مؤسسة دبي للمستقبل
DUBAI FUTURE FOUNDATION

SMART TOY AI AWARDS

WORLD ECONOMIC FORUM

UAE Centre for the Fourth Industrial Revolution

SMART TOY AWARDS 2022

Outcomes Report

November 2023

INTRODUCTION

The global Smart Toys market is expected to be valued at over USD $31 billion by 2027 and up to USD $69.6 billion by 2032, depending on estimates by research sources (Precision Reports, 2023; Global Insight Services, 2023; Polaris Market Research, 2023). This equates to an annual rate of approximately 14.6-19.5% CAGR on current market size. This rapidly outweighs the expected 6.52% CAGR for the whole toy and game sector 2023 through 2027 (Statistica Market Insights, 2022). Advancements in technological capability, especially in Artificial Intelligence (AI), are a significant factor in this growth.

AI is progressively reshaping our world and impacting younger generations. For the first time in history, children are growing up in an environment densely populated with sophisticated algorithms that gather and analyse data to formulate predictions based on observed patterns. From social media to edtech, video games, smart toys, and speakers, AI is an integral part of the products that children use daily, determining the content they view online, their educational curriculum, and their ways of play and interaction with others.

Despite the empowering and educational capabilities of AI, it also presents potential risks such as bias, cybersecurity concerns, and accessibility challenges. The recent proliferation of generative AI models will increase the need for systems that promote safe and secure AI deployment with children. Its remarkable ability to generate realistic and creative content has prompted many governments to consider new rules to manage AI. The recently proposed EU AI Act established obligations for providers and users depending on the level of risk from artificial intelligence. The act specifically calls out cognitive behavioural manipulation of people or specific vulnerable groups, for example voice-activated toys that encourage dangerous behaviour in children.

THE SMART TOY AWARDS

To address both the opportunities and risks of the technology, the World Economic Forum launched the Smart Toy Awards in 2021.

The 2022 Smart Toy Awards ceremony was hosted by the Centre for the Fourth Industrial Revolution UAE, a collaboration between the Dubai Future Foundation and the World Economic Forum. The ceremony marked the first in-person Awards edition.

The 2022 Smart Toy Awards ceremony, held on World Children's Day on November 20, was co-chaired by HE Omar Sultan Al Olama, Minister of State for Artificial Intelligence, Digital Economy and Remote Work in the United Arab Emirates, and will.i.am, global music artist, Founder & CEO of productivity tool FYI, and President of the i.am Angel Foundation. There were 43 applicants from 19 countries competing for the awards.

As a part of the testing phase, the Museum of the Future hosted children and parents over several days, who were able to play with and test the finalist toys, while providing important feedback. Based on a comprehensive assessment of the contenders, the judging committee determined the winners of the 2022 Smart Toy Awards, as detailed later in this report.

Focusing on responsible design, data collection, and the use of AI and technology, the 2022 Smart Toy Awards featured several categories, including: Most Innovative, Creative Play, Smart Companion, Educational, Robotics, and Learn to Code.

The assessment criteria for the awards were based on the FIRST Principles, as outlined in the World Economic Forum's AI for Children Toolkit. The principles are designed to be applied to both current and future AI applications as generative AI and other emerging AI applications are developed and integrated into AI products. These principles stipulate that smart toys must be:

FAIR

Company culture and processes must address ethics and bias concerns regarding how AI models are developed and the impact of the AI models in use.

INCLUSIVE

AI models should interact impartially with users from various cultures and of differing abilities. Therefore, product testing must encompass a wide-ranging demographic of users.

RESPONSIBLE

Offerings must embody the latest learning sciences to support healthy cognitive, social, emotional, and/or physical development.

SAFE

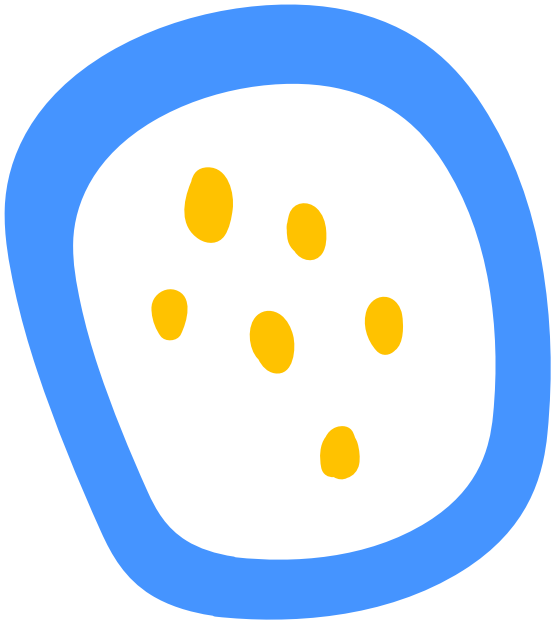
The technology must prioritise user and purchaser data security. The company is expected to disclose how its data collection and usage, while protecting privacy rights. Users should have the option to opt out at any time and request data removal or erasure.

TRANSPARENT

The company should communicate to buyers and users in layman's terms about why AI is implemented, how it operates and how its decisions can be explained. The company should also acknowledge AI's limitations and potential risks, while inviting oversight and audits.

The winners of the 2022 Smart Toy Awards were selected by judges who use governance criteria that were jointly developed with experts from the academic, public, private, and non-profit sectors.

The winning toys highlighted several **ethical considerations** such as key safety, policy, and governance considerations when using AI in smart toys. These include:

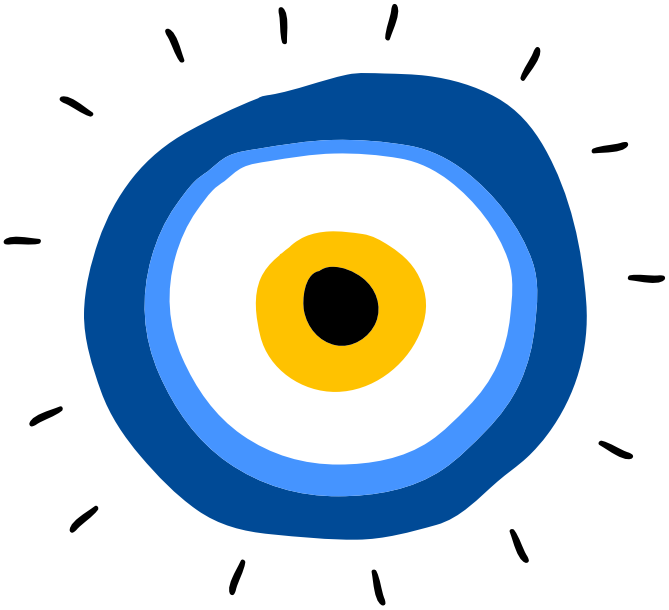


01

DATA PRIVACY

Smart toys should ensure that children's data is protected by minimising data collection and ensuring compliance with privacy regulations.

Smart toys, which are often connected to the internet or other devices, collect sensitive information that could be misused by the data collector, either the toy-maker or a third-party platform. According to one study, 77% of parents are concerned about protecting their family's digital privacy and 73% of parents are worried about third parties collecting personal data without their consent (S2 Grupo, 2023). Transparency about data collection practices and providing clear options for users to control and delete their data can empower parents to make informed decisions about their children's privacy.

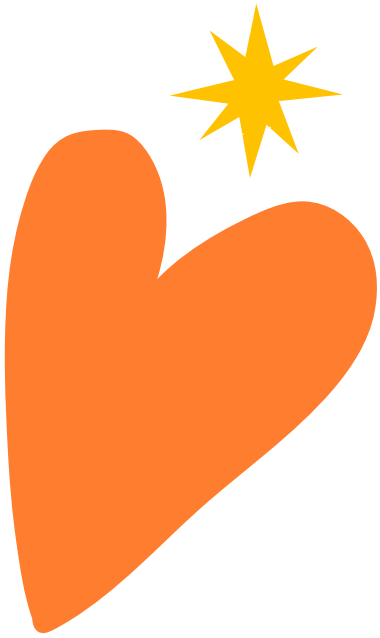


02

CYBERSECURITY

Smart toys must be safeguarded against cybersecurity threats like hacking, and the data collected should be shielded from unauthorised access.

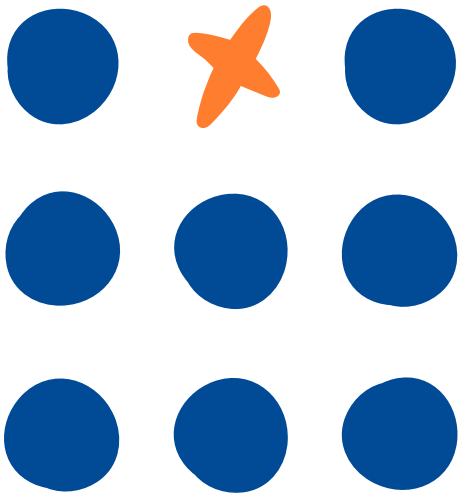
Risks include stealing personal data, credentials, image and sound, as well as spying, identity theft and denial of service. For parents, 90% recognize the importance of protecting their children's identity, location (88%), health data (87%), age (85%), school records (85%) and browsing history (84%) (S2 Grupo, 2023). Relevant protections include implementing robust security measures, obtaining explicit consent from parents or guardians, anonymising collected data whenever possible, and regularly updating and patching the toy's software to address any potential vulnerabilities.



03 SAFETY STANDARDS

Smart toys must adhere to safety standards, encompassing regulations on the use of potentially harmful materials and the safety of the product itself.

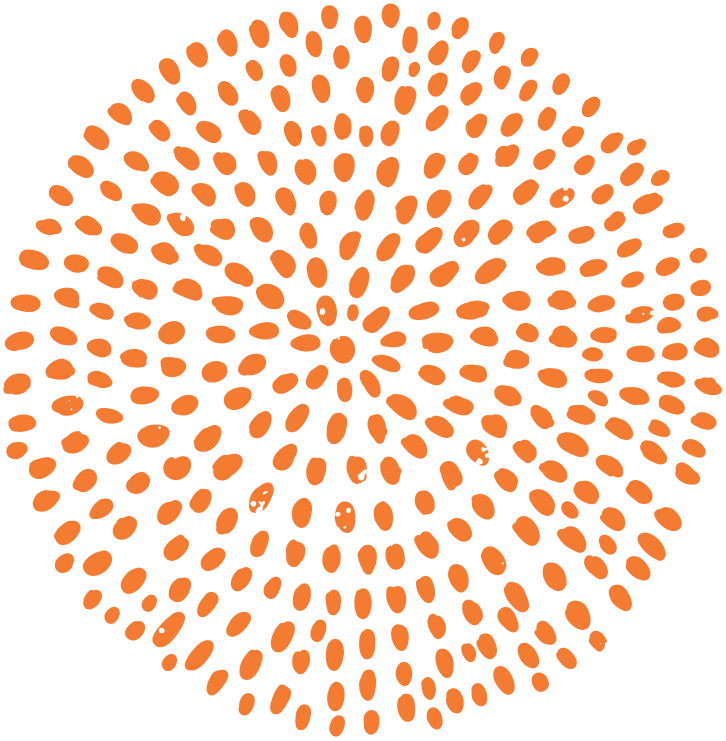
Smart toys have a higher risk of exposing children to potential hazards such as electrical shock or exposure to harmful materials given increased digital materials. With generative AI there is the additional risk of cognitive manipulation, that needs to be considered and managed—however standards currently do not exist to address this issue in toys. Designing the next generation of toys that seamlessly integrate generative AI is an exciting prospect but require stringent safety standards for children are at the forefront of technological advancements. Generative AI tends to 'hallucinate' which could feed children incorrect information or its lifelike, 'deepfake' creations could mislead children, and unmonitored AI could convince children to undertake undesirable activities if not appropriately controlled. More work is needed to develop standards that can be managed through rigorous testing, certification processes, and ongoing monitoring of the toy's safety. Regular inspections and collaboration with relevant regulatory bodies can help manufacturers identify and address any safety concerns promptly, ensuring the well-being of children during playtime.



04 BIAS AND DISCRIMINATION

Developers must ensure that AI algorithms are unbiased and do not perpetuate discrimination, particularly with regard to race, gender, and other protected characteristics.

Smart Toys should promote inclusivity and fairness, as these toys have the potential to shape children's perceptions and beliefs. It can be managed by implementing diverse and representative data sets during the training phase of AI algorithms, conducting regular audits to identify and mitigate bias, and involving diverse teams of developers, researchers, and ethicists to provide different perspectives and minimise unintentional biases in the design and development process. Additionally, transparent disclosure of the algorithm's limitations and biases to parents can help them make informed decisions about the toys they choose for their children.



05 EXPLAIN-ABILITY AND TRANSPARENCY

Smart toys must be transparent about how AI is implemented and provide explanations of their decision-making processes to users.

This is important to build trust in the toys and ensure users understand how the toys function and make decisions. Similar to the management of bias and discrimination, designing AI algorithms that are interpretable and providing clear information to users about the data being collected, how it is used, and the reasoning behind the toy's actions. Additionally, providing accessible and user-friendly interfaces that allow users to access and review the collected data and the algorithm's decision-making process can further enhance transparency and accountability.

Overall, there is a pressing need for developers to prioritise children's safety, privacy and well-being when incorporating AI into toys.

As AI gradually integrates into the 21st-century learning experience, the emergence of AI-driven smart toys is further transforming the educational landscape, offering new opportunities to combine learning with play in a seamless and engaging manner. At times, advanced toys can even adapt to a child's unique abilities and interests, creating personalised, interactive experiences that not only entertain, but also foster cognitive, emotional, and social growth. The winners of the 2022 Smart Toy Awards exemplify the potential of AI-infused educational tools, showcasing how innovative design and responsible data practices can come together to enrich children's lives.

While we celebrate the achievements of these cutting-edge products, it is essential to remember and uphold new standards of responsibility and sound governance. The rapid advancement of AI-driven technology has led to an increased focus on addressing potential risks and ethical concerns, ensuring that we harness the potential of AI-driven solutions while safeguarding the well-being of children. This year's Smart Toy Awards emphasised the importance of responsible AI development, championing products that prioritise fairness, inclusivity, safety, and transparency.

The future of education is in many ways intertwined with the continued evolution of AI, and the 2022 Smart Toy Awards serve as a testament to the incredible potential that lies ahead. By fostering a culture of innovation and responsibility, we can empower the next generation of learners, equipping them with the tools and knowledge they need to thrive in an increasingly complex world.

MOFLIN

Category

Most Innovative

Company

Vanguard Industries Inc.

Country

Japan

Age

7+ months

Emotional Comfort & Companionship with AI

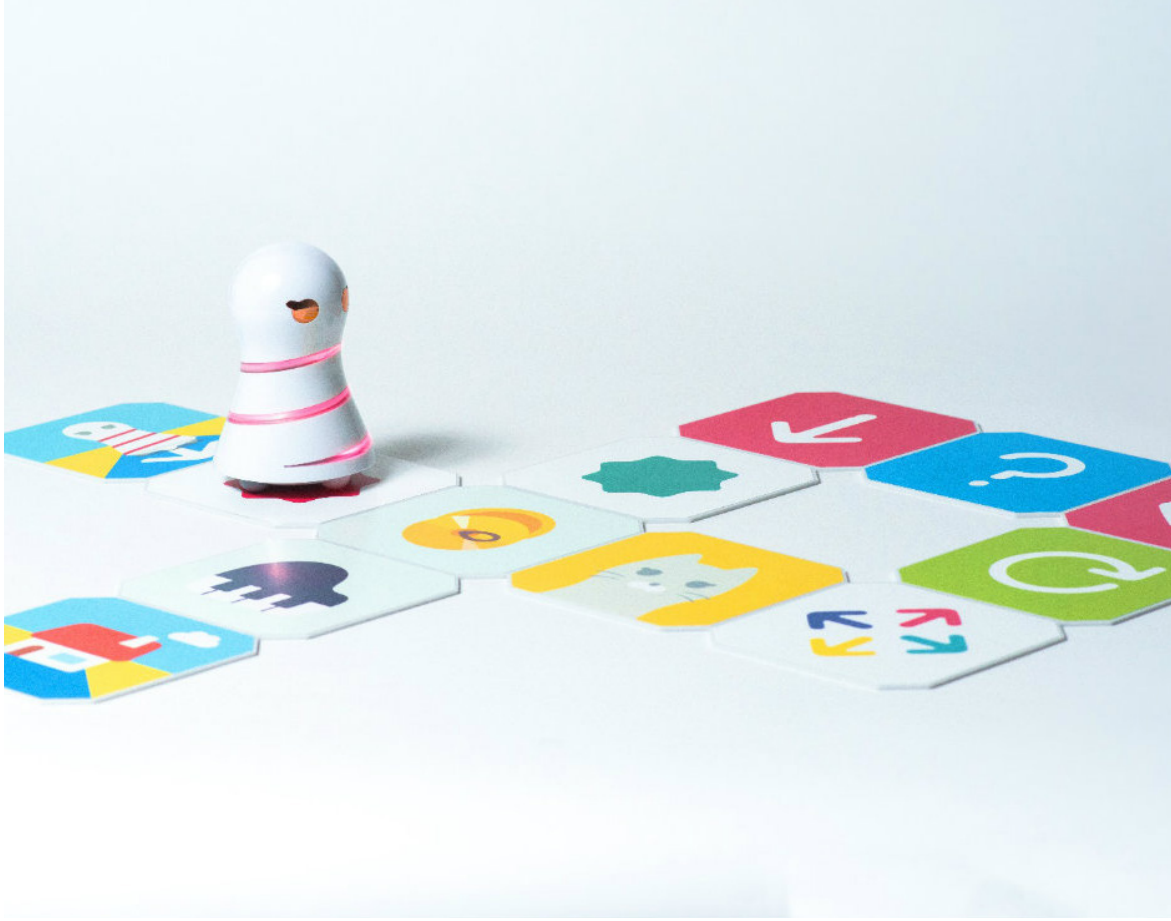
Moflin is a small AI pet robot that can fit in the palm of your hand. Unlike typical robots, Moflin has its own unique personality that develops through interaction with its owner.

Moflin is designed to be like a real animal, capable of producing essential reactions and transformations of a living creature from its newborn state. The AI has an emotional model and understands interactions from the owner in response to stimuli from various sensors, based on unsupervised learning. Its animal-like behavior is the result of a combination of movements that utilise genetic algorithms to produce reflexive, natural, and endearing actions.

The robot is designed to adapt to everyday life and has sensors that detect changes and an actuator that creates movement. This simple design philosophy eliminates the need for complicated settings or special monthly fees. Moflin is self-contained and will evolve through daily interactions with its owner. It does not upload images or voices to any server and is completely disconnected from the internet and networks. Moflin is also designed to have a software update mechanism using a network of smart phones and Bluetooth to apply program updates regarding future security concerns and product performance improvements.

Moflin is developed from the starting point of being like an actual living being with respect to AI and mechatronics. Its development includes testing and feedback from users of various age groups. Moflin is not just for children, but for people of all ages, including the elderly. It is an affectionate partner that stimulates motherly instincts and offers a very different experience from a typical affectionless robot. Living with an autonomous emotional being other than a human being is believed to have a calming and emotionally stabilising effect on a child's growth and development, similar to living with a pet.

To create transparency in Moflin's development, the project team behind the smart toy have made an ongoing effort to explain the background of the project, the potential of the technology, potential concerns, and the development path and difficulties encountered along the way to stakeholders. They have also effectively communicated in layman's terms about the data, algorithmic technology, and features, as well as addressed inquiries and provided explanations concerning the project in the context of AI.



KUMIITA

Category
Creative Play

Company
ICON Corp.

Country
Japan

Age
7+ months

Introducing Children to the World of Programming

KUMIITA is an innovative programming toy designed to introduce children to the world of programming in a fun and interactive way.

The smart toy was created to teach programming basics like program design and debugging, even without a teacher or adult who has complex programming language experience or knowledge. It is a toy that can be used by children as young as seven months old, and it adapts to their changing needs as they grow. The toy is designed to eliminate barriers based on age, nationality, and race by not using language, making it accessible to children around the world.

The KUMIITA panels are picture-only panels that do not use letters, and invisible data is printed on every panel to produce a variety of command operations that KUMIITA carries out. As KUMIITA moves along, it reads the command on each panel, expressing different programming concepts. Children can line up the panels in an infinite number of ways and change the order or arrangement of the panels to learn the differences in KUMIITA's movements. With over 3.8 million course arrangements, the ways to think about coding and execute the commands are almost endless.

The toy is designed to foster problem discovery, investigation, reasoning, and expression through programming. It teaches children to think logically and encourages them to try out different ideas to solve problems. The importance of persistence in the face of difficulty is also emphasised. Children are encouraged to focus on solving the problem on their own and to keep trying different combinations of panels until they achieve the desired result.

KUMIITA is easy to use, and no Wi-Fi connection or other device such as tablets and PCs is needed, making it safe from cyber-attacks and malicious content. The toy has been tested by children in different countries, and the easiness and simplicity of the toy keeps children engaged. The toy has been approved by various safety regulations, ensuring it is safe and sanitary for children aged 7 months and older.

SMART TEDDY

Category
Smart Companion

Company
Mishka AI, Inc.

Country
USA

Age
2 to 5 years

Learning and Development with a Smart Teddy

Smart Teddy aims to enhance children's learning and development in a safe and secure manner.

Developed by a team of engineers, teachers, and psychologists, Smart Teddy is a connected plush toy that helps parents teach and engage their children while also creating good habits. Smart Teddy is equipped with features that allow it to tell stories, help kids learn useful habits, and support an interest in learning, turning the learning process into a fun game.

The smart toy has a kid-friendly and safe interface, including buttons in its paws to listen to stories and fun facts, as well as a smart paw with an NFC antenna to interact with stickers or educational accessories. Parents have access to all features through a dedicated parental app, including a stories library, daily routines reminder, and educational games. The content and features of Smart Teddy are remotely updatable via WiFi, ensuring that the toy continuously evolves. Smart Teddy is also safe and secure, with no microphone or camera and it does not transfer any personal data to cloud storage but stores it directly on the device without access by company employees.

Smart Teddy's features and content are created in collaboration with psychologists and curriculum developers. Based on extensive research into the impact of excessive screentime, Smart Teddy has been designed to be a screen-free product, using modern data transfer technologies such as RFID and Bluetooth to update its features and content. The content is also designed to promote diversity and equality of people of any culture and is inclusive of all.

Smart Teddy is preparing to launch the use of AI to match content to a child's preferences, age, and actual skills. However, this feature will only be available if the parent activates it.

KARBO

Category
Educational

Company
DIDIJIN

Country
China

Age
6-10 years

Hands-on, physical learning of coding and computer technology

In today's world, computers have become increasingly complex and ubiquitous, with children exposed to electronic devices such as smartphones, laptops, and tablets at an early age. Despite this, understanding how computers work and the basics of coding can be challenging for children. To address this, the creators of Robot Karbo have designed a product that takes children back to the era of the first computer to help them learn about coding and computer technology.

Unlike a lot of coding robots on the market, Robot Karbo does not require a screen or a smartphone to operate. Instead, it works similarly to the world's first computer, ENIAC, which was programmed using punch cards. Robot Karbo uses tags with different patterns to represent action and logic commands, such as turning left or creating a loop, alongside a code tape where children can stick the tags together to create a code snippet that can be programmed into the Karbo's tape reel. An embedded camera in the Karbo scans the tape to recognise the tag patterns, and the robot then executes the corresponding command. The dot matrix display on top of the Karbo shows the command in action, giving children a visual representation of how the code works.

Additionally, Robot Karbo has obstacle detection, colour sensing, and sound sensing capabilities that children can program to interact with their environment, adding a level of complexity and interest to their coding experience.

One of the benefits of Robot Karbo is that it does not capture or analyse images of the children or their environment. The technology used in Robot Karbo, such as AI and computer vision, is solely for the purpose of recognising command tags and is embedded in the robot itself. Moreover, Robot Karbo is an offline product, meaning it does not require an internet connection, nor does it communicate directly with children through the camera or any other feature.

AVISHKAAR ROBOTICS PRO KIT

ER Series

Category
Robotics

Company
Avishkaar

Country
India

Age
10-15 years

Next-generation Educational Robotics

The Avishkaar Robotics PRO Kit is a comprehensive toolkit designed to help children build programmable robots.

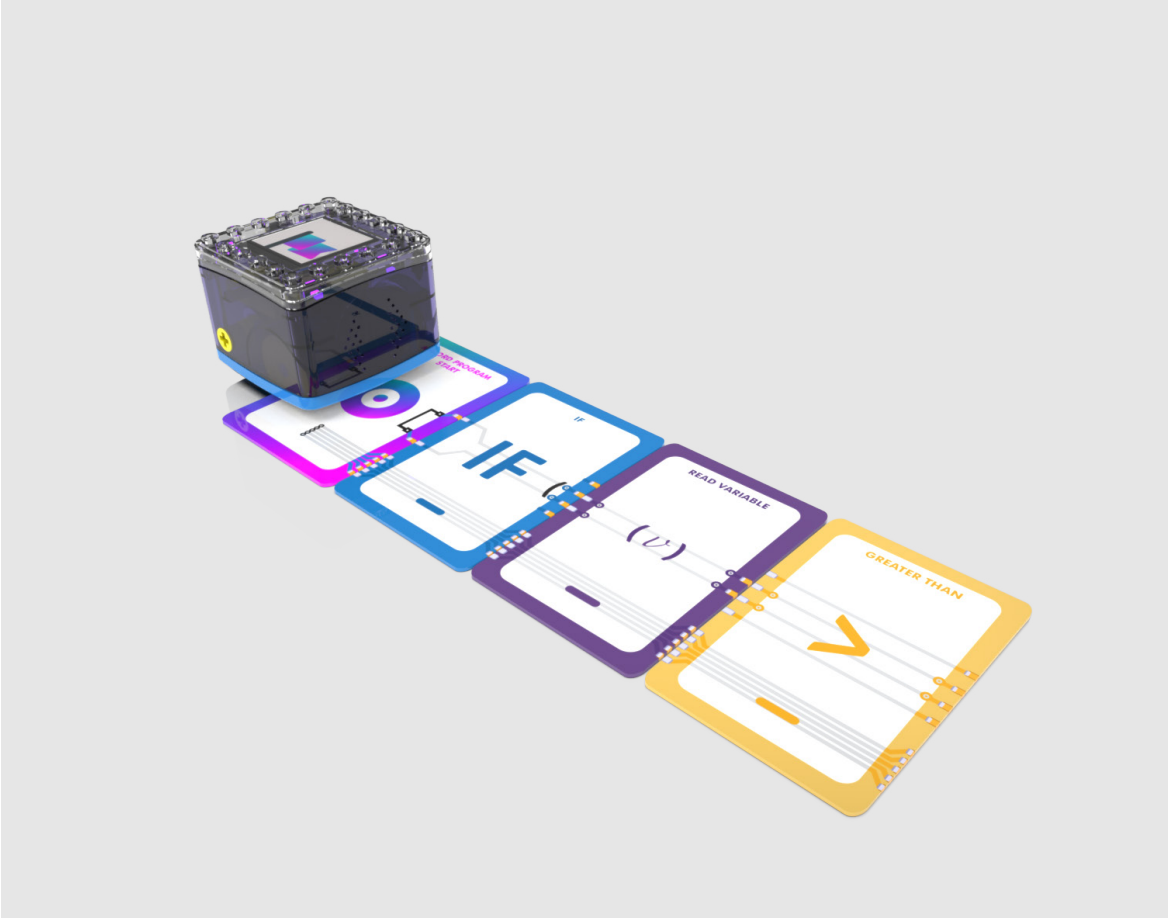
The kit comes with over 75 modular metal parts of different shapes and sizes that can be combined to create more than 200 models, from a simple line-follower robot to a complex all-terrain vehicle.

The real power of this kit lies in the FULL 2.0 Programmable brain, which can be combined with the Avishkaar Maker Studio (AMS), a block-based programming software, to build entirely automated AI robots capable of making decisions based on sensors' inputs and code algorithms. The FULL 2.0 brain supports wireless connection and OTA code burning, and two or more PRO Robots can interact with each other using WiFi and take synchronised action.

The Avishkaar Robotics PRO kit (ER-Series) is designed to teach children futuristic technologies of coding and robotics while instilling essential life skills such as creativity, rigor, communication, and teamwork. The curriculum matches the skill levels and attention spans of children as young as ten, allowing them to dive straight into creating exciting robots with the kit and learn coding and robotics from scratch.

To ensure children's safety and privacy, the Avishkaar Robotics PRO Kit uses an app for control (ARC) and online software (AMS) for coding. The app and online software comply with governing regulations on data privacy and protection. Children and parents need to create an account on the Avishkaar platform, where they consent to what data is captured and where this data will be used. Parent and child accounts are managed separately, and children's account details are hashed when saved in the database to protect their data. User testing and feedback have been incorporated from the initial stages of development, ensuring that the Avishkaar Robotics PRO Kit is easy to use and physically safe for both older and younger individuals. The kit packaging, instruction manual, and marketing material are gender-balanced to break the gender bias towards robotics.

In conclusion, the Avishkaar Robotics PRO Kit is an excellent tool for children to learn coding and robotics while developing essential life skills. Wn entith over 200 parts and AMS software, children can build an entirely automated AI robot.



KAIBOT

Category
Learn to Code

Company
Kai's Education

Country
New Zealand

Age:
6+ years

Kids Coding with Cards

KaiBot is a new robot that is designed to teach children how to code in a fun and engaging way.

It is the world's first hybrid robot, and uses a combination of screen-free coding cards and online coding platforms to help children learn how to code. The cards allow children to learn how to code without being glued to a screen, and they are a great way to help children develop their problem-solving and critical thinking skills.

As children progress, they can move on to using Blockly and Python when paired with the virtual Kainundrum platform. KaiBot acts as a computer interpreter, and if it scans an invalid coding card, the interpreted code will show an error bug message on the screen as soon as it encounters a problem. This makes it easier for children to debug their code and correct any errors they may encounter.

KaiBot is also equipped with AI technology, which includes microdots to allow accurate positioning of where the KaiBot sits on the KaiTiles. This not only makes it easier for children to control the robot, but it also adds an extra layer of complexity to the coding process. Children can use the KaiTiles to create their own mazes, escape rooms, and hide and seek games, which they can then code to play with their KaiBot.

Children can code and play as a single player or invite up to 6 players to join their game. This not only makes it more fun, but it also helps children develop their social skills and teamwork abilities.

KaiBot is designed to be a safe platform and toy, which means that no data is collected from children. Children choose an emoji and hat as their profile and customise it as they like. Teachers or parents can register an account, but no personal details are collected or kept.

In addition to teaching coding, KaiBot also includes screen-free coding cards that can help with social-emotional learning. For example, children can scan the happy card, and they will get a happy emoji on their KaiBot.

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