# **2022 IEEE/ACM Seventh International Conference on Internet-of-Things Design and Implementation (IoTDI 2022)**

**Virtual Conference** 3-6 May 2022



IEEE Catalog Number: CFP22F07-POD **ISBN:** 

978-1-6654-9642-1

# 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:	CFP22F07-POD
ISBN (Print-On-Demand):	978-1-6654-9642-1
ISBN (Online):	978-1-6654-9641-4

#### 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



# 2022 IEEE/ACM Seventh International Conference on Internet-of-Things Design and Implementation (IoTDI) IoTDI 2022

# **Table of Contents**

Message from the IoTDI 2022 General Chair	viii
Welcome from the IoTDI 2022 Organizers	ix
IoTDI 2022 Committee	<b>x</b>

#### **Technical Session: Networking**

RAScatter: Achieving Energy-Efficient Backscatter Readers via AI-Assisted Power Adaptation Kai Huang (University of Pittsburgh, USA), Ruirong Chen (University of Pittsburgh, USA), and Wei Gao (University of Pittsburgh, USA)	1
Real-Time Communication over LoRa Networks	14
Sezana Fahmida (Wayne State University, USA), Venkata Prashant	
Modekurthy (University of Nevada Last Vegas, USA), Dali Ismail	
(Southern Illinois University, USA), Aakriti Jain (Iowa State	
University, USA), and Abusayeed Saifullah (Iowa State University, USA)	
Poster Abstract: Data-Parallel Versus Task-Parallel Swarms for Small Unmanned Aerial	
Systems	28
Jayson Boubin (Ohio State University), Zichen Zhang (Ohio State	
University), John Chumley (Ohio State University), and Christopher	
Stewart (Ohio State University)	

#### **Technical Session: Context and Federated Learning**

CoPI: Enabling Probabilistic Conflict Prediction in Smart Space Through Context-Awareness	30
Jie Hua (The University of Texas at Austin, USA), Haoxiang Yu (The	
Jie Hua (The University of Texas at Austin, USA), Haoxiang Yu (The University of Texas at Austin, USA), Sangsu Lee (The University of	
Texas at Austin, USA), Hamim Md Adal (The University of New Mexico,	
USA), Colin Milhaup (The University of New Mexico, ŮSÅ), Gruia-Catalin	
Roman (The University of New Mexico, USA), and Christine Julien (The	
University of Texas at Austin, USA)	
Multimodal Federated Learning on IoT Data	43
Yuchen Zhao (UK Dementia Research Institute, Imperial College, UK),	
Payam Barnaghi (UK Dementia Research Institute, Imperial College, UK),	
and Hamed Haddadi (UK Dementia Research Institute, Imperial College,	
UK)	

# **Technical Session: Machine Learning for IoT**

Let's Grab a Drink: Teacher-Student Learning for Fluid Intake Monitoring using Smart Earphones	. 55
Earphones Shijia Zhang (The Pennsylvania State University, USA), Yilin Liu (The Pennsylvania State University, USA), and Mahanth Gowda (The Pennsylvania State University, USA)	
DeepScale: Online Frame Size Adaptation for Multi-object Tracking on Smart Cameras and Edge Servers	. 67
Keivan Nalaie (McMaster University, Canada), Renjie Xu (McMaster University, Canada), and Rong Zheng (McMaster University, Canada)	
Poster Abstract: Explainable Sensor Data-Driven Anomaly Detection in Internet of Things Systems	. 80
Moaz Tajammal Hussain (Cardiff University, United Kingdom) and Charith Perera (Cardiff University, United Kingdom)	

### **Technical Session: Security**

Hardware Based Identification for Intelligent Electronic Devices Girish Vaidya (Indian Institute of Science, India) and Prabhakar T. V. (Indian Institute of Science, India)	82
CTJammer: A Cross-Technology Reactive Jammer Towards Unlicensed LTE	
Ziwei Liu (Zhejiang University; ZJU-Hangzhou Global Scientific and	
Technological Innovation Center), Linzhong Xu (China Mobile Group	
Zhejiang Co., Ltd., China), Feng Lin (Zhejiang University;	
ZJU-Hangzhou Global Scientific and Technological Innovation Center;	
Key Laboratory of Blockchain and Cyberspace Governance of Zhejiang	
Province), Zhangsen Wang (Zhejiang University), and Kui Ren (Zhejiang	
University)	

#### **Technical Session: IoTDI Demo Session**

Demo Abstract: PARROT: Privacy by Design Tool for Internet of Things Nada Alhirabi, Omer Rana (Cardiff University, UK), and Charith Perera (Cardiff University, UK)	. 107
Demo Abstract: PrivacyCube: A Tangible Device for Improving Privacy Awareness in IoT Bayan Al Muhander (Cardiff University, UK), Omer Rana (Cardiff University, UK), Nalin Arachchilage (University of Auckland, New Zealand), and Charith Perera (Cardiff University, UK)	. 109
Demonstrating Virtual IO For Internet Of Things Devices Secured By TLS Server In Secure	
Element	111
Pascal Urien (Telecom Paris, France)	
Demo: Emulating 5G-Ready Mobile IoT Services Moysis Symeonides (University of Cyprus, Cyprus), Demetris Trihinas (University of Nicosia, Nicosia), George Pallis (University of Cyprus, Cyprus), and Marios D. Dikaiakos (University of Cyprus, Cyprus)	. 113

# **Technical Session: 5G and Privacy**

5G-Slicer: An Emulator for Mobile IoT Applications Deployed over 5G Network Slices Moysis Symeonides (University of Cyprus, Cyprus), Demetris Trihinas (University of Nicosia, Nicosia), George Pallis (University of Cyprus, Cyprus), Marios D. Dikaiakos (University of Cyprus, Cyprus), Constantinos Psomas (University of Cyprus, Cyprus), and Ioannis Krikidis (University of Cyprus, Cyprus)	115
To Share or Not to Share: On Location Privacy in IoT Sensor Data Franz Papst (Institute of Technical Informatics; Complexity Science Hub, Vienna), Naomi Stricker (Computer Engineering and Networks Laboratory), Rahim Entezari (Institute of Technical Informatics; Complexity Science Hub, Vienna), and Olga Saukh (Institute of Technical Informatics; Complexity Science Hub, Vienna)	128
Poster Abstract: Feasibility on Detecting Door Slamming Towards Monitoring Early Signs of Domestic Violence Osian Morgan (Cardiff University, UK), Hakan Kayan (Cardiff University, UK), and Charith Perera (Cardiff University, UK)	141

# **Technical Session: Security and Edge**

IOTA: A Framework for Analyzing System-Level Security of IoTs Zheng Fang (University of California, Davis), Hao Fu (University of California, Davis), Tianbo Gu (University of California, Davis), Pengfei Hu (Shandong University), Jinyue Song (University of California, Davis), Trent Jaeger (Pennsylvania State University), and Prasant Mohapatra (University of California, Davis)	143
$\pi$ -Configurator: Enabling Efficient Configuration of Pipelined Applications on the Edge Rafiuzzaman Mohammad (The University of British Columbia, Canada), Sathish Gopalakrishnan (The University of British Columbia, Canada), and Karthik Pattabiraman (The University of British Columbia, Canada)	156