



ROBOTS FOR THE ELDERLY AND DISABLED

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ROBOTICS TERMINOLOGY

- **Robot** – A mechanical device that performs human tasks, either automatically or by remote control.
- **Robopet** - Robopets are small animal-like robots which have the appearance and many of the behavioral characteristics of companion animals or pets
- **Robotics** – The study and application of robot technology.
- **Tele-robotics** – A robot that is operated remotely.

TYPES OF HEALTH AND DOMESTIC ROBOTS

- ❖ **Chatbots** – Siri, Alexa, etc.
- ❖ **Telepresence Robots** for checking on residents in Nursing facilities and Hospitals
- ❖ **Robots for lifting** and moving persons
- ❖ Robots for **helping with home duties** – Roomba, etc.
- ❖ **Robopets** – Dogs, Cats, and others

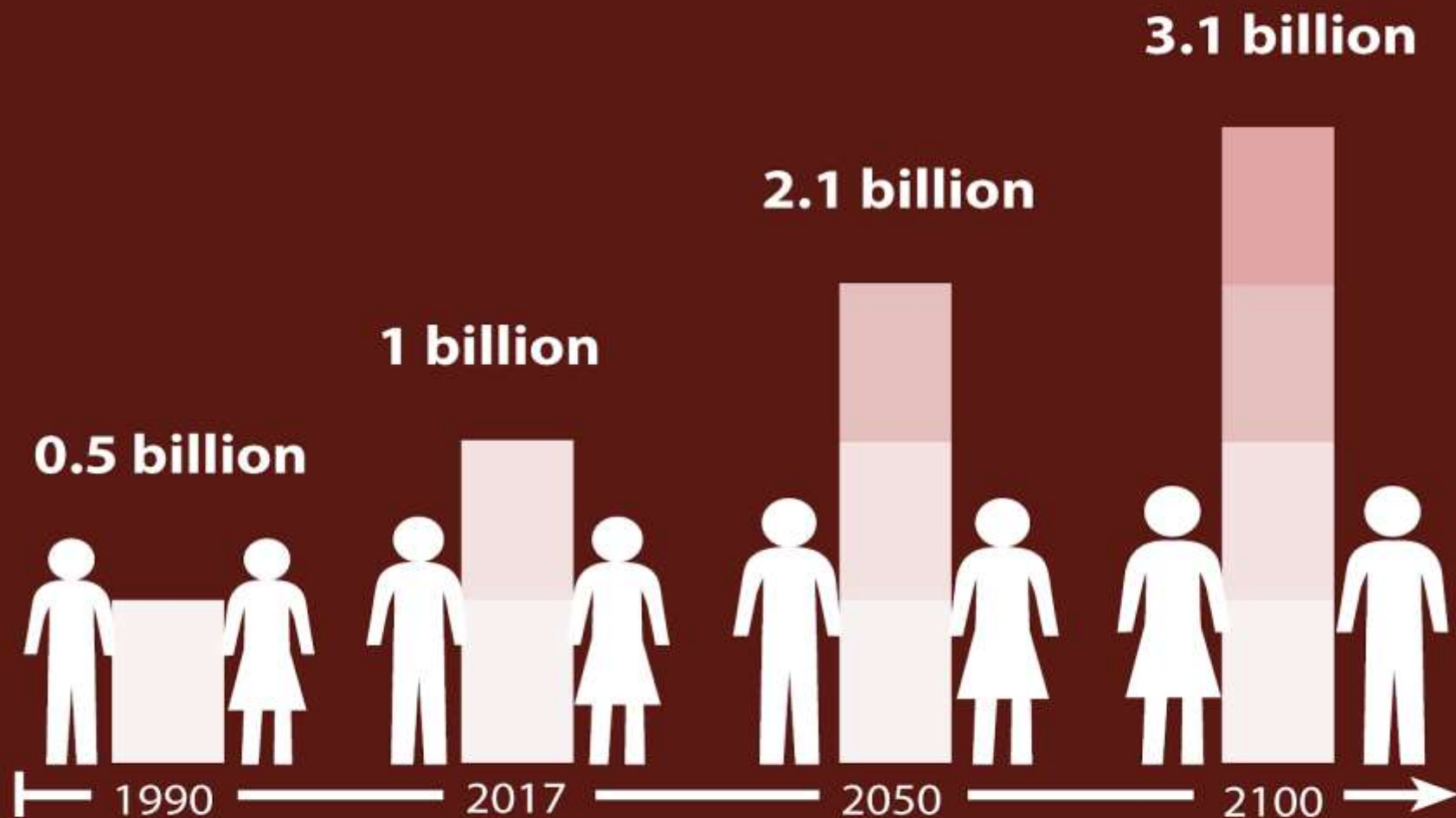


FACTS ABOUT AGING

- ❖ **The global population aged 60 years or over, numbered 962 million in 2017**, more than twice as large as in 1980 when there were 382 million older persons worldwide.
- ❖ **The number of older persons (those over 60) is expected to double again by 2050, when it is projected to reach nearly 2.1 billion.**
- ❖ By 2020, the number of people aged 60 years and older will outnumber children younger than 5 years.
- ❖ In 2050, 80% of older people will be living in low- and middle-income countries.
- ❖ **All countries face major challenges to ensure that their health and social systems are ready to make the most of this demographic shift.**

Ageing Population

Projected global population aged 60 years or over



Source: United Nations Department of Economic and Social Affairs,
Population Division, *World Population Prospects: The 2017 Revision*
Produced by: United Nations Department of Public Information

Better health for people with disabilities

- ❖ An estimated 25-30 percent of people aged 85 or older have dementia.
- ❖ At a global level, the share of 80+ people rose from 0.6% in 1950 (15 million) and is expected to reach 4% (400 million) by 2050.

Over **1 BILLION** people globally experience disability



1 in 7 people

People with disabilities have the same health care needs as others

But they are:

2x more likely to find inadequate health care providers' skills and facilities

3x more likely to be denied health care

4x more likely to be treated badly in the health care system



1/2 of people with disabilities cannot afford health care

They are:

50% more likely to suffer catastrophic health expenditure



These out-of-pocket health care payments can push a family into poverty

Rehabilitation and assistive devices can enable people with disabilities to be independent

70 MIL people need a wheelchair. Only 5-15% have access to one.



360 MIL people globally have moderate to profound hearing loss.

Production of hearing aids only meets: **10%** of global need **3%** of developing countries' needs

Making all health care services accessible to people with disabilities is achievable and will reduce unacceptable health disparities



remove physical barriers to health facilities, information and equipment



make health care affordable



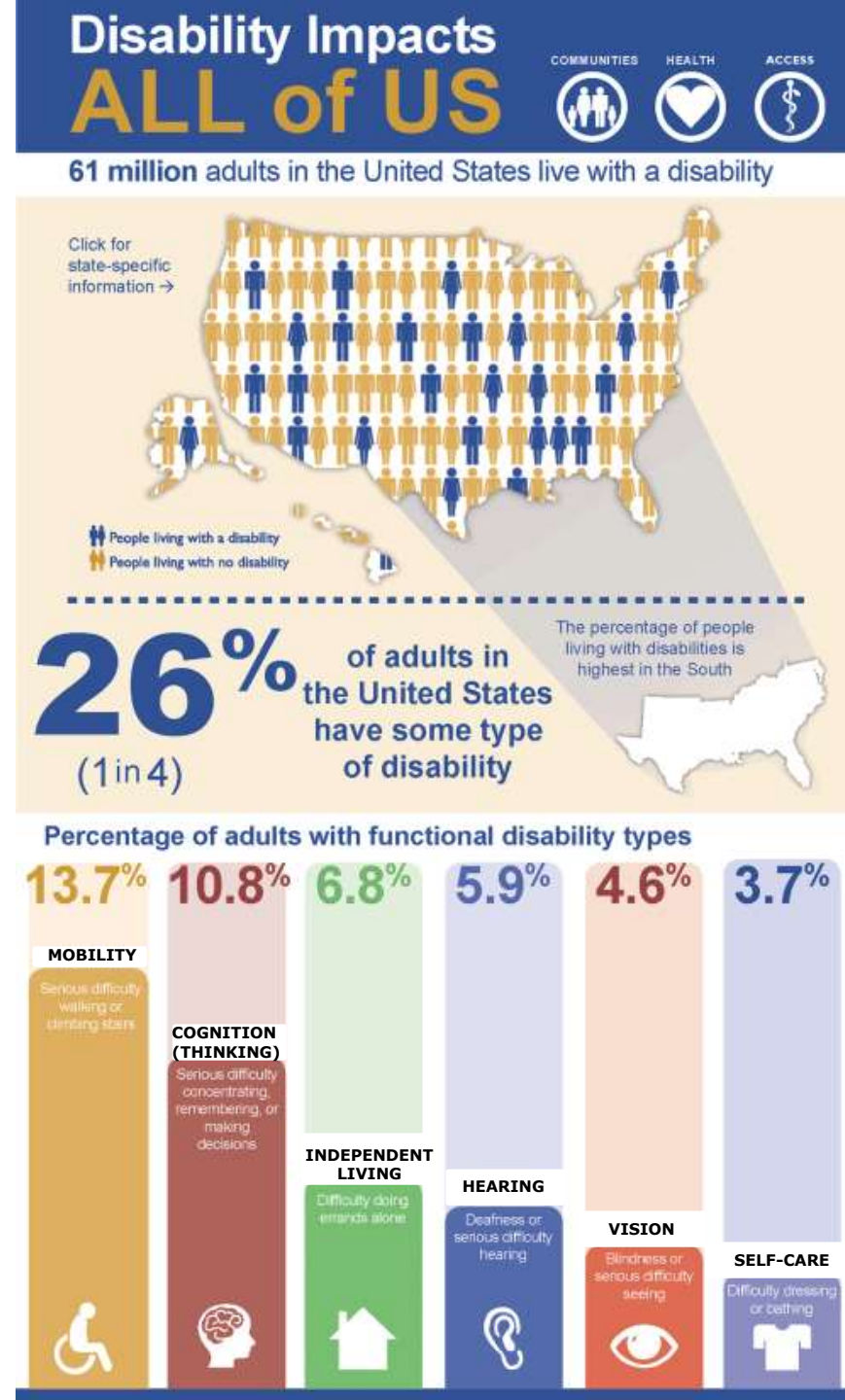
train all health care workers in disability issues including rights



invest in specific services such as rehabilitation

STATISTICS ABOUT PEOPLE WITH A DISABILITY

- ❖ About 15% of the world's population, or an estimated 1 billion people, live with disabilities.
- ❖ This figure is increasing through population growth, medical advances and the ageing process.
- ❖ In countries with life expectancies over 70 years, individuals spend on average about 8 years, or 11.5 % of their life span, living with disabilities.
- ❖ 80% of persons with disabilities live in developing countries



Disability and COMMUNITIES



Disability is especially common in these groups:

2 in 5

adults age 65 years and older have a disability



1 in 4

women have a disability



2 in 5

Non-Hispanic American Indians/ Alaska Natives have a disability



Disability and HEALTH



Adults living with disabilities are more likely to

	With Disabilities	Without Disabilities
 HAVE OBESITY	38.2%	26.2%
 SMOKE	28.2%	13.4%
 HAVE HEART DISEASE	11.5%	3.8%
 HAVE DIABETES	16.3%	7.2%

Disability and Healthcare ACCESS

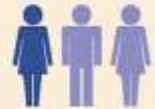


Healthcare access barriers for working-age adults include

1 in 3

adults with disabilities (18-44 years)

do not have a usual healthcare provider



1 in 3

adults with disabilities (18-44 years)

have an unmet healthcare need because of cost in the past year



1 in 4

adults with disabilities (45-64 years)

did not have a routine check-up in the past year



Making A DIFFERENCE



PUBLIC HEALTH IS FOR ALL OF US

CAREGIVERS

Definitions

A **caregiver**—sometimes called an ***informal caregiver***—is an unpaid individual (for example, a spouse, partner, family member, friend, or neighbor) involved in assisting others with activities of daily living and/or medical tasks.

Formal caregivers are paid care providers providing care in one's home or in a care setting (day care, residential facility, long-term care facility).



THE FUTURE ROLE OF ROBOTS AND HUMANS IN CAREGIVING

As populations age, one area where robots could help tremendously is caregiving.

It's a little trickier than just administering medicine or getting someone dressed.

The population of those over the age of 65 in America is expected to more than double by 2060, up from 46 million today to 98 million.

By then, the 65-and-older age group will represent nearly one-fourth of the population (they make up 15% now).



From 2016 to 2026, the number of home health aides is expected to increase by more than 40%.

In total, more than 1.3 million caregivers will be needed over the next 10 years.

This growing need is putting them under strain already as most are overworked, not paid well, so the jobs have a high turnover rate of 60%.



The current limit to the situation isn't in the technology, as robots can perform many caretaking duties, from doing home chores to assisting with physical therapy.

1) Part of it is making the technology more affordable.

2) **Good caretaking has an emotional element that's important and it has to be done with real people who care.**

Beyond repetitive manual tasks, robots could offer more assistance by engaging with patients, providing emotional support and social connection when caregivers are busy.



For instance, there are already Chatbots and Robots that can:

- 1) Talk about the weather during breakfast
- 2) Provide a reminder that a family member is coming to visit
- 3) Answer questions about a variety of topics.
- 4) Read and play games with patients.
- 5) Remind the person about taking their medications and making sure they did it.
- 6) Other stronger Robots could help with heavy lifting of the patient or other things or any other tedious work.

WHAT CAN A CHATBOT DO ?

You can ask questions using your voice or by typing in the same way you would ask a person.

The chatbot will usually respond in a conversational style, and it may carry out actions in response to your conversation (for example, order something for you).



Personal Assistants Require Service Providers



https://www.youtube.com/watch?v=ss2satDZdy0&feature=emb_logo 3 minutes

WHAT WOULD YOU DO IF YOU MET A DIGITAL HUMAN?

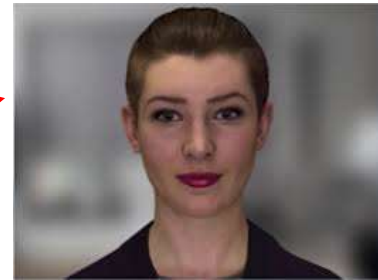
As it turns out, digital humans are already among us. All of these digital assistants were developed by the **Soul Machines Co.:**



Autodesk users have been interacting with **AVA** since the end of last year, when calling into customer support.



Travelers on **Air New Zealand** have been utilizing the services of **Sophie**, its digital travel concierge for a little more than six months.



Australians with disabilities are now able to work with a digital human named **Nadia**, designed to help users better navigate the **National Disability Insurance Scheme** (NDIS) and find the information they need.



Nadia can read users' emotions by "watching" their faces – not to mention give them the experience of talking to a celebrity, sort of: **Nadia's voice is**



Domestic robots

The Roomba domestic vacuum cleaner was the first successful domestic robot.

It does a single, menial job. Domestic robots are simple robots dedicated to a single task work in home use. They are used in simple but unwanted jobs, such as vacuum cleaning, floor washing, and lawn mowing.

Robots can:

Mop our floors

Mow our lawns

Help lift people into and out of chairs and beds

Follow recipes

Fold towels

Dispense pills

Robopets for social companionship

Relieve loneliness

Nudge forgetful elders to eat on a regular schedule.

The uses of Robots can be divided into 4 categories:

- ❖ Loneliness / social / connection
- ❖ Safety & security
- ❖ Digital health
- ❖ Quality of life

LONELINESS /SOCIAL/ AND CONNECTION TO THE WORLD

- ❖ Video calls
- ❖ Telepresence
- ❖ Games and apps for grand-kids
- ❖ Takes photos on request
- ❖ Records videos on request
- ❖ Functions to share (send/receive) messages, photos or videos with connections (friends/family)
- ❖ Capable of recognizing individuals and uses names during interactions
- ❖ Functions for the user to participate in established social networks



SAFETY & SECURITY

- ❖ Detection of falls or other emergencies
- ❖ Summon help for medical and environmental concerns
- ❖
- ❖ Intrusion detection
- ❖ Night patrol of home
- ❖ View home when away, especially after an alert
- ❖ Environmental sensors – temperature, Carbon Monoxide, etc.
- ❖ Fire/ smoke

DIGITAL HEALTH

Medications/pills schedule

- ❖ Reminder

- ❖ Monitor

Exercises

- ❖ Reminder

- ❖ Physical

- ❖ Mental/memory

- ❖ Medical/telehealth

QUALITY OF LIFE

Smart home/home automation

Assistance

- ❖ Project/view video
- ❖ Kitchen helper
- ❖ See who is at the door
- ❖ Alarm clock
- ❖ Calendar keeper
- ❖ TED Talks
- ❖ General questions

ENTERTAINMENT

Read books

Movies/TV shows

Music

Games

Education/information

News

Conversations with others

Telephone

Skype or Facetime

E-Mail

ROBOTS MAY BE HELPFUL WITH A SHORTAGE OF NURSING AIDES AND MORE OLDER PERSONS

Health care employs more than 4.5 million nursing and orderly aides in the United States alone.

With increasing numbers of older people and a shortage of skilled labor, countries may want to use robots to bridge the gap.

- ❖ Senior citizens may have difficulty keeping themselves busy and active, and companionships can encourage many seniors to participate in daily activities.
- ❖ This is particularly true if they are retired and live alone.
- ❖ Leading a secluded life can lead to a lack of desire to keep your home clean, make proper meals, and take care of yourself.
- ❖ This could lead to depression or the inability to socialize.

<https://www.youtube.com/watch?v=E7URXuTrat0> 2 minutes

Nursebot

The aging population, coupled with advances in medicine that enable people to overcome once deadly conditions, have created a nursing shortage.

To help combat this situation, researchers at the University of Pittsburgh, the University of Michigan, and Carnegie Mellon University have been working on **mobile robots that are designed specifically to help elderly people cope with day-to-day activities. This allows them to live at home, reducing strains on infrastructure and costs of nursing homes and rehab centers.**

Some robots are equipped with tele-presence capabilities, allowing live nurses or doctors to monitor medical conditions.



Anybots was founded in 2001 and performs robot research and development.

Within healthcare, AnyBots provides a type of immersive telepresence, meaning instead of focusing merely on audio and video communications, the AnyBots robot allows for movement controlled by a remote.

"If you're a doctor and have to manage 10 different nursing homes ... the robot can go in, and the doctor can control his movement and direction," said Shahid Shah, health IT analyst.

"It can turn on sensors at the control of not the person in the room, but the person who wants to do the communication," he said. Shah said this type of tele-presense is impressive since it can move in and out of a specific area and record findings.



The **Vasteras Giraff** is a mobile communication tool that enables the elderly to communicate with the outside world.

It's remote controlled, and it has wheels, a camera and a monitor.

Essentially, the Giraff is a robot that provides two-way video calling similar to Skype. A caregiver can control the robot using a typical PC.

To date, 42 Giraff robots have been delivered to seven European countries, and 20 more were recently built.



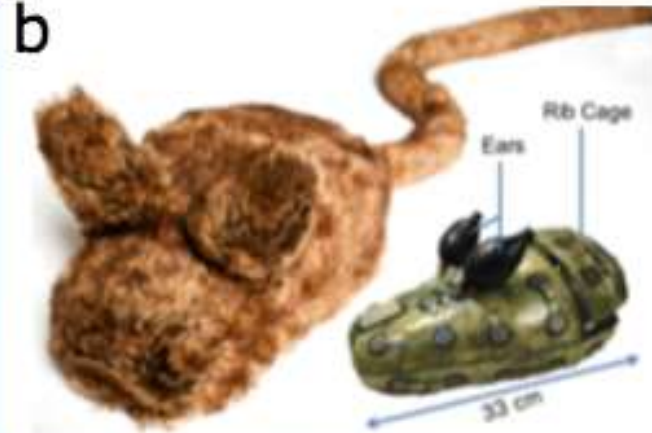
Earlier in 2012, robotics firm iRobot built an emerging technologies group and announced a partnership with InTouch Health to put its AVA telepresence technology to better use.

As a result, the two companies developed the **Remote Presence Virtual + Independent Telemedicine Assistant, or RP-VITA**, which combines iRobot's AVA telepresence units with InTouch health's distance education tools, creating a system that allows physicians to care for patients remotely.

The system features mapping and obstacle detection, as well as avoidance technology and an iPad user interface for control and interaction. The robot can also interface with diagnostic devices and electronic medical records (EMR) systems.



SOCIAL ROBOTS



Social robots - (a) Paro, (b) Haptic Creatures (c) NAO made by Aldebaran Robotics; (d) Betty, and (e) RECA

ElliQ is an “aging companion,” launched by Intuition Robotics, a startup founded in Israel in 2016.

Designed to keep elders active, independent, and engaged, ElliQ is a robot-associate named after a Norse goddess that represents old age.

It is a tabletop device that illuminates when you call it.

Besides wellness and environmental monitoring, it uses machine learning and computer vision to provide suggestions for entertainment and activities.



https://www.youtube.com/watch?v=URcuVfzwB4g&feature=emb_logo 2 minutes

ElliQ is priced at \$1,499, with free in-home installation, stated Intuition Robotics. Preorder customers will get a year of free support.

ROBEAR is a nursing robot that can do tasks such as lifting a patient from a bed in a wheelchair or supporting a patient who is standing but needs help in a gentle way.

It works and is still under development. It costs \$168,000 and \$252,000 so it's a big investment !



https://www.youtube.com/watch?v=0LaVwDmLDLw&list=PLJvSOafTuCUeMuDtS_fnA5sp7llz2RVAp
1.3 minutes

SAM

SAM is a robot companion that enhances the quality of life for elderly and disabled people.

It is designed to prevent the isolation of older people and to prevent them from falling.

SAM's main goals are:

- 1) Cope with the increased operating costs, staff turnover, accidents, and isolation of the elderly
- 2) Guarantee remote monitoring of patients
- 3) Provide for their physical safety and communication between residents, loved ones, and staff.



<https://www.youtube.com/watch?v=FjYeyJYhQHw>

2.2 minutes

NAO is a 23 inch tall humanoid robot. He is small, cute and round. You can't help but love him! NAO is intended to be a friendly companion around the house. He moves, recognizes you, hears you and even talks to you!

Aldebaran created NAO to be a true daily companion.

He is the little creature who helps you be your best. His humanoid form and extreme interactivity make him really endearing and loveable. Currently, it costs \$6,500 which will hopefully go down soon.



ZORA

Zora is an interactive caregiver who joins residents in aerobics and singing, playing games and reading for adults and children.

It weighs only 12.5 pounds, is just over 22.4 inches tall, and speaks an impressive nineteen languages.

Controlled by health professionals via a tablet, Zora can lead a physical therapy class, guide exercise, dancing, and read TV shows, weather forecasts, or local news.

NAO is the same robot; the difference is the simplified software developed for ZORA, focused on application in the rehabilitation and care sector.



<https://www.youtube.com/watch?v=jcMNY5EnQNQ> 1.7 minutes

SNUGGLEBOT

Loneliness is an increasing problem in today's world, especially during the current pandemic.

The design project was to develop a social companion robot for people in their homes.

There were 3 design goals:

- ❖ The robot should be physically comforting
- ❖ Socially engaging
- ❖ Require people to care for it.



https://www.youtube.com/watch?v=qmvB0W8E9Sc&feature=emb_logo 1.3 minutes

Pepper is a humanoid robot companion designed be sort of a kiosk at businesses like shopping malls, hospitals, and doctors' offices.

Pepper is also able to track eye contact and express emotion.

We spent a little time with Pepper and got its thoughts on how it helps people, Paris, robot uprisings, and tacos.

<https://www.youtube.com/watch?v=zJHyaD1psMc>

3.2 minutes



KURI

Kuri comes with a spherical head that can move in different direction, with animated eyes that allow it to show a variety of facial expressions.

A built-in 1080p camera allows it to see people and surroundings, as well as stream a live feed of everything it encounters to a companion app, so you can use it to check in on the house at any time of the day.

It can play music, and even read the kids a bedtime story.



<https://www.youtube.com/watch?v=aAi9ASA908>

Q

1.4 minutes

Mental commitment robotic baby seals named "Paro" are recharged at robot exhibition Robo Japan. The (US\$3,480) Paro, a cooing baby harp seal robot fitted with sensors beneath its fur and whiskers, is developed by Japan's Intelligent System Co, to soothe patients in hospitals and nursing homes

<https://www.youtube.com/watch?v=uoniG6g8KoA> 2.5 minutes



ROBOTIC PETS ARE HELPING PERSONS WITH DEMENTIA

Jennie has big brown eyes, soft golden fur and a tail that won't stop wagging.

Scratch behind her floppy ears, and she'll lean in for more. She even barks on command.

But Jennie's not a dog. She's a prototype for Tombot, a puppy-like companion robot being developed by a Santa Clarita, California-based company of the same name as a tool for comforting people with dementia.



<https://www.youtube.com/watch?v=cFvGAL9tesM> 4 minutes

ROBOT DOGS



<https://www.youtube.com/watch?v=7IagcHyPKQc> 2.6 MINUTES

ROBOTIC CATS



<https://www.youtube.com/watch?v=K0aC9qUMm1g>

CosmoBot, is part of a phenomenon called robotic therapy.

Doctors use CosmoBot to enhance the therapy of developmentally disabled children between 5 and 12 years old.

Using the robot can make therapy more interesting for children and allows for better success when achieving long-term therapy goals.

The company designed CosmoBot to collect data on a child's performance. This allows therapists to evaluate how successful the therapy is.



THE EXOSKELETON

An Exoskeleton can help us improve or give us better control of our physical capabilities.

Exoskeletons are wearable, powered robot frame devices that people can strap on to walk or lift heavy things, as examples.

We will see wearables better our senses like being able to hear people from across the room, or see things more accurately like binoculars. This will greatly benefit persons who are disabled.



ReWalk” by ReWalk Robotics is a mobile lower body exoskeleton for walking assist and/or walking rehabilitation, and potentially a replacement for the wheelchair.

ReWalk[™]
Robotics



MOBILE ROBOTS: You may never think about it, but transporting supplies, meals and other materials around the hospital is a drag on efficiency. One estimate shows that a typical 200-bed hospital moves meals, linens, lab samples, waste and other items the equivalent of 53 miles per day.

Enter **TUG, an autonomous mobile robot developed by Aethon Inc.** to ferry supplies to where they are needed, freeing employees from heavy physical loads and allowing them to focus on patient care.

They are programmed with the hospital's floor plan and are also equipped with a variety of sensors to ensure they don't run into anything on their way to the lab. They also kindly ask people to stand aside as they move into congested hallways.



<https://www.youtube.com/watch?v=MLZMAW9lqXE>

Kathy Hutchinson has been paralyzed from her neck down, for many years. Here, she controls a robot arm with her brain to move a bottle of coffee to her mouth.



<https://www.youtube.com/watch?v=D6CCpfE2NoQ> 3.5 minutes

Japan's Health Minister Yoichi Masuzoe sits with an assistive robot called "My Spoon" during a demonstration of health care robots in Tokyo. "My Spoon", developed by Japan's Secom is designed to help disabled people eat meals with joystick for controls using one's jaw, hand and feet.



Bestic is a small robotic arm with a spoon on the end. The arm can be easily maneuvered, and a user can independently control the spoon's movement on a plate to choose what and when to eat.

The robot has a "unique design" that fits on tables and can also be adjusted for each user by choosing buttons, a joystick, a foot control or another control device they prefer.



ROBOT HUMOR






R2 - D2


So vulgar they beeped out every single word he said

THE FOLLOWING PAGES AND ROBOT DESIGNS ARE BY SIMONE GIERTZ

I'm not a robot



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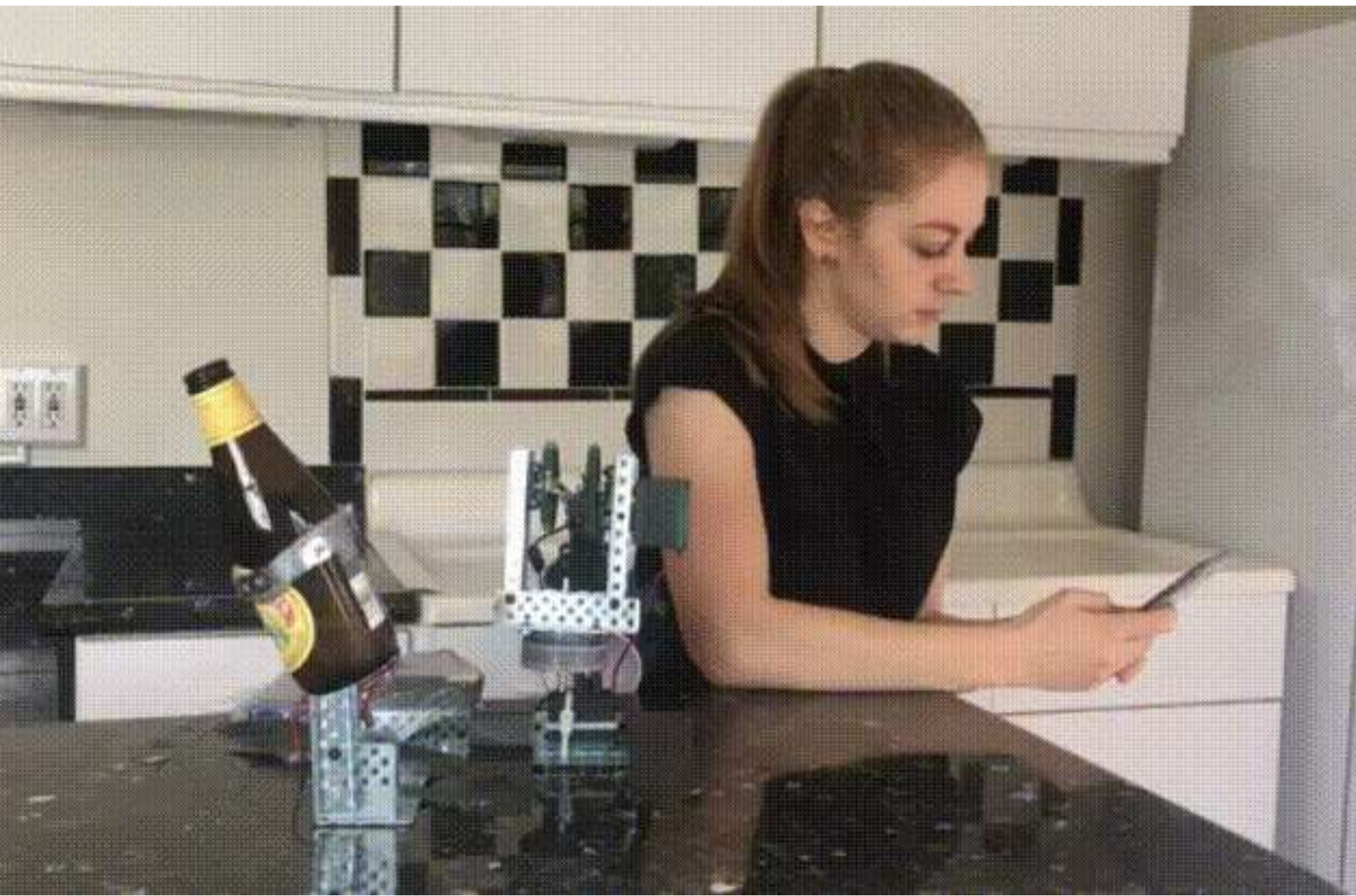
 [Click here to generate direct link](#)









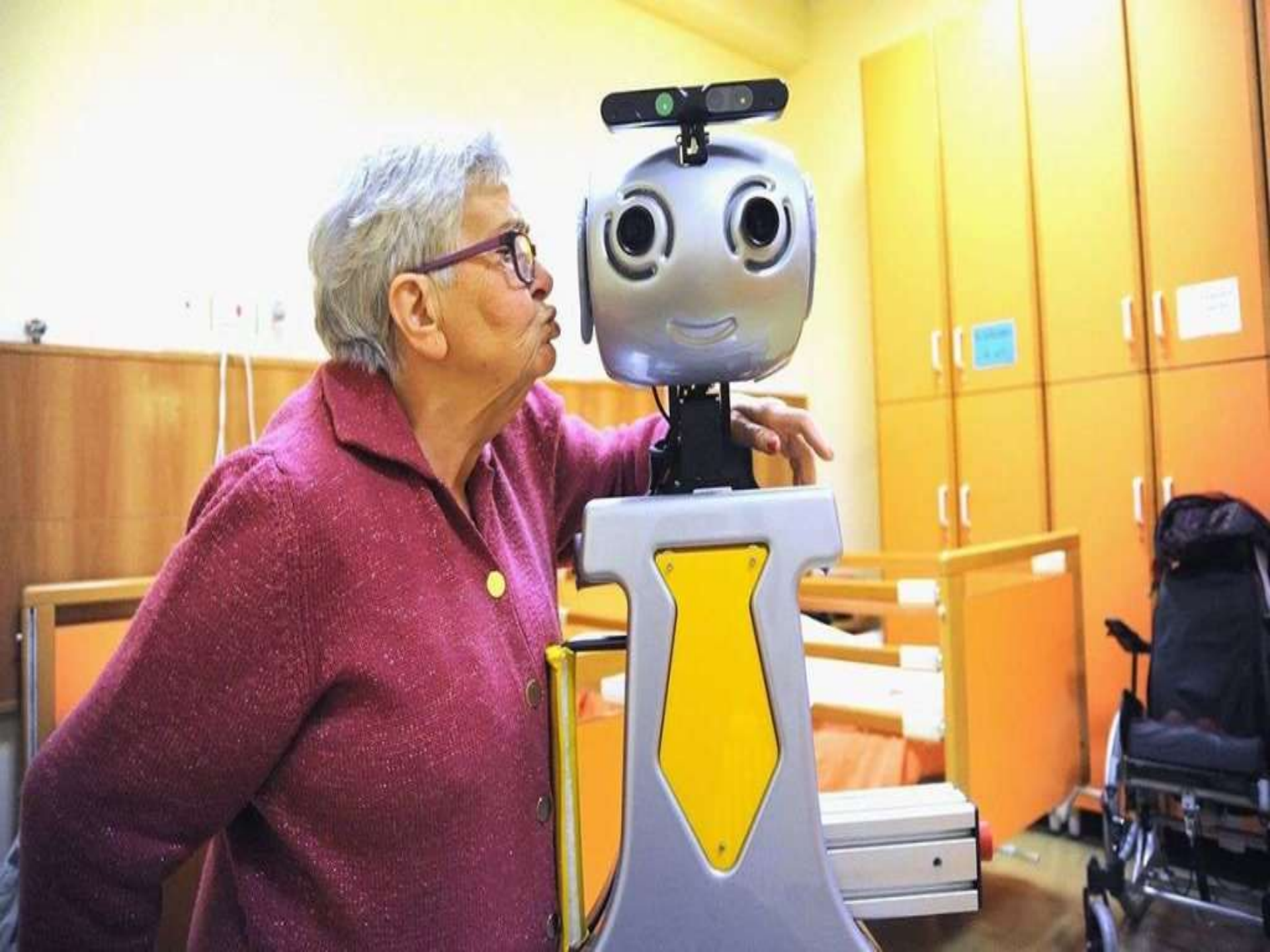












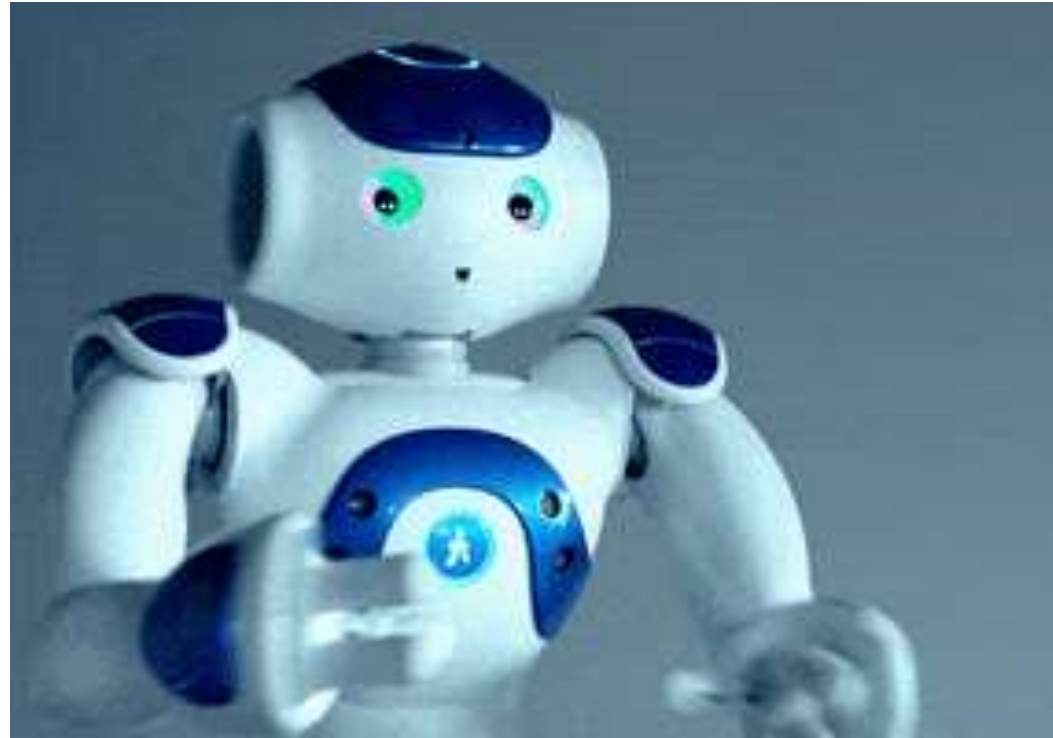
WALL-E ROBOT DOING SOME COOL MOVES !!

<https://www.youtube.com/watch?v=UWnWVuwwuX0>



<https://www.youtube.com/watch?v=lv6op2HHluM>

Thank You !!



BIBLIOGRAPHY

Excellent set of statistics about Caregivers

<https://www.caregiver.org/resources-health-issue-or-condition>