

RESPONSIBLE AI

Event Future Trends & Innovation.
 The Next Step in Horticulture Technology

Location World Horti Center, Naaldwijk

Date December 12, 2023

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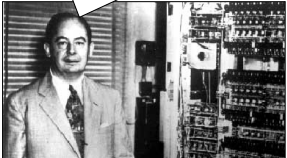
Dutch motto
 1815

TNO innovation
 for life

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AI EXPECTATIONS


1945
John von Neumann (ENIAC)
 "Approaching some essential singularity beyond which human affairs, as we know them, could not continue"



1951
Alan Turing
 Once the machine thinking method has started, it would not take long to outstrip our feeble powers

ALAN TURING
 FATHER OF COMPUTER SCIENCE
 100 YEARS JUNE 23 1912 - JUNE 7 1954

Turing imagined a machine of extreme purity and simplicity. It would be able to compute anything using only two symbols arranged in a potentially infinite one-dimensional sequence. He created this machine in his mind, as a thought experiment. Today we are surrounded by Turing machines, and it's thanks to him that I can share with you this message.



1997
IBM Deep Blue
 Beats world champion chess Garry Kasparov



2016
Google Deep Mind
 AlphaGo wins Go



2022
OpenAI
 general purpose ChatGPT



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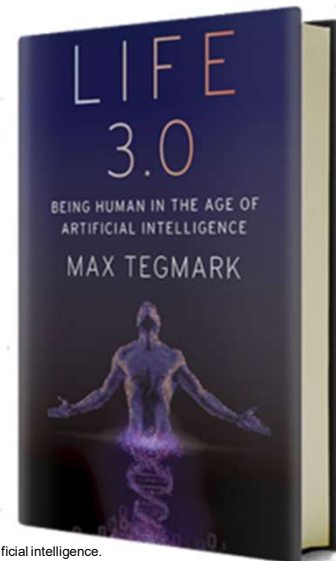
› HUMAN INTELLIGENCE

Conscious human information processing is very limited (≈ 50 bits/s),

requires full attention, is serial, is biased, and

we substantially forget what we learned.

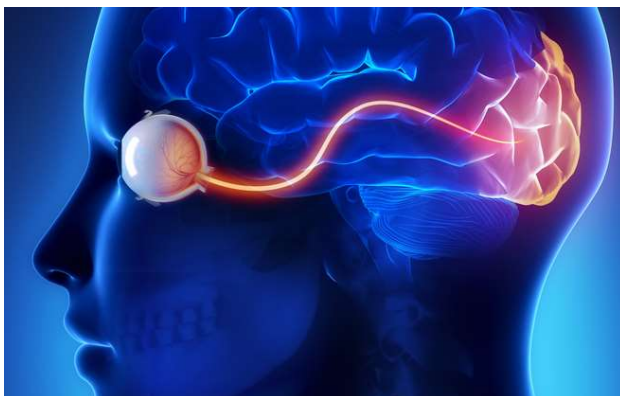
(Tegmark, 2017)



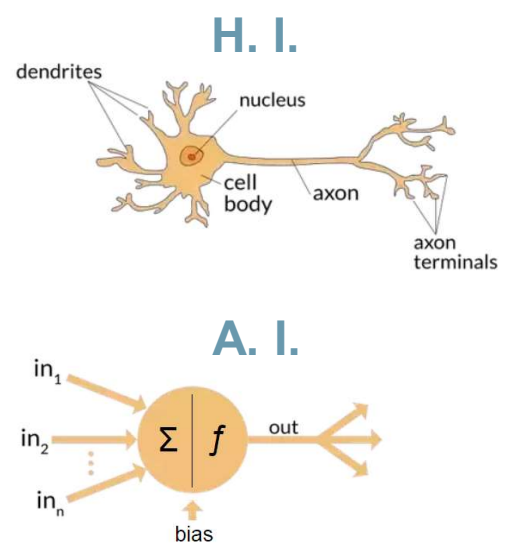
Tegmark, M. (2017). Life 3.0: Being human in the age of artificial intelligence. New York: Borzoi Book published by A.A. Knopf.

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› AI: INSPIRED BY THE HUMAN BRAIN

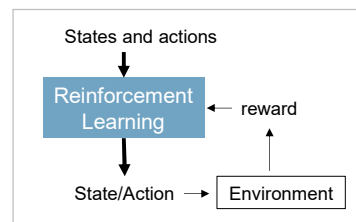
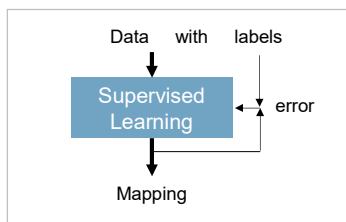
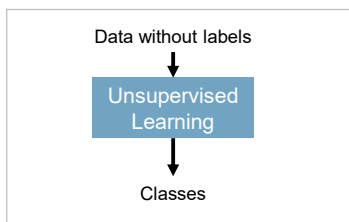
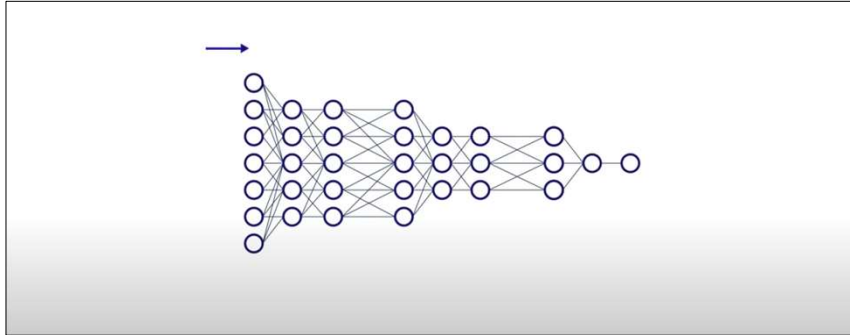


Human brain, 100 billion neurons



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› RECOGNIZING PATTERNS (WITHOUT UNDERSTANDING)

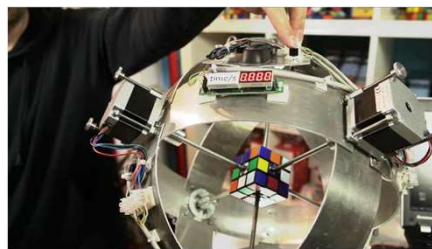


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› WITHOUT UNDERSTANDING



1 cube, Feliks Zemdegs (Australia), 4.22 s (2018)



1 cube, Robot Sub1 (Albert Beer, Germany), 0.887 sec (2016)



3 cubes while juggling, Que Jianyu (China), 306 s (2018)



Juggling robot, Chris Atkeson (CMU) (2016)



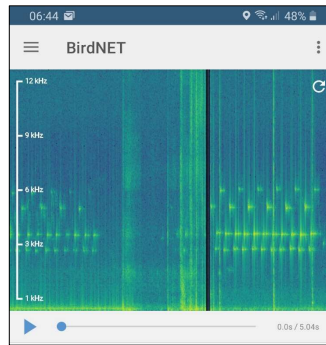
Solving cube with robot hand (OpenAI, founded by Elon Musk) (2019)

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IDENTIFY BIRDS

Cornell Lab of Ornithology

Classification of avian sounds based on the artificial neural network BirdNET.

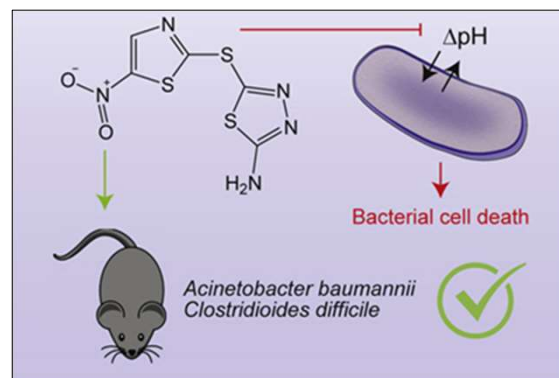


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DISCOVER ANTIBIOTICS

Jonathan Stokes et al. (2020)
A Deep Learning Approach to Antibiotic Discovery. Cell.

- find chemical **properties** that kill bacteria
- find chemical **molecules** that have these properties



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› EXPLAINABILITY

- Breast cancer detection by AI
- AI detects **better** than radiologists (no extra false alarms)
- “That we **don't** use this is **ethically irresponsible**” (prof v Ginneken, RUN)



[https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045\(23\)00298-X/fulltext](https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(23)00298-X/fulltext)

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› DATA BIAS

Classify criminal faces

- 1800 photos of Chinese men
- Classify criminal faces with 90% accuracy
- **confounding factors** such as collar and smile

Mugshots



LinkedIn



Source: Wu & Zhang (2016). Automated inference on criminality using face Images. arXiv:1611.04135v2.

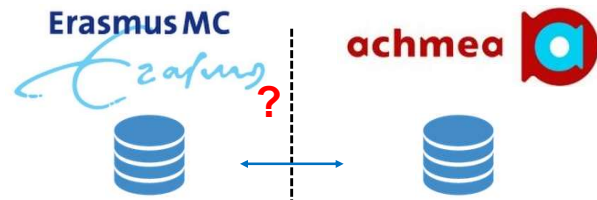
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DATA PRIVACY

› **BigMedilytics**
Heart failure hospitalization prediction model combining insurance and hospital data

› **Problem**
Sensitive data that cannot be shared!

› **Solution**
Secure data sharing



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AI IMPACT



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HORTIVATION

AUTONOMIE AANSTUREN

De productie wordt aangestuurd door autonome systemen

Route naar 2027

De systemen spreken dezelfde taal

De systemen werken naadloos samen

Digital Twinning

Predictive maintenance

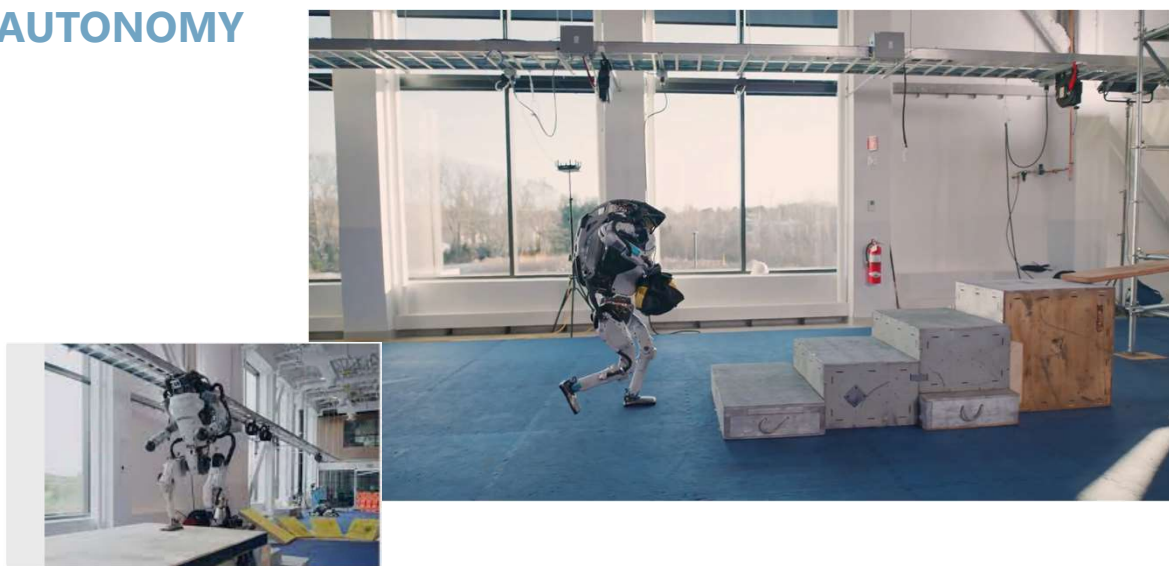
Klimaatregeling

Water- en energiemangement en oogsthandelingen

HORTIVATION
TECHNICAL SOLUTIONS FOR THE FUTURE

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AUTONOMY



Hortidaily
These could be the future tomato pickers"

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› TELLING AUTONOMOUS SYSTEMS WHAT TO DO



**“A system will do as told,
not as desired”**
(Selmar Smit, TNO)



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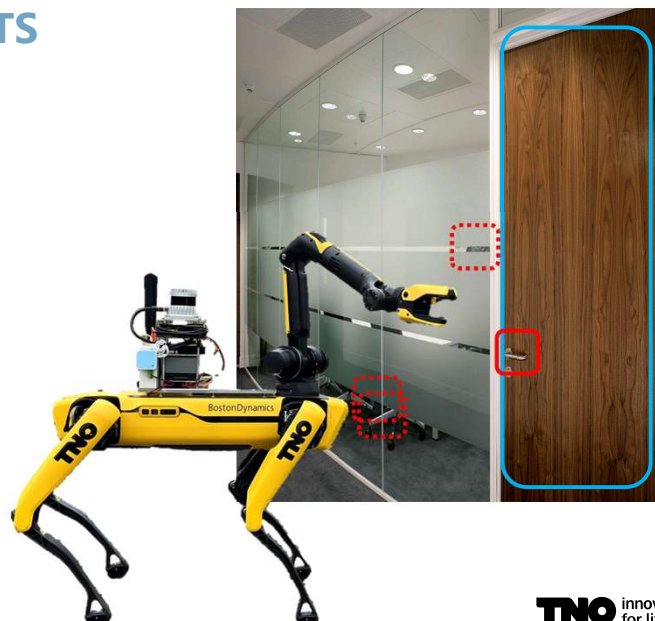
› MORAL RESCUE ROBOTS

Example rules

1. Rescue as many people as possible
2. Don't pass doors that are red taped

Moral dilemmas

- Pass 'red tape' to save lives?
- When 'call' supervisor?



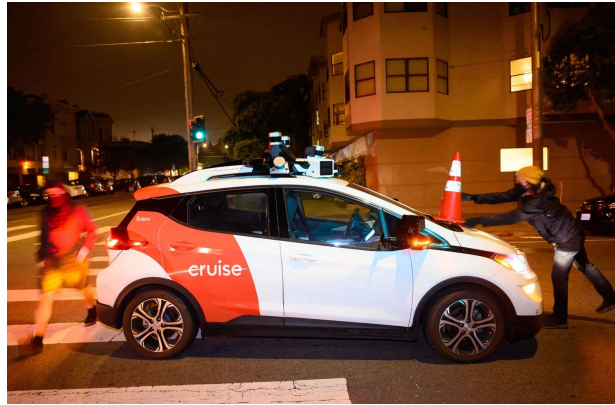
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› ROBOT TAXIS

Aug 2023
San Francisco has 24/7
robotaxis on its streets.

Nov 2023
Gary Marcus : Cruise is
really “remotely-assisted”
driving (by call-center).



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› MORAL SELF DRIVING VEHICLES

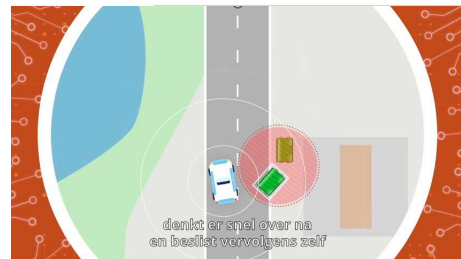
MACHINE LEARNING



- **Complex situations by example**
- **New situations?** Learn **rules/ethics**?
- Prove **safety**?

&

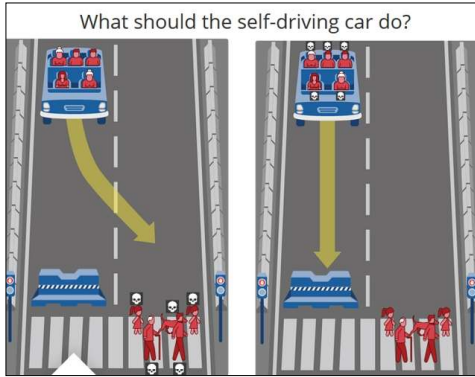
KNOWLEDGE MODEL



- **Competent?** (involve driver)
- **Objects/risks** (switch lanes)
- Include **harm** estimation

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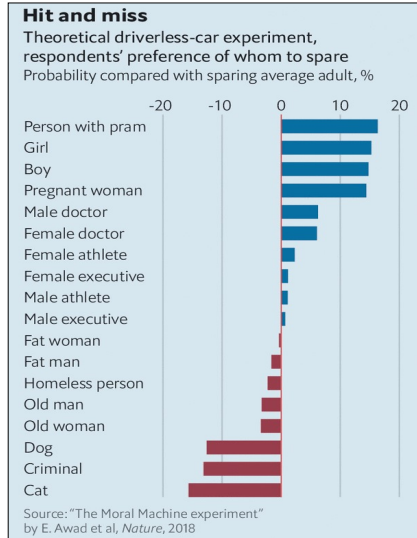
› MORAL MACHINE: SOCIETAL ALIGNMENT



The Moral machine (MIT)

Quantifying societal expectations about ethical principles that should guide machine behaviour.

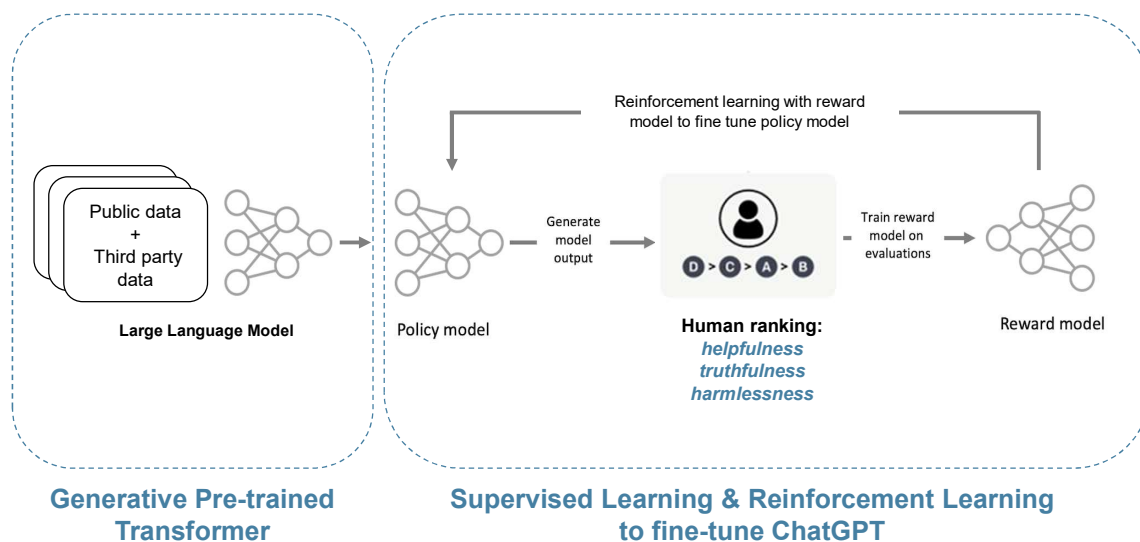
Edmond Awad et al (2018). *The Moral Machine experiment*. *Nature*.
www.nature.com/articles/s41586-018-0637-6



› AI – SECOND CLASS CITIZENS (ARNON GRUNBERG)



› GENERATIVE AI: EMERGENT INTELLIGENCE



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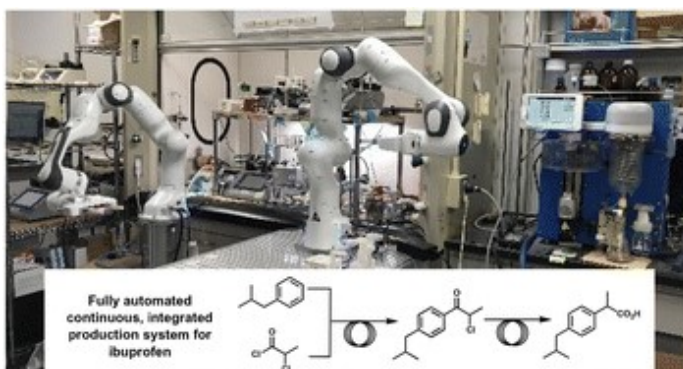
› HARMLESS?

2023: scientists at Carnegie Mellon University

- connected an AI system to a **hypothetical lab**
- asked it to **synthesize ibuprofen**.

AI showed how to produce **ibuprofen**

... and was also happy to produce chemical warfare agent **Sarin**.



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TRUTHFUL?



CUCUMBER CASE

A greengrocer puts **200 kg** of cucumbers outside at the **beginning** of the day, which consist of **99% water**.

At the **end** of the day, due to the heat, the cucumbers consist of only **98% water**.

How many **kg** of cucumbers are **left** at the end of the day?

ChatGPT: Let's approach this problem step by step.

- ... The remaining weight of the actual cucumber material is **2 kg**.
- ... So, at the end of the day, the greengrocer has **4950 kg** of cucumbers left.

ME: So, the cucumbers weigh **more** at the end of the day than at the start of the day?

ChatGPT: I **apologize** for the confusion in my previous response. You are correct, and I made a mistake in my calculations. **The weight of the cucumbers cannot increase due to water evaporation.**

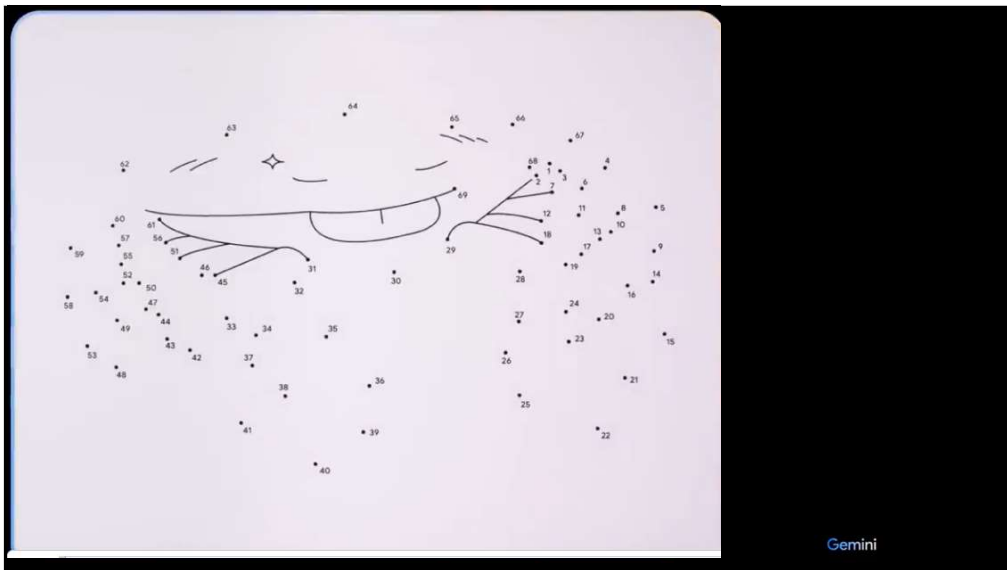
- ... So, at the end of the day, the greengrocer has **9900 kg** of cucumbers left.

ME: !?!?!?!?!?!?

ChatGP": I apologize once again ... I appreciate your patience.

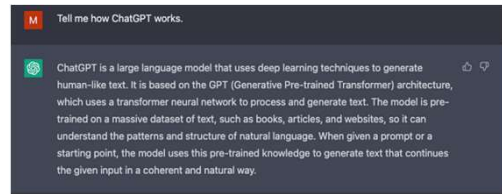
- ... So, at the **end** of the day, the greengrocer has approximately **202.04 kg** of cucumbers left.

2023-12-06: GEMINI, VISUAL PROMPTING



GENERATIVE AI

- **Natural language understanding**
text, sentiment analysis, medical diagnosis, legal research, market research
- **Natural language interaction**
chat bots, virtual assistants, customer support
- **Text generation**
translations, summaries, creative writing
- **Code generation**
basic coding and debug, preventing cyber attacks
- **Audiovisual content generation**
education, marketing, entertainment
- **Search**
search engines, educational platforms, R&D

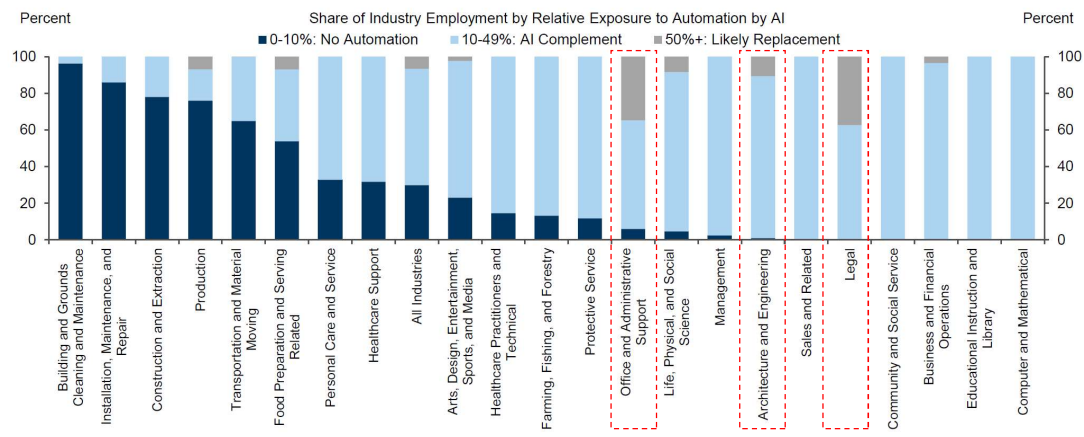


"Panel conversion of advertisers on the Cannes beach." (VK)



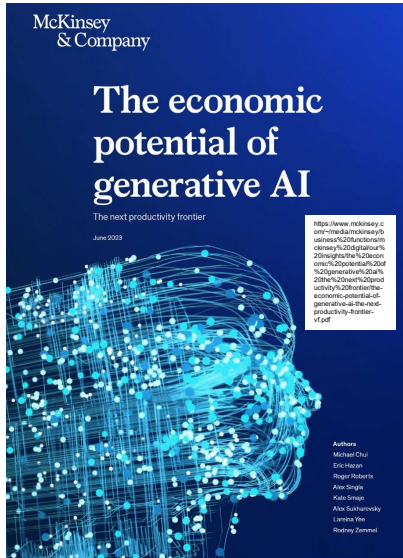
2023-03 GOLDMAN SACHS – 300M JOBS REPLACED

Exhibit 8: Replacement in Legal and Administrative Fields, Little Effect in Manual and Outdoor Jobs, and Productivity-Enhancement Everywhere Else



Goldman Sachs (2023-03-26). The Potentially Large Effects of Artificial Intelligence on Economic Growth.

2023-06 MCKINSEY – ECONOMIC IMPACT

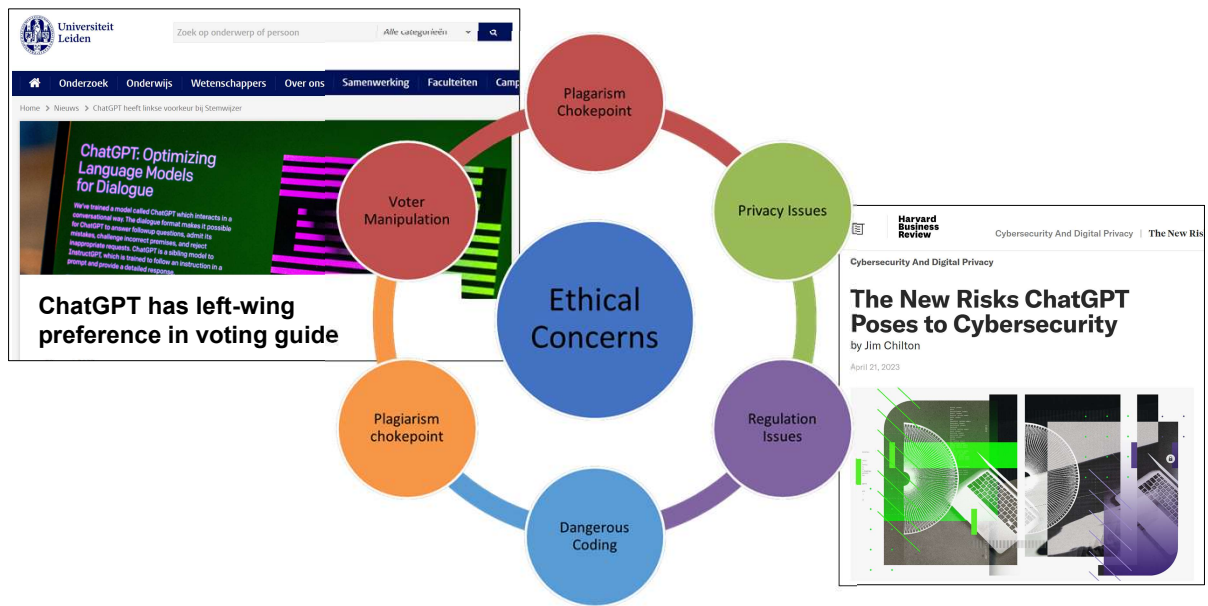


Generative AI can add 2.6-4.4 trillion\$ to global economy, of which 75% in :

- customer operations
- marketing and sales
- software engineering
- R&D

Biggest impact (% revenue) in banking (3-5%), high-tech (5-9%), and life sciences (3-5%).

ETHICAL CONCERNS



› EUROPEAN AI ACT



AI techniques : machine learning, ..., [general purpose AI](#)

Prohibited AI: violating [human rights](#); causing psychological/physical [harm](#); [social scoring](#) by public authorities; [predictive policing](#); ...

High Risk AI: [biometric identification](#); [critical infrastructures](#); [access education](#); [job selection](#); [law enforcement](#); [influencing elections](#); ...

Requirements **High-risk AI**

- Implementation of [risk management](#) system (art 9)
- Privacy and [data governance](#) (art 10)
- [Registration](#), incl logging '[environmental impact](#)' (art 12)
- [Transparency](#) and information to users (art 13)
- [Human agency](#) and [oversight](#) (art 14)
- [Accuracy](#), [robustness](#) and [cybersecurity](#) (art 15)

Measures in support of **innovation**

- Member States should establish [regulatory sandboxes](#) to facilitate development and testing of AI systems under strict [regulatory oversight](#) before employment.

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› HARARI – AI HAS HACKED OS OF HUMAN CIVILIZATION



AI has not yet developed [consciousness](#) and cannot yet [navigate](#) the [physical world](#) to [want](#) and be able to take over the world.

But it [can](#) generate [human like language](#), creating:

- [fake intimacy](#) (exploiting human weaknesses and biases)
- [fake culture](#) (shifting political and economical views)

AI can be '[used for good](#)' (eg [new solutions to ecological crisis](#)) but must be [regulated](#) very [carefully](#), like we did for nuclear energy.

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THANK YOU!