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Multimodal Conversational Agents for People with Neurodevelopmental Disorders

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ABSTRACT

Neurodevelopmental Disorders (NDD) involve developmental deficits in cognition, social interaction, and communication. Despite growing interest, gaps persist in understanding usability, effectiveness, and perceptions of such agents. We organize a workshop focusing on the use of conversational agents with multi-modal capabilities for therapeutic interventions in NDD. The workshop brings together researchers and practitioners to discuss design, evaluation, and ethical considerations. Anticipated outcomes include identifying challenges, sharing advancements, fostering collaboration, and charting future research directions.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; **Sound-based input / output**; **Accessibility technologies**.

KEYWORDS

Conversational Agents, Neurodevelopmental Disorders, Multimodal

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1 INTRODUCTION

Neurodevelopmental Disorders (NDD) are a group of conditions with onset in the developmental period characterized by deficits in cognitive, social, and communication areas [1]. NDD includes intellectual developmental disorder, global developmental delay, communication disorders, autism spectrum disorder, attention-deficit/hyperactivity disorder (ADHD), neurodevelopmental motor disorders,

and specific learning disorders [1]. In recent years, there has been a growing interest in utilizing conversational agents - i.e., software enabling access to information and services through voice [4] - as a means of providing therapeutic interventions for individuals with NDD [3]. Multi-modality (i.e., the variety of input and output types beyond the voice associated with specific interaction with an agent [5]) is one of the key factors driving the success of conversational agents for people with NDD [3]. This may be because conversational interaction empowered by multi-modality is generally perceived as safe and straightforward by people with NDD. Despite the recent hype in the human-computer interaction community, there is generally limited knowledge about the usability, effectiveness, and perception of conversational agents for people with NDD, given their broad spectrum of special needs to be addressed and the very multidisciplinary aspects to consider when designing and evaluating conversational agents for this target population [3]. Consequently, numerous questions and challenges related to the design, development, and evaluation of conversational agents for people with NDD remain unanswered.

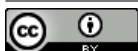
2 WORKSHOP GOAL

The Multimodal Conversational Agents for People with Neurodevelopmental Disorders workshop brings together researchers and practitioners in the field of multi-modal conversational agents for individuals with NDD, with the goal of fostering a multidisciplinary discourse on the latest research, technologies, and applications in the field. The workshop provides a stage for participants to share their findings, exchange ideas, and identify future research directions. Key themes of interest during the workshop include but are not limited to the design and development of multi-modal conversational agents for individuals with NDD, evaluating the effectiveness of these systems in real-world settings, understanding the specific needs of individuals with NDD and tailoring the systems accordingly, the use of artificial intelligence in the development of these systems, voice analysis and perception, and the social and ethical implications of using these systems.

3 EXPECTED OUTCOMES AND IMPACT

The expected outcomes of the workshop include the following:

- enhancing awareness and understanding of the needs and perspectives of individuals with neurodevelopmental disorders among the participants;



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- identifying current research gaps and challenges in the field of multimodal conversational agents for individuals with neurodevelopmental disorders;
- sharing the latest findings and advancements in the field, including new techniques, methods, and technologies;
- fostering collaboration and networking among participants from different backgrounds and disciplines, including academia, industry, and the neurodevelopmental disorder community;
- identifying future research directions and opportunities in the field and establishing a common research agenda for the community.

4 WORKSHOP CONTENT

4.1 Summary of the Accepted Papers

Two papers were accepted in the call for papers of the workshop.

- **Using Implicit Measures to Assess User Experience in Children: A Case Study on the Application of the Implicit Association Test (IAT)** by Eleonora Aida Beccaluva, Marta Curreri, Giulia Da Lisca, Pietro Corvari [2]. This paper introduces a novel approach to evaluating the user experience (UX) of multimodal interfaces designed for children, particularly those with and without neurodevelopmental disorders. It proposes the use of implicit metrics, specifically the Implicit Association Test (IAT), to assess children's preferences and attitudes without relying on direct questioning. The study's results highlight disparities between children's self-reported opinions and the implicit measurements, showcasing the potential of implicit measures like the IAT in enhancing UX evaluation for this demographic.
- **Design of Generative Multimodal AI Agents to enable Persons with Learning Disability** by Rajagopal A., Nirmala V., Jebadurai I. J., Vedamanickam A. M., Kumar P. U. [6]. This paper suggests using recent advances in multimodal and generative AI to address learning challenges in individuals with Visual or Auditory Processing Disorders. Such AI agents can dynamically adapt their interaction model based on each individual's needs, transforming information between visual and auditory modalities.

4.2 Keynote Speakers

The workshop features two prominent keynote speakers:

- **Prof. Maja Mataric**: As a leading figure in socially assistive robotics, Prof. Mataric discusses the potential of robot-assisted therapies for autism spectrum disorders. Her talk explores the science, technology, and implications of integrating robots into ASD therapy, emphasizing personalized support and ethical considerations.
- **Prof. Benjamin R. Cowan**: As a specialist in human-computer interaction, Prof. Cowan examines the evolution of conversational interfaces. His keynote highlights foundational insights that inform the design of interfaces beneficial for individuals with neurodevelopmental disorders.

5 WORKSHOP ORGANIZATION

5.1 Review Process

The workshop employed a diverse program committee to evaluate each paper. Submissions underwent 2-4 reviews to assess merit, guided by reviewers' judgments. The process maintained anonymity through double-blind reviews by experts, ensuring fairness and rigor in selecting impactful papers.

5.2 Organizing Committee

The organizers of this workshop are

- **Dr. Fabio Catania**, Massachusetts Institute of Technology, fabio@mit.edu,
- **Dr. Tanya Talkar**, Massachusetts Institute of Technology and Harvard University, tjtalkar@mit.edu,
- **Prof. Franca Garzotto**, Politecnico di Milano, franca.garzotto@polimi.it,
- **Prof. Benjamin R. Cowan**, University College Dublin, benjamin.cowan@ucd.ie,
- **Prof. Thomas F. Quatieri**, Massachusetts Institute of Technology and Harvard University, quatieri@ll.mit.edu,
- **Prof. Satrajit Ghosh**, Massachusetts Institute of Technology and Harvard University, satra@mit.edu.

6 CONCLUSION

The workshop on "Multimodal Conversational Agents for People with Neurodevelopmental Disorders" gathers a diverse range of experts to delve into the potential of conversational agents in addressing the complexities of Neurodevelopmental Disorders (NDD). The workshop is dedicated to nurturing interdisciplinary collaboration, a driving force behind innovative solutions that harmonize technology with NDD well-being. It also seeks to bridge existing gaps in comprehending usability, effectiveness, and ethical considerations within the NDD domain, encouraging further research in these areas. The anticipated impact of the workshop encompasses heightened awareness, the identification of gaps, and the augmentation of collaborative efforts, collectively steering the trajectory of NDD-focused conversational agent development.

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