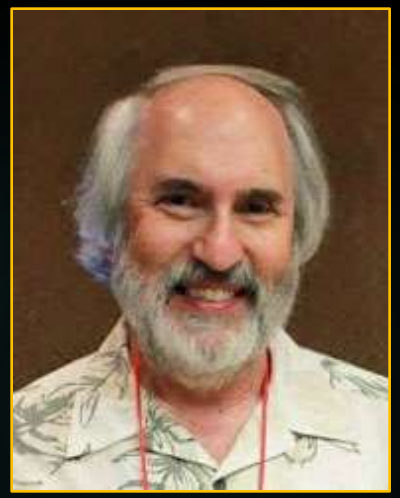
January 23, 2018

Panel of Stanford Students with a Disability

ENGR110/210
Perspectives in Assistive Technology



David L. Jaffe, MS

Instructor

Questions?

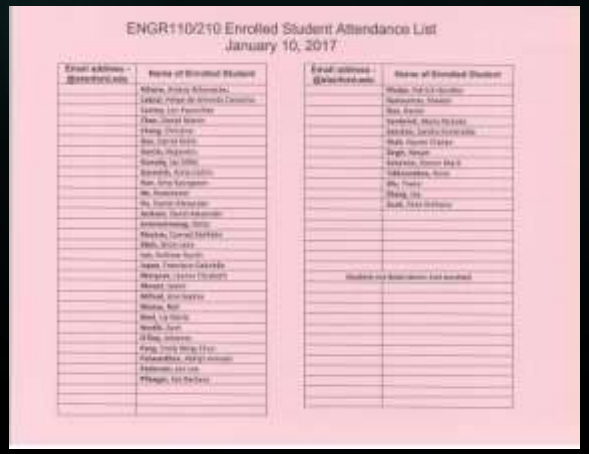
Attendance Sheet, Evaluation Form, and Meet with Dave Signup

For all students:

- Attendance Sheet
- Meet with Dave signup – Teams or individual students

For everyone:

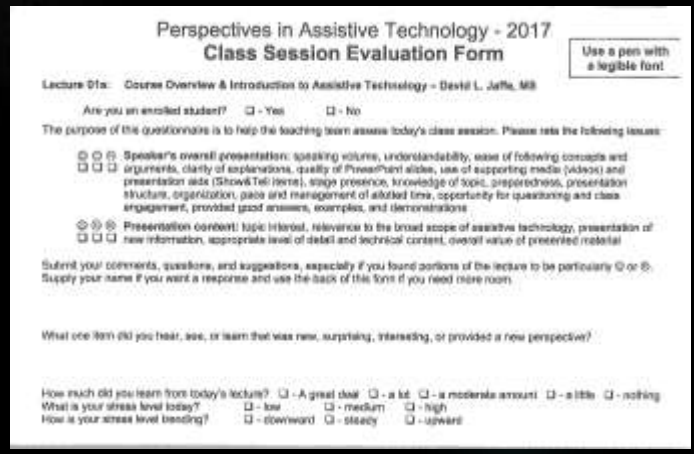
- Class Session Evaluation Form


ENGR110/210 Enrolled Student Attendance List
January 10, 2017


Sign Up to Meet with Dave

Before class outside Thornton 110
After class in Thornton 110
Other times in Peterson Building, Room 113

Date & Time	Enter Team Name & Specify 15 minute time block
Wednesday – January 18th	
Morning – 8:30am – 11:30am	
Afternoon – 1:00pm – 4:30pm	
Thursday – January 19th	
Morning – 8:30am – 11:30am	
Afternoon – 1pm – 2:30pm	
Before class – 3:45pm - outside classroom	
After class – 5pm	
Friday– January 20th	
Morning – 8:30am – 11:00am	


Perspectives in Assistive Technology - 2017
Class Session Evaluation Form

Use a pen with a legible font

Lecture 01a: Course Overview & Introduction to Assistive Technology – David L. Jaffe, MS

Are you an enrolled student? ☐ - Yes ☐ - No

The purpose of this questionnaire is to help the teaching team assess today's class session. Please rate the following issues:

☹ ☐ Speaker's overall presentation: speaking volume, understandability, ease of following concepts and arguments, clarity of explanations, quality of PowerPoint slides, use of supporting media (videos) and presentation aids (Show&Tell items), stage presence, knowledge of topic, preparedness, presentation structure, organization, pace and management of allotted time, opportunity for questioning and class engagement, provided good answers, examples, and demonstrations

☹ ☐ Presentation content: topic interest, relevance to the broad scope of assistive technology, presentation of new information, appropriate level of detail and technical content, overall value of presented material

Submit your comments, questions, and suggestions, especially if you found portions of the lecture to be particularly ☺ or ☹. Supply your name if you want a response and use the back of this form if you need more room.

What one item did you hear, see, or learn that was new, surprising, interesting, or provided a new perspective?

How much did you learn from today's lecture? ☐ - A great deal ☐ - a lot ☐ - a moderate amount ☐ - a little ☐ - nothing
What is your stress level today? ☐ - low ☐ - medium ☐ - high
How is your stress level trending? ☐ - downward ☐ - steady ☐ - upward

Team Projects

- Purchase PRL Shop passes
- Attend safety session
- Report team project progress
- Meet with Dave

Benefits of meeting with Dave

- Gain valuable perspectives on your Team or Individual Project
- Optimize your course and project experience
  - Receive best grade
  - Minimize fabrication time
  - Maximize prototype functionality
- Get a chocolate chip cookie

Formed Project Team

- **At Home Monitor**
- **Team EmPower**
  - Michael Eseigbe
  - Chase Milligan
  - Nathan Petrie

Formed Project Team

- **Wheelchair Camber Project**
- **The Fifth Team with No Name**
  - Jake Bailey
  - Roger Ibarra
  - Rachael Wallach

Formed Project Team

- **Projects for Abby's Wheelchair**
- **Wheelchair Workers**
  - Annie Graham
  - Erica Rivera
  - Madeline Weiner

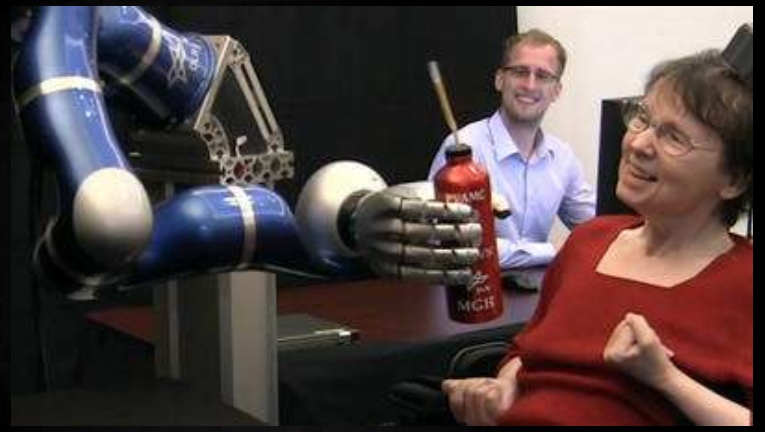
Pre-lecture Discussion Topics

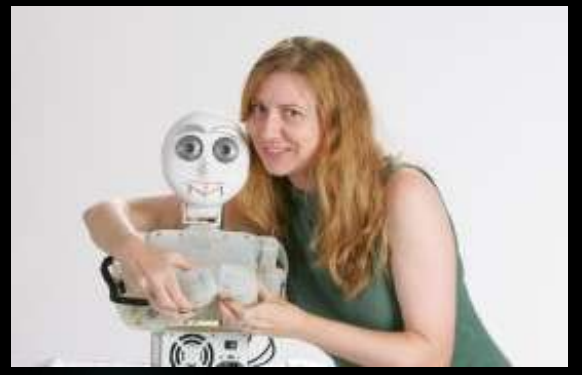
21	Assistive Robotics
18	Ethical / Moral Dilemmas
13	In the News
12	Ten Commandments of Making
12	Video Theatre
12	Marketing Terms
10	Overview of Accessibility
10	Vintage Assistive Technology
10	The Upside of Failure
8	Who is Disabled?
7	Famous people with disabilities

Assistive Robotics

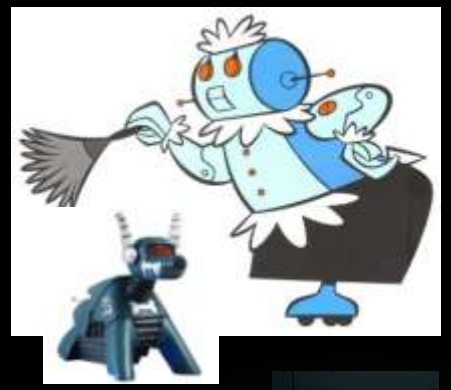
Agenda

- What is a robot?
- What is an assistive robot?
- Early assistive robots
- Assistive robots at VA
- Other assistive robots
- Summary
- Questions





Some images of robots



klaatu barada nikto

Robots

- **Industrial robots -** used in factories
- **Medical robots -** referred to as a medical device
  - Surgical robots - hip replacement, surgical master-slave manipulation
  - Movement Therapy Robots - provides diagnosis, trains, restores function, used in neuro-rehabilitation
  - Assistive robots - compensates for lost function
    - **Home servant** - assists with socialization and manipulation tasks such as grasping, feeding, cooking, activities of daily living
    - **Physical assistant** - provides walking assistance, prosthetics, exoskeletons (wearable devices)
    - **Personal mobility** - cars, wheelchairs, transfer devices

What is Assistive Robotics?

- **My definition:** An assistive robot is a device that can sense, process sensory information, and perform actions that benefit people with disabilities and older adults in the course of their daily living.

- Activities of daily living include: bathing & showering, dressing, food preparation & eating, mobility, personal hygiene & grooming, housework, taking medications, managing money, shopping, communicating, using technology, pet care, child rearing, engaging in religious observances, working, playing, vacationing, exercising, reading, relaxing, socializing, pursuing an education, etc

Users of Assistive Robotics

	Prevalence	Potential users
Spinal cord injury:	90,000	90,000
Cerebral palsy:	500,000	50,000
Rheumatoid arthritis:	2,100,000	20,000

Other: Frail older adults, ALS, MD, MS, stroke, temporary impairment, amputees, etc.

[Stanger CA (1996) Cawley MF, Demographics of rehabilitation robotics users. *Technology and Disability* 5, pp. 125-137.]

Early assistive robots

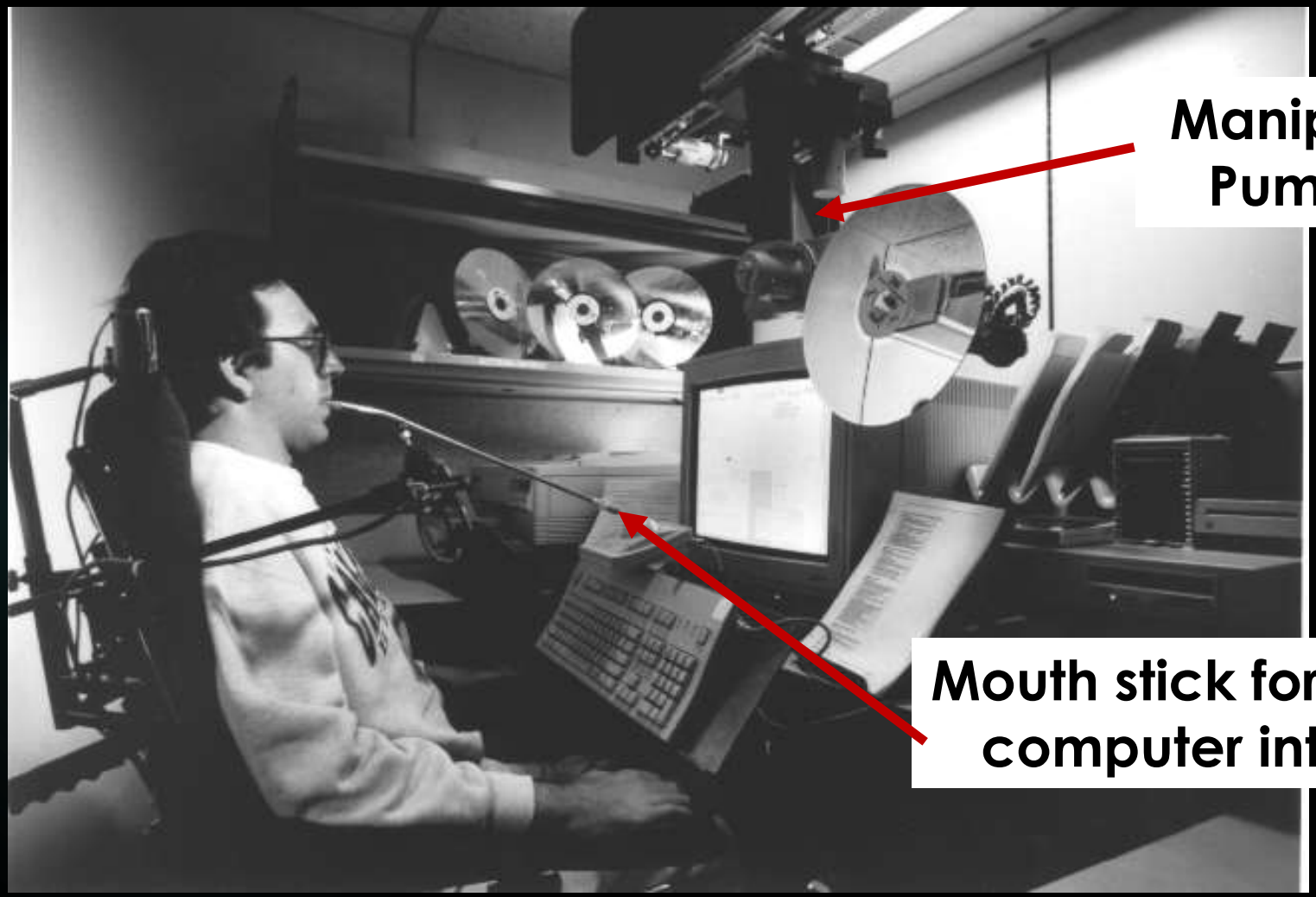
Rancho Golden Arm

Early assistive robots

JHU / APL Robotic Workstation

VA / Stanford MoVar

DeVAR & ProVAR
Desktop Vocational Assistant Robot



DeVAR & ProVAR
Desktop Vocational Assistant Robot

Robotic Arm Responds to Brain Waves

University of Toronto student Ryan Mintz and his team have created a robotic arm that responds to brain waves captured with their headset. Link

Jibo, “The World’s First Family Robot”

Jibo was designed to be an assistant, messenger, photographer, avatar, storyteller, and attentive companion that can help you live with greater independence and stay connected to those you love. Link

Hombot

Hombot is equipped with a camera for care workers to monitor residents, has smoke and gas detectors so it can warn about possible accidents and a receiver linked with sensors worn by residents that can issue a warning if the residents fall down.

A visitor watching an intelligent rehabilitation robot at the 9th China International Exhibition of Senior Care Rehabilitation Medicine and Health Care in Shanghai, May 26.

The use of robots is being considered for elderly care to cope with China's rapidly aging population and a shrinking workforce that includes care workers. Link

Luna

Luna is the first human size personal robot designed for everyday practical use. Luna can keep an eye out for older adults living on their own and help them to remain independent.
Link

Robot Drumming Prosthesis

This robotic drumming prosthesis has motors that power two drumsticks. One is controlled by muscle sensors, the other is autonomous. Jason Barnes can now flex his muscles to send signals to a computer, which tightens or loosens his drumstick. Link

ALIZ-E Nao Robot

A four-and-a-half year study shows social robots are helping children with diabetes accept their condition and be more confident about their futures. Link

Robots4Autism

Zeno R-25 is a revolutionary humanoid robot that engages children with autism faster than traditional therapy and intrinsically motivates them to learn. The goal is to augment traditional therapy by improving a child's ability to use social behaviors in natural contexts now and into adulthood. Link

Kaspar, the social robot

KASPAR is a child-sized humanoid robot designed to help teachers and parents support children with autism.
Link

Panasonic robot for eldercare

Panasonic has developed a nursing-care robot that helps the elderly walk or get out of bed. Link

Pepper

Japanese mobile carrier SoftBank recently introduced a robot named Pepper. The cooing, gesturing, laser-guided robot moves around freely on wheels much like other robots. However, the voice-enabled robot can react to heartfelt emotions as well. Link

Autonomous, Self-Steering Robot Cane

A co-robotic cane developed at the University of Arkansas at Little Rock promises to make life easier for blind people to navigate. The cameras detect obstacles in the user's path and provide audio feedback to facilitate safe travel. In addition, the cane provides guidance via a rolling tip that points in the proper direction.

Link

Soft Robot

This Carnegie Mellon project adapted robotic technology to meet the needs of older adults and people with disabilities, such as washing and feeding. Link

Hello Spoon

HelloSpoon is an assistive device technology developed for those who are unable to feed themselves. Link

Here's That Extra Pair of Robot Arms You've Always Wanted

Supernumerary Robotic Limbs (SRLs) are robotic limbs that, when worn, give you more limbs than you'd normally have. Link

Here's That Extra Pair of Robot Arms You've Always Wanted

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Supernumerary Robotic Fingers

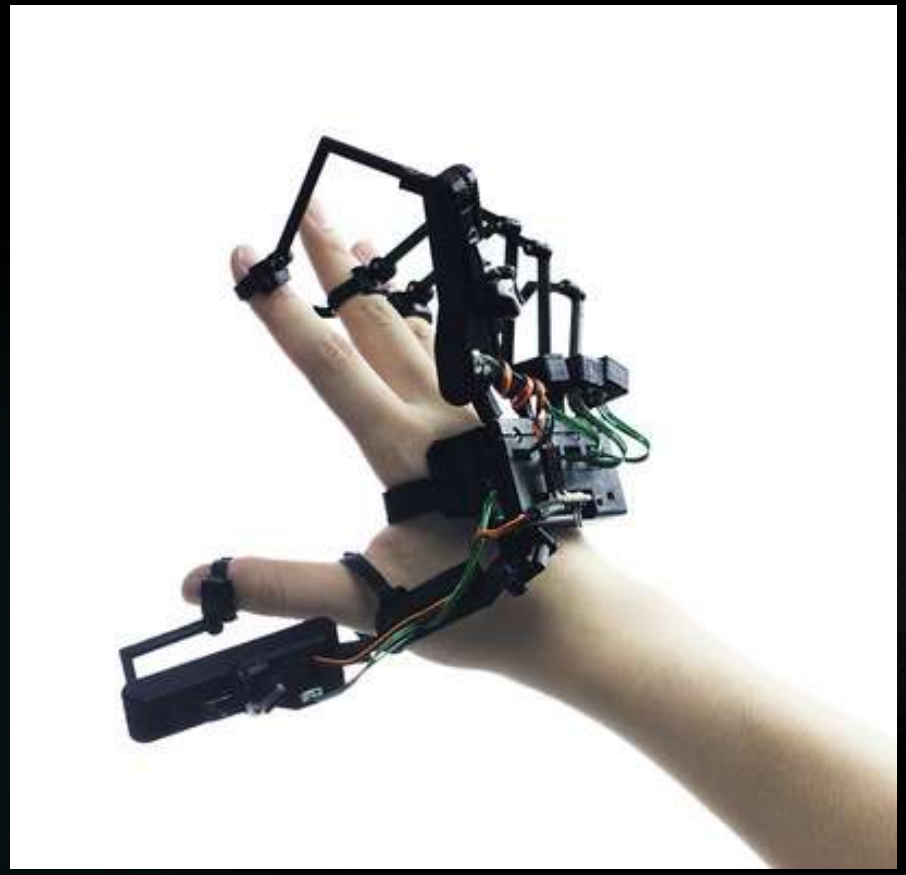
This MIT project added two large fingers to a glove. It lets users do things like hold an object with a couple of fingers while using the others to perform another job such as adding salt to a cup of liquid or opening the top of a jar.
Link

RoboGlove

RoboGlove is essentially a wearable exoskeleton gripping tool. It addresses repetitive stress syndrome by reducing the amount of stress involved in an action or process.

Link

DexmoF2



China's Dexta Robotics has created an exoskeleton for hands to allow gamers to touch the digital world. The Dexmo is a mechanical exoskeleton system that features force feedback, rotational sensors, and injection molded parts. Applications include medical rehabilitation. Link

Project Daniel

Not Impossible Labs used a 3D printer to create custom prosthetics for people like Daniel. The results may be crude compared to commercial solutions, but the cost is considerably lower, making it practical for third-world countries. Link

NASA Exoskeleton

The X1 is essentially a robot that detects the user's movements and augments them. Link

Honda Walking Assist Device

A variation of Honda's Walking Assist Device is being used in hospitals to assist in rehabilitation - is intended to help patients re-learn how to walk. Link

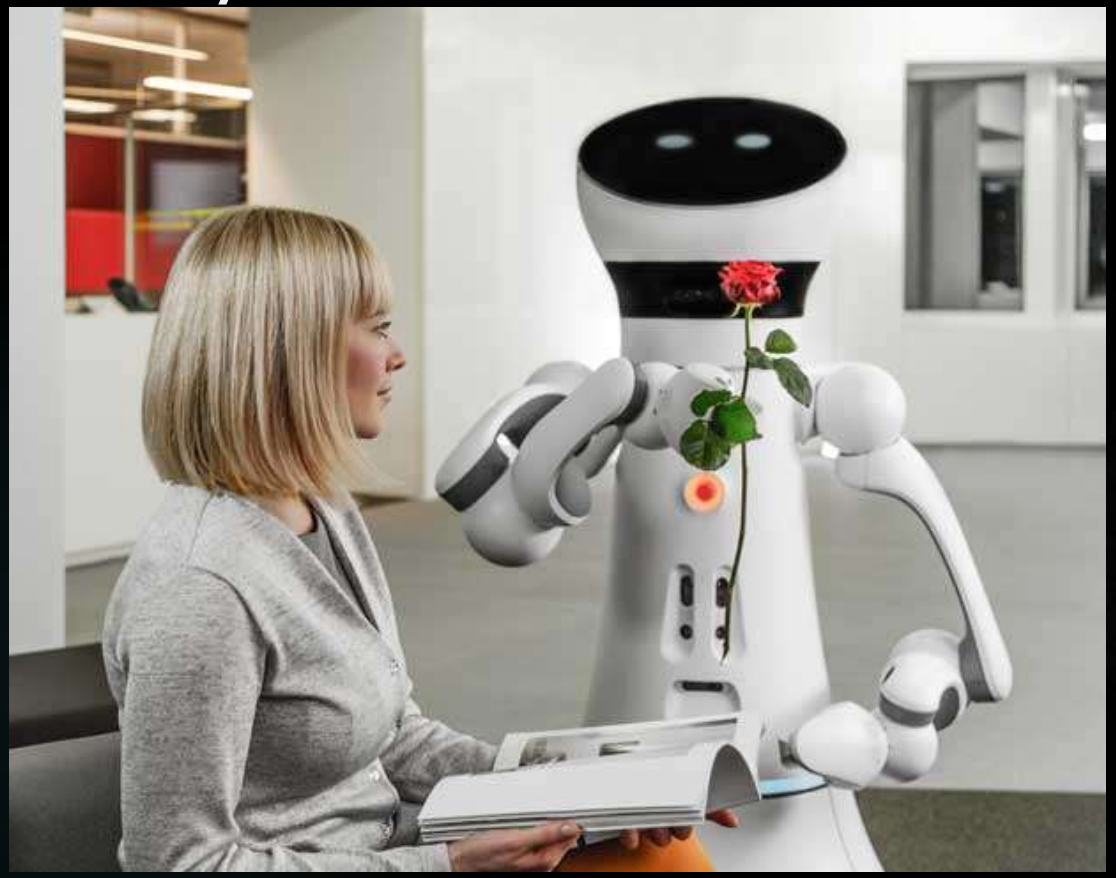
Honda Walking Assist Device with Bodyweight Support

The legs support your body when you crouch and give little tugs on your feet when you walk, making bipedal mobility less of a strain. Link

Honda U3-X

Marketed as a mobility device, the U3-X lets you hop on and zip around a room simply by shifting your body weight. The more you lean, the faster you go. Link

Robot Servant We All Want but Probably Can't Afford



After two decades of refinement, the Care-O-bot 4 robot is constructed out of five modules: base, torso, arms, sensor ring, and head. Each one of these modules can be swapped out depending on what you want the robot to do (and what your budget is).
Link

Personal Assistant for Limbless Teenager

Roboticists created a personal assistant to help Joanne O'Riordan, born without limbs, pick up small everyday items.
Link

Budgee Personal Shopping Robot

Budgee, the robot assistant, can carry 50 pounds and run up to 10 hours on a charge, and it has sensors on the front and side to avoid obstacles.
Link

Mobiserv

Mobiserv developed a social companion robot – an autonomous robot, containing processing power, data storage capability, various sensors, machine learning / experience gathering / adaptation, a touch screen, speech synthesis, and speech recognition. Link

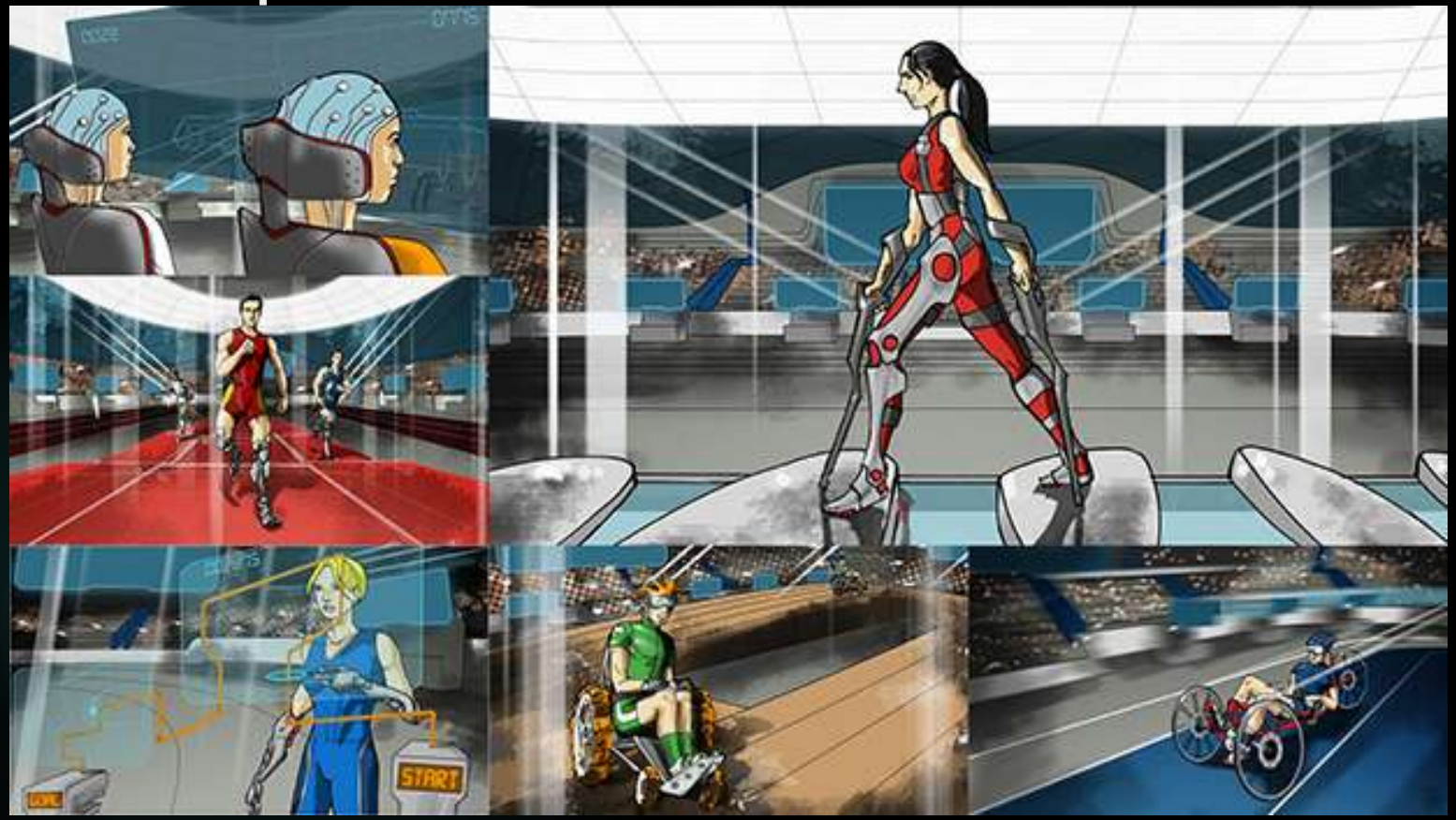
Keithbot

An injury that left one Kennard student unable to walk, isn't keeping him out of the classroom. 15-year-old Keith Griffin was hurt at basketball game, but with the help of a robot, he won't miss any time in school. Link

Exoskeleton Lets Paralyzed Veteran Walk Again

Army Sgt. Dan Rose is the second paralyzed US military veteran to own a motorized exoskeleton from Ekso Bionics.
Link

“Cybathlon” Invites Parathletes to Compete



Cybathlon 2016 is a championship for robot-assisted parathletes, and it sounds awesome. If some part of your body is assisted or moved by external power - for example, a robotic prosthetic or an exoskeleton - you can compete. Link

Soft Robot Glove

The soft robotic glove under development at the Wyss Institute could one day be an assistive device used for grasping objects, which could help patients suffering from muscular dystrophy, amyotrophic lateral sclerosis (ALS), incomplete spinal cord injury, or other hand impairments to regain some daily independence and control of their environment.
Link

Exosuit

MAX (Modular Agile eXoskeleton) is a workplace exoskeleton in three modules that allows workers to complete shoulder, lower back and leg-intensive tasks with reduced injury risk. Link

Prosthetic finger control

An ultrasonic sensor designed to allow amputees to control each individual finger in their prosthetic hand has helped an amputee - a musician - play the piano for the first time since his injury, note researchers from Georgia Institute of Technology. Link

Ohmni

The telepresence robot (called Ohmni) is designed to be as independent as possible. It's potentially ideal for family members who you don't live close to, or elderly family members who you like to talk to (and check up on) regularly.
Link

Exoskeleton Vest

The vest that Paul Collins has been wearing at Ford is made by Ekso Bionics, a Richmond, CA-based company. It's an electronic-free contraption, and the soft part that hugs his chest looks like the front of a backpack. But the back of it has a metal rod for a spine, and a small, curved pillow rests behind his neck. Extending from the spine are spring-loaded arm mechanics, ones that help Collins lift his arms to install carbon cans on Ford C-Max cars, and rubber grommets on Ford Focuses - about 70 cars an hour. Link

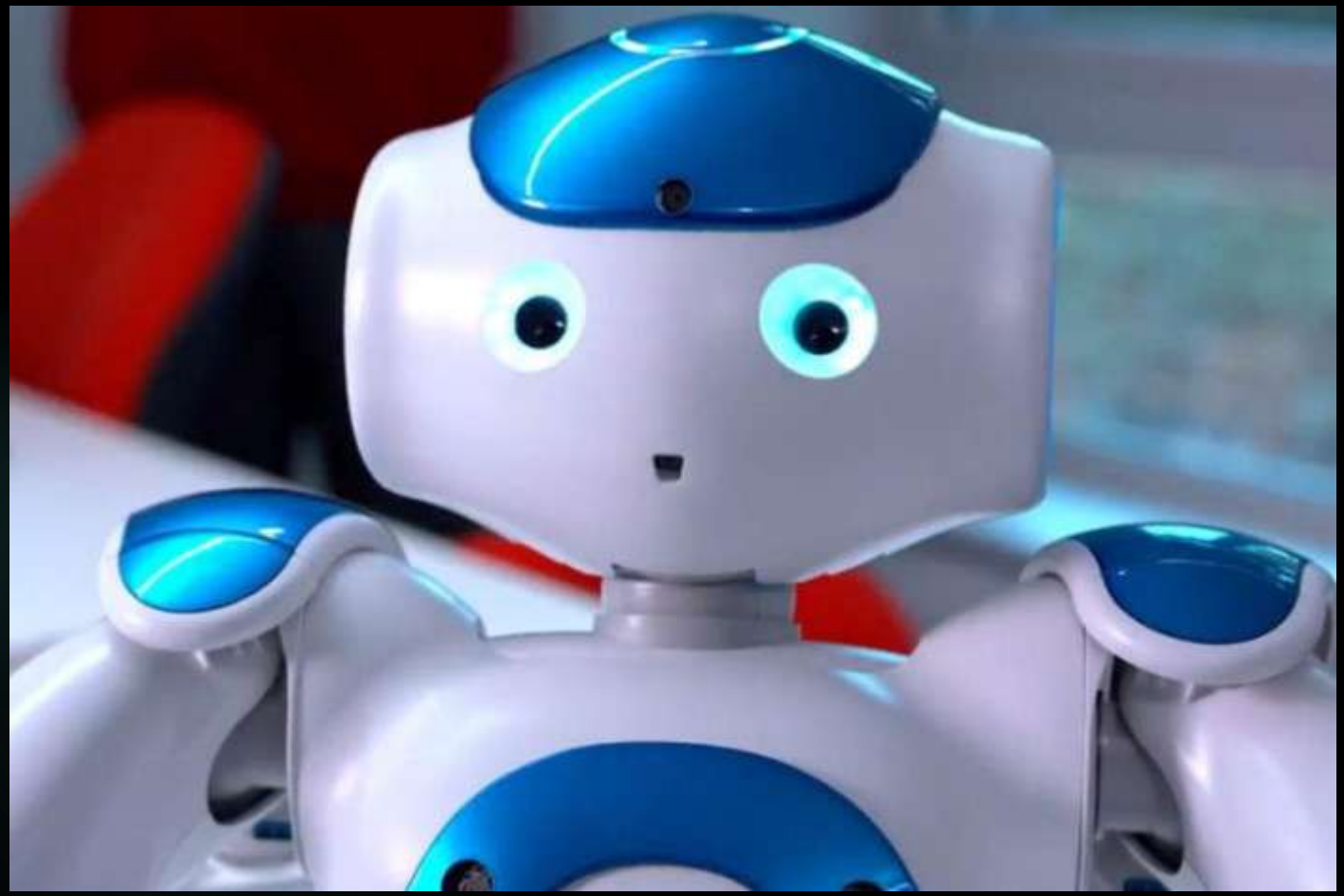
Health Care Assistant for People with Dementia

Stevie can perform some of its jobs autonomously, for example reminding users to take medication. It can also help users stay socially connected. For example, the screens in the head can facilitate a Skype call, eliminating the challenges many users face using telephones. Stevie can also regulate room temperatures and light levels, tasks that help to keep the occupant comfortable and reduce possible fall hazards. Link

A robot named Sophia

Sophia is a social humanoid robot developed by Hong Kong-based company Hanson Robotics. She is able to display more than 62 facial expressions. Sophia has been covered by media around the globe and has participated in many high-profile interviews. While interviewers around the world have been impressed by the sophistication of many of Sophia's responses to their questions, the bulk of Sophia's meaningful statements are believed by experts to be somewhat scripted. Link

Robbie, a toddler size robot



Researchers at Edge Hill University in the UK are developing robots designed to help monitor and care for the elderly, patients, and autistic children. Robbie can recognize 90 common objects as well as human actions and emotions. The researchers say this type of robotic system could become a companion to both children and older adults. Link

Lexo exoskeleton

Student team STARX (STrength Augmenting Robotic eXoskeletons) completed its second year, focused on making practical powered exoskeletons that increase the effective strength of the user. This year, they built a new load-bearing exoskeleton called the Lexo. In its finished state, this device will transfer a load of up to 100 lbs off of the user and into the ground so they do not feel the weight.
Link

Walking exoskeleton

Wandercraft in Paris has created an exoskeleton that will allow patients who are paralyzed from the waist down to walk upright, with a natural gait and the freedom to use their hands. Link

Autonomous wheelchair

Autonomous vehicles can add a new member to their ranks - the self-driving wheelchair. This summer, two robotic wheelchairs made headlines: one at a Singaporean hospital and another at a Japanese airport. Link

Powered clothing

Superflex's elastic muscle technology, developed originally under a DARPA grant intended to help soldiers carry gear with less fatigue, looks like the marriage of a wetsuit and kinesio-tape. An onboard computer ensures that it flexes in concert with your real muscles, much like an electric bike that supplements your pedaling with its motor. Link

Summary

- Robots come in a great variety of forms
- Assistive robots can be used in many ways to help people with disabilities (and their caregivers)
- Much research being pursued, most resulting in one-of-a-kind prototypes
- Few assistive robots are in common use today
- High cost and uncertain benefit are major barriers to their widespread adoption

Thursday, January 25th

Issues of Human Interface Design

Gary M. Berke, MS, CP, FAAOP

Stanford Medical Center

Today

Perspectives of Stanford Students with a Disability

Evan Feinberg

Zina Jawadi

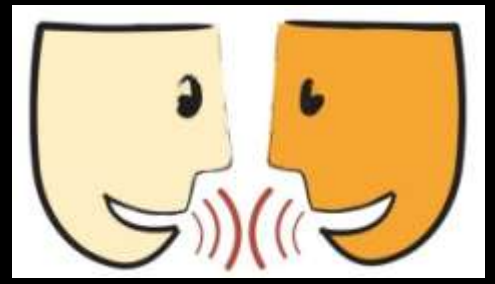
Bryce Connor Tuttle

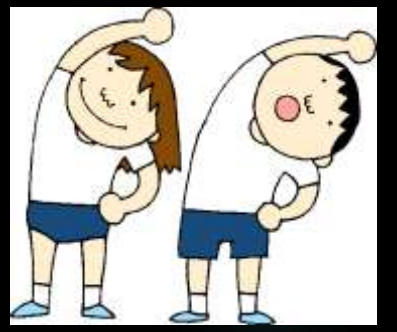
Brickelle Bro

Short Break

Break Activities

- Sign attendance sheet
- Grab a cookie
- Stand up and stretch
- Take a bio-break
- Text message, web-surf, email
- Talk with classmates
- Reflect on what was presented in class





Questions?

Adjourn

Laptops Galore

Time for Questions?

End the class