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Preface

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The International Conference on Artificial Intelligence in Education was held in Auckland, New Zealand, in 2011. This was a refereed selective conference, with 32% of the 153 paper submissions accepted as full papers. The Program Chairs invited authors of the papers that were considered for the Best Paper Award, to extend their conference paper for this special issue of the International Journal on Artificial Intelligence in Education. Papers were required to include additional unpublished material related to the original work, and the papers underwent further review by journal Executive Committee members and Specialist Reviewers. It is with great pleasure that we can now present even stronger and more detailed descriptions of this research - work that was already considered by members of the Senior Program Committee to be especially outstanding at the time of the conference. The best papers covered both traditional and developing areas of AIED, including research in specific domains and more generally, and considering tutoring and modelling approaches, and affective states. This illustrates much of current AIED research in terms of breadth of focus, also reflecting the variety of content in the AIED 2011 Proceedings. For the conference we could not define specific categories for these papers, as such a large proportion were multi-disciplinary, integrating many areas of AIED. The same holds for these extended contributions for IJAIED.

Stamper, Eagle, Barnes and Croy's paper builds on previous research with a logic tutor, adding automatic data-driven hints and looking at educational outcomes. Results indicated that students using this system were more persistent when taking deductive logic courses, completed more problems, and performed significantly better in a post-test than students who did not use the tutor. Further, these students had higher overall grades in the course. This result applied regardless of instructor or when the course was taught. Early hints were identified as being helpful; their effects were perceptible, even when hints were no longer available; and students did not abuse the hint facility.

Chang, Nelson and Mostow's contribution continues their extensive research on a reading tutor; in this paper they consider the learners' mental states with a single-channel EEG headset that can be easily used in school settings. Their aim was to complement the data available from traditional (e.g., from keyboard or mouse clicks) and other more recent methods for affect measurement (e.g., speech, eyes, skin conductance). The EEG data enabled systematic study of differences between reading easy and hard sentences to be identified for both children and adults, as well as oral and silent reading, which could allow detection of mental states, such as comprehension, engagement, and learning. This could, in turn, be highly useful in adaptive tutoring, as well as in investigations of learning processes themselves.

Forbes-Riley and Litman's paper looks at disengagement and performance in spoken dialog computer tutoring, with disengagement measured by both human annotation and machine learning methods – both methods were found to identify disengagement similarly. Some types of disengagement were found to negatively correlate with learning and user satisfaction, others were not found to do so. Using multiple dis-

engagement factors can, therefore, increase predictive power. The correlations between manually identified and machine learning models of disengagement promise useful future possibilities for helping students to overcome disengagement, with a resulting improvement in performance.

Käser, Baschera, Busetto, Klingler, Solenthaler, Buhman and Gross's paper follows the theme of engagement from a different perspective: seeking a general framework for the modelling of engagement dynamics. Their paper considers in particular, developmental dyslexia and dyscalculia. Their general model is based on the similarities and differences of these two cases, and leads to suggestions for a general model of engagement dynamics. However, this is a complex situation: while similarities in engagement patterns across the two cases suggest the suitability of a general framework, indicator functions and features were found to be domain-specific. Thus, a more general indicator function is required alongside the definition of comprehensive feature sets.

Continuing with the theme of affect, Lehman, D'Mello, Strain, Mills, Gross, Dobbins, Wallace, Millis and Graesser's approach focuses on learner confusion. Their paper considers inducing confusion and ultimately, with scaffolding, to increase opportunities for learning. Disagreements/contradictions were staged between animated agents, and self-report data indicated that confusion was, indeed, induced in the participants. Performance on forced-choice questions supported this finding. While contradictions were not sufficient to increase learning gains, with induced confusion, such an increase was observed. This leaves much room for further research on inducing confusion to facilitate learning, including how to scaffold such situations in an appropriate manner.

These contributions all bring something new and exciting to AIED, whether it be: measuring and modelling; approaches to tutoring; domain-related issues; empirical results that can lead to finer modelling for more precise adaptation and prediction; support and, indeed, temporary disruption to learners' affective states. We anticipate that, with the rapid advancement of technologies and data-collection and analysis possibilities, and the increasing availability of affordable technologies to enable evaluation in a variety of contexts, AIED research will continue to broaden. We look forward to this at the next AIED conference in Memphis, U.S.A.