



Working Conference "Artificial intelligence and education: A critical view through the lens of human rights, democracy, and the rule of law"

AI and Education: The myth, the challenges, and the path forward

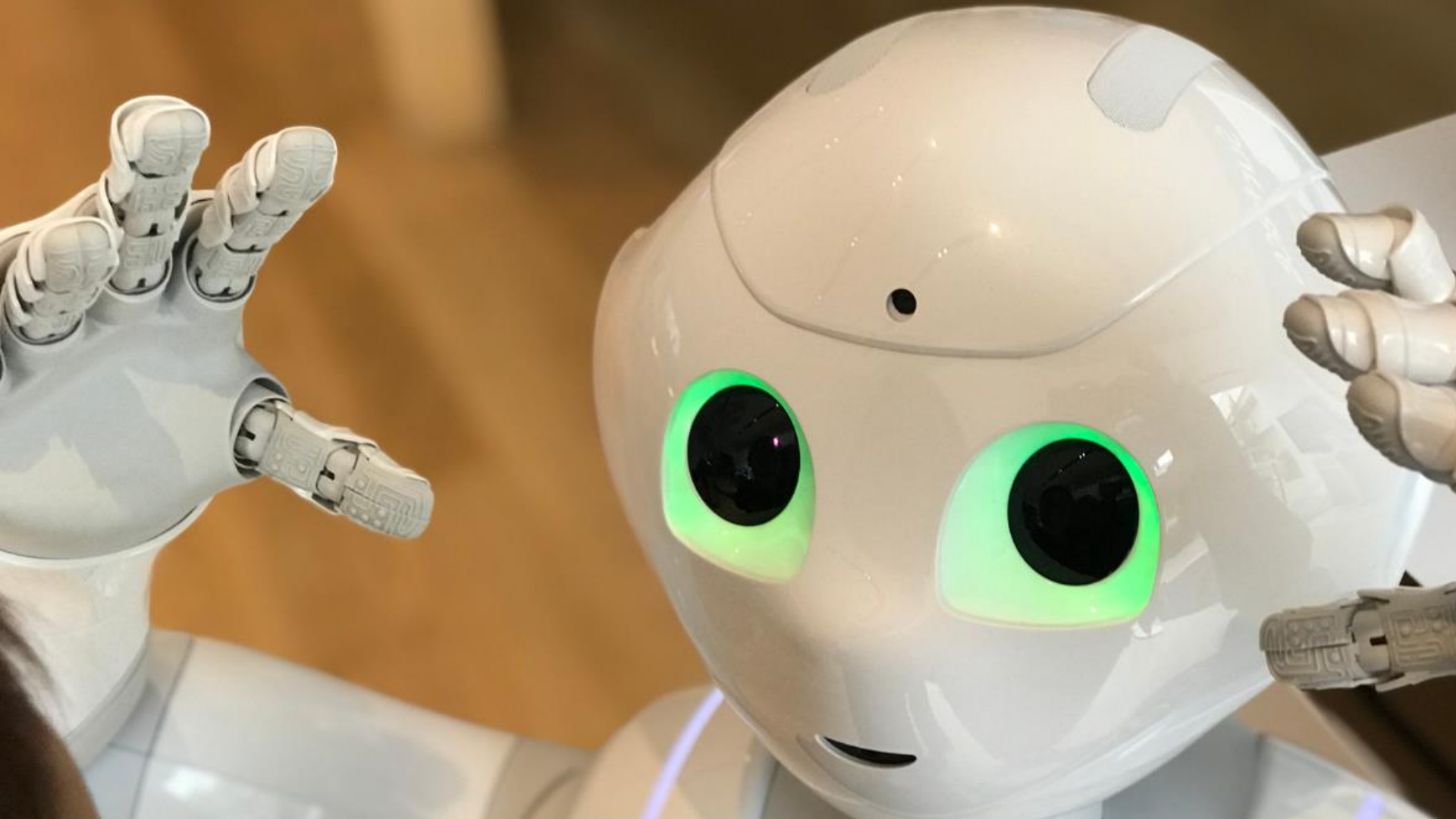
Prof. Dr. Dagmar Monett

Division Director Computer Science
Berlin School of Economics and Law

18th October 2022







A dark, moody photograph of laboratory glassware, including beakers and a graduated cylinder, with a blue semi-transparent overlay on the left side containing text.

THEORETICALLY, EMPIRICALLY

Defining Intelligence

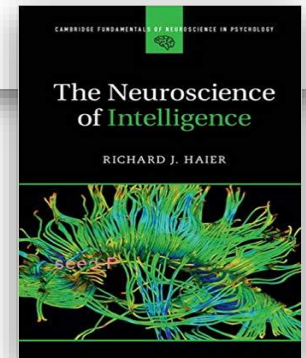
A widely accepted definition of intelligence

[Intelligence is] “a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience ... It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather it reflects a broader and deeper capability for comprehending our surroundings – ‘catching on’, ‘making sense’ of things, or ‘figuring out’ what to do” (Gottfredson, 1997a).

Most accepted definition, AGISI survey

Gottfredson, L. S. (1997a). Mainstream science on intelligence: An editorial with 52 signatories, history, and bibliography. *Intelligence*, 24: 13-23.

As cited in **Haier**, R. J. (2017). *The Neuroscience of Intelligence*. New York: Cambridge University Press.



Three definitions of AI

... among other 500+

“Artificial Intelligence is ... **the study of the computations that make it possible to perceive, reason, and act.**”

Winston, P. H. (1992)

Artificial Intelligence. Third Edition,
Addison-Wesley Publishing Company.

“The essence of intelligence is the principle of **adapting to the environment** while working with insufficient knowledge and resources.”

Wang, P. (2008)

What do you mean by “AI”? In Proceedings of the First AGI Conference, Frontiers in Artificial Intelligence and Applications, 171: 362–373, IOS Press.

Legg, S. and Hutter, M. (2007)

Universal Intelligence: A Definition of Machine Intelligence.
Minds and Machines, 17(4):391-444, Springer.

“Intelligence measures an agent's ability **to achieve goals in a wide range of environments.**”

Defining (A)I: A comparison

1921

Symposium

Participants

14

**Primary
affiliation**

Educational Psychology

Countries

USA, Europe

Focus

Prediction of behavior

Definitions

14

**Type of
definitions**

Only definitions of
human intelligence

5 (14) educational psychologists define intelligence

[Intelligence is ...]

... the power of **good responses** from the point of view of truth or facts; (Thorndike, 1921)

... the ability to carry on **abstract thinking**; (Terman , 1921)

... having learned or ability to **learn to adjust** oneself to the environment; (Colvin , 1921)

... the capacity for **knowledge**; (Henmon, 1921)

... the capacity to **acquire capacity**. (Woodrow, 1921)

As referred to in **Lanz, P.** (2000). The Concept of Intelligence in Psychology and Philosophy. In Cruse, H., Dean, J., and Ritter, H. (eds.) Prerational Intelligence: Adaptive Behavior and Intelligent Systems Without Symbols and Logic, Vol. 1, 19-30, Springer.

Defining (A)I: A comparison

1921

Symposium

1986

Symposium

Participants

14

25

**Primary
affiliation**

Educational Psychology

Diverse Psychologies
(educational, cognitive,
behavioural, social, cross-
cultural, etc.)

Countries

USA, Europe

USA, Europe

Focus

Prediction of behavior

Understanding of
behaviour

Definitions

14

25

**Type of
definitions**

Only definitions of
human intelligence

Mostly definitions of
human intelligence

16 (25) leading psychologists define intelligence

[**Intelligence** is] an **elusive** concept (Estes, 1986); an **illusory** unified capacity (Horn, 1986); a cognitive proficiency (Glaser, 1986); a **polymorphous** set of qualities elusive to define, explain, and measure (Brown, 1986); a **pluralistic** (Anastasi, 1986), **context-dependent** concept (Anastasi, 1986; Sternberg, 1986); a **medley** of important events, a **mixture** of different things (Horn, 1986); a **finite set** of independent abilities operating as a complex system (Detterman, 1986); the **sum total** of all cognitive processes (Das, 1986); a **collective** term for demonstrated, mental individual differences (Hunt, 1986); mental **self-government** (Sternberg, 1986); a **judgement** or attribution that people do, and not a quality residing in the individual (Goodnow, 1986); a **hypothetical** (Zigler, 1986), **culture-bound**, **ethnocentric**, and excessively **narrow** (Berry, 1986), **societal construct**, a concept in the mind of a society at large (Carroll, 1986).

A summary of some of the definitions that are included in **Sternberg**, R. J. and **Detterman**, D. K. (1986). What is intelligence? Contemporary Viewpoints on its Nature and Definition. Norwood, NJ: Ablex.

Defining (A)I: A comparison

1921

Symposium

1986

Symposium

2019

AGISI survey

Participants

14

25

567 (academia: 79.7%)

Primary affiliation

Educational Psychology

Diverse Psychologies
(educational, cognitive,
behavioural, social, cross-
cultural, etc.)

Computer Science,
Engineering, Biology,
Neurosciences,
Philosophy,
Cognitive Science, etc.

Countries

USA, Europe

USA, Europe

57+ countries

Focus

Prediction of behavior

Understanding of
behaviour

Computation of behavior

Definitions

14

25

343 (+ 4128 opinions)

Type of definitions

Only definitions of
human intelligence

Mostly definitions of
human intelligence

Explicit distinction human
vs. machine intelligence

Example of findings: Cognitive biases undermine consensus

“Intelligence is concerned mainly with rational action. Ideally, an intelligent agent takes the best possible action in a situation.”

(Russell & Norvig, 2010)

“Intelligence is concerned mainly with **rational** action. Ideally, an intelligent agent takes the **best** possible action in a situation.”

“Intelligence is concerned **mainly** with **rational** action. **Ideally**, an intelligent agent takes the **best** possible action in a situation.”

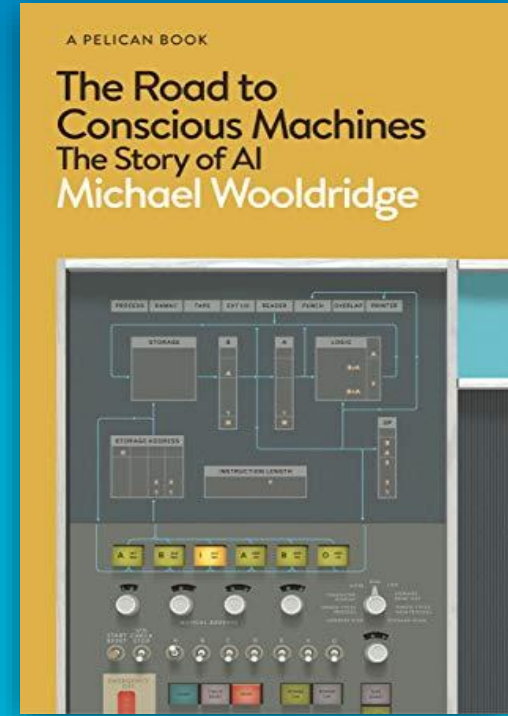
Monett, D., Hoge, L., & Lewis, C. W. P. (2019). *Cognitive Biases Undermine Consensus on Definitions of Intelligence and Limit Understanding*. In U. Furbach, S. Hölldobler, M. Ragni, R. Rzepka, C. Schon, J. Vallverdu, & A. Włodarczyk (eds.), *Joint Proceedings of the Workshops LaCATODA 2019 & BtG 2019 at IJCAI 2019*, 2452: 52-59, CEUR-WS, Macao, China.

THE GRAND DREAM,
THE BRIGHT FUTURE

The AI Promise




“
The long-term dream of AI is to build machines that have the **full range of capabilities for intelligent actions** that people have—to build machines that are self-aware, conscious and autonomous in the same way that people like you and me are.



Wooldridge, M. (2020). *The Road to Conscious Machines: The Story of AI*. UK: Pelican Random House.

The promise of AI in education



Together with sensors and learning management systems, Artificial Intelligence (AI) can give teachers a real sense of how different students learn differently, where students get interested and where they get bored, where they advance and where they get stuck. Technology can help adapt learning to different student needs and give learners greater ownership over what they learn, how they learn, where they learn and when they learn. [...] And of course, AI is helping assessment and exams make big leaps, whether these are assessments through simulations, hands-on assessments in vocational settings, or machine-learning algorithms scoring essays.

Andreas Schleicher

Director, OECD Directorate for Education and Skills, commenting the OECD Digital Education Outlook 2021

<https://oecdeditoday.com/how-radically-reimagine-teaching-learning-digital-technology/>



WHY NOW?

The AI Momentum

An AI momentum. Why now?

Big Data
(training and
test data)

**Improved
algorithms**
(and models, and
parameters)

Open access
(publications,
pre peer review)

Open source
(algorithms,
experiments)

**Computer
power**
(hardware, GPUs)

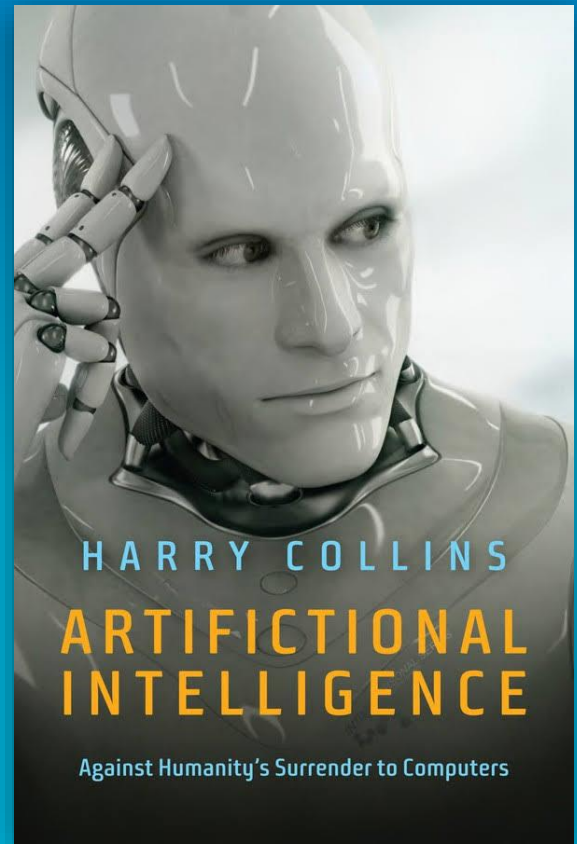
**Cloud
computing**
(development
platforms and
storage)

The background is a complex, abstract composition. It features a dark, almost black, upper portion that transitions into a vibrant blue horizontal band. Below this band, the background is a mix of white and light blue, with numerous translucent, spherical bubbles of varying sizes scattered throughout. Some bubbles are larger and more prominent, while others are smaller and more numerous. The overall effect is one of depth and movement, reminiscent of a microscopic view of a liquid or a digital simulation of particles. The blue band is semi-transparent, allowing the underlying textures and colors to be visible through it.

THE MYTH

Artificial? Intelligence?

“**Artificial intelligence**, the one
“available through
the newspapers,
books and films.”



Collins, H. (2018). *Artificial Intelligence: Against Humanity's Surrender to Computers*. Cambridge, UK: Polity Press.

Misleading news

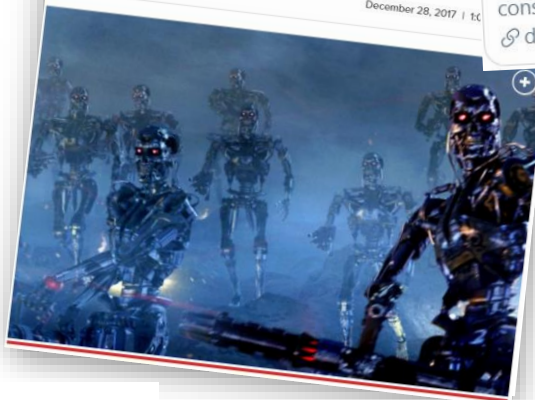
This new AI can read your mind and predict your thoughts
July 3, 2017 | 11:22am | Updated

By Mike Wolner, BGR



5 terrifying stories that warn of an AI apocalypse
December 28, 2017 | 11:22am | Updated

By Lauren Tousignant



EXCLUSIVE ++
AI to bring 'mankind to edge of APOCALYPSE' – with robots a bigger ...
THE quest to create artificial intelligence will have apocalyptic consequences, an expert has warned.
Robot writes op-ed promising to destroy mankind
September 11, 2020 | 5:24pm | Updated

By Laura Ralano

**AI
hype**



McKinsey: One-third of US workers could be jobless by 2030 due to ...
The consulting firm estimates that between 400 million and 800 million people globally could be displaced by automation.
cncb.com

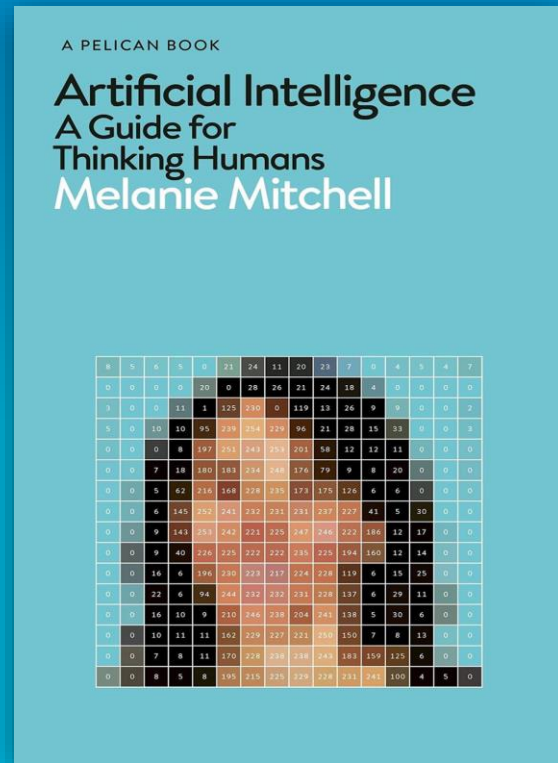
Google AI built 'AI child' more advanced than anything humans have ever made
December 6, 2017 | 11:22am | Updated

*Mark Hodge, The Sun



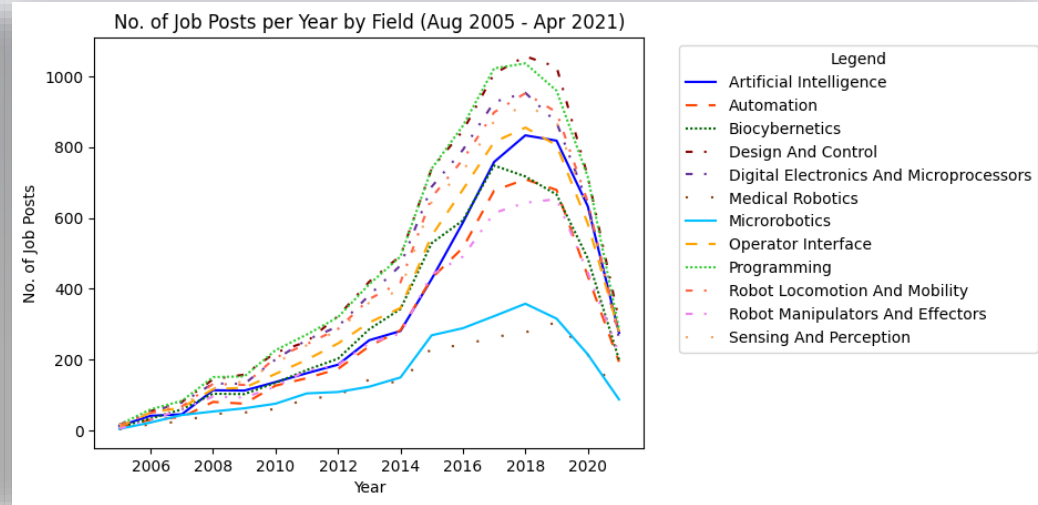
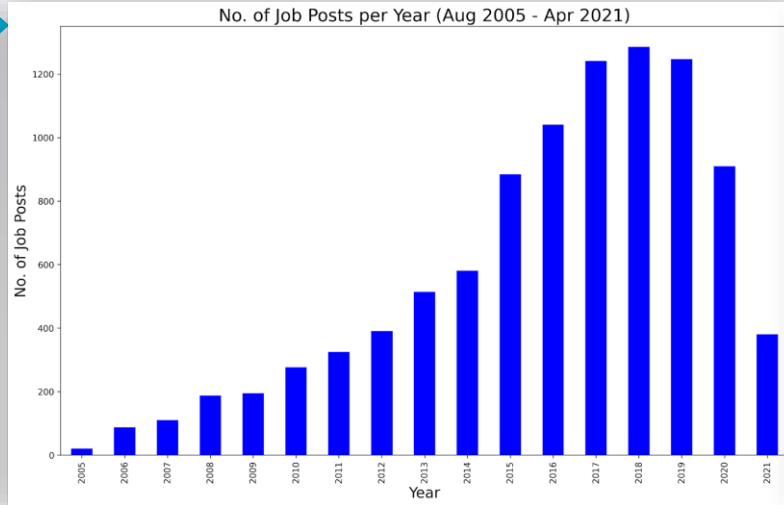


If you rely on movies and science fiction (and even some popular non-fiction) for your view of AI, you will be afraid of AI becoming conscious, turning malevolent, and trying to enslave or kill us all. But given how far the field seems from achieving anything like general intelligence, this is not what most people in the AI community worry about."



Mitchell, M. (2019). Artificial Intelligence: A Guide for Thinking Humans. UK: Pelican Random House.

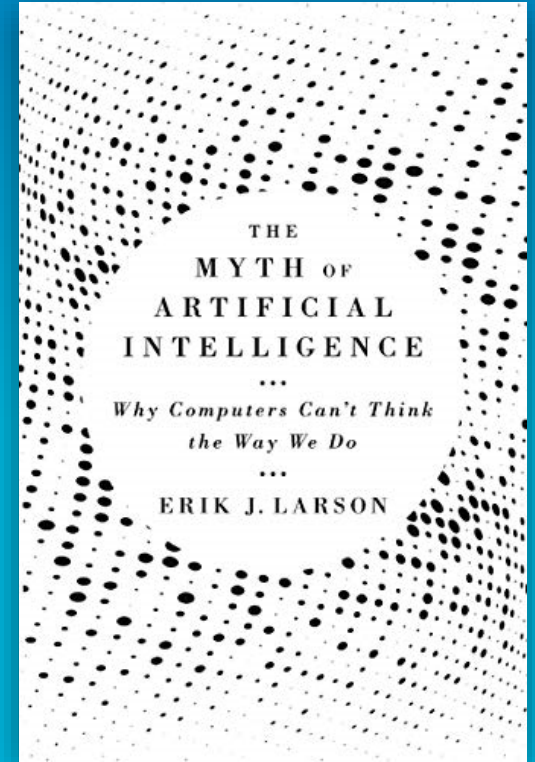
Jobs are not disappearing. Not yet.



(9,680 job posts from the [robotics-worldwide Archives](#), "a fully moderated email list of robotics researchers worldwide," 08/2005-04/2021)

Anandarajah, L., & Monett, D. (2021). Will Robots Take all the Jobs? Not yet. In Matos, F. (Ed.), Proceedings of the 3rd European Conference on the Impact of Artificial Intelligence and Robotics, ECI AIR 2021 (a virtual conference), pp. 1-10, Academic Conferences International Ltd., Reading, UK, November 18th, 2021 [online]. Available at: <https://www.slideshare.net/dmonett/anandarajah-monett-2021-eciair>.

“
The myth is not that true AI is possible. As to that, the future of AI is a scientific unknown. **The myth of artificial intelligence is that its arrival is inevitable, and only a matter of time**—that we have already embarked on the path that will lead to human-level AI, and then superintelligence. We have not.



Larson, E. J. (2021). *The Myth of Artificial Intelligence: Why computers can't think the way we do*. Cambridge, MA: Belknap, Harvard University Press.



THE STILL LONG PATH AHEAD

The challenges ahead

Sometimes,
the promise of AI in education
looks very different from
the reality of AI in education.

UK ditches exam results generated by biased algorithm after student protests



Photo by Lucy North / MI News / NurPhoto via Getty Images

/ Protesters chanted 'Fuck the algorithm' outside the country's Department for Education

By JON PORTER / @jonporty

Aug 17, 2020, 6:16 PM GMT+2 | □



<https://www.theverge.com/2020/8/17/21372045/uk-a-level-results-algorithm-biased-coronavirus-covid-19-pandemic-university-applications>

Cheating allegations engulf Dartmouth medical school

By **Laura Krantz** Globe Staff, Updated April 15, 2021, 6:52 p.m.

Administration, faculty! Typical case of anthropomorphism, a window to lack of accountability

~~The e-mail accused her~~ — and, she later learned, more than a dozen other students — ~~of cheating~~ by accessing online course materials while taking a test on a different software platform. The school said that it had ~~electronic evidence of misconduct~~, and that she was invited to make a brief statement defending herself at a tribunal to be held over Zoom in a week.

<https://www.bostonglobe.com/2021/04/15/metro/cheating-allegations-chill-students-dartmouth-medical-school/>

▶ A couple of months later...

Victory! Dartmouth Ends Unfounded Cheating Investigation After Students, Rights Groups Speak Out

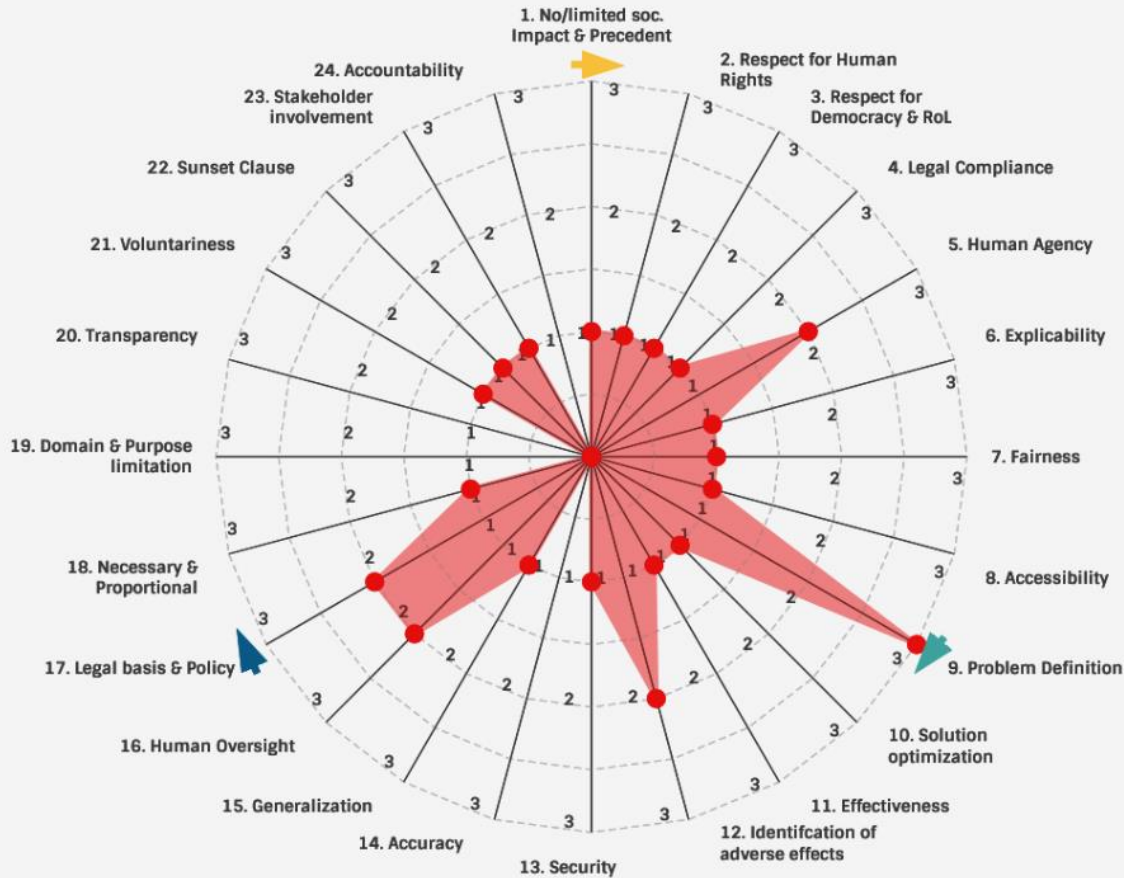
DEEPLINKS BLOG

BY **JASON KELLEY**

JUNE 10, 2021

<https://www.eff.org/deeplinks/2021/06/dartmouth-ends-misguided-investigation-after-students-rights-groups-speak-out>

AI-Driven Proctoring To Flag "Suspicious Behaviour"



0 = unknown

1 = no compliance

2 = partial compliance

3 = full compliance

"[The] use of [online proctoring] has faced objections from student-representative bodies who deem OP to infringe privacy and autonomy of students by exposing them to extensive surveillance."

<https://allai.nl/portfolio-item/online-proctoring/>

Philosophy & Technology

<https://doi.org/10.1007/s13347-021-00476-1>

RESEARCH ARTICLE



Good Proctor or “Big Brother”? Ethics of Online Exam Supervision Technologies

Simon Coghlan^{1,2}  · Tim Miller^{1,2} · Jeannie Paterson^{2,3}

Received: 10 November 2020 / Accepted: 24 August 2021

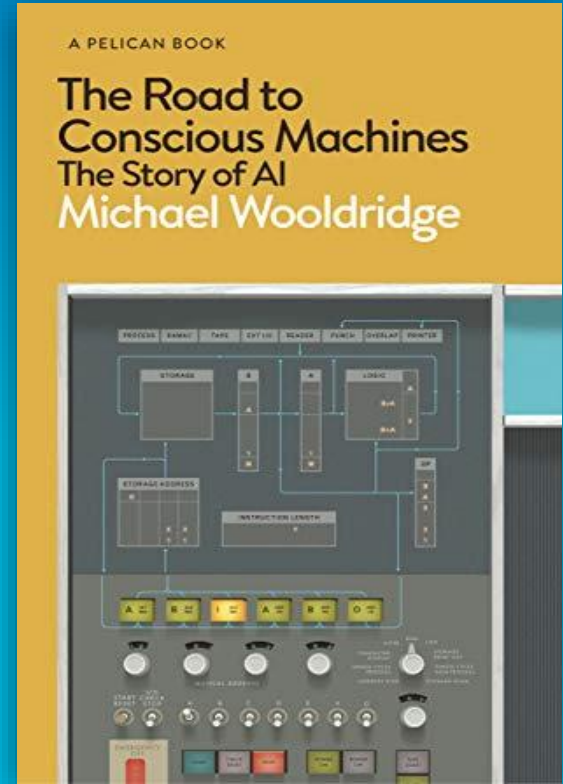
© The Author(s), under exclusive licence to Springer Nature B.V. 2021

<https://link.springer.com/epdf/10.1007/s13347-021-00476-1>

Online proctoring, one among many!

- ▶ **Highly intrusive surveillance machinery**; Corporations' interests-driven
- ▶ **Lack of AI literacy**; educational institutions buying what they are told
- ▶ Psychology, Sociology, Education experts **not involved**
- ▶ Identifies "suspicious" behaviours; "detects" fraud ⇒ **Inaccurate**; no extensive research comparing to human experience
- ▶ Privacy (data use and sharing **without students or parents' consent**)
- ▶ **No opt-out**; no alternative examination mechanisms
- ▶ **Zero transparency**; **blurry or no accountability**; **no explainability**
- ▶ **Discrimination** (e.g. students with special conditions), etc.

“ The reality of AI for the foreseeable future is **very different** to the grand dream.



Wooldridge, M. (2020). *The Road to Conscious Machines: The Story of AI*. UK: Pelican Random House.







A close-up photograph of a person wearing a white lab coat and blue nitrile gloves, operating a black and blue microscope. The person's hands are visible, adjusting the microscope's components. The background is a blurred laboratory environment. A semi-transparent blue horizontal bar is overlaid across the middle of the image, containing white text.

FAR FROM STRAIGHTFORWARD

Coming forward

The future of AI in education is bright, but we need to pay careful attention to *how, for what, and for whom* AI is used.

AI literacy.

Start early.



AI Campus Original



COURSE

Daten- und Algorithmenethik

Hochschule für Wirtschaft und Recht
Berlin

Prof. Dr. Claudia Lemke

Prof. Dr. Dagmar Monett Díaz



jederzeit



Daten- und Algorithmenethik



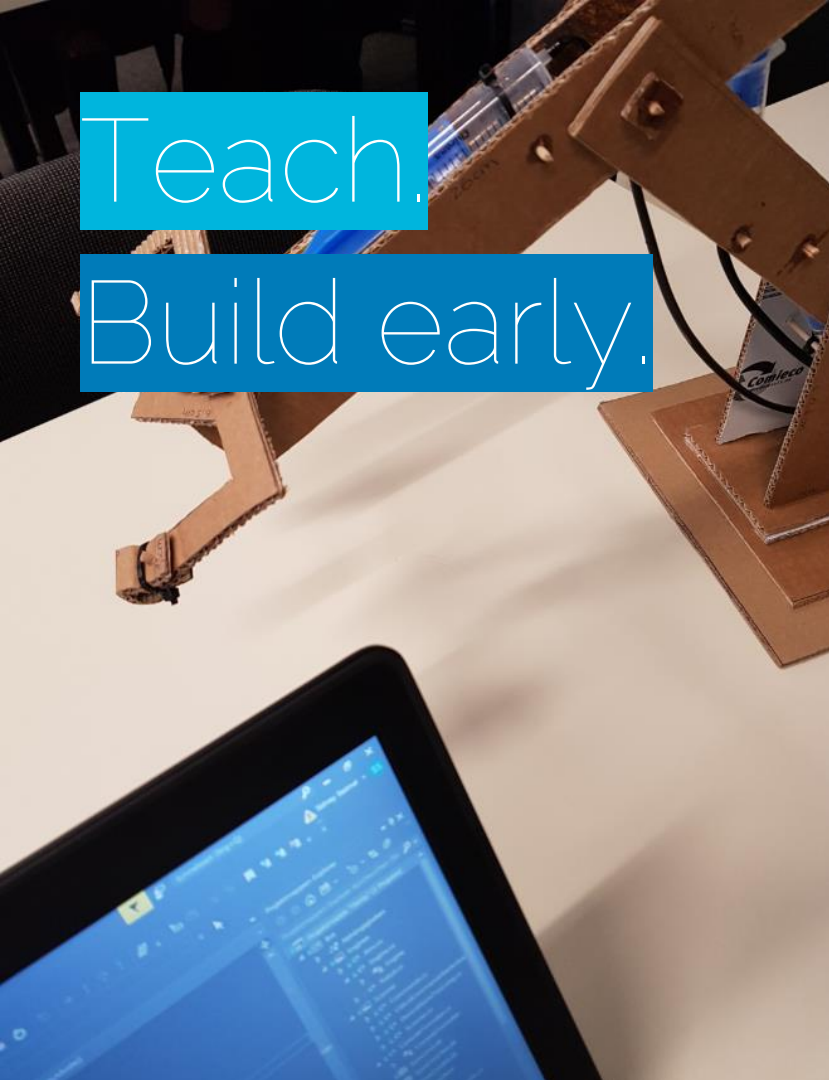
KI-Campus

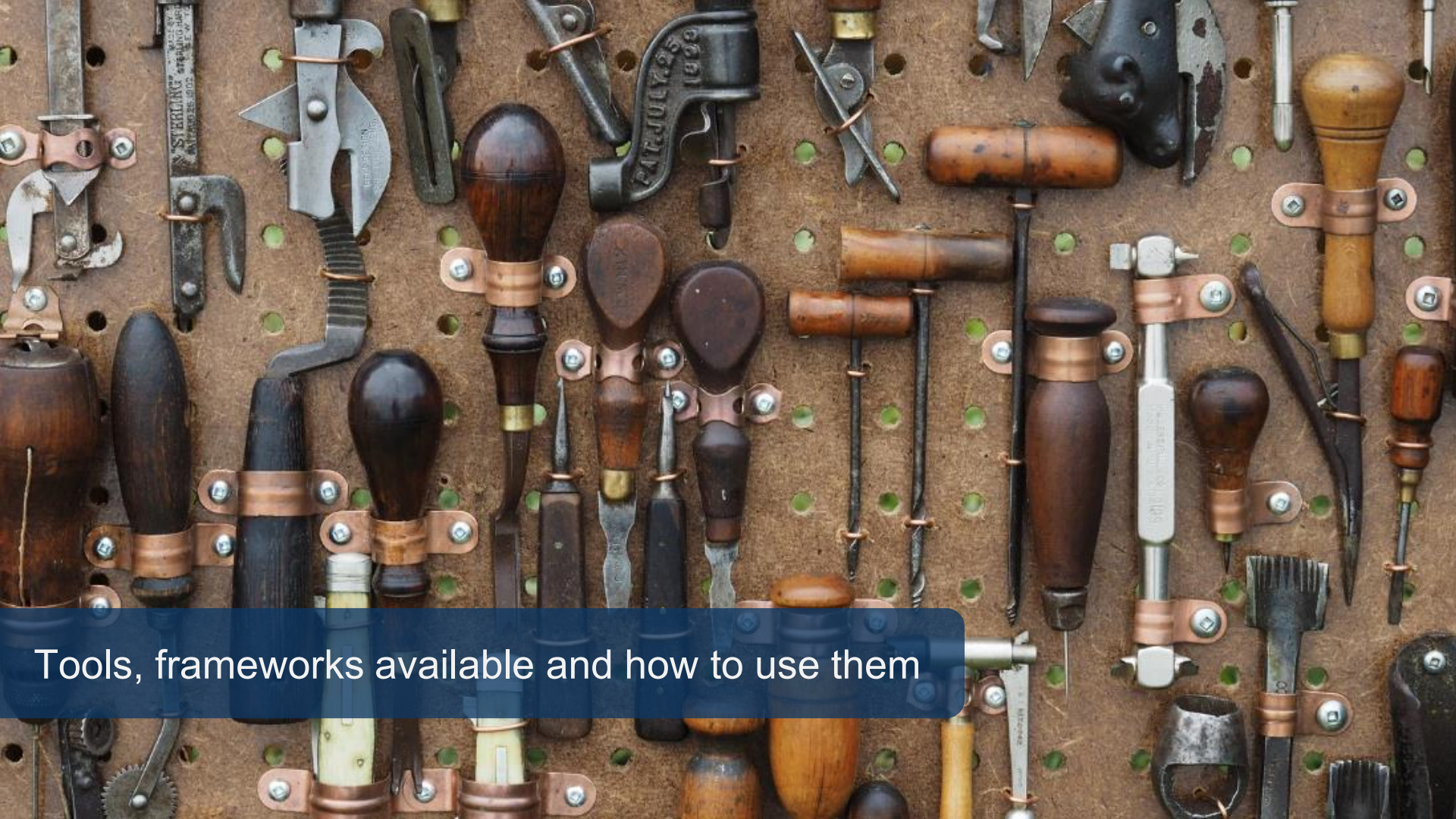
Die Lernplattform
für Künstliche Intelligenz

<https://ki-campus.org/courses/daethik2020>

Teach.

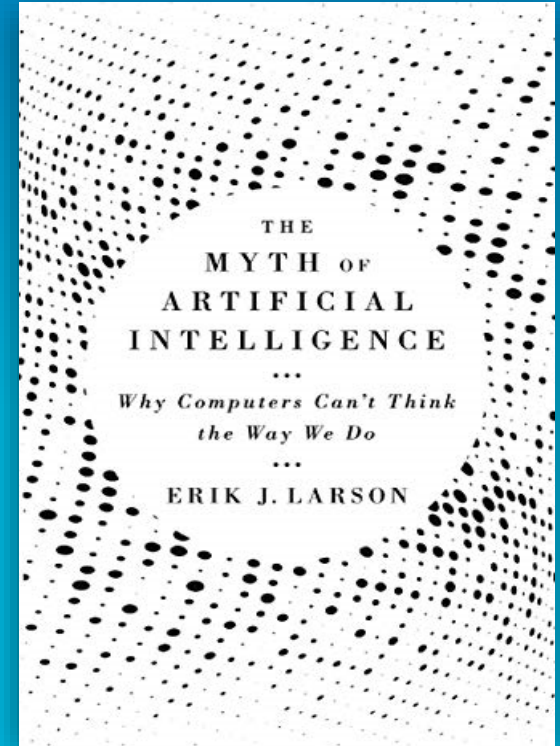
Build early.





Tools, frameworks available and how to use them

“
Success on narrow applications get us not one step closer to general intelligence. [...] No algorithm exists for general intelligence.

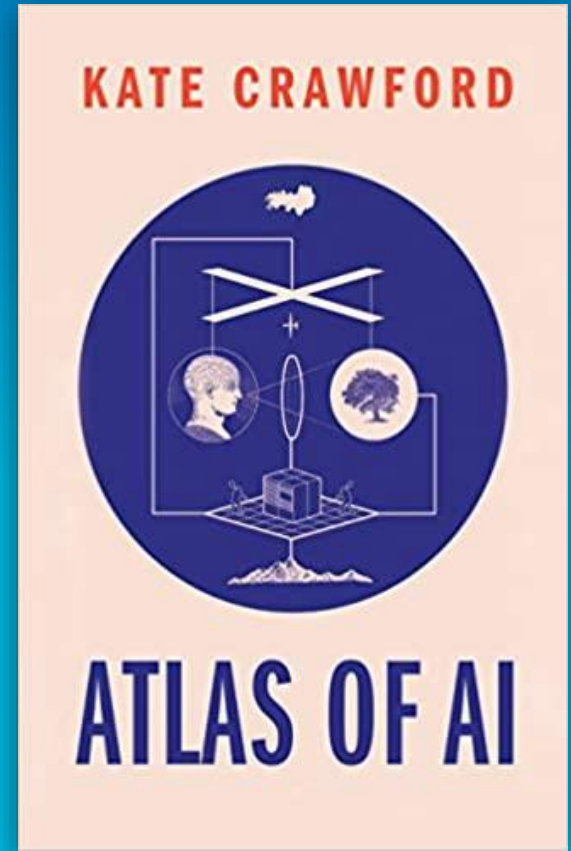


Larson, E. J. (2021). *The Myth of Artificial Intelligence: Why computers can't think the way we do*. Cambridge, MA: Belknap, Harvard University Press.



Surveillance. Control. Power

“[M]any underpaid workers are required to help build, maintain, and test AI systems. [...] The technical AI research community relies on cheap, crowd-sourced labor for many **tasks that can't be done by machines.**”

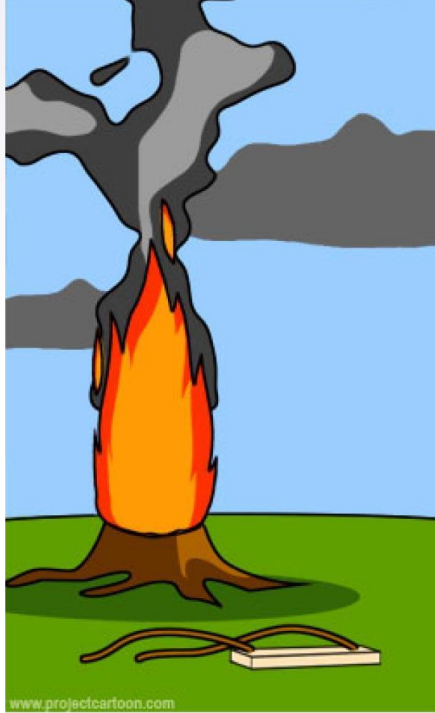


Crawford, K. (2021). Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. Yale University Press.

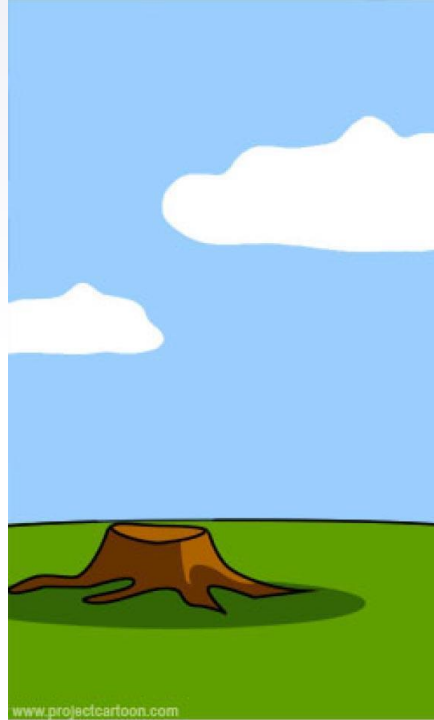


Human rights, values, ethical aspects

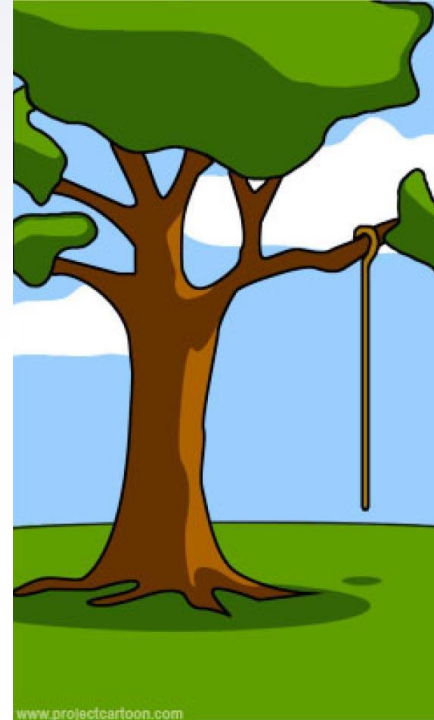
AI? Which AI?



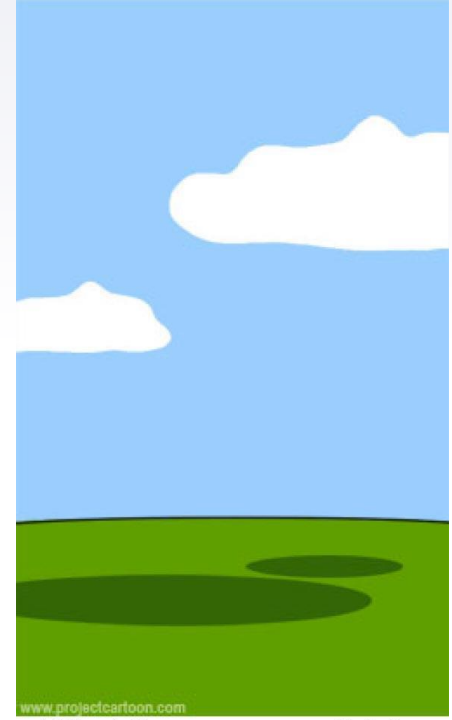
How the user data was processed



How ethical aspects were considered



How much AI there is inside



What the company thinks about regulation



THE UNIVERSAL DECLARATION OF Human Rights

Recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of justice, peace and good in the world.

Disregard and contempt for human rights have resulted in barbarous acts which have outraged the conscience of mankind and the solemnity of a world in which freedom, justice, peace and good will shall prevail and in which the dignity and worth of the human person shall be the highest aspiration of the common people.

It is essential if man is not to be exploited by his fellow men, that he be enabled to realize his spiritual, material and intellectual development and that he be assisted in the development of his personality.

It is the duty of States to secure to everyone the rights and freedoms hereinafter set out.

The people of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have

declared in common moral progress and better standards of life in larger freedom.

Whereas there have been phleged themselves to achieve, in co-operation with the United Nations, the promotion of universal respect and observance of human rights and fundamental freedoms,

and whereas a common understanding of these rights and freedoms is of the greatest importance for the full realization of the pledge,

and whereas common standards should be embodied in a common instrument of reference for all peoples and all nations, in the light of their varied individual and social systems, keeping this Declaration constant in mind, shall enter its binding and operative program for their rights and freedoms and for progressive measures, national and international, to secure their universal and effective recognition and observance, taking into account the various legal systems, customs, religions and traditions of the different peoples of the world, and whereas



INDEPENDENT HIGH-LEVEL EXPERT GROUP ON ARTIFICIAL INTELLIGENCE SET UP BY THE EUROPEAN COMMISSION



POLICY AND INVESTMENT RECOMMENDATIONS FOR



INDEPENDENT HIGH-LEVEL EXPERT GROUP ON ARTIFICIAL INTELLIGENCE SET UP BY THE EUROPEAN COMMISSION



TRUSTWORTHY AI ASSESSMENT LIST



INDEPENDENT HIGH-LEVEL EXPERT GROUP ON ARTIFICIAL INTELLIGENCE SET UP BY THE EUROPEAN COMMISSION



ETHICS GUIDELINES FOR TRUSTWORTHY AI



ETHICALLY ALIGNED DESIGN First Edition

A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems



ETHICALLY ALIGNED DESIGN First Edition Overview

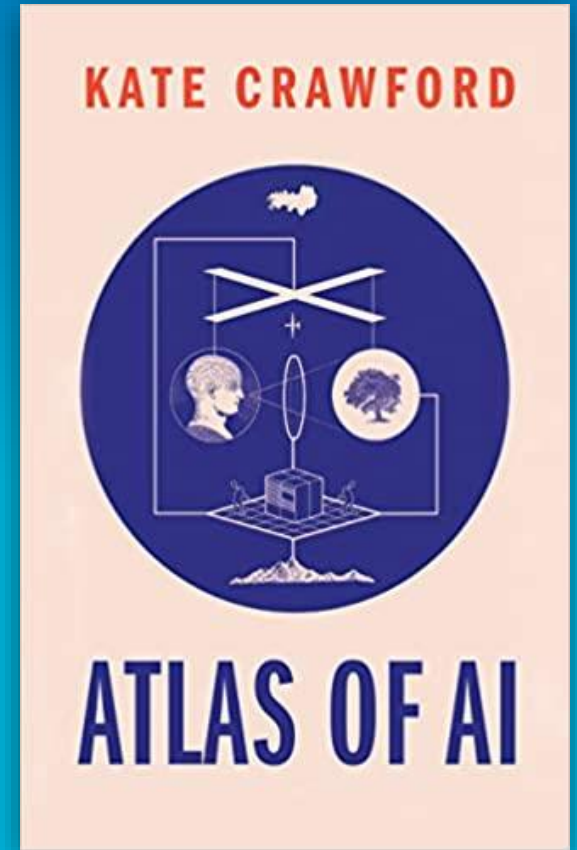
A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems





Inter-, intra-, multi-disciplinarity. Collaboration

“AI is neither artificial not intelligent. Rather, artificial intelligence is both embodied and material, made from natural resources, fuel, human labor, infrastructures, logistics, histories, and classifications.”

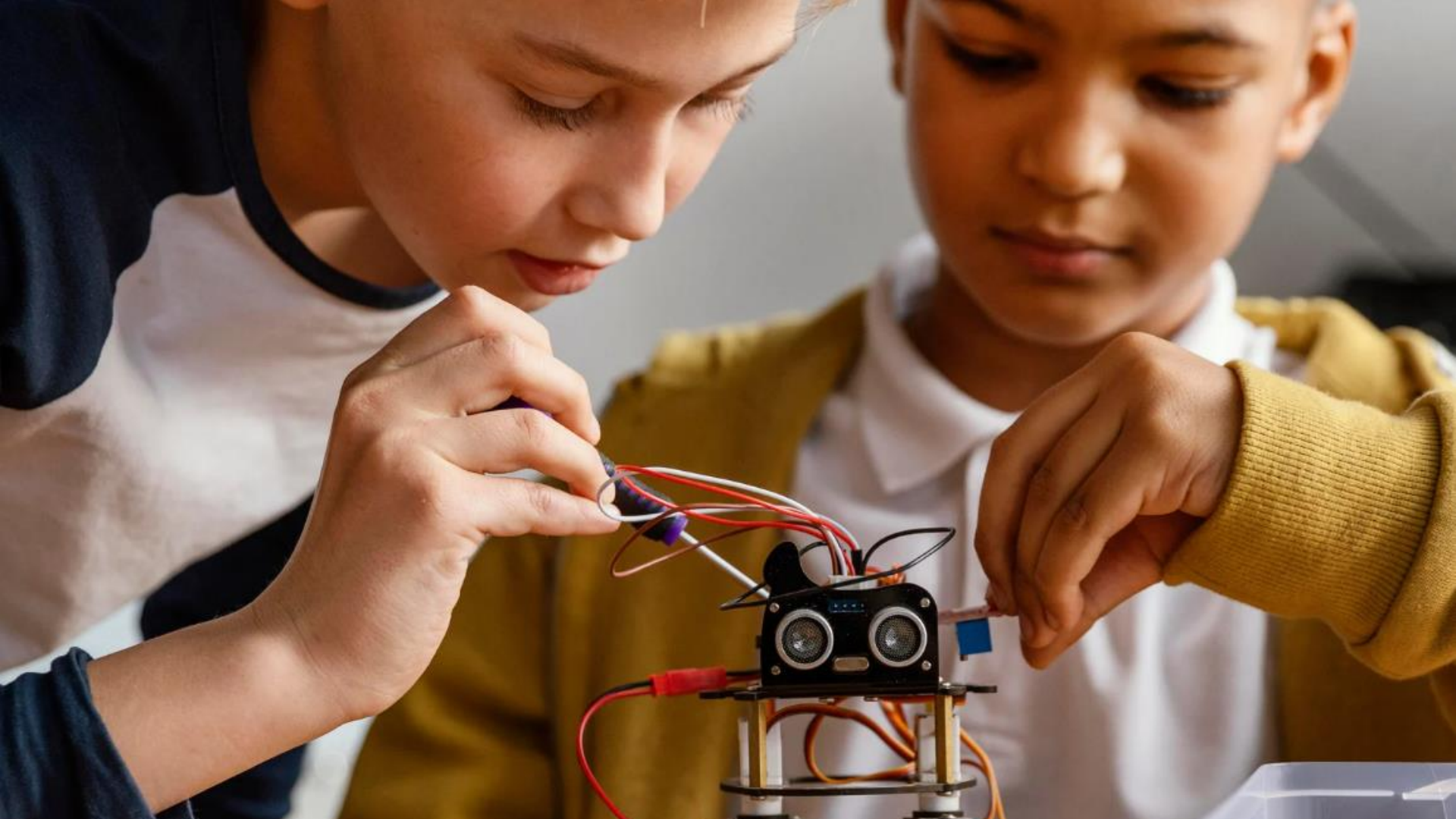


Crawford, K. (2021). Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. Yale University Press.

Dream big.

But...





Contact

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