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Knowledge Representation for Health-Care

Data, Processes and Guidelines

AIME 2009 Workshop KR4HC 2009
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Revised Selected and Invited Papers

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Preface

This book is the result of merging two workshops series, namely, one on computerized guidelines and protocols and the other one on knowledge management for health care procedures. The merge resulted in the KR4HC workshop: Knowledge Representation for Health Care: Data, Processes, and Guidelines. This workshop was held in conjunction with the 12th Conference on Artificial Intelligence in Medicine (AIME 2009), in Verona, Italy. The book included, in addition to the full-length workshop papers, invited peer-reviewed advanced papers on lessons learned in these fields.

The KR4HC workshop continued a line of successful guideline workshops held in 2000, 2004, 2006, 2007, and 2008. Following the success of the first European Workshop on Computerized Guidelines and Protocols held in Leipzig, Germany, in 2000, the Symposium on Computerized Guidelines and Protocols (CGP 2004) was organized in Prague, Czech Republic in 2004 to identify use cases for guideline-based applications in health care, computerized methods for supporting the guideline development process, and pressing issues and promising approaches for developing usable and maintainable vehicles for guideline delivery. In 2006 an ECAI 2006 workshop at Riva del Garda, Italy, entitled "AI Techniques in Health Care: Evidence-Based Guidelines and Protocols" was organized to bring together researchers from different branches of artificial intelligence to examine cutting-edge approaches to guideline modeling and development and to consider how different communities can cooperate to address the challenges of computer-based guideline development. This ECAI 2006 workshop continued with a workshop on "Computer-Based Clinical Guidelines and Protocols (CCG 2008)" held at the Lorentz Centre of Leiden University at the beginning of 2008, which resulted in the book "Computer-Based Clinical Guidelines and Protocols: A Primer and Current Trends" edited by Annette ten Teije, Silvia Miksch, and Peter Lucas and published by IOS Press in 2008.

Running in parallel to the previous workshops, the KR4HC workshop was the sixth in a series of workshops and publications devoted to the formalization, organization, and deployment of procedural knowledge in health care. These previous workshops and publications are the IEEE CBMS 2007 special track on "Machine Learning and Management of Health Care Procedural Knowledge" held in Maribor, Slovenia in 2007; the AIME 2007 workshop entitled "From Medical Knowledge to Global Health Care" held in Amsterdam, The Netherlands, in 2007; the ECAI 2008 workshop on "Knowledge Management for Health Care Procedures" in Patras, Greece, in 2008, and the Springer *Lecture Notes in Artificial Intelligence* books LNAI 4924 and LNAI 5626, both edited by David Riaño in 2008 and 2009, respectively.

As computerized health care support systems are rapidly becoming more knowledge intensive, the representation of medical knowledge in a form that

enables reasoning is growing in relevance and taking a more central role in the area of medical informatics. In order to achieve a successful decision-support and knowledge management approach to medical knowledge representation, the scientific community has to provide efficient representations, technologies, and tools to integrate all the important elements that health care providers work with: electronic health records and health care information systems, clinical practice guidelines and standardized medical technologies, codification standards, etc.

Synergies to integrate the above-mentioned elements and types of knowledge must be sought both in the medical problems (e.g., prevention, diagnosis, therapy, prognosis, etc.) and also in the computer science and artificial intelligence technologies (e.g., natural language processing, digital libraries, knowledge representation, knowledge integration and merging, decision support systems, machine learning, e-learning, etc.).

This book presents 11 selected and extended papers out of 23 submissions of the Workshop on "Knowledge Representation for Health Care: Data, Processes and Guidelines (KR4HC 2009)". All extended papers were reviewed by at least two reviewers and revised accordingly. The topics range from patient data management, maintaining and extracting medical ontologies, temporal representation and reasoning to guideline and protocol design, execution, and dissemination as well as the integration of electronic patient records into guideline-based care and decision-support systems.

We invited four well-known researchers in the scientific community to submit state-of-the-art papers, which were reviewed by at least two reviewers and revised accordingly. Dionisio Acosta, Vivek Patkar, Mo Keshtgar, and John Fox propose a computational framework to provide a clinical guideline-based decision support system for breast cancer multidisciplinary meeting. Silvia Panzarasa, Silvana Quaglini, Anna Cavallini, Giuseppe Micieli, Simona Marcheselli, and Mario Stefanelli address the challenging topic of integrating a decision model used to represent and execute guideline recommendations with end-user interface and the electronic patient record. Mor Peleg presents an approach to sharing computer-interpretable guidelines with more than one implementing institution. David Riaño introduces a knowledge management architecture to integrate, maintain, and share medical and clinical data, information and knowledge.

Thanks should go to the people who contributed to the KR4HC 2009 workshop: the authors of the submitted papers, the authors of the invited papers, the members of the Organizing Committee, the members of the Program Committee and the sponsor institutions.

We aim to organize KR4HC every year in conjunction with a Medical Informatics or Artificial Intelligence conference in order to offer a stable platform for the interaction of the community in the area of knowledge representation for health care.

December 2009

David Riaño
Annette ten Teije
Silvia Miksch
Mor Peleg

Organization

The workshop "Knowledge Representation for Health-Care: Data, Processes, and Guidelines" and the edition of this book were organized by D. Riaño (Rovira i Virgili University, Tarragona, Spain), A. ten Teije (Vrije Universiteit Amsterdam, Amsterdam, The Netherlands), S. Miksch (Danube University Krems, Krems, Austria), and M. Peleg (University of Haifa, Haifa, Israel).

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