois Institute of Technology, USA), and Hangguan Shan (Zhejiang University, China)</i>	

A non-Contact Mental Fatigue Detection Method for Space Medical Experiment using Multi-Feature Fusion Model	197
<i>Yu Yan (Hefei University of Technology, China), Shuai Ding (Hefei University of Technology, China), Zijie Yue (Hefei University of Technology, China), Hui Yang (China Astronaut Research and Training Center, China), Lina Qu (China Astronaut Research and Training Center, China), and Yinghui Li (China Astronaut Research and Training Center, China)</i>	
Quantum Machine Learning for Electricity Theft Detection: an Initial Investigation	204
<i>Lianting Xue (North China Electric Power University, China), Long Cheng (North China Electric Power University, China), Yuancheng Li (North China Electric Power University, China), and Ying Mao (Fordham University, USA)</i>	
FLZip: An Efficient and Privacy-Preserving Framework for Cross-Silo Federated Learning	209
<i>Xiaojie Feng (Shanghai University of Electric Power, China) and Haizhou Du (Shanghai University of Electric Power, China)</i>	
Vulnerability Characterization and Privacy Quantification for Cyber-Physical Systems	217
<i>Arpan Bhattacharjee (University of Nevada, Reno), Shahriar Badsha (University of Nevada, Reno), Md Tamjid Hossain (University of Nevada, Reno), Charalambos Konstantinou (KAUST, Saudi Arabia), and Xueping Liang (University of North Carolina, Greensboro)</i>	
Offensive and Defensive Countermeasure Technology of Return-Oriented Programming	224
<i>Zixuan Xu (Beijing Institute of Technology, China), Jingci Zhang (Beijing Institute of Technology, China), Shang Ai (Guangzhou University, China), Chen Liang (Beijing Information Science & Technology University, China), Lu Liu (Beijing Institute of Technology, China), and Yuanzhang Li (Beijing Institute of Technology, China)</i>	
Motion Resistant Facial Video Based Heart Rate Estimation Method using Head-Mounted Camera	229
<i>Jidong Geng (Anhui University, China), Chao Zhang (Anhui University, China), Haoyuan Gao (Anhui University, China), Yang Lv (Anhui University, China), and Xiaopei Wu (Anhui University, China)</i>	
GPDP: Game-Enhanced Personalized Differentially Private Smart Community	238
<i>Yuping Zhang (Chengdu Technological University, China), Youyang Qu (Deakin University, Australia), Longxiang Gao (Deakin University, Australia), Bruce Gu (Victoria University, Australia), Lei Cui (Taiyuan University of Science and Technology, China), and Xuemeng Zhai (University of Electronic Science and Technology of China, China)</i>	
A Secure Cloud-Edge Collaborative Logistic Regression Model	244
<i>Chen Wang (Northeastern University, China), Jian Xu (Northeastern University, China), and Long Yin (Northeastern University, China)</i>	

Side-Channel Analysis-Based Model Extraction on Intelligent CPS: An Information Theory Perspective	254
<i>Qianqian Pan (Shanghai Jiao Tong University, China; Shanghai Key Laboratory of Integrated Administration Technologies for Information Security, China), Jun Wu (Shanghai Jiao Tong University, China; Shanghai Key Laboratory of Integrated Administration Technologies for Information Security, China), Xi Lin (Shanghai Jiao Tong University, China; Shanghai Key Laboratory of Integrated Administration Technologies for Information Security, China), and Jianhua Li (Shanghai Jiao Tong University, China; Shanghai Key Laboratory of Integrated Administration Technologies for Information Security, China)</i>	
Taxonomy and Survey of Performance Prediction Systems for the Distributed Systems Including the Clouds	262
<i>Sena Seneviratne (Sydney University, Australia), Liyanage C De Silva (Universiti Brunei Darussalam, Brunei), and Sanjeeva Witharana (University of Leeds, United Kingdom)</i>	
The Registration-Based Scheduling for Avoiding Collision using the Triggered RAW for IEEE 802.11ah	269
<i>Chung-Ming Huang (National Cheng Kung University, Taiwan) and Shu-Hang Huang (National Cheng Kung University, Taiwan)</i>	
GauPro: An Accuracy-Improved Indoor Positioning System Based on Beacon Probabilistic Fingerprint	276
<i>Yu Zhang (The University of Sydney, Australia; CHUR Networks, Australia), Zhongzheng Lai (The University of Sydney, Australia; CHUR Networks, Australia), Dong Yuan (The University of Sydney, Australia), Wei Bao (The University of Sydney, Australia), Bing Bing Zhou (The University of Sydney, Australia), Jing Qiu (The University of Sydney, Australia), Shen Wang (CHUR Networks, Australia), and Stewart Adams (CHUR Networks, Australia)</i>	
Digital Twins Bonds Society with Cyber-Physical Energy Systems: a Literature Review	284
<i>Ali Aghazadeh Ardebili (University of Salento, Italy), Antonella Longo (University of Salento, Italy), and Antonio Ficarella (University of Salento, Italy)</i>	
Impact of Image Compression on CNN Performance Metrics for CPS Nodes at the Arctic Tundra ..	290
<i>Steffen Randrup (UiT Tromso, Norway), Issam Raïs (UiT Tromso, Norway), John Markus Bjørndalen (UiT Tromso, Norway), Phuong Hoai Ha (UiT Tromso, Norway), and Otto Anshus (UiT Tromso, Norway)</i>	
A Quick Recovery Strategy for Network Failure Under Multipath Multicast Transmissions	298
<i>Chao Xu (Tsinghua University, China), Jessie Hui Wang (Tsinghua University, China), Rui Li (Tsinghua University, China), Tao Yu (Tsinghua University, China), and Jilong Wang (Tsinghua University, China)</i>	

On Dynamic Resource Allocation for Blockchain Assisted Federated Learning over Wireless Channels	306
<i>Xiumei Deng (Nanjing University of Science and Technology, China), Jun Li (Nanjing University of Science and Technology, China), Long Shi (Nanjing University of Science and Technology, China), Zhe Wang (Nanjing University of Science and Technology, China), Jessie Hui Wang (Tsinghua University, China), and Taotao Wang (Shenzhen University, China)</i>	
Intelligent Data-Driven Vessel Trajectory Prediction in Marine Transportation Cyber-Physical System	314
<i>Ryan Wen Liu (Wuhan University of Technology, China), Maohan Liang (Wuhan University of Technology, China), Jiangtian Nie (Nanyang Technological University, Singapore), Xianjun Deng (Huazhong University of Science and Technology, China), Zehui Xiong (Singapore University of Technology and Design, Singapore), Jiawen Kang (Nanyang Technological University, Singapore), Helin Yang (Nanyang Technological University, Singapore), and Yang Zhang (Nanjing University of Aeronautics and Astronautics, China)</i>	
Research on Social Attribute Aware-Based Vehicular Opportunistic Routing Protocol	322
<i>Jieying Zhou (Sun Yat-sen University, China), Junyao Zheng (Sun Yat-sen University, China), Pengfei He (Sun Yat-sen University, China), and Weigang Wu (Sun Yat-sen University, China)</i>	
SAFSN: A Self-Attention Based Neural Network for Encrypted Mobile Traffic Classification	330
<i>Chengyuan Zhang (Tsinghua University, China), Changqing An (Tsinghua University, China; Peng Cheng Laboratory, China), Jessie Hui Wang (Tsinghua University, China; Peng Cheng Laboratory, China), Ziyi Zhao (Tsinghua University, China), Tao Yu (Tsinghua University, China; Peng Cheng Laboratory, China), and Jilong Wang (Tsinghua University, China)</i>	
Revocable Outsourcing Multi-Authority ABE for Medical Data in Mobile Cloud	338
<i>Arthur Sandor Voundi Koe (Guangzhou University, China), Juan Tang (Guangzhou University, China), Shan Ai (Guangzhou University, China), Hongyang Yan (Guangzhou University, China), and Shiwen Zhang (Hunan University of Science and Technology, China)</i>	
Automatic Generation of Workflows for Efficient Design Space Exploration for Cyber-Physical Systems	346
<i>Yon Vanommeslaeghe (University of Antwerp, Belgium), Joachim Denil (University of Antwerp, Belgium), Bert Van Acker (University of Antwerp, Belgium; AnSyMo/Cosys, Flanders Make, Belgium), and Paul De Meulenaere (University of Antwerp, Belgium)</i>	
Speeding up Block Propagation in Bitcoin Network: A Cut-Through Relaying Scheme	352
<i>Lihao Zhang (The Chinese University of Hong Kong, China), Taotao Wang (Shenzhen University, China), and Soung Chang Liew (The Chinese University of Hong Kong, China)</i>	

2021 IEEE Smart Data (SmartData)

Citizenly: A Platform to Encourage Data-Driven Decision Making for the Community by the Community	359
<i>Md Towhidul Absar Chowdhury (Rochester Institute of Technology, USA)</i> <i>and Naveen Sharma (Rochester Institute of Technology, USA)</i>	
May SARS-CoV-2 be Prevented by an Indoor air Monitoring Smart Data Service?	365
<i>Antonella Longo (University of Salento, Italy), Ali Aghazadeh Ardebili</i> <i>(University of Salento, Italy), Marco Zappatore (University of</i> <i>Salento, Italy), and Divya Pragna Mulla (University of Salento, Italy)</i>	
Smart Data Analytics on COVID-19 Data	372
<i>Carson K. Leung (University of Manitoba, Canada), Chenru Zhao</i> <i>(University of Manitoba, Canada), and Hao Zheng (University of</i> <i>Manitoba, Canada)</i>	
s2Cloud: A Novel Cloud System for Mobile Health Big Data Management	380
<i>Jake Stauffer (Indiana University-Purdue University, Indianapolis) and</i> <i>Qingxue Zhang (Indiana University-Purdue University, Indianapolis)</i>	
Optimized Route Calculation Technology with Smart Building Platform	384
<i>Hideya Yoshiuchi (Hitachi, Ltd., Research & Development Group, Japan)</i>	
Question-Answer Generation for Data Augmentation	391
<i>Juei-Yian Lin (National Sun Yat-sen University, Taiwan), Jhih-Yuan</i> <i>Huang (National Sun Yat-sen University, Taiwan), and Wei-Po Lee</i> <i>(National Sun Yat-sen University, Taiwan)</i>	
Author Index	399