Contents

Keynote Presentations

Physics of the Medical Record: Handling Time in Health Record Studies
George Hripcsak ........................... 3

Contextualisation of Biomedical Knowledge Through Large-Scale Processing of Literature, Clinical Narratives and Social Media
Goran Nenadic ......................... 7

Process Mining and Phenotyping

An Active Learning Framework for Efficient Condition Severity Classification
Nir Nissim, Mary Regina Boland, Robert Moskovitch, Nicholas P. Tattonetti, Yuval Elovici, Yuval Shahar, and George Hripcsak ......................... 13

Predictive Monitoring of Local Anomalies in Clinical Treatment Processes
Zhengxing Huang, Jose M. Juarez, Wei Dong, Lei Ji, and Huilong Duan ......................... 25

Mining Surgery Phase-Related Sequential Rules from Vertebroplasty Simulations Traces
Ben-Manson Toussaint and Vanda Luengo ......................... 35

Data Driven Order Set Development Using Metaheuristic Optimization
Yiye Zhang and Rema Padman ......................... 47

Conceptual Modeling of Clinical Pathways: Making Data and Processes Connected
Carlo Combi, Barbara Oliboni, and Alberto Gabrieli ......................... 57

Data Mining and Machine Learning

Distributed Learning to Protect Privacy in Multi-centric Clinical Studies
Andrea Damiani, Mauro Vallati, Roberto Gatta, Nicola Dinapoli, Arthur Jochems, Timo Deist, Johan van Soest, Andre Dekker, and Vincenzo Valentini ......................... 65
Minining Hierarchical Pathology Data Using Inductive Logic Programming................................................................. 76
    Tim Op De Beeck, Arjen Hommersom, Jan Van Haaren,
    Maarten van der Heijden, Jesse Davis, Peter Lucas, Lucy Overbeek,
    and Iris Nagtegaal

What if Your Floor Could Tell Someone You Fell? A Device Free Fall Detection Method............................................. 86
    Roberto Luis Shinmoto Torres, Asanga Wickramasinghe,
    Viet Ninh Pham, and Damith Chinthana Ranasinghe

Domain Knowledge Based Hierarchical Feature Selection for 30-Day Hospital Readmission Prediction .......................... 96
    Sandro Radovanovic, Milan Vukicevic, Ana Kovacevic,
    Gregor Stiglic, and Zoran Obradovic

A Genomic Data Fusion Framework to Exploit Rare and Common Variants for Association Discovery ............................ 101
    Simone Marini, Ivan Limongelli, Ettore Rizzo, Tan Da,
    and Riccardo Bellazzi

Collaborative Filtering for Estimating Health Related Utilities in Decision Support Systems ............................................ 106
    Enea Parimbelli, Silvana Quaglini, Riccardo Bellazzi, and John H. Holmes

**Temporal Data Mining**

Updating Stochastic Networks to Integrate Cross-Sectional and Longitudinal Studies ............................................. 113
    Allan Tucker and Yuanxi Li

Optimal Sub-sequence Matching for the Automatic Prediction of Surgical Tasks ....................................................... 123
    Germain Forestier, François Petitjean, Laurent Riffaud, and Pierre Jannin

On the Advantage of Using Dedicated Data Mining Techniques to Predict Colorectal Cancer .................................... 133
    Reinier Kop, Mark Hoogendoorn, Leon M.G. Moons,
    Mattijs E. Numans, and Annette ten Teije

Identifying Chemotherapy Regimens in Electronic Health Record Data Using Interval-Encoded Sequence Alignment .......... 143
    Haider Syed and Amar K. Das
An Evaluation Framework for the Comparison of Fine-Grained Predictive Models in Health Care ........................................ 148
  Ward R.J. van Breda, Mark Hoogendoorn, A.E. Eiben, and Matthias Berking

A Model for Cross-Platform Searches in Temporal Microarray Data . . . . 153
  Guenter Tusch, Olvi Tole, and Mary Ellen Hoinski

Uncertainty and Bayesian Networks

Risk Assessment for Primary Coronary Heart Disease Event Using Dynamic Bayesian Networks ........................................ 161
  Katia Orphanou, Athena Stassopoulou, and Elpida Keravnou

Uncertainty Propagation in Biomedical Models ............................. 166
  Andrea Franco, Marco Correia, and Jorge Cruz

A Bayesian Network for Probabilistic Reasoning and Imputation of Missing Risk Factors in Type 2 Diabetes ............................ 172
  Francesco Sambo, Andrea Facchinetti, Liisa Hakaste, Jasmina Kravic, Barbara Di Camillo, Giuseppe Fico, Jaakko Tuomilehto, Leif Groop, Rafael Gabriel, Tuomi Tiinamaija, and Claudio Cobelli

Causal Discovery from Medical Data: Dealing with Missing Values and a Mixture of Discrete and Continuous Data ................................ 177
  Elena Sokolova, Perry Groot, Tom Claassen, Daniel von Rhein, Jan Buitelaar, and Tom Heskes

Modeling Coronary Artery Calcification Levels from Behavioral Data in a Clinical Study .................................................... 182
  Shuo Yang, Kristian Kersting, Greg Terry, Jefferey Carr, and Sriraam Natarajan

Running Genome Wide Data Analysis Using a Parallel Approach on a Cloud Platform ....................................................... 188
  Andrea Demartini, Davide Capozzi, Alberto Malovini, and Riccardo Bellazzi

Text Mining

Extracting Adverse Drug Events from Text Using Human Advice ....... 195
  Phillip Odom, Vishal Bangera, Tushar Khot, David Page, and Sriraam Natarajan

An Analysis of Twitter Data on E-cigarette Sentiments and Promotion ................................................................. 205
  Andreea Kamiana Godea, Cornelia Caragea, Florin Adrian Bulgarov, and Suhasini Ramisetty-Mikler
Determining User Similarity in Healthcare Social Media Using Content Similarity and Structural Similarity ................................................. 216
   Ling Jiang and Christopher C. Yang

Biomedical Concepts Extraction Based on Possibilistic Network and Vector Space Model ................................................................. 227
   Wiem Chebil, Lina Fatima Soualmia, Mohamed Nazih Omri, and Stéfan Jacques Darmoni

Answering PICO Clinical Questions: A Semantic Graph-Based Approach .......................................................... 232
   Eya Znaidi, Lynda Tamine, and Chiraz Latiri

Semantic Analysis and Automatic Corpus Construction for Entailment Recognition in Medical Texts ...................................................... 238
   Asma Ben Abacha, Duy Dinh, and Yassine Mrabet

Automatic Computing of Global Emotional Polarity in French Health Forum Messages ................................................................. 243
   Natalia Grabar and Loïc Dumonet

Automatic Symptom Extraction from Texts to Enhance Knowledge Discovery on Rare Diseases .......................................................... 249
   Jean-Philippe Métivier, Laurie Serrano, Thierry Charnois, Bertrand Cuissart, and Antoine Widlöcher

Prediction in Clinical Practice

A Composite Model for Classifying Parotid Shrinkage in Radiotherapy Patients Using Heterogeneous Data ........................................... 257
   Marco Pota, Elisa Scalco, Giuseppe Sanguineti, Maria Luisa Belli, Giovanni Mauro Cattaneo, Massimo Esposito, and Giovanna Rizzo

Feasibility of Spirography Features for Objective Assessment of Motor Symptoms in Parkinson’s Disease .............................................. 267
   Aleksander Sadikov, Jure Žabkar, Martin Možina, Vida Groznik, Dag Nyholm, and Mevludin Memedi

Using Multivariate Sequential Patterns to Improve Survival Prediction in Intensive Care Burn Unit .................................................. 277
   Isidoro J. Casanova, Manuel Campos, Jose M. Juarez, Antonio Fernandez-Fernandez-Arroyo, and Jose A. Lorente

A Heterogeneous Multi-Task Learning for Predicting RBC Transfusion and Perioperative Outcomes ........................................... 287
   Che Ngufor, Sudhindra Upadhyaya, Dennis Murphree, Nageswar Madde, Daryl Kor, and Jyotishman Pathak
Comparison of Probabilistic versus Non-probabilistic Electronic Nose Classification Methods in an Animal Model .......................... 298
   Camilla Colombo, Jan Hendrik Leopold, Lieuwe D.J. Bos, Riccardo Bellazzi, and Ameen Abu-Hanna

Knowledge Representation and Guidelines

Detecting New Evidence for Evidence-Based Guidelines Using a Semantic Distance Method .......................... 307
   Qing Hu, Zhisheng Huang, Annette ten Teije, and Frank van Harmelen

Analyzing Recommendations Interactions in Clinical Guidelines: Impact of Action Type Hierarchies and Causation Beliefs 317
   Veruska Zamborlini, Marcos da Silveira, Cedric Pruski, Annette ten Teije, and Frank van Harmelen

A General Approach to Represent and Query Now-Relative Medical Data in Relational Databases .......................... 327
   Luca Anselma, Luca Piovesan, Abdul Sattar, Bela Stantic, and Paolo Terenziani

Temporal Conformance Analysis of Clinical Guidelines Execution .............. 332
   Matteo Spiotta, Paolo Terenziani, and Daniele Theseider Dupré

Combining Decision Support System-Generated Recommendations with Interactive Guideline Visualization for Better Informed Decisions .......................... 337
   Lucia Sacchi, Enea Parimbelli, Silvia Panzarasa, Natalia Viani, Elena Rizzo, Carlo Napolitano, Roxana Ioana Budasu, and Silvana Quaglini

Author Index .......................... 343
Artificial Intelligence in Medicine
15th Conference on Artificial Intelligence in Medicine, AIME 2015, Pavia, Italy, June 17-20, 2015. Proceedings
Holmes, J.H.; Bellazzi, R.; Sacchi, L.; Peek, N. (Eds.)
2015, XVI, 345 p. 76 illus., Softcover
ISBN: 978-3-319-19550-6