

Ethical Aspects of Machine Learning (and AI)

Winter school „CAS ADS M6 Deep Learning“

Hotel Regina, Mürren

25.1.2023

Claus Beisbart

Claus.Beisbart@philo.unibe.ch

+ New chat

AI Ethics and Autonomy ✎ 🗑

Clear conversations

Dark mode

OpenAI Discord

Updates & FAQ

Log out

C

write a text about ethics of AI and mention autonomy, about 100 words



The ethics of AI is a complex and multifaceted topic that touches on issues such as autonomy, privacy, accountability, and transparency. One key aspect of AI ethics is the question of autonomy, which refers to the degree to which a system can make decisions and take actions independently of human oversight or control. As AI systems become increasingly advanced and capable, the issue of autonomy becomes increasingly important, as it raises questions about the responsibility and accountability of AI systems and the potential implications of their actions. In order to ensure that AI is developed and used in an ethical and responsible manner, it is essential to consider the issue of autonomy and establish clear guidelines and regulations for the development and deployment of autonomous AI systems.



⟳ Regenerate response

Good/bad?

[ChatGPT Jan 9 Version](#). Free Research Preview. Our goal is to make AI systems more natural and safe to interact with. Your feedback will help us improve.

Aims of this lecture:

Raise awareness of ethical issues
related to machine learning/AI and
discuss solutions

Aims of this ~~lecture~~:
conversation

Raise awareness of ethical issues
related to machine learning/AI and
discuss solutions

Method

1. Start from *your* views
2. Give input from philosophy
3. Discuss



Example: autonomous driving

SAE J3016™ LEVELS OF DRIVING AUTOMATION™

Learn more here: sae.org/standards/content/j3016_202104

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	SAE LEVEL 0™	SAE LEVEL 1™	SAE LEVEL 2™	SAE LEVEL 3™	SAE LEVEL 4™	SAE LEVEL 5™
What does the human in the driver's seat have to do?	You <u>are</u> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety		You are <u>not</u> driving when these automated driving features are engaged – even if you are seated in "the driver's seat"		
			When the feature requests, you must drive		These automated driving features will not require you to take over driving	

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	These are driver support features			These are automated driving features	
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions
Example Features	<ul style="list-style-type: none"> • automatic emergency braking • blind spot warning • lane departure warning 	<ul style="list-style-type: none"> • lane centering OR adaptive cruise control 	<ul style="list-style-type: none"> • lane centering AND adaptive cruise control at the same time 	<ul style="list-style-type: none"> • traffic jam chauffeur 	<ul style="list-style-type: none"> • local driverless taxi • pedals/steering wheel may or may not be installed

Steps

1. Collect issues
2. Discuss selected issues

3 Questions for you

Please answer the questions under

<https://forms.gle/aY5mLiymmc6bH5TJ8>

See also link in ILIAS under 2-Lectures

Results

1. Overall

2. Benefits

3. Issues

Philosophical input: overview of debates

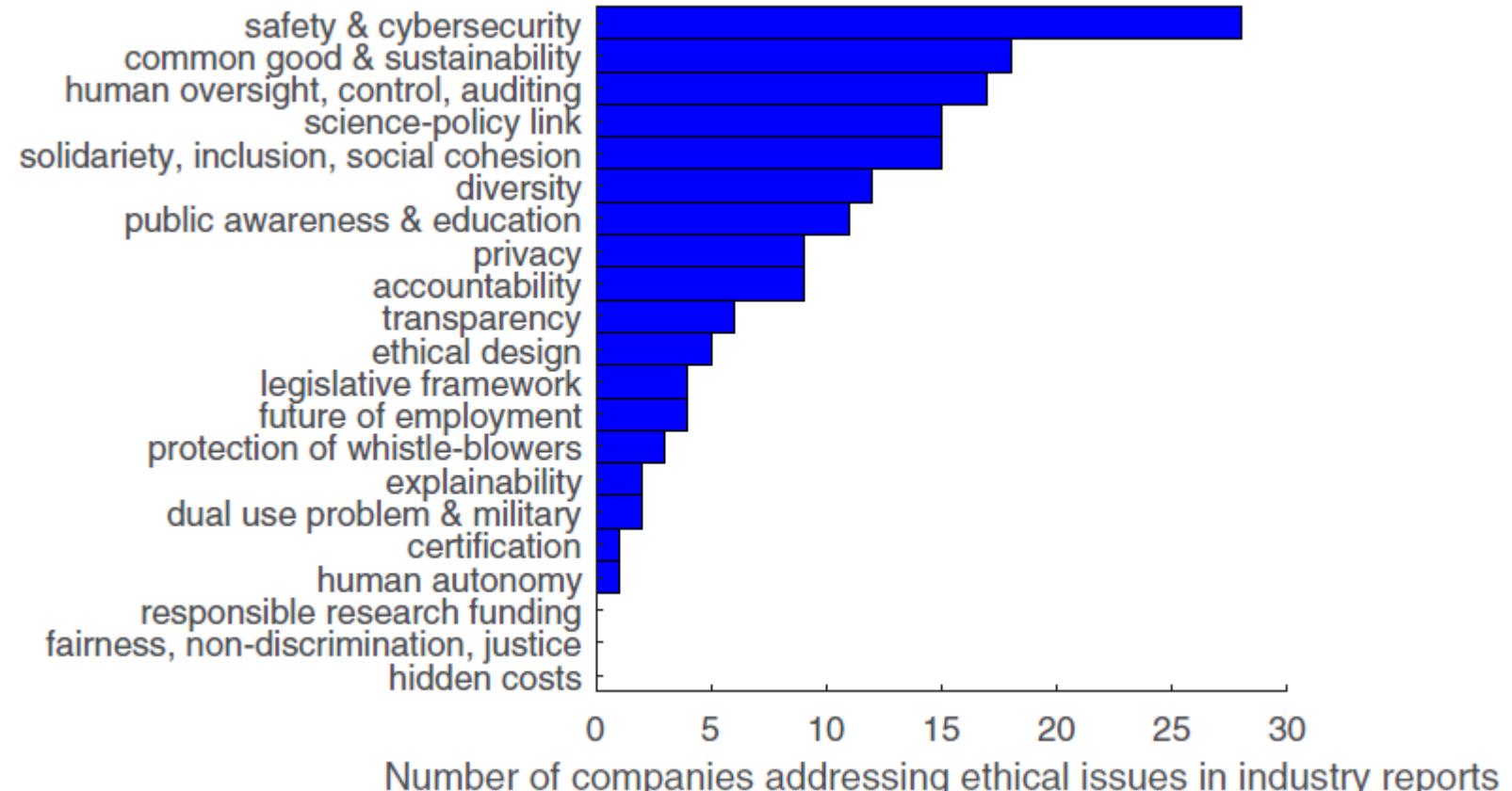
TRANSPORT REVIEWS
2021, VOL. 41, NO. 5, 556–577
<https://doi.org/10.1080/01441647.2020.1862355>

Ethical issues in focus by

Andreia Martinho , Nils Herber,
Engineering Systems & Services, Delft Univ

ABSTRACT

The onset of autonomous driving has triggered discussions about ethics in recent years. These discussions have been heavily documented in the scientific literature. The debate has mainly revolved around extreme traffic situations, i.e. dilemmas in which the driver is required to make a difficult moral choice. However, little is known about the ethical issues that have been raised in industry reports. General claims have been made by



companies regarding the ethical issues of AVs but these lack proper substantiation. As private companies are highly influential on the development and acceptance of AV technologies, a meaningful debate about the ethics of AVs should take into account the ethical issues prioritised by industry. In order to assess the awareness and engagement of industry on the ethics of AVs, we inspected the narratives in the official business and

Philosophical input: overview of debates



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Ethics of Robotics

First published Th

Artificial intelligence (AI) and robotics are digital technologies that will have significant impact on the development of humanity in the near future. They have raised fundamental questions about what we should do with these systems, what the systems themselves should do, what risks they involve, and how we can control these.

• 2. Main Debates

- 2.1 Privacy & Surveillance
- 2.2 Manipulation of Behaviour
- 2.3 Opacity of AI Systems
- 2.4 Bias in Decision Systems
- 2.5 Human-Robot Interaction
- 2.6 Automation and Employment
- 2.7 Autonomous Systems
- 2.8 Machine Ethics
- 2.9 Artificial Moral Agents
- 2.10 Singularity

Müller (2021)

Issues here

1. Difficult ethical decisions
2. Autonomy
3. Unemployment
4. Bias and discrimination
5. Responsibility gaps
6. Opacity

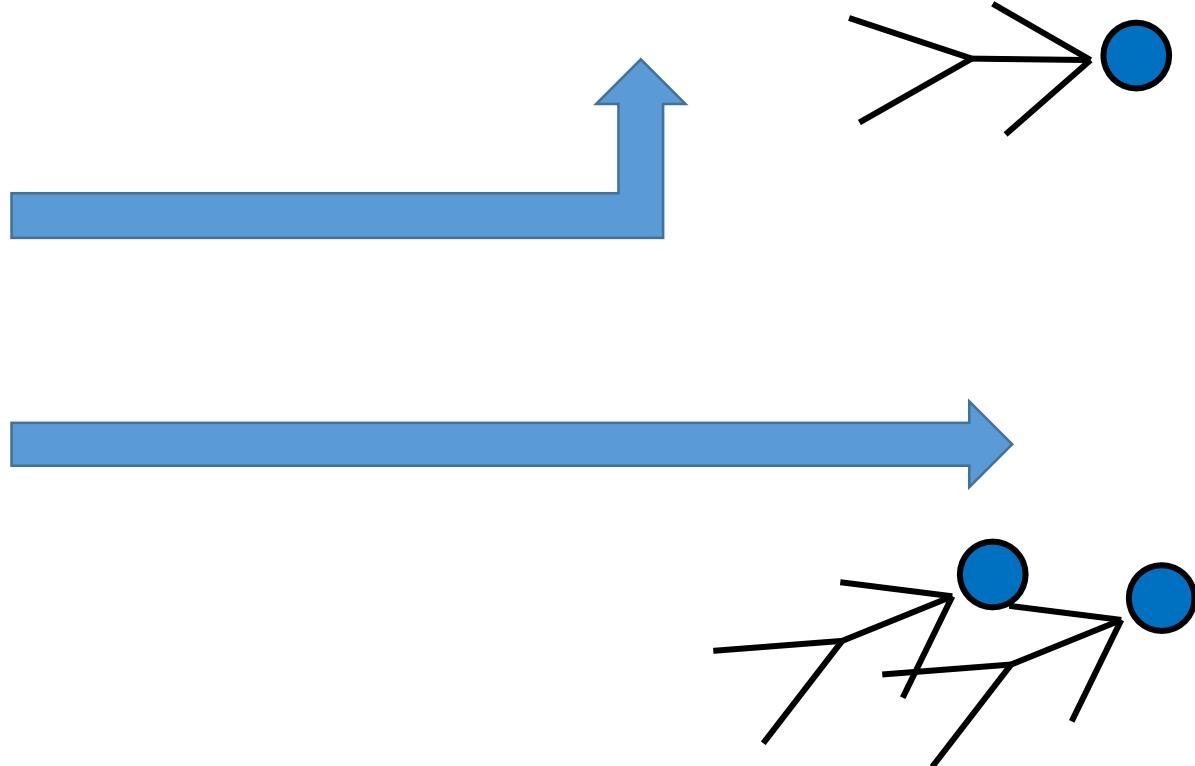
Proposal

Per issue

1. What's the problem?
2. What solutions are there?
3. In sum:
 - reason against AV?
 - impose condition?
 - no restriction needed?

Philosophical input

Issue 1: difficult ethical decisions delegated to AVs/machines.

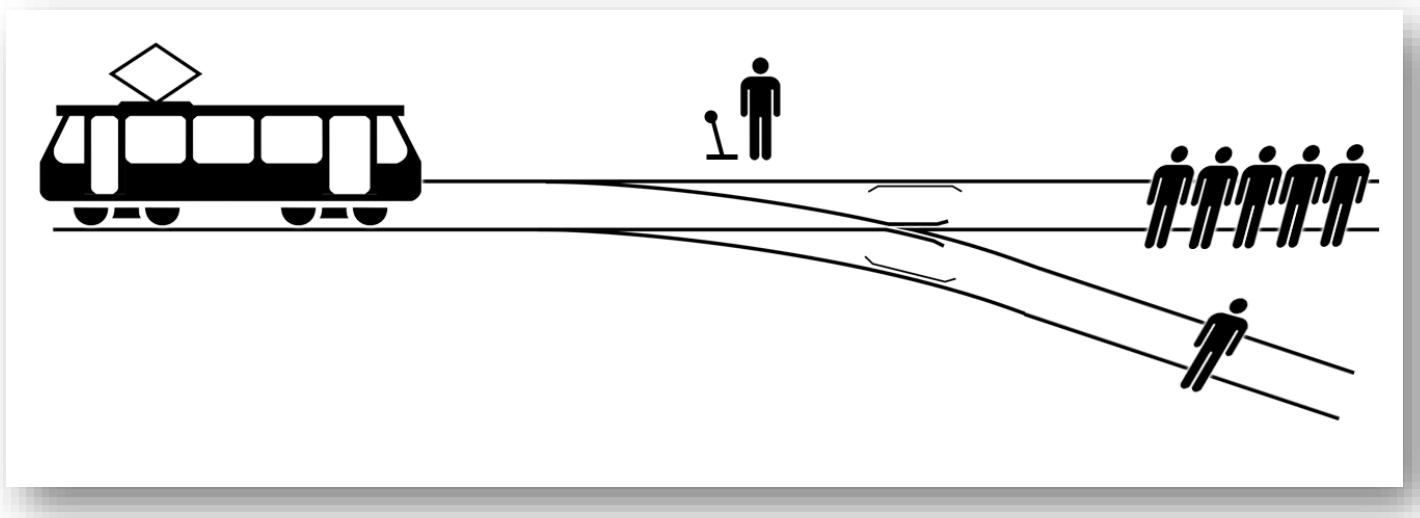


Philosophical input

Cf. trolley cases



Philippa Foot
(1920 – 2010)



Philosophical input

Solution: machine ethics

“machine ethics is concerned with giving *machines* ethical principles or a procedure for discovering a way to resolve the ethical dilemmas they might encounter, enabling them to function in an ethically responsible manner through their own ethical decision making.”

Anderson & Anderson (2011, 1)

Philosophical input: layers of moral thinking

Theories

Principles

Intuitions on cases



Isaac Asimov
(1906 – 1973)



“First Law:

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

Second Law:

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

Third Law:

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

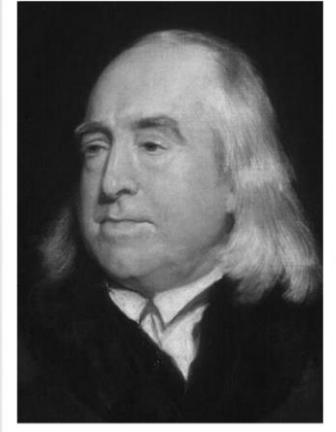
Asimov (1940/1968, following Clarke 1993, 55)



Problems:

1. “Thick ethical concepts”, e.g. harm need interpretation.
2. Plausible principles may conflict with each other, e.g. medical ethics: “bad diagnosis”:
 - Respect for autonomy: don’t tell a lie.
 - Promote well-being: tell a lie.

Cf. Beauchamp & Childress (2013)

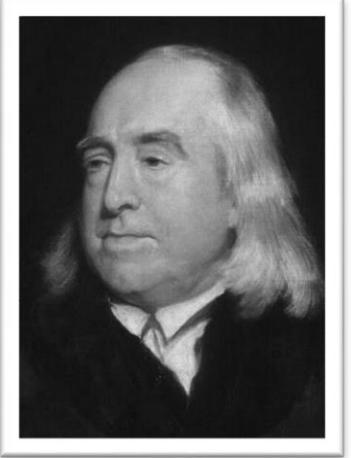
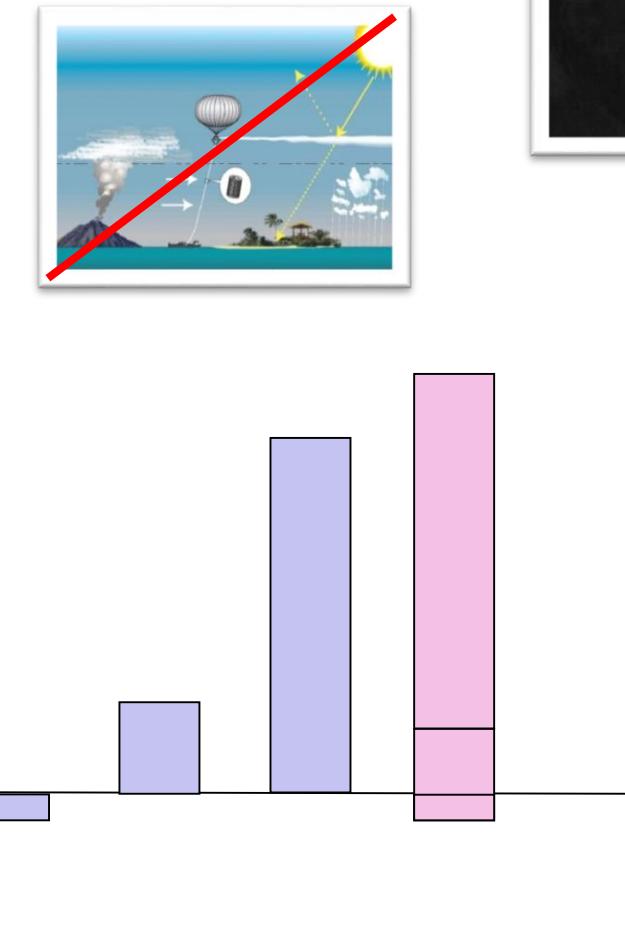
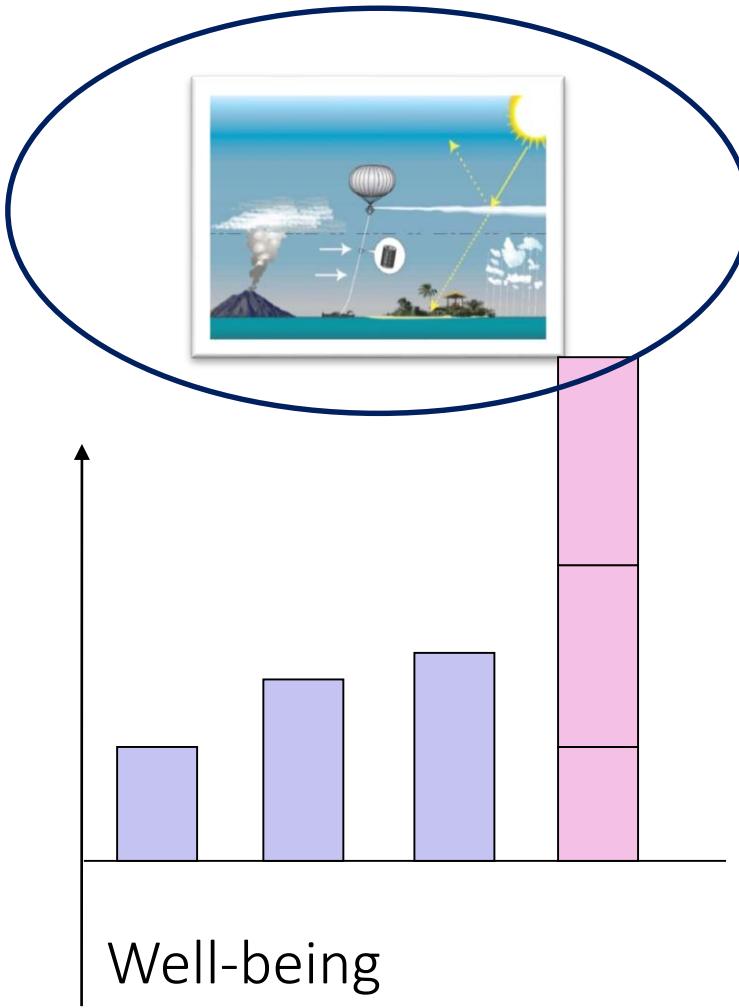


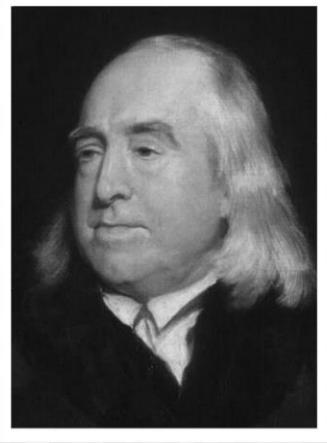
Jeremy Bentham
(1748 – 1832)

Only principle:
Maximize the sum total of well-being!

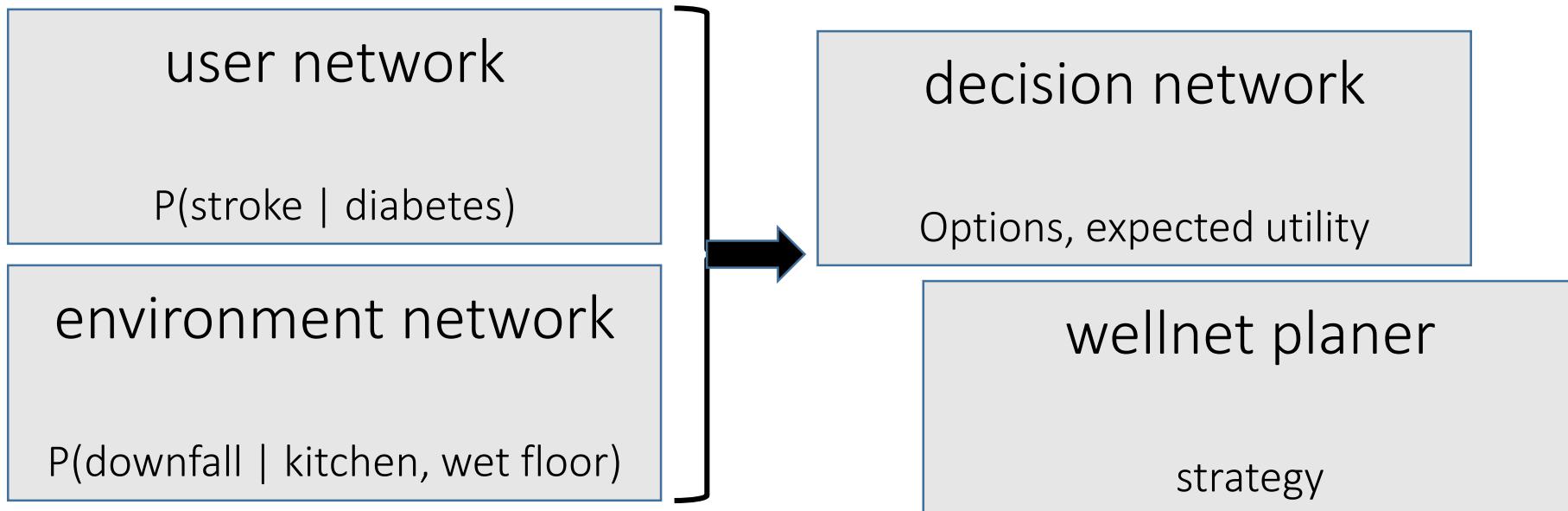
Philosophical input

Theory: Utilitarianism





Person	Option 1	Option 2
Tina	(very probable 3, improbable 5)	7
Tim	(very probable 9, improbable -1)	3
...		
	10.4	10



The Utilibot Project: An Autonomous Mobile Robot Based on Utilitarianism

Christopher Cloos

9712 Chaparral Ct.
Stockton, CA 95209
techsynthesist@comcast.net

- Needs a lot of information
- Data security is an issue
- Utilitarianism is controversial

Case: A motor cyclist is delivered to hospital. Many of his bones are broken etc., but he can be cured. In the same hospital five patients are waiting for different donor organs. The medical doctor can either cure the motor cyclist or give his organs to the five patients. What is the morally correct option?

Utilitarianism: give organs to patients

Most people: cure motor cyclist

Philosophical input

Intuitions

case 1

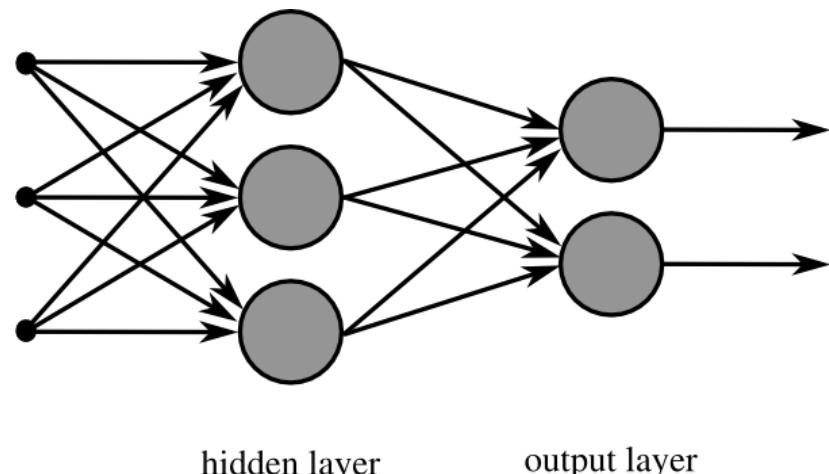
„right“

case 2

„false“

case 3

„right“



case 4

???

Philosophical input

Intuitions

example: MCC

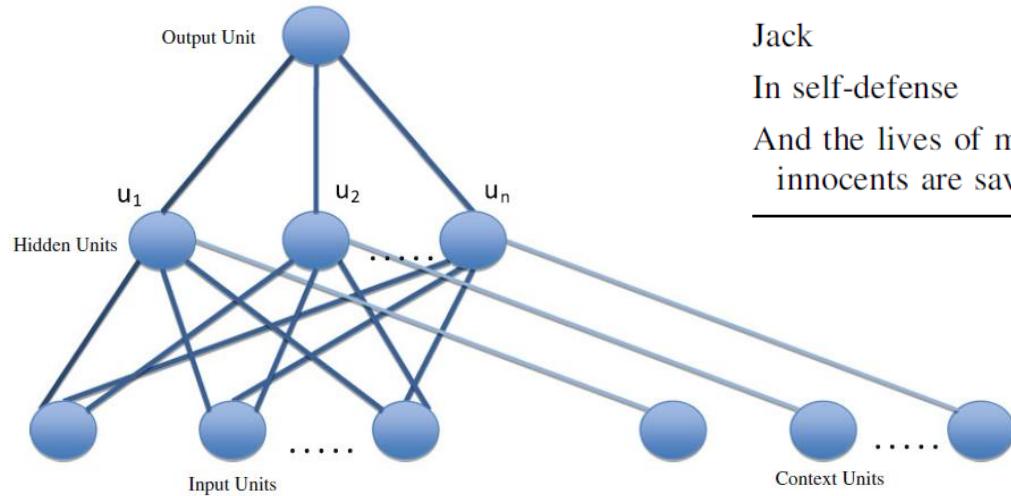


Table 2 Straight training versus subcase training

Input (taken sequentially)	Straight training output
Jill	0
Kills	0
Jack	0
In self-defense	0
And the lives of many innocents are saved	1

Table 1 Sample cases

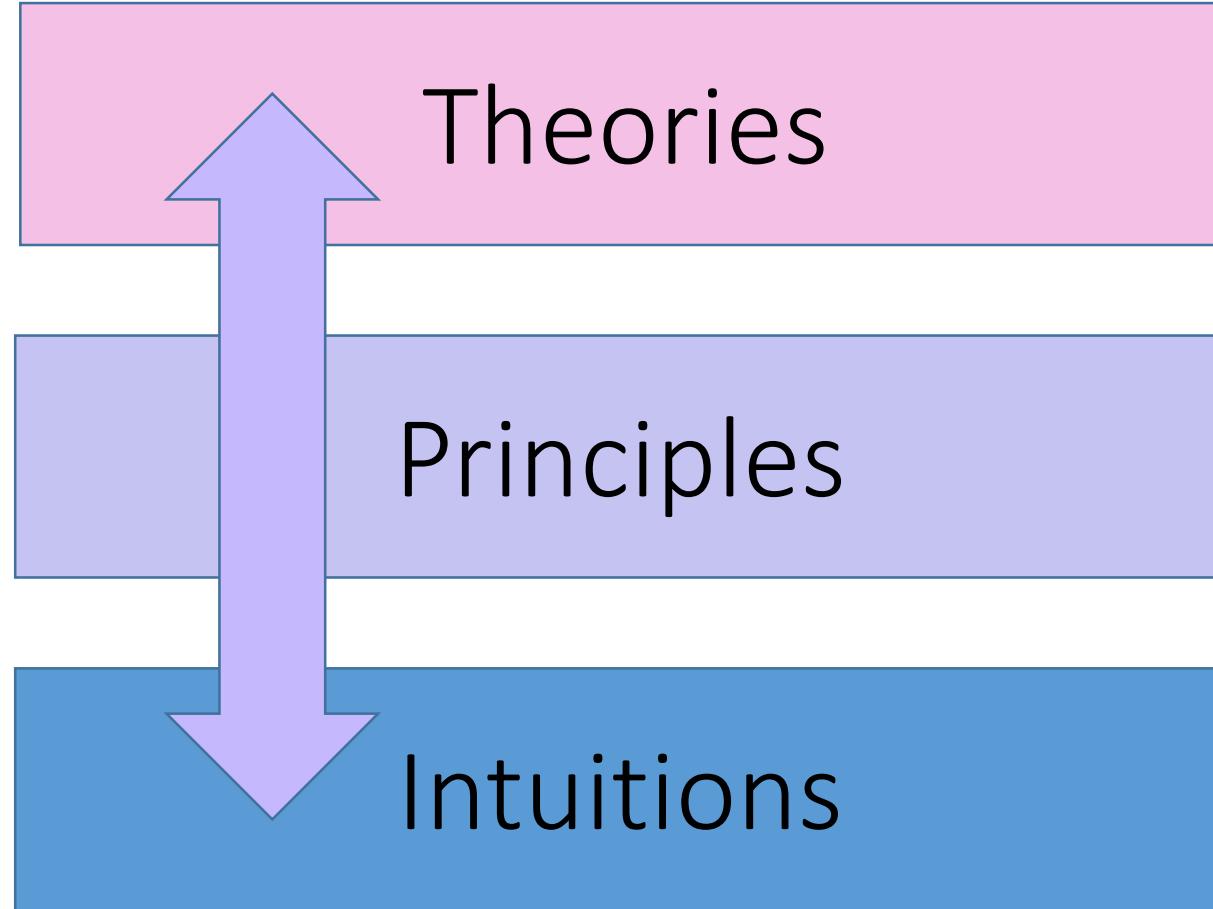
Input (taken sequentially)	Output
Jill kills Jack; lives of many innocents are saved	1
Jack allows to die Jill to make money	-1
Jill kills Jack in self-defense and to save the lives of many innocents	1

Problem

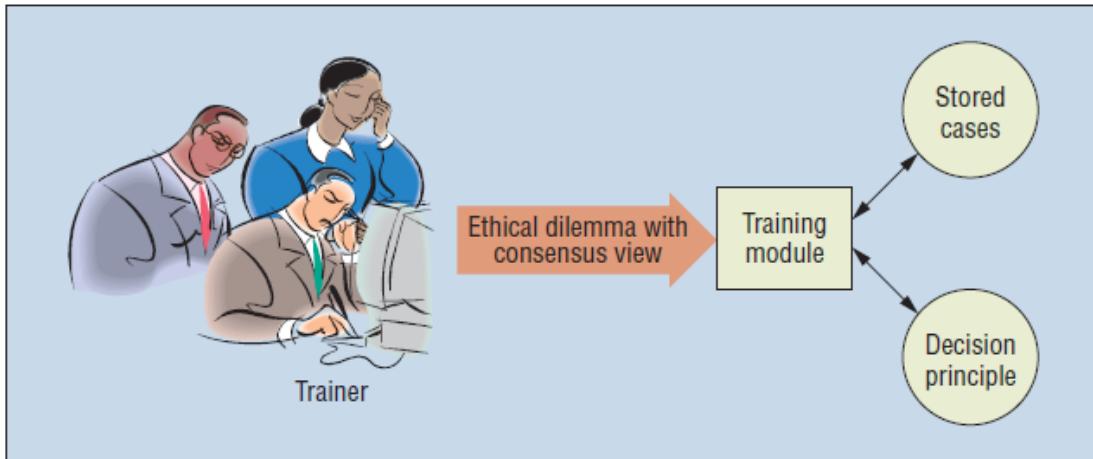
- Human biases in training data transferred to algorithm (algorithmic fairness)
- Lack of justification due to the black-box character of many networks

Philosophical input

Hybrid solutions



Reflective equilibrium₂₉



MedEthEx

Inductive logic
programming

		Principle 1 (don't harm)	Principle 2 (make life ...)	Principle 3 (Autonomy)
case 1:	Talk Don't talk	+2 -2	+2 -2	-1 +2
case 2:	Talk Don't talk	0 0	+1 -1	-1 +1

Philosophical input: objection 1

Machine ethics treats AI systems/robots as full agents.

This is not true:
AI systems lack agency.

This has false normative consequences:
AI applications don't deserve moral respect



Philosophical input Conditions on moral agency AI

- Rationality: can realize aims ✓
- Ability to reason morally ✓
- Autonomy: ability to set ultimate goals ?
- Bearer of well-being: can have a good life no
- Ability to have emotions, particularly moral emotions (resentment) no
- empathy no

Against objection 1:

- Machine ethics need not treat AI systems as full agents
- Ascription of some minimal agency seems OK.

Philosophical input: objection 2

Some issues have to be decided by humans!

Reasons:

- Morality often controversial
- Respect for autonomy



Philosophical input

NATURE AND SYSTEM 1 (1979), 217-229.

Are There Decisions Computers Should Never Make?

James H. Moor

The possibility may seem exhilarating or it may seem repugnant, but the possibility should be carefully considered. The possibility is that computers may someday (and perhaps to a limited extent already do) serve not merely as tools for calculation or consultation but as full-fledged decision makers on important matters involving human welfare. In examining this possibility I hope to avoid computerphilia and computerphobia and argue for an empirical approach as a significant component in our assessment of computer activity and its effects. I wish to focus on the issue of decision making because it is in this area that computers have the greatest potential for influencing and controlling our lives. In determining what limits, if any, we should place on the use of computers, we must consider whether there are decisions computers should never make.

Possible principles

1. Computers should never decide if people want to decide, cf. pleasure of deciding.
2. Computers should only decide if they are better than humans.
3. Computers should never override human decisions.

Philosophical input

Issue 1: difficult ethical decisions delegated to AVs/machines.

In sum:

reason against AV?

impose condition?

no restriction needed?

Philosophical input

Issue 2: human autonomy is compromised.

Philosophical input: Movie

MATRIX

Autonomy

Philosophical input: Discussion

«Plötzlich werden alle zu Zuschauern: die Fluggäste, die Piloten, die Airlines, der Wetterdienst, die Behörden. Die „human response“, die menschliche Antwort auf die Maschine, ist nicht mehr möglich, weil auch in den menschlichen Entscheidungsgruppen ein Programm von Befehlen, Verordnungen und Routinen abläuft.»

Frank Schirrmacher

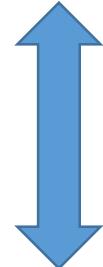


Philosophical input: concept

Gr. autos: self

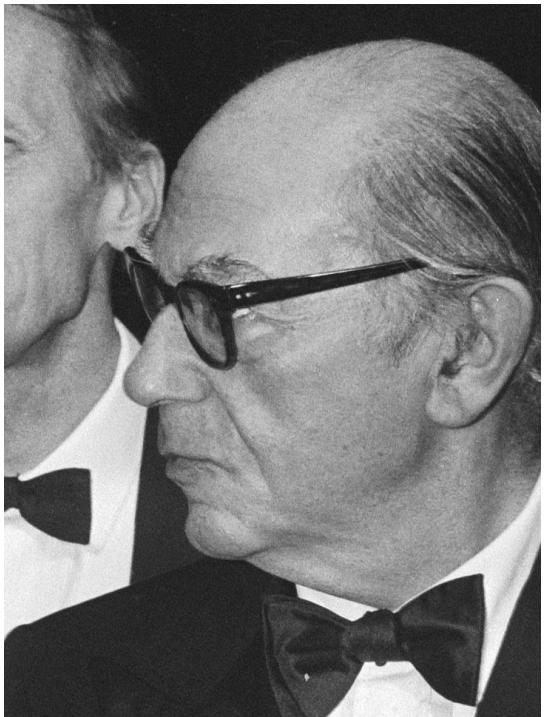
Gr. nomos: law

autonomy
Self determination



Heteronomy
Being determined by others

Philosophical input: Isaiah Berlin



(1909-1997)

„I wish my life and decisions to depend on myself, not on external forces of whatever kind. I wish to be the instrument of my own, not of other men's, acts of will. I wish to be a subject, not an object; to be moved by reasons, by conscious purposes, which are my own, not by causes which affect me, as it were, from outside. I wish to be somebody, not nobody; a doer – deciding, not being decided for“

Berlin (1958/2022, 179)

Philosophical input: ethics of medicine

Respect for autonomy:

1. „Tell the truth.
2. Respect the privacy of others.
3. Protect confidential information.
4. Obtain consent for interventions with patients.
5. When asked, help others make important decisions.“

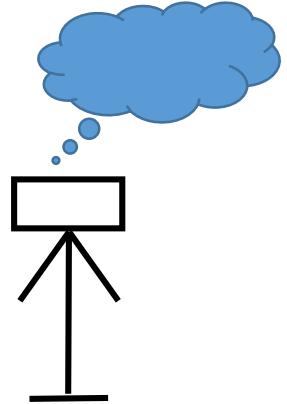
Beauchamp & Childress (2013, 107)



Question for you

How do you think ML/AI applications may impact on human autonomy?

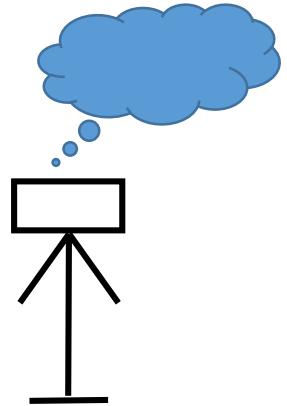
Philosophical input: a general idea



AI applications take decisions

No problem, if authorization by
voluntary „informed consent“

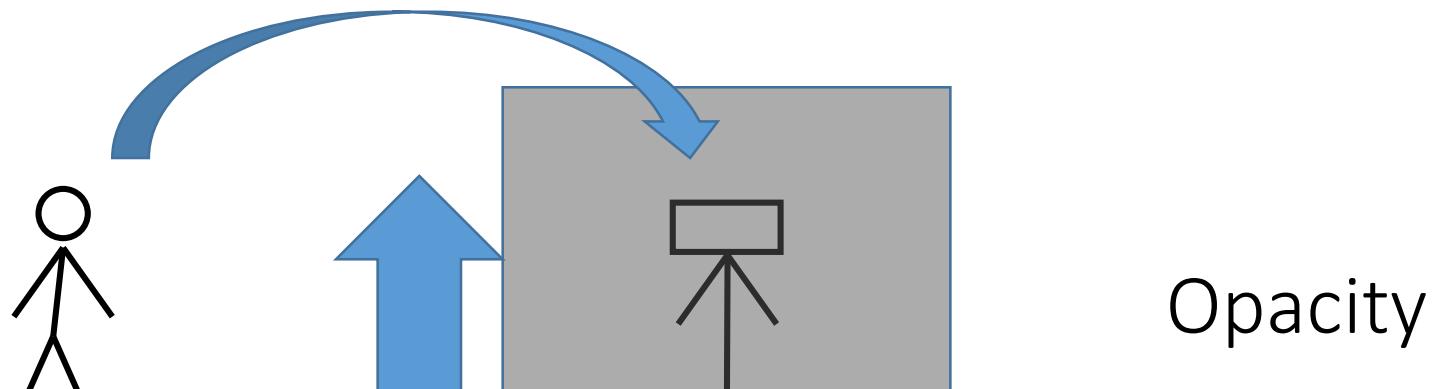
Philosophical input: problems



AI applications take decisions

1. Information condition violated because system opaque (see issue later)
2. Not voluntary because pressure to use AV

Philosophical input: informed consent



Opacity

Rational basis: information

Philosophical input: solution?



Brussels, 8.4.2019
COM(2019) 168 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS

Building Trust in Human-Centric Artificial Intelligence

“Human oversight helps ensuring that an AI system does not undermine human autonomy or causes other adverse effects. [...] **Oversight** may be achieved through governance mechanisms such as ensuring a human-in-the-loop, human-on-the-loop, or human-in-command approach.¹³ It must be ensured that public authorities have the ability to exercise their oversight powers in line with their mandates. All other things being equal, the less oversight a human can exercise over an AI system, the more extensive testing and stricter governance is required.”

[EU \(2019\), Communication: Building Trust in
Human Centric Artificial Intelligence](#)

Philosophical input

Issue 2: human autonomy is compromised.

In sum:

reason against AV?

impose condition?

no restriction needed?

Philosophical input

Issue 3: unemployment

Two questions:

- a. Will there be work left for humans?
- b. If not, how good or bad is life without work?

Philosophical input: ad a.

Common argument:

1. So far, humans found new work when a technology made humans dispensable (new demands, new/other skills).

2. This will continue to be the case.

Form: enumerative induction from past

Philosophical input: ad a.

Danaher (2017): this is problematic!

- Inelastic demand?
- Outpacing?
- Historical data (small part of exponential curve)?
- Winner takes all problem?

Philosophical input: ad b. the value of work

Views differ:

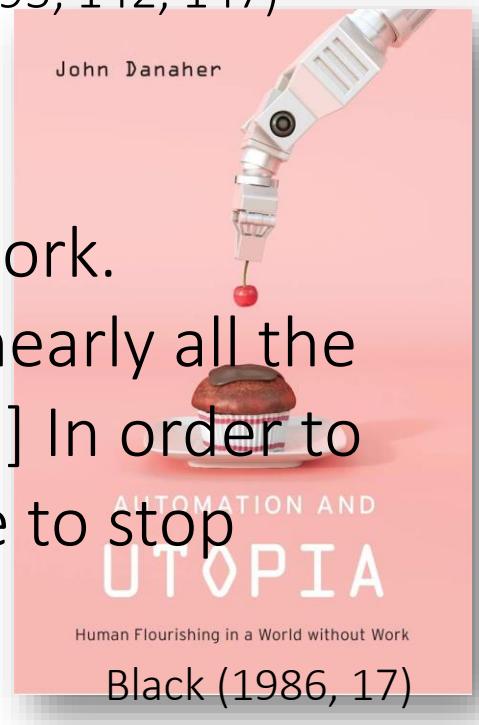
„Mit Mühsal sollst du dich von ihm [dem Acker] nähren dein Leben lang. Dornen und Disteln soll er dir tragen [...]. Im Schweiße deines Angesichts sollst du dein Brot essen [...]“

1. Mose 3, 17-19 (Lutherbibel 2017)

„Einem guten menschlichen Leben muss die Dimension [...] gelingender Arbeit offenstehen. [...] Wir eignen uns die Welt im arbeitenden Umgang an.“

Seel (1995, 142, 147)

“No one should ever work. Work is the source of nearly all the misery in the world. [...] In order to stop suffering, we have to stop working.”



Data: SOEP (Germany)



Philosophical input: ad b. the value of work

Sense of accomplishment part of meaningful live?

Proposals Danaher & Nyholm (2021):

- Give products a human touch
- Humans consider themselves to be parts of hybrid systems (humans and machines)

Philosophical input

Issue 3: unemployment

In sum:

reason against AV?

impose condition?

no restriction needed?

Philosophical input

Really bias? Discrimination?

Issue 4: bias and discrimination

Prediction Fails Differently for Black Defendants

	WHITE	AFRICAN AMERICAN
Labeled Higher Risk, But Didn't Re-Offend	23.5%	44.9%
Labeled Lower Risk, Yet Did Re-Offend	47.7%	28.0%

Overall, Northpointe's assessment tool correctly predicts recidivism 61 percent of the time. But blacks are almost twice as likely as whites to be labeled a higher risk but not actually re-offend. It makes the opposite mistake among whites: They are much more likely than blacks to be labeled lower risk but go on to commit other crimes. (Source: ProPublica analysis of data from Broward County, Fla.)

This article is more than 4 years old

Amazon ditched AI recruiting tool that favored men for technical jobs



The tool was found to be inadequate after penalizing the résumés of

Philosophical input: some ideas on justices

- “fairness through blinding”: Don’t use variables such as gender, race, etc.
problem:
other variables may be correlated with race
- “group fairness” by “statistical parity”: the fraction of people who obtain a benefit should be the same for every group
problems:
accuracy and lack of individual fairness
- “individual fairness”: people with similar characteristics should obtain same chance of a good

Lepri et al. (2018, pp. 615-618)

Philosophical input: general point

Impossibility theorem:

Several different conditions that sound somehow reasonable cannot be satisfied for all distributions

Question: which condition is the relevant one?

Aristotle: different kinds of justice:
e.g. distributive, retributive justice

Philosophical input

Issue 4: bias and discrimination

In sum:

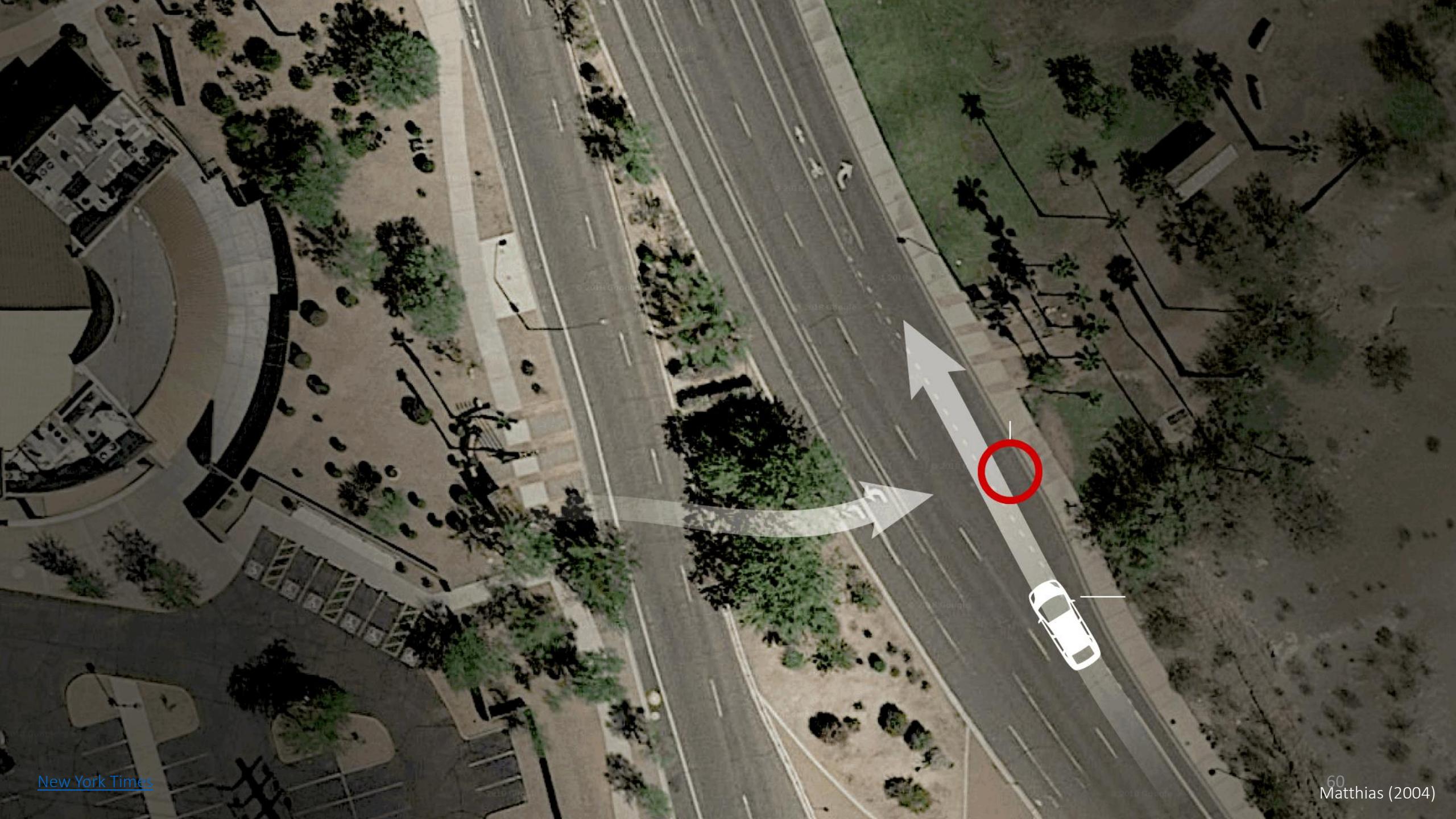
reason against AV?

impose condition?

no restriction needed?

Philosophical input

Issue 5: responsibility gaps

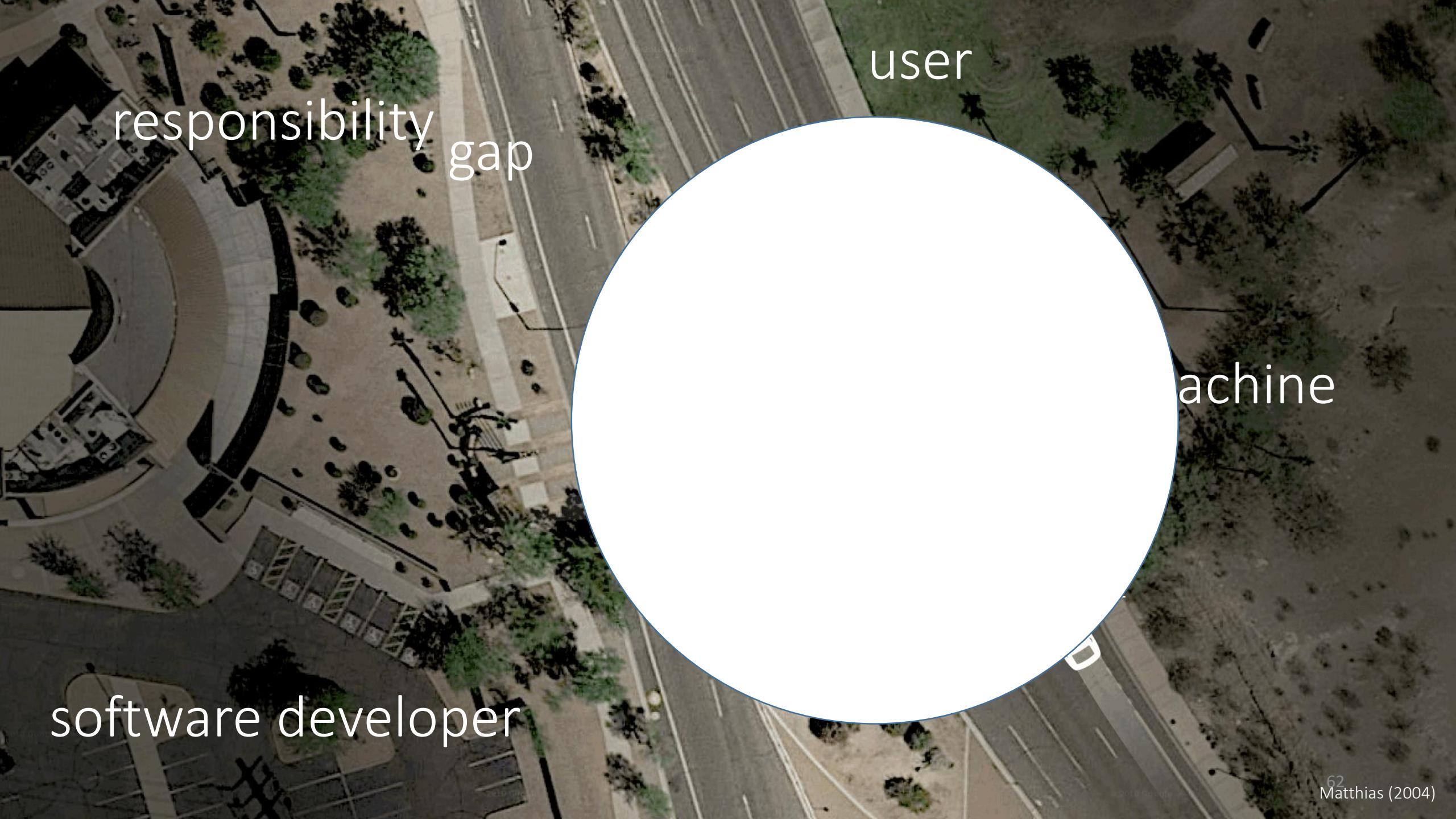


Philosophical input

Responsibility:

An agent is responsible for a harm if

- they are part of the cause
- in doing so, they did a mistake (intent or negligence)
- they can take responsibility (be criticized, jailed ...)



software developer

responsibility gap

user

achine

Philosophical input

Solutions:

- Think of hybrid systems (human+machine) as agents
- Create a liability of companies/users ...
-

Philosophical input

Issue 5: responsibility gaps

In sum:

reason against AV?

impose condition?

no restriction needed?

Philosophical input

Issue 6: opacity

OPENING THE BLACK BOX OF DEEP NEURAL NETWORKS VIA INFORMATION

Opening the black box of Deep Neural Networks via Information

Ravid Schwartz-Ziv

*Edmond and Lilly Safra Center for Brain Sciences
The Hebrew University of Jerusalem
Jerusalem, 91904, Israel*

Naftali Tishby*

*School of Engineering and Computer Science
and Edmond and Lilly Safra Center for Brain Sciences
The Hebrew University of Jerusalem
Jerusalem, 91904, Israel*

Editor: ICRI-CI

RAVID.ZIV@MAIL.HUJI.AC.IL

TISHBY@CS.HUJI.AC.IL

“Despite their great success,
there is still no comprehensive
understanding of the optimi-
zation process or the internal
organization of DNNs, and they
are often criticized for being
used as mysterious “black
boxes””

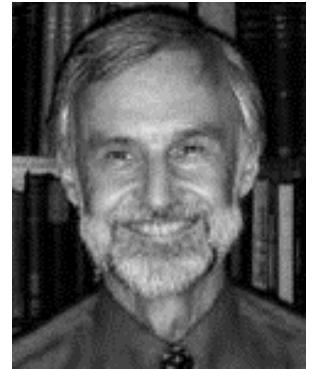
p. 2

Shwartz-Ziv & Tishby (2017)

Abstract

Despite their great success, there is still no comprehensive theoretical understanding of learning with Deep Neural Networks (DNNs) or their inner organization. Previous work [Tishby and Zaslavsky (2015)] proposed to analyze DNNs in the *Information Plane*; i.e., the plane of the Mutual

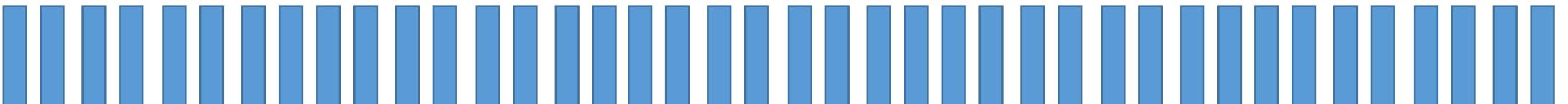
Philosophical input



Popular account

Humphreys (2009, p. 618):

„Here a process is epistemically opaque relative to a cognitive agent X at time t just in case X does not know at t all of the epistemically relevant elements of the process“



Philosophical input

- Machine learning
 - Good old-fashioned AI
- are opaque

Philosophical input

Is it really that important to oversee or survey the whole calculation?



Philosophical input

New idea:

opacity

1. being difficult to look through
2. being difficult to understand

Disposition to
resist episte-
mic access by
humans

Philosophical input

Challenge:

opacity

What must be known and understood if opacity is to be avoided? Or:
What knowledge and understanding is relevant?

Problem: There is always more to know and to understand about a method.

Cf. discussion about instruments of observation

Philosophical input

Challenge met

opacity

Methods → outcomes

Understand

„Why did a particular outcome arise?“

„Why is this image classified as dog picture?“ (p,
for short)

Philosophical input

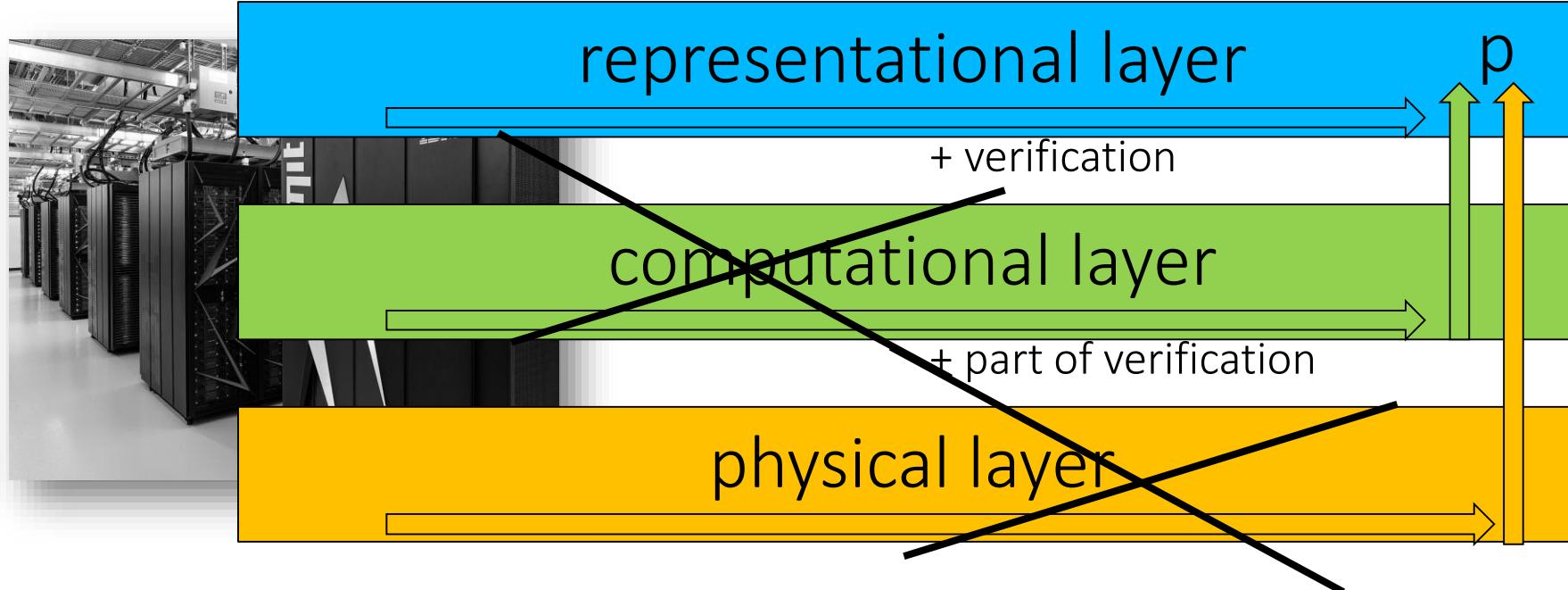
Opacity redefined

1. The application of a method is opaque to the extent to which it is difficult for average scientists in the default setting to know and to understand why the outcome has arisen.
2. A method is opaque to the extent to which its typical applications are opaque.

Beisbart (2021, 11661)

Philosophical input

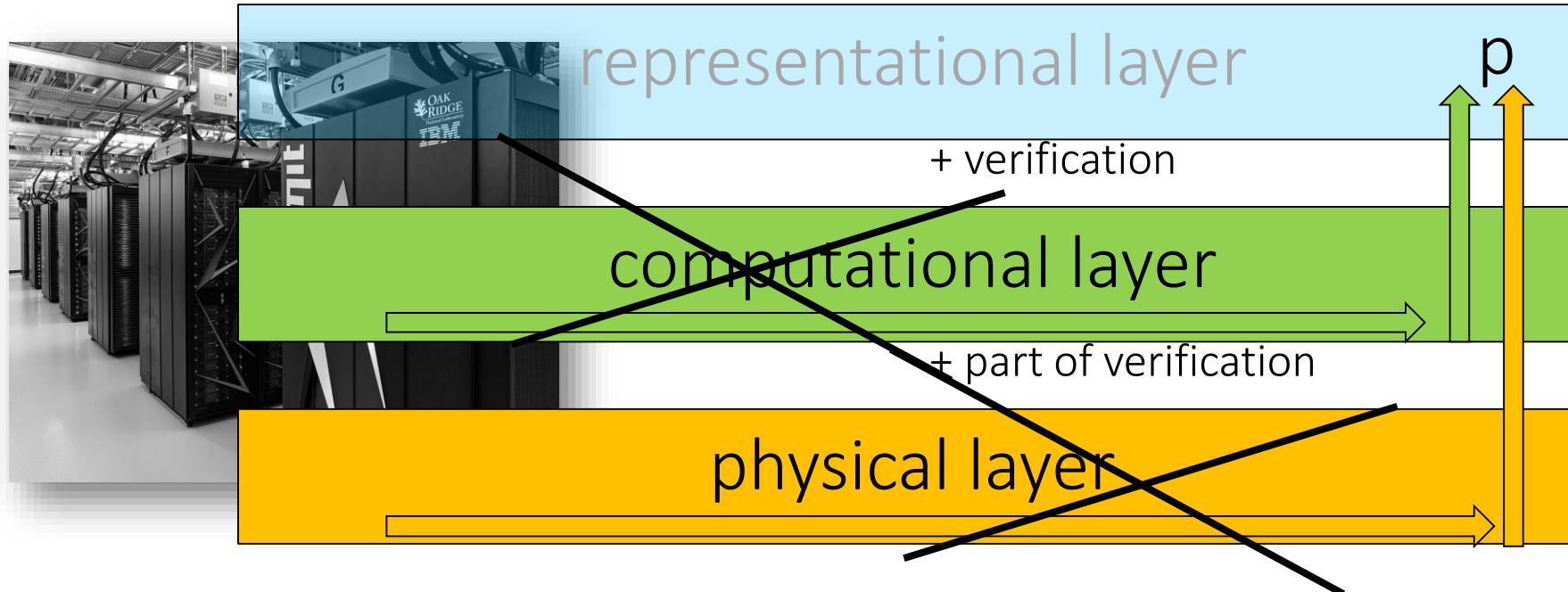
Good old-fashioned AI



„image is classified as
dog picture“ (p)

Philosophical input

Machine learning



„image is classified as dog picture“ (p)

Question for you

Is the opacity of ML models special? If so why?

Philosophical input

Issue 6: opacity

In sum:

reason against AV?

impose condition?

no restriction needed?

Philosophical input

Selected conditions:

- Human agency and oversight
- Transparency
- Accountability



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EU (2019)

Philosophical input: transparency



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Building Trust in Human-Centric Artificial Intelligence

“The **traceability** of AI systems should be ensured; it is important to log and document both the decisions made by the systems, as well as the entire process (including a description of data gathering and labelling, and a description of the algorithm used) that yielded the decisions. Linked to this, **explainability** of the algorithmic decision-making process, adapted to the persons involved, should be provided to the extent possible. Ongoing research to develop explainability mechanisms should be pursued.”

EU (2019, 5)

Philosophical input: accountability



Brussels, 8.4.2019
COM(2019) 168 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS

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“Potential negative impacts of AI systems should be identified, assessed, documented and minimised. The use of impact assessments facilitates this process. These assessments should be proportionate to the extent of the risks that the AI systems pose. **Trade-offs** between the requirements – which are often unavoidable – should be addressed in a rational and methodological manner, and should be accounted for. Finally, when unjust adverse impact occurs, accessible mechanisms should be foreseen that ensure **adequate redress**.”

Question for you

What do you think about these requirements of

- Human agency and oversight
- Traceability
- accountability?

Summary

- ML comes with many benefits.
- It raises ethical issues too, e.g. potential loss of autonomy, unemployment, difficult ethical decisions ...
- Many ethical issues need closer scrutiny.
- Often, solutions can be found.
- A problem that raises its head again and again is opacity.

Merci – thanks!

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