

# Is this the end of household chores?

Few of us relish housework. Who wouldn't welcome a helping hand to tackle chores like laundry?

So it may be exciting to learn that laundry-folding robots already exist. The best-known version is the Japanese clothes-folding machine the [Laundroid](#). Another one has recently been invented, too, with software designed by the University of California, Berkeley and hardware by Rethink Robotics.

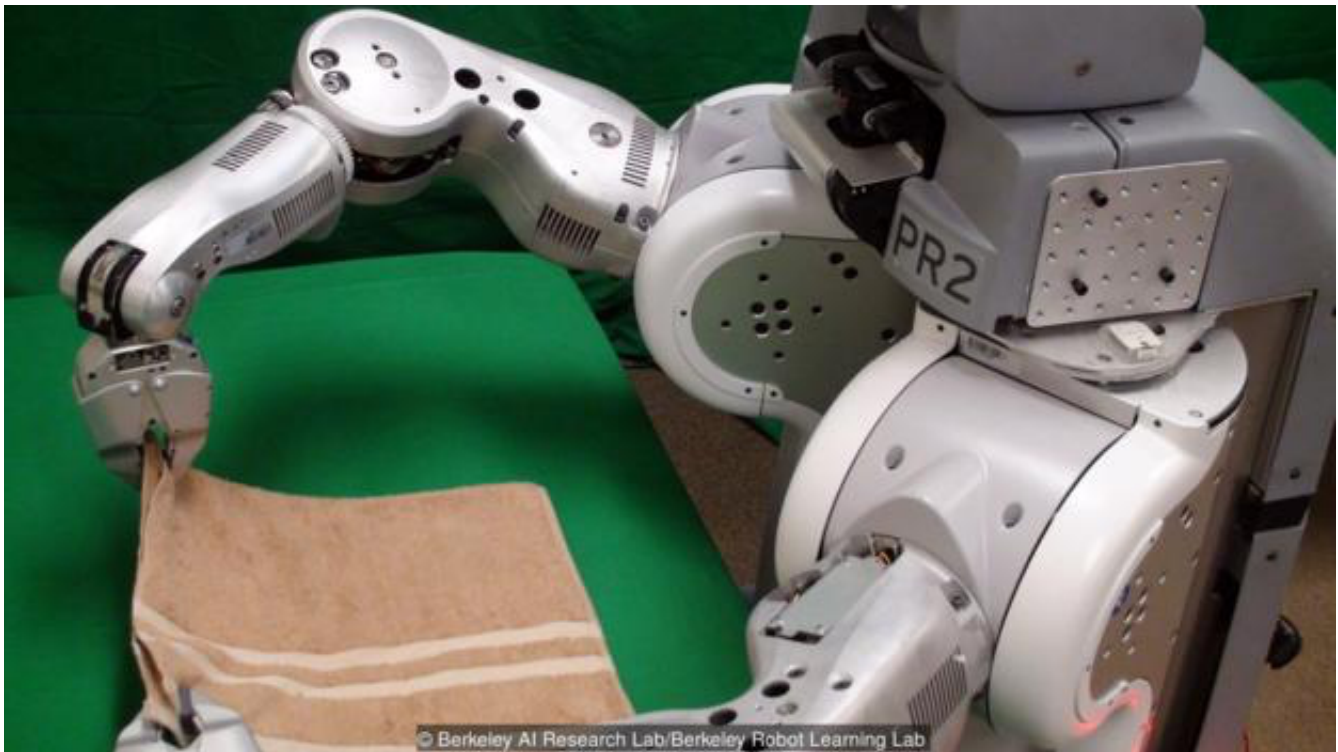
But don't get too excited. While the robots have an admirable level of concentration on the task at hand, their progress is painfully slow. The Laundroid takes four minutes to fold an item. The Rethink Robotics helper? Fifteen.

The robots may be coming, but probably not for a while.

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Still, getting the technology even this far was a feat. And developing robots that can assist at home doesn't just help with the laundry: it allows researchers to understand core problems with AI in general. If they can crack a laundry-folding robot, they can apply these lessons to other, more critical situations, such as emergency response, disaster recovery or household caregiving.



Folding a single towel may take this robot 15 minutes, but the technology's importance goes beyond laundry (Credit: Berkeley AI Research Lab/Berkeley Robot Learning Lab)

*It takes 15 minutes to do something we unconsciously do in seconds – Mariana Pestana*

This is because developing autonomous assistants to help with domestic tasks is more complicated

than it seems. While household chores are relatively easy for humans to achieve, they are surprisingly difficult for an autonomous system to understand and carry out reliably.

This is the paradox, says Mariana Pestana, co-curator of the exhibition [The Future Starts Here](#) at London's Victoria & Albert Museum where the robot is featured. It “comes out of deep learning and one of the universities at the forefront of AI development – but takes 15 minutes to do something we unconsciously do in seconds.”

An average household has constantly varying conditions – such as children who do not necessarily understand the robot's inner workings and who may issue it with arbitrary new objectives every day (think of the requests issued

to Apple's Siri).

“An autonomous assistant that works well in this setting would have to be versatile, robust to changes in the environment, and easy to work with,” says Siddharth Srivastava, who helped develop the robot while a staff scientist at Berkeley.

*Watch the laundry-folding robot in (slow-paced) action below:*

One of the challenges encountered by Srivastava and his team was getting the robot to understand the kind of high-level tasks that its human master might want it to do. “As anyone who has worked in a team knows, an assistant is not very helpful if they need instructions about every minute aspect of the problem,” Srivastava says.

Robots, of course, have no ‘innate’ knowledge. While we might like to tell an assistive robot to just ‘do the laundry’, the robot needs much more information, from how to move each of its joints to where it should look as it performs each operation, and how to use its cameras and sensors.

These difficulties are further compounded if we want a robot that can do more than just the laundry. After all, a one-task robot would be of limited help in blitzing domestic duties.



Digital home assistants are getting better at understanding a variety of instructions, but they remain far from foolproof (Credit: Getty Images)

*We need to develop algorithms that would allow the robot to compute what it needs to do in order to solve a given task – Siddharth Srivastava*

So a truly helpful robot would need to accept and perform a range of tasks given by its user. Clearly, it is not possible to pre-programme the robot

for every possible chore permutation in every single household. “Instead,” Srivastava says, “we need to develop algorithms for hierarchical planning, perception and reasoning that would allow the robot to compute what it needs to do in order to solve a given task.” This is far from a solved problem – it’s an active area of research, with many teams developing and testing possible solutions.

Can Srivastava envisage a time when domestic assistive robots will be commonplace? For him, the change will be gradual, in keeping with other autonomous AI and robotics applications, such as self-driving cars. Robotic vacuum cleaners already exist. So, of course, do digital assistants such as

Alexa (which, in theory, can answer basic questions – though experience suggests it often doesn't take much to stump them).



Robotic vacuum cleaners already exist (Credit: Getty Images)

But the computational complexity of reasoning and planning over extended time periods is higher, and it also involves additional problems that are not so critical for existing applications.

Assistive robots need to be easy to use and adaptable to the skill level of the person they are helping – who, for the most part, are unlikely to have advanced degrees in AI and robotics. And robots need to carry out tasks that the system designers may not have planned for.

“Unlike the domain of operations of industrial robots and cars, households are much more unstructured and expected behaviours are more difficult to define,” Srivastava says. “In order to realise the potential of widespread societal benefit from assistive AI systems, we need to develop new principles for designing them in a way that makes them easier to work with, understand,

and maintain.”

Once that is developed, though, there are plenty of possibilities for other applications. Robots could assist with wound care, medication management or preparing food for special diets.

Multiple problems need solving before this is a reality – but there may be a day when we look back on a plodding laundry-folding robot as the beginning of the end of humanity’s household chores.

*You can see the laundry-folding robot in the exhibition [\*\*The Future Starts Here\*\*](#) at London’s Victoria & Albert Museum, on until 4 November 2018.*

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