# Child-Centred AI Design: Definition, Operation, and Considerations

Ge Wang
ge.wang@cs.ox.ac.uk
Department of Computer Science.
University of Oxford
UK

Kaiwen Sun
kwsun@umich.edu
School of Information. University of
Michigan
USA

Ayça Atabey
ayca.atabey@ed.ac.uk
School of Law, Centre for Data,
Culture & Society. University of
Edinburgh
UK

Kruakae Pothong
kruakae@5rightsfoundation.com
Department of Media and
Communications, The London School
of Economics and Political Science
5Rights Foundation
UK

Grace C Lin
gcl@mit.edu
Scheller Teacher Education Program |
The Education Arcade. The
Massachusetts Institute of Technology
USA

Jun Zhao
jun.zhao@cs.ox.ac.uk
Department of Computer Science.
University of Oxford
UK

Jason C Yip
jcyip@uw.edu
Information School. University of
Washington
USA

## ABSTRACT

AI systems and related algorithms are starting to play a variety of roles in the digital ecosystems of children - being embedded in the connected toys, smart home IoT technologies, apps, and services they interact with on a daily basis. Going forward, AI systems will, in all likelihood, become even more pervasive in children's applications simply due to their sheer usefulness in creating compelling, adaptive, and personal user experiences. Yet, understanding the ways that AI-driven systems used by children operate, and how AI could be designed to better anticipate and respond to children's diverse requirements is still a new and emerging area of investigation. *Our goals* of this workshop are to (1) extend the current critically constructive dialogue around the meaning of child-centred AI design and (2) explore ways to operationalise such child-centred AI design in practice, and finally (3) further expand and foster a community for those who are interested in designing and developing child-centred AI systems.

## CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**.

## KEYWORDS

child-computer interaction, Child-Centred AI design

## 1 BACKGROUND

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 [1, 25]. Such AI systems provide children many benefits, such as pleasure and conveniences from connected devices [21, 23], personalised teaching and learning from intelligent tutoring systems [8, 19], or online content monitoring and filtering algorithms that proactively identify potentially harmful content or contexts before they are experienced [13, 24]. AI systems in games and entertainment services provide personalised content recommendations [9], while social robots power the interactive characters in ways that make them engaging and human-like [4, 12]. Going forward, AI systems will, in all likelihood, become altogether even more pervasive in children's applications simply due to their sheer usefulness in creating compelling, adaptive, and personal user experiences [3]. Despite its enormous potential, the use of AI and data processing activities related to the use of AI systems come with new kinds of risks, some of which raise concerns for children's privacy, safety, development, and life prospects. For example, AI systems could create potential biases against certain

groups [5, 11], such as children from different socioeconomic or ethnic groups who might be impacted disproportionately on psychological or social levels in their formative years [1, 25]. Similarly, inscrutability and unpredictability could inadvertently cause children to be exposed to harm in content filtering systems in ways that were difficult to anticipate or predict, such as those crafted by malicious adversaries [1]. Moreover, children are among those at greatest risk of privacy-related harms when Internet-connected smart home devices designed without children's unique needs in mind collect children's data that could affect them throughout the lifetimes they have yet to live [2, 23]. Parents also expressed concerns regarding children's safety using smart home technologies when AI systems lack safety guardrails for child users, such as lacking granular access control [23, 26].

There has been extensive research regarding designing with and for children that support and empower children's informed decisions in designing child-related systems that span across a variety of AI application domains [27]. Meanwhile, the recent discussion around age-appropriate design code [2] drew much attention to how to design with children's needs in mind, and what, indeed does child-centred mean when it comes to designing for children's interactions with AI systems. To foster future child-centred AI, we need to go beyond some existing design vocabularies that treat children's needs on a surface level (e.g., simply using child-friendly voices or restricting content for children of specific ages) and reposition the design focus towards the human factors of CCAI (child-centred AI) - processing children's data fairly and designing with children's best interests in mind to treat them in more respectful, fair, and autonomy-supportive ways. Given CCAI is as much HCI's problem as it is AI's [27], we believe CHI is an ideal venue to ensure the human side of CCAI is appropriately addressed. In fact, we have already seen great interest in topics around child-centred AI in CHI. For instance, varying work on designing for and with children appear each year in different subcommittees such as *Learning, Education, and Families* [10, 14, 29], *Design* [15, 17, 28], *Games and Play* [6, 16, 18], and *Privacy and Security* [7, 22, 30]. Meanwhile, extensive work has been emerging focusing on AI design in CHI from venues such as the *HCXAI* workshop in 2022, the *AI for the Margins* workshop in 2021, and the *AI for HCI* workshop in 2020. The two branches of work and communities behind them were separate but related, and sometimes they touched on similar topics but in different ways [27]. We see a strong need to connect people from different domains in CHI who are all interested in designing AI from a child-centred perspective. Meanwhile, despite increased research and interest in supporting child-centred AI design, we noticed a lack of workshops exploring how AI design could be better made for children from the last five years of CHI (as well as other conferences in the SIGCHI community, including CSCW, UbiComp and more); and even previous workshops in IDC have not typically focused on the AI aspects of designing for children. This workshop would provide great contribution to the community as one of the very first attempts to draw people's attention to such a critical and yet under-discussed topic of child-centred AI.

Additionally, apart from the previously mentioned HCI- and AI- communities, we argue it is important to include other communities so as not to reinvent the wheel. Considering the broad applications and use cases of AI systems and how children are impacted in different ways interacting with such systems. It is important to examine these issues and challenges in joint conversations with people from different fields such as education, child development, and public policies, to account for diverse factors, approaches, and perspectives that shape the development of AI and human experience. For instance, while all working around designing for a better experience for children, researchers from HCI and design domain may typically focus on the interaction between children and AI as well as their user experience and perceptions on a specific topic [31]; whereas researchers from education domain may focus more on children's learning performance and long-term behavioural change [20]; Likewise, the work from researchers in policy guidance domain may be more heavily oriented around how AI for children could be associated with greater societal impact [25]. By connecting people from different fields, such as HCI and design, algorithms and applications, policy guidance, data protection law, and education, as well as with different practices in the CHI and adjacent academic communities such as academic researchers and industry practitioners, we want to bring people together from different domains who they don't often speak in the same language, and pay attention to design implications of commonly used yet differently defined abstract principles (e.g., age-appropriate, fairness) across different disciplines, especially in the fields that are emerging and evolving when it comes to an understanding on the ways that AI-systems are used for children. We believe this workshop, supported by the various expertise offered by our organisers from multiple domains and disciplines including AI, HCI, Education, Law and Policy, would serve as a great opportunity for attracting researchers and relevant stakeholders from multiple disciplines, contributing towards a deeper understanding on what may count towards future child-centred AI design.

## 2 GOALS OF THE WORKSHOP

By facilitating a junction of diverse perspectives from relevant stakeholders around child-centred AI, *our goals* of this workshop are to (1) extend the current critically constructive dialogue around what it means by designing for child-centered AI and (2) explore ways to operationalise such child-centred AI design in practice, and finally (3) further expand and foster a community for those who are interested in designing and developing child-centred AI systems.

By connecting people from different fields such as algorithms and applications, policy guidance, and education, as well as with different practices in the CHI and adjacent academic communities such as academic researchers and industry practitioners, we want to bring people together from different domains who they don't often speak in the same language. By attracting researchers and relevant stakeholders from multiple disciplines, we aim to contribute towards a deeper understanding in terms of what child-centred AI design means for different people working in different domains, and whether can there be some kind of consensus drawn in terms of what the key design principles to consider for future child-centred AI design; Meanwhile, we aim to discuss and and explore ways to operationalize these discussed child-centred AI design principle in practice, and discuss what might be the challenges around such operationalisation. Such operationalisation can include methods at the conceptual, methodological, technical, and ethical levels, and

include aspects such as frameworks, transferable evaluation methods, and actionable design guidelines. Thus, we are interested in a wide range of topics. The following list of guiding questions is not an exhaustive one; rather, it is provided as sources of inspiration:

- What are the issues and concerns around the lack of child-centred AI design?
- What are the challenges in building child-centred AI and strategies to address such issues?
- What are the methodology and lessons learned to build child-centred AI, including ethical considerations?
- What should be the guiding principles (e.g, age-appropriate design, humane by design, fairness) for child-centred AI design?
- How can existing principles, such as age-appropriate design, humane by design, fairness and more be translated into the design of AI systems used by children?
- What are the practical measures and safeguards that can be taken to ensure children are treated in a child-centred manner (e.g., respectfully, fairly) in their interaction with AI-driven technologies?
- What are the implications of child-centred AI around children's everyday lives (e.g., privacy, safety, digital literacy), and what are the broader societal, policy, and educational implications for building child-centred AI?
- What are the roles and responsibilities in child-centered AI research?

## 3 ORGANISERS

We believe our organizing committee is well-suited to conduct this workshop, given both the diversity of our disciplines as well as a common interest grounded in child-centred AI design. Our team comes from a variety of background in the field of HCI, User Experience (UX), Human-Robot-Interaction, Education, as well as Regulations and Policy.

**Ge Wang** is the main contact person for the workshop. She is a PhD student at the University of Oxford, Department of Computer Science. Her research focuses on Child-Computer/AI interaction, and investigates the algorithmic impact on families and children, exploring the potential for designing more age-appropriate AI for families. She has experience co-organising several workshops, seminars and forums, and served as a volunteer in several previous conferences (and workshops) including CHI 2022, CSCW 2022.

**Kaiwen Sun** is a PhD candidate at the University of Michigan, School of Information. Her research focuses on understanding and supporting children's privacy and safety needs in the context of smart home technologies through designing and developing child-centered features and controls. She received Meta Research PhD Fellowship Award in 2022 for the Privacy and Data Use research area.

**Ayça Atabey** is a PhD student at Edinburgh University and is an affiliate at the Centre for Data, Culture & Society of the Edinburgh Futures Institute. She is a PhD Enrichment student at Alan Turing Institute. She conducts interdisciplinary research in data protection,

human rights and consumer laws, and in Human-Computer Interaction. Her research focuses on vulnerability, fairness, and AI from a gender and age perspective. She is the Editor-in-Chief at SCRIPTed Journal on IT, IP, and Medical Law. She received Alan Turing Institute's PhD Enrichment Award in 2022 and currently works as a researcher at BILGI IT Law Institute, a research assistant at 5Rights Foundation-Digital Futures Commission, and a Consultant on Data Protection, Human Rights and Migration at UN Women covering Europe & Central Asia region.

**Kruakae Pothong** is a researcher at 5Rights and visiting research fellow in the Department of Media and Communications at London School of Economics and Political Science. Her current research focuses on child-centred design of digital services. Her broader research interests span the areas of human-computer interaction, digital ethics, data protection, Internet and other related policies. She specialises in designing social-technical research, using deliberative methods to elicit human values and expectations of technological advances, such as the Internet of Things (IoT) and distributed ledgers.

**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.

**Jun Zhao** is a senior research fellow at the University of Oxford, Department of Computer Science. Her research focuses on investigating the impact of algorithm-based decision makings upon our everyday life, especially for families and young children. For this, she takes a human-centric approach, focusing on understanding real users' needs, in order to design technologies that can make a real impact. Currently, she is leading the KOALA project and the ReEnTrust project. She work 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.

**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 on designing social media technologies to support neighborhoods 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 and broker online information for their English-language learning parents. He is a senior research fellow at the Joan Ganz Cooney Center at Sesame Workshop.

## 4  WORKSHOP LOGISTICS

Below we describe the logistics for our workshop, this includes our **pre-workshop plans**, the **mode of workshop**, the **website, Slack channel and asynchronous engagement**, as well as our **accessibility statement**.

**Pre-Workshop Plans.** Our pre-workshop plans serve three goals: **advertising** (to raise awareness and receive strong submissions), **building community**, and **recruiting extra expert reviewers** (if necessary). **First**, the call for participation will be distributed via HCI-, UX-, AI, Edu- and Policy- for children-related mailing lists. We will further use our own distribution lists (based on a variety of seminars and forums we have held before). We will also use Twitter and LinkedIn to advertise the workshop and engage with prospective participants. **Second**, in terms of community building, apart from the organisers' personal academic networks, we also plan to utilize the engagement through advertisements on social media to expand our community. **Third**, based on past data on the seminars and forums we have held, we expect around 30 submissions, which should be able to be covered by our 7 committee members who have extensive expertise on reviewing relevant submissions. If we have more submissions beyond the scope of our core group of committee members, we will recruit extra expert reviewers, prioritising diversity of perspectives and representation in an effort to make the workshop as accessible and equitable as possible.

**Workshop Mode: Hybrid.** To promote equitable participation, we will host a hybrid workshop. We have reached this decision based on consultation with different CHI stakeholders around Covid-related complexities, global vaccine inequities, and visa restrictions. The hybrid mode allows us to broaden participation globally since travel costs and visas could become less relevant for remote participants. Meanwhile, we aim to support both the experience of our in-person and remote participants. Remote participants will engage in interaction with in-person participants through a variety of means including our website, Slack channel, Miro boards as well as Zoom, as we outline below.

**Website, Slack Channel, Zoom, Miro and Asynchronous Engagement.** The workshop website is available at https://www.ccai2023.org/. It contains the call for participation including dates and author instructions. We will provide background information on the topics, actual links to interesting news on HCI and CCAI, as well as, the background of each organizer. Our website will further provide a rich source of information and engagement for the workshop to enable the access of keynotes, expert panel discussions, paper presentations, downloadable proceedings, as well as portals to our group design activities. Given the hybrid nature of the proposed workshop, Slack will host our participants virtually. As we outline below (in Workshop Structure), we will use a combination of Slack, Zoom and Miro for the workshop. We will also have a hybrid registration desk to ensure registered participants get access to workshop related activities. Taken together, the website, Slack channel, Miro boards afford effective asynchronous engagement as these tools proved to support discussions and save records of the presentations and design activities based on our prior experiences.

Beyond asynchronous avenues, we will use Zoom for live presentations and Q&A sessions.

**Accessibility Statement.** We are committed to providing an inclusive environment and we will do our best to accommodate requests for any special assistance from our participants. All materials will be provided in an accessible format (e.g., subtitles and transcriptions will be provided throughout the workshop). Authors submitting to our workshop will be strongly encouraged to work on improving the accessibility of their papers, including adding figure descriptions, in compliance with the SIGCHI's Guide to an Accessible Submission (https://sigchi.org/conferences/author-resources/accessibility-guide/).

## 5  WORKSHOP STRUCTURE

This will be a one-day workshop consisting of approx. 30 participants and the organizers. The workshop will be conducted in a hybrid format, combining traditional paper presentations and ideation and prototyping activities. Approximately **2 weeks before the workshop**, we will send out links to all participants to introduce themselves in the Slack channel and to have access to workshop materials. Both in-person and remote participants will be asked for a short introduction on their background and experience around child-centred AI design in form of a Pecha-Kucha style one minute presentation (www.pechakucha.org) prior to the workshop, which will be posted on our website. All participants with an accepted paper submission will be invited to prepare and submit a three-minute video presentation, which also will be presented on our website. The deadline for self-introduction and video paper presentation submissions will be three days before the workshop, and will become alive one day prior to the workshop.

The workshop (see Table 1) will be devoted to a half-day keynote speech and paper presentation session, and a half-day group activity session. The keynote speech and all paper presentations will happen both in-person and in Zoom while the discussion happens on dedicated channels in Slack. This combination not only promoted a smooth experience (without cluttering the chat on Zoom calls) but also allowed for asynchronous engagement. Moreover, speakers appreciated being able to continue the conversation threads in Slack even after their talks are over.

In the **morning sessions** of the workshop, we will begin with a brief *introductory session* that aligns participants with the workshop goals, outlines key activities, and introduces the organizers. Next, we will have a *keynote speech* from an invited speaker who is a thought leader at the intersection of child-centred AI and HCI. The rest of the morning will include sessions for *paper presentations*.

The **afternoon sessions** of the workshop mainly involves group activities including group discussion and group design activities. It kicks off with an *introductory session* that aligns participants with the goal of the group activities, and the material to use for group discussion and design. Then, *group discussion* takes place, in which the participants are invited to explore concepts and design principles for designing child-centred AI, contributing towards a deeper understanding of what future child-centred AI design might mean for children. Discussion topics will be crowd-sourced and curated by the organising committee, but mainly around topics

| Time | Session |
|---|---|
| 2 weeks before the workshop | Participants introduce themselves in the Slack Channel, and have access to workshop materials. |
| 9:00 - 9:20 | Introduction of workshop organisers, participants, topics, and goals |
| 9:20 - 10:20 | Keynote Speech by invited speaker and Q&A session |
| 10:20 - 10:30 | Coffee break |
| 10:30 - 12:00 | Paper Session |
| 12:00 - 13:30 | Lunch Break |
| 13:30 - 14:00 | Introduction of group activities, topics, and goals |
| 14:00 - 15:20 | Group Activity 1: Group Discussion |
| 15:20 - 15:30 | Coffee Break |
| 15:30 - 17:00 | Group Activity 2: Group Design |
| 17:00 - 17:30 | Wrap-up |
| 17:30 | Drinks & Dinner (optional) |

**Table 1: Tentative workshop schedule (time is in local timezone)**

such as *What do we mean by designing for child-centred AI?*; *What might be the keywords to consider when we say designing for child-centred AI?*; *What are the challenges to overcome when designing for child-centred AI?* We will gather topics through surveys before the workshop. These topics can be shared before the workshop to allow for group formation before we go live. This way, we can minimize coordination challenges, which will help us keep the workshop on time. Breakout rooms on Slack and/or Zoom will be provided (max 6 people per room). After the group discussion activity and coffee break, participants will be invited to the *group design* activity, participants will form into groups of 5-6, and explore the design space of child-centred AI by envisioning and creating interface concepts, interaction designs, and low-fidelity paper prototypes, operationalising the previously discussed design principles into practice. Similarly, breakout rooms on Slack and/or Zoom will be provided. To promote the interaction between in-person and remote participants, the design activities will be mainly conducted through Miro (https://miro.com/), which is a tool for online board collaboration. We will make sure each group contains an approximately equal number of in-person and remote participants.

## 6 POST-WORKSHOP PLANS

We have a two-part plan regarding the post-workshop outcomes. The first is to do with producing archivable results and contents. To start with, we plan to synthesise and analyse the results gathered from our group discussion and group design activities into a report on the workshop outcome first, which may be transformed into publishable results to selected journals or magazines. Meanwhile, we plan to invite strong submissions from the workshop to expand and submit to a special issue in a selected journal (e.g., Special Issue in ACM Transactions on Intelligent Systems). We may also invite participants to write up synthesis papers that could be published at ACM Interactions or Communications of the ACM and focused on open research areas and grand challenges in Child-Centred AI.

Secondly, a central goal of this workshop is community building for researchers and practitioners in this area. So, we plan to continue the conversation on Slack with our participants. We also plan to use the website as an archival repository of workshop contents and new resources to foster continuous conversations and attract new community members. Moreover, this workshop will mark the

launching of the CCAI Forum, which is a bimonthly seminar series aiming to provide insight into the future of child-centred AI. The forum will develop a series of events including lectures, seminars, and workshops to bring together interested scholars and professionals. Last, if there is a critical mass of interested participants, we will explore opportunities to transform the workshop/forum into a new conference in the future (similar to how FAT* workshops lead to ACM FAccT conference).

## 7 CALL FOR PARTICIPATION

AI systems and related algorithms are starting to play a variety of roles in the digital ecosystems of children - being embedded in the connected toys, smart home IoT technologies, apps, and services they interact with daily. Going forward, AI systems will, in all likelihood, become even more pervasive in children's applications simply due to their sheer usefulness in creating compelling, adaptive, and personal user experiences. Yet, understanding the ways that AI-systems are being used in systems for children, and how AI could be designed in more child-centred manner is still a new and emerging area of investigation. This hybrid one-day workshop aims to extend the current critically constructive dialogue around what it means by designing for child-centred AI and explore ways to operationalise them in practice. We call for papers up to 4 pages excluding references that address topics involving: the issues (e.g. concerns and challenges), the methodology (and lessons learnt), the design principles, the practical measures and safeguards, the implications (e.g., around children's everyday lives, and the broader societal, policy, educational implications), and the roles and responsibilities to consider for future child-centred AI design. All papers should follow the CHI Extended Abstract format and be submitted through the workshop's submission site (https://www.ccai2023.org/). The submissions will be reviewed by the workshop organizers and program committee. All accepted papers will be published through our website and presented at the workshop, provided at least one author attends the workshop and registers at least one day of the conference.

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