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Preface: AIME 2017

In this issue of the Artificial Intelligence in Medicine (AIIM) journal, we present a selection of outstanding papers that were presented at the Sixteenth European Conference on Artificial Intelligence in Medicine (AIME 2017) in Vienna, Austria, from June 21 - 24, 2017.

The program for the AIME 2017 Conference was prepared by Scientific Program Committee Chair Annette ten Teije (Vrije Universiteit Amsterdam, The Netherlands), Local Organising Committee Chair Christian Popow (University of Vienna, Austria), and AIME 2015 Scientific Program Committee Chair and Doctoral Consortium Chair 2017 John H. Holmes (University of Pennsylvania, USA), and AIME2015 Local Organising co-chair Lucia Sacchi (University of Pavia, Italy).

Authors were invited to submit original contributions regarding the development of theory, techniques, and applications of AI in biomedicine and health, including the exploitation of AI approaches to molecular medicine and biomedical informatics and to organisational aspects of healthcare.

The AIME 2017 conference had the privilege of hosting two invited speakers: Stefan Schulz, from the University of Graz, Austria, and Kenneth J. Barker, from T.J. Watson Research Center, IBM Research, New York, USA. In his keynote entitled "SNOMED CT: The Thorny Way Towards Interoperability of Clinical Routine Data" Stefan Schulz discussed the crucial role of the quality of the vocabularies and the annotation process for achieving data interoperability. The quality of terminology-annotated clinical data should be considered with realism, and the automated annotation approaches have to take into account human inter-annotator disagreement. Ken Barker's keynote focused on intelligent question answer (QA) systems to support professionals in medicine and health care to explore the medical literature. In their approach the three main dimensions are context analysis, content management, and answer management. Furthermore, the collaborative setting plays a role in the learning capabilities of the adaptable QA system.

AIME2017 hosted the sixth edition of the AIME Doctoral Consortium, where six PhD students had the opportunity to present their research goals, proposed methods, and preliminary results. A scientific panel consisting of experienced researchers in the field (Riccardo Bellazzi, Mor Peleg, David Riaño, Lucia Sacchi, Yuval Shahar, and Allan Tucker) provided constructive feedback to the students in an informal atmosphere. The Doctoral Consortium was chaired by John H. Holmes.

In addition, four workshops were organized after the AIME 2017 main conference. These included the 9th International Workshop on Knowledge Representation for Health Care (KRH4C) and the 10th International Workshop on Process-Oriented Information Systems in Health Care (ProHealth), joined together for the second time at AIME. This workshop was chaired by David Riaño, Richard Lenz, Mor Peleg, and Manfred Reichert. A second full-day workshop was the Second Workshop on Extracting and Processing of Rich Semantics from Medical Texts, chaired by Kerstin Denecke, Yihan Deng, Thierry Declerck, and Frank van Harmelen. The third workshop was the Second Workshop on Artificial Intelligence for Diabetes, chaired by Clare Martin, Beatriz López, and Pau Herrero Vinas. The fourth workshop was the Workshop on Advanced Predictive Models in Health Care organized by Niels Peek, Gregor Štiglic, Nophar Geifman, Petra Povalej Brzan, and Matthew Sperrin.

In addition to the workshops, five interactive half-day tutorials were presented prior to the AIME 2017 main conference: (1) Natural Language Processing for Clinical Information Extraction (organised by Stéphane Meystre, Meliha Yetisgen, Scott DuVall, Hua Xu); (2) Latest Speech and Signal Processing for Affective and Behavioral Computing in mHealth, (organised by Bjorn Schuller, Bodgan Vlasenko, Hesam Sagha), (3) Evaluation of Prediction Models in Medicine (organised by Ameen Abu-Hanna); (4) Medical Decision Analysis with Probabilistic Graphical Models (organised by Francisco Javier Diez, Manuel Luque); (5) Clinical Fuzzy Control Systems and Fuzzy Automata with HL7's Clinical Decision Support Standard: The Fuzzy Arden Syntax (organised by Jeroen de Bruin, Klaus-Peter Adlassnig).

The main programme received 113 submissions (94 full, 19 short papers). Twenty-one long papers (an acceptance rate of 22%) and 24 short papers (including demo papers) were accepted; one short paper was withdrawn. Each long paper was presented in a 25-minute oral presentation during the conference. Each regular short paper was presented in a five-minute presentation and by a poster during the poster sessions. Each demo short paper was presented in a five-minute presentation and by a demo during the demo sessions. The papers were organized according to their topics in the following main themes: (1) Ontologies and Knowledge Representation (2) Bayesian Methods; (3) Temporal methods; (4) Natural Language Processing; (5) Health Care Processes; (6) Machine Learning; and (7) Demos.

Among the accepted full papers, those that scored best during the conference review process were considered suitable for possible publication in this issue of Artificial Intelligence in Medicine. Authors of the twelve selected papers were invited to submit a revised and extended version of their contributions, which underwent a further peer-review and revision process in addition to that used for the AIME conference. Every paper was reviewed by at least three reviewers, where at least one reviewer had reviewed the paper for the AIME conference and at least one reviewer reviewed the paper for the first time. As a result of this process, eight papers were accepted. In the following we present a brief summary of these papers.

Forestier [8] is one of the papers concerning temporal reasoning in this special issue.

In their paper entitled "Automatic and quantitative evaluation of

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surgical skills enables to improve surgical patient care', they describe an approach for discovery and ranking of discriminative and interpretable patterns of surgical practice from recordings of surgical motions. Their approach use Symbolic Aggregate ApproXimation (SAX) to identify discriminative patterns that characterize specific surgical motion and Vector Space Model (VSM) for discovering the patterns. They run experiments on three surgical motion datasets. The results show that the identified patterns can be used to accurately classify individual gestures, skill levels and surgical interfaces.

In [3] the authors propose a method that monitors a clinical decision support system, and detects changes in the system's behaviour that might indicate a malfunction. In particular they pay attention to the rule firing counts. They give a score to a new datum that indicates the likelihood of a change in the system. Experiments show that their change-point detection method outperforms existing methods.

The authors of paper [1] work on methods for personalised management of Parkinson's disease patients. They developed an algorithm that discovers the impact of symptoms on the progression of Parkinson disease. Furthermore they developed a methodology for detecting patterns of medications dosage changes based on the patient status. Multitask learning using predictive clustering trees and short time analysis are used in their approach. In their experiments they use the Parkinson Progression Markers Initiative (PPMI) data sets of patient symptoms and medications logs. Results are promising and a step towards improving the management of Parkinson disease.

Smart homes are becoming more and more popular for healthcare applications. In Sfar [4] they show a new approach for detecting the risk of anomalies in the environment regarding user activities. Their approach is based on anomaly-cause extraction from a given dataset using causal association rules mining. Using Markov logic network machine learning method the risk of anomalies is detected, and enables to recommend suitable action to avoid the potential anomaly. They developed a prototype to evaluate their method for early anomaly detection and action recommendation.

Rodrigues et al. [7] developed and evaluate a new causality assessment support system for a regional pharmacovigilance centre. The structure of the Bayesian network was defined by experts and the parameters were learned from suspected adverse drug reactions reports. The network is evaluated according the WHO causality assessment guidelines both in a retrospective cohort and a prospective cohort. Positive results are obtained in higher levels of causality, and difficulties are encountered in cases with lower level of causality.

Yamada and Kobayashi [6] propose a model to detect mental fatigue in natural viewing situations. Their approach differs from existing ones in two ways: their focus is on natural viewing situations and on both younger and older adults. They use support vector machine models for a two-class classification model, and an improved support vector machine recursive feature elimination for feature selection. They tested their fatigue detection model on the eye-tracking data of younger and older adults who are watching video clips before and after performing cognitive tasks.

In the paper [2] entitled "Automatic Classification of Radiological Reports for Clinical Care" the authors describe a method for exploiting the free-text clinical narratives in the chest computed tomography reports such that the content is available to radiologists in an aggregated form. Radiological reports contain a large amount of free-text. Annotating each report according to a schema enables to train different machine learning based classifiers. They developed a hierarchical classification system that use both a set of syntactical and semantic features. The results of the experiments are promising. In the near future they will integrate the hierarchical classification system in the authoring phase of radiological reports.

Epure [5] propose a method to analyse online communication to study verbal behaviour, human interaction and behavioral changes in medicine. Their method is based on automatic intention classification using supervised machine learning and identification of conversational processes using process mining technique. This work gives new perspectives on health communication, behaviour, and discourse analyses.

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