



3rd ICMI Workshop on Bridging Social Sciences and AI for Understanding Child Behaviour

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ABSTRACT

Child behaviour is a topic of great scientific interest across a wide range of disciplines, including social sciences and artificial intelligence (AI). Knowledge in these different fields is not yet integrated to its full potential. The aim of this workshop was to bring researchers from these fields together. The first two workshops had a significant impact. In this workshop, we discussed topics such as the use of AI techniques to better examine and model interactions and children's emotional development, analyzing head movement patterns with respect to child age. This workshop was a successful new step towards the objective of bridging social sciences and AI, attracting contributions from various academic fields on child behaviour analysis. This document summarizes the accepted papers.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; • **Applied computing** → **Law, social and behavioral sciences**.

KEYWORDS

human computer interaction, child computer interaction, child psychology, parent child interaction

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1 INTRODUCTION

The social and behavioural sciences, encompassing study disciplines such as developmental psychology, child psychiatry, and pedagogy, are all interested in typical and atypical child behavior. Analysing and modelling child behaviour is also a hot topic

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in artificial intelligence (AI) with its own unique challenges. However, information from these many fields is not fully integrated due to, among other things, the distribution of knowledge in different channels (e.g., journal papers vs conference proceedings) and using distinct research methods. The papers also address the need to automate analyses of multimodal interactions, which is labour-intensive work to do manually. Topics such as automatic emotion recognition in children and head movement patterns during interactions are addressed. In addition, one of the keynote speakers discusses work on using automatic speech recognition to track children's reading development. All these approaches use AI techniques to gain insights into children's development. This is the third edition of the workshop on Bridging Social Sciences and AI for Understanding Child Behaviour (WoCBU) after the first two editions were successfully held in 2020 [1] and 2021 [5]. In the WoCBU series, we aim to connect researchers from the social sciences and AI to (1) demonstrate the potential of using AI for automatically analysing child behaviour and (2) demonstrate the challenges and opportunities that researchers face in (large-scale) child behaviour analyses, which AI may also help to address.

The workshop was organised in conjunction with the 24th ACM International Conference on Multimodal Interaction, which took place in Bengaluru (Bengaluru), India. The Worldwide Conference on Multimodal Human-Human and Human-Computer Interaction (ICMI) is the leading international venue for multidisciplinary research on multimodal human-human and human-computer interaction, interfaces, and system development. The conference will concentrate on the theoretical and empirical foundations, component technologies, and integrated multimodal processing techniques that characterize the discipline of multimodal interaction analysis, interface design, and system development.

2 WORKSHOP CONTENT

Overall, three contributions were accepted for inclusion in the workshop. The submissions highlight the diversity of social science and AI research in child behaviour, including topics such as examining head movement patterns during face-to-face conversations, predicting backchannel behaviour in multimodal child-caregiver interactions, and analysing children's emotional development. All papers utilise AI techniques to address the specific problems.

2.1 Summary of the Accepted Papers

- **Head Movement Patterns during Face-to-Face Conversations Vary with Age**, by Denisa McDonald, Casey Zampella, Evangelos Sariyandi, Aashvi Manakiwala, Ellis Dejardin, John Herrington, Robert Schultz, and Birkan Tunc [4]. The main focus of this paper is on investigating how head movement patterns during face-to-face conversations vary with age from childhood through adulthood leveraging computer vision techniques due to their suitability for analysis of social behaviors in naturalistic settings, since video data capture can be unobtrusively embedded within conversations between two social partners. The methods in this work include unsupervised learning for movement pattern clustering, and supervised classification and regression as a function of age. The results demonstrate that 3-minute video recordings of head movements during conversations show patterns that distinguish between participants that are younger vs. older than 12 years with 78% accuracy. Furthermore, our models identified which patterns of head movement associate with which age group.
- **Predicting Backchannel Signaling in Multimodal Child-Caregiver Conversations**, by Jing Liu, Mitja Nikolaus, Kübra Bodur, and Abdellah Fourtassi [2]. The authors show that it is possible to leverage machine learning model predictions to predict children's background channeling production based on the interlocutor's inviting cues in child-caregiver naturalistic conversations. Authors further prove that contrary to what have been suggested in previous in-lab studies, children between the ages of 6 and 12 can actually produce and respond to backchannel inviting cues as consistently as adults do, suggesting an adult-like form of coordination.
- **Approbation of the Child's Emotional Development Method (CEDM)**, by Elena Lyakso, Olga Frolova, Egor Kleshnev, Nersisson Ruban, Mary A. Mekala, and K. V. Arulalan [3]. This study addresses the need to develop a new method for assessing children's emotional development, one that is suitable for children across all ages and communities. The authors design and test a new method - combining physiological, psychophysiological, psychological, and AI techniques - on 10 typically developing children, 10 children with an autism spectrum disorder, and 10 children with Down syndrome. The results of this pilot suggest differences between the three groups of children, confirming that they differ in their emotional development.

2.2 Keynote Speakers

We also invited two keynote speakers from different fields:

- Shrikanth Narayanan is University Professor and Niki & C. L. Max Nikias Chair in Engineering at the University of Southern California. He converges technological advances in sensing, machine learning and computing, which offers tremendous opportunities for continuous contextually rich yet unobtrusive multimodal, spatiotemporal characterisation of a child's behaviour, communication and interaction, across stages of development.

- Catia Cucchiarini is Principal Investigator in the research group Language and Speech, Learning and Therapy, and the Centre for Language and Speech Technology at Radboud University. In her work, she uses automatic speech recognition-based reading tutors to support children learning to read and gain insights into their reading development.

These researchers were selected to bring perspectives from different fields within the ICMI community to address the workshop's theme: bridging social sciences and AI for understanding child behaviour.

3 WORKSHOP ORGANIZATION

3.1 Review Process

Submissions were reviewed single-blind by members of the program committee (PC). Despite the fact that it was not requested, two manuscripts were submitted for double-blind review. At least three PC members examined each manuscript. The organizing committee gave two reviews for two articles related to each member's study domain.

3.2 Organizing Committee

- Heysem Kaya, Utrecht University, the Netherlands
- Anika van der Klis, Utrecht University, the Netherlands
- Saeid Safavi, University of Surrey, United Kingdom
- Maryam Najafian, MIT, United States

3.3 Program Committee

- Olga Frolova, St. Petersburg State University, Russia
- Sarah Gillet, KTH Royal Institute of Technology, Sweden
- Alexey Karpov, SPIIRAS, Russia
- Heysem Kaya, Utrecht University, the Netherlands
- Anika van der Klis, Utrecht University, the Netherlands
- Elena Lyakso, St. Petersburg State University, Russia
- Ronald Poppe, Utrecht University, the Netherlands
- Saeid Safavi, University of Surrey, United Kingdom
- Albert Ali Salah, Utrecht University, the Netherlands

4 CONCLUSIONS

The third workshop on Bridging Social Sciences and AI for Understanding Child Behaviour was again a success. We received applications from a variety of fields and see this as a promising step toward accomplishing the workshop's aims of promoting interdisciplinary awareness and collaborations. Some of the submissions already had multidisciplinary author groups, while others used examples or techniques from the social sciences or AI. We are excited to continue working on this multidisciplinary initiative to further improve the understanding of child behaviour.

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