

## WHAT CAN ROBOTS DO FOR YOU?

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### YOUNG REVIEWERS:



**WILLIAM**

AGE: 8



**ZI-AN**

AGE: 8

You have probably seen movies in which robots do things like drive cars, deliver groceries, and fight space battles. But have you ever thought about what a robot could do for *you*? In the field of human-robot interaction, scientists study how robots can help people and what people think of robots. In this article, we meet three children in a classroom of the future and find out what robots do for them and how those robots know what to do. At school, Mia works with a robot friend who helps her learn a foreign language. Noah has special needs, and a robot in a hospital helps him learn about feelings and how to get along with other people. Last, Ari has a robot at home that helps her read, chats with her siblings, and helps her parents.

### ROBOT HELPERS IN YOUR LIFE

Imagine a classroom in the future, where teachers, children, and robots work together (Figure 1). Children in this future classroom still

learn the same way they do today: from their teacher, from reading, and by doing learning activities. But in addition, there are robots in the back of the classroom that can help kids with reading and learning activities. Just like every child learns in their own way and every teacher has their own way of teaching, every robot has its own skills and abilities. Some robots have wheels, so they can move around with children. Others have fur, so that children can hug them. Robots have one big advantage over other new technologies: they have bodies that can move around and interact directly with people and things, sometimes by touching them. Because they have bodies, robots are especially able to help people in a range of situations. They can go to people who need help and move around with people. They can even play and give people hugs.

### Figure 1

In a classroom of the future, the teacher is teaching a class. At the back of the classroom, robots are helping children learn a new language.



Figure 1

### SOCIAL ROBOTS

Social robots are robots that can talk, listen, and understand feelings like humans do. They are like friendly helpers that learn to be good friends.

In this article, we will talk about **social robots**, which are robots that can interact with people, and we will explain how these robots could help kids like you. We will follow three children in our imaginary classroom, named Mia, Noah, and Ari. We will describe how the robots are a part of their daily lives and explain how the robots know what to do. First, we will meet Mia, who is practicing her foreign language skills in class. Then, we will follow Noah to a center at a hospital, where a robot helps him improve his social skills. Finally, we will meet Ari, whose family has a robot at their home.

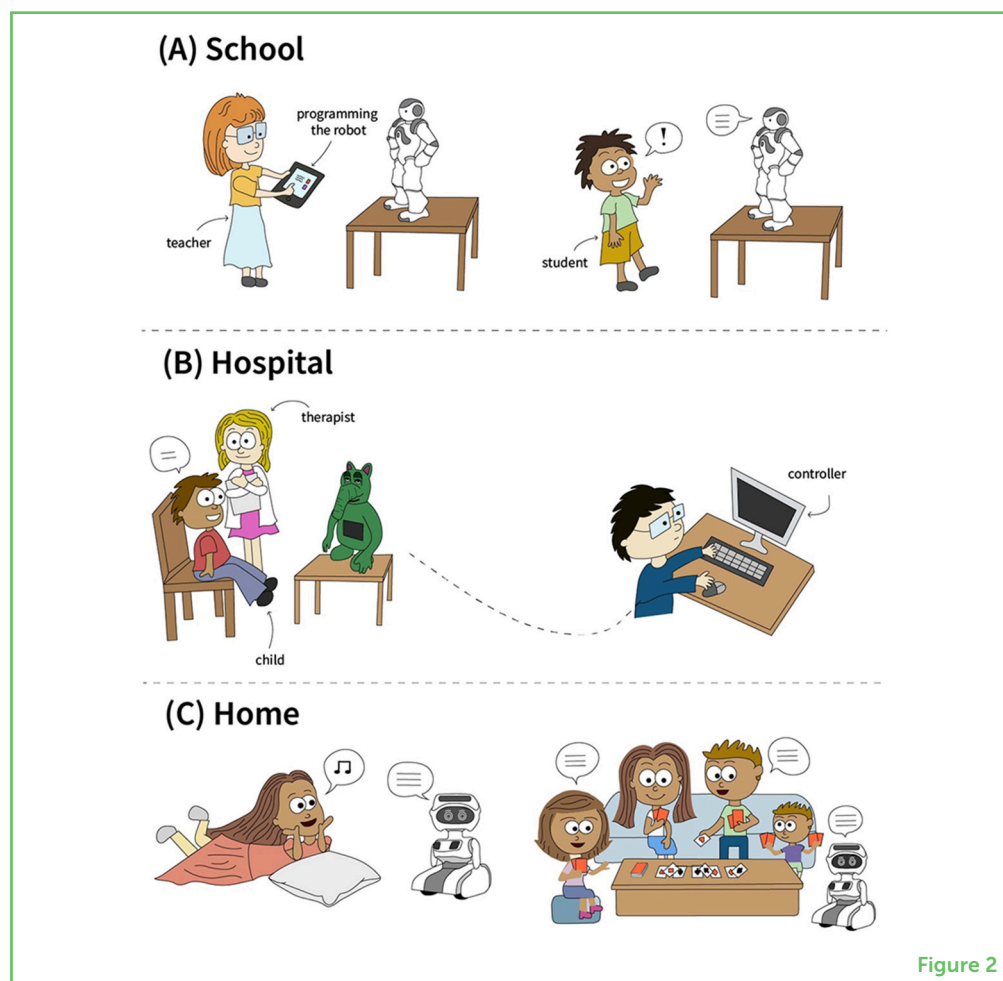
### ROBOTS IN SCHOOL

As you can see in the classroom of the future, students in the back of the classroom are interacting with two robots called Nao and Misty. These robots can make learning interesting and personalize the learning experience for each kid [1]. That morning, the teacher

programmed the robots with the day's French lesson (Figure 2A). She gave the robots exercises with various levels of difficulty and told the robots how much practice each student needs. After the teacher's morning lecture, the kids work one-on-one with one of the robots that helps them practice French vocabulary and expressions. The teacher always keeps an eye on the robot, and the teacher programs exactly what the robot will say and do. So, the robot is helping the teacher, not replacing the teacher. The teacher always makes sure the children feel safe and get a good education.

**Figure 2**

Children interacting with robots. **(A)** In school, the teacher programs the robot before class, and during class, students can interact with the robot to learn. **(B)** In the hospital, therapists can help children with autism or other disorders to interact with a robot that helps them to recognize emotions. Another therapist in a different room uses a computer to control the robot based on the child's responses. **(C)** At home, children can learn to read with a robot or have fun chatting with it. Families can also play games with the robot.



**Figure 2**

Right now, it is Mia's turn to work on her French with the robot Nao. The session starts with the robot asking Mia some questions, to see what she already knows. With this test, the robot can decide what part of the lesson to cover, to help Mia practice what she learned recently. The robot sometimes gives Mia more information about the topic and helps her work through exercises that help her understand the ideas better. Sometimes Mia thinks of Nao as a friend who is learning with her. Sometimes Mia must help Nao understand some harder ideas, and sometimes Nao helps Mia. Learning and practicing with the robot is different from learning and practicing with other children. When practicing with a robot, particularly when she is not sure how to pronounce words or respond to questions, Mia feels less nervous



and is willing to try new things, like pronouncing difficult words for the first time.

## ROBOTS IN THE HOSPITAL

Noah is a student who has special needs because of a condition called **autism**. This means that socializing with other children can be difficult for him (for more about how people pay attention to each other, see this [Frontiers for Young Minds article](#)). To get help, Noah goes to see a therapist several times a week at a hospital center near where he lives. During these sessions, Noah plays games with a robot to learn how to understand emotions, to know when to wait, and to know when it is his turn to play. While Noah and the robot are playing the game, a therapist is there to help Noah know what he should do and explain things when the robot does something that Noah does not understand. As you can see in [Figure 2B](#), the robot does not have to look like a human. Instead, it can be in the shape of a friendly character or an imaginary animal, which might make the robot more approachable for children like Noah.

It is not easy for the robot to work with Noah, because it must understand his individual needs and change its behavior to make the **therapy** specific for him. Mistakes in the robot's behavior can confuse kids like Noah so, during therapy sessions, the robot is controlled remotely by another therapist [2]. This therapist watches what Noah does or says and chooses the best next step for the robot, to make sure that Noah has fun and builds the skills he needs to play with other kids.

Some children with autism might feel shy around adults or therapists. But these small and friendly robots might feel less scary and can help children be more comfortable. Therapists and teachers might not need the help of robots for children who do not feel shy around adults.

## ROBOTS AT HOME

Ari's family has a social robot at home, named Misty, that motivates Ari to read ([Figure 2C](#)). Every day, Misty sets a reading goal and Ari reads to the robot. When they read together, Misty shares comments about what it thinks and feels about the reading. Ari enjoys spending time with Misty, because the robot often says something funny or interesting about the book they are reading together. Misty's job at home is not just to read with Ari. Other members of Ari's family also want to interact with Misty. Ari's younger sister, Ada, prefers to talk to Misty about her feelings and what she wants for her birthday, because she sees Misty as a friend. Misty is also a playful friend when the family gets together. It helps the family play their favorite board games and helps them learn new games. Ari's dad also occasionally asks the robot

### AUTISM

A brain development condition that affects how a person sees and interacts with others. A child with autism might find it hard to make friends or get along with other children.

### THERAPY

A supportive process in which a trained professional helps people work through emotional, mental, or behavioral challenges to improve their wellbeing and life quality.

for a dinner recipe, but he otherwise does not have long talks with Misty. Over dinner, Ari's mom likes to have private family conversations, and she must remind Misty not to share these conversations with strangers. Misty reminds Ari's grandmother to take her medicine and they enjoy having light exercise sessions when nobody is at home during the day. From this snapshot of Ari's home life, we can see that family members may have different ideas about what a social robot should do in their home, such as whether it should be a friend or a helper [3].

## PROGRAMMING ROBOTS TO UNDERSTAND THE WORLD

It can be hard for robots to understand everything going on around them, especially in a place where a lot of things are happening at once. So, scientists must develop new solutions to help these robots work reliably and **autonomously**, meaning on their own. Remember Ari reading with Misty. Misty occasionally has trouble seeing the page of a book because the room is dark, or hearing what Ari says because of noise in the background. As a solution, we can put special tags on the pages of the book, so Misty can see them more easily. As Ari shows Misty a special tag, the robot's cameras detect the page, recognize Ari's face, and figure out what Ari is looking at. Based on what Misty sees through its cameras, a computer program called an **algorithm** decides what Misty should do with its face, body, expressions, and words. An algorithm means the steps or rules followed to solve a problem.

Robots can be programmed to change to their behaviors depending on the needs of specific children. When playing a game, they can help children learn how to control their emotions, and teach children how to deal with winning and losing. Researchers should be careful when programming these robots, so they do not hurt children's feelings but keep children's trust. Teachers, parents, or older siblings can always keep an eye on the robot. They can also join in the fun so children are not left alone with the robot! Just like video games, robots can be fun to play with, but they are not designed to replace friends and family. Parents and teachers will need to set rules for how long and how much the child can play with the robot.

## CONCLUSION

As you can see from these examples, in the future, social robots might be a part of your life in a lot of different ways. We can imagine having robots around that can help children like you learn in the classroom, get therapy at the hospital, or even keep your grandparents company when you are not around. These robots are not just science fiction anymore! **Robotics** research, especially human-robot interactions, is a field that is growing quickly. Scientists are working hard to make

### AUTONOMOUSLY

Independently, without needing help to make decisions. Autonomous robots use algorithms to decide what is the best thing to do, without needing human help.

### ALGORITHM

The steps or rules followed to solve a problem. Algorithms can be very easy or very hard. A cooking recipe is an algorithm. Computers or robots usually follow many algorithms.

### ROBOTICS

The field of science and technology that designs, builds, and studies machines called robots. These robots can do all sorts of jobs, like helping in factories, exploring space, or even just playing with us.

sure these robots are friendly and helpful, so they can make our lives easier and happier. As technology keeps improving, we might see more and more of these helpful robots becoming a normal part of our lives, changing the way we live and interact with machines. It is an exciting journey to see how robots and people can work together in the future!

## ACKNOWLEDGMENTS

We would like to thank Hui-Ru (Irene) Ho and Alison Nicole Jacobs for the supporting the design of the figures included in this paper. This work was supported by the National Science Foundation awards 2152163, 2202802, 2247381, and 2312354.

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**SUBMITTED:** 26 July 2023; **ACCEPTED:** 26 February 2024;

**PUBLISHED ONLINE:** 13 March 2024.

**EDITOR:** Inge Katrin Herrmann, Balgrist University Hospital, Switzerland

**SCIENCE MENTORS:** Yuan Yang and Yunchao Tang

**CITATION:** Cagiltay B, Senft E and Mutlu B (2024) What Can Robots Do For You? *Front. Young Minds* 12:1267614. doi: 10.3389/frym.2024.1267614

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The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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## YOUNG REVIEWERS



### WILLIAM, AGE: 8

William is a little scientist who likes STEM. He is excited about mathematics, mechanics (including robots), electronics, and chemistry. He likes reading National Geographic for Kids and Children's Encyclopedias. He is very curious about new technologies and likes programming. He has creative thoughts and critical thinking. He likes playing Go Robot Mouse, Programmable Robot Puppy, and Dot and Dash Robot.



### ZI-AN, AGE: 8

Hi, I am coming from a family of teachers, I have inherited a love for knowledge and learning. But my biggest joy? That is definitely my little brother. I absolutely love goofing around and making him laugh! I am fascinated about science. I want to research the secrets of everlasting life, so that people I love will never grow old or die.

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