



GUEST EDITORIAL

Artificial Intelligence in Medicine AIME '05

The present issue of Artificial Intelligence in Medicine (AIIM) contains a selection of expanded versions of papers presented during the 10th Conference on Artificial Intelligence in Medicine (AIME '05), held in Aberdeen, Scotland, 23–27 July 2005. This conference provides, biennially, a unique opportunity to present and discuss the international state of art of artificial intelligence (AI) in medicine (AIM) from both a research and an application perspective.

The call for papers resulted in an all-time high number of very well-elaborated scientific paper submissions (148 paper submissions, 128% more than AIME '03). Submissions came from 32 different countries including 13 from outside Europe. At the end of the reviewing process, we accepted 35 full papers for oral presentation (a 23.6% acceptance rate) and 34 short papers for poster presentation (a 22.3% acceptance rate). The papers and the sessions were organized according to the following themes: (1) temporal representation and reasoning, (2) decision support systems, (3) clinical guidelines and protocols, (4) ontology and terminology, (5) case-based reasoning, signal interpretation, visual mining, (6) computer vision and imaging, (7) knowledge management, and (8) machine learning, knowledge discovery and data mining. These themes reflect the current interests of researchers in AI in medicine.

Based on a mixture of several criteria, including the initial reviewers' comments, the lively discussion following the paper's presentation during the conference, and on the ranking provided by the chair person of each session, the guest editors asked 13 authors to submit an extended version of their initial manuscript. After a careful evaluation by three external reviewers and the editors, six papers were finally selected for the present issue.

This final selection does not cover all the themes presented during the conference, since this was not the aim of the special issue. However, it does give a flavor of the high quality of the papers presented during the AIME '05 conference.

The paper by Liliana Ironi and Stefania Tentoni [1] covers qualitative spatial reasoning. Automatic detection of arrhythmia is a challenging problem in cardiology. The authors present a new method based on spatial aggregation to interpret electrocardiac maps obtained by body surface mapping. The spatio-temporal information is gathered into epicardial activation isochrone maps that are processed to extract the excitation wavefront structure and to characterize the wavefront propagation. The proposed methods provide a robust and efficient way to identify salient pieces of information in activation maps.

Reasoning about temporal information is very crucial in the medical field; suitable database models and query languages are therefore needed to store such information and reason about it. Temporal databases try to support medical staff. However, they have many limitations. Paolo Terenziani et al. [2] analyze the classical point-based approach and extend the temporal semantics of temporal databases in order to deal with telic expressions in medical data. The authors argue that all temporal database models use point-based semantics even when they use interval-based representations. This has limitations since it does not capture the semantics of telic data, namely no downward or upward inheritance and countability. The authors propose a three-sorted model based on interval-semantics and a query language for dealing with both telic and atelic data, as well as conversions from the one type to the other.

The next three papers deal, on the one hand, with the fields of natural language processing, linguistic analysis, and information extraction, and on the other, with guideline-based care and how these methods can be utilized to support different tasks in this area. The scientific literature in the Biomedical area is growing very fast, increasingly making it more difficult to find the most relevant papers. Fabio Rinaldi et al. [3] describe and evaluate an approach to automate the extraction of gene and protein

functional relations by mining from biomedical literature. The authors have implemented a text mining system using a novel dependency based parser and tested it on two text corpora: DepGenia and ATRC. They showed that their deep-linguistic approach can be applied to real world text and offers high-precision results, while retaining sufficient recall values.

The other two papers try to support the modeling of clinical practice guideline into a (semi-) formal guideline representation language. Radu Serban et al. [4] introduce a method to extract control knowledge from free-text guidelines by instantiating one or more predefined linguistic patterns, thus reducing human effort in modeling guidelines. The method was applied to a real evidence-based guideline for treating breast cancer patient. An initial evaluation was made, to measure the precision of detecting the type of procedural knowledge mentioned and the coverage of the gold standard model. The gold standard was defined by the modeling of the same guideline by knowledge engineers.

The other paper by Katharina Kaiser et al. [5] addresses a similar goal, namely to ease the guideline modeling process. They propose a new multi-step approach using information extraction methods to support the human modeler by both automating parts of the modeling process and making the modeling process traceable and comprehensible. Particular attention is paid to identifying information about clinical processes and relationships between these processes. The methodology that they developed does not depend on particular guideline formalisms. They have applied their methodology to 18 real guidelines of otolaryngology using 6 guidelines to obtain their heuristics and 12 guidelines as test set and showed that their approach achieves good results in terms of precision and recall.

Sketching is ubiquitous in medicine, because physicians use sketches to convey diagnosis and treatments to patients or to explain complex circumstances to medical students. Peter Haddawy et al. [6] propose a system, which is able to understand anatomical sketches. Novel algorithms for sketch recognition and part identification are presented. The accuracy of the proposed system is evaluated on sketches provided by students. The results are compared to the judgment of an experienced physician. Promising results are obtained.

In ending this editorial, we would like to thank all the authors for accepting our invitation to submit an extended version of their initial work and to thank all the reviewers who have greatly contributed to the quality of this special issue.

Moreover, we would like to express our best wishes for the next AIME conference to be held in Amsterdam, The Netherlands, in 2007. We have no doubt that this conference, as with all past AIME conferences, will constitute an important event for the AIM community.

References

- [1] Ironi L, Tentoni S. Automated detection of qualitative spatio-temporal features in electrocardiac activation maps. *Artif Intell Med* 2007;39:99–111.
- [2] Terenziani P, Richard TS, Bottrighi A, Torchio M, Molino G. Extending temporal databases to deal with telic/atelic medical data. *Artif Intell Med* 2007;39:113–26.
- [3] Rinaldi F, Schneider G, Kaljurand K, Hess M, Andronis C, Konstandi O, et al. Mining of relations between proteins over biomedical scientific literature using a deep-linguistic approach. *Artif Intell Med* 2007;39:127–36.
- [4] Serban R, ten Teije A, van Harmelen F, Marcos M, Polo-Conde C. Extraction and use of linguistic patterns for modelling medical guidelines. *Artif Intell Med* 2007;39:137–49.
- [5] Kaiser K, Akkaya C, Miksch S. How can information extraction ease formalizing treatment processes in clinical practice guidelines? A method and its evaluation. *Artif Intell Med* 2007;39:151–63.
- [6] Haddawy P, Matthew ND, Kaewruen P, Sarakhette N, Hong HL. Anatomical sketch understanding: recognizing explicit and implicit structure. *Artif Intell Med* 2007;39:165–77.

Silvia Miksch*

*Danube University Krems, Department of
Information & Knowledge Engineering,
Dr. Karl-Dorrek-Strasse 30, A-3500 Krems, Austria*
URL:<http://www.donau-uni.ac.at/ike>

Jim Hunter¹

*University of Aberdeen, Department of Computing
Science, Aberdeen AB24 3UE, United Kingdom*
<http://www.csd.abdn.ac.uk/~jhunter/>

Elpida Keravnou²

*University of Cyprus, Department of Computer
Science, P.O. Box 20537, Nicosia 1678, Cyprus*
[http://www.cs.ucy.ac.cy/webPages/PEOPLE/
faculty/kerav.htm](http://www.cs.ucy.ac.cy/webPages/PEOPLE/faculty/kerav.htm)

*Corresponding author. Tel.: +43 2732 893 2451/50;
fax: +43 2732 893 4450

¹Tel.: +44 1224 272287; fax: +44 1224 273422.

²Tel.: +357 22 892694; fax: +357 22 892701.

*E-mail addresses: silvia.miksch@donau-uni.ac.at
(Silvia Miksch)
jhunter@csd.abdn.ac.uk (J. Hunter)
elpida@ucy.ac.cy (E. Keravnou)*