

2016 IEEE International Conference on Healthcare Informatics (ICHI 2016)

**Chicago, Illinois, USA
4-7 October 2016**



**IEEE Catalog Number: CFP1644U-POD
ISBN: 978-1-5090-6118-1**

**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:	CFP1644U-POD
ISBN (Print-On-Demand):	978-1-5090-6118-1
ISBN (Online):	978-1-5090-6117-4

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

2016 IEEE International Conference on Healthcare Informatics

ICHI 2016

Table of Contents

Welcome from the ICHI 2016 General Chairs	xiv
Organizing Committee	xvi
Program Committee Members	xviii
Reviewers	xix
Keynotes	xxi
Workshop Committee	xxvi
Tutorial Abstracts	xxviii
Industry Track Abstracts	xxxiv
Panel Abstracts	xxxix
Healthcare Data Analytics Challenge	xli
Doctoral Consortium	xlii

Workshop — Health Data Science: Creation, Analysis and Interpretation

Predicting the Helpfulness of Online Physician Reviews	1
<i>Nujood Alodadi and Lina Zhou</i>	
Towards Identifying Leading Indicators of Smoking Cessation Attempts from Social Media	7
<i>Aron Culotta</i>	
Drugs or Dancing? Using Real-Time Machine Learning to Classify Streamed “Dabbing” Homograph Tweets	10
<i>Antonio A. Ginart, Sanmay Das, Jenine K. Harris, Roger Wong, Hao Yan, Melissa Krauss, and Patricia A. Cavazos-Rehg</i>	
Prevalence and Attitudes about Illicit and Prescription Drugs on Twitter	14
<i>Iris Seaman and Christophe Giraud-Carrier</i>	
A Personalized Approach for Detecting Unusual Sleep from Time Series Sleep-Tracking Data	18
<i>Zilu Liang, Mario Alberto Chapa Martell, and Takuichi Nishimura</i>	

Human Daily Activity Recognition for Healthcare Using Wearable and Visual Sensing Data	24
<i>Xi Liu, Lei Liu, Steven J. Simske, and Jerry Liu</i>	
Timing of Coping Instruction Presentation for Real-Time Acute Stress Management: Long-Term Implications for Improved Surgical Performance	32
<i>Lauren Kennedy and Sarah Henrickson Parker</i>	

Paper Session 1: Healthcare Systems

Seamless Design of Decision-Intensive Care Pathways	35
<i>Carlo Combi, Barbara Oliboni, Alessandro Zardiniy, and Francesca Zerbato</i>	
Access Control Model for Cooperative Healthcare Environments: Modeling and Verification	46
<i>Mohamed Abomhara, Huihui Yang, and Geir M. K�ien</i>	
Using Access Control to Mitigate Insider Threats to Healthcare Systems	55
<i>Suhair Alshehri, Sumita Mishra, and Rajendra K. Raj</i>	
Using Electronic Medical Records and Physician Data to Improve Information Retrieval for Evidence-Based Care	61
<i>Mengqi Jin, Hongli Li, Christopher H. Schmid, and Byron C. Wallace</i>	
Learning Optimal Individualized Treatment Rules from Electronic Health Record Data	65
<i>Yuanjia Wang, Peng Wu, Ying Liu, Chunhua Weng, and Donglin Zeng</i>	

Paper Session 2: Temporal Analytics

Unsupervised Time-Series Clustering Over Lab Data for Automatic Identification of Uncontrolled Diabetes	72
<i>Alexander Rusanov, Patric V. Prado, and Chunhua Weng</i>	
Combining Naive Bayes Classifiers with Temporal Association Rules for Coronary Heart Disease Diagnosis	81
<i>Kalia Orphanou, Arianna Dagliati, Lucia Sacchi, Athena Stassopoulou, Elpida Keravnou, and Riccardo Bellazzi</i>	
Predicting Clinical Events by Combining Static and Dynamic Information Using Recurrent Neural Networks	93
<i>Crist�bal Esteban, Oliver Staeck, Stephan Baier, Yinchong Yang, and Volker Tresp</i>	
Linking Patient Alone Time and Provider Time to Staffing Levels and LOS at the Emergency Department: A RFID Based Study	102
<i>Shivaram P. Arunachalam, Gomathi Marisamy, Mustafa Sir, David Nestler, Thomas Hellmich, and Kalyan Pasupathy</i>	
Mining Online Heterogeneous Healthcare Networks for Drug Repositioning	106
<i>Mengnan Zhao and Christopher C. Yang</i>	

Paper Session 3: Tools to Support Patient Care

Virtual Standardized Patient as a Training Tool for Mild TBI Screening	113
<i>Raghavi Sakpal, Dale-Marie Wilson, Christine Elnitsky, Katherine Taber, and Timothy W. Breatly</i>	
Usability Evaluation of a Pediatric Virtual Patient Creation Tool	118
<i>Lauren Cairco Dukes, Nancy Meehan, and Larry F. Hodges</i>	
A Patient Deterioration Warning System for Boosting Situational Awareness of Monitored Patients	129
<i>Thomas Schmidt, Annmarie Lassen, and Uffe Kock Wil</i>	
Combining Mouse and Keyboard Events with Higher Level Desktop Actions to Detect Mild Cognitive Impairment	139
<i>Ann Gledson, Dommy Asfiandy, Joseph Mellor, Thamer Omer Faraj Ba-Dhfari, Gemma Stringer, Samuel Couth, Alistair Burns, Iracema Leroi, Xiaojun Zeng, John Keane, Christopher Bull, Paul Rayson, Alistair Sutcliffe, and Peter Sawyer</i>	
A Proactive Solution, using Wearable and Mobile Applications, for Closing the Gap between the Rehabilitation Team and Cardiac Patients	146
<i>Remus A. Dobrican and Denis Zampunieris</i>	

Paper Session 4: Helping People Help Themselves

Human Factors in the Design of Longitudinal Smartphone-based Wellness Surveys	156
<i>Sudip Vhaduri and Christian Poellabauer</i>	
Extending Agent Based Telehealth Platform with Activities of Daily Living Reasoning Capabilities	168
<i>Daniel Bjerring Jørgensen, Kasper Hallenborg, and Yves Demazeau</i>	
Forecasting Patient Outflow from Wards having No Real-Time Clinical Data	177
<i>Shivapratap Gopakumar, Truyen Tran, Wei Luo, Dinh Phung, and Svetha Venkatesh</i>	
Predicting Seizures from Electroencephalography Recordings: A Knowledge Transfer Strategy	184
<i>Jian Liang, Rui Lu, Changshui Zhang, and Fei Wang</i>	

Paper Session 5: Activity and Tracking

Peer Influence on the Engagement of Fitness Tracker Usage: A Diabetic and Obesity Study	192
<i>Yu Chen, Yunan Chen, Mirana Randriambelonoro, Antoine Geissbuhler, and Pearl Pu</i>	

Exploring Longitudinal Use of Activity Trackers	198
<i>Jochen Meyer, Jochen Schnauber, Wilko Heuten, Harm Wienbergen, Rainer Hambrecht, Hans-Jürgen Appelrath, and Susanne Boll</i>	
“Technology isn’t Always the Best”: The Intersection of Health Tracking Technologies and Information Practices of Digital Natives	207
<i>Eunjeong Cheon, Mohammad Hossein Jarrahi, and Norman Makoto Su</i>	
Going Outside While Staying Inside — Exercise Motivation with Immersive vs. Non-immersive Recreational Virtual Environment Augmentation for Older Adult Nursing Home Residents	216
<i>Jon Ram Bruun-Pedersen, Stefania Serafin, and Lise Busk Kofoed</i>	
#Sleep_as_Android: Feasibility of Using Sleep Logs on Twitter for Sleep Studies	227
<i>Fatema Akbar and Ingmar Weber</i>	

Paper Session 6: Medical Information Exchange, Mining in Networks and EHR

A Secure Framework for Medical Information Exchange (MI-X) between Healthcare Providers	234
<i>Ahmed Ibrahim, Baban Mahmood, and Mukesh Singhal</i>	
Discovering Drug-Drug Interactions and Associated Adverse Drug Reactions with Triad Prediction in Heterogeneous Healthcare Networks	244
<i>Haodong Yang and Christopher C. Yang</i>	
A fully integrated open-source toolkit for mining healthcare big-data: architecture and applications	255
<i>A. Ravishankar Rao and Daniel Clarke</i>	
Detection of Chronic Kidney Disease and Selecting Important Predictive Attributes	262
<i>Asif Salekin and John Stankovic</i>	
Mining the Clinical Narrative: All Text are Not Equal	271
<i>Keith Feldman, Nicholas Hazekamp, and Nitesh V. Chawla</i>	

Industry Track

Personalized Recommendation in Online Health Communities with Heterogeneous Network Mining	281
<i>Ling Jiang and Christopher C. Yang</i>	
Big-Data Based Decision-Support Systems to Improve Clinicians' Cognition	285
<i>Don Roosan, Matthew Samore, Makoto Jones, Yarden Livnat, and Justin Clutter</i>	
Improvements on the Effectiveness and Scalability of CMS Referral Analytics System	289
<i>Xin Wang, Qingxin Wu, Xu Liu, Yugang Jia, and Nathan Cohen</i>	

A Comprehensive Informatics Framework to Increase Breast Cancer Risk Assessment and Chemoprevention in the Primary Care Setting	293
<i>Jeffrey Wood, Katherine Crew, Rita Kukafka, and Joseph Finkelstein</i>	
Supporting Patient Healing through ICUsmartCARE: Technologies that Enable Family Collaboration, Presence, and Information Flow	297
<i>Anthony Faiola, Elizabeth Lerner Papautsky, and Min Joo</i>	

Poster Session 1

E-Health Readiness Assessment in Uganda: Integration of Telemedicine Services into Public Healthcare System	301
<i>Vincent Micheal Kiberu and Vincent Micheal Kiberu</i>	
LabLinker: Finding Links of Laboratory Test Results between Structured Records and Clinical Notes	302
<i>Sijia Liu, Vipin Chaudhary, Liwei Wang, and Hongfang Liu</i>	
An Interactive Retrieval Framework for Online Health Information	303
<i>Mingkun Gao, Liu Yuan, and Wai-Tat Fu</i>	
Poster Paper: An Accurate Crowdsourcing-Based Adaptive Fall Detection Approach Using Smart Devices	304
<i>Hsuan-Man Chen, Chi-Kang Chen, Hsin-I Wu, and Ren-Song Tsay</i>	
Patterns of Interaction within Smoking Cessation Groups on Facebook: A Social Network Analysis	305
<i>Mengnan Zhao, Christopher C. Yang, Johannes Thrul, and Danielle Ramo</i>	
Large Scale Infrastructure for Health Data Analytics	306
<i>Samantha Crossfield, Owen Johnson, and Thomas Fleming</i>	
Medical Diagnostics Reusable Knowledge Components	307
<i>Morcous Massoud</i>	
Developing an Intelligent Cross-Facility-Based Therapeutic Decision Reminder Engine	308
<i>Cheng-Yi Yang, Ming-Chieh Tsai, Ray-Jade Chen, Yu-Sheng Lo, Lan-Ying Kang, and Chien-Tsai Liu</i>	
A Simple, Subscription-Based Clinical Result Notification System	309
<i>Thomas Nahass, Benjamin H. Slovis, Hojjat Salmasian, Gilad Kuperman, and David K. Vawdrey</i>	
Organizational Characteristics and Strategic Information Systems Planning: A Study of United States Hospitals	310
<i>Soumya Upadhyay, Deirdre McCaughey, William Opoku-Agyeman, and Darell Burke</i>	

A Data Mining Approach on the Structure of Patient Satisfaction in HCAHPS Databases	311
<i>Masumi Okuda, Akira Yasuda, and Shusaku Tsumoto</i>	
Development of a Medication Information Generator System for Older Adults	312
<i>Hyunggu Jung and Jiyoun Lee</i>	
Mining Nurse Care Data: A Study Case on Pressure Ulcer Prediction	313
<i>A. Ammar Ghaibeh, Yoko Setoguchi, and Hiroki Moriguchi</i>	
Dual Clustering for Clinical Care Construction	314
<i>Haruko Iwata, Shusaku Tsumoto, and Shoji Hirano</i>	
Poster Paper: Predicting Seizures from Electroencephalography Recordings: A Knowledge Transfer Strategy	315
<i>Jian Liang, Rui Lu, Changshui Zhang, and Fei Wang</i>	
Comparing SAS® Text Miner, Python, R: Analysis on Random Forest and SVM Models for Text Mining	316
<i>Arun Jalanila and Nirmal Subramanian</i>	
Efficient Population of Structured Data Forms for Medical Records Using Syntactic Constraints and Intermediate Text	317
<i>Ronald P. Loui and Ashley Hollinshead</i>	
Empathic Virtual Assistant for Healthcare Information with Positive Emotional Experience	318
<i>Hyo Jin Do and Wai-Tat Fu</i>	
Mindbot: A Social-Based Medical Virtual Assistant	319
<i>Ping-Jing Yang and Wai-Tat Fu</i>	
SecondLook: Participatory Design Process to Create a Phone App that Detects Digital Dating Abuse	320
<i>Tania Roy, Larry F. Hodges, Shaundra Bryant Daily, and Jerome McClendon</i>	
Key Challenges to Enabling IT in Healthcare	328
<i>Mike Krey</i>	
Medical Text Simplification by Medical Trainees: A Feasibility Study	334
<i>Yong K. Choi, Katrin Kirchhoff, and Anne M. Turner</i>	
Hand-to-Mouth Motion Tracking in Free-Living Conditions for Improved Weight Control	341
<i>Chris Fortuna, Christophe Giraud-Carrier, and Joshua West</i>	
Visual Effect on the Odor Identification Ability of Children with Autism Spectrum Disorder	349
<i>Sayaka Matsumoto, Shohei Horiguchi, Hiroshi Shigeno, and Ken-Ichi Okada</i>	
Predicting Adverse Drug Events Using Heterogeneous Event Sequences	356
<i>Isak Karlsson and Henrik Boström</i>	

Evaluation Strategies for Telehealth Implementations	363
<i>Anthony Maeder and Nathan Poultney</i>	
Communication Patterns in a Collaborative Medication Scheduling Task among Older Adults	367
<i>Thomas G. Kannampallil, Daniel G. Morrow, Wai-Tat Fu, Liza Raquel, and Angela Muriset</i>	
Developing Novel Machine Learning Algorithms to Improve Sedentary Assessment for Youth Health Enhancement	375
<i>Gowtham Kumar Golla, Jordan A. Carlson, Jun Huan, Jacqueline Kerr, Tarrah Mitchell, and Kelsey Borner</i>	
Evaluating EHR Data Availability for Cohort Selection in Retrospective Studies	380
<i>Morgan Harrell, Daniel Fabbri, and Mia Levy</i>	
Enhance Network Communications in a Cloud-Based Real-Time Health Analytics Platform Using SDN	388
<i>Alireza Izaddoost and Carolyn McGregor</i>	
Combining Particle Filtering and Transmission Modeling for TB Control	392
<i>Rahim Oraji, Vernon H. Hoepfner, Anahita Safarishahrbijari, and Nathaniel D. Osgood</i>	
Deep State Space Models for Computational Phenotyping	399
<i>Soumya Ghosh, Yu Cheng, and Zhaonan Sun</i>	
A Platform based on Multiple Regression to Estimate the Effect of in-Hospital Events on Total Charges	403
<i>Dimitrios Zikos and Dhanashri Ostwal</i>	
Poster Session 2	
An Improved Data Representation for Smoking Detection with Wearable Respiration Sensors	409
<i>Laura Hiatt, Roy J. Adams, and Benjamin M. Marlin</i>	
Patient Care Index as an All-Inclusive Predictor of Health Information Technology Performance	410
<i>Jacob Krive</i>	
Mutiv: Music-based Mobile Application to Support Joggers	411
<i>Sangwook Lee and Hyunggu Jung</i>	
Secondary Users and the Personal mHealth Record: Designing Tools to Improve Collaboration Between Patients and Providers	412
<i>Harry D. Tunnell IV, Mark Pfaff, and Anthony Faiola</i>	
What's in the Store? A Review of Arabic Medical and Health Apps in the App Store	413
<i>Fatema Akbar and Luis Fernandez-Luque</i>	

Towards Informal Caregiver Identification in Social Media	414
<i>Reda Al-Bahrani, Margaret K. Danilovich, Ankit Agrawal, and Alok Choudhary</i>	
Healthcare Assessment Questions Non-invasive Ambient Sensors	415
<i>Dino Nienhold, Rolf Dornberger, and Safak Korkut</i>	
A Multi-featured Approach for Wearable Sensor-Based Human Activity Recognition	423
<i>Delaram Yazdansepas, Anzah H. Niazi, Jennifer L. Gay, Frederick W. Maier, Lakshmish Ramaswamy, Khaled Rasheed, and Matthew P. Buman</i>	
Visual Health Reminder: A Reminder for Medication Intake and Measuring Blood Pressure to Support Elderly People	432
<i>René Baranyi, Sascha Rainer, Stefan Schlossarek, Nadja Lederer, and Thomas Grechenig</i>	
Using the CareMap with Health Incidents Statistics for Generating the Realistic Synthetic Electronic Healthcare Record	439
<i>Scott McLachlan, Kudakwashe Dube, and Thomas Gallagher</i>	
Participatory Design of a Pediatric Virtual Patient Creation Tool	449
<i>Lauren Cairco Dukes, Nancy Meehan, and Larry F. Hodges</i>	
An Accurate Crowdsourcing-Based Adaptive Fall Detection Approach Using Smart Devices	456
<i>Hsuan-Man Chen, Chi-Kang Chen, Hsin-I Wu, and Ren-Song Tsay</i>	
eSeniorCare: Technology for Promoting Well-Being of Older Adults in Independent Living Facilities	461
<i>Dipanwita Dasgupta, Kimberly Green Reeves, Beenish Chaudhry, Mayra Duarte, and Nitesh V. Chawla</i>	
Sensor-Based Tracking and Big Data Processing of Patient Activities in Ambient Assisted Living	473
<i>Dino Nienhold, Rolf Dornberger, and Safak Korkut</i>	
Measuring Stress, Anxiety, and Depression in PTSD Sufferers Using Micro-Movements from Video	483
<i>Remington A. Holt, Sarah Jones, and Gloria Washington</i>	
An Iterative Dimensionality-Scaling System for Real-Time Health Monitoring Applications	488
<i>Haik Kalantarian, Majid Sarrafzadeh, Shibo Zhang, and Nabil Alshurafa</i>	
Should I see a Healthcare Professional or can I perform Self-care: Self-Referral Decision Support for Patients with Low Back Pain	495
<i>Wendy Oude Nijeweme-d'Hollosy, Lex van Velsen, Karin G. M. Groothuis-Oudshoorn, Remko Soer, and Hermie Hermens</i>	
Serenity: A Low-Cost and Patient-Guided Mobile Virtual Reality Intervention for Cancer Coping	504
<i>Xuan Li, Nina Jolani, Thien-Tien Dao, and Holly Jimison</i>	

GEAR: A Mobile Game-Assisted Rehabilitation System	511
<i>Mufizur Rahman, Atreyi Kankanhalli, Bimlesh Wadhwa, Yeow Chen Hua,</i>	
<i>Cheng Kai Kei, Lim Jeong Hoon, Sharmila Jayakkumar, and Chua Cai Lin</i>	
CoRAD: Visual Analytics for Cohort Analysis	517
<i>Rishikesan Kamaleswaran, Andrew James, Christopher Collins,</i>	
<i>and Carolyn McGregor</i>	
Analyzing Multiple Medical Corpora Using Word Embedding	527
<i>Jian Huang, Keyang Xu, and V. G. Vinod Vydiswaran</i>	
Author Index	534