# 2018 IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE 2018)

Washington, DC, USA 26-28 September 2018



**IEEE Catalog Number: ISBN:** 

CFP18D42-POD 978-1-5386-7207-5

## Copyright © 2018, Association for Computing Machinery (ACM) 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:
 CFP18D42-POD

 ISBN (Print-On-Demand):
 978-1-5386-7207-5

 ISBN (Online):
 978-1-5386-7206-8

## 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

Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



# 2018 IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE) CHASE 2018

## **Table of Contents**

Message from the General Chairs ix  Message from the Workshop Chair x  Organizing Committee xi  Steering Committee xii  Technical Program Committee xiii	
Demo/Poster Session	
Estimating Caloric Intake in Bedridden Hospital Patients with Audio and Neck-Worn Sensors .1 Shibo Zhang (Northwestern University), Dzung Nguyen (Northwestern University), Gan Zhang (Northwestern University), Runsheng Xu (Northwestern University), Nikolaos Maglaveras (Northwestern University), and Nabil Alshurafa (Northwestern University)	
An Innovative App for the Management of Chronic Wound Treatment .3	
Motor Skill Improvement Tool for Apraxia .5	
Wearable in Cloud .7	
AccuWiSe: Accurate Wireless Vital Sensing System for a Group of Exercisers – Hardware Configura Shinsuke Hara (Osaka City University), Takuma Hamagami (Oki Electric Industry Co., Ltd.), Yasutaka Kawamoto (Oki Electric Industry Co., Ltd.), Hiroyuki Yomo (Kansai University), Ryusuke Miyamoto (Meiji University), Takunori Shimazaki (Soliton Systems K.K.), Hiroyuki Okuhata (Soliton Systems K.K.), Fumie Ono (NICT), and Kenichi Takizawa (NICT)	ition <u>.9.</u>

AccuWiSe: Accurate Wireless Vital Sensing System for a Group of Exercisers - System Performance .11  Takuma Hamagami (Oki Electric Industry Co., Ltd.), Yasutaka Kawamoto  (Oki Electric Industry Co., Ltd.), Shinsuke Hara (Osaka City  University), Hiroyuki Yomo (Kansai University), Ryusuke Miyamoto  (Meiji University), Takunori Shimazaki (Soliton Systems K.K.),  Hiroyuki Okuhata (Soliton Systems K.K.), Fumie Ono (NICT), and Kenichi  Takizawa (NICT)
Automated Tremor Detection in Parkinson's Disease Using Accelerometer Signals .13.  Ada Zhang (Carnegie Mellon University), Rubén San-Segundo (Universidad Politécnica de Madrid), Stanislav Panev (Carnegie Mellon University), Griffin Tabor (Carnegie Mellon University), Katelyn Stebbins (Carnegie Mellon University), Andrew Whitford (Carnegie Mellon University), Fernando De la Torre (Carnegie Mellon University), and Jessica Hodgins (Carnegie Mellon University)
A Mobile Platform for Model-Based Monitoring of Glucose-Insulin Homeostasis for Diabetics .15
Connected Capacitive Sensor Array for Upper-Extremity Motor Rehabilitation .1.7
Knee Osteoarthritis Severity Level Classification Using Whole Knee Cartilage Damage Index and ANN .19  Yaodong Du (Pace University), Juan Shan (Pace University), Rania  Almajalid (Pace University), and Ming Zhang (Tufts Medical Center)
Detection and Monitoring of Repetitions Using an mHealth-Enabled Resistance Band .22.  Curtis L. Petersen (Dartmouth), Emily V. Wechsler (Dartmouth), Ryan J.  Halter (Dartmouth), George G. Boateng (Dartmouth), Patrick O. Proctor  (Dartmouth), David F. Kotz (Dartmouth), Summer B. Cook (University of  New Hampshire), and John A. Batsis (Dartmouth)
A Computational Efficient Fuzzy Clustering Algorithm for Big Incomplete Longitudinal Trial Data .25  Venkata Sukumar Gurugubelli (University of Massachusetts Dartmouth),  Zhouzhou Li (University of Massachusetts Dartmouth), Honggang Wang  (University of Massachusetts Dartmouth), and Hua Fang (University of  Massachusetts Dartmouth)
Improved Ergonomic Risk Factor Assessment Using OpenSim and Inertial Measurement Units .27
Patient Identification Based on Wrist Activity Data .29
A Wearable System for Situational Awareness Estimation in Underground Mines 3.1.  Xian Li (Michigan Technological University), Ye Sun (Michigan  Technological University), Zhen Liu (Michigan Technological  University), and Matthew Portfleet (Michigan Techological University)

### Workshop Session 1: BIGDATA4HEALTH

Creating Prognostic Systems by the Mann-Whitney Parameter .33......

Huan Wang (The George Washington University), Matthew Hueman (Walter Reed National Military Medical Center), Qing Pan (The George Washington University), Donald Henson (The Uniformed Services University of the Health Sciences), Arnold Schwartz (The George Washington University), Li Sheng (Drexel University), and Dechang Chen (The Uniformed Services University of the Health Sciences) Modeling Patients' Online Medical Conversations: A Granger Causality Approach .40..... Giovanni Delnevo (University of Bologna), Marco Roccetti (University of Bologna), and Silvia Mirri (University of Bologna) Workshop Session 2: BIGDATA4HEALTH Convolutional Neural Networks as Means to Identify Apposite Sensor Combination for Human Activity Recognition .45... Muhammad U. S. Khan (COMSATS University Islamabad), Assad Abbas (COMSATS University Islamabad), Mazhar Ali (COMSATS University Islamabad), Muhammad Jawad (COMSATS University Islamabad), and Samee U. Khan (North Dakota State University, USA) The Healthcare IoT Ecosystem: Advantages of Fog Computing Near the Edge .5.1..... Karen Thurston (University of Idaho, Coeur d'Alene) and Daniel Conte de Leon (University of Idaho) Workshop Session 3: DL-EDGE-IOT IoT-Based Healthcare System for Real-Time Maternal Stress Monitoring .57. Olugbenga Oti (University of Turku), Iman Azimi (University of Turku), Arman Anzanpour (University of Turku), Amir M. Rahmani (University of California Irvine, USA and Institute of Computer Technology, TU WIEN), Anna Axelin (University of Turku, Finland), and Pasi Liljeberg (University of Turku) Empowering Healthcare IoT Systems with Hierarchical Edge-Based Deep Learning .63..... Iman Azimi (University of Turku), Janne Takalo-Mattila (VTT Technical Research Centre of Finland), Arman Anzanpour (University of Turku), Amir M. Rahmani (University of California Irvine, Vienna University of Technology), Juha-Pekka Soininen (VTT Technical Research Centre of Finland), and Pasi Liljeberg (University of Turku) **Workshop Session 4: DL-EDGE-IOT** Heartbeat Classification in Wearables Using Multi-layer Perceptron and Time-Frequency Joint Distribution of ECG .69. Anup Kumar Das (Drexel University), Francky Catthoor (IMEC), and Siebren Schaafsma (IMEC-NL)

SmartEAR: Smartwatch-Based Unsupervised Learning for Multi-modal Signal Analysis in Opportunistic Sensing Framework 75
Debanjan Borthakur (URI), Andrew Peltier (URI), Harishchandra Dubey
(URI), Joshua Gyllinsky (URI), and Kunal Mankodiya (URI)
Workshop Session 5: MEDSPT
A Novel Authentication Biometric for Pacemakers 81
Misbehavior Detection of Embedded IoT Devices in Medical Cyber Physical Systems .88.  Ilsun You (Soonchunhyang University), Kangbin Yim (Soonchunhyang University), Vishal Sharma (Soonchunhyang University), Gaurav Choudhary (Soonchunhyang University), Ing-Ray Chen (Virginia Tech), and Jin-Hee Cho (Virginia Tech)
The Danger of Missing Instructions: A Systematic Analysis of Security Requirements for MCPS .94
An Improved User Authentication Scheme for Telecare Medical Information Systems 100
CyberPDF: Smart and Secure Coordinate-based Automated Health PDF Data Batch Extraction .106
Author Index 113.