



DES 5002: Designing Robots for Social Good

Lecture 03

Human-Centered Robotics

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Robot of the Day



Human-Centered Robotics

- The Human Side of Robots
- Social Good Exemplified
 - A Gentle Definition, Clean Air, Smart Phones
- A Conceptual Framework
 - From Literature to Business
- Sustainable Development Goals
 - United Nations, US, China, SET ArDeSoRo

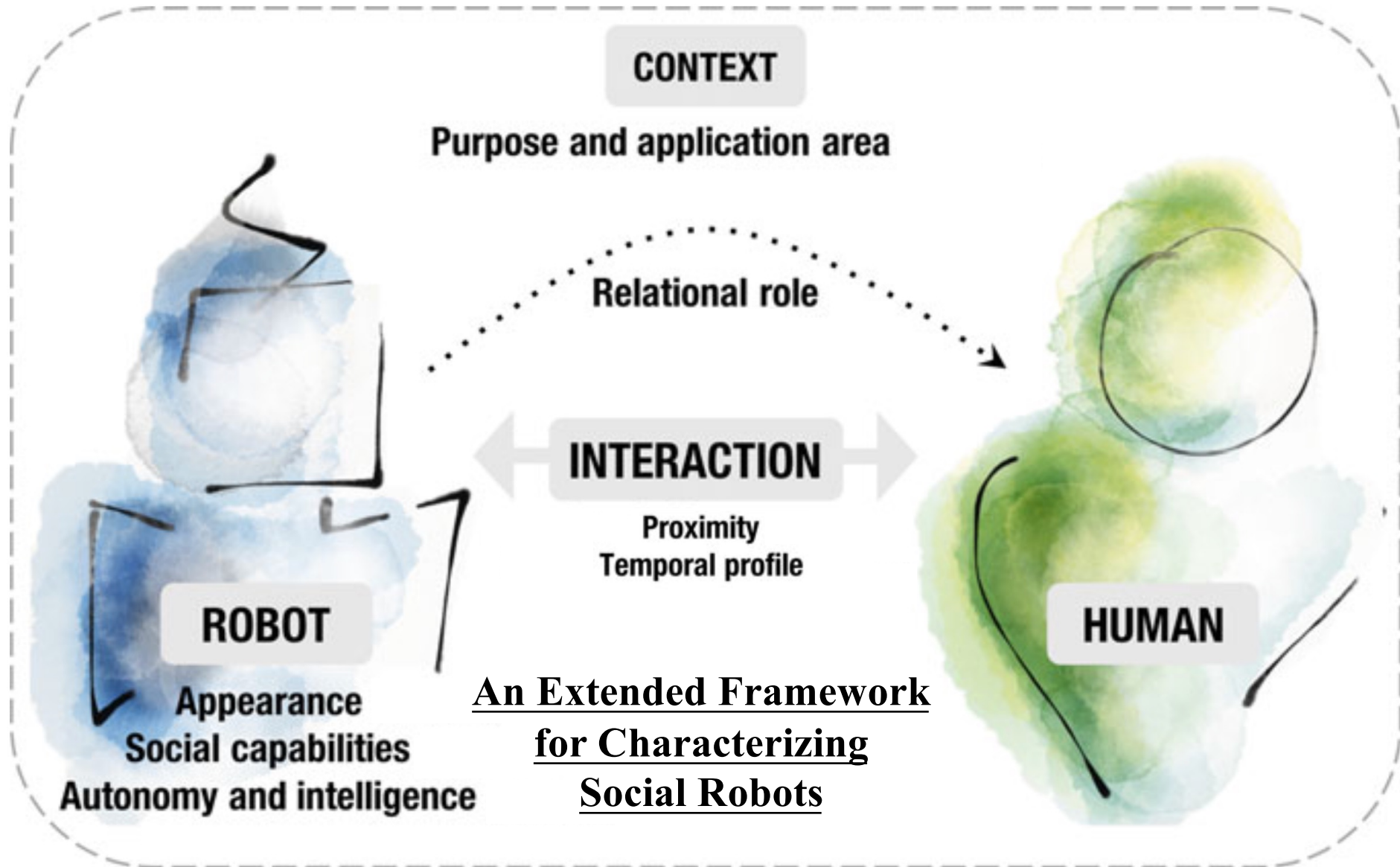
Why Design the Robots?

- Robots are machines that sense, plan, and act towards autonomous interactions.

1. **Defining social good**
2. **Understanding people and contexts**
3. **Deciding whether a robot is needed**
4. **Translating needs into requirements**
5. **Evaluating benefits and trade-offs**



Social Characteristics of Robots



Purpose and application area

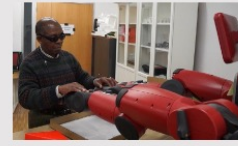
Healthcare and therapy



NAO and child with ASD interacting [16]



Paro emotionally assisting the elderly [168]



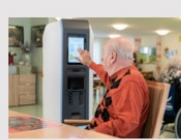
Baxter assisting a blind person [31]



Robota assisting a child with ASD [29]



Pearl assisting an elder person [147]



SeRoDi assisting an elder person



Robear carrying a patient

Industry

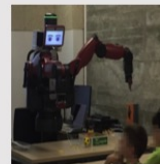


Baxter being synesthetically taught in a factory



Locusbots™ collaboratively operating in a warehouse

Education, entertainment and art



Baxter teaching children [67]



Bee-bot used for educational activities



HERB acting in a play [209]



Furby with a child

Home and workplace



CoBot navigating an office corridor [19]



Care-O-bot 4 in a home



Bossa Nova's supermarket robot



HERB engaging in kitchen tasks

Search and rescue



Inuktun & Packbot equipped with social behavior [25]



Survivor buddy/Inuktun in a simulated disaster environment [181]

Public service



Robovie in a shopping mall [170]



Roboceptionist at department reception [79]



Pepper at a store entrance

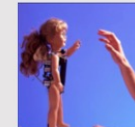


Robotinho on a museum tour [63]

Social sciences

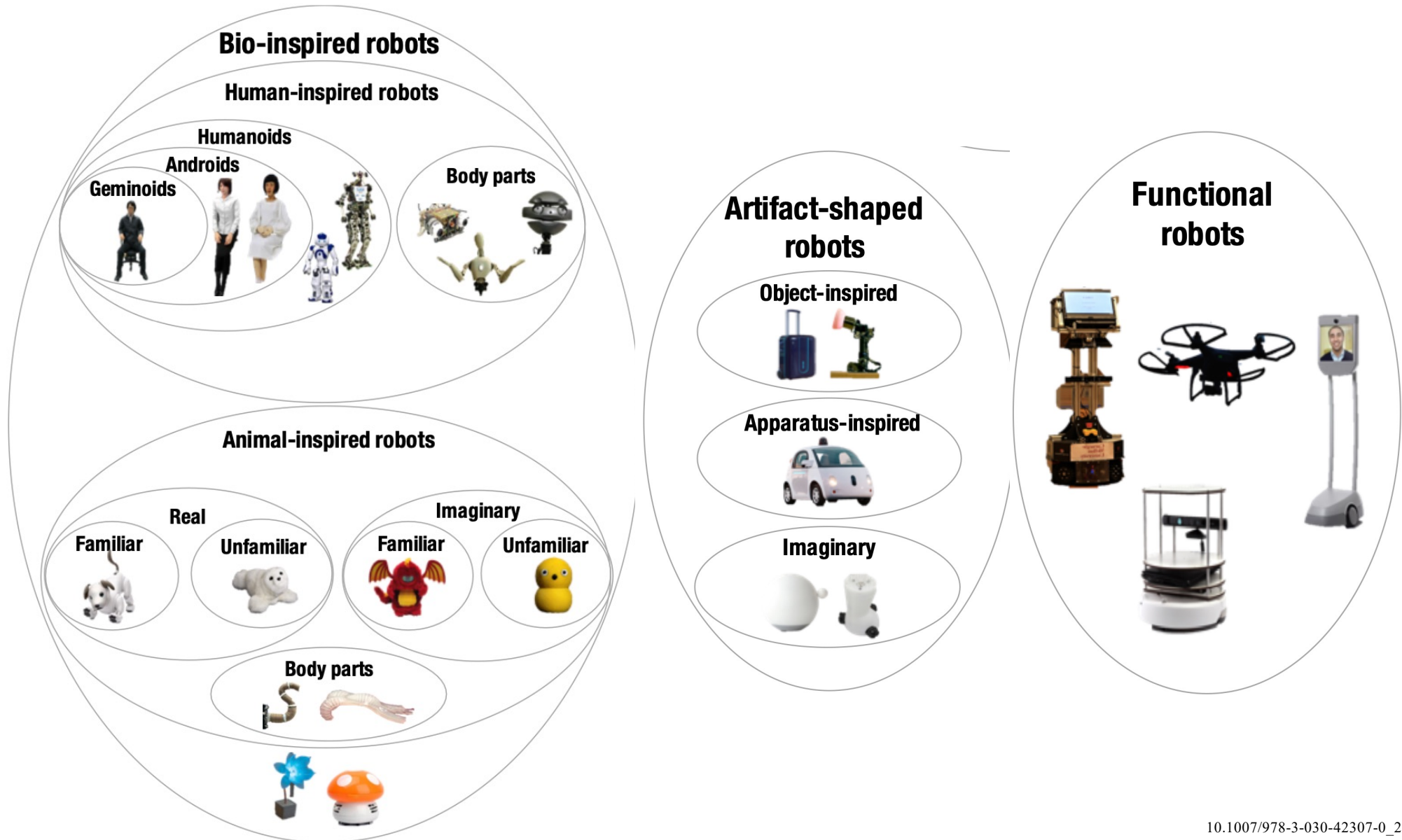


Cog used to study human cognition



Robota used to study child development [53]

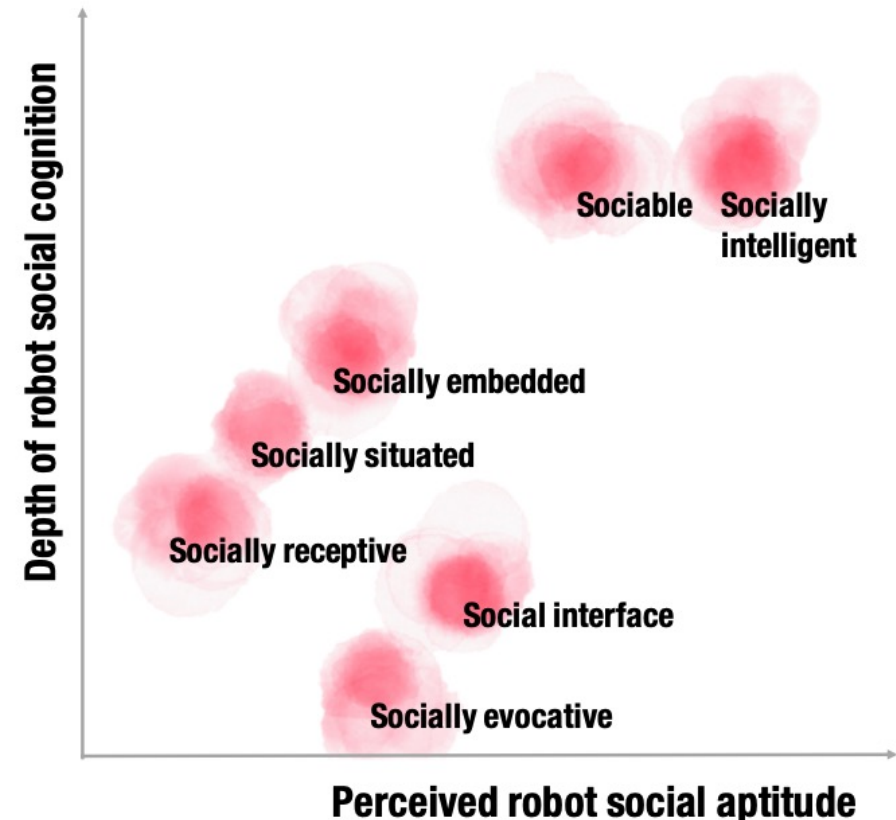
Appearance



Social capabilities

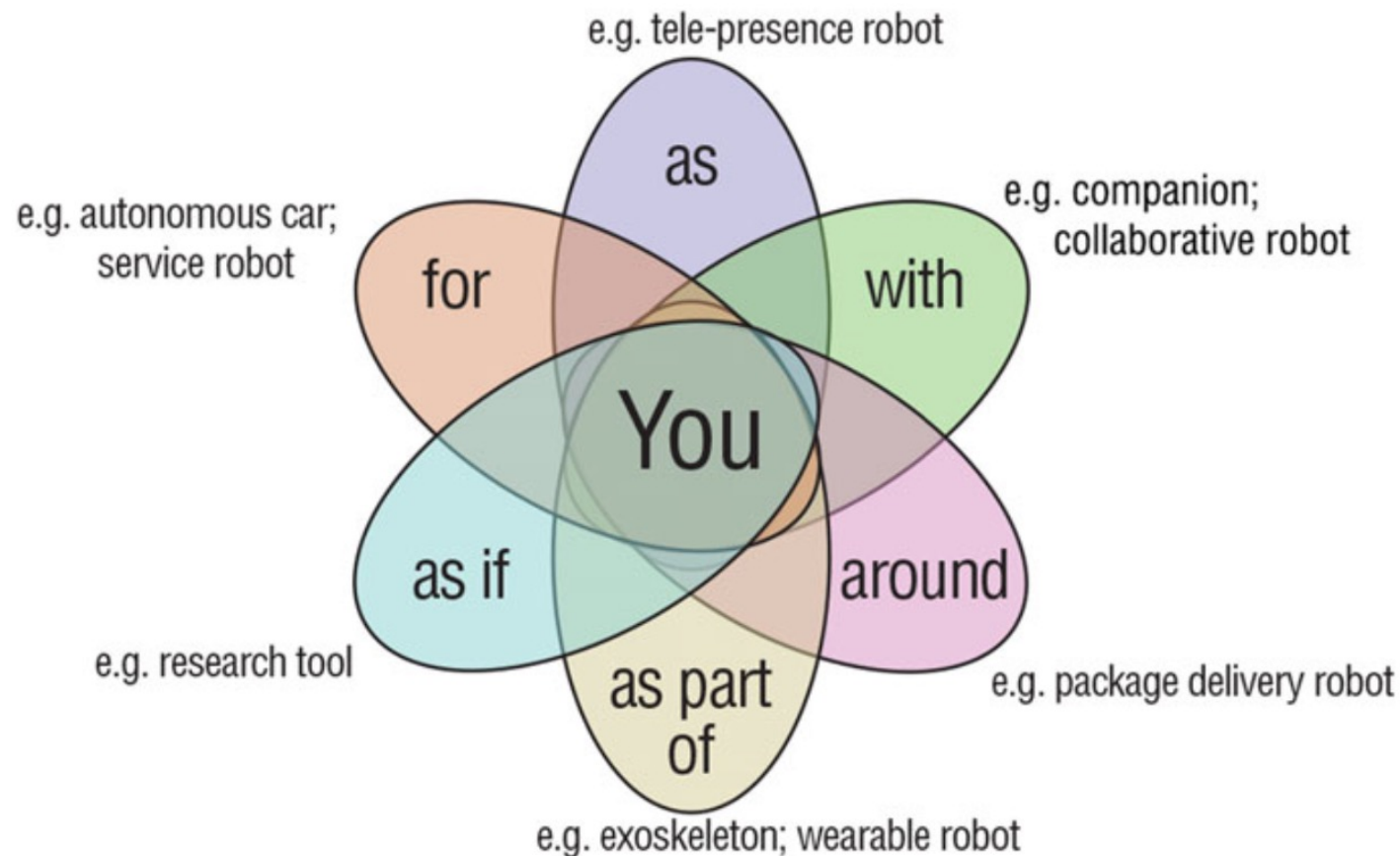
How robots can engage in and maintain social interactions of varying complexities

1. Communicating using natural language or non-verbal modalities (such as lights, movements, or sound)
2. Expressing affective behaviors and/or perceiving human emotions
3. Possessing a distinctive personality or character
4. Modeling social aspects of humans,
5. Learning and/or developing social skills
6. Establishing and maintaining social relationships

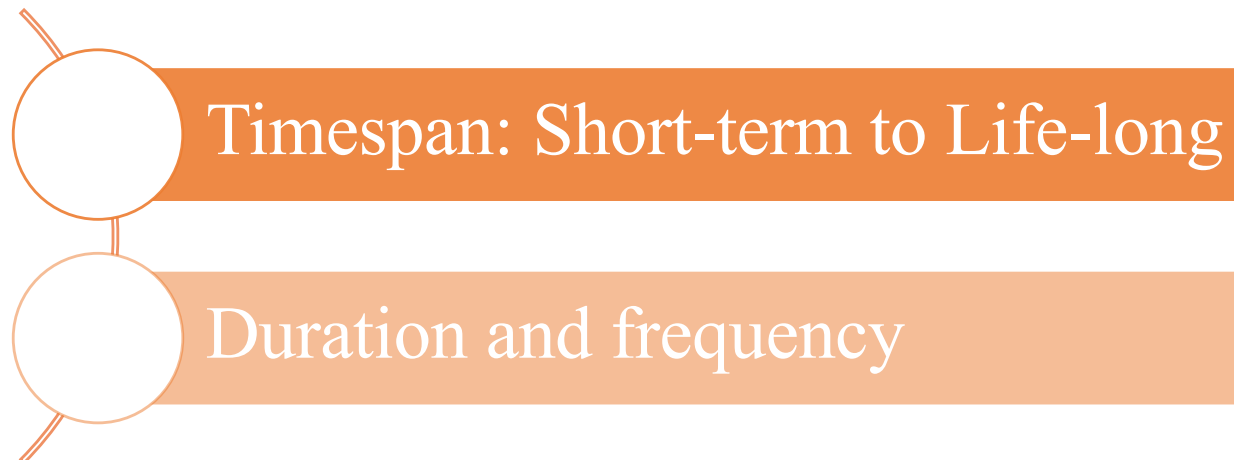
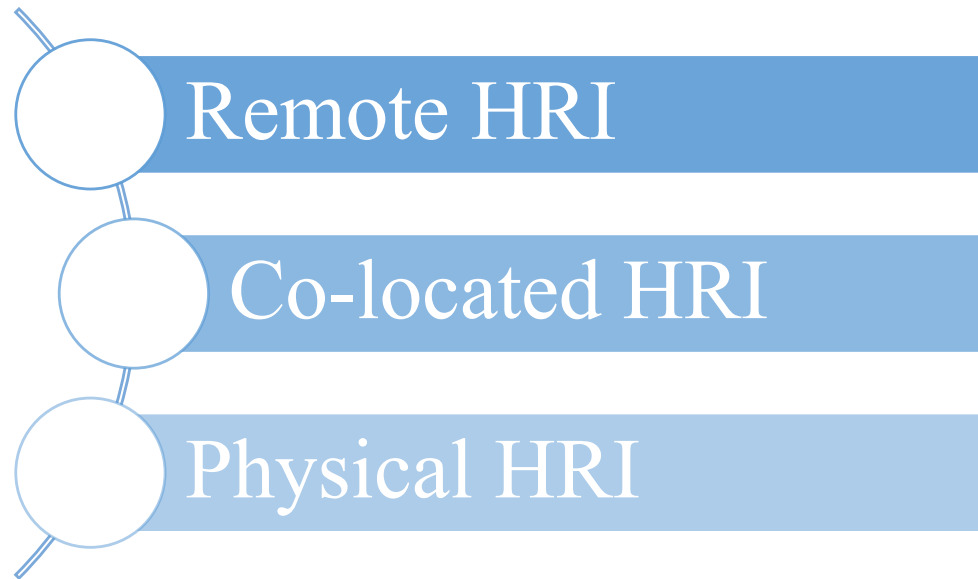


Relational role

The role that a robot is designed to fulfill within an interaction



Proximity and Temporal profile



Examples of Social Good

- Something that benefits the largest number of people in the largest possible way.



Clean Air



Clean Water



Literacy



Healthcare

- Also known as "*common good*," social good can trace its history to Ancient Greek philosophers and implies *a positive impact on individuals or society in general.*

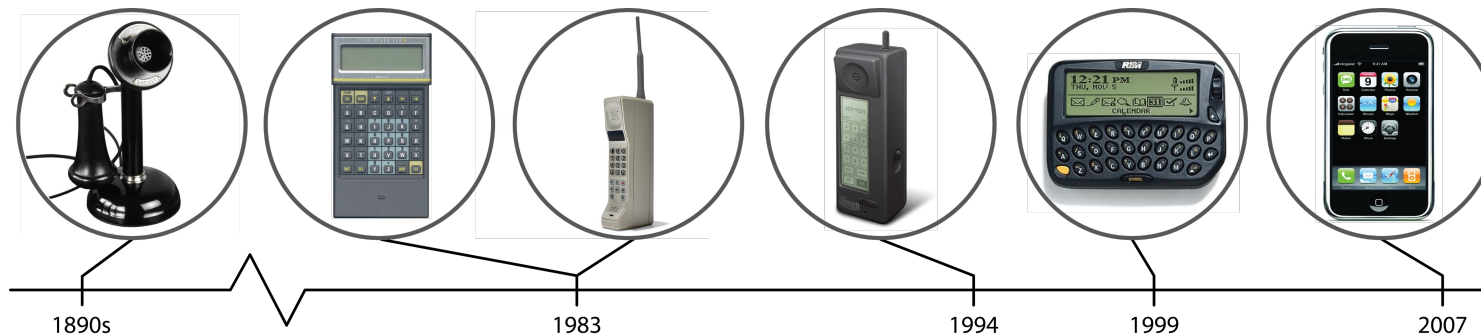
Examples of Social Good

- Something that **benefits** the largest number of people in the largest possible way.
- Something **designed** as a Product or Service for the mass
- Provide benefits for the people as **a positive change**
- **Technology innovation** to enforce possible ways of **impact**

A broad concept that fits almost everything designed

Smart Phones as Social Good?

- Something that benefits the largest number of people in the largest possible way.



- Phones are created to provide wireless communication
- Besides communication, any other benefits?
- How to make smart phones accessible for the mass?
- Would it cause other problems with smart phones?

Smart Phones as Social Good?

PRESS RELEASE

July 21, 2020

Apple commits to be 100 percent carbon neutral for its supply chain and products by 2030



<https://www.apple.com/newsroom/2020/07/apple-commits-to-be-100-percent-carbon-neutral-for-its-supply-chain-and-products-by-2030/>

Already carbon neutral today for corporate emissions worldwide, the company plans to bring its entire carbon footprint to net zero 20 years sooner than IPCC targets



Apple's Climate Roadmap

- **Low carbon product design**
 - Apple will continue to increase the use of low carbon and recycled materials in its products, innovate in product recycling, and design products to be as energy efficient as possible.
- **Expanding energy efficiency**
 - Apple will identify new ways to lower energy use at its corporate facilities and help its supply chain make the same transition.
- **Renewable energy**
 - Apple will remain at 100 percent renewable energy for its operations — focusing on creating new projects and moving its entire supply chain to clean power.
- **Process and material innovations**
 - Apple will tackle emissions through technological improvements to processes and materials needed for its products.

Apple's disassembly robot, Daisy, is the most efficient way to reclaim more of the valuable materials stored in iPhone. Daisy can take apart up to 200 iPhone devices per hour, removing and sorting components, so that Apple can recover materials that traditional recyclers can't — and at a higher quality.



**Apple's disassembly robot, Daisy,
can take apart up to 200 iPhone devices per hour**

Apple's latest recycling innovation — a robot the company is calling “Dave” — disassembles the Taptic Engine from iPhone to better recover key materials such as rare earth magnets and tungsten while also enabling recovery of steel, the next step following its line of “Daisy” iPhone disassembly robots.



奇迹笨小孩?



The other side of Smart Phones



The Zoomer tween in their natural habitat. Leon Neal/Getty Images

#1 NEW YORK TIMES BESTSELLER

The Anxious Generation

How the Great Rewiring of
Childhood Is Causing an Epidemic
of Mental Illness

A
WALL STREET
JOURNAL
TOP 10 BOOK
of 2024

Jonathan Haidt

Coauthor of *The Coddling of the American Mind*

前言 失落的童年

第一部分 Z世代成为焦虑的一代

第1章 Z世代成为焦虑的一代

第二部分 玩耍式童年的退场

第2章 成长的需求：慢慢成长、自由玩耍、现实交往

第3章 成长的动力：冒险式玩耍对儿童发展意义深远

第4章 成长的阻碍：缺失的成人礼对青少年心理影响重大

第三部分 手机式童年的兴起

第5章 孩子面临的4大伤害：社会剥夺、睡眠剥夺、注意力碎片化和成瘾

第6章 焦虑的女孩

第7章 孤独的男孩

第8章 精神的提升还是内在的退化

第四部分 合力守护孩子们的健康童年

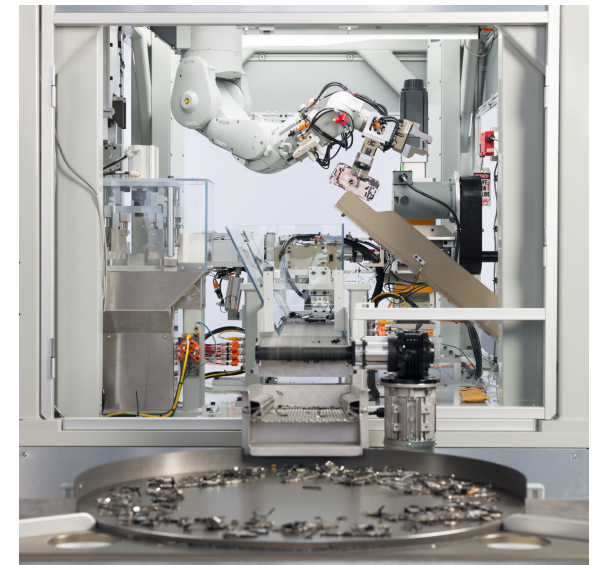
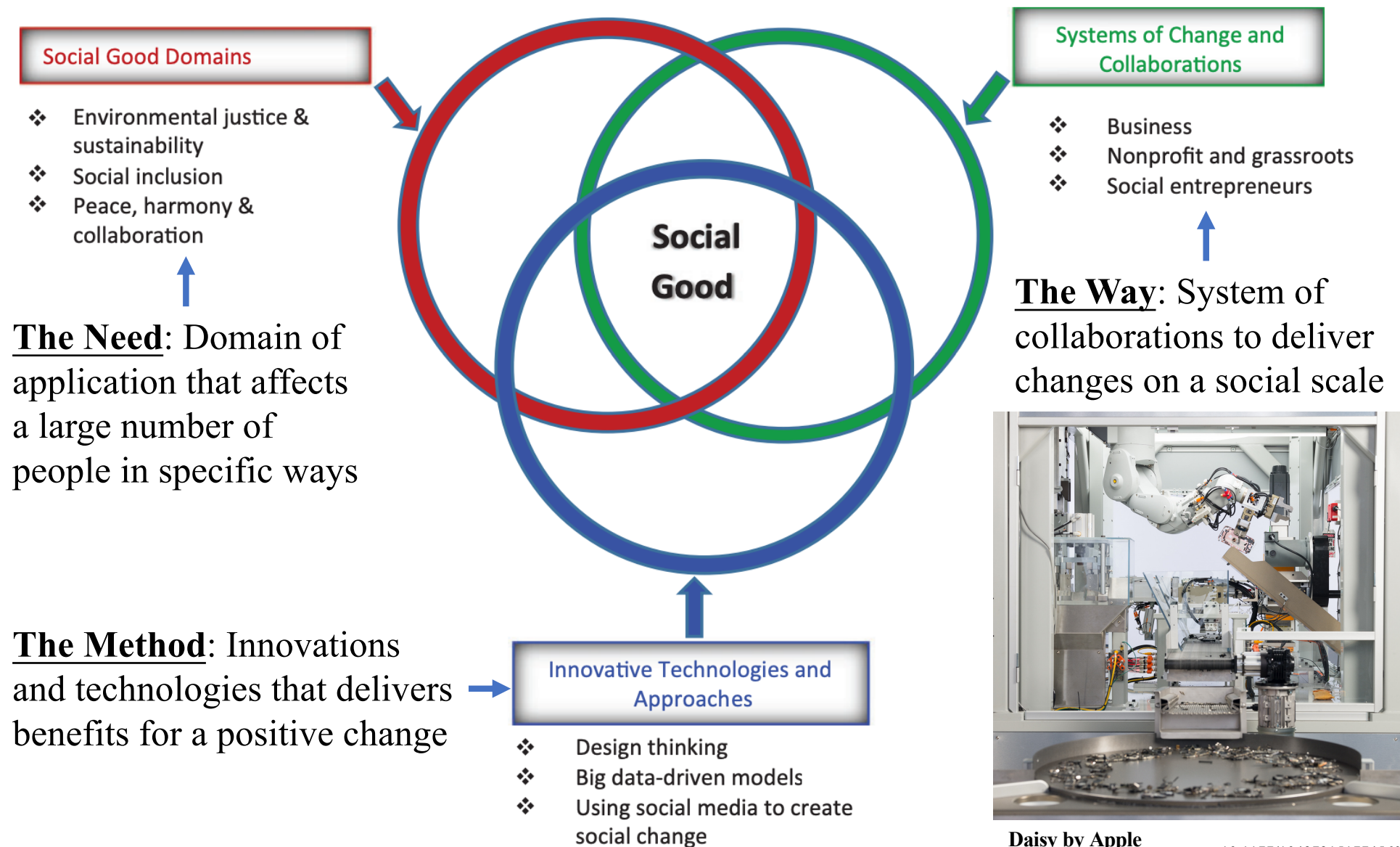
第9章 时代呼吁的集体行动

第10章 社会可以做什么

第11章 学校可以做什么

第12章 父母可以做什么

Conceptual Framework of Social Good



Daisy by Apple

Technology and social adaptation

What new technology offers

Less dangerous and repetitive work
Higher productivity and more time

What society must manage

Job disruption and unequal benefits
Dependency and loss of practice



Will we need a gym for the mind?

Physical automation

Machines reduce physical effort
in many everyday tasks.

People make time for exercise
to maintain physical fitness.

Cognitive automation

AI can take over parts of writing,
analysis and planning.

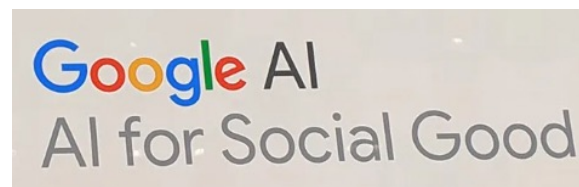
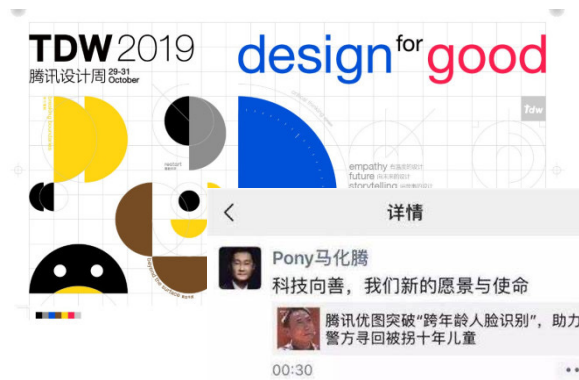
Will we make time for mental
challenges to keep skills active?



Social Good vs. Business Incentives

- The capitalism-based definition of business states that companies exist only to provide the maximum possible return to shareholders.
 - This has often **not** run parallel to serving the common good in ways such as promoting clean air and water or financial independence for all citizens.

As corporations focus more on corporate *sustainability efforts and social responsibility* in recognition of a de facto social contract with the public, their *business models* may expand to *include* more work to promote *social good* in their day-to-day strategies and operations.



Apple commits to be 100 percent carbon neutral for its supply chain and products by 2030



<https://sdgs.un.org/goals>

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17 Goals	169 Targets	230 Indicators
EXAMPLE Goal 1: End poverty in all its forms everywhere 	EXAMPLE Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	EXAMPLE Indicator 1.4.1 Proportion of population living in households with access to basic services EXAMPLE Indicator 1.4.2 Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure

Origins of the SDGs



- The SDGs are the continuation of 8 goals adopted by the UN in 2000 called the Millennium Development Goals (MDGs)
 - A number of world leaders were involved in the creation of these goals
 - The MDGs were set to be achieved by 2015
- The SDGs were created through a mass effort to identify the problems that global citizens believed to be important
 - Door-to-door surveys
 - My World Online Survey
 - The UN Rio+20 Conference
 - An open working group of 70+ countries



Five Themes
of SDGs

Highlights of China's Domestic Progress



- **SDG 6:** access to safe drinking water provided to almost all rural population; innocent treatment of rate of urban garbage reaching 95%; urban sewage treatment rate 92.4%; water quality and efficiency further improved.



- **SDG 7:** formulation of Energy Production and Consumption Revolution Strategy (2016-2030), highly aligned with energy-related SDGs; capability increased in securing energy supply and access to electricity provided to the entire population; energy structure and efficiency steadily improved;



- **SDG 11:** greatly improving government-subsidized housing projects and conditions. By end 2016, 11.26 million families had moved into public rental houses and 2.69 million families enjoyed rental subsidies.



- **SDG 12:** a “dual control” system adopted to control the aggregate consumption volume and intensity of energy and water consumption; further reduction on food waste and production losses; improvement in the management of chemicals and waste, and in green development public awareness and procurement.

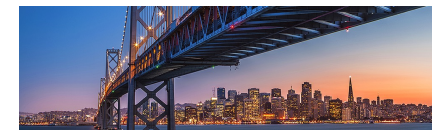
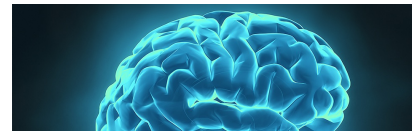


- **SDG 15:** establishment of wetland protection system, restoration of degraded farmland into forests and grassland; prohibition of commercial logging of natural forests.

NAE Grand Challenges for Engineering

- SUSTAINABILITY
 - Make Solar Energy Economical
 - Provide Energy from Fusion
 - Develop Carbon Sequestration Methods
 - Manage the Nitrogen Cycle
- HEALTH
 - Provide Access to Clean Water
 - Advance Health Informatics
 - Engineer Better Medicines
 - Reverse-Engineer the Brain
- SECURITY
 - Prevent Nuclear Terror
 - Secure Cyberspace
- JOY OF LIVING
 - Restore and Improve Urban Infrastructure
 - Enhance Virtual Reality
 - Advance Personalized Learning
 - Engineer the Tools of Scientific Discovery

A Different Perspective on Social Good



A little discussion on your background and research area

Team Formation
4 members per team



DES 5002: Designing Robots for Social Good

Thank you~

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