

2016 IEEE First International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE 2016)

**Washington, DC, USA
27-29 June 2016**



**IEEE Catalog Number: CFP16D42-POD
ISBN: 978-1-5090-0944-2**

**Copyright © 2016 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 publication is a representation of what appears in the IEEE Digital Libraries. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP16D42-POD
ISBN (Print-On-Demand):	978-1-5090-0944-2
ISBN (Online):	978-1-5090-0943-5

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

2016 IEEE First Conference on Connected Health: Applications, Systems and Engineering Technologies

CHASE 2016

Table of Contents

Welcome Message from the Chairs.....	xii
Organizing Committee Members	xiii
Technical Program Committee Members	xv
Additional Reviewers	xvii

CCH 2016: The First International Workshop on Cloud Connected Health and Search 2016: Safe, Energy-Aware, & Reliable Connected Health

Keynote

Open Issues in Reliability, Safety, and Efficiency of Connected Health	1
<i>Amjad Gawanmeh</i>	

Session 1: Cloud Connected Health

A Mobile Solution for Fast and Accurate Medical Emergency Reporting	7
<i>Esraa I. Abou El Safa and Ghada A. El Khayat</i>	
Equal Area User Clustering Algorithm for Energy Efficient Cellular Network	13
<i>Hailu Belay Kassa, Shanko Chura Areo, Estifanos Yohannes, Dereje Hailemariam, Yacob Astatke, Farzad Moazzami, and Wondimu Zegeye</i>	
Reliable Transport Protocol Based on Loss-Recovery and Fairness for Wireless Body Area Networks	18
<i>Richard Jaramillo, Alejandro Quintero, and Steven Chamberland</i>	
Automatic Assessment of Environmental Hazards for Fall Prevention Using Smart-Cameras	24
<i>Jeffrey Kutchka, Danielle Tchuinkou, Joel Mandebi, Erman Nghonda, and Christophe Bobda</i>	

Stroke Prediction Context-Aware Health Care System	30
<i>Hamid Mccheick, Hoda Nasser, Mohamed Dbouk, and Ahmad Nasser</i>	

Session 2: Cloud Connected Health and Safe, Energy-Aware, & Reliable Connected Health

Transforming Healthcare through Life-Long Personal Digital Footprints	36
<i>Magnus Stenhaug, Håvard D. Johansen, and Dag Johansen</i>	
Architectural Approaches for Implementing Clinical Decision Support Systems in Cloud: A Systematic Review	42
<i>Luis Tabares, Jhonatan Hernandez, and Ivan Cabezas</i>	
Manage My Condition: A Standard Framework for the Development of Cloud-Based Medical Condition Management Applications	48
<i>Cristiano Tapparello, Wendi Heinzelman, Kelly Conn, and Craig A. Mullen</i>	
A Patient Centered Cloud Platform for Mobile-Health Enabled Clinical Research	54
<i>Bradley Witbrodt and Vaidy Sunderam</i>	

BIGDATA4HEALTH 2016: The International Workshop on Big Data Analytics for Smart and Connected Health

Session 1: eHealth in Cloud Environment

Clustering Cancer Data by Areas between Survival Curves	61
<i>Dechang Chen, Huan Wang, Donald E. Henson, Li Sheng, Matthew T. Hueman, and Arnold M. Schwartz</i>	
Large Scale Cloud-Based Deformable Registration for Image Guided Therapy	67
<i>Shahram Mohrehkesh, Andriy Fedorov, Arun Brahmavar Vishwanatha, Fotis Drakopoulos, Ron Kikinis, and Nikos Chrisochoides</i>	
A Mobile Cloud Computing Model Using the Cloudlet Scheme for Big Data Applications	73
<i>Lo'ai A. Tawalbeh, Waseem Bakheder, and Houbing Song</i>	

Session 2: Novel Applications on Smart and Mobile Devices

BigEAR: Inferring the Ambient and Emotional Correlates from Smartphone-Based Acoustic Big Data	78
<i>Harishchandra Dubey, Matthias R. Mehl, and Kunal Mankodiya</i>	
Bring Biomedical Ontologies to Personalized Healthcare: A Smart Inquiry Framework	84
<i>Guangzhi Zhang, Rongfang Bie, and Yunchuan Sun</i>	

MedSPT 2016: The First International Workshop on Security, Privacy, and Trustrworthiness in Medical Cyber Physical System

Session 1: Security & Detection

Cloud-Based Secure Logger for Medical Devices	89
<i>Hung Nguyen, Bipeen Acharya, Radoslav Ivanov, Andreas Haeberlen, Linh T. X. Phan, Oleg Sokolsky, Jesse Walker, James Weimer, William Hanson, and Insup Lee</i>	
Lightweight Detection of On-Body Sensor Impersonator in Body Area Networks	95
<i>Liping Xie, Weichao Wang, and Tuanfa Qin</i>	
Distributed Network Intrusion Detection Systems: An Artificial Immune System Approach	101
<i>Obinna Igbe, Ihab Darwish, and Tarek Saadawi</i>	

Session 2: Security Medical CPS Design

Implementing Informed Consent as Information-Flow Policies for Secure Analytics on eHealth Data: Principles and Practices	107
<i>Anders T. Gjerdum, Håvard D. Johansen, and Dag Johansen</i>	
Towards Autonomic Security Management of Healthcare Information Systems	113
<i>Qian Chen, Jonathan Lambright, and Sherif Abdelwahed</i>	
Design of a Secure, Biofeedback, Head-and-Neck Posture Correction System	119
<i>Da-Yin Liao</i>	
The Study of the Enhanced External Counterpulsation System Based on Smart Clothes	125
<i>Ting-Kai Wu, Chung-Chih Lin, Wun-Ye Ku, Yi-Shin Liou, Chih-Yu Yang, Ming-Yih Lee, Wen-Yen Lin, and Tsai-Hsuan Tsai</i>	

CHASE 2016: IEEE First Conference on Connected Health: Applications, Systems and Engineering Technologies

Session 1: Applications

Identifying Rare Diseases from Behavioural Data: A Machine Learning Approach	130
<i>Haley MacLeod, Shuo Yang, Kim Oakes, Kay Connelly, and Sriraam Natarajan</i>	
Automated Functional and Behavioral Health Assessment of Older Adults with Dementia	140
<i>Mohammad Arif Ul Alam, Nirmalya Roy, Sarah Holmes, Aryya Gangopadhyay, and Elizabeth Galik</i>	

Kalman-Filter-Based Walking Distance Estimation for a Smart-Watch	150
<i>Young Soo Suh, Ebrahim Nemati, and Majid Sarrafzadeh</i>	
Heart Rate Monitoring During Intense Physical Activities Using a Motion	
Artifact Corrupted Signal Reconstruction Algorithm in Wearable	
Electrocardiogram Sensor	157
<i>S. M. A. Salehizadeh, Y. Noh, and K. H. Chon</i>	
iHear Food: Eating Detection Using Commodity Bluetooth Headsets	163
<i>Yang Gao, Ning Zhang, Honghao Wang, Xiang Ding, Xu Ye, Guanling Chen, and Yu Cao</i>	
A Survey of Secure Multiparty Computation Protocols for Privacy Preserving	
Genetic Tests	173
<i>Tamara Dugan and Xukai Zou</i>	

Session 2: Systems & Applications

Motion Scale: A Body Motion Monitoring System Using Bed-Mounted Wireless	
Load Cells	183
<i>Musaab Alaziz, Zhenhua Jia, Jian Liu, Richard Howard, Yingying Chen, and Yanyong Zhang</i>	
Smartphone Based Digital Stethoscope for Connected Health — A Direct	
Acoustic Coupling Technique	193
<i>Arijit Sinharay, Deb Ghosh, Parijat Deshpande, Shahnawaz Alam, Rohan Banerjee, and Arpan Pal</i>	
Enhanced Wearable Medical Systems for Effective Blood Glucose Control	199
<i>Jialin Gao, Ping Yi, Zicheng Chi, and Ting Zhu</i>	
Real-Time Tidal Volume Estimation Using Iso-surface Reconstruction	209
<i>Shane Transue, Phuc Nguyen, Tam Vu, and Min-Hyung Choi</i>	
Multiple-vs Non-or Single-Imputation Based Fuzzy Clustering for Incomplete	
Longitudinal Behavioral Intervention Data	219
<i>Zhaoyang Zhang and Hua Fang</i>	

Session 3: Applications

Clinician-in-the-Loop Annotation of ICU Bedside Alarm Data	229
<i>Alexander Roederer, Joseph Dimartino, Jacob Gutsche, Margaret Mullen-Fortino, Sachin Shah, C. William Hanson, and Insup Lee</i>	
Using Wi-Fi Signals to Characterize Human Gait for Identification and Activity	
Monitoring	238
<i>Yan Li and Ting Zhu</i>	
Recognizing Eating Gestures Using Context Dependent Hidden Markov	
Models	248
<i>Yiru Shen, Eric Muth, and Adam Hoover</i>	

Sensing from the Bottom: Smart Insole Enabled Patient Handling Activity Recognition Through Manifold Learning	254
<i>Feng Lin, Chen Song, Xiaowei Xu, Lora Cavuoto, and Wenyao Xu</i>	
Multi-view Bi-clustering to Identify Smartphone Sensing Features Indicative of Depression	264
<i>Asma Ahmad Farhan, Jin Lu, Jinbo Bi, Alexander Russell, Bing Wang, and Athanasios Bamis</i>	
Improving Tuberculosis Diagnostics Using Deep Learning and Mobile Health Technologies among Resource-Poor and Marginalized Communities	274
<i>Yu Cao, Chang Liu, Benyuan Liu, Maria J. Brunette, Ning Zhang, Tong Sun, Peifeng Zhang, Jesus Peinado, Epifanio Sanchez Garavito, Leonid Lecca Garcia, and Walter H. Curioso</i>	

Session 4: Engineering & Applications

A Telemonitoring Framework for Android Devices	282
<i>Daniel Aranki, Gregorij Kurillo, Adarsh Mani, Phillip Azar, Jochem Van Gaalen, Quan Peng, Priyanka Nigam, Maya P. Reddy, Sneha Sankavaram, Qiyin Wu, and Ruzena Bajcsy</i>	
TCPM: Topic-Based Clinical Pathway Mining	292
<i>Xiao Xu, Tao Jin, Zhijie Wei, Cheng Lv, and Jianmin Wang</i>	
Real-Time Data-Driven Gait Phase Detection Using Infinite Gaussian Mixture Model and Parallel Particle Filter	302
<i>Ioannis Papavasileiou, Wenlong Zhang, and Song Han</i>	
The Selection and Validation of Biosensors for Studying a Novel Healthcare Environment	312
<i>Jesse Schettler, Steven R. Green, Hazem H. Refai, and Justin Feinstein</i>	

Demo Papers

Developing Medical Condition Management Applications Using Manage My Condition	322
<i>Cristiano Tapparello, Wendi Heinzelman, Kelly Conn, and Craig A. Mullen</i>	
MyPalmVein: A Palm Vein-Based Low-Cost Mobile Identification System for Wide Age Range	324
<i>Jie Cao, Weisong Shi, Abdulbaset Salim, and Paul Kilgore</i>	
CyberCare: A Novel Electronic Health Record Management System	326
<i>Nida Butt and Juan Shan</i>	
Microsleep Prediction Using an EKG Capable Heart Rate Monitor	328
<i>Amanda Watson and Gang Zhou</i>	
Securely Sharing Encrypted Medical Information	330
<i>Arnab Deb Gupta, Yuriy Polyakov, Kurt Rohloff, and Gerard Ryan</i>	

Flappy Breath: A Smartphone-Based Breath Exergame	332
<i>Matthew Stafford, Feng Lin, and Wenyao Xu</i>	

Poster Papers

Utilizing ICT Tools when Developing Healthcare Processes and Action Plans for Special Needs Children	334
<i>Dena Hussain and Linn Gustavsson Christiernin</i>	
Central Blood Pressure Monitoring via an Automatic Arm Cuff	336
<i>Jiankun Liu, Keerthana Natarajan, Mingwu Gao, and Hao-Min Cheng</i>	
User Centric Design for Aging Population: Early Experiences and Lessons	338
<i>Lanyu Xu, Heather Ann Fritz, and Weisong Shi</i>	
Tracking the Diffusion of Contact-Induced Disease from Social Interactions and Limited Observations of Symptoms	340
<i>Le Fang, Tong Guan, Wen Dong, and Chunming Qiao</i>	
Cardiovascular Risk Predictors Estimation via Carotid Tonometry and Ankle Cuff Oscillation Measurement	342
<i>Albert Lee, Zahra Ghasemi, Chang-Sei Kim, Jin-Oh Hahn, Ramakrishna Mukkamala, Hao-Min Cheng, Chen-Huan Chen, and Shih-Hsien Sung</i>	
Connected Heart Rate Sensors to Monitor Sleep Quality: Electrodes, Chest Belt and Smartwatch Users Acceptability	344
<i>Mathieu Simonnet, Bernard Gourvennec, and Romain Billot</i>	
Toward E-Health Applications for Suicide Prevention	346
<i>S. Berrouiguet, R. Billot, P. Lenca, P. Tanguy, E. Baca-García, M. Simonnet, and B. Gourvennec</i>	
Realizing Optimal Chest Compression Fraction During Cardiopulmonary Resuscitation	348
<i>Josh Talkington and Ram Dantu</i>	
Derivative Spectroscopy in Non-invasive Blood-Glucose Analysis	350
<i>Vishnu Dantu</i>	
Index of Difficulty between Multiple Joint Movements Using Fitts Law	352
<i>Neeraj K. Gupta and Siva Dantu</i>	
A Real-Time Low-Complexity Fall Detection System on the Smartphone	354
<i>Weihao Qu, Feng Lin, and Wenyao Xu</i>	
A Deep Learning Method for Microaneurysm Detection in Fundus Images	357
<i>Juan Shan and Lin Li</i>	
A Simultaneous Key Generation Technique for Health Information Exchange (HIE) Based on Existing Patients' Credentials	359
<i>Ahmed Ibrahim and Mukesh Singhal</i>	

Automatic Detection of Periods of Eating Using Wrist Motion Tracking	362
<i>Surya Sharma, Phillip Jasper, Eric Muth, and Adam Hoover</i>	
Detecting Out-of-Bed Activities to Prevent Pneumonia for Hospitalized Patient	
Using Microsoft Kinect V2	364
<i>Liang Liu and Sanjay Mehrotra</i>	
Motion and Noise Artifact-Resilient Atrial Fibrillation Detection Using	
a Smartphone	366
<i>Rifat Zaman, Jo Woon Chong, Chae Ho Cho, Nada Esa, David D. McManus, and Ki H. Chon</i>	
Wearable Sensor Selection, Motion Representation and their Effect	
on Exercise Classification	370
<i>Nicholas Hosein and Soheil Ghiasi</i>	
iDr: An Intelligent Digital Ruler App for Remote Wound Assessment	380
<i>Adam Yee, Mihir Patel, Ethan Wu, Steven Yi, Guy Marti, and John Harmon</i>	
Addressing Provenance Issues in Big Data Genome Wide Association Studies	
(GWAS)	382
<i>David Lauzon, Beatriz Kanzki, Victor Dupuy, Alain April, Michael S. Phillips, Johanne Tremblay, and Pavel Hamet</i>	
Automatic Tampering Detection Paradigm to Support Personal Health Record	388
<i>Abdul Razaque, Fathi H. Amsaad, Musbah Abdulgader, Vijay Chand Mannava, Ibrahim Elwarfalli, and Pavan Teja Kilari</i>	
Ubiquitous Computing and Context-aware Applications: Survey	
and Contributions	394
<i>Hamid Mccheick</i>	
Author Index	398