2020 16th International Conference on Mobility, Sensing and Networking (MSN 2020)

Tokyo, Japan 17 – 19 December 2020



IEEE Catalog Number: CFP2030F-POD **ISBN:**

978-1-7281-9236-9

Copyright © 2020 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:	CFP2030F-POD
ISBN (Print-On-Demand):	978-1-7281-9236-9
ISBN (Online):	978-1-7281-9916-0

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



2020 16th International Conference on Mobility, Sensing and Networking (MSN) MSN 2020

Table of Contents

Message from General Chairs	xxiv
Message from Technical Program Chairs	xxv
Organizing Committee	
Technical Program Committee	xxvii
5G B5G 2020 Workshop	xxxii
AI2OT 2020 Workshop	xxxiii
AINSC 2020 Workshop	xxxiv
ECAISS 2020 Workshop	xxxv
MSRLA 2020 Workshop	xxxvi
UEIoT 2020 Workshop	xxxvii
Keynotes	xxxviii
Panel	xlii
Sponsors	xliii

Part I: MSN 2020 Main Conference

A Centralized Controller for Reliable and Available Wireless Schedules in Industrial	1
Networks	. 1
Remous-Aris Koutsiamanis (IMT Atlantique, IRISA, France), Georgios Z. Papadopoulos (IMT Atlantique, IRISA, France), Bruno Quoitin (University of Mons (UMONS), Belgium), and Nicolas Montavont (IMT	
(University of Mons (UMONS), Belgium), and Nicolas Montavont (IMT Atlantique, IRISA, France)	
A FAIR Extension for the MQTT Protocol	10
Dariush Salami (Aalto University, Finland), Olga Streibel (Disruptive	
Technologies, Bayer AG), Marcus Rhenius (Information Technology,	
Product Supply, Pharmaceuticals, Bayer AG), and Stephan Sigg (Aalto	
University, Finland)	

A Game Theoretical Pricing Scheme for Vehicles in Vehicular Edge Computing	17
A Global Brain Fuelled by Local Intelligence Optimizing Mobile Services and Networks with AI	23
A Near-Optimal Protocol for the Subset Selection Problem in RFID Systems	33
A Priority Task Scheduling Algorithm Based on Residual Energy in EH-WSNs	13
A QoE-Based 360° Video Adaptive Bitrate Delivery and Caching Scheme for C-RAN	19
Adaptive Machine Learning: A Framework for Active Malware Detection	57
AirQ: A Privacy-Preserving Truth Discovery Framework for Vehicular Air Quality Monitoring	65

Rui Liu (University of Victoria, Canada) and Jianping Pan (University of Victoria, Canada)

An Efficient Data Aggregation Scheme with Local Differential Privacy in Smart Grid
An Online Pricing Strategy of EV Charging and Data Caching in Highway Service Stations
 Analysing Ballistocardiography for Pervasive Healthcare
BDTF: A Blockchain-Based Data Trading Framework with Trusted Execution Environment
 BIA: A Blockchain-Based Identity Authorization Mechanism
Compressed Multivariate Kernel Density Estimation for WiFi Fingerprint-Based Localization 106 Zhendong Xu (Inner Mongolia University, China), Baoqi Huang (Inner Mongolia University, China), Bing Jia (Inner Mongolia University, China), and Wuyungerile Li (Inner Mongolia University, China)
CoOMO: Cost-Efficient Computation Outsourcing with Multi-Site Offloading for Mobile-Edge Services
COPSS-Lite: A Lightweight ICN Based Pub/Sub System for IoT Environments

Data Collection Strategy Based on Drone Technology in Wireless Sensor Networks
Deep Reinforcement Learning for Optimal Resource Allocation in Blockchain-Based IoV Secure Systems
Detection of Malicious Nodes in Drone Ad-Hoc Network Based on Supervised Learning and Clustering Algorithms
Dynamic Resource Allocation for Hierarchical Federated Learning
Dynamic Spectrum Allocation Enabled Multi-User Latency Minimization in Mobile Edge Computing 161 Yang Li (State Key Laboratory of Internet of Things for Smart City, 161 University of Macau, China; University of Macau, China), Yuan Wu (State Key Laboratory of Internet of Things for Smart City, University of Macau, China; University of Macau, China), and Weijia Jia (BNU-UIC Institute of Artificial Intelligence and Future Networks, Beijing Normal University (Zhuhai), China) 100
Efficient Algorithm for Multi-Constrained Opportunistic Wireless Scheduling
Efficient Distributed Training in Heterogeneous Mobile Networks with Active Sampling 174 Yunhui Guo (University of California, San Diego, USA), Xiaofan Yu (University of California, San Diego, USA), Kamalika Chaudhuri (University of California, San Diego, USA), and Tajana Rosing (University of California, San Diego, USA)

Efficient Service Entity Chain Placement in Mobile Edge Computing
 Energy-Efficient Trajectory Planning and Speed Scheduling for UAV-Assisted Data Collection 190 Weidu Ye (Southeast University, China), Wenjia Wu (Southeast University, China), Feng Shan (Southeast University, China), Ming Yang (Southeast University, China), and Junzhou Luo (Southeast University, China)
Energy-Saving Strategy for Edge Computing by Collaborative Processing Tasks on Base Stations
Zhongjun Ma (Hefei University of Technology, China), Zhenchun Wei (Hefei University of Technology, China; Engineering Research Center of Safety Critical Industrial Measurement and Control Technology, China), Wenjie Zhang (Hefei University of Technology, China), Zengwei Lyu (Hefei University of Technology, China; Engineering Research Center of Safety Critical Industrial Measurement and Control Technology, China), Junyi Xu (Hefei University of Technology, China), and Benhong Zhang (Hefei University of Technology, China; Engineering Research Center of Safety Critical Industrial Measurement and Control Technology, China)
 Enhancing IoT Anomaly Detection Performance for Federated Learning
Evaluation Environment using edge Computing for Artificial Intelligence-Based Irrigation System
 FD-Band: A Ubiquitous Fall Detection System Using Low-Cost COTS Smart Band
Federated Deep Payload Classification for Industrial Internet with Cloud-Edge Architecture 228 Peng Zhou (Shanghai University)

Fine-Grained Device and Data Access Control of Community Medical Internet of Things
Joint Service Caching and Computation Offloading to Maximize System Profits in Mobile Edge-Cloud Computing
Jointly Video Bitrate Adaptation and Multicast Resource Allocation in Mobile Edge Networks 252 Simin Li (AnHui Province Key Laboratory of Future Networks, University of Science and Technology of China, China), Xiaobin Tan (AnHui Province Key Laboratory of Future Networks, University of Science and Technology of China, China), Shunyi Wang (AnHui Province Key Laboratory of Future Networks, University of Science and Technology of China, China), Jian Yang (AnHui Province Key Laboratory of Future Networks, University of Science and Technology of China, China), and Quan Zheng (AnHui Province Key Laboratory of Future Networks, University of Science and Technology of China, China)
Lifetime Improvements of Smart Sensors Maintenance Protocol in Prospect of IoT-based Rampal Power Plant
Load Balancing and Resource Management in Distributed B5G Networks
Magic Wand : Towards Plug-and-Play Gesture Recognition on Smartwatch

 Markov Probability Fingerprints: A Method for Identifying Encrypted Video Traffic
MEC-Assisted FoV-Aware and QoE-Driven Adaptive 360° Video Streaming for Virtual Reality 291 <i>Chih-ho Hsu (National Taiwan University, Taiwan)</i>
 MobiFit: Contactless Fitness Assistant for Freehand Exercises Using Just One Cellular Signal Receiver
Multivariate and Multi-Frequency LSTM Based Fine-Grained Productivity Forecasting for Industrial IoT
 Online Distributed Job Dispatching with Outdated and Partially-Observable Information
Optimal Defense Strategy against Evasion Attacks
Optimizing Functional Split of Baseband Processing on TWDM-PON Based Fronthaul Network 330 Go Hasegawa (Research Institute of Electrical Communication, Tohoku University, JAPAN), Masayuki Murata (Osaka University, JAPAN), Yoshihiro Nakahira (Oki Electronics Industry Co., Ltd., JAPAN), Masayuki Kashima (Oki Electronics Industry Co., Ltd., JAPAN), and Shingo Ata (Osaka City University, JAPAN)

Privacy-Protecting Reputation Management Scheme in IoV-Based Mobile Crowdsensing Zhifei Wang (Beijing Key Lab of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications, Beijing Laboratory of Advanced Information Networks, China), Luning Liu (Beijing Key Lab of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications, Beijing Laboratory of Advanced Information Networks, China), Luhan Wang (Beijing Key Lab of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications, Beijing University of Posts and Telecommunications, Beijing Laboratory of Advanced Information Networks, China), Xiangming Wen (Beijing Key Lab of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications, Beijing Laboratory of Advanced Information Networks, China), and Wenpeng Jing (Beijing Key Lab of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications, Beijing Laboratory of Advanced Information Networks, China), and Wenpeng Jing (Beijing Key Lab of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications, Beijing Laboratory of Advanced Information Networks, China), Beijing Laboratory of Advanced Information Networks, China)	337
QoS Optimization of DNN Serving Systems Based on Per-Request Latency Characteristics Jianfeng Zhang (Institute of Systems and Networks, Nankai University, China), Wensheng Zhang (Institute of Automation, Institute of Automation, Chinese Academy of Sciences, China), Lingjun Pu (Nankai University, China), and Jingdong Xu (Institute of Systems and Networks, State Key Laboratory of Integrated Services Networks, Xidian University, China)	344
Real-Time Survivor Detection in UAV Thermal Imagery Based on Deep Learning Jiong Dong (Muroran Institute of Technology, Japan), Kaoru Ota (Muroran Institute of Technology, Japan), and Mianxiong Dong (Muroran Institute of Technology, Japan)	352
Real-Time Task Offloading for Data and Computation Intensive Services in Vehicular Fog Computing Environments <i>Chunhui Liu (Chongqing University, China), Kai Liu (Chongqing University, China), Xincao Xu (Chongqing University, China), Hualing Ren (Chongqing University, China), Feiyu Jin (Chongqing University, China), and Songtao Guo (Chongqing University, China)</i>	360
Reinforcement Learning Based Joint Channel/Subframe Selection Scheme for Fair LTE-WiFi Coexistence	367
Research on D2D Data Transmission Protocol in NDN Bo Cui (Inner Mongolia Key Laboratory of Wireless Networking and Mobile Computing, China;Inner Mongolia University, China), Xinmiao Jian (Inner Mongolia Key Laboratory of Wireless Networking and Mobile Computing, China;Inner Mongolia University, China), and Qi Chen (Inner	373

Mongolia University, China)

 RF-WTI: Wood Types Identification Based on Commodity RFID Devices
 SASAK: Shrinking the Attack Surface for AndroidKernel with Stricter "seccomp" Restrictions
 Scheduling Mix-Flow in SD-DCN Based on Deep Reinforcement Learning with Private Link 395 Jinjie Lu (Guangzhou University, China), Waixi Liu (Guangzhou University, China), Yinghao Zhu (Guangzhou University, China), Sen Ling (Guangzhou University, China), Zhitao Chen (Guangzhou University, China), and Jiaqi Zeng (Guangzhou University, China)
SDN Based Computation Offloading for Industrial Internet of Things

 Simultaneous Multi-Face Zoom Tracking for 3-D People-Flow Analysis with Face Identification
 SSR: Joint Optimization of Recommendation and Adaptive Bitrate Streaming for Short-form Video Feed
Terminal-Edge-Cloud Collaboration: An Enabling Technology for Robust Multimedia Streaming 427 Dapeng Wu (Chongqing University of Posts and Telecommunications, China), Jin Yang (Chongqing University of Posts and Telecommunications, China), Honggang Wang (University of Massachusetts Dartmouth, USA), Boran Yang (Chongqing University of Posts and Telecommunications, China), and Ruyan Wang (Chongqing University of Posts and Telecommunications, China)
 Throughput Maximization for UAV-Enabled Data Collection
Tile-Based Multi-Source Adaptive Streaming for 360-Degree Ultra-High-Definition Videos
TL-IDPS: Two Level Intrusion Detection and Prevention System using Probabilistic Optimal Feature Set Estimation 449 Ernest Ntizikira (Dalian University of Technology, China), Lei Wang 449 (Dalian University of Technology, China; Peng Cheng Laboratory, 449 China), Bingxian Lu (Dalian University of Technology, China), and 449

Xinxin Lu (Dalian University of Technology, China)

Towards mmWave Localization with Controllable Reflectors in NLoS Scenarios	
 Training Machine Learning Models through Preserved Decentralization	
 Urban Mobility Prediction Based on LSTM and Discrete Position Relationship Model	
 Weighted Local Outlier Factor for Detecting Anomaly on In-Vehicle Network	
 Wireless Information and Energy Provision with Practical Modulation in Energy Self-Sustainable Wireless Networks	

Invited Papers

Analyzing Eye-Movements of Drivers with Different Experiences When Making a Turn Bo Wu (Waseda University, Japan), Shoji Nishimura (Waseda University, Japan), Qun Jin (Waseda University, Japan), and Yishui Zhu (Chang'an University, China)	502
Autonomous Security Analysis and Penetration Testing Ankur Chowdhary (Arizona State University), Dijiang Huang (Arizona State University), Jayasurya Sevalur Mahendran (Arizona State University), Daniel Romo (Arizona State University), Yuli Deng (Arizona State University), and Abdulhakim Sabur (Arizona State University)	508
 Early Botnet Detection for the Internet and the Internet of Things by Autonomous Machine Learning Anderson Bergamini de Neira (CCSC - Center for Computational Security Science, Federal University of Paraná, Brazil), Alex Medeiros Araujo (CCSC - Center for Computational Security Science, Federal University of Paraná, Brazil), and Michele Nogueira (CCSC - Center for Computational Security Science, Federal University of Paraná, Brazil) 	516
Identifying Unfamiliar Callers' Professions from Privacy-Preserving Mobile Phone Data Jiaquan Zhang (University of Göttingen, Germany), Xiaoming Yao (China Telecom Cloud Branch, China), and Xiaoming Fu (University of Göttingen, Germany)	524
Length Matters: Fast Internet Encrypted Traffic Service Classification Based on Multi-PDU Lengths	531
[Invited] LoRaCTP: A LoRa Based Content Transfer Protocol for Sustainable Edge Computing Kiyoshy Nakamura (Universitat Poliéecnica de Valéncia, Spain), Pietro Manzoni (Universitat Poliéecnica de Valéncia, Spain), Marco Zennaro (ICTP, Italy), Juan-Carlos Cano (Universitat Poliéecnica de Valéncia, Spain), and Carlos T. Calafate (Universitat Poliéecnica de Valéncia, Spain)	539
Machine Learning Enabled Secure Collection of Phasor Data in Smart Power Grid Networks Wassila Lalouani (University of Maryland Baltimore County, USA) and Mohamed Younis (University of Maryland Baltimore County, USA)	546
 Mobility-Aware Offloading and Resource Allocation in MEC-Enabled IoT Networks Han Hu (Jiangsu Key Laboratory of Wireless Communications, Nanjing University of Posts and Telecommunications, China; Jiangsu Key Lab of Broadband Wireless Communication and Internet of Things, Nanjing University of Posts and Telecommunications, Nanjing, China), Weiwei Song (Jiangsu Key Laboratory of Wireless Communications, Nanjing University of Posts and Telecommunications, China; Jiangsu Key Lab of Broadband Wireless Communications, China; Jiangsu Key Lab of Broadband Wireless Communications, China; Jiangsu Key Lab of Broadband Wireless Communication and Internet of Things, Nanjing University of Posts and Telecommunications, Nanjing, China), Qun Wang (Utah State University, Logan, USA), Fuhui Zhou (Nanjing University of Aeronautics and Astronautics, Nanjing), and Rose Qingyang Hu (Utah State University, Logan, USA) 	554

Multi-Dimensional Impact Detection and Diagnosis in Cellular Networks	1
 [Invited] NDN Based Participatory Crowdsensing Framework with Area-Focused Interest Forwarding	<i>9</i>
 NoPTPeer:Protecting Android Devices from Stealthy Spoofing and Stealing in WLANs without Privilege	'6
Real-Time Emotion Recognition for Sales 58 Si-Ahmed Naas (Aalto University) and Stephan Sigg (Aalto University) 58	\$4
Resilient Caching in Information-Centric Networking	12
Subject-Adaptive Skeleton Tracking with RFID 59 Chao Yang (Auburn University, Auburn Xuyu)	19
Trapdoor Assignment of PEKS-Based NDN Strategy in Two-Tier Networks	17
User Interest Communities Influence Maximization in a Competitive Environment	.4

Poster & Demo Papers

A Study on MQTT Node Selection	. 622
Fu Chen (Central University of Finance and Economics, China), Yujia	
Huo (Central University of Finance and Economics, China), Kun Liu (Central University of Finance and Economics, China), Wenying Tang	
(Central University of Finance and Economics, China), Wenying Tang	
(Central University of Finance and Economics, China) Jianmino Zhu	
(Central University of Finance and Economics, China), and Zhiyuan Sui (Central University of Finance and Economics, China)	
(Central University of Finance and Economics, China)	
Impact of Mode Selection on the Performance of D2D-Unlicensed Communications	. 624
Ganggui Wang (The University of Electro-Communications), Celimuge Wu	
(The University of Electro-Communications), Tsutomu Yoshinaga (The	
University of Electro-Communications), and Rui Yin (Zhejiang	
University City College)	
amoersity City Contege)	

UAV-Empowered Protocol for Information Sharing in VDTN62	26
Zhaoyang Du (The University of Electro-Communications, Tokyo, Japan),	
Celimuge Wu (The University of Electro-Communications, Tokyo, Japan),	
and Tsutomu Yoshinaga (The University of Electro-Communications,	
Tokyo, Japan)	
Demo Abstract: Vision-Aided 3D Human Pose Estimation with RFID	28
Chao Yang (Auburn University, Auburn, AL), Xuyu Wang (California State	
University, Sacramento, CA), and Shiwen Mao (Auburn University,	
Auburn AI)	

Auburn, AL)

Part II: MSN 2020 Co-Located Workshops

Workshop on 5G/B5G Security

Workshop on Advances in Intelligent Mobile Networks for Smart Cities (AINSC)

A Traffic Engineering Technology Based on Segment Routing in SDN
An Ensemble Learning Approach for Extracting Concept Prerequisite Relations from Wikipedia642 Yang Zhou (Hubei University, China), Kui Xiao (Hubei University, China), and Yan Zhang (Hubei University, China)
Boosting Cooperative Game with Complete Information in Multi-UAV Mesh Router Networks 648 Wei Zhao (Anhui University of Technology, China), Taoyang Zhou (Anhui University of Technology, China), Xuangou Wu (Anhui University of Technology, China), Xiujun Wang (Anhui University of Technology, China), Ruilin Pan (Anhui University of Technology, China), and Xun Shao (Regional Innovation and Social Design Engineering, Kitami Institute of Technology, Japan)
Community Preference-Based Information-Centric Networking Cache

(Pinduoduo Inc., China)

Design and Analysis of Decentralized Interactive Cyber Defense Approach Based on
Multi-Agent Coordination
Ming Liu (National Computer Network Emergency Response Technical
Team/Coordination Center of China, China), Lu Ma (National Computer
Network Emergency Response Technical Team/Coordination Center of
China, China), Chao Li (National Computer Network Emergency Response
Technical Team/Coordination Center of China, China), Weiling Chang
(National Computer Network Emergency Response Technical
Team/Coordination Center of China, China), Yuanjie Wang (National
Computer Network Emergency Response Technical Team/Coordination Center
of China, China), Jianming Cui (Chang'an University, China), and
Yingying Ji (National Computer Network Emergency Response Technical
Team/Coordination Center of China, China)
Improving the Response Time of SDN Controllers Based on Vertical Handover

Saudi Arabia), Dandan Liu (Wuhan University, China; University of Ottawa, Canada), and Amiya Nayak (University of Ottawa, Canada)

1st International Workshop on Mobile Sensing with Radio, Light, and Acoustic (MSRLA)

A Collision-free MAC Protocol Based on Quorum System for Underwater Acoustic Sensor Networks	671
A Privacy-Preserving and Collusion-Resisting Top-k Query Processing in WSNs	577
 AcousticThermo: Temperature Monitoring Using Acoustic Pulse Signal	583

Gesture Recognition System Based on Neural Networks by Using COTS RFID Tag Array
 Real-Time and Accurate RFID Tag Localization Based on Multiple Feature Fusion
1st International Workshop on Ubiquitous Electric Internet of Things (UEIoT)
Coding Based Distributed Data Shuffling for Low Communication Cost in Data Center Networks 700 Junpeng Liang (South China University of Technology, China), Lei Yang (South China University of Technology, China), Zhenyu Wang (South China University of Technology, China), Xuxun Liu (South China University of Technology, China), and Weigang Wu (Sun Yat-sen University, China)
 Improving Analysis of Automatic Distribution Changes for Power Grid
Privacy-Preserving Techniques for Protecting Large-Scale Data of Cyber-Physical Systems
 Research on Load Forecasting Model on Power Sensor Net
Research on Visualization Planning Method of Distribution Network Based on Graphical Model Integration
He Huang (State Grid Jiangsu Electric Power Co., Ltd, China), Xian Zhou (State Grid Taizhou Power Supply Company, China), Liang Guo (State Grid Taizhou Power Supply Company, China), Hao Chang (State Grid Taizhou Power Supply Company, China), and Ning Ma (State Grid Taizhou Power Supply Company, China)

Researches on Intelligent Traffic Signal Control Based on Deep Reinforcement Learning Juan Luo (Hunan University, Changsha, P.R. China), Xinyu Li (Hunan University, Changsha, P.R. China), and Yanliu Zheng (Hunan University, Changsha, P.R. China)	. 729
 WSAD: An Unsupervised Web Session Anomaly Detection Method	. 735

2nd International Workshop on Artificial Intelligence Applications in Internet of Things (AI2OT)

A Method to Construct Vulnerability Knowledge Graph Based on Heterogeneous Data
 ECDT: Exploiting Correlation Diversity for Knowledge Transfer in Partial Domain Adaptation746 Shichang He (Hunan University, P.R. China), Xuan Liu (Hunan University, P.R. China; Tsinghua University, P.R. China), Xinning Chen (Hunan University, P.R. China), and Ying Huang (Hunan University, P.R. China)
 Study on Location and Sizing Programming of Regional Substation

2nd International Workshop on Edge Computing and Artificial Intelligence based Sensor-Cloud System (ECAISS)

A Game-Theoretical Approach for Task Offloading in Edge Computing .	
Juan Luo (Hunan University, China), Qian Qian (Hunan University,	
China), Luxiu Yin (Hunan University, China), and Ying Qiao (Hunan	
University, China)	

A Low Cost Edge Computing and LoRaWAN Real Time Video Analytics for Road Traffic Monitoring
A Novel Service Composition Approach for Offloading in Mobile Edge Computing
 Accurate IoT Device Identification from Merely Packet Length
 An Optimal Wireless Transmission Strategy Based on Coherent Beamforming and Successive Interference Cancellation for Edge Computing
Dependency-Aware Dynamic Task Scheduling in Mobile-Edge Computing
Game Theory Based Joint Task Offloading and Resource Allocation Algorithm for Mobile Edge Computing
Load Balancing Mechanisms of Unmanned Surface Vehicle Cluster Based on Marine Vehicular Fog Computing