Advances in artificial intelligence research in health

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EDITORIAL

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The business of health delivery is complex. Employing over 850,000 people, and delivering services to 21.3 million residents, the Australian health care system is currently strained to the maximum in dealing with increasing demand for services and an acute shortage of skilled professionals. The National e-Health Strategy drives a nationwide research agenda to provide the infrastructure and tools required to support the planning, management and delivery of health care services.

Deriving principles from the disciplines of computer science, mathematics, philosophy and physiology, and consisting of different fields, from machine vision to expert systems, the field of Artificial Intelligence (AI) deals with the creation of "machines that can think". Focused on traits of reasoning, knowledge representation, planning, learning, communication, perception and social intelligence, AI has been widely applied to augment the state of the art in Health Informatics.

This special issue reports on the latest developments in the field of AI motivated research in the health domain. The special issue arose from the inaugural Australian Workshop on Artificial Intelligence in Health (AIH 2011). It was held in conjunction with the 24th Australasian Joint Conference on

Artificial Intelligence (AI2011), in Perth, Australia, in December 2011. The AIH 2011 workshop was a first of its kind, national initiative that aimed to bring together scholars and practitioners in the field of AI-driven health informatics to present and discuss their research, share their knowledge and experiences, define key research challenges and explore possible collaborations to advance e-Health development nationally and internationally. Therefore, the affiliation of AIH 2011 with AI2011 was both timely and mutually beneficial for the communities involved in these events.

AIH 2011 received 16 full paper submissions and each paper was reviewed by three program committee members. Six papers were accepted as full papers and five as short papers accompanied with posters.

The workshop brought together researchers from a variety of disciplines across various parts of the country and provided an excellent forum for discussion and exchange of ideas. In addition to presentation of papers, the workshop featured two keynote addresses, a poster session during lunch, and a panel discussion.

The first keynote address, "Using Artificial Intelligence to transform the management of Chronic Disease", was delivered by Professor Michael Georgeff. In addition to presenting ongoing research efforts to apply AI techniques to better manage chronic disease, Professor Georgeff discussed the greatest innovations in healthcare from a medical practitioner's viewpoint and focussed on how AI could be leveraged to transform healthcare.

The second keynote address, "Knowledge Acquisition Issues in Interpreting Laboratory Data", was presented by Professor Paul Compton and posed a number of questions related to large-scale knowledge acquisition for decision-support systems in medicine, drawing lessons from experience in working with knowledge acquisition tools that support over 300 million diagnostics laboratory reports.

The workshop concluded with a panel discussion in which Professor Abdul Sattar and Professor Yogi Kanagasingam joined the keynote speakers to address the topic "AI for eHealth: 2012 and Beyond". The discussion that ensued was very energetic and actively engaged audience interaction. Topics discussed ranged from the emerging contribution of AI over the past five decades, current issues with the marketing and uptake of AI-based solutions in mainstream healthcare, and the challenges for AI-based research and application in years to come. The panel and audience also acknowledged the key role a workshop like this would play in driving collaborative research efforts between AI and health informatics research communities.

All accepted papers were also invited to revise and submit their manuscripts for inclusion in this special issue of the *Australasian Medical Journal* (AMJ). Seven papers and a letter to the editor have been accepted for publication in the journal.

The first paper, by Bevan Koopman, Peter Bruza, Laurianne Sitbon and Michael Lawley, titled "Towards Semantic Search and Inference in Electronic Medical Records", presents concept-based information retrieval for searching electronic medical records and demonstrates that the approach outperforms keyword-based search, working especially well for queries where the latter performs poorly. This paper was awarded the best paper prize at the workshop.

The second paper, by Kinzang Chhogyal, Abhaya Nayak, Rolf Schwitter and Abdul Sattar, titled "A Causal Model for Fluctuating Sugar Levels in Diabetes Patients", investigates the use of fixed distance based belief revision to improve causal models. A simple scenario for fluctuating blood sugar levels in a diabetes patient is used to demonstrate the efficacy of this approach.

The third paper, by Alexander Krumpholz, David Hawking, Richard Jones, Tom Gedeon and Hugh Greville, titled "Automated Medical Literature Retrieval", describes a system for the retrieval of relevant medical publications using queries generated automatically from data present in an electronic patient record. Integrated into an electronic record system, such a system would proactively support medical practitioners in the delivery of care.

The fourth paper, by Abeed Sarker, Diego Molla and Cecile Paris, titled "Extractive Summarisation of Medical Documents", proposes a query focused approach for automatically summarising medical documents and helping medical practitioners find relevant information.

The fifth paper, by Diego Molla and Maria Elena Santiago-Martinez, titled "A Corpus for Evidence Based Summarisation", presents a corpus of clinical questions and answers designed for training and testing automated text summarisers to support evidence-based medicine.

The sixth paper, by Di Xiao, Janardhan Vignarajan, Jane Lock, Shaun Frost, Mei-Ling Tay-Kearney and Yogi Kanagasingam, titled "Retinal Image Registration and Comparison for Clinical Decision Support", proposes a set of accurate and robust retinal image registration solutions for longitudinal retinal image alignment and comparison.

The seventh paper, by Amol Wagholikar, Maggie Fung and Colleen Nelson, titled "Improving Self-Care of Patients with Chronic Disease using Online Personal Health Record", employs a case-based reasoning approach to self care for advanced prostate cancer patients in an online patient health record environment.

A letter to the editor, by Anthony Nguyen, Yue Kimi Sun, Laurianne Sitbon and Shlomo Geva, titled "Representation Of Assertions In Clinical Free Text Using SNOMED CT," explores the use of the SNOMED CT terminology for representing medical concepts and their assertions in clinical free text. The authors demonstrate that that populating assertions as attribute values using SNOMED CT allows over 93% of assertions in their experimental dataset to be represented.

We hope that the breadth and diversity of the papers presented at the workshop and published in this special issue will foster further collaboration and AI driven research in health.

generously donated their time and expertise and provided very comprehensive reviews of the submitted papers.