

# AI 4 sustainability

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“In an **A.I.-first** world, we are rethinking all our products,” Sundar Pichai CEO Google.”  
The New York Times, May 18, 2017

predicted that by 2030, **AI will add up to** USD 15.7 trillion of the global economy which is more than the present output of China and India combined. “

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November 2019

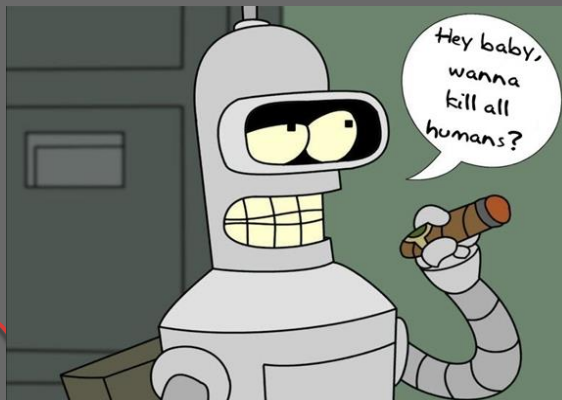


## AI RECAP

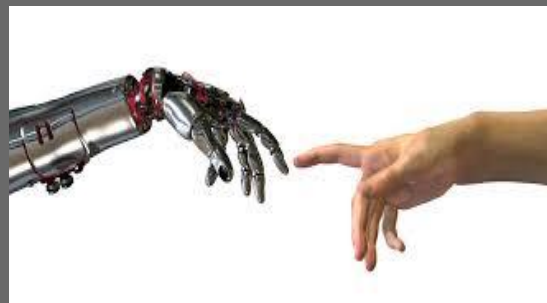
## AI for SUSTAINABILITY



## REALIZATIONS AND THREATS



## AI for GOOD



**Perceive** the accessible Environment

Collect and **interpret** Data either structured or not

Infer **Knowledge** from Data

Apply **Reasoning** processes to Knowledge

**Decide** and take the best possible **Action!**

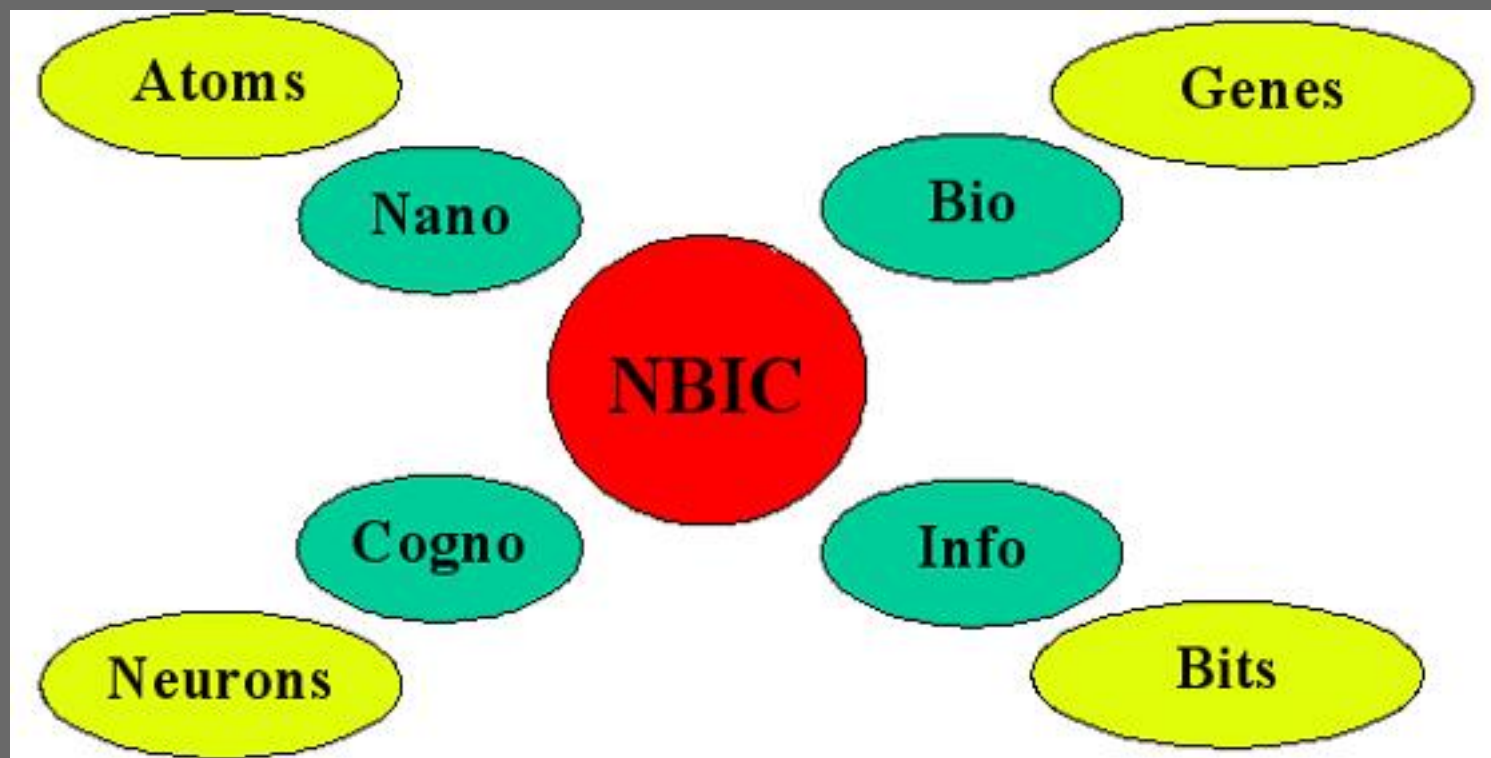
May **learn and adapt** its behaviour

AI was **NATURALLY** created by Humans!!  
Concerning Natural Intelligent, discussion goes on ...



**Criativity ...?**

## Sciences Synergy will shape the future



# What is really NEW about AI ???

✓ **HARDWARE:** High Computational Power

Summit supercomputer

AI/ Deep Learning for climate changes



AI Supercomputer

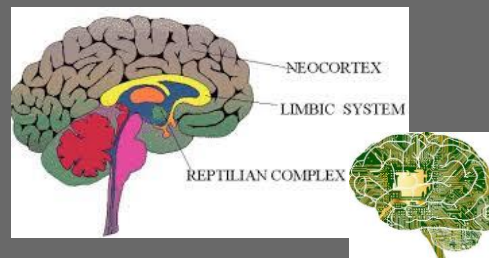


✓ **BIG DATA** (Petabytes  $10^{15}$ ....)

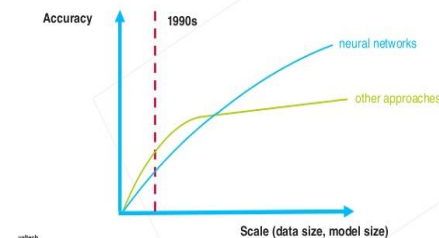


✓ **DEEP LEARNING**

Artificial Neural Networks based



More Data + Bigger Models

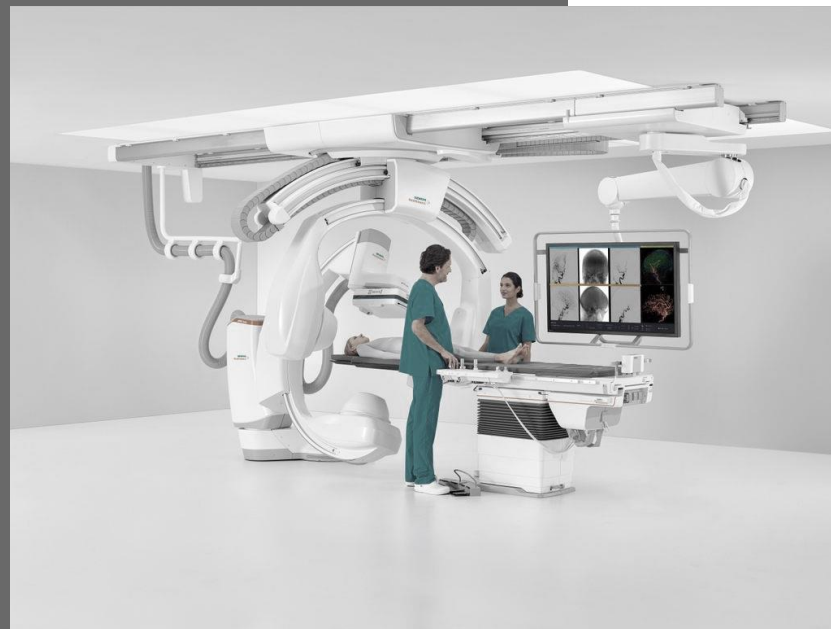


valtech.

<https://www.scribd.com/document/635732799/Jeff-Deans-Lecture-for-YC-AI>

✓ neocortex allows pre-processed sensory signals to propagate through a complex hierarchy of modules

## AI achievements



➤ IBM WATSON Health was tested for the diagnosis of 1000 cancer situations:

99% similar to the best human specialists.

*Propose new unforeseen treatments in 34% of the situations by looking into available research articles*

Good

## AI Impact

How IBM Watson Overpromised and Underdelivered on AI  
Health Care, Eliza Strickland, IEEE Spectrum

carefully controlled experiments.

Only a **few** AI-based tools have been **approved** by regulators

mismatch between the **promise** of ML and the **reality** of medical care



# AI achievements

“IBM **Debater** argued for governments subsidizing preschool. Professional human debater [Harish Natarajan](#) argued against”

Good



selected **ten** most relevant articles from 4 million.  
Scanned 3,000 sentences in top ten articles

Not enough

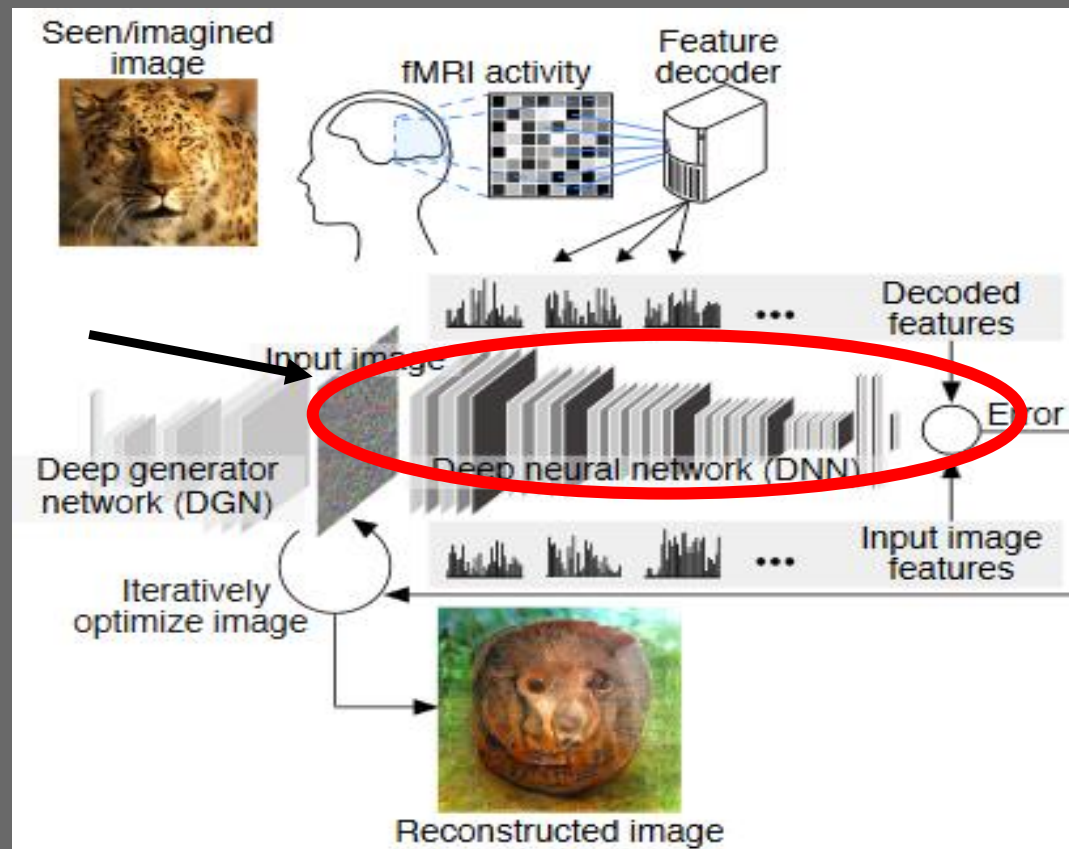
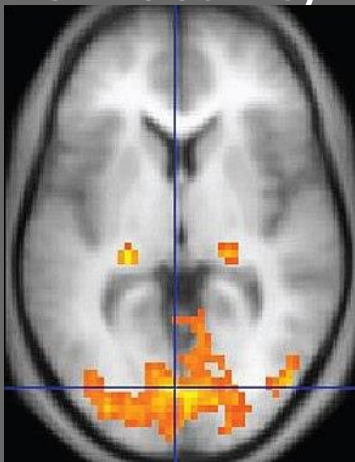
Assessed **pro** and **con opinion polarity** of candidate claims.  
Constructed its **speech with top claim predictions.**



## AI achievements

Detect images/thoughts in the Brain ....

Retrieve Images through fMRI signals of Brain activity



Guohua Shen, Tomoyasu Horikawa, Kei Majima and Yukiyasu Kamitani  
ATR Computational Neuroscience Laboratories, **Kyoto University, Japan**

**OBJECTIVE:**

**Maximize AI Benefits while Minimizing the Risks.**



**Human and Planet-centric approach is needed!!**



**Attention to vulnerable groups: Child, aged people, patients, disabled, minorities and other animal species**

**Attention to asymmetry in Power and Information between Employers and employees, Producers and Consumers, Predators and Preys ...**

Starting a military **AI arms race is a bad idea**, and should be prevented by a ban on offensive autonomous weapons beyond meaningful human control.

Autonomous Weapons: an Open Letter from AI & Robotics Researchers <http://tinyurl.com/awletter>



**By 2030, do you think it is most likely that advancing *AI* and related technology systems will *enhance human capacities* and empower them?**

The answers of the 979 respondents include:

- **63%** who said most people will be better off
- **37%** who said most people will *not* be better off
- 25 respondents who chose not to select either option

**Pew Research Center** , Dec 10, 2018

*Artificial Intelligence and the Future of Humans*

*By Janna Anderson, Lee Rainie and Alex Luchsinger*

## SUSTAINABILITY

**Environmental sustainability** is one of the most promising domains to deploy 'AI for Good'

**Brundtland Report 1987**

Sustainable development is the one that satisfies the needs of the present **without adversely affecting** the conditions for future generations

well-being along three dimensions:

**environmental, social, and economic.**

Naive to expect simple **'win-win-win'** situations

## SUSTAINABILITY

2018 report by Intel, 74% of 200 business decision-makers in environmental sustainability:  
“AI would help solve environmental problems”

WEF study outlines over 80 possible uses for AI solutions:  
Climate protection, autonomous e-mobility, intelligent grids, weather modeling ...

## AI 4 Sustainable Environment



increase the performance of climate modeling

- environment protection policy is largely dependent on the quality of **information** available
- spotting climate **change factors**: tropical cyclones, weather fronts, tidal changes, which can cause heavy precipitation and are often impossible for humans to identify just in time  
**haven't had the tools to read and manage it**
- In India, **AI** has helped farmers **get 30 per cent higher yields** per hectare by providing information on preparing the land, applying fertilizer and choosing sowing dates (Indian Gov. Rep. 2018)

## AI 4 Sustainable Environment

Google's **DeepMind AI** has helped the organization to **curb their data centre energy usage by 40** per reducing overall greenhouse gas emissions." with Earth Friendly' or 'Eco-Friendly' AI mechanisms.

- **IBM Green Horizon** project is utilizing an AI system that can forecast **air pollution**, track pollution sources and develop potential strategies and solutions to tackle it

- Combined with our smart building technology, **Microsoft** will be the first large **corporate campus** to reach **Zero-carbon and Zero-waste** goals



## AI 4 Sustainable Environment

- flexible and autonomous **electric grids**, integrating more renewable energy.
- MAS decide the way people/**PROSUMERS** receive and use electricity in their homes, offices

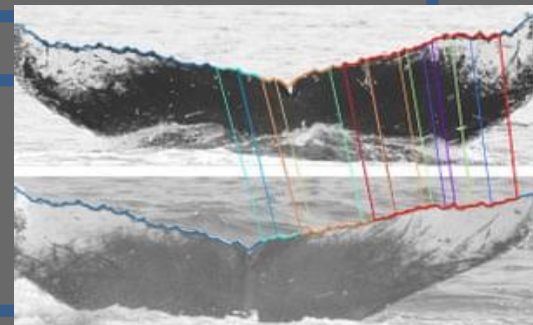
**AI for Earth** can turn huge quantities of data into detailed information about each species of trees in a forest



## AI 4 Sustainable Environment

### WATER

- keep a **track of marine litter** and measure water pollution levels. eight million metric tons of plastic annually dumped into the oceans
- to create a precise picture of each unique ice surface and determine its **melting rate**
- *Ocean Data Alliance* is developing a ML system to provide data from satellites and ocean exploration **to monitor** shipping, ocean mining, fishing, coral or other diseases in the sea
- identify individual humpback **whales** by the edges and visual texture of their parasites.



## AI 4 Sustainable Environment

### LAND

- one-third of the Earth's soil has already been degraded

automated **data** collection and **decision-making** to optimize **farming processes**. Parameters such as hydration, plant nutrition, and diseases can be monitored in real-time

Systems interact directly with crops to detect and act on the best times to plant, spray, and harvest, decreasing the need for the fertilizers and pesticides polluting the soil

. **AI-enabled drones** for plant disease **detection**, poacher route prediction, erosion monitoring, species identification, and animal migration tracking .

Advanced AI and vision techniques

## AI 4 Sustainable Environment

### AIR

- tools to better **monitor pollution** and identify sources of air quality faster and more accurately ... a gas leak ...
- 91 percent of the world population lives in places that fail to meet World Health Organization (WHO) air quality guidelines. it's already killing 7 million people globally each year.
- **Autonomous vehicles** can enact a 2 to 4 percent reduction in oil consumption annually over the next 10 years, *Intelligent Transportation Society of America Report*
- AI-enabled **traffic lights** can contribute to reducing air pollution. Machine vision and AI to adjust to the flow of traffic

## AI 4 Sustainable Environment

We need systems that gather, analyze and intelligently **interpret meaningful data** leading to optimization

- information that arises during the **production** process could be used to **improve the energy consumption** and capacity of machines
- **AI and IoT** for environmental sustainability along with eco-friendly hardware to reduce the generation of **e-waste.**
- if the life cycle of a part is over or has turned faulty it guides the consumer through replacement

**SMART \*: Cities, Homes, Factories**

## Recommendations

ART in ARTificial Intelligence:

**Accountability**, **Responsibility**, **Transparency**

**A:** To **whom** should we address if an autonomous vehicle runs over a pedestrian?

**R:** **System providers** are responsible for the **clarity** of the decision-making.

**T:** **System developers** must guarantee the right **specification**, development and deployment **good practices** of the AI systems. To decide whether or not it is preferable to have the “**Human in the Loop**” and **Ethical Software Constraints**



Say YES to some competences delegation to AI!  
**Obsolete humans ? Never!**

Use AI for Society Good!!!

**Help Planet preservation !!**

**We ALL should be civically interested in the future  
that is being shaped now**

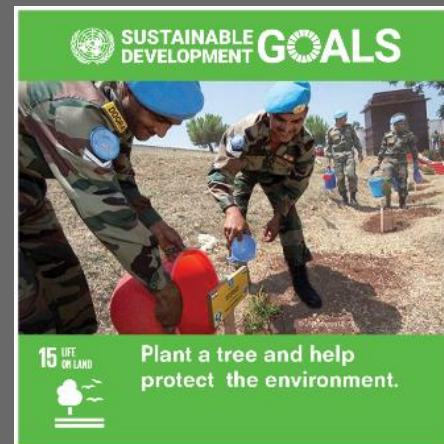
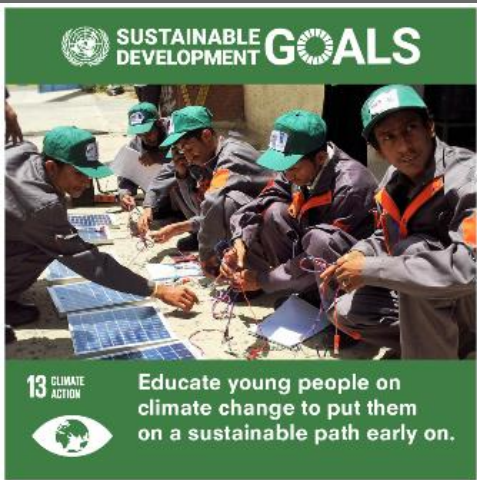
A Organização das Nações Unidas estabeleceu **17 Objetivos do Desenvolvimento Sustentável (ODS)** com metas ambiciosas para 2030



**ODS6.** Água e Saneamento

**ODS7** Energias Renováveis e acessíveis

**ODS11.** Cidades e Comunidades Sustentáveis



**ODS13.** Ação climática

**ODS14.** Proteger a vida marinha

**ODS15.** Proteger a vida terrestre