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Editorial for the special issue on child-centred AI

1. Introduction and state-of-the-art

AI systems and related algorithms are playing a variety of roles in the digital ecosystems for children - being embedded in the connected toys, smart home IoT technologies, apps, and services they interact with on a daily basis (UNICEF, 2020; wef, 2019). Such AI systems provide children many benefits, such as pleasure and conveniences from connected devices (Strengers et al., 2019; Sun et al., 2021), personalised teaching and learning from intelligent tutoring systems (Ramachandran et al., 2017; Fadhil and Villafiorita, 2017), or online content monitoring and filtering algorithms that proactively identify potentially harmful content or contexts before they are experienced (Tahir et al., 2019; Kumaresamoorthy and Firdhous, 2018). However, despite its enormous potential, the use of AI systems come with new kinds of risks, raising concerns for children's privacy, safety, development, and life prospects (Corbett-Davies et al., 2017; UNICEF, 2020; wef, 2019).

While, there has been extensive research of designing with and for children by the HCI community (Druin, 1999), research has shown gaps in existing approaches in taking a child-centred approach, prioritising children's specific needs, best interests, and well-beings (Wang et al., 2024). The community still have little consensus about (i) how to tailor AI systems in ways to align with the cognitive, emotional, and developmental capabilities of children, considering their unique vulnerabilities and rights; (ii) how to protect children's privacy, safety, and security at the same time of harnessing the potential of AI for enhancing children's lives; (iii) how to uphold the values of inclusivity, transparency, and ethical & critical engagement in the context of all children; and (iv) how to promote children's overall growth and development and minimise potential risks and harmful impacts.

Furthermore, despite the long history of child-centred research within the HCI community, the current landscape of AI systems for children is largely dominated by protection- and restriction-oriented design approaches (Hertog et al., 2024). While these approaches are grounded in a recognition of children's vulnerabilities and their need for safe and secure digital environments, the emphasis on restrictive design risks inadvertently undermining children's agency (Wang et al., 2021), their capacity for playful engagement, and opportunities for exploration (Livingstone and Pothong, 2021). Such an imbalance not only limits children's ability to actively shape their interactions with AI but also harms their rights to participation, respect, and flourishing (Pothong et al., 2024). Moreover, an over-reliance on restrictive safeguards is also misaligned with evidence from developmental and learning research, which have shown that children learn and develop most effectively

through exploratory, playful, and self-directed activities (Parker and Thomsen, 2019; Zosh et al., 2022). As a result, there arises a critical need to call on the community to develop a more balanced, child-centred, and agency-focused approach, particularly given the rapid rise of AI systems in children's everyday lives.

This special issue has aimed to provide a timely contribution to this critical open question: *how should a more balanced, child-centred, and agency-focused approach to designing AI systems for children look like?* We are pleased that the nine papers accepted for publication in this special issue present a wide range of state-of-the-art research related to AI and children and provide critical inputs to this challenging open question, through the exploration of: new ways of supporting children's critical AI literacy and understanding by Kim et al. (2025); Zhou et al. (2025); Wilson et al. (2025); creative approaches of using AI to support children's learning by He et al. (2025); Vargas-Diaz et al. (2025); Zha et al. (2025); new design methods with children by Wilson et al. (2025); Zhu et al. (2025); fostering children's social and emotional development by Fan et al. (2025); and creating child-centred AI technologies by enhancing privacy preservation by Dutta et al. (2025). All accepted articles underwent peer review and revisions before their final publication in this special issue and we detail their contributions below.

2. Summary of contributions: Towards a balanced, child-centred, and agency-focused AI for children

Across the papers in this special issue, a coherent set of themes have emerged, which have enriched our understanding of what a child-centred and agency-fostering design means in the context of AI systems for children. Rather than rejecting protection and safety, the findings collectively inform us the potential benefits of rebalancing safeguards with empowerment, and constraints with opportunities for social connection, exploration, and participation.

2.1. From passive protection to supported autonomy

A central finding across the collection is that child-centred AI should not merely protect children from harm, but actively support the development of autonomy. Zhu et al. (2025) demonstrate that when children co-design AI systems, they develop *dispositional autonomy*, an inclination to intentionally shape their own actions and shift from passive AI users to active decision-makers. Similarly, Zhou et al. (2025) show that embodied and analogical co-design activities could enable children

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to critically engage with AI concepts, encouraging questioning rather than passive compliance. Together, these findings suggest that balanced design can scaffold children's decision-making and highlight that **autonomy does not always imply independence from adults or systems; it often involves supportive mechanisms, such as structures, prompts, or learning activities, to enable children to gradually take ownership/autonomy of their interactions with AI.**

2.2. Designing for co-agency rather than replacement

Several papers also reveal that agency in child-AI interaction is often relational, emerging through collaboration among children, caregivers, educators, and AI systems. The shared reading studies (Vargas-Diaz et al., 2025; He et al., 2025) illustrate how conversational agents can strengthen, rather than replace, parental involvement. They highlighted the benefits of designs that facilitate children and parents to co-create stories, choose roles together, and negotiate meaning, with AI acting as a facilitator. Wilson et al. (2025)'s futuring work similarly highlights children's desire for AI systems that support relationships and shared decision-making within learning communities. These findings challenge the narratives of AI efficiency and automation, suggesting that **a child-centred approach should prioritise co-agency and design AI systems that foster human relationships and connection instead of replacing them.**

2.3. Play, creativity, and exploration as core design values

Another highlight theme is the importance of playful, creative, and exploratory engagement as foundational to agency-focused AI design, discussed by studies from educational and developmental contexts. Kim et al. (2025) show that unplugged, embodied, and playful AI literacy activities broaden participation and reduce exclusion, particularly for under-represented groups. Zha et al. (2025)'s LLM-powered project-based learning study further demonstrates that creativity and open-ended exploration foster deeper engagement, while also revealing the need for design mechanisms that prevent over-reliance on AI outputs. Together, these studies emphasise that **play should not be an optional feature, but should be considered as a critical mechanism for children to experiment, take risks, and develop critical understanding of AI systems.**

2.4. Agency being developmentally and contextually grounded

A balanced child-centred approach must be developmentally sensitive and attentive to children's diverse contexts. For younger children, agency is often expressed through narrative, role-play, and guided interaction. The studies on early childhood reading (Vargas-Diaz et al., 2025; He et al., 2025) and emotional learning for children with ASD (Fan et al., 2025) show that agency can be supported through carefully designed scaffolds that enable generalisation, expression, and meaning-making without overwhelming the child. For older children and adolescents, agency increasingly involves critical reflection, abstraction, and future-oriented thinking, as seen in AI literacy, co-design, and futuring studies (Zhu et al., 2025; Zhou et al., 2025; Wilson et al., 2025). These findings underline that **child-centred AI cannot be one-size-fits-all, but must evolve alongside children's cognitive, social, and emotional development.**

3. Directions for future research

While the collection of papers from our special issue contribute a deeper understanding of the forefront of our current research in creating ethical AI systems for children and crucial findings of how an agency-fostering AI system for children could look like, they also highlighted some critical future research directions for the HCI community.

3.1. Advancing awareness and conceptual clarity around children's agency in AI design

Future research should work toward raising awareness and strengthening conceptual clarity around what it means to design for children's agency in AI systems. While our special issue collection has shown the great potential of designing for children's agency (Zhu et al., 2025; Zhou et al., 2025), agency is often implicitly defined or narrowly operationalised. There is a need for theoretical and empirical work that further articulates age-appropriate, context-sensitive forms of agency, distinguishing between autonomy, co-agency, and supported decision-making. Such efforts would help move the field beyond protection-only paradigms and support designers and researchers in intentionally embedding agency as a core design goal across educational, domestic, and play contexts.

3.2. Accounting for relational and social dimensions of child-AI interaction

A second important direction lies in more deeply examining the relational nature of children's interactions with AI systems. As demonstrated across several papers in this issue, children's agency often emerges through relationships with parents, caregivers, educators, peers, and AI systems themselves (Vargas-Diaz et al., 2025; He et al., 2025). However, designing for social connections is not always explicitly considered, which overlap children's need for social support or connections during their interactions with AI (Bandura, 2006). Future research should therefore adopt relational and socio-ecological perspectives, investigating how AI can be designed to support co-agency, collaboration, and shared meaning-making rather than individualised or isolating experiences.

3.3. Integrating agency and ethics as complementary design goals

There is a clear need for further research that bridges agency-focused design with ethical principles in child-centred AI. While some papers (Dutta et al., 2025) address the protection of children's data through privacy-preserving speech-recognition designs, or foreground inclusion by considering neurodiversity, bilingualism, and cultural specificity (Fan et al., 2025; He et al., 2025), children's agency is not explicitly examined in these contexts. Supporting children's agency may at times appear to conflict with ethical considerations, such as ensuring safety through restricted access or enforced age verification. However, agency can also provide a critical lens for developing more nuanced and age-appropriate approaches to ethical design. At the same time, ethical principles, such as privacy, fairness, transparency, and safety, provide the foundation for fostering children's agency in ways that are private, fair, transparent, and safe. Future work should therefore explore how ethical design can move beyond harm prevention to actively enable meaningful, confident, and informed participation by children (Zhao and Durose, 2026). This includes investigating design strategies that make ethical considerations visible and negotiable to children, as well as examining how agency-supportive interactions can coexist with robust safeguards (Wang et al., 2024). Such research would help reframe ethics and agency as mutually reinforcing, rather than competing, priorities.

3.4. Amplifying children's voices in the design of ethical AI systems

Finally, future research must more systematically centre children's voices in the design and governance of ethical AI systems for children. While participatory and co-design approaches are increasingly common, children's perspectives are not always meaningfully incorporated into research findings, nor are they consistently used to shape the ethical values, trade-offs, and rules embedded in AI technologies. Future studies should therefore explore methods that enable children to meaningfully express their views on fairness, responsibility, trust, and harm (Atabey et al., 2025), and to influence ethical decision-making processes in age-appropriate ways. As part of promoting ethical research with children, the research community must also reflect more critically on how children's voices are responsibly and consistently represented

in the reporting of findings (Read et al., 2025). Elevating children from informants to ethical stakeholders is essential for developing AI systems that genuinely reflect children's needs, rights, and lived experiences.

4. Closing remarks

It has been a privilege to create and edit this special issue and to provide a timely input to this rapidly emerging field. While the HCI community has a long tradition of designing for children, the articles collected here highlight several open challenges in designing AI systems for children, particularly given these systems' opacity and their strong impact on children's developing self-regulation and digital literacy. We hope this special issue offers exemplary methods for working and designing with children, as well as a forward-looking understanding of the open challenges we must address as a community, especially in balancing children's empowerment and agency within the context of AI.

5. Notes on contributors

Dr Jun Zhao is a senior research fellow at the University of Oxford, Department of Computer Science and founder of the Oxford Child-Centred AI Design Lab. Her research focuses on investigating the impact of algorithm-based decision makings upon our everyday life, especially for families and children. For this, she takes a human-centric approach, focusing on understanding real users' needs, to design technologies that can make a real impact. She works closely with schools, children, families as well as technologists for children, to understand the technological, societal and regulatory challenges that we are facing, to inform national and international policymakers, technology designers and families.

Dr. Grace C. Lin is a learning scientist and assessment designer at MIT with over 10 years of experience in research projects focusing on building students' capacity to learn. Her past and present projects include a practitioner-oriented early childhood measures repository, ed tech games and apps, and project-based learning curricula in math and AI that incorporate playful assessments.

Dr. Jason C. Yip is an Associate Professor at the Information School and an adjunct assistant professor in the Department of Human-Centered Design and Engineering at the University of Washington. His research examines how technologies can support parents and children learning together. He is a co-principal investigator on a National Science Foundation Cyberlearning project focused on designing social media technologies to support neighbourhoods learning science together. He is the director of KidsTeam UW, an intergenerational group of children (ages 7–11) and researchers co-designing new technologies and learning activities for children, with children. Dr. Yip is the principal investigator of a Google Faculty Research Award project that examines how Latino children search for and broker online information for their English-language learning parents. He is a senior research fellow at the Joan Ganz Cooney Centre at Sesame Workshop.

Dr. Zhen Bai is an Assistant Professor co-leading the ROCHCI research group at the Department of Computer Science, University of Rochester. Dr. Bai's research focuses on creating embodied and intelligent user interfaces to foster socio-emotional (e.g., social understanding, curiosity, communication) and STEM learning (e.g., AI literacy, scientific inquiry) for children with diverse backgrounds (e.g., autism, deaf and hard of hearing). Dr. Bai's work is supported by NSF, Google Inclusion Research Award, and the Asaro Biggar family fellowship.

Dr Ayça Atabey is a post-doctoral researcher at the University of Edinburgh. She received PhD Enrichment Award from the Alan Turing Institute, where she currently worked on Child-Centred AI. She is an affiliate at the Centre for Data, Culture & Society of the Edinburgh Futures Institute. She conducts interdisciplinary research at the intersection of Law and Human-Computer Interaction, focusing on fairness in design and regulation. She also works at the Digital Futures for Children centre at LSE focusing on AI-EdTech design, regulation and child rights. She previously worked as a consultant at 5Rights Foundation-Digital Futures Commission, and at UN Women covering Europe & Central Asia region.

Dr. Ge Wang is an Assistant Professor in the Siebel School of Computing and Data Science at the University of Illinois Urbana-Champaign. Her research lies at the intersection of human-computer interaction (HCI), human-centred artificial intelligence (HAI), and usable security and privacy, with a particular focus on vulnerable populations. She was the lead organiser for the CHI 2023 workshop on Child-Centred AI Design: Definition, Operation, and Considerations, during which she chaired the reviewing process for all submissions.

Dr. Kaiwen Sun is an Assistant Professor in the Luddy School of Informatics, Computing, and Engineering at Indiana University Bloomington. Her research addresses critical challenges at the intersection of Human-Computer Interaction (HCI), Human-Centered Privacy, and Human-Centered AI, focusing on the privacy, security, and safety concerns of diverse and sensitive populations. She co-chaired the reviewing process for the CHI 2023 workshop on Child-Centred AI Design: Definition, Operation, and Considerations.

CRedit authorship contribution statement

Jun Zhao: Writing – review & editing, Writing – original draft, Conceptualization. **Grace Lin:** Writing – review & editing, Conceptualization. **Jason Yip:** Writing – review & editing. **Bai Zhen:** Writing – review & editing. **Ayca Atabey:** Writing – review & editing, Conceptualization. **Ge Wang:** Conceptualization. **Kaiwen Sun:** Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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Data availability

No data was used for the research described in the article.

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