Università di Genova

SCUOLA DI SCIENZE MATEMATICHE, FISICHE E NATURALI

Science is Scool Cultural Association

Christmas Lecture

Lunedì 15 dicembre | ore 17 | Aula magna | via Balbi 5

IA e tecnologie conviviali. Aspetti sociali, etici e ambientali delle *macchine calibrate con (tanti) dati*

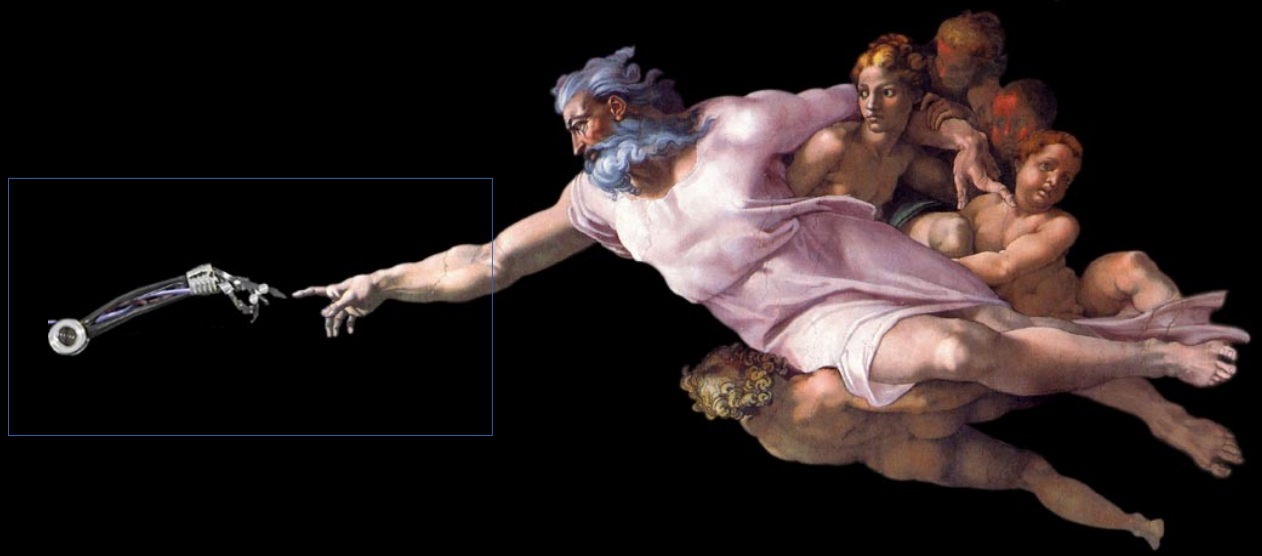
Relatore: Norberto Patrignani. Docente di Computer Ethics al Politecnico di Torino, rappresentante nazionale al TC9-Technology and Society dell'IFIP e nel Committee on Professional Ethics dell'ACM.

L'IA centralizzata in mano alle Big Tech è socialmente, eticamente e ambientalmente insostenibile; è diventata tecnologia del dominio e strumento principale della guerra del XXI secolo.

Può esistere una IA conviviale? Una collezione di strumenti digitali controllati dagli esseri umani per lavorare meglio, basati su tecnologie aperte, comunitarie, decentrate e interoperabili?

Per prenotarsi all'evento consultare il link sul sito della scuola:
https://scienze.unige.it/node/2933

Verrà rilasciato l'attestato di partecipazione a chi lo richiederà



IA e tecnologie conviviali. Aspetti sociali, etici e ambientali delle *macchine calibrate con (tanti) dati*

Università di Genova | Scienze MFN
Scuola di Scienze Matematiche, Fisiche e Naturali

Science is Scool Cultural Association

Genova, 15 Dicembre 02025

l'IA centralizzata in mano alle Big Tech
è socialmente, eticamente e ambientalmente insostenibile

è diventata tecnologia del dominio e
strumento principale della guerra del XXI secolo

possono esistere delle IA
– *macchine calibrate con (tanti) dati* –
decentrate?

esistono delle ***tecnologie conviviali***?
aperte, comunitarie, decentrate e interoperabili?

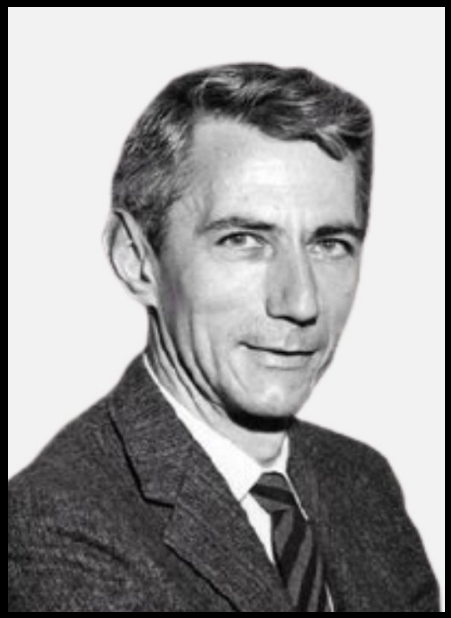
un po' di storia

inizia l'era dell'informazione (diversa da materia e energia!)

Alan Turing
(1912-1954)

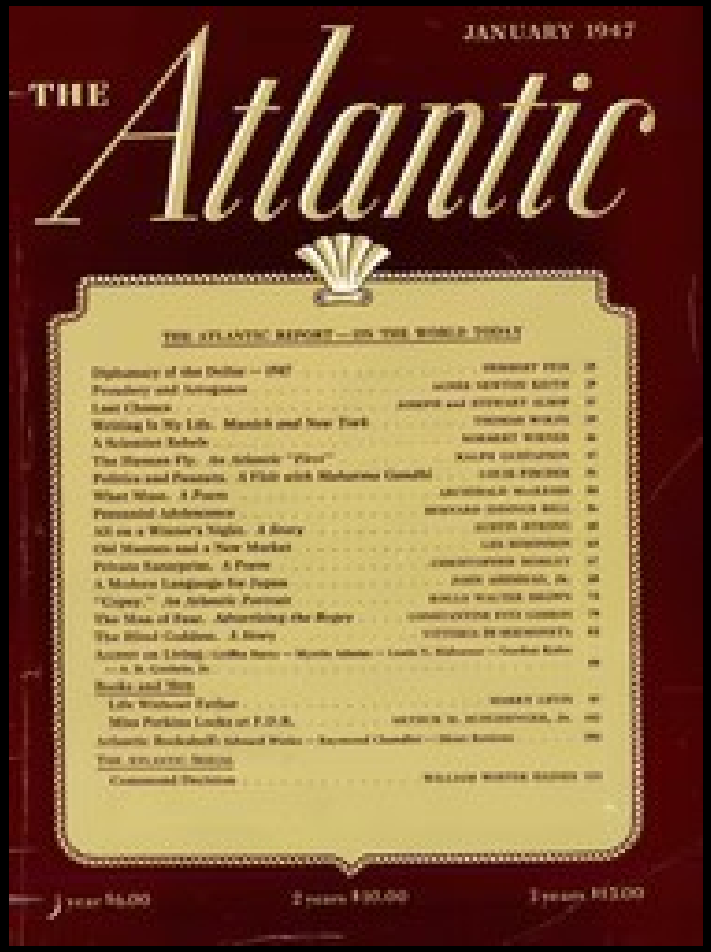
John Von Neumann
(1903-1957)

Norbert Wiener
(1894-1964)



Claude Shannon
(1916-2001)

1947: Wiener, uno scienziato si ribella



A SCIENTIST REBELS

The letter which follows was addressed by one of our ranking mathematicians to a research scientist of a great aircraft corporation, who had asked him for the technical account of a certain line of research he had conducted in the war. Professor Wiener's indignation at being requested to participate in indiscriminate rearmament, less than two years after victory, is typical of many American scientists who served their country faithfully during the war.

Professor of Mathematics in one of our great Eastern institutions, NORBERT WIENER was born in Columbia, Missouri, in 1894, the son of Leo Wiener, Professor of Slavic Languages at Harvard University. He took his doctorate at Harvard and did his graduate work in England and in Göttingen. Today he is esteemed one of the world's foremost mathematical analysts. His ideas played a significant part in the development of the theories of communication and control which were essential in winning the war. — THE EDITOR

SIR: —

I have received from you a note in which you state that you are engaged in a project concerning controlled missiles, and in which you request a copy of a paper which I wrote for the National Defense Research Committee during the war.

As the paper is the property of a government organization, you are of course at complete liberty to turn to that government organization for such information as I could give you. If it is out of print as you say, and they desire to make it available for you, there are doubtless proper avenues of approach to them.

When, however, you turn to me for information concerning controlled missiles, there are several considerations which determine my reply. In the past, the comity of scholars has made it a custom to furnish scientific information to any person seriously seeking it. However, we must face these facts: The policy of the government itself during and after the war, say in the bombing of Hiroshima and Nagasaki, has made it clear that to provide scientific information is not a necessarily innocent act, and may entail the gravest consequences. One therefore cannot escape reconsidering the established custom of the scientist to give information to every person who may inquire of him. The interchange of ideas which is one of the great traditions of science must of course receive certain limitations when the scientist becomes an arbiter of life and death.

For the sake, however, of the scientist and the public, these limitations should be as intelligent as possible. The measures taken during the war by our military agencies, in restricting the free intercourse among scientists on related projects or even on the same project, have gone so far that it is clear that if continued in time of peace this policy will lead to the total irresponsibility of the scientist, and ultimately to the death of science. Both of these are disastrous for our civilization, and entail grave and immediate peril for the public.

I realize, of course, that I am acting as the censor of my own ideas, and it may sound arbitrary, but I will not accept a censorship in which I do not participate. The experience of the scientists who have worked on the atomic bomb has indicated that in any investigation of this kind the scientist ends by putting unlimited powers in the hands of the people whom he is least inclined to trust with their use. It is perfectly clear also that to disseminate information about a weapon in the present state of our civilization is to make it practically certain that that weapon will be used. In that respect the controlled missile represents the still imperfect supplement to the atom bomb and to bacterial warfare.

The practical use of guided missiles can only be to kill foreign civilians indiscriminately, and it furnishes no protection whatsoever to civilians in this country. I cannot conceive a situation in which such weapons can produce any effect other than extending the kamikaze way of fighting to whole nations. Their possession can do nothing but endanger us by encouraging the tragic insolence of the military mind.

If therefore I do not desire to participate in the bombing or poisoning of defenseless peoples — and I most certainly do not — I must take a serious responsibility as to those to whom I disclose my scientific ideas. Since it is obvious that with sufficient effort you can obtain my material, even though it is out of print, I can only protest *pro forma* in refusing to give you any information concerning my past work. However, I rejoice at the fact that my material is not readily available, inasmuch as it gives me the opportunity to raise this serious moral issue. I do not expect to publish any future work of mine which may do damage in the hands of irresponsible militarists.

I am taking the liberty of calling this letter to the attention of other people in scientific work. I believe it is only proper that they should know of it in order to make their own independent decisions, if similar situations should confront them.

NORBERT WIENER

46

Fonte: Wiener, N. (1947). A Scientist Rebels, *The Atlantic*, January

1955: Dartmouth

Alan Turing (1912-1954) era morto,
John Von Neumann (1903-1957) era molto malato (1955),
Norbert Wiener (1894-1964) NON venne invitato...
Claude Shannon venne invitato

A PROPOSAL FOR THE
DARTMOUTH SUMMER RESEARCH PROJECT
ON ARTIFICIAL INTELLIGENCE

J. McCarthy, Dartmouth College
M. L. Minsky, Harvard University
N. Rochester, I.B.M. Corporation
C.E. Shannon, Bell Telephone Laboratories

August 31, 1955

Oliver Selfridge, Nathaniel Rochester, Marvin Minsky, John McCarthy
Ray Solomonoff, Peter M. Milner, Claude Shannon

Fonte: Solomonoff, G. (2023, 6 May). The Meeting of the Minds That Launched AI, IEEE Spectrum

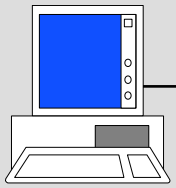
2001: Cloud Computing: Back to the Future

1950

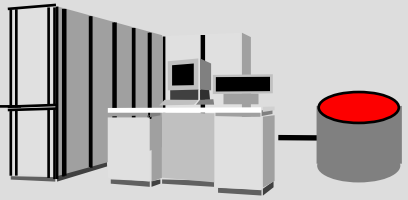
Input

Output

Network



Terminals



Host

Storage

Processing

Host-Centric Computing

1965

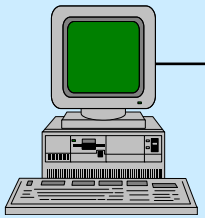
Input

Storage

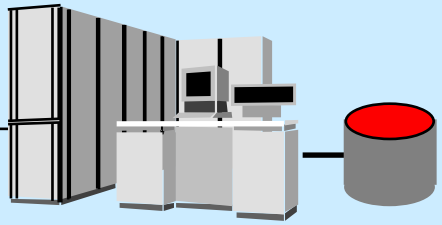
Processing

Output

Network



PCs



Host

Distributed, Client/Server Computing

2000

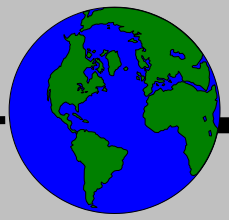
"all IP addresses are equal" but some IP addresses are more equal than others...

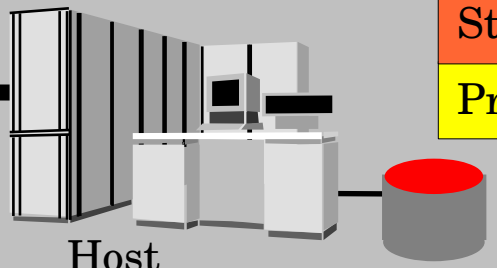
Input

Output

Network

TouchScreens





Host

Storage

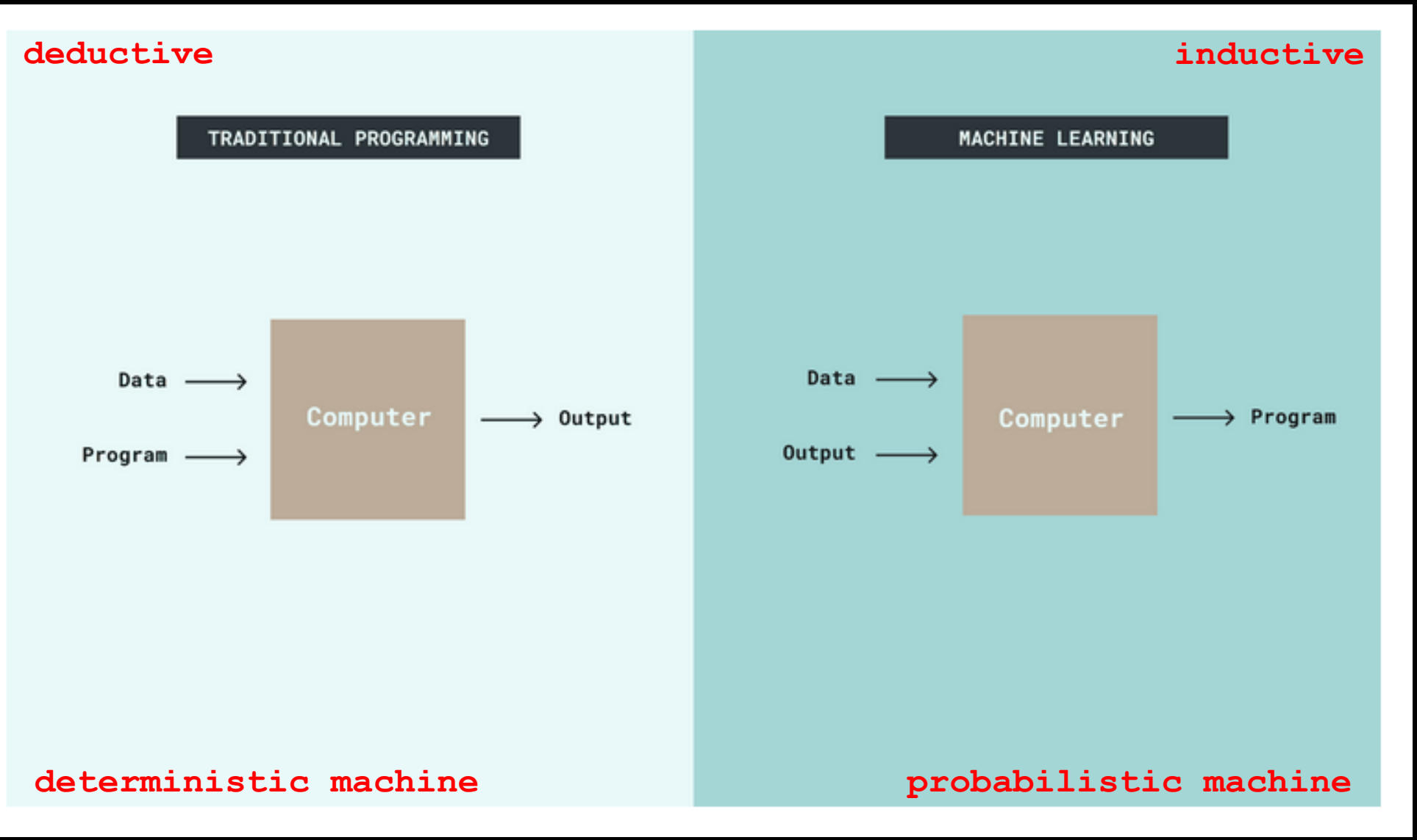
Processing

Cloud Computing

Habeas Data?

Fonte: Bansky, *Mobile Lovers*, 2014

programmazione tradizionale (*software algoritmico*) vs machine learning (*software statistico*)



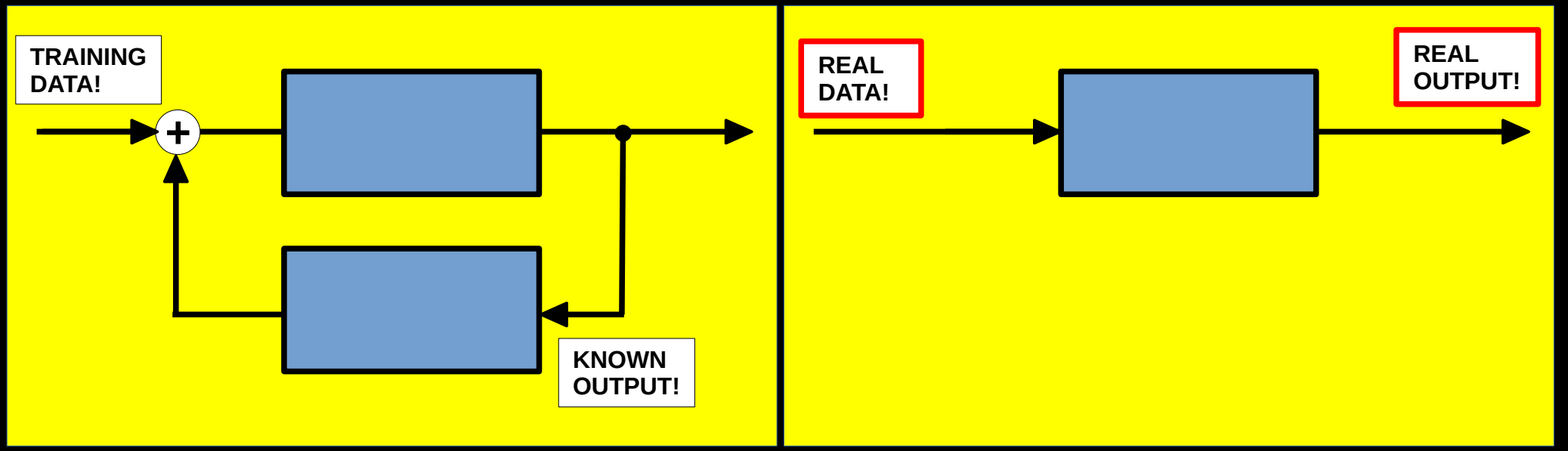
Machine Learning (ML): il sistema genera (calibra) le regole (programma) dagli esempi (dati)

Large Language Models (LLM): il sistema costruisce una "rappresentaione statistica del mondo" e la usa per generare "nuovi" contenuti basati su brevi descrizioni ("prompt engineering", nuovo paradigma di interazione HCI!)

Fonte: Harvard University (2024). Fundamentals of ML

1941-1960, conferenze Macy Foundation sulla cibernetica

cibernetica (Wiener, 1948)
Norbert Wiener (1894-1964): il feedback loop,
nel "machine learning" l'idea di base è: "minimizzare l'errore"



"calibrazione" "calcolo"

Fonte: Patrignani N., Whitehouse D. (2018). *Slow Tech and ICT*. Palgrave-McMillan

2009: ImageNet

ImageNet project leader

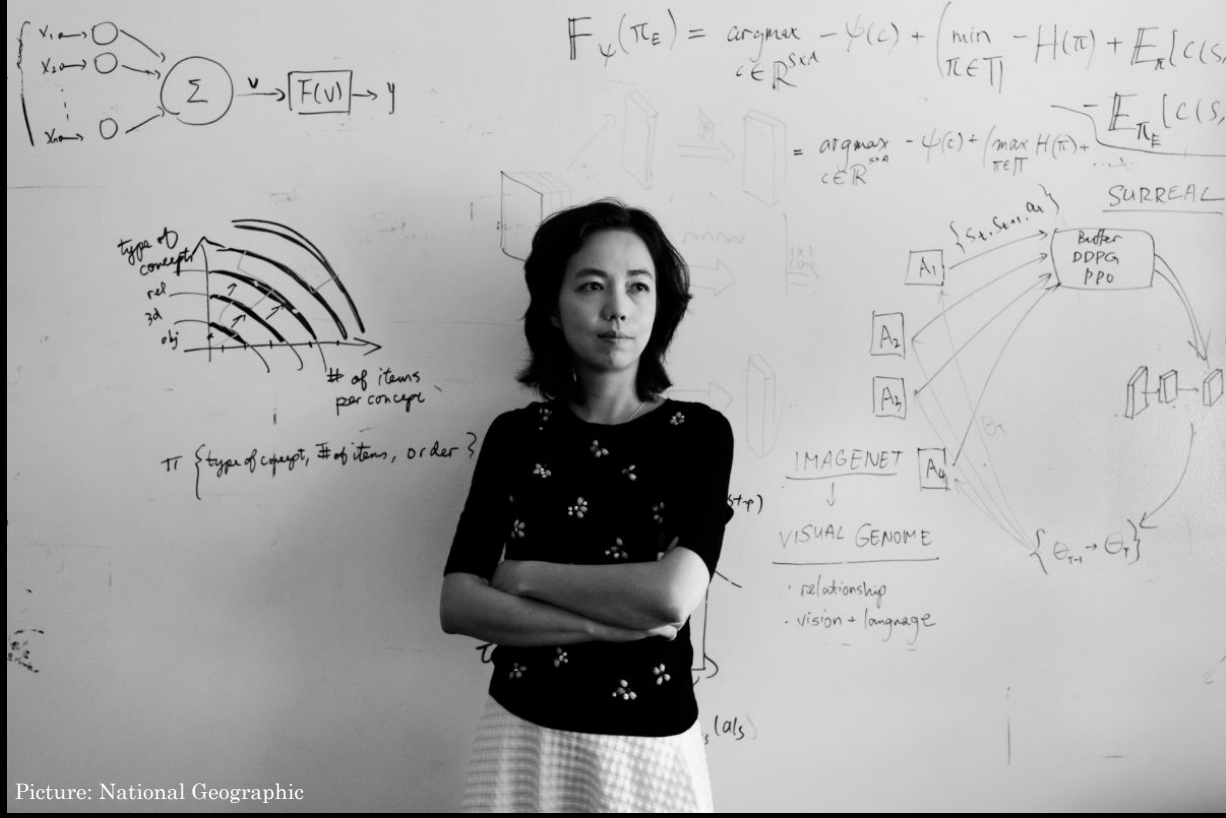
Professor of computer science at
Stanford University

Co-director of the Stanford Institute for
Human-Centered Artificial Intelligence

Co-director of the Stanford Vision and Learning Lab

Director of the
Stanford Artificial Intelligence Laboratory (SAIL)

Co-founder AI4ALL

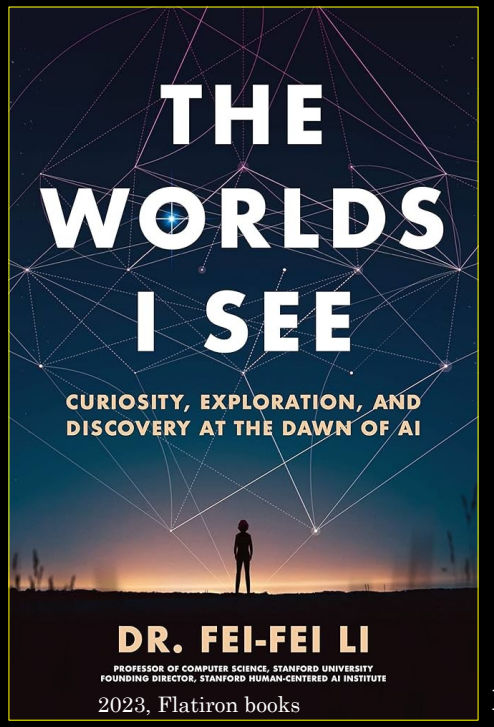


Picture: National Geographic

Fei-Fei Li

14 x 10^6 immagini, > 20.000 categorie
manualmente (!) annotate (50 immagini / minuto) da
49.000 (Amazon Mechanical Turk) lavoratori da 150 paesi...


Picture: Andrej Karpathy



2023, Flatiron books

Fonte: IEEE Conference on Computer Vision and Pattern Recognition, Miami, IEEE, 18 August 2009,
Jia Deng; Wei Dong; Richard Socher; Li-Jia Li; Kai Li; Li Fei-Fe (2009). IImageNet: A large-scale hierarchical image database, IEEE Explore

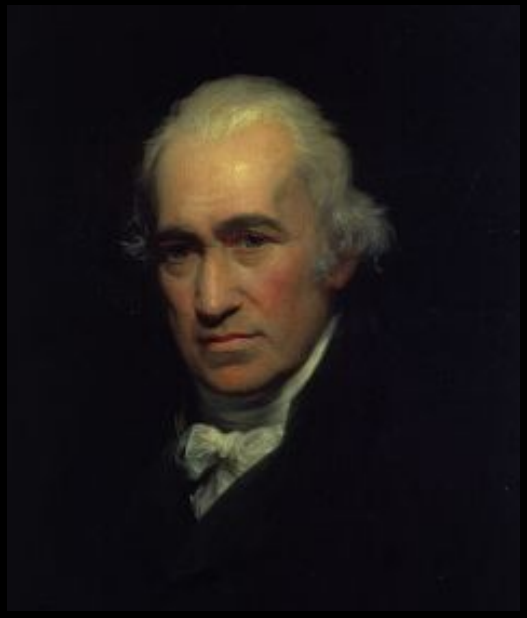
etica e AI: trasparenza?

"...quello che questa nuova generazione di IA
era in grado di fare -
buono o cattivo, atteso o meno -
veniva complicato dalla
mancanza di trasparenza intrinseca
nella sua progettazione ..."

Fei Fei Li, 2023

Fonte: Fei Fei Li (2023). *The Worlds I See*, Flatiron, p.284

1788: James Watt, *la macchina a vapore*
1824: Carnot, *leggi della termodinamica, entropia, la freccia del tempo*



James Watt
(1736-1819)

Sadi Carnot
(1796-1832)

"*reinserire nella meccanica*
la scienza delle macchine,
che ne era rimasta separata"
(Carnot)

36 anni dopo
la macchina
viene compreso
come e *perché* funzionava ....

macchine a vapore = artefatti empirici (fino a Carnot!) ... come i chatbot!?

Fonte: S.Colonna, "Mantenimento dell'equilibrio tra produzione e utilizzazione in un sistema a rete", 2014

2012: AlexNet

DOI:10.1145/3065386

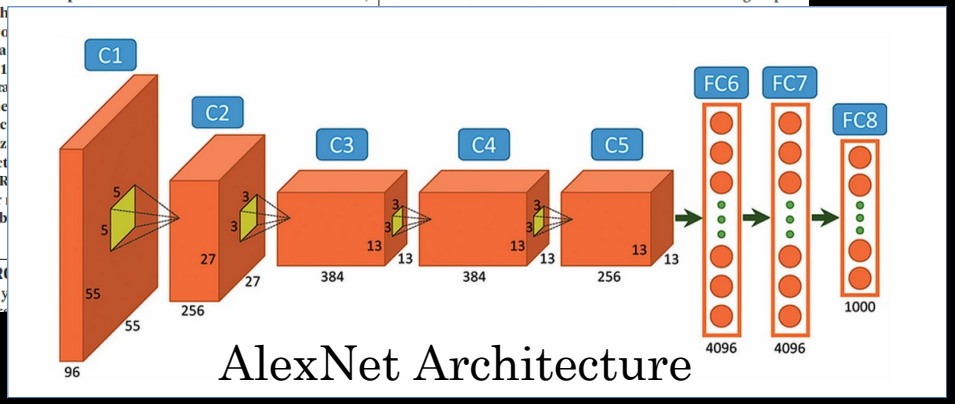
ImageNet Classification with Deep Convolutional Neural Networks

By Alex Krizhevsky, Ilya Sutskever, and Geoffrey E. Hinton

Abstract

We trained a large, deep convolutional neural network to classify the 1.2 million high-resolution images in the ImageNet LSVRC-2010 contest into the 1000 different classes. On the test data, we achieved top-1 and top-5 error rates of 37.5% and 17.0%, respectively, which is considerably better than the previous state-of-the-art. The neural network, which

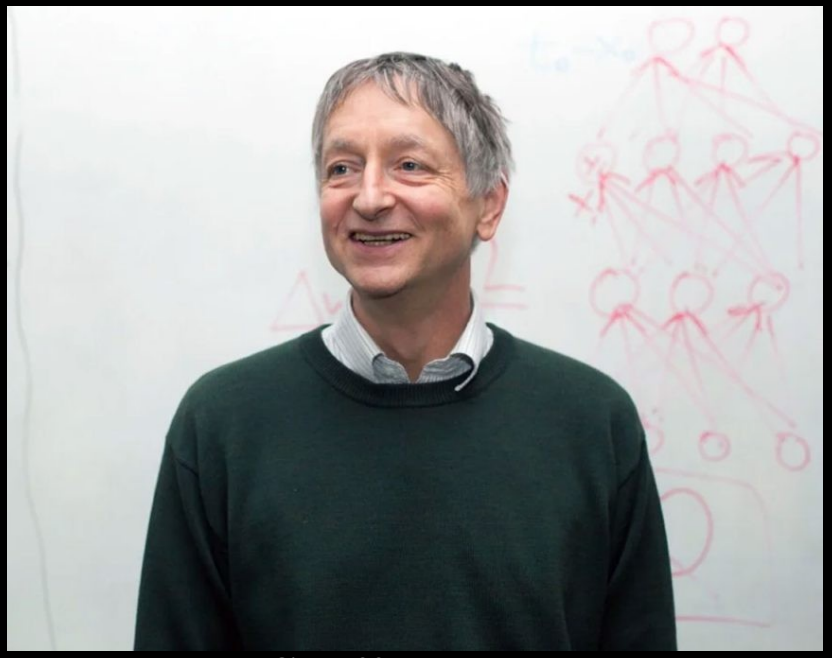
that were widely investigated in the 1980s. These networks used multiple layers of feature detectors that were all learned from the training data. Neuroscientists and psychologists had hypothesized that a hierarchy of such feature detectors would provide a robust way to recognize objects but they had no idea how such a hierarchy could be learned. There was great excitement in the 1980s because several different research groups



AlexNet Architecture

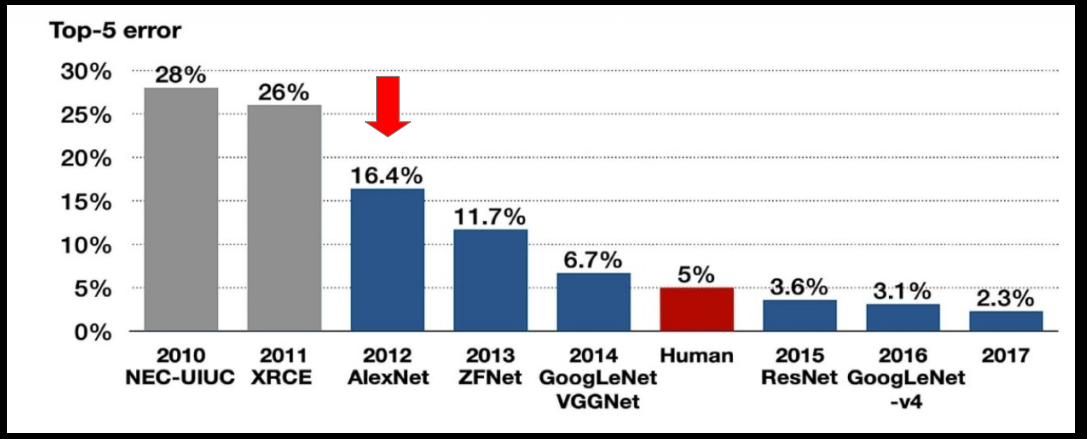
DNN-research (a startup with his two students (Alex Krizhevsky, Ilya Sutskever) was sold for 44 M$ to Google via an auction! against Microsoft, Baidu, Deep Mind (acq.by Google in 2014) at Lake Tahoe, Nevada on December 2012

Fonte: Communications of the ACM, visio.ai



Geoffrey Hinton

- Turing Award 2018 (with Yoshua Bengio, Yann LeCun
- Nobel Price in Physics 2024 (with John Hopfield)
- University of Toronto
- Google (left in 2023 citing concerns about the risks of AI)



Fontee: A Fully-Automated Deep Learning Pipeline for Cervical Cancer Classification, Expert Systems with Applications, Sept.2019

Zeno di Elea?

"*vedo un grosso problema:*
non poter più sapere cosa è vero."

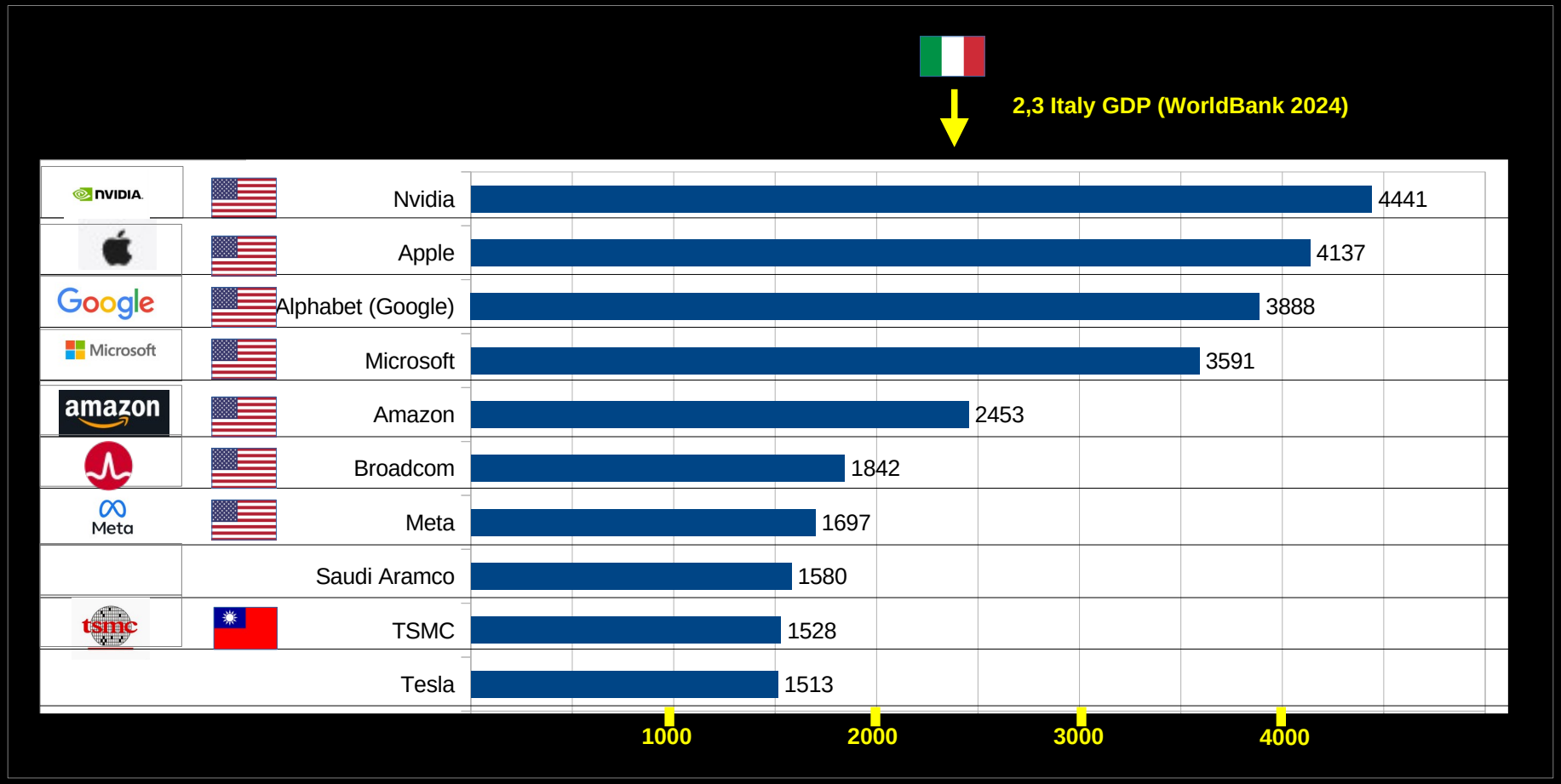
Geoffrey Hinton, 2023

'The Godfather of A.I.' Leaves Google and Warns of Danger Ahead, *The New York Times*, 4 May 2023

Fonte: Zeno of Elea shows Youths the Doors of Truth and False (Veritas et Falsitas), Pellegrino Tibaldi (1527-1596) ("Il Pellegrini"), Fresco in the Library of El Escorial, Madrid, Source: Wikimedia Commons

2025: the 10 largest companies in the world by market capitalization (in billion U.S. dollars)

6 Dec 2025

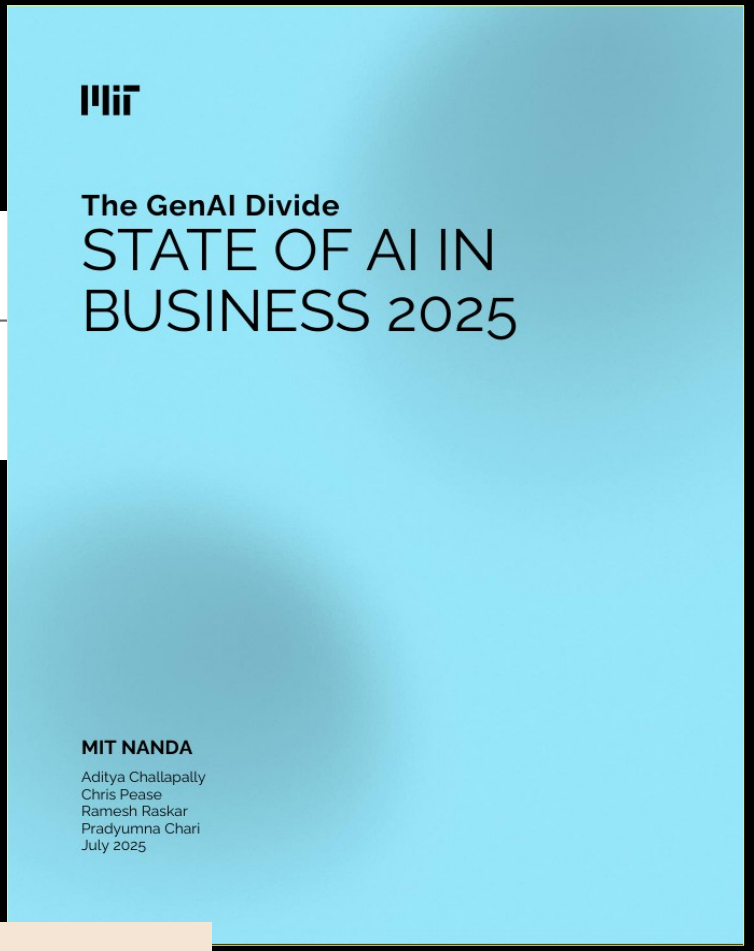


Fonte: Forbes, CompaniesMarketcap.com, 6 Dec 2025

2025: non si vedono risultati

2 EXECUTIVE SUMMARY

Despite $30–40 billion in enterprise investment into GenAI, this report uncovers a surprising result in that 95% of organizations are getting zero return. The outcomes are so starkly



Il Sole 24 ORE

Servizio | Intelligenza artificiale

Mit: 95% dei progetti aziendali GenAi non produce valore, solo il 5% porta ritorni

L'uso non ufficiale di AI tra i dipendenti supera le licenze, influenzando più dei progetti ufficiali il cambiamento lavorativo. È quanto emerge dal rapporto "State of AI in Business 2025", elaborato dal team di ricerca Mit Nanda (Networked Agents and Decentralized AI) su oltre 300 iniziative AI, 52 interviste aziendali e 153 questionari raccolti in conferenze di settore

20 agosto 2025

Fonte: MIT NANDA (2025). State of AI in business 2025 - IlSole24Ore (2025, 20 Agosto). Mit: 95% dei progetti aziendali GenAi non produce valore, solo il 5% porta ritorni.

una svolta disperata verso la monetizzazione delle "intelligenze artificiali" esistenti

chatbot di compagnia
basati su "intelligenze artificiali"

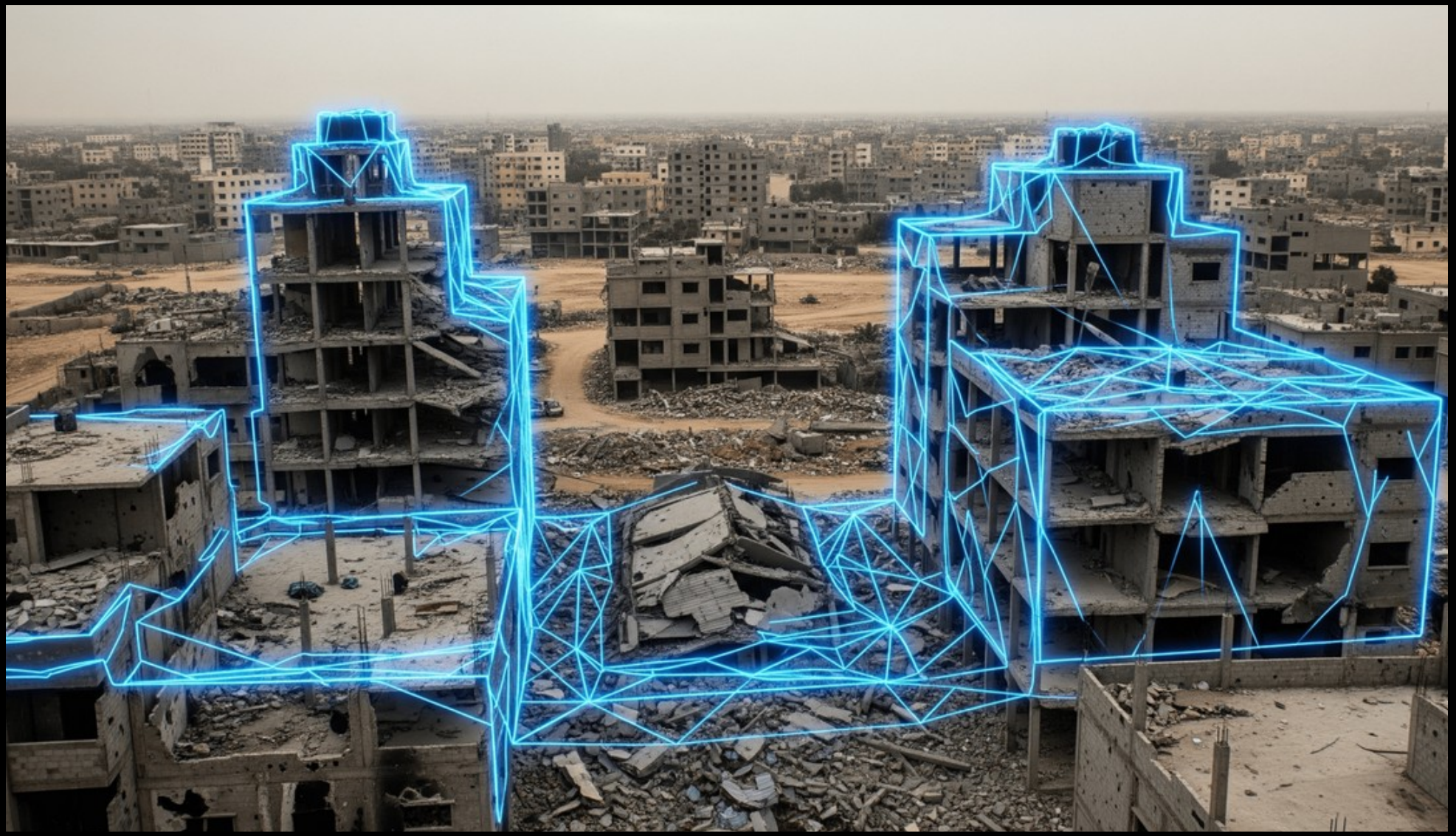
"*all you want to **hear**, all you want to **see***", Blade Runner 2049

armi letali autonome
basate su "intelligenze artificiali"

"*at its core, artificial intelligence is a **military technology***", Peter Thiel, Palantir

Fonte: Blade Runner 2049, Denis Villeneuve, 2017 - STM_KARGU_2 . Thiel, P. (2019, 1 Aug). Good for Google, Bad for America, *New York Times*

il ruolo delle Big Tech in scenari di guerra

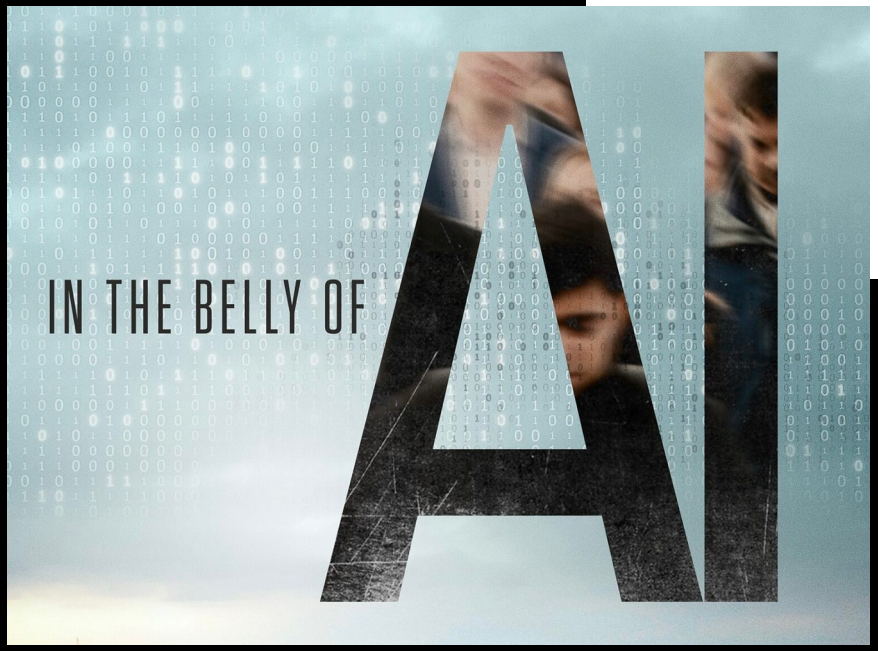


Fonte: magazine.cisp.unipi.it/ruolo-big-tech-genocidio-di-gaza/ - Centro Interdisciplinare Scienze per la Pace (CISP), Università di Pisa.

humans!

HAAS
Humans-As-A-Service

libro



documentario

Fonte: Feltrinelli, 2020; Henri Poulain, 2025

il turno dei colletti bianchi?

Fonte: Harris, M. (2024). Should we let AI take our jobs…if it generates less carbon? *Anthropocene*

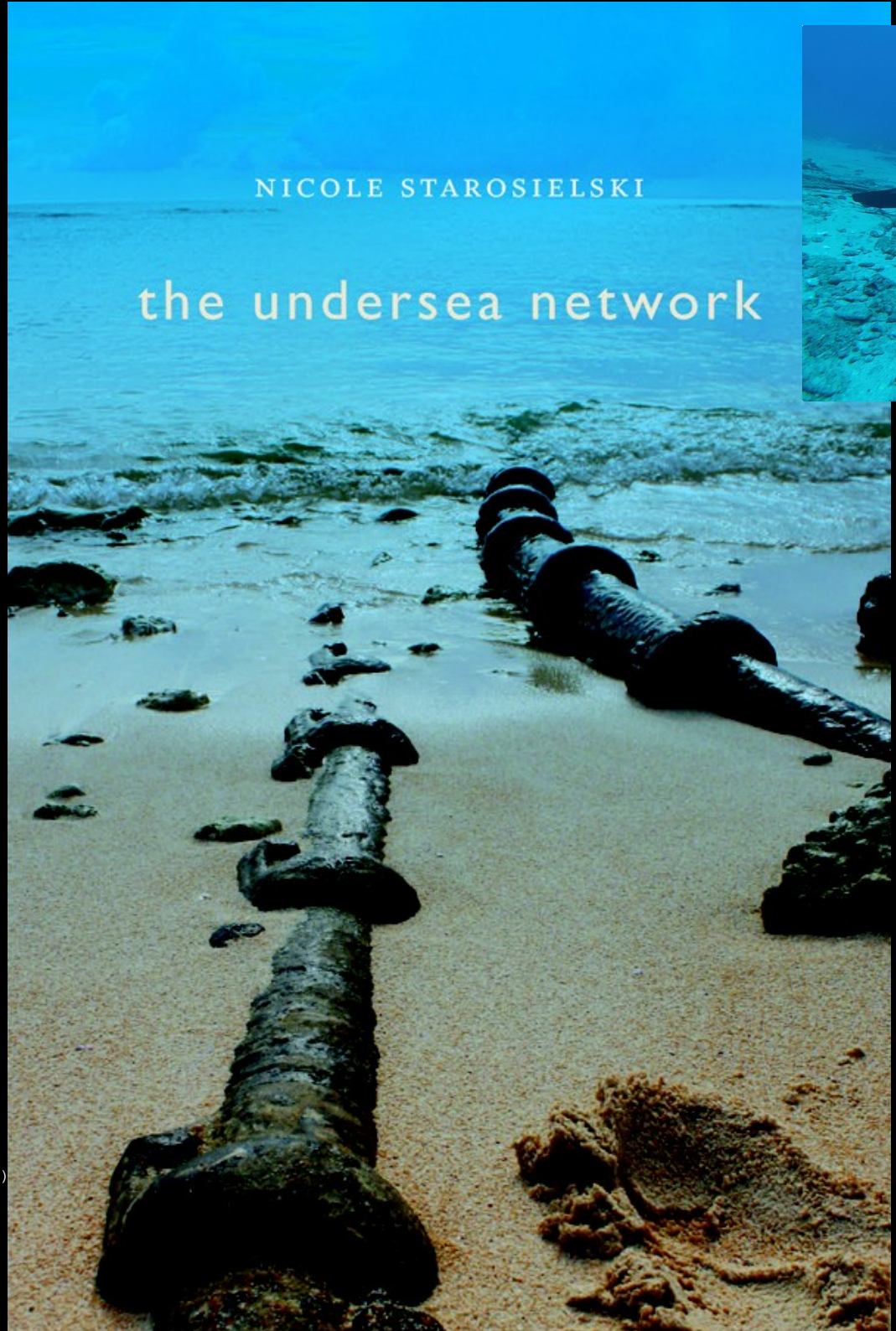
NSA Data Center, UTAH

110.000 m²

consumi elettrici data center (world)
2022 333 TWh
2025 536 TWh (ITA 312 TWh)
2026 681 TWh
2030 1065 TWh

numero di datacenter (world)
2024 5709 data center
2030 8378 data center

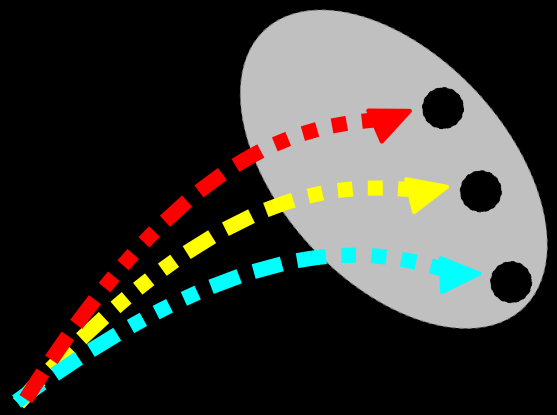
Fonte: Terna - Wong, Y. (2024). How Many Data Centers Are There and Where Are They Being Built? - Goldman Sachs (2024). AI, data centers and the coming US power demand surge,



99% of data traffic goes under sea
 1% of data traffic goes satellite (2023)
Source: https://blog.telegeography.com

Fonte: Duke University Press, 2015

evitare il cedimento epistemologico



- forecast, pre-***vedere*** =
  - fore+cast,
    to estimate how something will be in the future
  - *prae* (avanti) *videre* (vedere), vedere prima
    (soprattutto con gli occhi della mente)

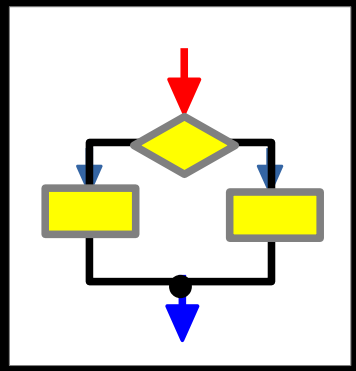
- prediction, pre-***dire*** =
  - prophecy, to pronounce solemnly,
    a statement of what will happen in the future
  - *prae* (avanti) *dicere* (dire), annunciare che una cosa futura avverrà

- prescription, pre-***scrivere*** =
  - order, direction, written directions from a doctor
  - *prae* (avanti) *scribere* (scrivere), ordinare, comandare per iscritto,
    ordine del medico

Fonte: Wikimedia Commons - Francisco de Goya (1746–1828), Il sonno della ragione produce mostri

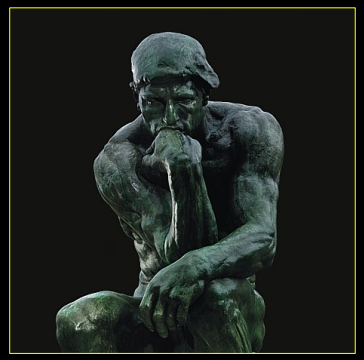
1976: decisione? scelta?

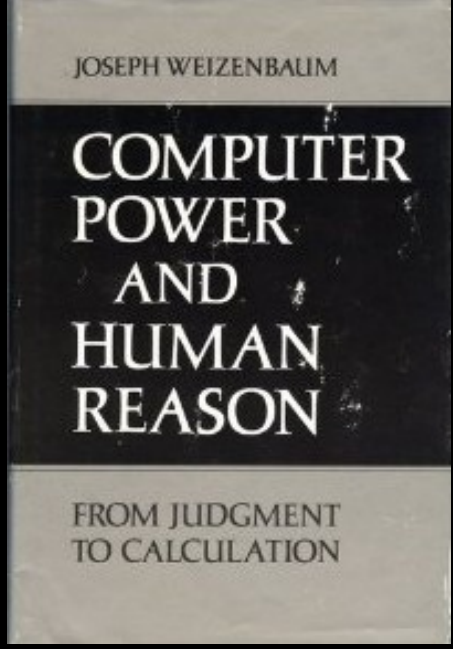
<u>Decisione</u>
è una attività computazionale,
qualcosa che può essere programmata



Joseph Weizenbaum
(1923-2008)

<u>Scelta</u>
è il prodotto del giudizio non del calcolo,
è la capacità di scelta che alla fine ci rende umani



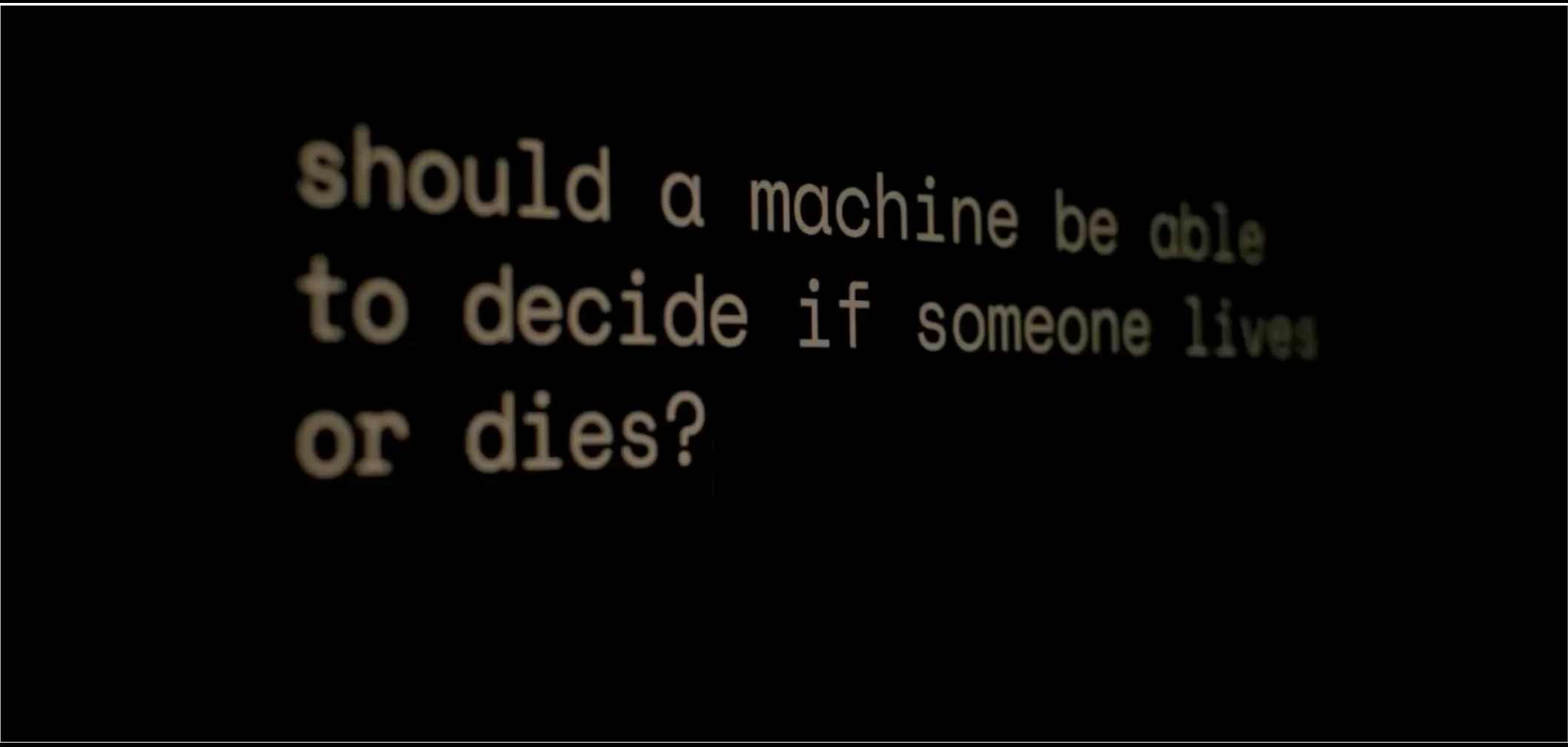


"***<u>Il mito dell'inevitabilità tecnologica</u>***, *politica e sociale ...*
<u>non permette di porsi domande di verità o di giustizia</u>"

Joseph Weizenbaum, 1976

Fonte: Weizenbaum J., "Computer Power and Human Reason: From Judgment To Calculation", Freeman, 1976

2022: immoral code



**può una macchina essere capace
di decidere la vita o la morte di qualcuno?**

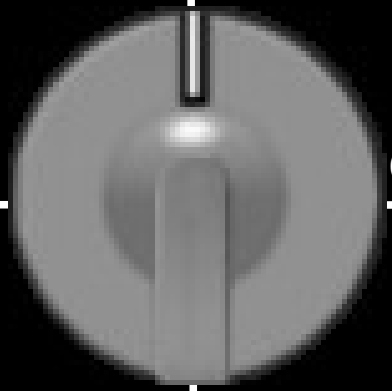
Fonte: https://www.stopkillerrobots.org/

auto a guida autonoma: la manopola dell'etica?

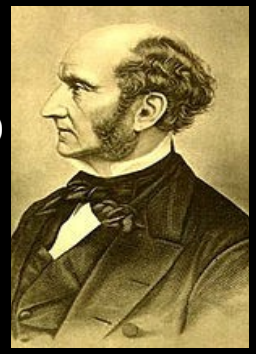
Immanuel Kant
(1724-1804)

DEONTOLOGISMO

OFF



CONSEQUENTALISMO



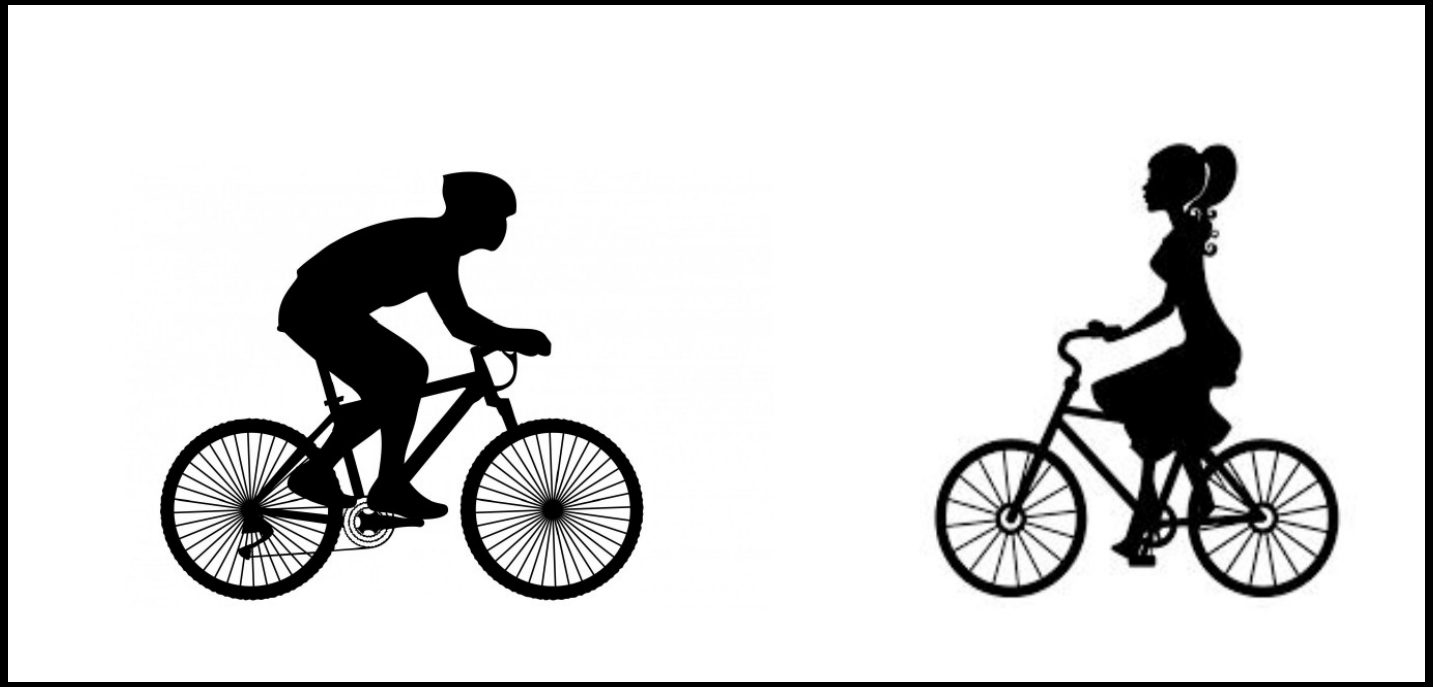
John Stuart Mill
(1806-1873)

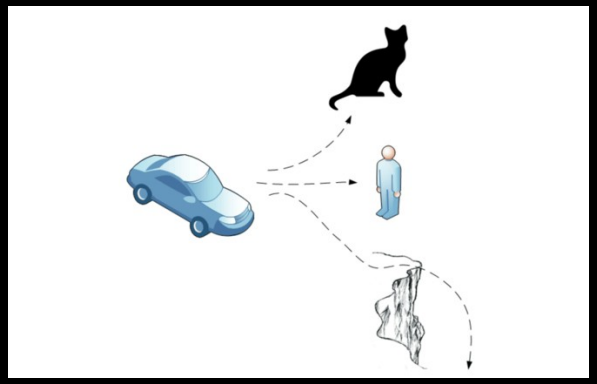
RELATIVISMO

Baruch Spinoza
(1632-1677)

Fonte: Patrignani, N. (2017). *Computer Ethics*, Politecnico di Torino, materiali del corso

etica delle auto a guida autonoma?

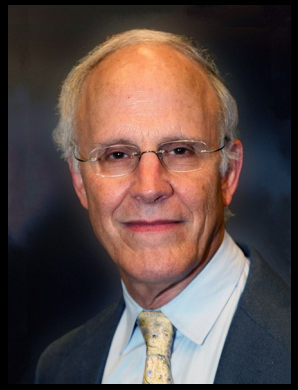




consequenzialismo?
conseguenze indesiderate:
investire un ciclista con il casco
invece di uno senza casco
minimizzerebbe il danno...
d'altra parte, ciò scoraggerebbe l'uso del casco...

Fonte: Tamburrini, G. (2022). Veicoli a guida autonoma ed etica normativa, Etica, Scienza dei Dati e Intelligenza Artificiale, Lezione 11 Maggio 2022

AI, Tecnologia *vs* Fisica, Scienza



David Gross

"*osservare, formulare ipotesi, verificare e replicare*
sono i fondamenti del metodo scientifico
... l'intelligenza artificiale,
per quanto potente e affascinante,
si muove su un terreno completamente diverso:
non osserva, non verifica, non replica...
si limita a calcolare la risposta più probabile,
pescando da un mare di dati pre-esistenti,
senza cercare la verità...
ed è proprio in questa carenza intrinseca
che risiede il limite invalicabile
che separa l'intelligenza artificiale dalla Fisica,
la tecnologia dalla Scienza..."

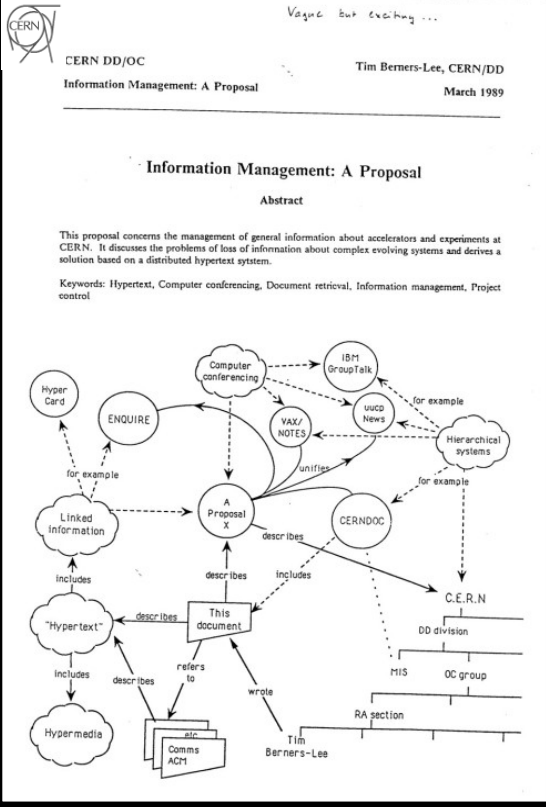
David Gross, Premio Nobel per la Fisica 2004

Fonte: Dotti, G. (2024, 8 Dicembre). *L'intelligenza artificiale può essere un rischio per la ricerca*, Sole24Ore.

che fare?

2025: Tim Berners Lee

Tim Berners Lee



Vague but exciting ...

CERN DD/OC

Tim Berners-Lee, CERN/DD

Information Management: A Proposal

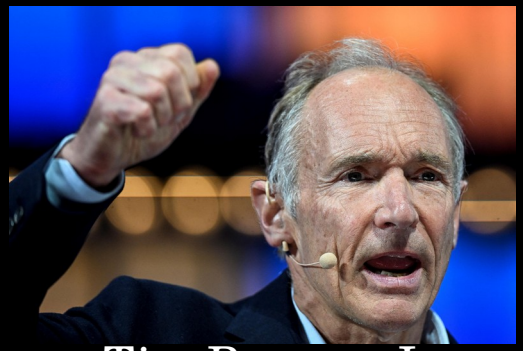
March 1989

Information Management: A Proposal

Abstract

This proposal concerns the management of general information about accelerators and experiments at CERN. It discusses the problems of loss of information about complex evolving systems and derives a solution based on a distributed hypertext system.

Keywords: Hypertext, Computer conferencing, Document retrieval, Information management, Project control



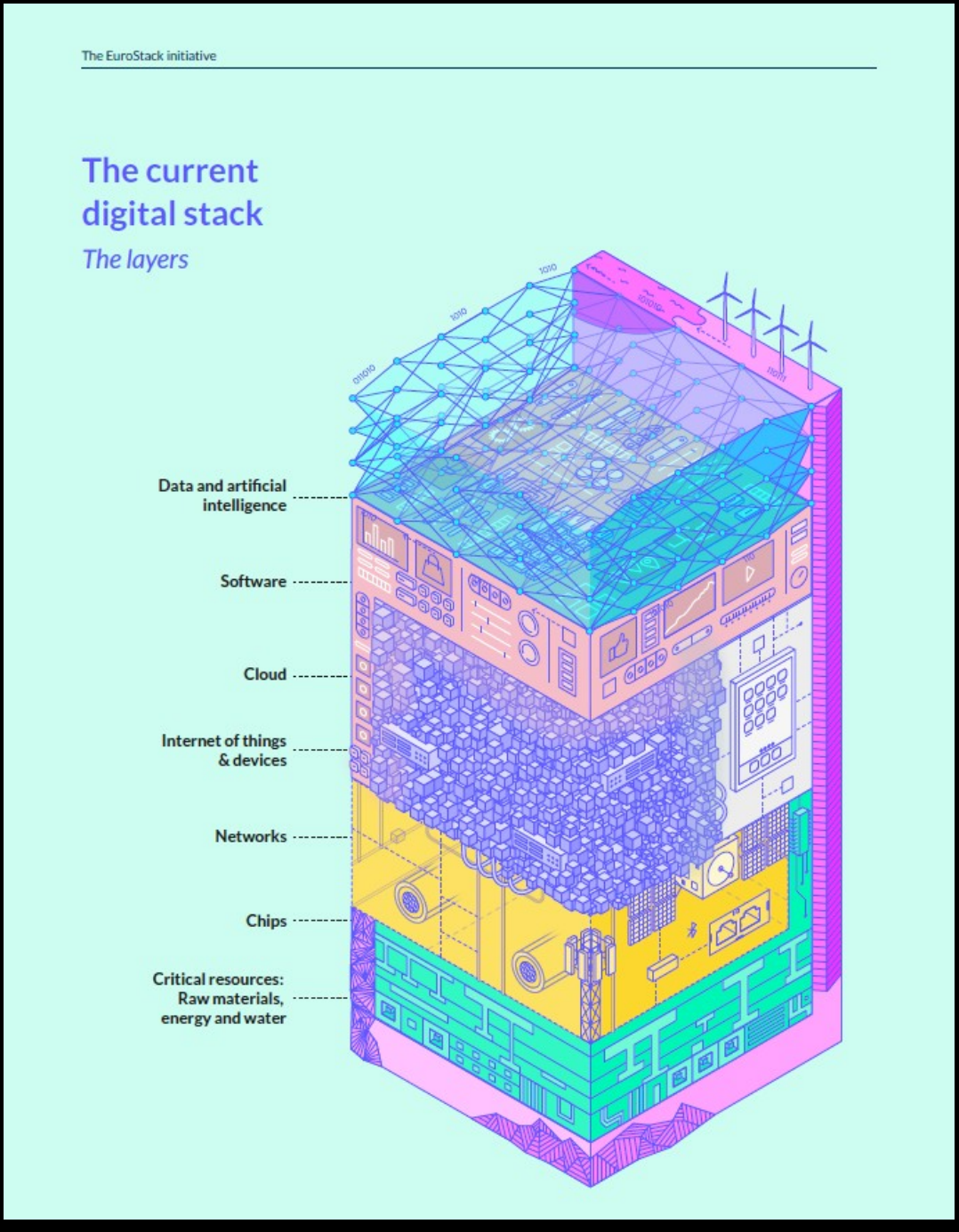
Tim Berners Lee
(1955-)

"*le persone sono state ridotte*
a prodotti di consumo per l'inserzionista...
quando crei un algoritmo che crea dipendenza,
sai cosa stai facendo...
c'è ancora tempo per costruire macchine
che funzionino per gli esseri umani,
e non il contrario"

Tim Berners Lee, Harvard talk, 2 Ottobre 2025

Fonte: public.web.cern.ch, Tim Berners-Lee. (n.d.). BrainyQuote.com. Retrieved November 29, 2016, from BrainyQuote.com

2025: EuroStack
per un'alternativa europea alle Big Tech



Fonte: Bria/Timmers/Gernone (2025): *EuroStack – A European Alternative for Digital Sovereignty*. Bertelsmann Stiftung. Gütersloh.

2021: Distributed AI Research Institute

We cut through the AI hype.

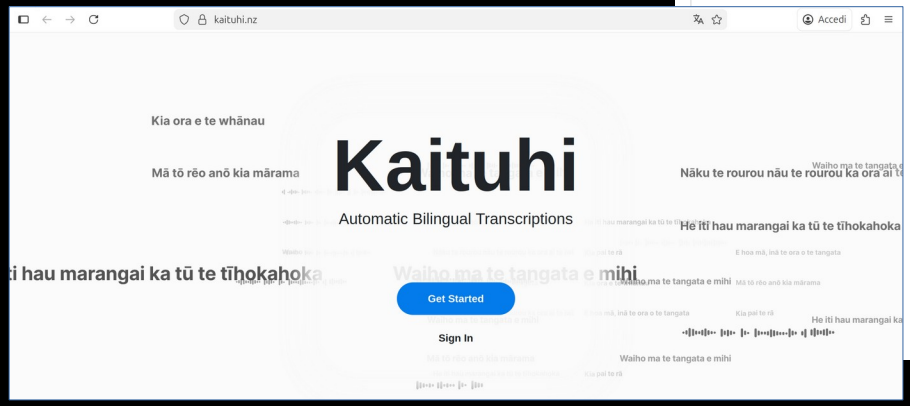
AI has become more than just a buzzword. We show what “AI” can *really* do (and what it can’t).

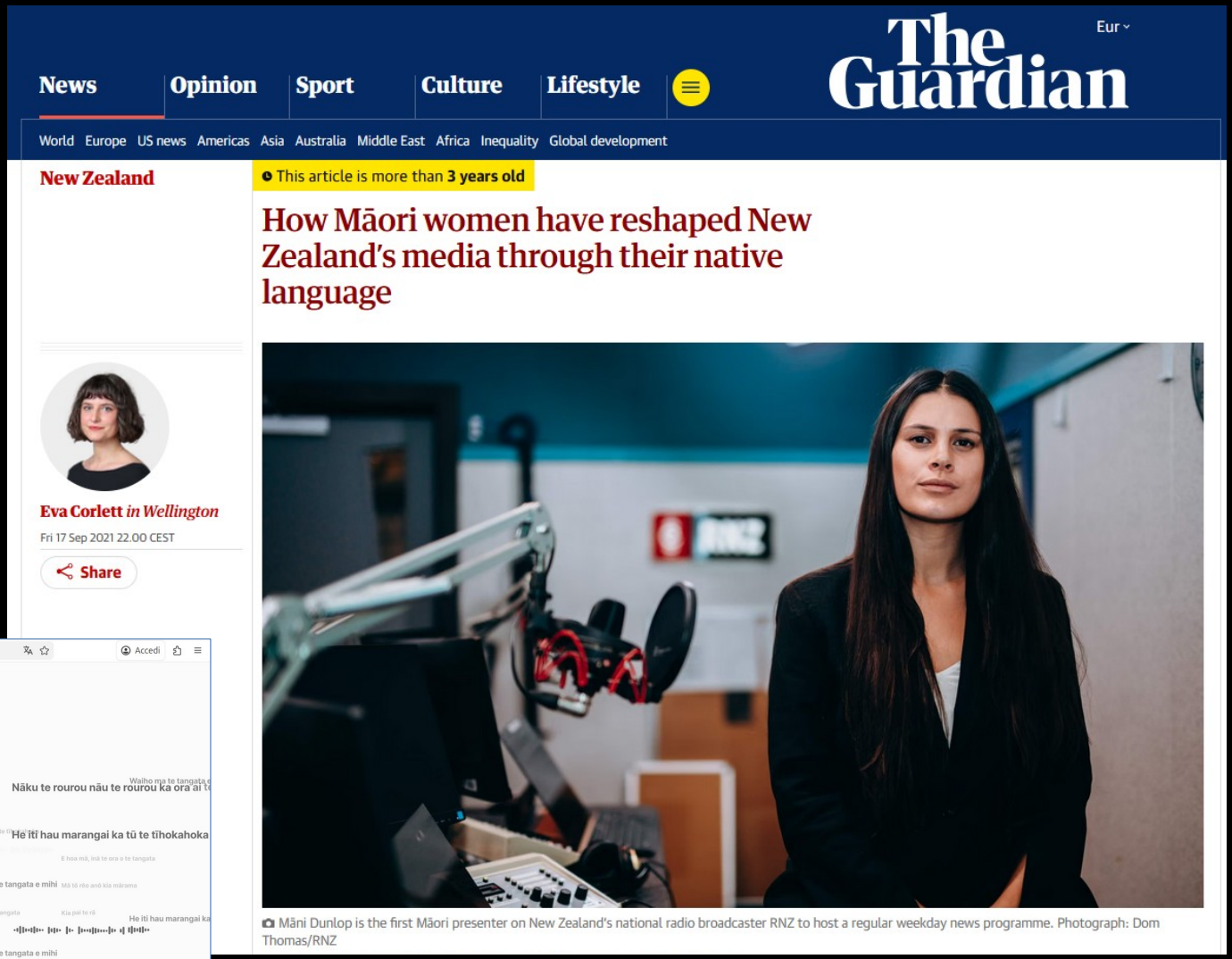
un istituto indipendente,
basato sulla comunità
dedicato a contrastare
l'influenza pervasiva delle Big Tech
sulla ricerca, lo sviluppo e l'implementazione dell'AI

Timnit Gebru
Founder and Executive Director

Fonte: www.dair-institute.org/

2021: può l'AI essere una tecnologia conviviale?





Progetto Kaituhi
un progetto sviluppato da un gruppo di donne Maori della Nuova Zelanda
che permette la trascrizione automatica per le lingue Maori e
che è stato costruito in modo che i dati utilizzati rimangano nella comunità e
non vengano utilizzati dalle *Big Tech*

Fonte: Carlett, E. (2021, 17 Sep). How Maori Women have reshaped New Zealand's media, *The Guardian*

macchine calibrate con (tanti) dati a scuola?

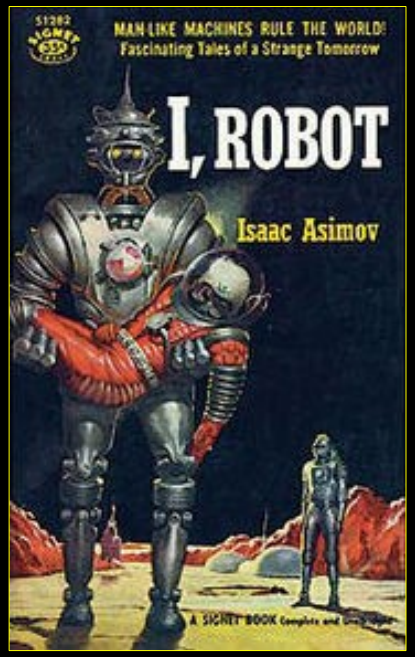
Isaac Asimov
(1920 - 1992)

1942: 3 Laws of Robotics

1st Law
A robot may not injure a human being or,
through inaction,
allow a human being to come to harm.

2nd Law
A robot must obey orders given to it by human beings,
except where such orders
would conflict with the First Law.

3rd Law
A robot must protect its own existence
as long as such protection
does not conflict with the First or Second Law.



es.
1. leggere l'opera più famosa di Asimov
2. sulla traccia delle 3 Leggi della Robotica scrivere un breve racconto
3. collegarsi ad un chatbot (gemini, chapgpt, etc.) e chiedere di scrivere un breve racconto sulla traccia delle 3 Leggi della Robotica
4. confrontare i due testi
5. il racconto scritto dagli umani può essere migliorato?

Fonte: https://insegnareindigitale.zanichelli.it/ia - Asimov. I. (1942). I, Robot

modelli aperti e locali

nature

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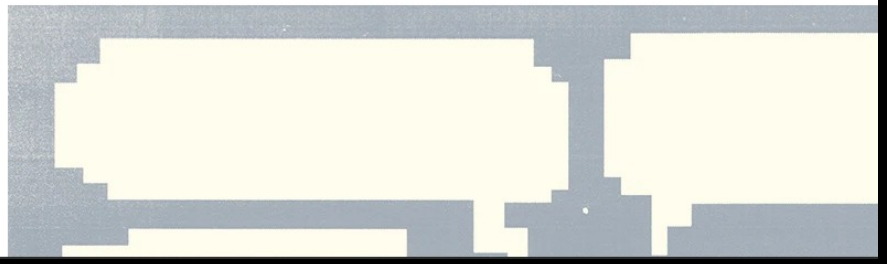
nature > technology features > article

TECHNOLOGY FEATURE | 16 September 2024

Forget ChatGPT: why researchers now run small AIs on their laptops

Artificial-intelligence models are typically used online, but a host of openly available tools is changing that. Here's how to get started with local AIs.

By Matthew Hutson



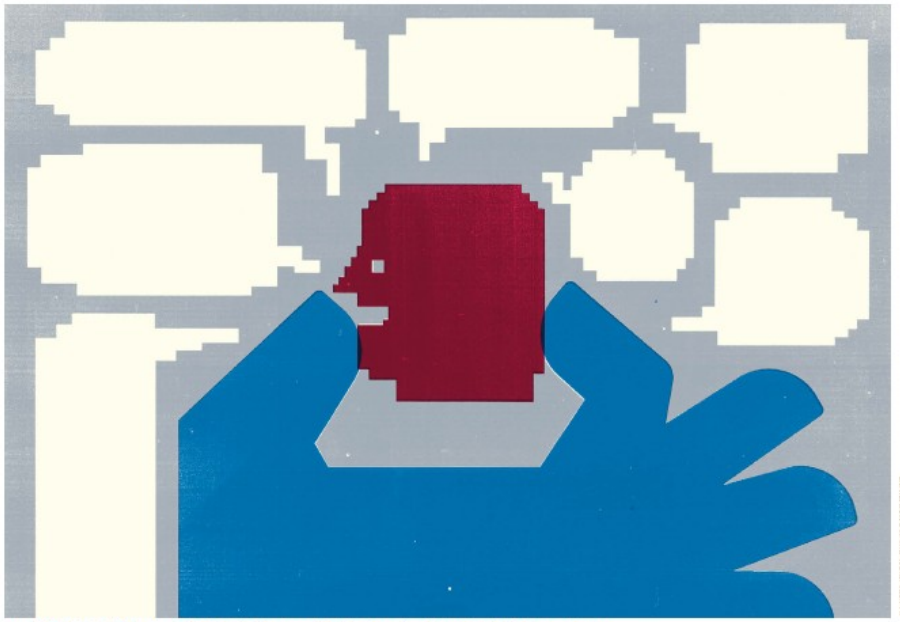


ILLUSTRATION: THE PROJECT TWINS

FORGET CHATGPT: HOW TO RUN AI LOCALLY ON A LAPTOP

Researchers typically use AIs online, but a host of openly available tools means they don't have to. **By Matthew Hutson**

The website histo.fyi is a database of structures of immune-system proteins called major histocompatibility complex (MHC) molecules. It includes images, data tables and amino-acid sequences, and is run by bioinformatician Chris Thorpe, who uses artificial intelligence (AI) tools called large language models (LLMs) to convert those assets into readable summaries. But he doesn't use ChatGPT, or any other web-based LLM. Instead, Thorpe runs the AI on his laptop.

Over the past couple of years, chatbots based on LLMs have won praise for their ability to write poetry or engage in conversations. Some LLMs have hundreds of billions of parameters – the more parameters, the greater the complexity – and can be accessed only online. But two more recent trends have blossomed. First, organizations are making 'open weights' versions of LLMs, in which the weights and biases used to train a model are publicly available, so that users can download and run them locally, if they have the computing power. Second, technology firms are making scaled-down versions that can be run on consumer hardware – and that rival the performance of older, larger models.

Researchers might use such tools to save money, protect the confidentiality of patients or corporations, or ensure reproducibility. Thorpe, who's based in Oxford, UK, and works at the European Molecular Biology Laboratory's European Bioinformatics Institute in Hinxton, UK, is just one of many researchers exploring what the tools can do. That trend is likely to grow, Thorpe says. As computers get faster and models become more efficient, people will increasingly have AIs running on their laptops or mobile devices for all but the most intensive needs. Scientists will finally have AI assistants at their fingertips – but the actual algorithms, not just remote access to them.

Big things in small packages

Several large tech firms and research institutes have released small and open-weights models over the past few years, including Google DeepMind in London; Meta in Menlo Park, California; and the Allen Institute for Artificial Intelligence in Seattle, Washington. ('Small' is relative – these models can contain some 30 billion parameters, which is large by comparison with earlier models.)

Although the California tech firm OpenAI hasn't open-weighted its current GPT models, its partner Microsoft in Redmond, Washington, has been on a spree, releasing the small

Fonte: Hudson, M. (2024). Forget ChatGPT: How to Run AI Locally on a Laptop, *nature*, vol.633, 19 September 2024

2025: edge computing?

Servizio | Intelligenza artificiale

Qualcomm compra Arduino, l'azienda di Ivrea celebre per le schede open source

Il colosso californiano, nell'ambito della strategia di espansione sull'intelligenza artificiale, acquisisce l'azienda cofondata da Massimo Banzi, che lascia dopo 20 anni

di Luca Salvioli

7 ottobre 2025

Il Sole 24 ORE

WIRED

RICCARDO PICCOLO ECONOMIA 07.10.2025

Arduino entra nel mondo Qualcomm, per portare l'intelligenza artificiale in milioni di dispositivi

Il colosso americano dei chip acquisisce l'azienda italiana nata a Ivrea, simbolo del movimento maker mondiale

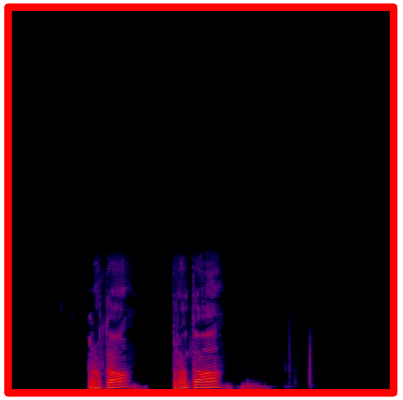
non è sempre vero che *bigger is better*
spesso ***small is beautiful***

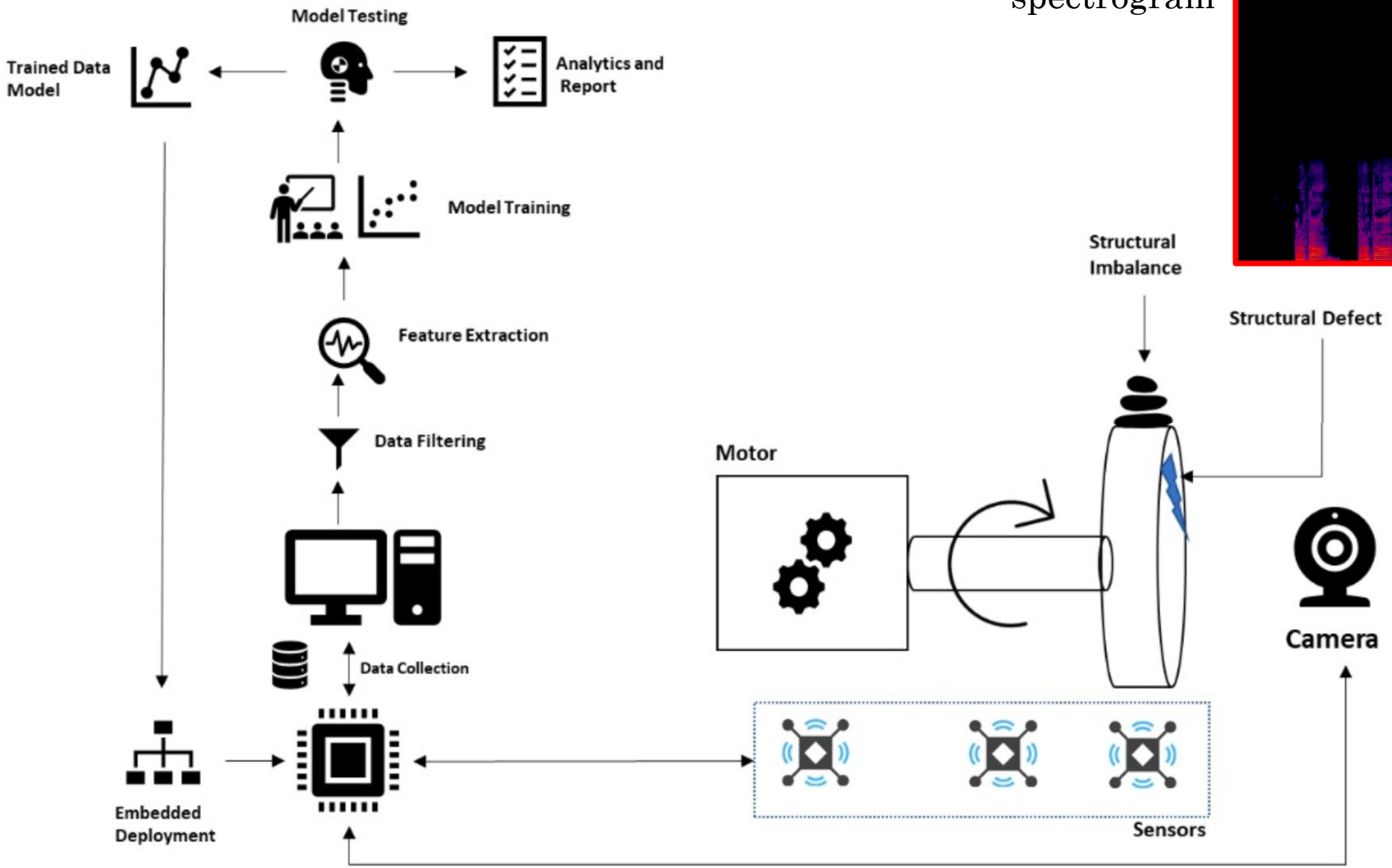
Fonte: Salvioli, L. (2025, 7 Ottobre). Qualcomm compra Arduino, *IlSole24Ore*
Piccolo, R. (2025, 7 Ottobre). Arduino entra nel mondo Qualcomm, *Wired*

"macchine calibrate con (tanti) dati"
per applicazioni locali a basso consumo energetico

edge computing

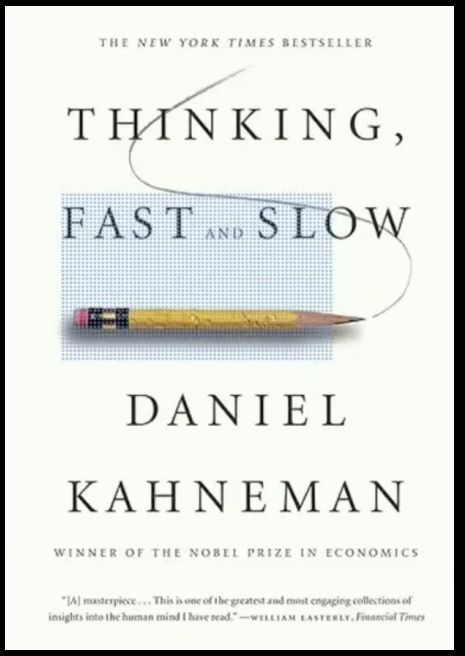
spectrogram





Fonte: Kawady, T.A. et al. (2025, 20 June). AI driven fault diagnosis approach for stator turn to turn faults in induction motors, *nature, scientific reports*

2011: pensieri veloci e lenti



colmare il divario tra
(approccio induttivo)
le reti neurali artificiali
(System I di Kahnemann)
e
(approccio deduttivo)
l'AI "classica" o "simbolica"
(System II di Kahneman)

AlphaFold is an AI program
developed by DeepMind (Google/Alphabet)
which performs predictions of protein structure
it is designed using **symbolic + machine learning techniques**

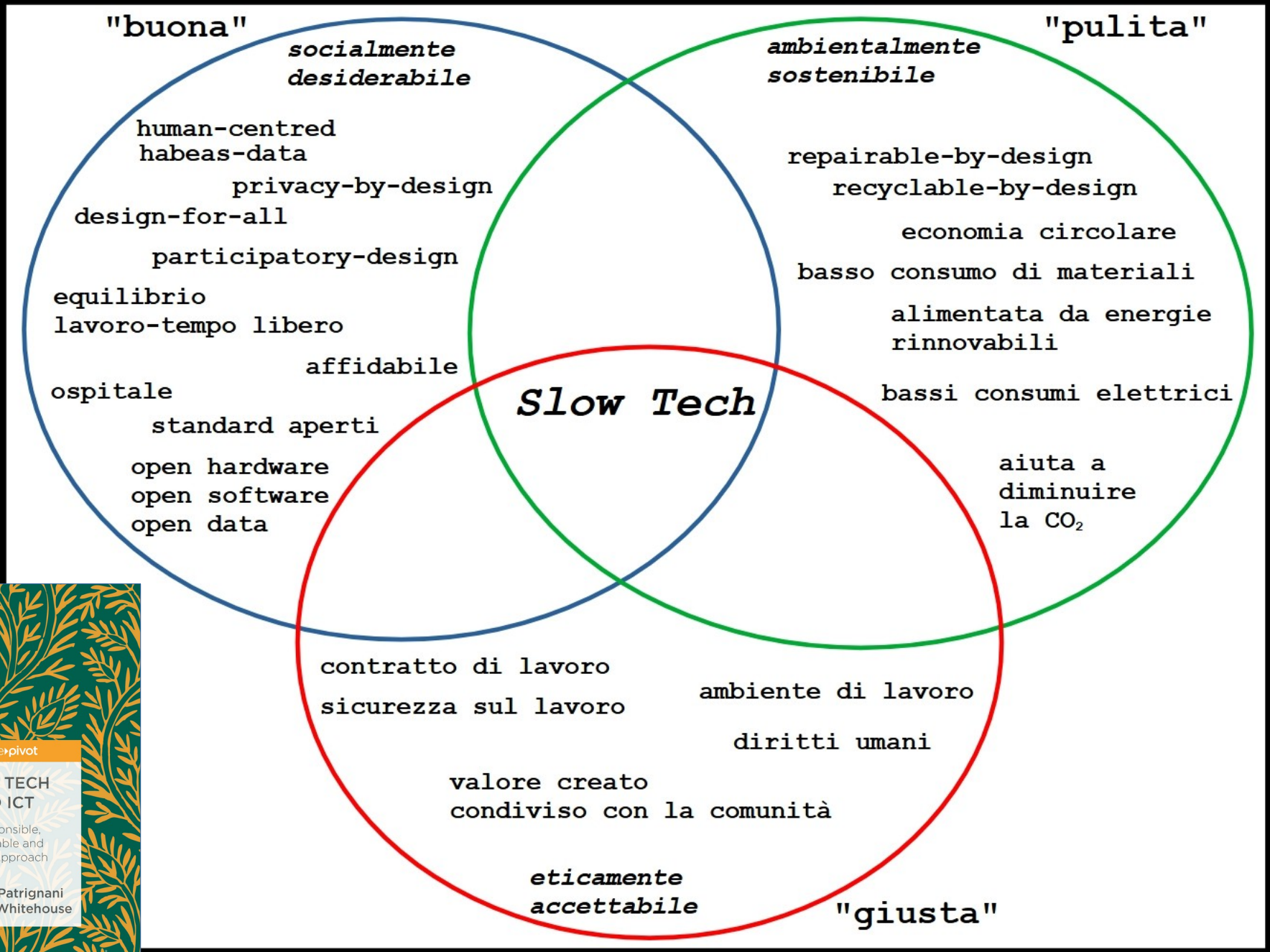
Fonte: Kahneman, D. (2012). Thinking, Fast and Slow, Penguin - aplhaserver.com

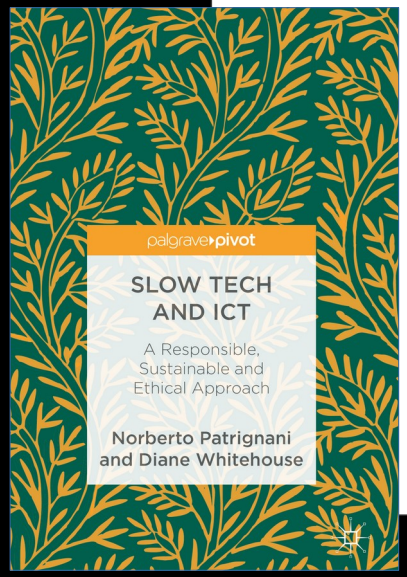
induttivo + deduttivo

la macchina calibrata
con (tanti) dati correlando
le ***immagini delle vibrazioni dal sensore video***
con la
frequenza del rumore dal sensore audio con la
mancata accensione
dal report dello stato generale
cerca nel
grafo del modello del motore
per identificare il componente
che potrebbe causare tutte
le evidenze segnalate: un guasto al
iniettore del cilindro n.3

induttivo (pattern estratti dai dati)
+
deduttivo (regole dedotte dal modello della realtà)

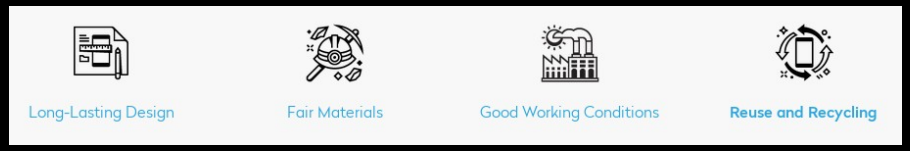
Slow Tech

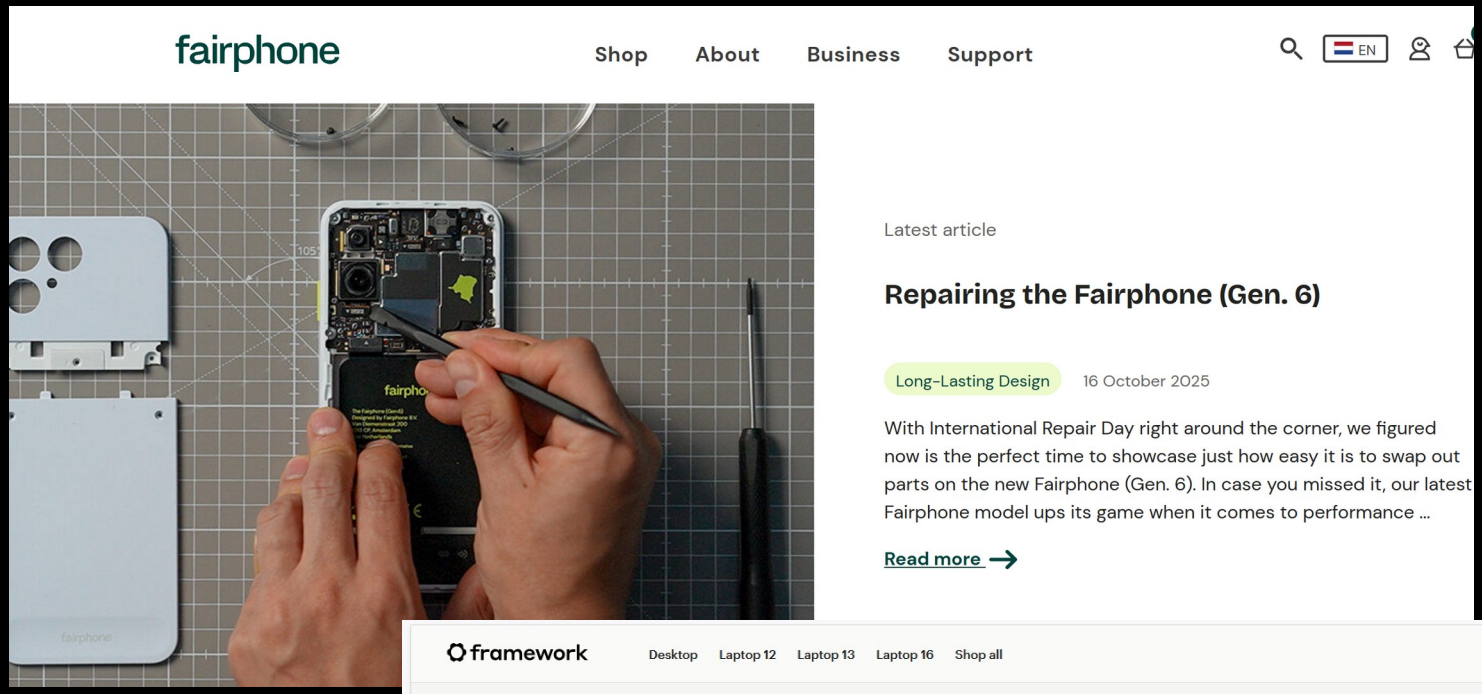


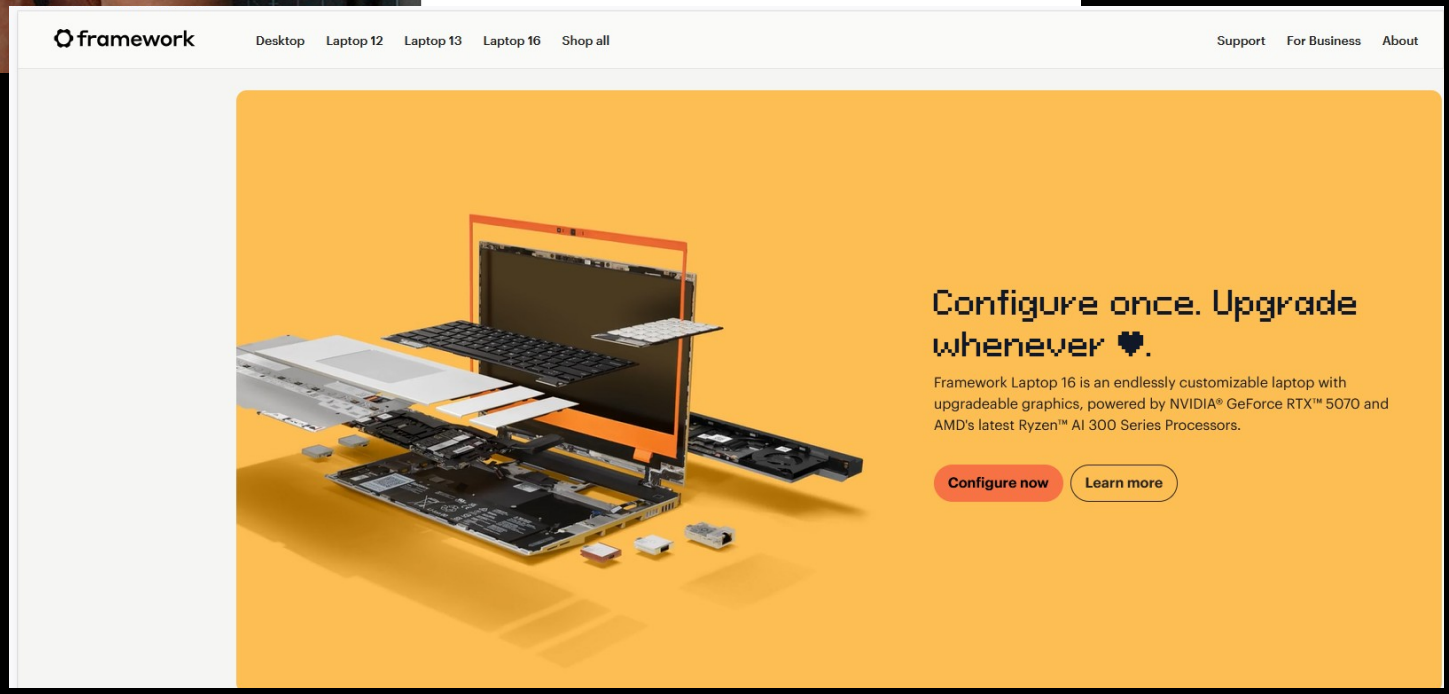


Fonte: Patrignani, N. (2020). *Teaching Computer Ethics: Steps towards Slow Tech, a Good, Clean, and Fair ICT*. Uppsala University. download URN: urn:nbn:se:uu:diva-403686
Patrignani, N., Whitehouse, D. (2018). *Slow Tech and ICT*, Palgrave

casi di studio

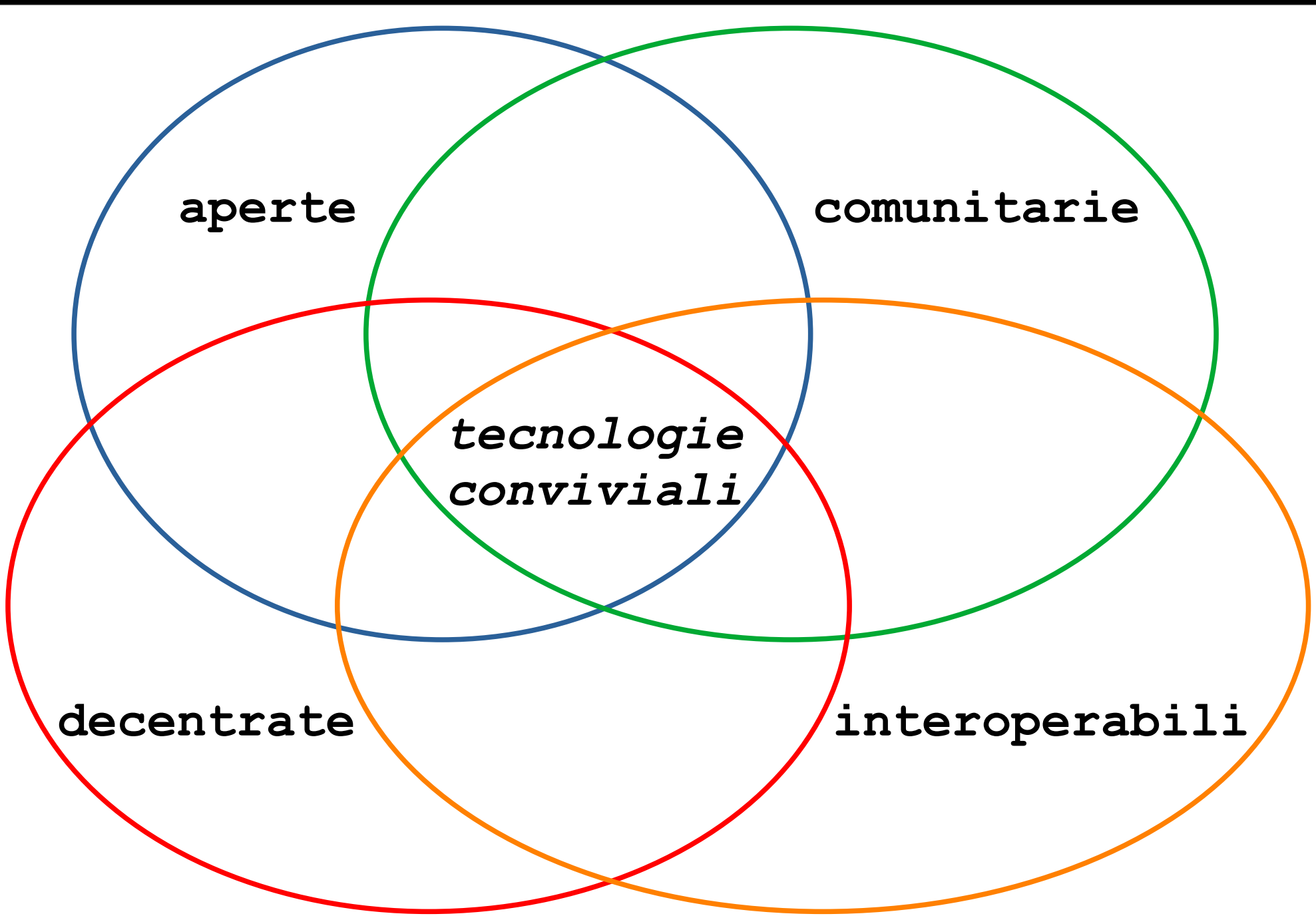






Source: www.fairphone.com - frame.work

tecnologie conviviali



casi di studio





GMail


Zoom


GoogleMaps


Youtube


Facebook 
X


Instagram


WhatsApp


tecnologie conviviali




Linux, GNU
Arduino, open hardware


LibreOffice open formats


Firefox 
Brave 
LibreWolf 
Solid (Web)


Tuta (mail) 
Proton (mail)


Framatalk 
Jitsi


OpenStreetMap


PeerTube


Mastodon 
Bluesky 
Friendica


Pixelfed


Signal 
Matrix

aperte
comunitarie
decentrate
interoperabili
Slow Tech



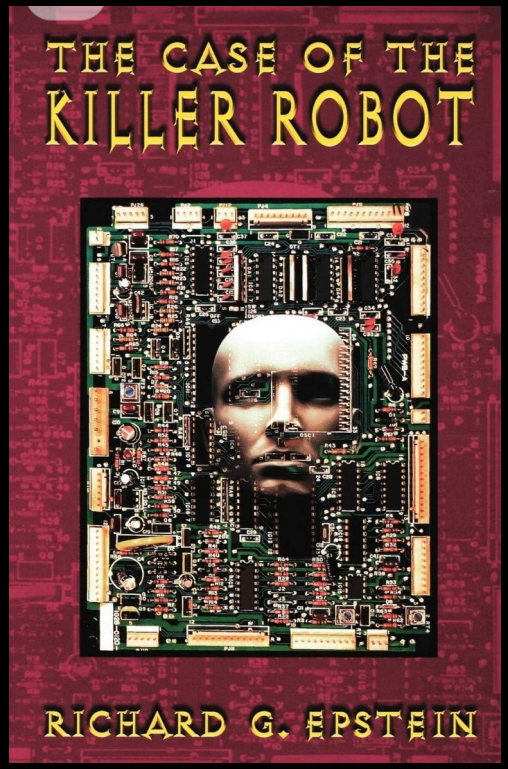


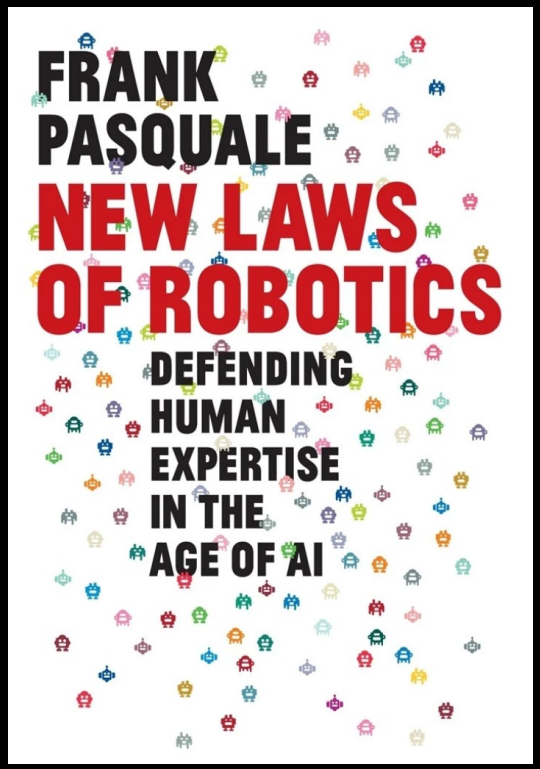
casi di studio → tecnologie conviviali

aperte
comunitarie
decentrate
interoperabili
Slow Tech

GoogleDocs	Framapad
GoogleClassroom	moodle
GoogleDrive	Nextcloud
Doodle	Framadate
GoogleForms	Framaforms
GoogleCalendar	Proton Calendar, Framagenda
eventbrite	Mobilizon
LLM	Apertus

Robotica e AI - libri fondamentali





2020: New 4 Laws of Robotics

Robotics systems and AI
1. SHOULD complement professionals, not replace them
2. SHOULD NOT counterfeit humanity.
3. SHOULD NOT intensify zero-sum arms races.
4. MUST ALWAYS indicate the identity of their creator(s), controller(s), and owner(s).

"*milestones in the history of computing*"

Ronald Anderson,
Chair of ACM Committee of Computer Ethics

Fonte: Epstein, R.G. (1996). The case of the killer robot, Wiley - Pasquale, F. (2020). New Laws of Robotics. Definding Human expertise in the Age of AI, Harvard Univrsity Press

principi etici

1. rispetto dell'autonomia umana

i sistemi di IA *non devono subordinare, costringere, ingannare, manipolare, condizionare gli esseri umani…*
la distribuzione delle funzioni tra esseri umani e sistemi di IA dovrebbe seguire
i principi di progettazione antropocentrica e
lasciare ampie opportunita' di ***scelta*** *all'essere umano*

2. prevenzione dei danni

i sistemi di IA ***non devono causare danni*** ... occorre *tutelare la dignità umana nonche' l'integrita' fisica e psichica…*
implica anche il rispetto dell'*ambiente naturale* e di tutti gli esseri viventi

3. equità

garantire una distribuzione giusta ed equa di costi e benefici e
garantire che gli i*ndividui e i gruppi siano liberi da distorsioni inique, discriminazioni e stigmatizzazioni…*
l'organismo *responsabile della decisione deve essere* ***identificabile*** *e i* ***processi decisionali devono essere spiegabili***

4. esplicabilita'

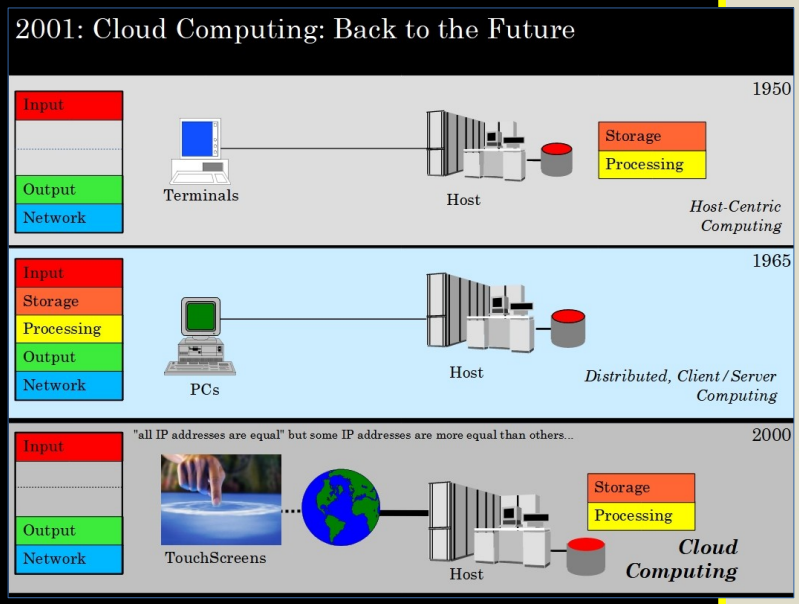
i processi devono essere trasparenti, le capacità e lo scopo dei sistemi di IA devono essere comunicati apertamente e
le decisioni, per quanto possibile, devono essere ***spiegate a coloro che ne sono interessati***...
perché un modello ha generato un particolare risultato? ("*black-box*"? ...),
quali dataset sono stati usati? ... tracciabilità ? ... verificabilità ?

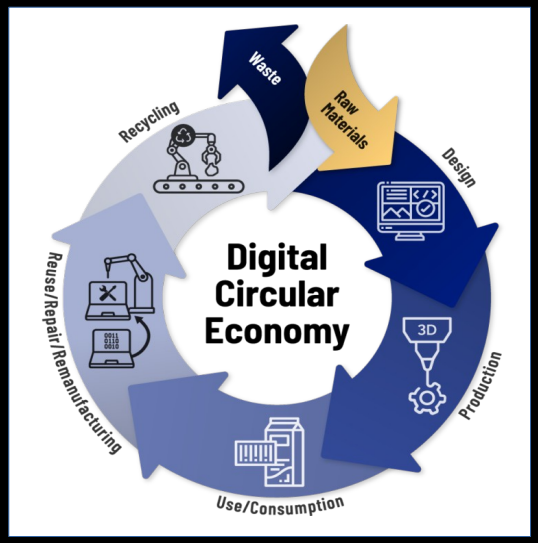
Fonte: EU (2018, Aprile). Comunicazione "Intelligenza Artificiale per l'Europa" (COM(2018)-237

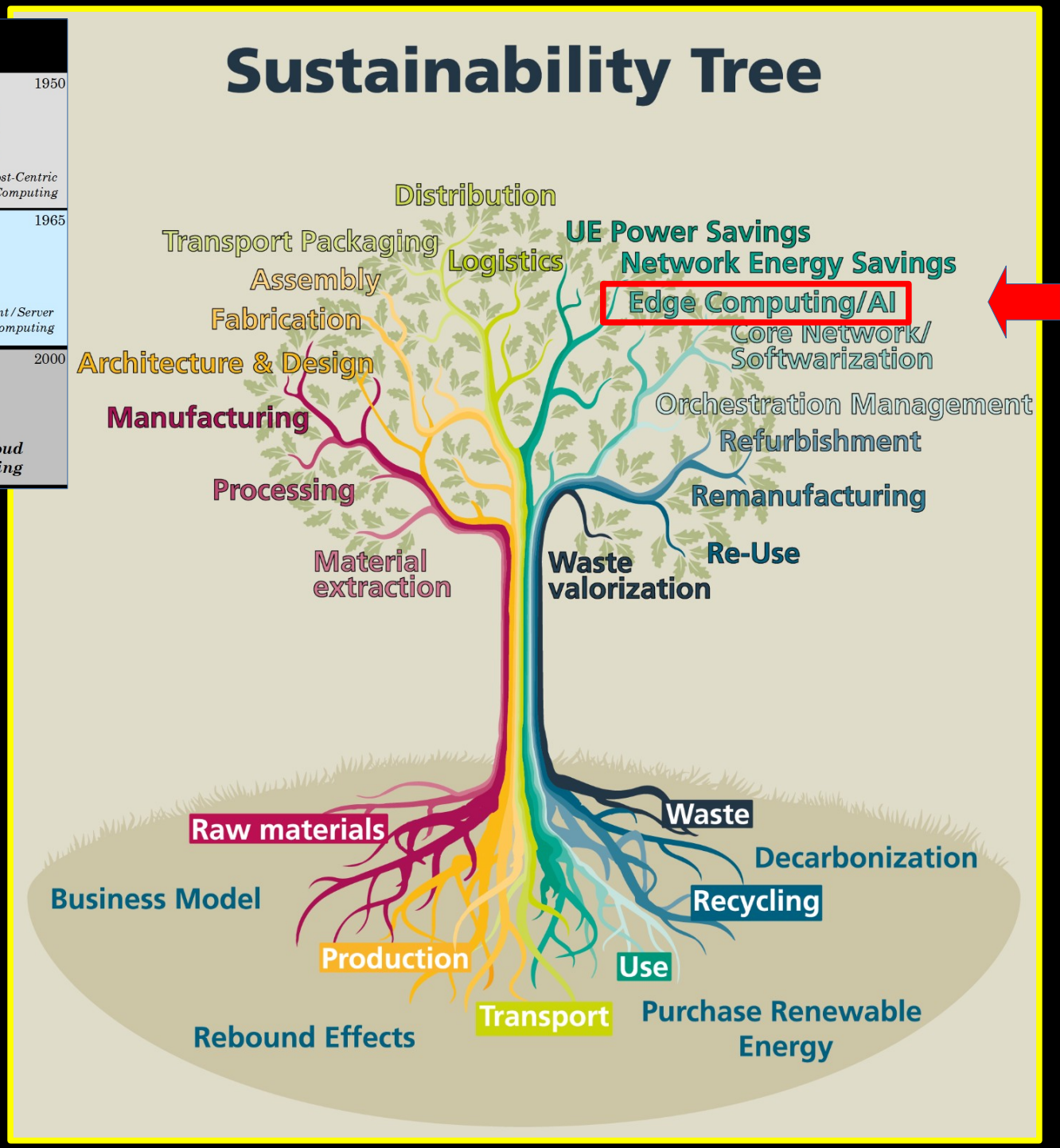
futuro?

2025: come sarà la 4a era del digitale?

sustainable computing?







Fonte: Fraunhofer.de (2025). Sustainable ICT-Systems, https://www.iis.fraunhofer.de/en/ff/lv/iot-system/tech/sustainable-ict.html

2017: Joy e Mariette

le tecnologie digitali sono ***uno specchio***
che mostra a noi e agli altri chi vogliamo essere

Fonte: Joy e Mariette - Blade Runner 2049, Denis Villeneuve, 2027 - Capurro, R. (2007). Etica e robotica, I robot, maschere del desiderio umano, Athenet, Luglio 2007

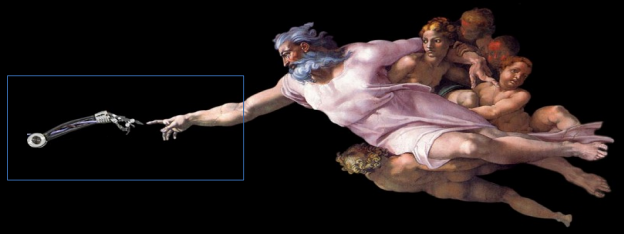
giorni senza tecnologia

Può l'industria darsi dei fini?
Si trovano questi semplicemente
nell'indice dei profitti?

Adriano Olivetti, 1955

Adriano Olivetti
Discorso "*Ai lavoratori di Pozzuoli*"
per l'inaugurazione dello stabilimento di Pozzuoli, 23 Aprile 1955
in A.Olivetti (1959), "*Città dell'uomo*", Edizioni di Comunità, Milano

Adriano Olivetti
(1901-1960)



IA e tecnologie conviviali.
Aspetti sociali, etici e ambientali
delle *macchine calibrate con (tanti) dati*

grazie!