Policy guidance on AI for children

DRAFT 1.0 | SEPTEMBER 2020

unicef | for every child

Ministry for Foreign Affairs of Finland

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Contents

Acknowledgements

Executive summary

According to the OECD, artificial intelligence (AI) refers to machine-based systems that, given a set of human-defined objectives, can make predictions, recommendations, or decisions that influence real or virtual environments.

■ Artificial Intelligence (AI) systems are fundamentally changing the world and affecting present and future generations of children. Children are already interacting with AI technologies in many different ways: they are embedded in toys, virtual assistants and video games, and are used to drive chatbots and adaptive learning software. Algorithms provide recommendations to children on what videos to watch next, what news to read, what music to listen to and who to be friends with. In addition to these direct interactions between children and AI, children's lives and well-being are also indirectly impacted by automated decision-making systems that determine issues as varied as welfare subsidies, quality of health care and education access, and their families' housing applications. This impact has implications for all children, including those from developing countries who may be equally impacted by lost opportunities as a result of not being able to enjoy the benefits of AI systems.

As the world's leading organization for children, UNICEF recognizes the potential that AI systems have for supporting every child's development. We are leveraging AI systems to improve our programming, including mapping the digital connectivity of schools, predicting the spread of diseases and improving poverty estimation. While AI is a force for innovation and can support the achievement of the Sustainable Development Goals (SDGs), it also poses risks for children, such as to their privacy, safety and security. Since AI systems can work unnoticed and at great scale, the risk of widespread exclusion and discrimination is real. As more and more decisions are delegated to intelligent systems, we are also forced, in the words of a UN High Level Panel, to "rethink our understandings of human dignity and agency, as algorithms are increasingly sophisticated at manipulating our choices."[1] For children's agency, this rethinking is critical. Due to the extensive social, economic and ethical implications of AI technologies, governments and many organizations are setting guidelines for its development and implementation. However, even though the rights of children need acute attention in the digital age,[2] this is not being reflected in the global policy and implementation efforts to make AI systems serve society better. Simply put: children interact with or are impacted by AI systems that are not designed for them, and current policies do not address this. Furthermore, whatever is known about how children interact with and are impacted by AI is just the start. The disruptive effects of AI will transform children's lives in ways we cannot yet understand, for better or for worse. Our collective actions on AI today are critical for shaping a future that children deserve.

Efforts to democratize the benefits of AI systems for all children urgently need to be broadened. The first step is to recognize the unique opportunities and risks that AI systems represent for children, and then to act to leverage and mitigate them, respectively, in ways that recognize the different contexts of children, especially those from marginalized communities. Children's varied characteristics, such as their developmental stages and different learning abilities, need to be considered in the design and implementation of AI systems.

In partnership with the Government of Finland, UNICEF offers this draft policy guidance as a complement to efforts to promote human-centric AI, by introducing a child rights lens. The ultimate purpose of the guidance is to aid the protection and empowerment of children in interactions with AI systems and enable access to its benefits in all aspects of life.

The guidance provides a brief description of what we mean by AI and AI systems. It then considers the range of ways in which AI systems impact children today, which are illustrated by use cases or examples that highlight the key opportunities, risks and concerns. Drawing on the Convention on the Rights of the Child, the foundations for child-centred AI are presented: AI policies and systems should aim to protect children, provide equitably for their needs and rights, and empower them to participate in an AI world by contributing to the development and use of AI. Building on this foundation are nine requirements for child-centred AI, complementing key work already underway, but with a central focus on children

Foundation = { uphold children's rights }
Through the lenses of protection, provision and participation

1 **Support children's development and well-being**
Let AI help me develop to my full potential.

2 **Ensure inclusion of and for children**
Include me and those around me.

3 **Prioritize fairness and non-discrimination for children**
AI must be for all children.

4 **Protect children's data and privacy**
Ensure my privacy in an AI world.

5 **Ensure safety for children**
I need to be safe in the AI world.

6 **Provide transparency, explainability, and accountability for children**
I need to know how AI impacts me. You need to be accountable for that.

7 **Empower governments and businesses with knowledge of AI and children's rights**
You must know what my rights are and uphold them.

8 **Prepare children for present and future developments in AI**
If I am well prepared now, I can contribute to responsible AI for the future.

9 **Create an enabling environment**
Make it possible for all to contribute to child-centred AI.

■
See all recommendations

Each requirement has a number of recommendations to guide governments and the business sector. To further support implementation of the guidance, a set of practical implementation tools and a list of complementary online resources are provided.

We invite and challenge governments and businesses to use this guidance in their work and to openly and collaboratively share their experiences. The guidance does not claim to have all the answers and we acknowledge the challenge of equally balancing indivisible child rights in the digital environment. Yet we know that it is not only possible, but also necessary, for children in an AI world.

Introduction

"Most of the technologies that exist are not made with children in mind."

VOICES OF YOUTH, AI WORKSHOP, BRAZIL

Why the guidance is needed

In the last few years, over 60 countries have released a range of AI policy initiatives,[3] focusing largely on how to leverage AI systems for economic growth and national competitiveness.[4] This is not surprising: AI systems will potentially deliver additional economic output of around USD13 trillion by 2030.[5] Beyond economic growth, the use of AI systems will fundamentally enhance or disrupt many spheres of life, such as expediting health diagnostics, improving the management of traffic flows for safer cities, impacting how news and social information are received and supporting more targeted disaster response efforts. However, because AI systems can analyse huge amounts of data and make inferences at an unprecedented speed and scale, often in a way shaped by the commercial and political agendas of those who create and deploy them, the potential for widespread harm – such as exclusion and discrimination of certain groups and individuals – is real. Moreover, since expertise and resources on AI are concentrated within a few countries and organizations, asymmetries of power and knowledge affect how the benefits of AI can be widely shared.[6] Such asymmetries especially affect developing countries, which are largely absent from, or not sufficiently represented in, most prominent forums on AI, despite having a significant opportunity to benefit from AI-powered technologies.[7]

The concern for a world where AI systems are deployed unchecked has raised burning questions about the impact, governance and accountability of these technologies. In order to ensure that AI policies and systems serve humanity and are developed in an ethical way, governments, intergovernmental organizations, companies and advocacy groups have developed over 160 sets of AI principles.[8] The promotion of human rights is central to most of these documents, which further converge around core themes including privacy, accountability, safety and security, transparency and explainability, fairness and non-discrimination, human control of technology and professional responsibility.[9] While there is growing consensus around what the principles require, far less is known about *how* to effectively apply them. Even while the majority of national AI strategies mention human rights, very few seriously consider how AI systems actually impact those rights,[10] and what can be done to address this.

Though the AI principles are all valid when children are involved, the unique characteristics and rights of children require a much deeper reflection on the impact of AI and how the principles need to be applied differently for them. In UNICEF's review of 19 national AI strategies we found that, in general, engagement on children's issues is immature. There is little acknowledgement about how AI is likely to affect children and specific mentions of children's rights tend to be limited to education, health and privacy. "Furthermore, even less is being said about the risks children may be exposed to from AI systems or mitigation efforts for certain services that utilize predictive analytics or other types of algorithmic modelling to make determinations about children's futures."[11] Children are less able to fully understand the

implications of AI technology and often do not have the opportunities or the avenues to communicate their opinions, nor the right advocates to support them, and often lack the resources to respond to instances of bias or to rectify any misconceptions or inaccuracies in their data.[12]

While, overall, governments need additional capacity and expertise to engage on issues around AI and to bring national oversight or governance to the use of such technologies,[13] the need for support to drive child-centred AI policies and systems is just as great. Children have unique physical and psychological attributes that require special attention in the application of AI systems that increasingly shape the information and services children receive and the opportunities they are afforded. It is crucial to recognize that their development and education will further be mediated and filtered by AI, and they will have an increasingly high level of exposure to AI systems over the course of their lives. National AI strategies, corporate codes of conduct and the implementation of AI systems must reflect the needs and potential of at least one-third of online users: children.[14] The need for child-centred policies is important even in instances where children's direct engagement with AI systems is limited (e.g. due to a lack of connectivity), given that indirect engagement through tools such as surveillance cameras and predictive modelling significantly impact children and their rights.

The purpose of the guidance is not to create another set of AI-related principles, but rather to complement existing work by:

Purpose and target audience of the guidance

> Raising awareness of children's rights and how AI systems can uphold or undermine those rights; and
> Providing requirements and recommendations to uphold children's rights in government and business AI policies and practices.

Since most AI policies are designed and implemented by governments and the business sector, we have focused the guidance on these two groups:

> Government policymakers at the national, regional or local level who create AI policies and strategies and governmental agencies that implement them; and
> Business leaders who create AI systems' guides and codes of conduct for their companies and software and hardware development teams that implement them. Specifically, we are targeting businesses that provide AI-enabled products and services, such as social media platforms and providers of educational technology and health diagnostic systems.

We acknowledge that there are many other stakeholders in the AI policy and implementation ecosystem, including United Nations (UN) bodies, civil society organizations and academia. These groups should also find the policy guidance valuable. For example, civil society organizations may use it to monitor how other governments and businesses fare towards achieving child-centred AI.

How the guidance was developed

This guidance was co-developed through a broad consultative process with inputs from a variety of experts aiming to capture the local AI-related needs and realities of policymakers and businesses around the world, and included children's voices in the process.

Five consultation workshops were convened with experts on AI systems, children and digital rights in Africa, East Asia and the Pacific, Europe, Latin America and the Caribbean and North America. Over 200 participants from government, the private sector, academia, civil society and UN agencies representing 39 countries were involved.

A survey was sent to policymakers and experts who could not attend the workshops. A total of 33 responses were received, including from non-traditional AI countries such as Cameroon, Jamaica and Nepal.

Almost 250 children were consulted through nine workshops held in Brazil, Chile, South Africa, Sweden and the United States.

More information can be found in the workshop reports, available on the project website.[15] The inputs from the consultations are reflected in the policy guidance and key quotes from the child workshops are included to demonstrate their hopes, concerns and questions around AI systems.

This guidance builds on and refers to key related resources, including the Memorandum on Artificial Intelligence and Child Rights by UC Berkeley and UNICEF,[16] the Berkman Klein Center's report on Youth and Artificial Intelligence,[17] and UNICEF's work on responsible data for children[18] and its governance.[19]

How to use the guidance

The guidance should be used in a variety of contexts:

> When creating, reviewing and/or updating AI policies, strategies or codes of conduct;
> When developing and implementing AI systems that children interact with or may be impacted by; and
> When driving change throughout the life cycle of policy and technology development, within governments and companies.

While we have tried to be as practical as possible in the requirements and recommendations, the guidance must remain high-level so that it can be applied according to local contexts. To support implementation, two practical tools accompany the guidance: an operationalization roadmap for policymakers and a development canvas for AI software teams.

1.0 /

What do we mean by AI?

*"What excites me about AI? It is the future.
To keep up I want to learn this now."*

VOICES OF YOUTH, AI WORKSHOP, SWEDEN

AI refers to machine-based systems that can, given a set of human-defined objectives, make predictions, recommendations, or decisions that influence real or virtual environments.[20] AI systems interact with us and act on our environment, either directly or indirectly. Often, they appear to operate autonomously, and can adapt their behaviour by learning about the context.

Simply speaking, AI systems function by following rules or by learning from examples (supervised or unsupervised), or by trial and error (reinforcement learning). Many AI applications currently in use – from recommendation systems to smart robots – rely heavily on machine learning techniques for pattern recognition. By discovering patterns in data, computers can process text, voice, images or videos and plan and act accordingly.

{ Examples of most used techniques found in common AI applications }

	Chatbots	Recommendation systems	Robots	Automated decision-making
Natural language processing	✓	✗	✓	✓
Computer vision	✗	✗	✓	✗
Rule-based models	✓	✓	✓	✓
Learning from examples	✓	✓	✓	✓
Planning techniques	✓	✗	✓	✗
Predictive analytics	✓	✓	✗	✓
Reinforcement learning	✗	✓	✓	✗

These techniques employ statistical methods to process large amounts of data about us and the world. Both the algorithms and data are key influences on the results of the AI system. Data is always a limited representation of reality, and the results of the AI system depend on the data it uses. At the same time, the teams that develop the algorithms, decide on which algorithms to use, and determine how the results will be implemented, must also include a diversity of disciplines and backgrounds in order to minimize bias and undesirable impacts. To minimize bias in the results of AI systems, data needs to reflect the gender, race, cultural, and other characteristics of the groups that use or are otherwise impacted by

Data

Facts, figures or information that are used to train AI about humans and the world.

Machine learning

A programming technique in which a software system is provided thousands of examples of a concept and searches for patterns by itself.

(Deep) neural networks

A number of information processing units that send information between each other, similarly to the way neurons work in our brain. Combined with ever-powerful computers and large amounts of data, this technique enables more efficient machine learning.

Predictive analytics

Statistical techniques that analyze data to make predictions about unknown events or outcomes.

Pattern recognition

The automated identification of regularities in data used, for example, for image processing or computer vision.

Natural language processing (NLP)

Systems used, for example, by chatbots and voice assistants, are designed to understand and generate human language, either written or spoken.

Computer vision techniques

Techniques that provide computers with understanding of digital images or videos, such as for facial recognition.

the system. It is also important to note that AI systems are mostly embedded within digital systems and hardware. For this reason, it is often said that AI is everywhere and nowhere. Consequently, it can be difficult to focus only on AI-related aspects in a guidance such as this without also discussing related digital ecosystem issues. While explainability and accountability are principles specific to AI systems, the protection of user privacy and the concern for fairness and inclusion are relevant for the whole digital ecosystem.

Efforts towards responsible, or trustworthy, AI are increasing around the world, through which governments and businesses recognize the need for safer and more ethical and transparent approaches to AI policy and development.[21] Responsible AI is about ensuring that AI systems are ethical, legal, beneficial and robust, that these properties are verifiable, and that organizations that deploy or use these systems are held accountable.[22]

Responsible AI is about ensuring that AI systems are ethical, legal, beneficial and robust

Finally, it is critical to understand that AI systems are not magic.[23] People design, train and guide AI, from those that set AI policies and strategies, to the software programmers who build AI systems, to the people that collect and tag the data used by them, to the individuals who interact with them. This means that everyone in the AI development ecosystem needs to understand the key issues that require them to contribute to responsible AI. This could include being well-informed about why and how an AI system has been designed, by whom and for what purpose.

Children's rights and AI: Opportunities and risks

"I'm undecided. On one hand, I want privacy, but on another, I want to be protected and be given correct information that will help me as a child. I think a chatbot is a good idea but parents need to be involved in helping me make decisions about my life."

VOICES OF YOUTH, AI WORKSHOP, SOUTH AFRICA

<2.1>
What are children's rights?

The basis for the guidance is the Convention on the Rights of the Child (CRC),[24] which sets out the rights that must be realized for every child, that is every person under the age of 18, to develop to her or his full potential. AI systems can uphold or undermine children's rights, depending on how they are used. This impact should be central to how AI policies and systems are developed so as not only to respect but also to uphold all children's rights, and can be viewed through the lenses of protection, provision and participation.

The lens of protection includes rights to protection against discrimination, abuse and all forms of exploitation, the right to privacy and, by extension, to the protection of children's personal data. It also includes access to remedies ensuring that children have avenues for formal (including legal) complaint in cases where their rights have been breached. Provision includes rights to services, skills and resources that are necessary to ensure children's survival and development to their full potential, under the principle of equal opportunity so that every child has a fair chance. Examples are the right to health care, education, information, rest and leisure, and play. Lastly, participation includes the right of children to freely express their views in all matters affecting them, with those views being given due weight. In addition, a children's rights-based approach rejects a traditional welfare approach to children's needs and vulnerabilities and instead recognizes children as human beings with dignity, agency and a distinct set of rights and entitlements, rather than as passive objects of care and charity.

Overall, the realization of children's rights is guided by a particularly important article in the CRC: that in all actions concerning children, public and private stakeholders should always act in the best interests of the child. Building on the CRC and in recognition of the role of the private sector to also uphold child rights, the Children's Rights and Business Principles offer a comprehensive range of actions that all businesses should take to respect and support children's rights in everything they do – in the workplace, marketplace, community and environment.[25]

<2.2>
How children are impacted by AI systems

Today's children are the first generation that will never remember a time before smartphones. They are the first generation whose health care and education are increasingly mediated by AI-powered applications and devices, and some will be the first to regularly ride in self-driving cars. They are also the generation for which AI-related risks, such as an increasing digital divide, job automation and privacy infringements must be addressed before becoming even more entrenched in the future. Even while many governments and organizations are already seeking to develop human-centric AI policies and systems, child-specific considerations must equally be front and centre in AI development.

It is also important to realize that different socioeconomic, geographic and cultural contexts, as well as developmental stages[26] of children's physical, cognitive, emotional and psychological capacities all influence the impact of AI on children. The interaction between AI systems and children is complex and not only limited to those systems designed for and used by children. In many cases, even when AI systems are not specifically meant for children, children are interacting with them. In other cases, AI systems that are not used by children, may affect the child in direct or indirect ways. In general, it is important to ask the following questions:

> Do children interact with the system?
> Was the system designed for children?
> Does the system impact children?

If any of the answers are "yes", all of the requirements and recommendations described in this guidance should be implemented.

<2.3>
Key opportunities

Below are some of the most relevant and often cited opportunities – followed by key risks – associated with AI systems; we also

Today's children are the first generation that will never remember a time before smartphones

provide a few concrete examples of their direct or indirect impact on children. The opportunities, risks and use cases are not meant to be exhaustive; they are illustrative of key issues to consider around child-centred AI.

Aid children's education and development

AI systems show promise in improving educational opportunities, from early learning to virtual mentoring to school management.[27] AI-enabled learning tools have been shown to help children learn how to collaborate and develop critical thinking and problem-solving skills.[28] Adaptive learning platforms have the potential to provide personalized learning experiences to address each user's unique needs. When combined with traditional teaching methods, such customization and one-on-one intelligent tutoring could be greatly beneficial to children with learning difficulties.[29] Other types of AI-enabled educational tools can help teachers generate curricula without having to develop them from scratch.[30]

Given these potential benefits, some national AI strategies have already begun to focus on ways to improve the delivery of educational services to young people, including in primary schooling.[31] Additionally, AI-based interactive games, chatbots and robots introduce new outlets for children to express themselves and think creatively – much-needed skills in the era of AI. For instance, game activities with social robots could help young children learn to read and tell stories, increase their vocabulary and learn to draw images.[32]

Contribute to better health outcomes for children

AI-enabled systems are being deployed to diagnose illnesses,[33] triage patients[34] and recommend treatments. AI capabilities such as natural language processing (NLP) can help researchers process vast amounts of health data, read thousands of scholarly articles and generate summaries to facilitate further research and treatments.[35] Within health, AI is also being applied to better understand and combat the COVID-19 pandemic, even though human rights advocates caution against fast

innovation and its unintended consequences. Efforts include contactless screening of symptoms and models to estimate the number of infections that go undetected.[36]

AI systems are also showing capacity to contribute to emotional support, especially for children, although current methods of sensing affection and emotion are methodologically and, in many cases, ethically questionable.[37] However, in highly controlled settings and under conditions of utmost care, there is increasingly scope to use emotional AI-enabled children's products to detect moods and evolving mental health issues, assist family dynamics with parental support, and help with behaviour regulation through socio-emotional learning.[38] It should be noted that AI technologies should always ensure that children are directed to online and offline human support for sensitive scenarios, such as in seeking support on mental health related issues or bullying.

Support the achievement of the SDGs

According to a recent report on the role of AI in achieving the SDGs, "AI can enable the accomplishment of 134 targets across all the goals".[39] There are several existing initiatives that explore how AI can serve as a force for good. The UN's AI for Good Global Summit is one example that works to accelerate progress on the SDGs by convening policymakers and creators of AI applications in the hope that these might be scaled for global impact.[40] The Oxford Initiative on AI×SDGs is also seeking to determine how AI can be used to support and advance the SDGs by conducting research and recommending tools and best practices for policymakers.[41] Linking AI policies and strategies with the SDGs can greatly help to advance children's development and well-being, and prioritize the equity and inclusion of children.[42] However, in order to enable the positive impacts of AI, regulatory oversight for AI-based technologies is essential. Currently, there is little or no oversight of AI systems globally.[43] A promising proposal on a 'Digital Commons Architecture' was put forth by the UN Secretary-General's High-level Panel on Digital Cooperation with the "aim to synergize efforts by governments, civil society and

businesses to ensure that digital technologies promote the SDGs and to address risks of social harm".[44]

‹2.4›
Key risks and concerns

Systemic and automated discrimination and exclusion through bias

Algorithmic bias is the systemic under- or over-prediction of probabilities for a specific population,[45] such as children. Causes include unrepresentative, flawed or biased training data, context blindness, and the uninformed use of outcomes without human control. If the data used to train AI systems does not sufficiently reflect children's varied characteristics, then the results may be biased against them. Such exclusion can have long-lasting effects for children, impacting a range of key decisions throughout their lifetime. While data is a key component of AI systems, framing bias as purely a data problem is too narrow a view.[46] Bias is also a result of the social context of AI development and use, including the organizations, people and institutions that create, develop, deploy, use and control AI systems, those who collect data, and the people who are affected by them. If the broader context, including regulations (or lack thereof), perpetuates or does not prevent discrimination, including against children, then this will negatively influence the development of AI-based systems.

Limitations of children's opportunities and development from AI-based predictive analytics and profiling

In many cases, predictive modelling applications are developed with the aim to improve the allocation of social welfare services and access to justice and healthcare, but are based on the statistical analysis of past cases and criteria sourced from different databases, including public welfare benefits, medical records, judicial information and more. This is also the main concern with this type of AI application.[47] Studies from around the world show that input data into such systems are often not recorded in a systematic way across government agencies, criteria are applied differently and inconsistently, and often highly relevant aspects are missing or wrongly reported.[48] Moreover, training machine learning systems on past data and on data that has not been collected for the specific case, can reinforce, if not amplify, historical patterns of systemic bias and discrimination, if not validated by experts,[49] including those on child rights.

AI-based systems are also used for profiling. Predictions made by AI systems use proxies for an individual, which bring the risk "to lock individuals into a user profile…" that does not sufficiently allow for differing contexts or "…confine them to a filtering bubble, which would restrict and confine their possibilities for personal development."[50] By aligning too closely with the user's perceived preferences (such as their "likes"), the bubble these techniques create means the user only sees what the system assumes she or he likes to see. The use of similar techniques to adapt a commercial or political message to the specific characteristics of a user is known as *microtargeting* and is used to influence user behaviour for effective advertising or by political parties to influence voters' opinions.

These techniques, largely driven by business interests, can limit a child's worldview, online experience and level of knowledge, and as such, the child's right to freedom of expression and opinion.[51] For example, the AI system may not account for children from minority groups or children who differ substantially from their peers, or may not support alternate developmental trajectories that are not usually represented in data sets. As a result, such systems could potentially reinforce stereotypes for children and limit the full set of possibilities that should be made available to every child, including for girls and LGBT children. This can result in, or reinforce, negative self-perceptions, which can lead to self-harm or missed opportunities. Ultimately, when children grow up under constant surveillance[52] and their agency and autonomy are constrained by AI systems, their well-being and potential to fully develop will be limited.

Infringement on data protection and privacy rights

AI systems need data and, in many cases, the data involved is private: for example, location information, medical records and biometric data. As such, AI challenges traditional notions of consent, purpose and use limitation, as well as transparency and accountability – the pillars upon which international data protection standards rest.[53] Children merit specific protection with regard to their personal data, as they may be "less aware of the risks, consequences and safeguards concerned and their rights in relation to the processing of personal data".[54] Further, when considering the privacy of children, it is important to understand that young children may not grasp the concept of privacy and therefore may disclose too much information to AI systems they interact with.[55] Breaches of privacy can result in risks to the physical safety of the child – for example, by hackers – and their potential opportunities. At the same time, parents and legal guardians often do not have the information or capabilities to ensure their child's safety and privacy. Nor may they be aware of future, unknown uses of their children's data.

> It is important to understand that young children may not grasp the concept of privacy

Exacerbation of the digital divide

Research shows that traditionally disadvantaged communities, including their children, are similarly disadvantaged in the digital world.[56] Emerging technologies, such as AI systems, bring risks of increasing inequalities due to unevenly distributed access to technology, limited digital skills and abilities to leverage its related benefits, and an inability to transform internet use into favourable offline outcomes.[57] The digital divide results in differential access to AI-enabled services and can prevent children from reaching their full potential and unlocking the opportunities they will need to succeed in an increasingly AI dependent world. As highlighted by the ITU, "from an impact perspective … areas with the most data and the most robust digital infrastructure will be the first to reap the benefits of these technologies, leaving under-resourced, less-connected communities even further behind than they are now. And from a development perspective, areas without strong technical capacities (both human and digital) may find it challenging to participate in the global governance dialogue, and to compete with more established market competitors."[58] Variances in technology access and education quality greatly influence the skill levels children will be able to attain and that will enable them to be active users and consumers of AI and digital content. For example, according to a recent report, North America and China stand to gain the most from developments in AI, while developing countries in Africa, Latin America and Asia will experience more modest gains.[59]

< case studies >

Opportunities or risks?

The use cases below illuminate how AI systems can present both opportunities and risks for children. We acknowledge that children around the world use and are impacted by AI systems differently. Some of the examples are more applicable in developed country settings and some are controversial due to their potential risks.

Future of work

AI systems will change the nature of work and affect the type and number of future jobs, with positive or negative implications. It has been predicted that many of the jobs the current education systems are preparing children for will be irrelevant by the time they are adults. At the same time, up to 65 per cent of children in primary school today will be working in jobs that do not even exist yet.[60] A 2017 McKinsey & Company report estimates that AI and robotics could eliminate about 30 per cent of the world's workforce by 2030,[61] and the World Economic Forum predicts that technology could displace 75 million jobs by 2022. However, it also notes that 133 million new ones could be created.[62] Preparing children for the future will require education systems to be aligned with the needs of the future workforce, which includes soft skills, such as creativity and communication; technical skills, such as coding; and a lifelong learning ecosystem that supports children into their full adulthood.

AI-enabled toys

AI-enabled toys are physical toys that interact with children and utilize AI techniques such as NLP to listen and respond, computer vision to see or robotics to move. While the toy manufacturers purport to create playful and creative opportunities for children, with some claiming to enhance literacy, social skills and language development,[63] these claims need further comparative study to substantiate their developmental impact. Overall, the devices raise serious questions about how children's interactions with smart toys may influence their own perceptions of intelligence, cognitive development and social behaviour – especially during different developmental stages.[64] Moreover, the use of smart toys poses risks around children's security and privacy.[65] Smart toys are often permanently connected to the web and are susceptible to hacking and other security breaches. This has led some national governments, like Germany, to ban some AI-enabled toys.[66] In many cases, the data collected from children – such as conversations and photos – are sent to the toy makers and third parties for processing and storage.

AI-powered voice assistants and chatbots

Virtual voice assistants and chatbots utilize NLP, automatic speech recognition and machine learning to recognize verbal commands, identify patterns, retrieve information and generate responses. While these systems have not always been built or tailored for children, millions of children are being shaped by them either emotionally or behaviourally.[67,68] Proponents of these technologies have cited benefits that include support for children with visual impairments or limited mobility,[69] and new ways of learning and stoking children's curiosity and creativity.[70] Additionally, some chatbots aim to make studying easier and more time-efficient for students.

However, the use of chatbots can lead to additional risks for children, especially in mental health, when bots do not recognize appeals for help or provide inadequate advice. For instance, a 2018 testing of two mental health chatbots by the BBC revealed that the applications failed to properly handle children's reports of sexual abuse, even though both apps had been considered suitable for children.[71] According to a UNICEF briefing, "when not designed carefully, chatbots can compound rather than dispel distress" which "is particularly risky in the case of young users who may not have the emotional resilience to cope with a negative or confusing chatbot response experience."[72] Moreover, chatbots may pose several security threats including spoofing (impersonating someone else), tampering with data, data theft and vulnerability to cyberattacks, and may enforce bias, given that they often select a predetermined reply based on the most matching keywords or similar wording pattern.

Further concerns related to chatbot and personal assistant technologies relate to privacy and data ownership. For instance, given that voice assistants typically rely on storing voice recordings to facilitate the system's continuous learning, child rights advocates have raised questions over the lack of clarity in company data retention policies and child and parental consent.[73]

Facial recognition systems for biometric identification

Facial recognition systems employ computer vision techniques and machine learning algorithms to determine, process and analyse a person's facial features with a wide range of aims, such as verifying an individual's identity against an existing record. For identification purposes, it may be used in border management, crime analysis and prevention, and school surveillance for claimed reasons of improved security. Facial recognition is increasingly being used as a means of a digital identity "credential" for both legal and functional identification. While not a replacement for legal ID, which makes people visible to a state and is a recognized right, this technology may more quickly or easily validate an existing identity record.

The associated human and child rights risks and limitations are great. Privacy advocates have warned against its use in government mass surveillance efforts and as a law enforcement investigative tool, particularly as it can be utilized to profile, track and suppress vulnerable communities. In some cases, these systems also raise issues of meaningful consent as people may not know who is collecting the biometric data or even that it is being collected, how it is being stored or how it could be applied. Furthermore, inaccuracies in facial recognition detection continue to persist, including less reliable matching for children's faces[74] and other groups based on gender and ethnicity,[75] such as women of colour. As a consequence, this could cement existing social biases and lead to discrimination or further marginalization of minority communities.[76]

<2.5>
What do children think about AI?

In our consultations with children – mainly 14 to 16 years old – we explained AI systems and their impacts, with the aim of raising awareness of the key issues and then to get their views on AI. We listened to children's perspectives on the ethics of certain AI systems, such as automated screening of university applications or health chatbots, and asked how they feel about how AI systems impact their lives. Across the nine workshops we saw similarities and differences amongst the children's responses. A full report of the child consultations will be released in late 2020, with some of the following key messages:

While there is much about AI that excites children, they don't want AI to completely replace engagement with humans.

The children recognize that interacting with AI systems has its benefits, but also that there is sometimes a clear need to talk to a human, be it a parent or an adult professional. On sensitive issues, such as tracking instances of bullying or providing health advice, children do not only want or trust a machine in the loop.

Parents or caregivers are seen as key stakeholders in children's AI-powered lives.

The children felt that since parents and caregivers are the ones who give them devices in the first place, they should educate children about the risks of AI systems and be more involved in their digital lives. Yet, some child participants acknowledged that most parents don't have sufficient knowledge on these topics, and worried that parents don't respect their children's privacy.

Children have high expectations of the AI technology industry.

The child participants called for greater transparency from companies that develop AI technology and voiced the need for them to educate people, especially children, about

their products. They feel companies need to understand that children may use their products even if they aren't the intended users and should engage children as primary users in the design or feedback process.

Concerns around data privacy in the context of AI are a common theme.

The children are worried that AI systems collect too much data and that their privacy may need to be balanced against their other rights, such as to health care or education. For some of the children, there is an acceptable level of data privacy loss as a matter of fact, or a reasonable trade-off for using AI-based systems.

Local context influences children's views on AI.

While, overall, participants are concerned about AI-based automation potentially causing job losses, the children in Johannesburg are particularly worried about this aspect. This is not surprising given that South Africa has a very high youth unemployment rate.

AI child consultation workshop in São Paulo, Brazil

Foundations for child-centred AI

Considering the variety of ways in which AI impacts children, and the related opportunities and risks, the CRC provides the foundation for AI policies and systems to uphold children's rights.[77] It not only takes a protective position, but also one of empowerment and agency for children. We recommend that governments and businesses engage in all AI-related activities guided by these perspectives:

Protection = { do no harm }

Children need to be protected from any harmful and discriminatory impacts of AI systems and interact with them in a safe way. AI systems should also be leveraged to actively protect children from harm and exploitation.

Provision = { do good }

The opportunities that AI systems bring to children of all ages and backgrounds – such as to support their education, health care and right to play – need to be fully leveraged when, and this is critical, it is appropriate to use AI systems.

Participation = { include all children }

Ensuring participation means that children are given agency and opportunity to shape AI systems, and make educated decisions on their use of AI and the impact that AI can have on their lives. All children should be empowered by AI and play a leading role in designing a responsible digital future for all.

When applying this foundation to AI policies, systems design, development and deployment, it is critical to note that regardless of regulatory frameworks, children are entitled to the rights foreseen under the CRC until they reach the age of 18. Reaching the age of digital consent, which begins at 13 years old in many countries, does not mean they should then be treated as adults.

"I worry that the tech we create will belong to the wrong people, or that it is easy to hack"

VOICES OF YOUTH, AI WORKSHOP, USA

Requirements for child-centred AI

"I'd like to see [AI] taught in schools, because it's something we use all the time and everywhere and we have no idea [about it]."

VOICES OF YOUTH, AI WORKSHOP, CHILE

To operationalize the foundations, we recommend that governments, policymakers and businesses that develop, implement or use AI systems meet the nine requirements for child-centred AI:

1 **Support children's development and well-being**
Let AI help me develop to my full potential.

2 **Ensure inclusion of and for children**
Include me and those around me.

3 **Prioritize fairness and non-discrimination for children**
AI must be for all children.

4 **Protect children's data and privacy**
Ensure my privacy in an AI world.

5 **Ensure safety for children**
I need to be safe in the AI world.

6 **Provide transparency, explainability, and accountability for children**
I need to know how AI impacts me. You need to be accountable for that.

7 **Empower governments and businesses with knowledge of AI and children's rights**
You must know what my rights are and uphold them.

8 **Prepare children for present and future developments in AI**
If I am well prepared now, I can contribute to responsible AI for the future.

9 **Create an enabling environment**
Make it possible for all to contribute to child-centred AI.

In this chapter we provide concrete recommendations to help fulfil these requirements. The clickable notes refer to useful resources, examples, reports and articles. At the end of the chapter, an overview of all the requirements and recommendations can be found.

The following overarching recommendations apply in all contexts:

The requirements apply whenever AI systems interact with or impact children, regardless of whether the system was designed for or targeted at children. AI developers should acknowledge this reality and AI-related policies should require that a child-appropriate approach be applied in the design and development of AI systems. When relevant AI policies are being developed, they should cater to children as the default users of AI systems.

Develop and deploy AI systems in a way that simultaneously upholds children's collective rights to protection, provision and participation. When moving from policy to practice it is necessary to acknowledge and, openly and collaboratively, try to address the potential tensions between these principles. Even as all child rights are indivisible, upholding them equally and simultaneously can demand striking a delicate balance. For example, how can children's privacy and agency be best protected while collecting sufficient data on children for specific AI-based health interventions?

Foster a multi-stakeholder approach both in government and in business. Since AI impacts many aspects of society, a multi-stakeholder approach is needed in the creation of AI policies and systems that cross organizational and departmental boundaries. Additionally, including children and child rights advocates as stakeholders will allow for coordinated AI guidelines, regulations and systems that are both realistic and ambitious, and can contribute to building trust in governments.[78]

Adapt to the national or local context. We acknowledge that governments and companies are at different stages along the AI maturity spectrum: from exploratory to mature, from setting up a strategy to implementing it in a way that incorporates contextual awareness and is fully funded. The requirements and recommendations below should be considered by all stakeholders, regardless of the AI policy or system's level of maturity, but should be adapted and implemented according to the local context. One strategic way to localize AI policies is to align them with national development plans, where possible.

1 Support children's development and well-being

■ When applied appropriately, AI systems can support the realization of every child's right to develop into adulthood and contribute to his or her well-being, which involves being healthy and flourishing across mental, physical, social and environmental spheres of life.

Prioritize how AI systems can benefit children, in particular in AI policies and strategies. AI policies and strategies should be informed by a sound knowledge of the impacts of AI on children, including the unique developmental and well-being benefits and, more importantly, risks associated with AI systems for children. The benefits should be leveraged and given support in policies and strategies, along with actions to mitigate any risks.

Develop and apply a design for a child rights approach. This may appear to be an obvious recommendation, however it requires a serious commitment to putting the child at the centre of AI policy and system design, development and deployment. To do this, AI technologies should be created and designed with a child rights approach, which could include privacy by design, safety by design and inclusion by design.

Leverage AI systems to support and increase children's well-being and environmental sustainability.[80] Since children will increasingly spend a large part of their lives interacting with or being impacted by AI systems, developers of AI systems should tie their designs to existing well-being frameworks and metrics[81] – ideally ones focused on children specifically – and adopt some measure of improved child well-being as a primary success criterion for system quality. Beyond well-being, AI systems should not negatively impact the physical environment so that children can live in a sustainable world with a healthy climate.

Sidebar

Age Appropriate Design

A code of practice for online services including AI systems, provides practical guidelines for putting the child at the centre of many of the requirements outlined here, such as data protection, transparency and profiling of children.[79]

Designing for Children Guide

A collection of practical approaches to involve children at each step of a development process, including co-designing and prototype testing with children.[82]

2 Ensure inclusion of and for children

■ When developing AI systems, design principles that address the widest possible range of users should be applied so that all children can use the AI product or service, regardless of their age, gender identities, abilities or other characteristics. We recommend that the active participation of children be encouraged in the design, development and implementation of AI systems, and that children are considered in the context of the intended use, so that the benefits of AI systems will be available and appropriate for all potential child users.

Strive for diversity amongst those who design, develop, collect and process data, implement, research, regulate and oversee AI systems. With diverse teams, biases can be reduced and the perspectives of disadvantaged or minority groups are more likely to be considered and actively included. Diversity includes not

only different voices, but also informed ones. In the same way that children should be AI literate, the creators of AI systems should be child-rights literate.

Adopt an inclusive design approach when developing AI products that will be used by children or impact them. An AI inclusion by design[83] approach ensures that all children can use AI products or services, regardless of their age, gender identities, geographic and cultural diversity. This can ensure relevance for and use by children that may otherwise be excluded through bias, discrimination or profiling. Include a broad range of stakeholders in design teams, such as parents, teachers, child psychologists, child rights experts, and, where appropriate, children themselves.

Support meaningful child participation, both in AI policies and in the design and development processes. When an AI system is intended for children, or when children can be expected to use the system, or if the system impacts children even if they are not direct users, meaningful children's participation in the design and development process is strongly recommended,[84] in accordance with their right under article 12 of the CRC.

3   Prioritize fairness and non-discrimination for children

AI systems should not lead to discrimination against children on any basis, including age, ethnicity, race, gender identities, disability, rural or urban contexts, socioeconomic status or location. The promotion of equal opportunities and fairness for every child should underpin the policies, development and intended benefits of AI systems.

■
Additional resources

Actively support the most marginalized children so that they may benefit from AI systems. Not all children face equal circumstances and therefore not all can benefit equally from AI systems. AI policies should prioritize the most vulnerable children, including girls, children from minority or marginalized groups, children with disabilities and those in refugee contexts, in order to mitigate against further exclusion of such children through AI-related policies and systems. Part of achieving this shared benefit requires attention to the differences in cultural, social and regional contexts of AI-related policies and activities. Further, efforts may include capacity-building projects by governments and other stakeholders for developers of AI policies and systems in order to effectively promote the inclusion of marginalized groups to benefit from AI.

Develop datasets so that a diversity of children's data are included. Data equity and representation of all relevant children for a particular AI system, including children from different regions (including rural communities), ages, socioeconomic conditions and ethnicities, is essential to protect and benefit children. For example, in the case of data-driven health care, children's treatment or medication should not be based on adults' data since this could cause unknown risks to children's health.

Seek to eliminate any prejudicial bias against children, or against certain groups of children, that leads to discrimination and exclusion. Aside from testing data for representativeness and equitability of different groups of children, data also need to be tested for accuracy, consistency, validity and quality. In addition, algorithms need to be programmed, continuously tested and adjusted as needed, to seek fairness in results.[85] Since there is no one optimal technical definition of fairness to prevent bias, developers need to consider the trade-off of multiple fairness definitions. Meanwhile, they should recognize how measures of fairness affect children differently.

4 Protect children's data and privacy

Additional resources

■ AI policies and systems should recognize the value and unique vulnerability of children's data and their privacy in a protective and empowering way. Children's data includes the content they create, information collected about them and what is inferred through algorithms. Beyond child data protection regulations, special protections are needed for marginalized groups and for particularly sensitive data, including ethnicity and biometric data.[87]

Follow a responsible data approach for the handling of data for and about children. Given that children are considered a vulnerable group, their data should be handled with the highest level of protection. Further, the use and governance of children's data must be proportional to help address the inherent tension between the need to use sufficient data about children so that AI systems can best benefit them, while minimizing data collection to ensure fewer risks to privacy and security.[88]

Promote children's data agency. Support children's ability to maintain agency over their personal data, with the capacity to access, securely share, understand the use of, control and delete their data, in accordance with their age and maturity. Given that the responsibility for data protection can never be left entirely to children, this must include their wider social ecosystem, such as parents and caregivers – who need to provide consent for the use of younger children's data – as well as educators and social workers, in some cases. Moreover, as children's understanding of consent changes, the process of giving consent should be revisited at key developmental stages in the life of a child.

Adopt a privacy-by-design approach. Governments and businesses should explicitly address children's privacy in AI policies and apply it in the design and implementation of AI systems. The protection of children's privacy and data is intricately interwoven with their right to freedom of expression, access to diverse information and protection from economic exploitation, including through profiling and digital marketing.[90]

Consider protections at the group level. Profiling is no longer only tied to an individual, but to collections of individuals based on a wide range of characteristics, such as their ethnicity, locations, online behaviours and ages. There is a need to not only protect an individual's right to privacy – the default regulatory and practice position – but to also take a collective view so that group characteristics, such as cultural diversity, are protected. Profiling and responsible data practices should thus also apply to data of collective groups through the establishment of clear policies, procedures, and responsibilities for mitigating group data risks.[91]

UNICEF's Good Governance of Children's Data

This initiative has a number of papers on emerging AI and data related issues, such as child rights and data protection by design, state surveillance and responsible group data for children.[92]

5 Ensure safety for children

■ Children's safety within AI systems should be assured, both in the short and in the long term. Children are biologically and psychologically distinct from adults and will be impacted differently by AI systems. Further, children use digital services and apps in unanticipated ways, have different perspectives on privacy and security and often develop creative techniques to engage with the digital world. As such, the specificities of children need to be considered sufficiently in every context in which the technology is used.[93]

Call for mechanisms for assessing and continually monitoring the impact of AI systems on children in AI policies and strategies. AI policies and strategies should call for child rights impact assessments (even when AI systems are being considered for procurement[94]), mitigation strategies following a risk-based, safety-by-design approach,[95] and be backed up by top-level commitment to halt harmful AI practices. For governments, taking a risk-based approach to impact assessments helps to ensure that AI regulatory interventions are proportionate.[96]

Continuously assess and monitor AI's impact on children throughout the entire AI development life cycle. Ensure and develop a means to address potential risks, opportunities and overall impact in the planning, development and implementation

phases of AI systems.[97] This includes identifying the impact of AI systems on social systems and structures, and on the development of children and their cognitive skills.[98] Measures also need to be put in place to set thresholds for impacts and political will is needed to halt harmful AI practices for children, even while the same AI systems may be beneficial to other groups.

Require testing of AI systems for safety, security and robustness. AI systems need to be constantly tested to ensure they are safe, secure and robust. This may include requirements for a human in the loop where automated decision-making for children is concerned, and extra checks on the system's resilience against hacking and cyberattacks. Safety and ethical certification for AI systems that target, or impact, children is one way to measure and, for organizations, to demonstrate commitment to child-centred AI.

Leverage the use of AI systems to promote children's safety. Where relevant, ensure that AI technologies are used to safeguard children. This includes developing dedicated services and products to protect children and their environment, for example, to identify abducted children[99] and to detect child sexual abuse material, through use of AI.[100]

6 Provide transparency, explainability and accountability for children

The purpose and potential impact of AI systems should be understandable by a range of stakeholders, including child users and their parents or caregivers, to empower them to decide whether or not to use such platforms. However, it is not sufficient to simplify the language used to explain how and why a system made a particular decision, or in the case of a robot, acted the way it did. Transparency about the aims and motivations underlying AI policy and system development processes is also valuable as a means to better inform parents and caregivers who provide consent for their children to use the systems, as well as a way to hold policymakers, regulators, designers, developers, implementers and procurers of AI policies and systems accountable for the actions and impacts of such products.

■ Additional resources

Strive to explicitly address children when promoting explainability and transparency of AI systems. Even though the requirements of explainability and transparency are included in most recommendations for ethical and trustworthy AI, it is important that they are aligned with children's needs and capacities.

Use age-appropriate language to describe AI. A child who interacts directly with an AI system (e.g. a toy, chatbot or online system) has the right for explanation at an age-appropriate level and inclusive manner, including through the use of animations, to understand how the system works and how it uses and maintains data about them. Requirements of explanation, transparency and redress also apply to AI systems that impact children indirectly.

General Data Protection Regulation (GDPR)
Children living in the European Union are entitled to specific protection of their personal data, according to the European Union's GDPR.[102]

Make AI systems transparent to the extent that children and their caregivers can understand the interaction. Children should be notified in a forthright manner when they interact directly with an AI system, to avoid a situation where they think they are interacting with a human. In addition, AI should not be used as the only input to determine key life decisions that impact children, for example medical diagnoses, welfare decisions or processing school applications, without a human in the loop to make the final decision. Children and their caregivers should be notified that AI systems have been used to guide such important decisions.

Develop AI systems so that they protect and empower child users according to legal and policy frameworks, regardless of children's understandings of the system. This implies that the development of AI systems cannot ignore or exploit any child's lack of understanding or vulnerability. This accountability can be bolstered by encouraging the reporting of potentially harmful features of the AI system.

Review, update and develop AI-related regulatory frameworks to integrate child rights. Governance frameworks, including ethical guidelines, laws, standards and regulatory bodies, should be established and adjusted to oversee processes which ensure that the application of AI systems does not infringe child rights. Where needed, governments should develop new regulatory frameworks, since not all countries have laws specifically addressing the risks associated with children's data, digital rights and AI.

Establish AI oversight bodies compliant with principles and regulations and set up support mechanisms for redress. Processes should be established for the timely redress of any discriminatory outputs, and oversight bodies – populated by a multifaceted and interdisciplinary range of stakeholders – should be created to receive appeals and continually monitor children's safety and protection. This requires audits to check for child rights infringements and to include child rights experts in the design, implementation and evaluation of the audits, based on existing functional and legal mechanisms.

7 Empower governments and businesses with knowledge of AI and children's rights

In order to develop and ensure child-centred AI, knowledge of how children and AI systems intersect is a necessary starting place – but is not enough on its own. Equally, it is not adequate to simply mention human or child rights in the ethics chapters of AI documents (a common occurrence in national AI strategies).[104] Both must be supported by a commitment to put children first, since this can create a competitive advantage and long-term sustainable value.

■ Additional resources

Ensure capacity-building on AI and child rights for policymakers, top management and AI system developers. They should have awareness and sufficient knowledge of child rights, AI-related opportunities for children's development, and, where appropriate, on the use of AI for the achievement of the SDGs, either for their policies or their products or services.

Capitalize on customers' demand for trusted and transparent AI solutions for children. Businesses that invest in safe, responsible and ethical AI designed for children can strengthen their existing corporate sustainability initiatives, while ensuring benefits for their business by integrating respect and support for children's rights into the core strategies and operations.[105] As consumers and the wider public make greater demands for technology services to have the right safeguards in place, business should capitalize on this market opportunity[106] and thereby also mitigate against corporate reputational risks for AI-related harms.[107]

Commit to child-centred AI and put in place mechanisms to realize this in practice. Knowledge of the opportunities and risks around AI and children must be translated into action. The aim is for organization-wide awareness of child rights issues around AI that is supported by a commitment to child-centred AI from top leadership,[108] so that when ethics or development teams raise red flags, they are taken seriously. For policymakers, national AI strategies should not be led by economic incentives but should first be based on upholding child and human rights.

Prepare children for present and future developments in AI

■ The promotion of AI-related skills as a part of education curricula beginning at an early age can empower children to understand the AI systems and devices that are increasingly in their lives. Further, this will help to prepare them as future users and potential developers of AI and will support their engagement with the changing job market.

Develop and update formal and informal education programmes globally to include the technical and soft skills needed to flourish in an AI world, including in the future workplace.[109] Digital literacy refers to the knowledge, skills and attitudes that allow children to flourish and thrive in an increasingly global digital world, and to be safe and empowered, in ways that are appropriate to their age and local cultures and contexts.[110] In an AI context, knowledge includes basic AI concepts and data literacy, skills such as basic AI programming, and attitudes and values to understand the ethics of AI.[111] AI literacy, which is currently not very common in digital curricula,[112] should also involve educating children on their rights as users, so that they can become *conscious users* of AI-based systems. Children also need to develop critical thinking and emotional intelligence skills, which current AI systems are not capable of, within a lifelong learning approach to support their resilience to thrive in and adapt to a changing world.[113] Special attention should be given to ensure girls are included in AI literacy programmes, given their underrepresentation in digital literacy programmes in general.

Consider a national self-assessment for teachers to assess and then develop their AI awareness and skills. To improve children's digital literacy and the awareness of the impact that AI systems can have on their lives, their teachers need to have these skills as well. Therefore, the curricula of teacher education programmes should increase awareness of the societal and personal impacts of AI systems on children.[114] Simultaneously, in-service teachers should be actively encouraged to take courses to acquire AI system awareness and know-how.

Leverage the use of AI systems in education, when it is appropriate. When evidence demonstrates the benefits of AI systems in education without risks, such opportunities should be leveraged. This is particularly relevant for marginalized children, children with special needs and for personalized education for minorities – all groups that are often underserved by current educational offerings and stand to benefit from proven new approaches.

Facilitate and encourage collaboration between businesses and educational institutions. This includes encouraging summer camps and field visits, and inspirational talks from AI developers at schools, and the inclusion of educational institutions in the development of AI tools for basic education and teacher training.

Forecasting of relevant job skills to inform curriculum updates can help prepare children for the future workplace.

Develop and promote awareness campaigns for parents, caregivers and society as a whole. These campaigns could focus on AI literacy,[120] digital safety, privacy and the importance of setting rules at home about the use of AI systems. The efforts should help families, caregivers and children to reflect on what data children are allowed to share, why, with whom and where, and what AI systems children can use.[121] It is important to acknowledge that not all parents may have the time and resources to learn about the technologies their children use, and to support them appropriately. Schools and out-of-school learning institutions play a key role in providing additional support.

9 Create an enabling environment for child-centred AI

AI-related policies, strategies and systems exist within a broad ecosystem. Focusing on policy and practice alone is not enough. The enabling environment for child-centred AI includes developing digital infrastructure, funding child-centred AI and supporting ongoing research on the impacts of AI systems on children, as well as a multi-stakeholder approach to digital cooperation.

■
Additional resources

Support infrastructure development to address the digital divide and aim for equitable sharing of the benefits of AI. In general, children who have more digital opportunities, including reliable internet access at home and at school, stand to benefit

more from AI systems. This emerging "AI divide"[123] must shift as the benefits of AI systems cannot be limited to a few, while all share the risks. AI policies and systems need to be supported by investment in digital infrastructure and the broader digital ecosystem of child-appropriate skills, content and services, as well as ongoing efforts to address social barriers that prevent children, and especially girls, from using digital technology.

Provide funding and incentives for child-centred AI policies and strategies. Policymakers and corporate leaders need to understand that developing and implementing child-centred AI policies will require dedicated funding, particularly in the Global South. Creating an enabling environment can include actively engaging in the development of international regulations (which encourage governments and companies to comply), and providing incentives to private sector and government agencies to develop more child-centred AI policies and systems.[124] These could include supporting national, regional and international level competitions and awards that recognize best practices in innovative and ethical AI systems for children.[125]

Support research on AI for and with children across the system's life cycle. There is a need for sound definitions, case studies and rigorous research on the impact of AI on children and their personal development in the short and long term.[126] Studies should include children from a range of contexts, such as various developmental stages, those who live in rural and urban areas, have disabilities, or are particularly vulnerable for any other reason. A key element is to undertake participatory research, not only on children, but also with them.

Engage in digital cooperation. While digital technologies – including AI-based systems – cut uniquely across international boundaries, policy silos and professional domains, the current means and levels of international cooperation are sorely lacking. Consequently, the UN Secretary-General's High-level Panel on Digital Cooperation recommends enhanced efforts on AI cooperation, including by investment in the creation of digital public goods: open source software, open data, open AI models, open standards and open content.[127] Increased child-centred AI would benefit greatly with the support of governments and private sector in such cooperation and from the sharing of resources and approaches.

Requirements and recommendations

< overview >

3. Prioritize fairness and non-discrimination for children

> Actively support the most marginalized children so that they may benefit from AI systems.
> Develop datasets so that a diversity of children's data are included.
> Seek to eliminate any prejudicial bias against children, or against certain groups of children, that leads to discrimination and exclusion.

1. Support children's development and well-being

> Prioritize how AI systems can benefit children, in particular in AI policies and strategies.
> Develop and apply a design for a child rights approach.
> Leverage AI systems to support and increase children's well-being and environmental sustainability.

4. Protect children's data and privacy

> Follow a responsible data approach for the handling of data for and about children.
> Promote children's data agency.
> Adopt a privacy-by-design approach.
> Consider protections at the group level.

2. Ensure inclusion of and for children

> Strive for diversity amongst those who design, develop, collect and process data, implement, research, regulate and oversee AI systems.
> Adopt an inclusive design approach when developing AI products that will be used by children or impact them.
> Support meaningful child participation, both in AI policies and in the design and development processes.

5. Ensure safety for children

> Call for mechanisms for assessing and continually monitoring the impact of AI systems on children in AI policies and strategies.
> Continuously assess and monitor AI's impact on children throughout the entire AI development life cycle.
> Require testing of AI systems for safety, security and robustness.
> Leverage the use of AI systems to promote children's safety.

6. Provide transparency, explainability and accountability for children

> Strive to explicitly address children when promoting explainability and transparency of AI systems.
> Use age-appropriate language to describe AI.
> Make AI systems transparent to the extent that children and their caregivers can understand the interaction.
> Develop AI systems so that they protect and empower child users according to legal and policy frameworks, regardless of children's understanding of the system.
> Review, update and develop AI-related regulatory frameworks to integrate child rights.
> Establish AI oversight bodies compliant with principles and regulations and set up mechanisms for redress.

8. Prepare children for present and future developments in AI

> Develop and update formal and informal education programmes globally to include technical and soft skills needed to flourish in an AI world, including in the future workplace.
> Consider a national self-assessment for teachers to assess and then develop their AI awareness and skills.
> Leverage the use of AI systems in education, when it is appropriate.
> Facilitate and encourage collaboration between businesses and educational institutions.
> Develop and promote awareness campaigns for parents, caregivers and society as a whole.

7. Empower governments and businesses with knowledge of AI and children's rights

> Ensure capacity-building on AI and child rights for policymakers, top management and AI system developers.
> Capitalize on customers' demand for trusted and transparent AI solutions for children.
> Commit to child-centred AI and put in place mechanisms to realize this in practice.

9. Create an enabling environment for child-centred AI

> Support infrastructure development to address the digital divide and aim for equitable sharing of the benefits of AI.
> Provide funding and incentives for child-centred AI policies and strategies.
> Support research on AI for and with children across the system's life cycle.
> Engage in digital cooperation.

< next steps >

Feedback and pilot testing

AI technology and its uses are evolving rapidly, as are the lived experiences and contexts of children around the world who interact with AI systems. This guidance outlines how children are impacted by AI by discussing key risks and opportunities and presenting illustrative use cases. In order to ensure continued alignment of AI systems with the rights and situations of children, policy guidance needs to be updated regularly. This document should thus be seen as an early contribution to child-centred AI.

Public consultation

We are seeking input from stakeholders who are interested in or working in areas related to the fields of AI and children's rights. This includes AI policymakers and developers from government agencies, companies, civil society, international organizations, academics and citizens. We invite stakeholders to express their views on the draft guidance and provide feedback and comments by 16 October, 2020.

The next version, which will include input from the public review, will be released in 2021.

Implementing the guidance and sharing case studies

In order for the policy guidance to address the many implementation complexities, it needs to be applied by policymakers, public organizations and businesses for validation and local adaptation. We thus invite governments and the business sector to pilot this guidance in their field and openly share their findings.

The following steps are proposed:

1. Use the guidance practically, such as when creating or updating AI policies, or developing AI systems.
2. Document the experience, including the purpose of the AI policy or system, the target audience and which of the guidance requirements and recommendations were implemented. Document what worked, what was challenging and what recommendations can be suggested for improvements.
3. Publicly share the findings in any way, such as through blogs, project reports or conference presentations.
4. Let us know by sending a link to the findings at ai4children@unicef.org.

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125 For example, the forthcoming World Economic Forum Smart Toy Awards's Generation AI project: https://www.weforum.org/projects/generation-ai.

126 See the Memorandum on Artificial Intelligence and Child Rights by UC Berkeley and UNICEF for suggestions, https://www.unicef.org/innovation/reports/memoAIchildrights, accessed 20 September 2020.

127 See Secretary-General's High-level Panel on Digital Cooperation, 'Recommended Actions', https://www.un.org/en/digital-cooperation-panel/ and the Roadmap: https://www.un.org/en/content/digital-cooperation-roadmap/.

128 For more information about the 'GenU' initiative see, https://www.generationunlimited.org/.