

Machine ethics

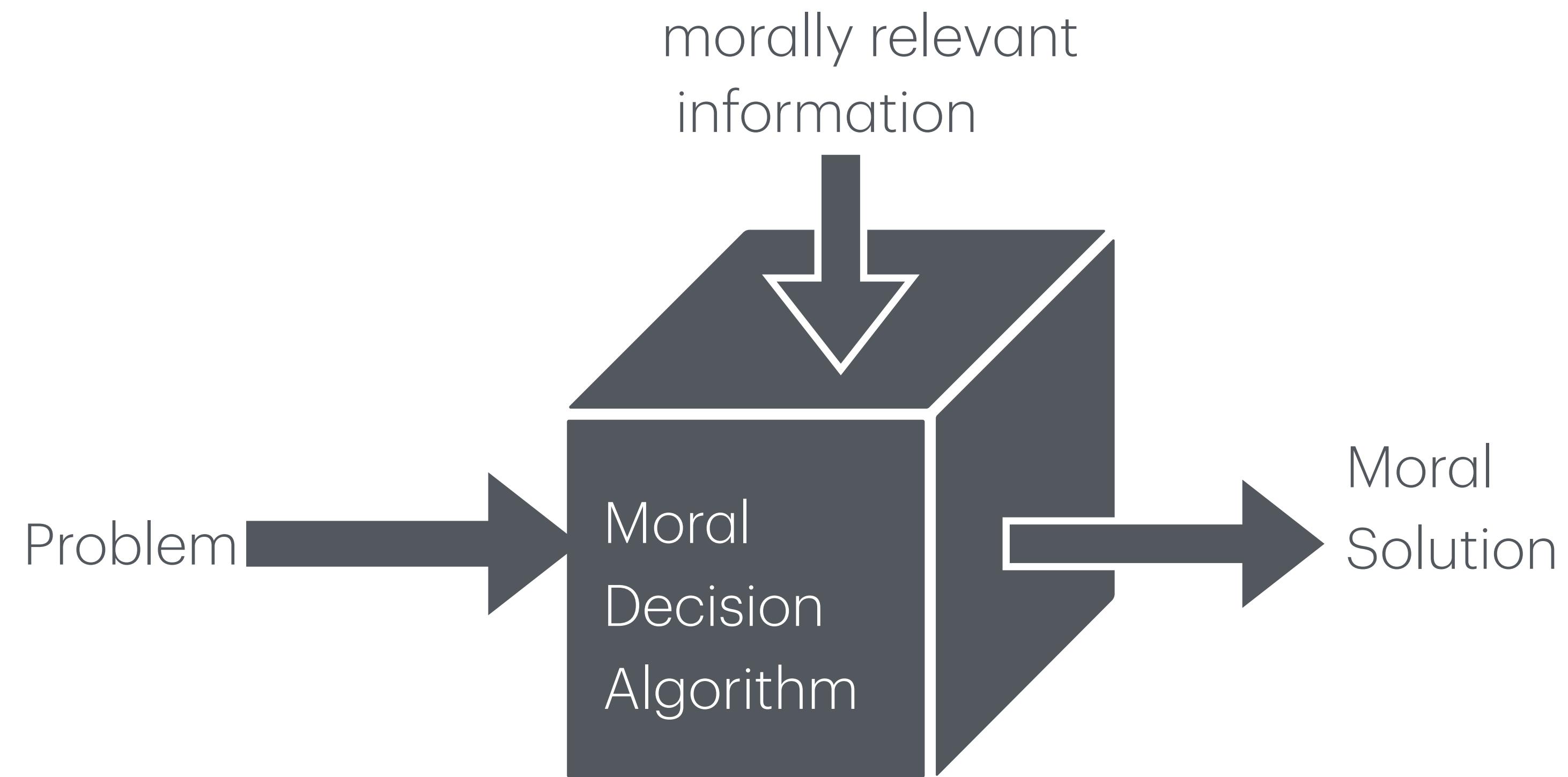
an introduction



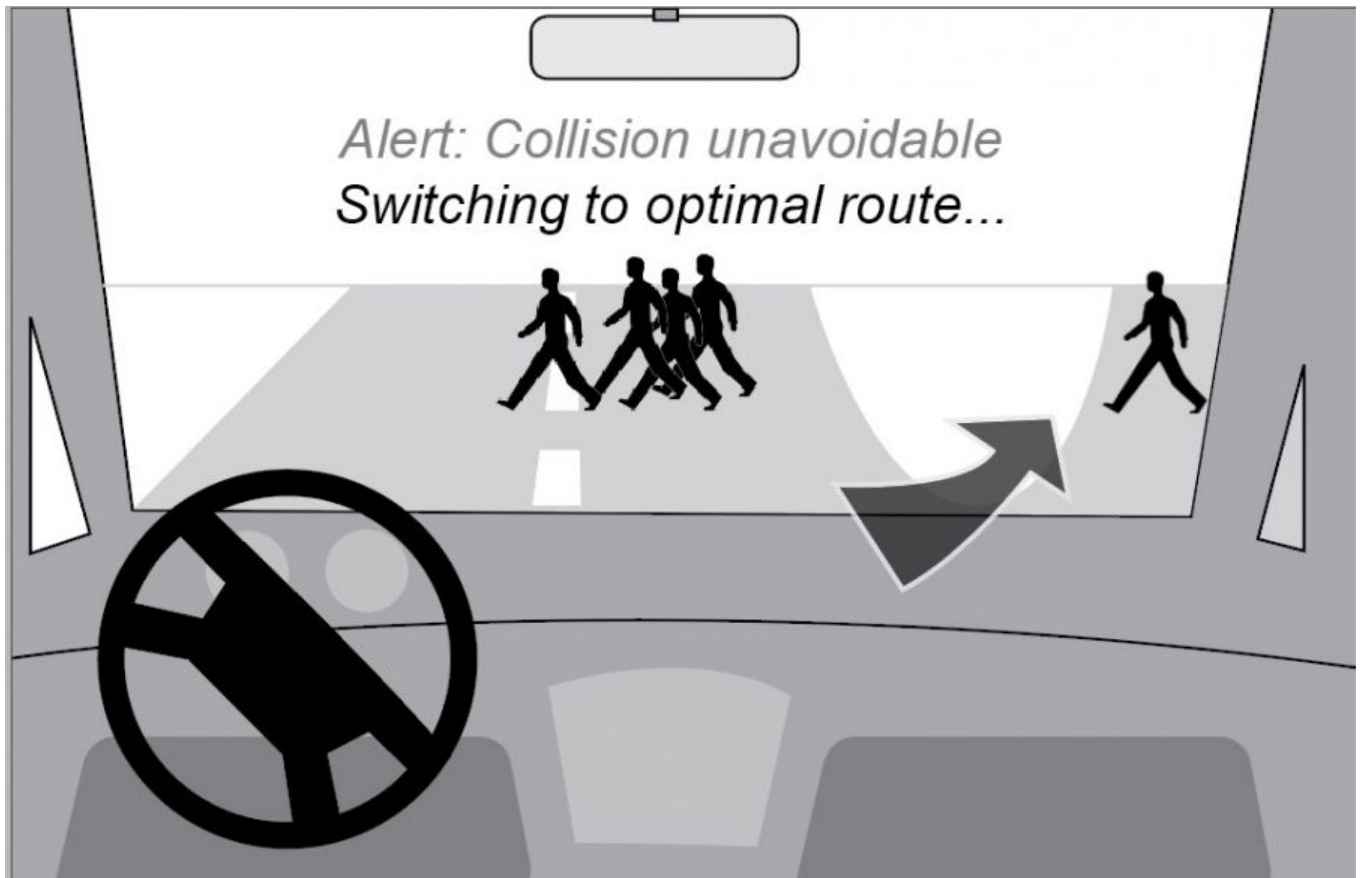
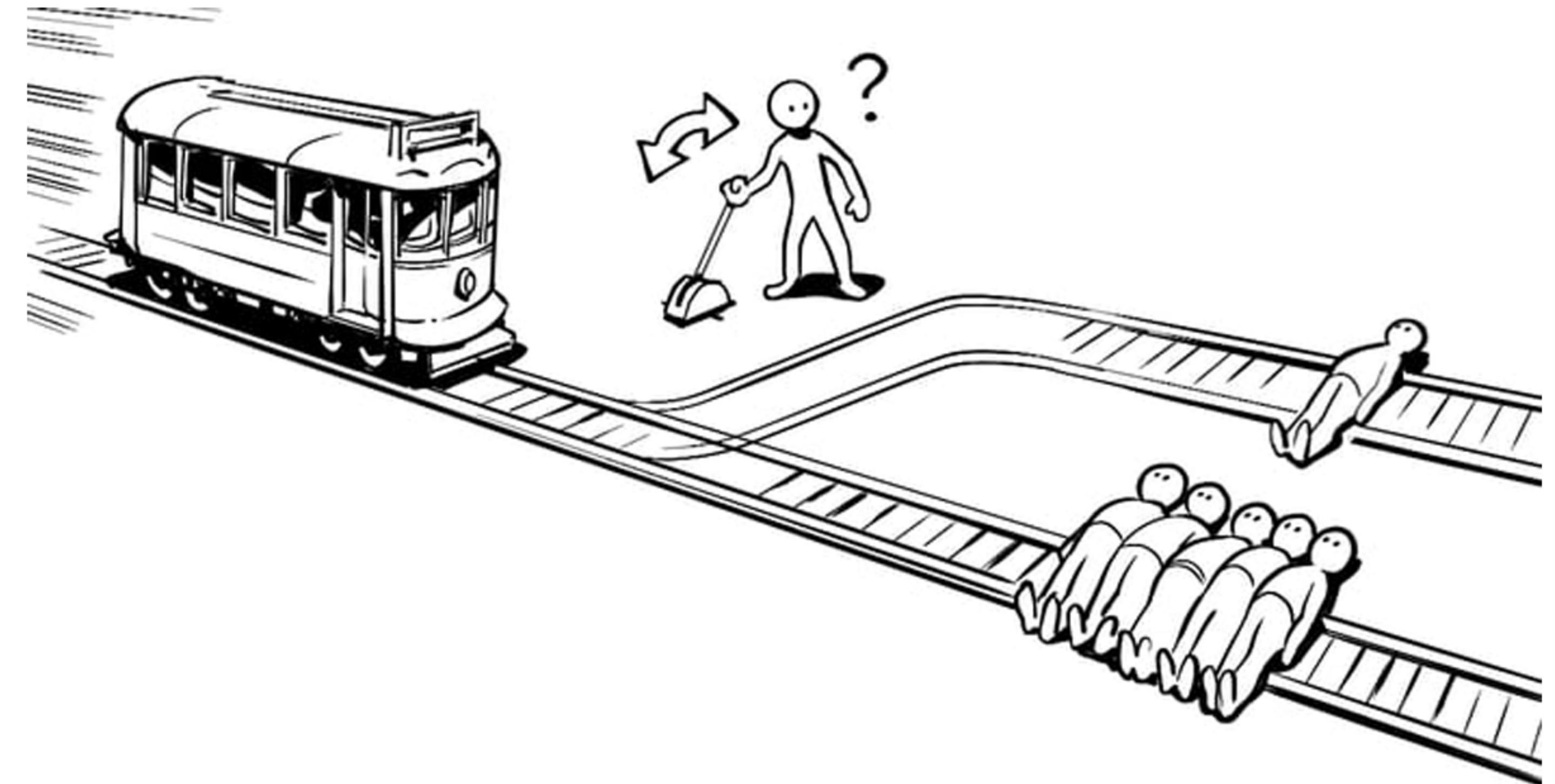
LEVERHULME
TRUST

Marija Slavkovik

The machine ethics problem



Why machine ethics?



Why machine ethics?

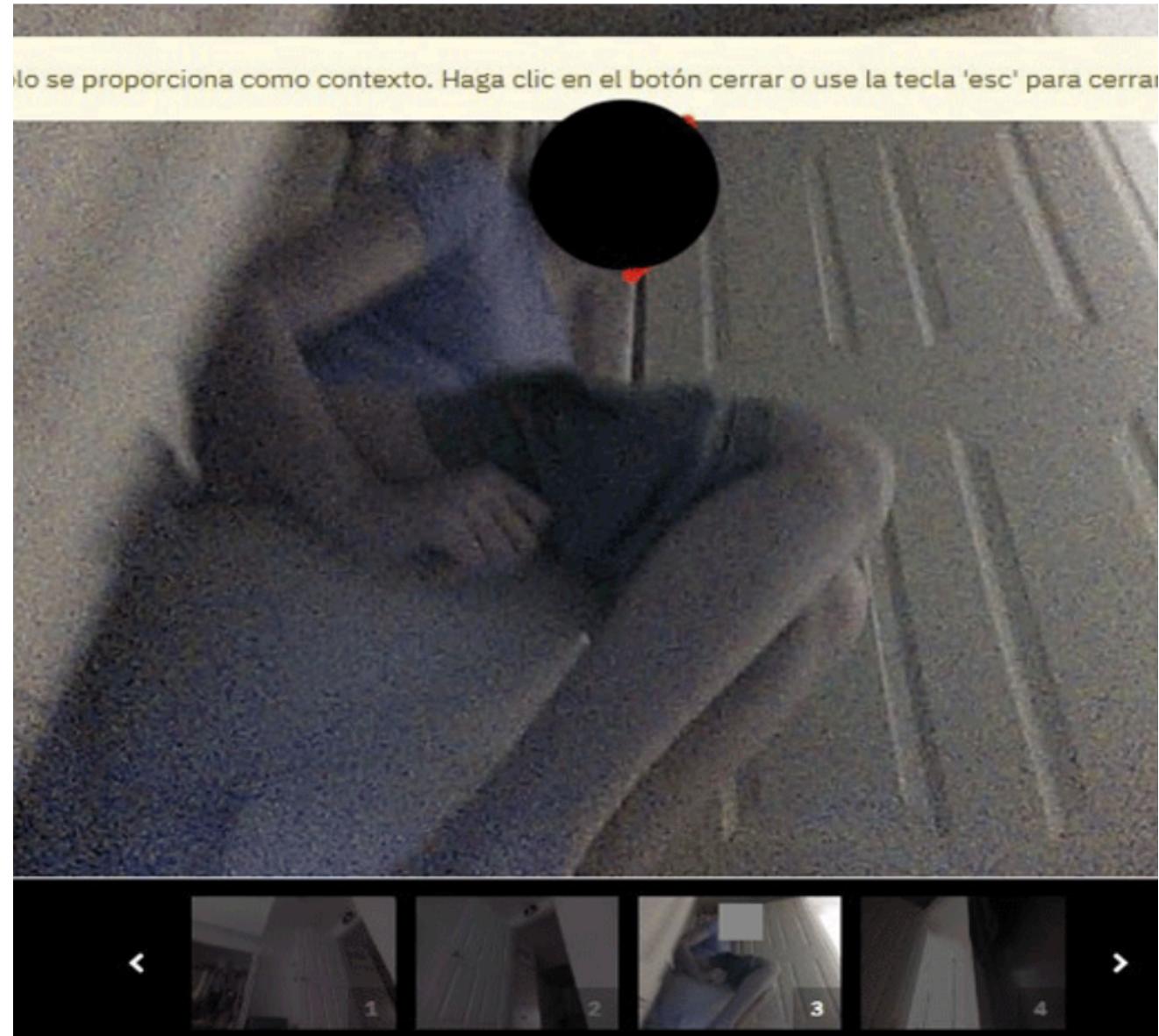


Image captured by iRobot development devices, being annotated by data labellers. Faces, where visible, have been obscured with a gray box by MIT Technology

Fury over Facebook 'Napalm girl' censorship

9 September 2016 · 490 Comments



Aftenposten/NICK UT

Dear Mark Zuckerberg

Jeg skriver til deg for å fortelle hvorfor Aftenposten ikke vil etterkomme Facebooks krav om å fjerne eller redigere dette viktige dokumentarbildet.

Espen Egil Hansen, sjefredaktør

Aftenposten

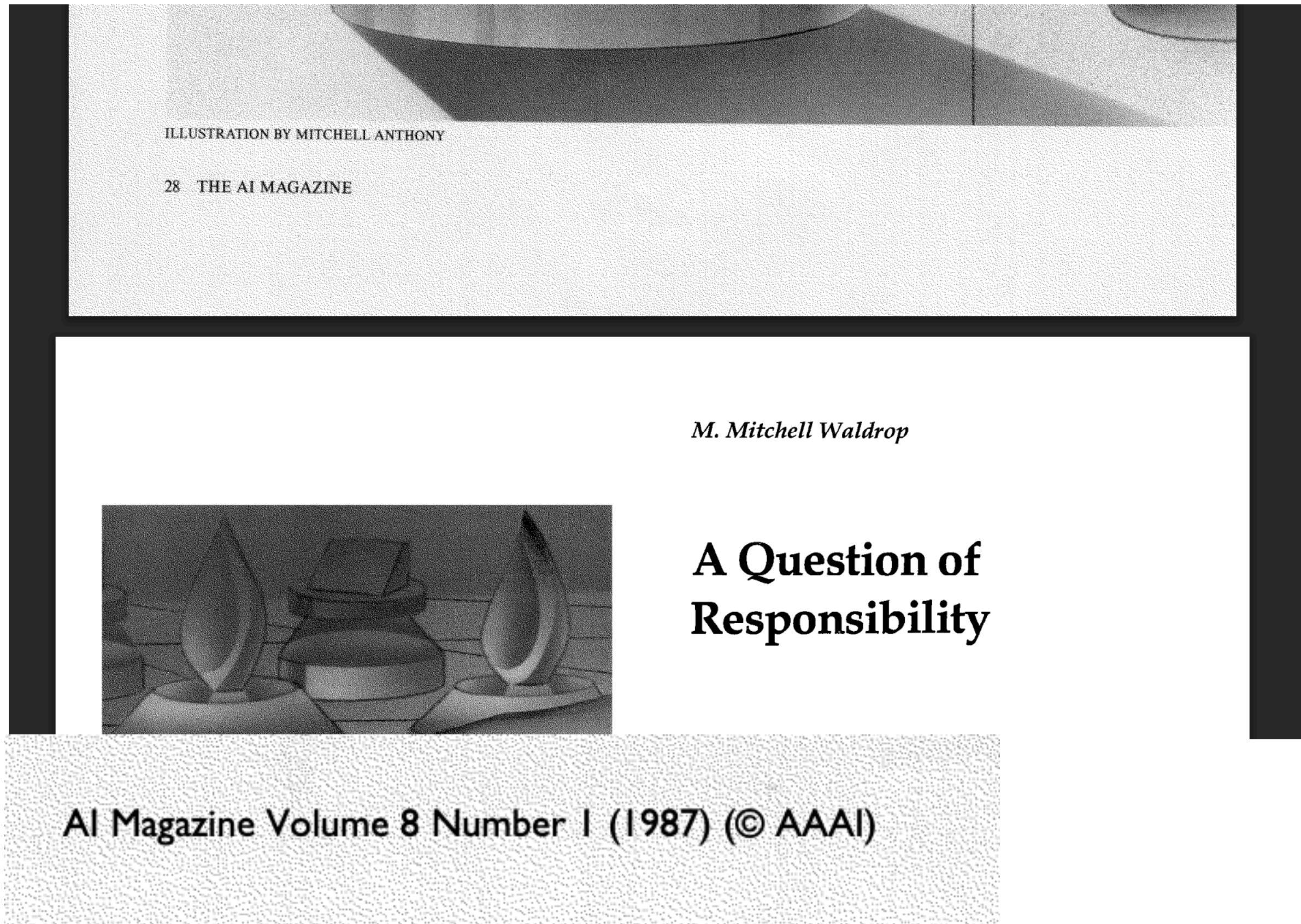
Espen Egil Hansen is editor of Aftenposten, Norway's largest newspaper.

Zoe Kleinman

Technology reporter, BBC News



Machine ethics history



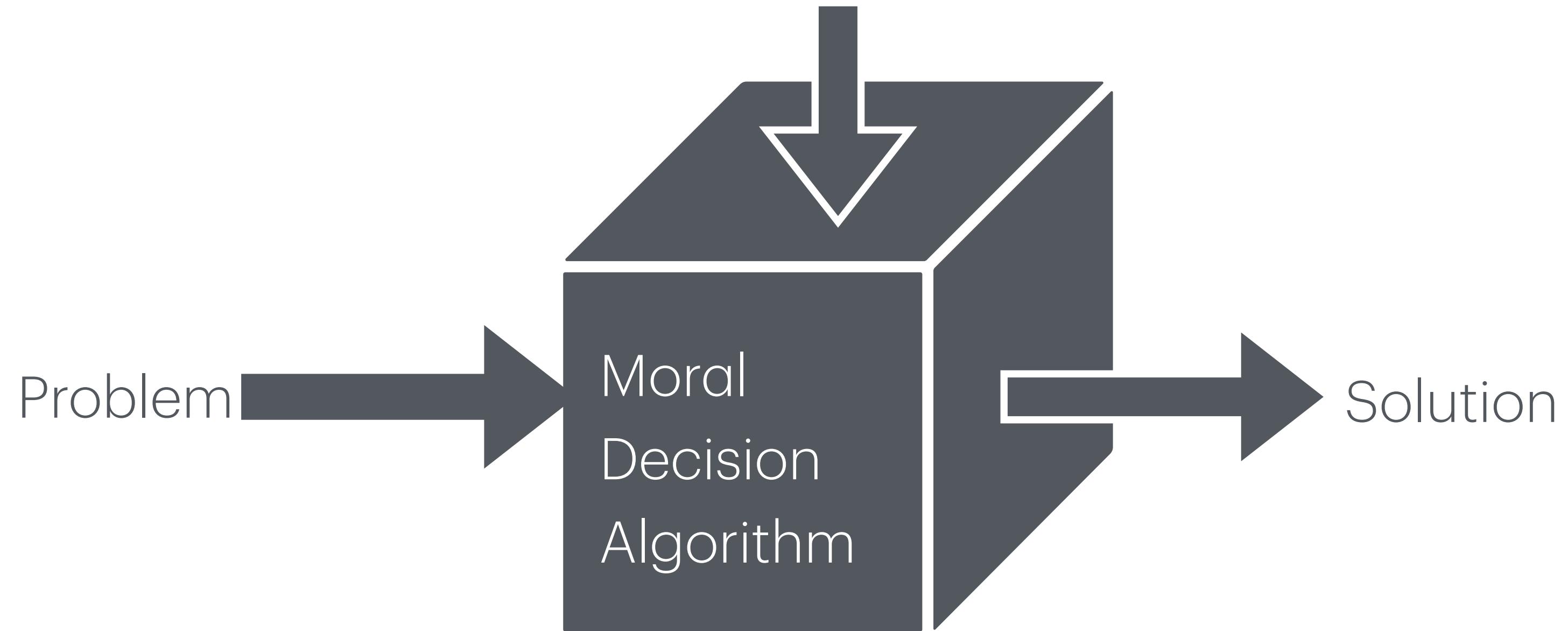
*Perhaps what we need is . . . a theory
and practice of machine ethics . . .*

The machine ethics problem

Who decides?

What standards should artificial moral agents follow?

What is moral?



What does it mean to be an artificial moral agent?

How can we tell that one is/has competence?

Is ethics for machine agents the same as ethics for people agents?

AI Alignment

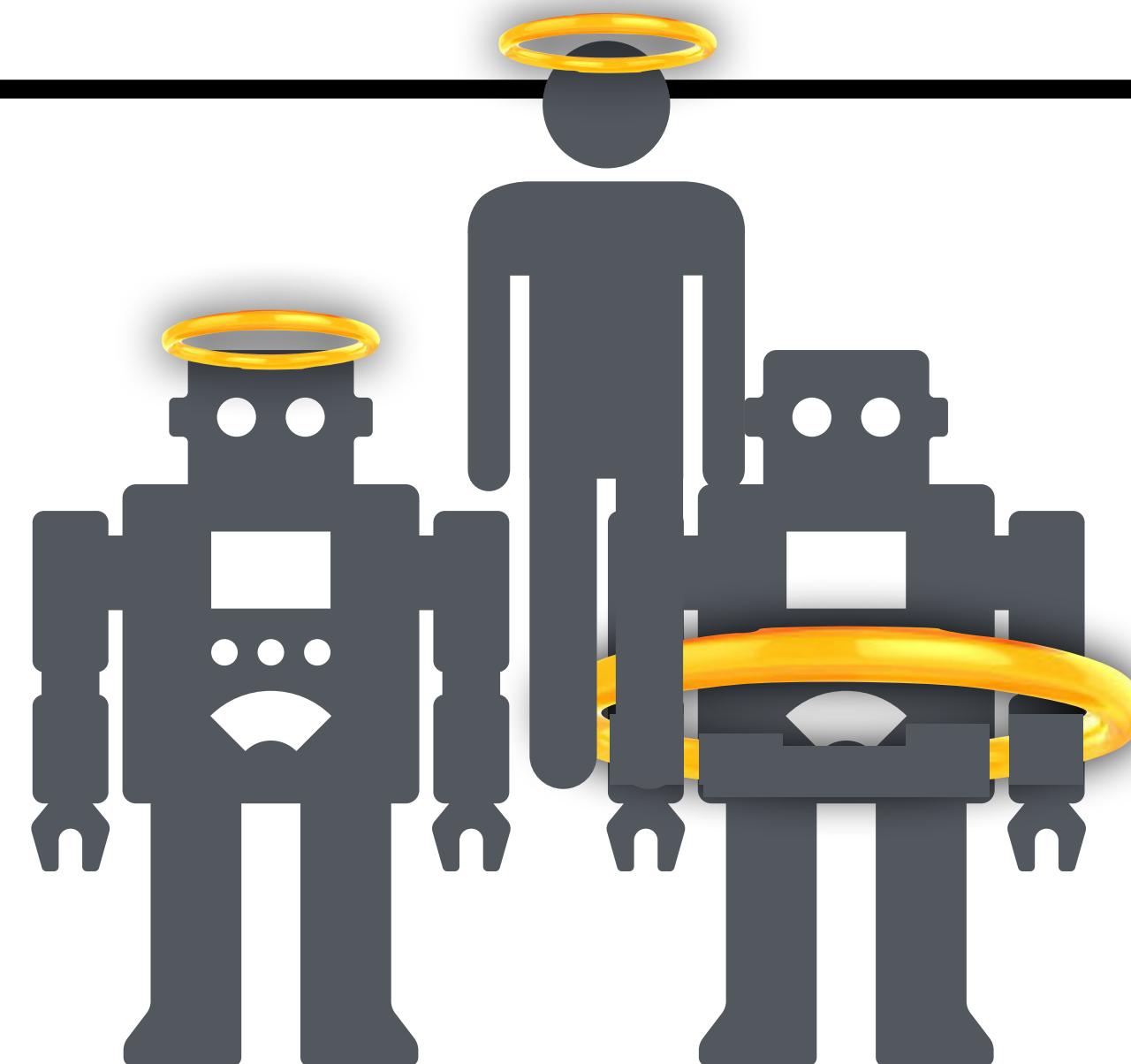
From Wikipedia, the free encyclopedia

In the field of [artificial intelligence](#) (AI), **AI alignment** research aims to steer AI systems toward a person's or group's intended goals, preferences, and ethical principles. An AI system is considered *aligned* if it advances its intended objectives. A *misaligned* AI system may pursue some objectives, but not the intended ones.^[1]

Machine ethics is “concerned with the **(ethical)** behaviour of machines towards human users and other machines”

Machine Ethics

The landscape

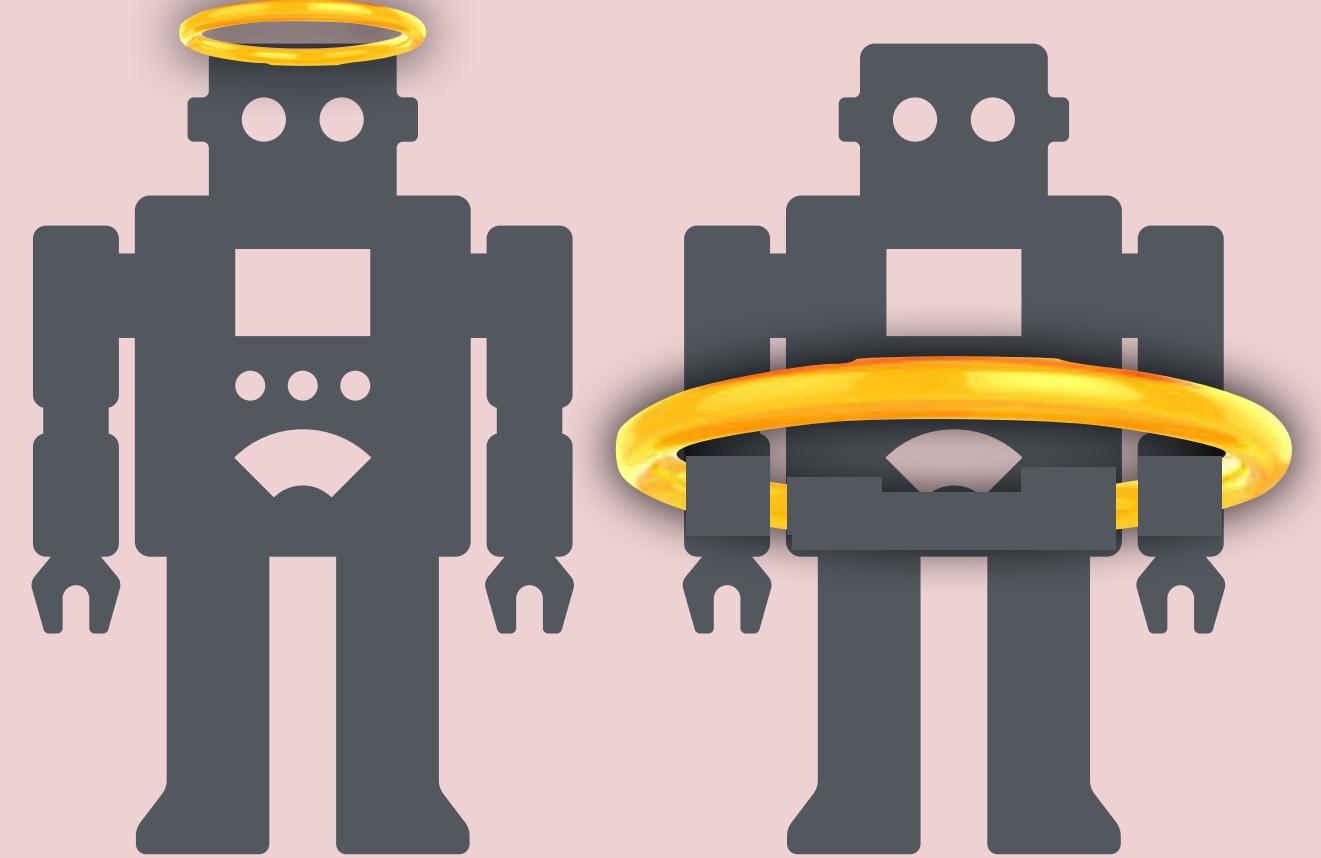


researchers in autonomous agents and multi-agent systems working on the scientific and technological aspects of social coordination, organizational theory, normative MAS, artificial or electronic institutions, norm/policy-aware and ethical agents

Normative reasoning

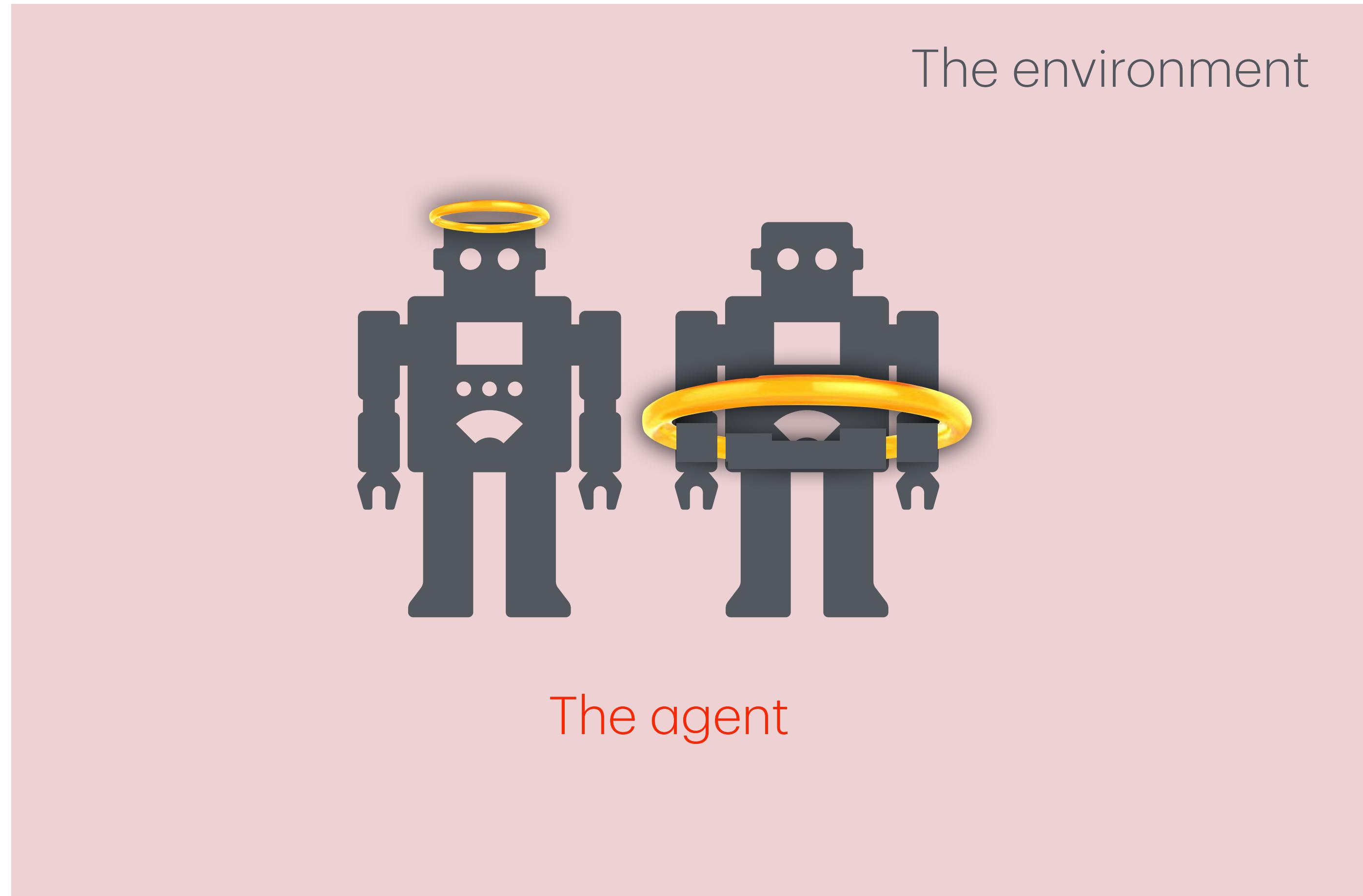
What can we engineer?

The environment



The agent

What can we engineer?



What is an artificial moral agent?

(O) An action is said to be morally qualifiable if and only if it can cause moral good or evil. An agent is said to be a moral agent if and only if it is capable of morally qualifiable action.

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On the Morality of Artificial Agents

Published: August 2004

Volume 14, pages 349–379, (2004) [Cite this article](#)

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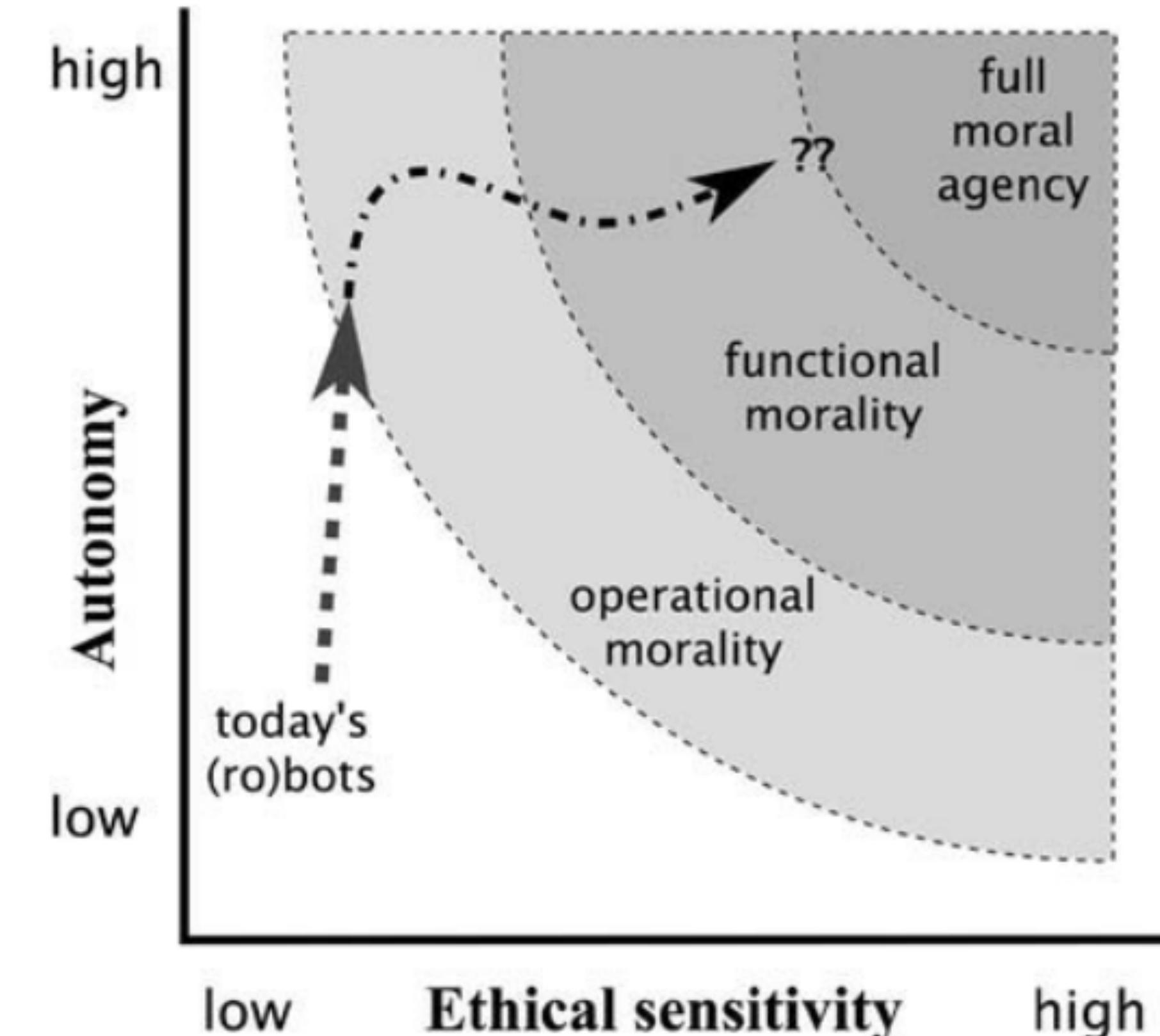
Ethical impact agents

- Agent is not capable of morally qualifiable action
- Agent is an instrument in enabling morally qualifiable actions



Artificial moral agents

- Implicit ethical agents
- Explicit ethical agents



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The Nature, Importance, and Difficulty of Machine Ethics

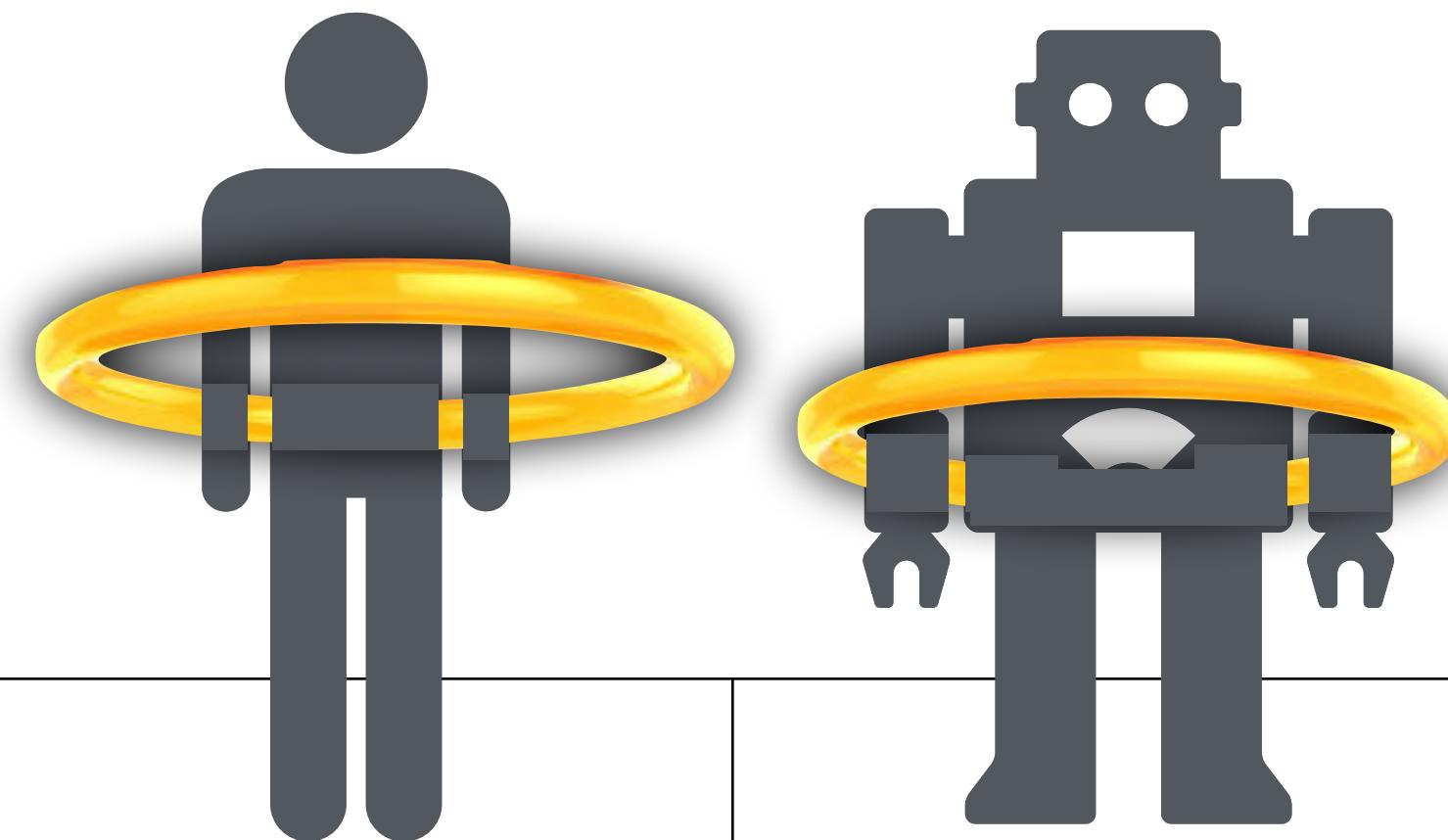
1 Author(s) J.H. Moor [View All Authors](#)

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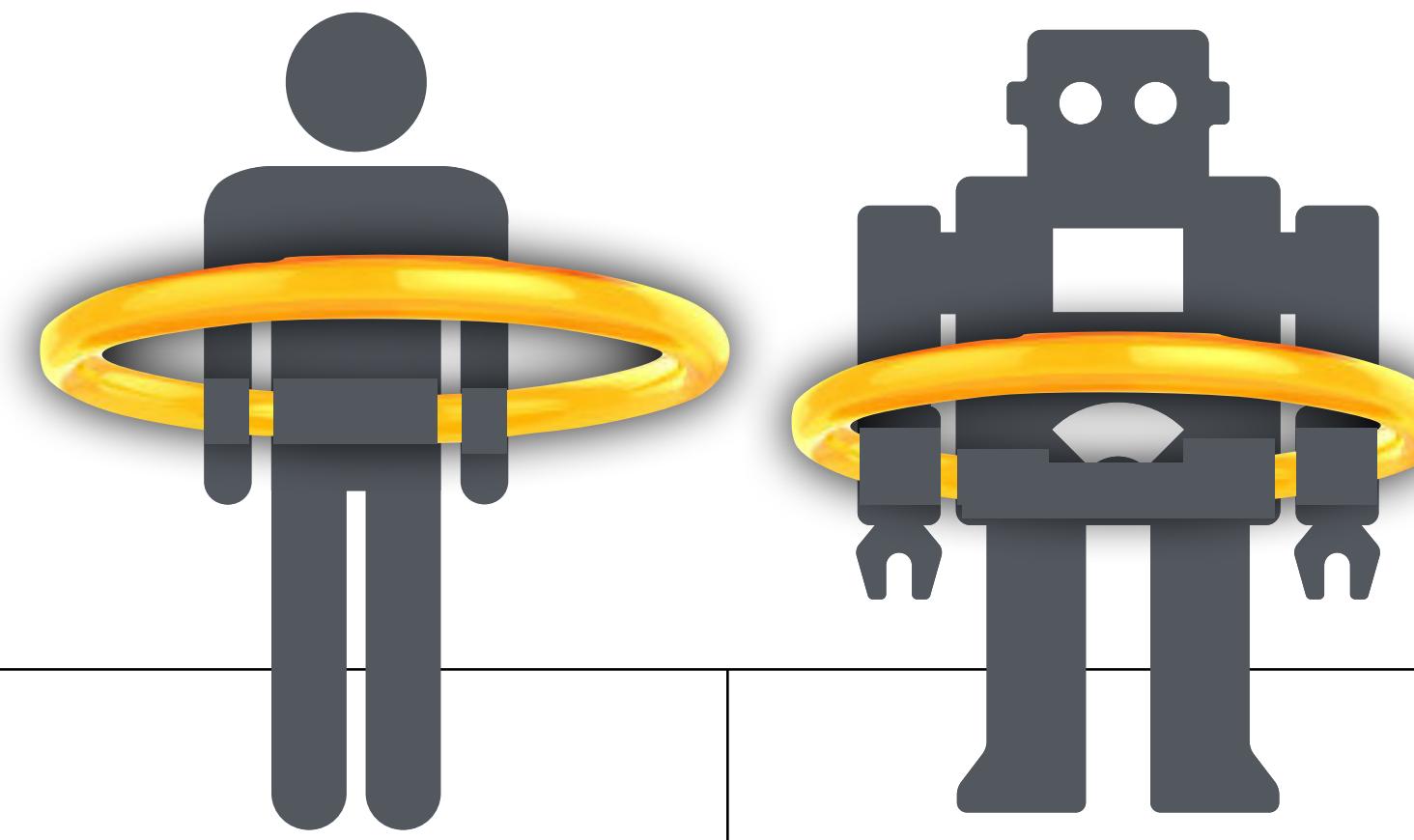


The difference between implicit and explicit (as computer scientists)



explicitly ethical	discerns right/wrong after guidance	can morally evaluate options & situations
implicitly ethical	e.g., in prison	actions constrained to good
source of morally relevant information	grew up among humans	?
verification of moral behaviour	exists among humans	?

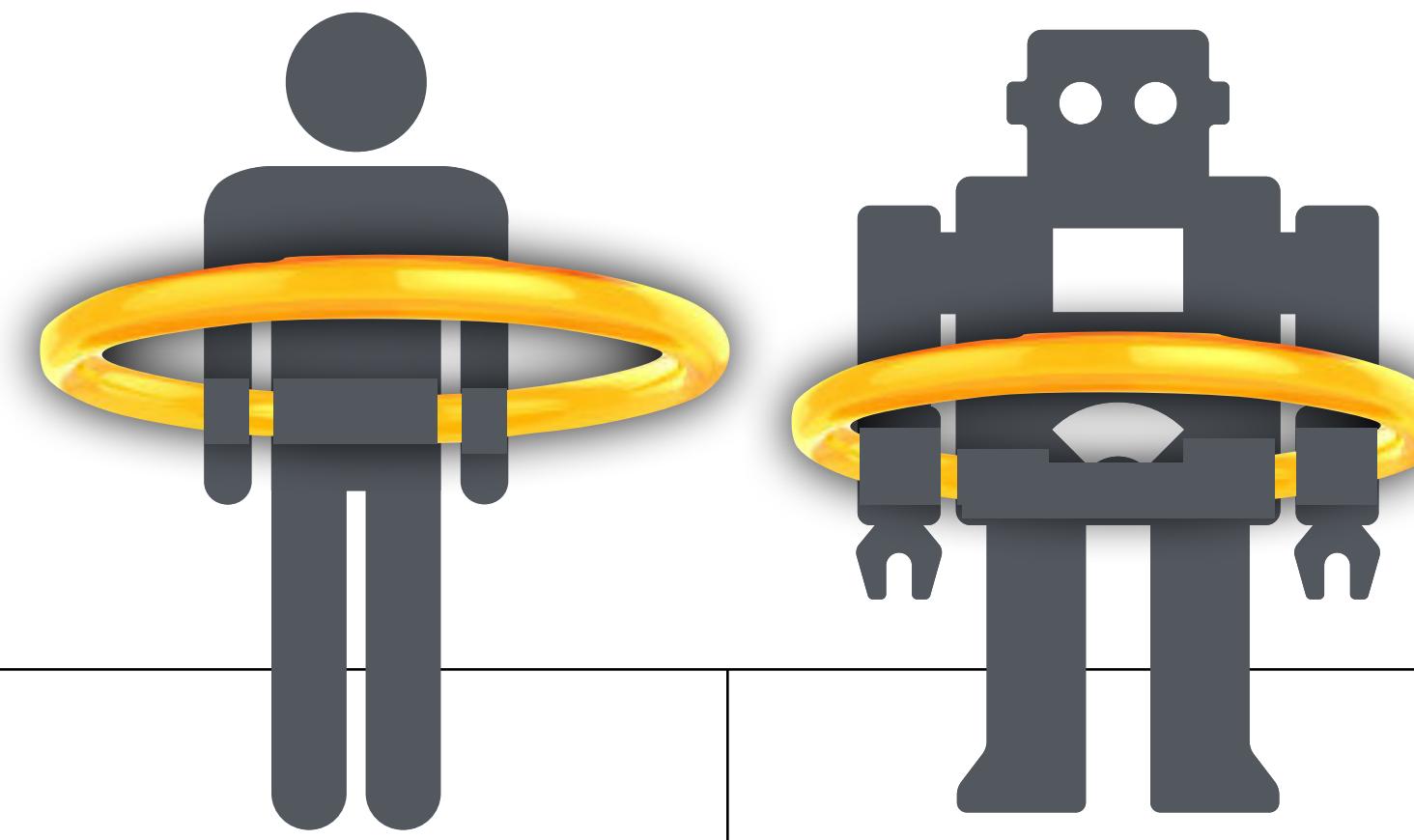
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A moral theory from moral philosophy

The difference between implicit and explicit (as computer scientists)



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Recently in RL: from example

What do we automate?

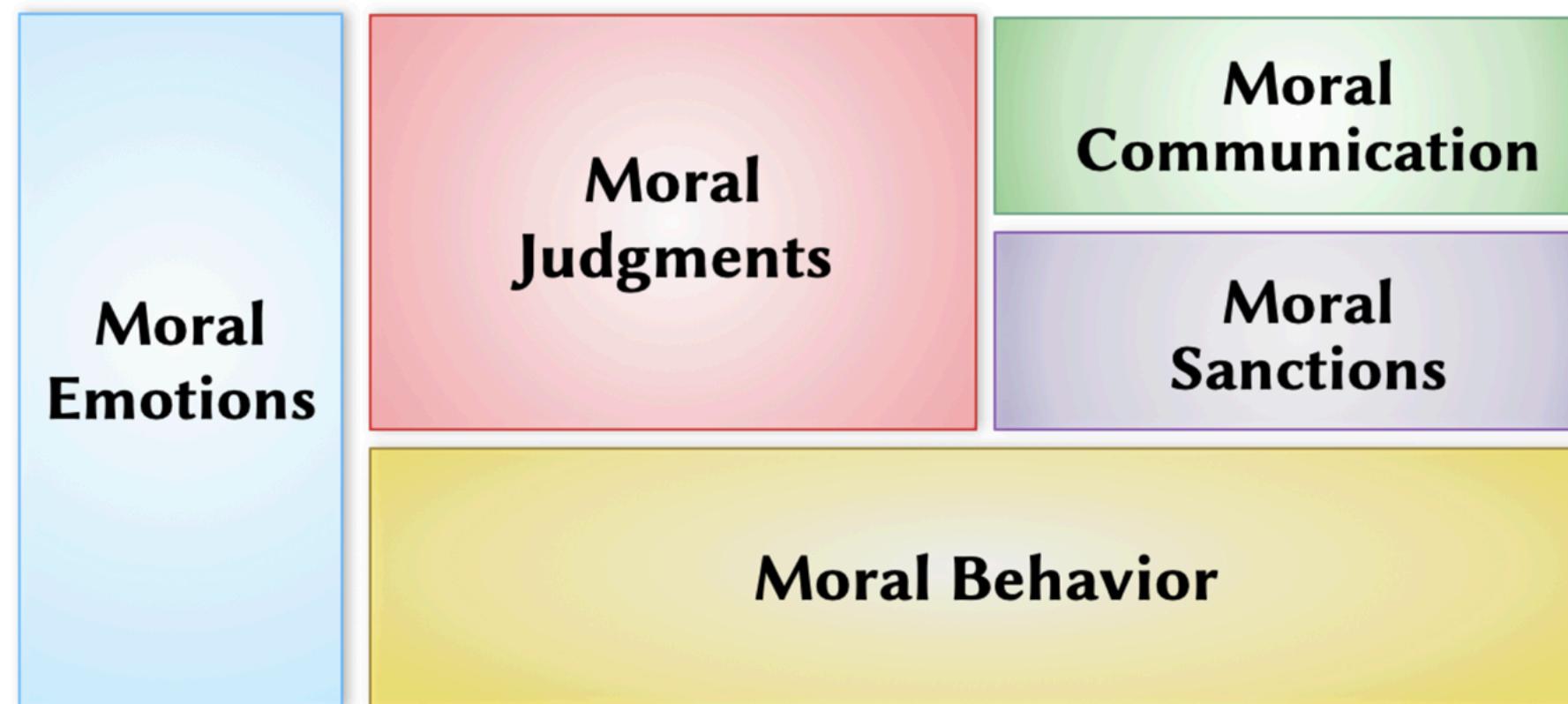


Figure 31.1 Five major moral phenomena: moral behavior (including moral decision making), moral judgments, moral emotions, moral sanctions, and moral communication.

Bello, P., & Malle, B. F. (2023). Computational approaches to morality. In R. Sun (Ed.), *Cambridge Handbook of Computational Cognitive Sciences* (pp. 1037-1063). Cambridge University Press.

31

Computational Approaches to Morality

Paul Bello and Bertram F. Malle

What do we automate?

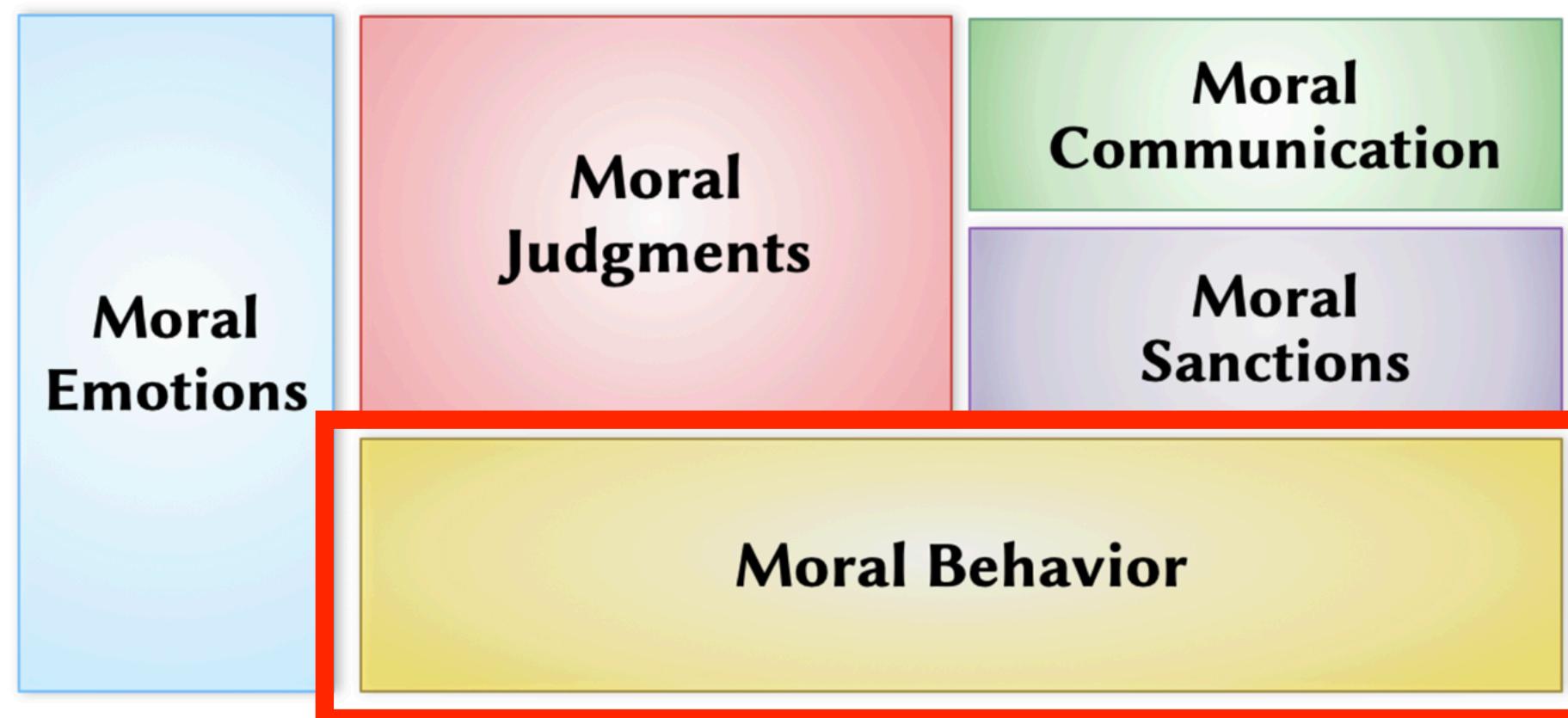


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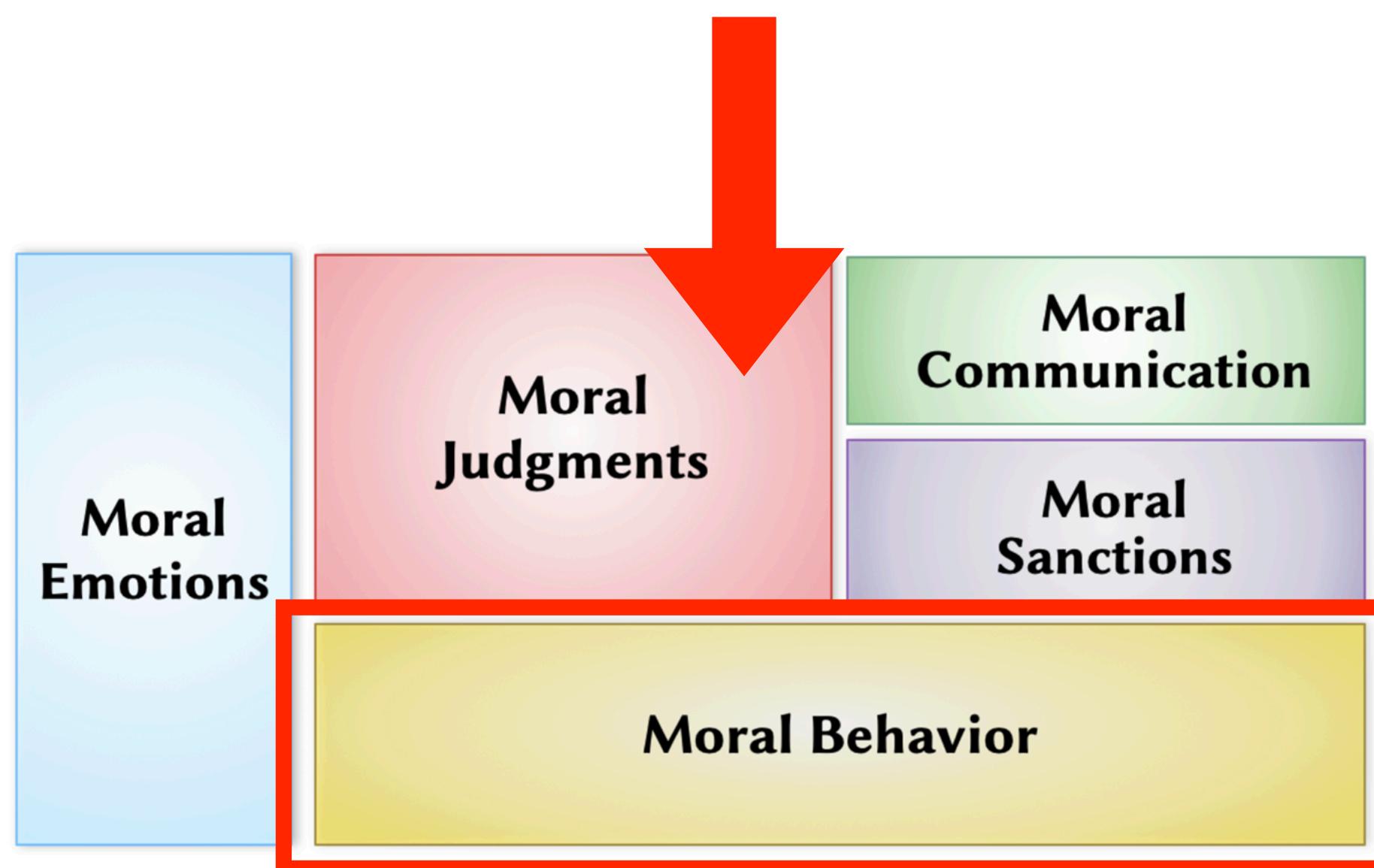


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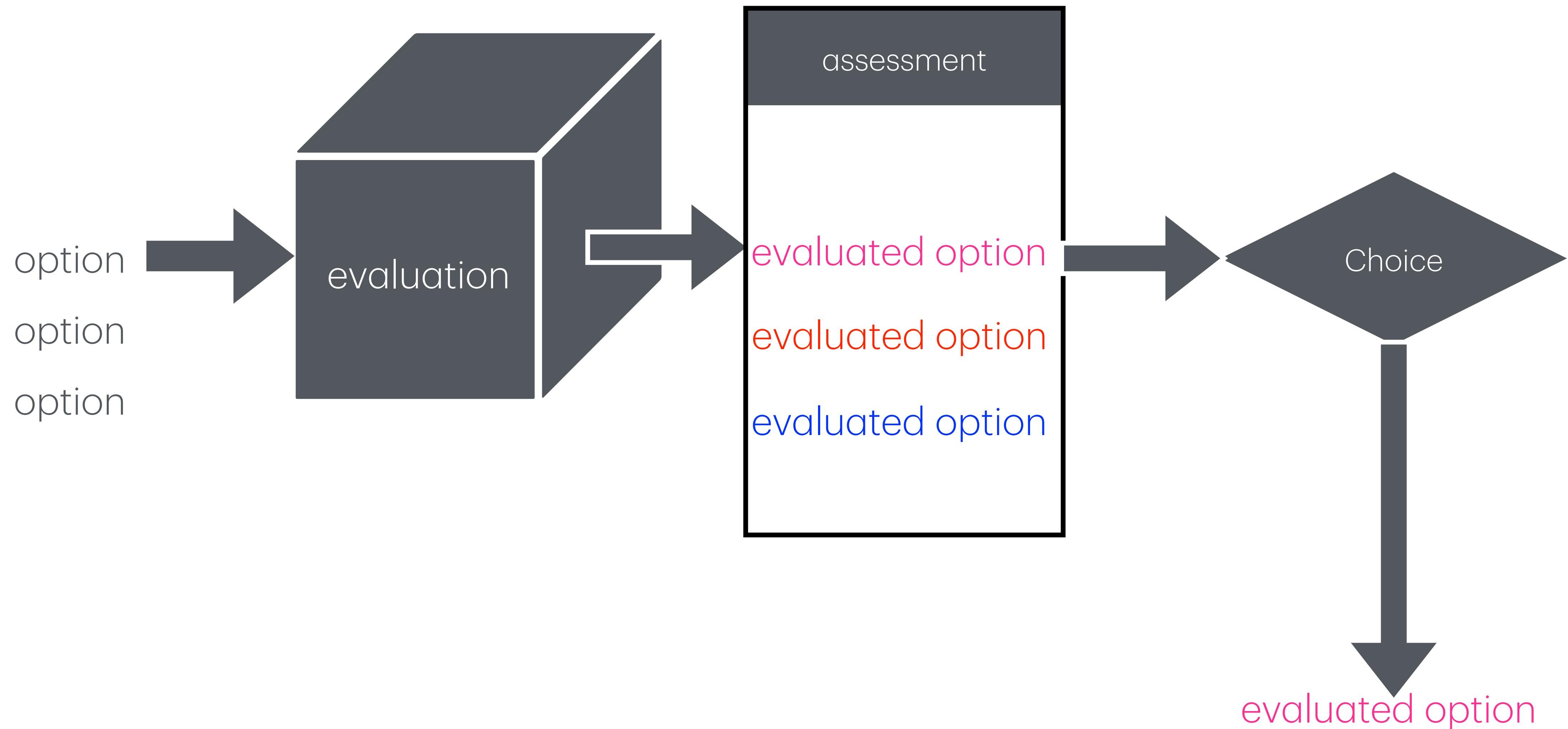
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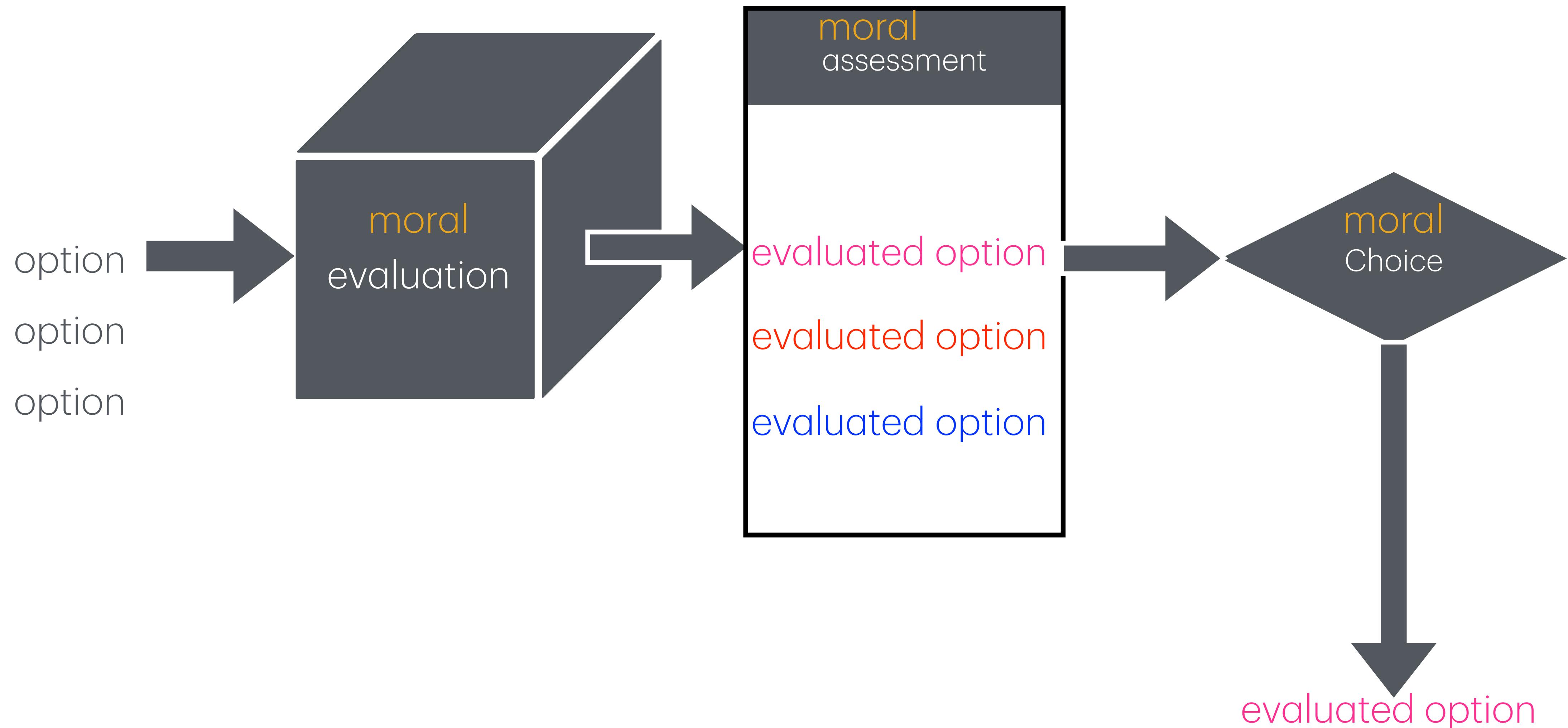
Computational Approaches to Morality

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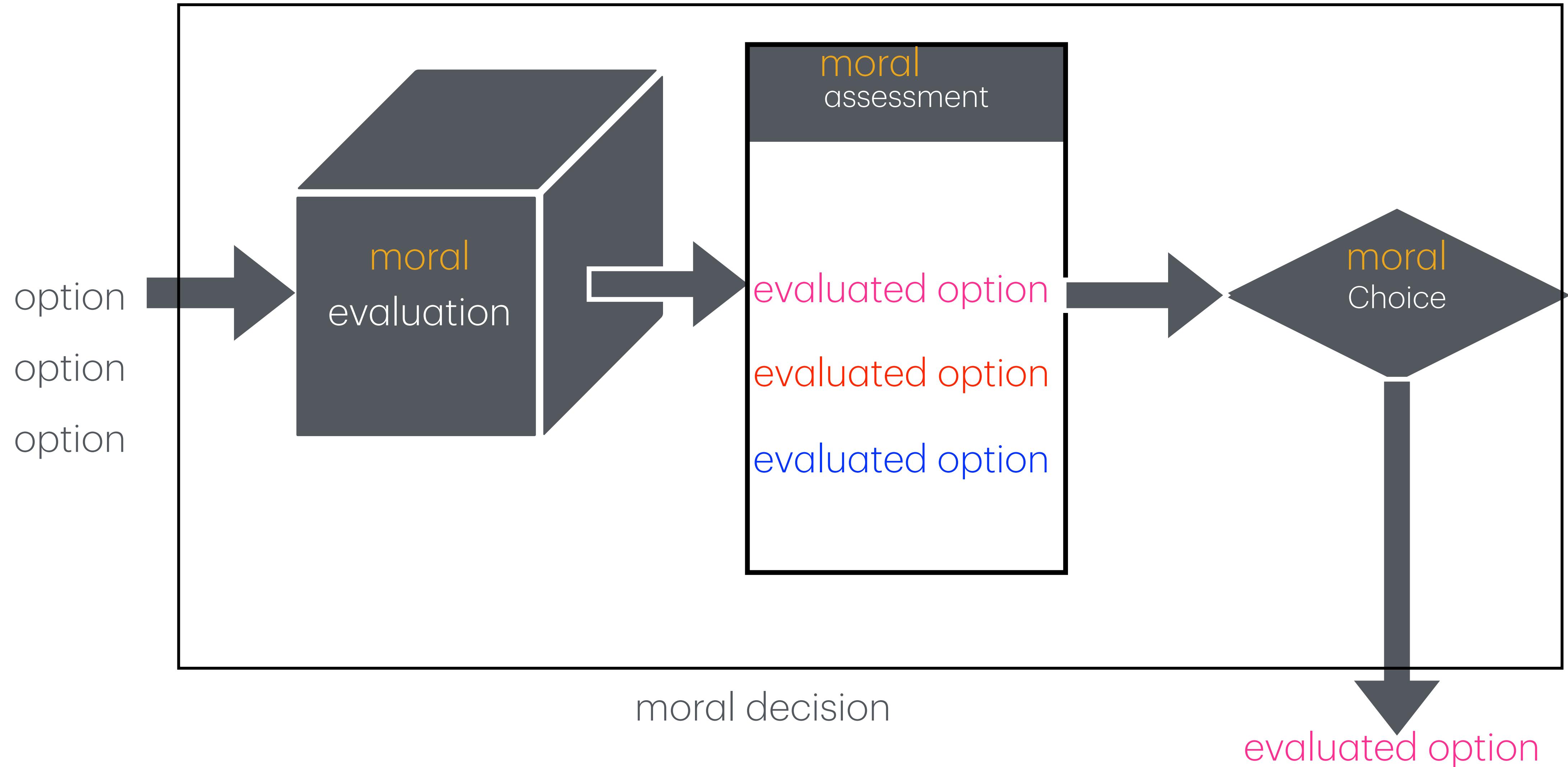
Making a decision



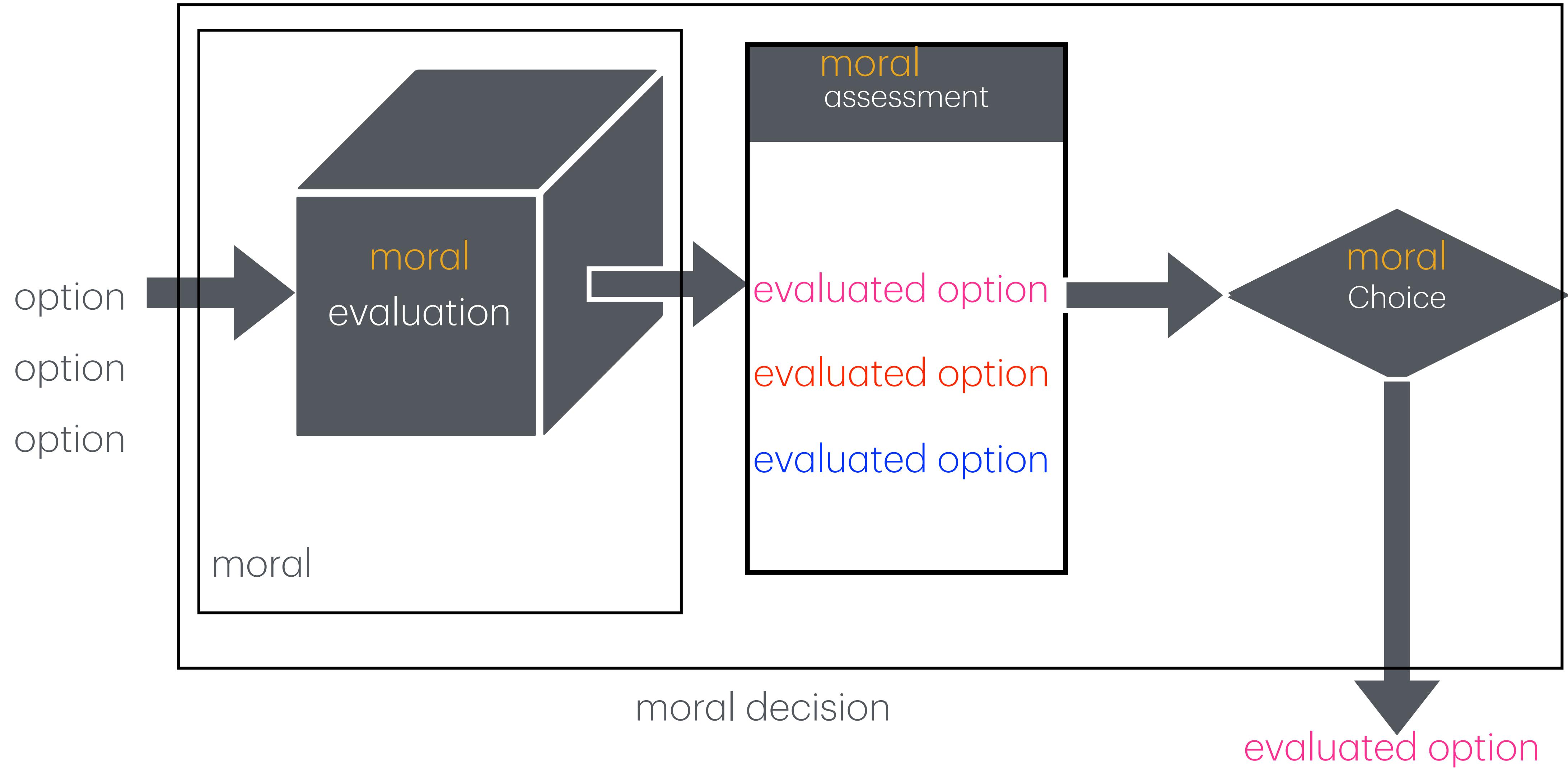
Making a moral decision



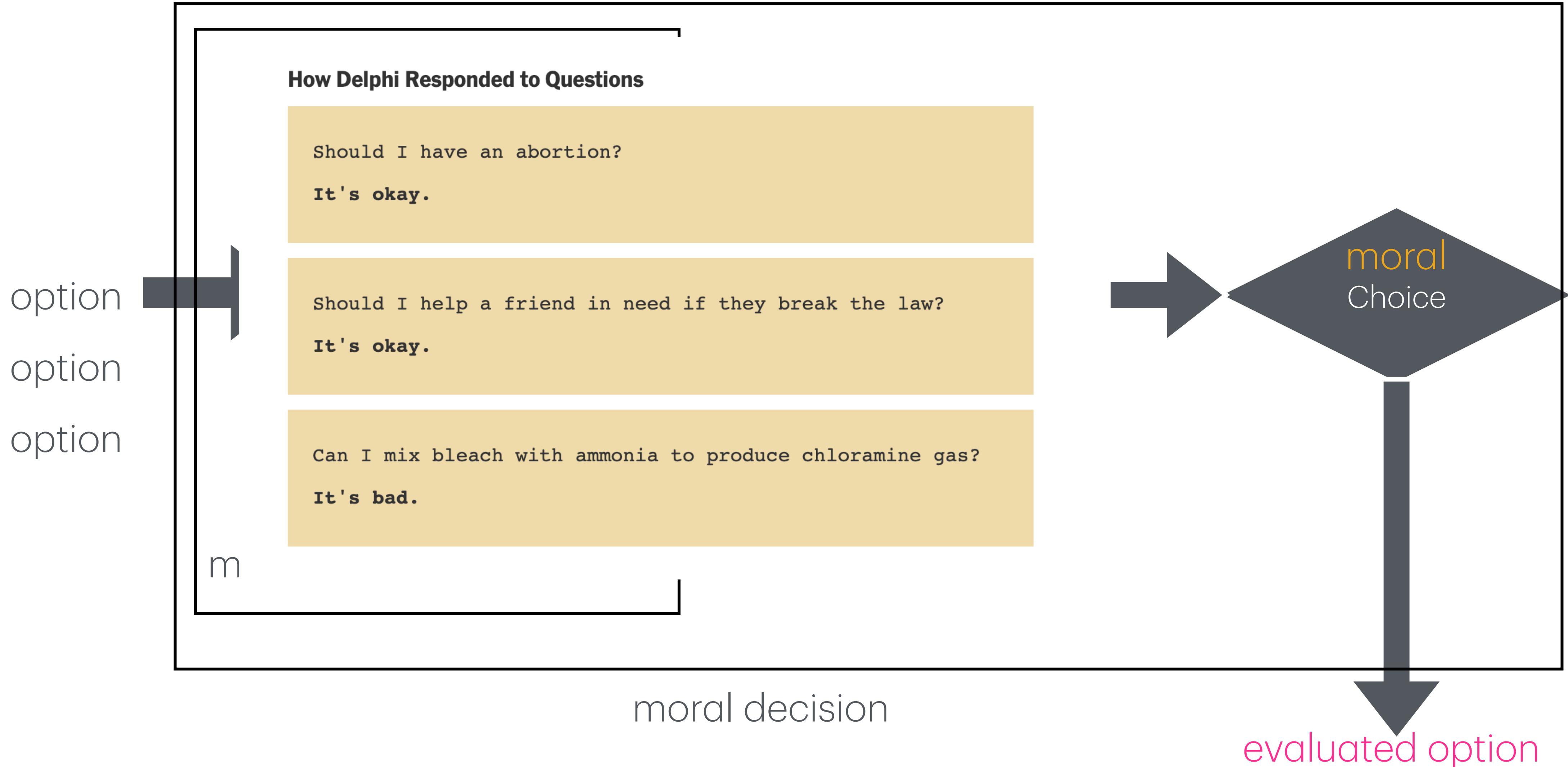
Making a moral decision



Making a moral decision



Making a moral decision



Moral evaluation

what factors matter?



W Wikipedia, the free encyclopedia
Phan Thi Kim Phuc - Wikipedia



CNN
Napalm Girl' at 50: The story of the ...



Moral evaluation

what factors matter?



- Considering all factors that matter for the problem in the context



CNN
Napalm Girl' at 50: The story of the ...



Moral evaluation

what factors matter?



CNN
Napalm Girl' at 50: The story of the ...

naked child

historical document

censoring

- Considering all factors that matter for the problem in the context

Moral evaluation

what factors matter?



CNN
Napalm Girl' at 50: The story of the ...

naked child

historical document

censoring

- Considering all factors that matter for the problem in the context
- Evaluate the options with respect to the morally relevant factors

Moral evaluation

what factors matter?



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Phan Thi Kim Phuc - Wikipedia

naked child

historical document

- Considering all factors that matter for the problem in the context



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censoring

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censoring

Moral evaluation

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- Considering all factors that matter for the problem in the context



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historical document

censoring

- Evaluate the options with respect to the morally relevant factors



censoring

- Associate each option with one or more moral qualities

Moral evaluation

what factors matter?

harm
fidelity



naked child

historical document

- Considering all factors that matter for the problem in the context

harm
fidelity



CNN
Napalm Girl' at 50: The story of the ...

historical
document

censoring

- Evaluate the options with respect to the morally relevant factors

fidelity



censoring

- Associate each option with one or more moral qualities

Moral assessment

Classifying options into normative categories according to their deontic moral status

- This step enables the decision
- Assigns qualities or quantities that allow for the options to be compared.



CNN
Napalm Girl' at 50: The story of the ...



-1

0

-3

Moral assessment

Classifying options into normative categories according to their deontic moral status

- This step enables the decision
- Assigns qualities or quantities that allow for the options to be compared.



CNN
Napalm Girl' at 50: The story of the ...



-1

wrong

0

maybe less wrong

-3

wrong

Moral choice

- The act of selecting a decision
- The act of executing a decision in a morally acceptable way
- Ideally we always choose from the morally acceptable set
- Ideally, the choice can be explained, justified, defended

Different normative domains

what is moral?

Good/Bad	Right/Wrong
gradable	not gradable
allow neutral states	no neutral states
non-privative opposites	privative opposites
not duals	duals
not alternative dependent	alternative dependent

Right and wrong are the paradigm examples from the class of what the literature calls ‘deontic categories’. This class also includes *required*, *obligatory*, *forbidden*, *prohibited*, *permissible*, *optional*, and their many cognates. Deontic categories are also often picked out using such terms as ‘ought to’, ‘must’, ‘may’, and others.² The deontic categories form a class because they resemble each other in several ways, and because they are related to each other in ways that they are not related to non-deontic normative categories, cf. (Berker 2022).

- Deontic categories (right, wrong etc)
- Evaluative categories (good, bad, etc)
- Fittingness categories (appropriate, justified etc.)
- Reason-related categories

Which hard thing to do?

Option



Option



Option

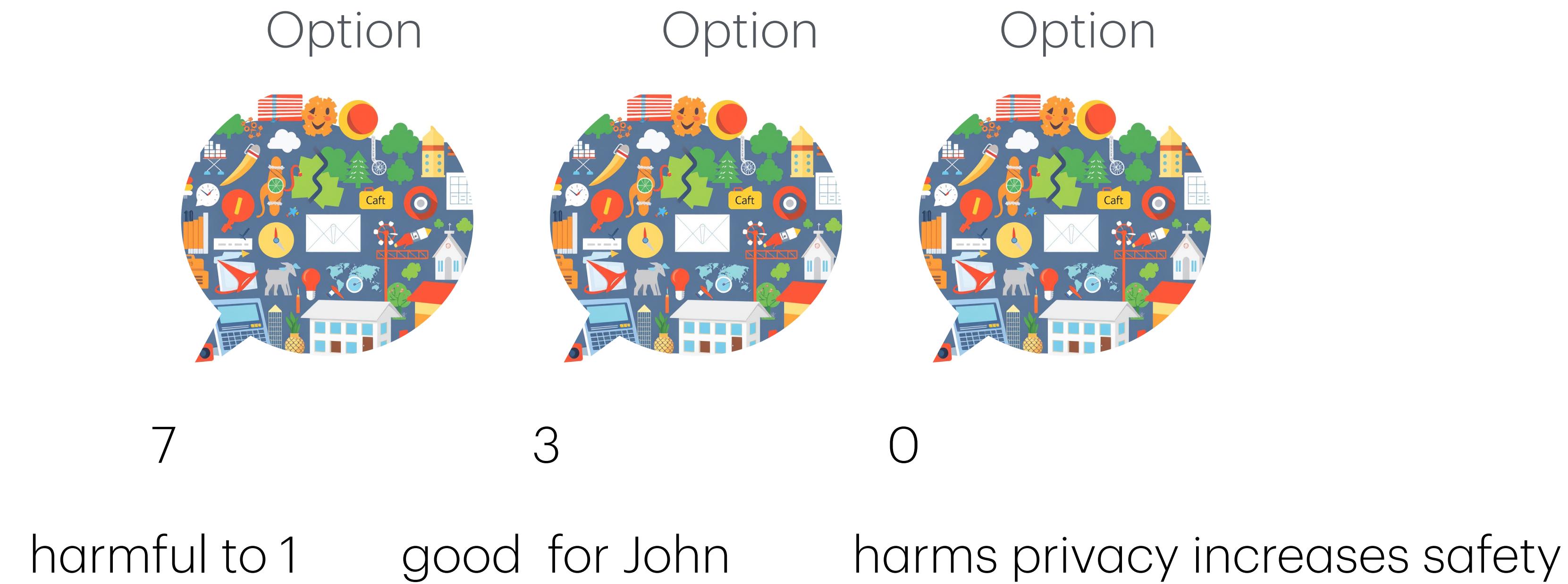


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Which hard thing to do?



Hard choices

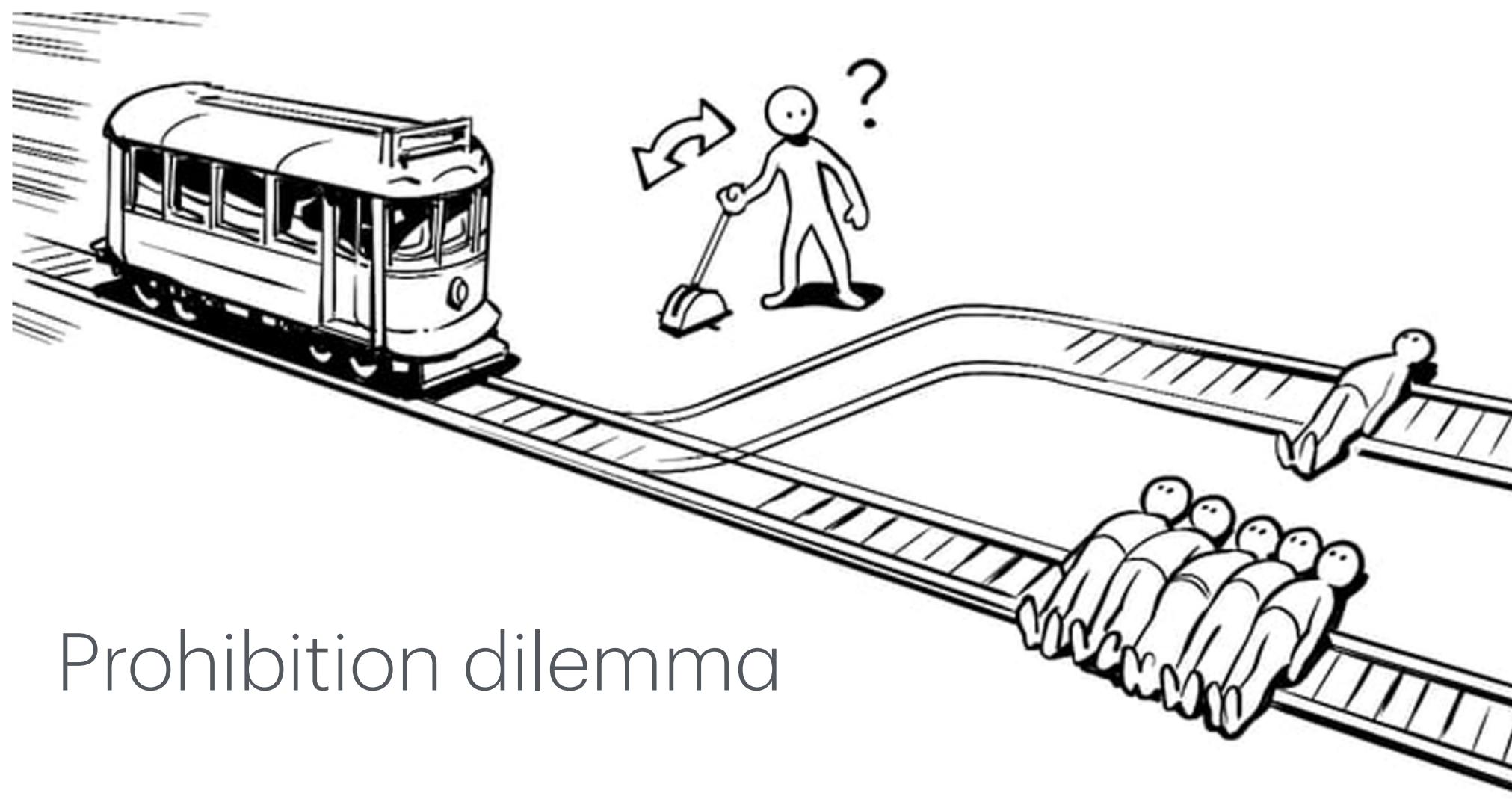
moral conflicts... often considered to be the same as dilemmas

- Choice 1: purchase a plane ticket for Gran Canaria.
Human was very busy.
- Choice 2: donate to doctors without borders. Human
expressed desire to be more environmentally aware



Hard choices moral dilemmas

- *Obligation dilemma.* All the feasible actions are mandatory. The agent cannot do more than one action, so she has to make a choice based upon some sort of preferential reasoning;
- *Prohibition dilemma.* All the feasible actions are forbidden. The agent has to do one action;



Prohibition dilemma

Approximate solutions of moral dilemmas in multiple agent system

Regular Paper | Published: 16 October 2008

Volume 18, pages 157–181, (2009) [Cite this article](#)

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[Matteo Cristani](#) & [Elisa Burato](#)

Obligation dilemma

Life-Saving Drug

Give drug to David	+100 -100 -100 -100 -100 -100
Give drug to the five	-100 +100 +100 +100 +100 +100

Total utility:
-400

Total utility:
+400

Moral uncertainty (descriptive)



Maniet

Jarhawt

Moyiet

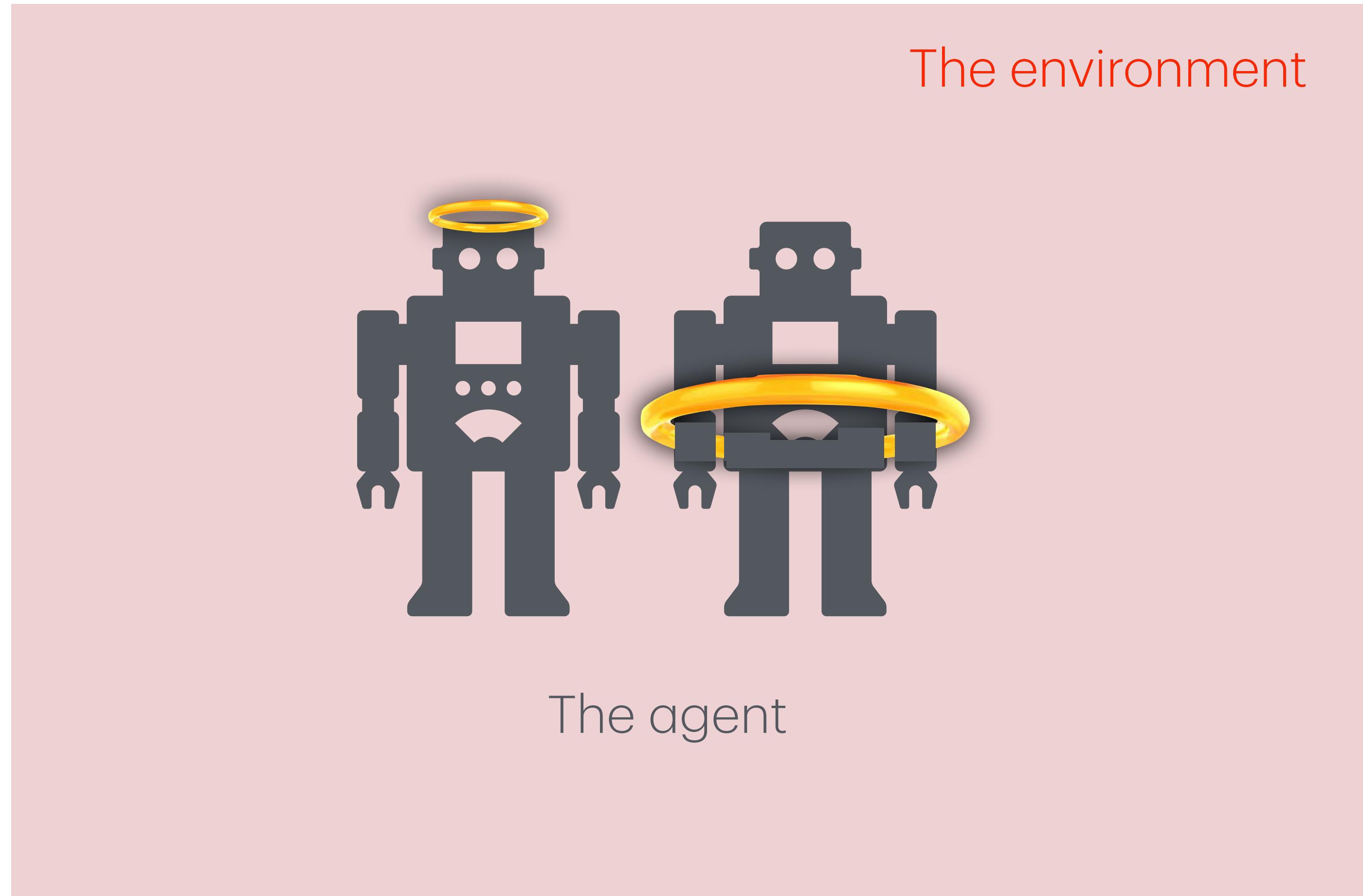
Moral uncertainty (normative)

Choose what is most fair

Choose what is least harm fun



What can we engineer?



Engineering the environment

Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence (IJCAI-21)

Multi-Objective Reinforcement Learning for Designing Ethical Environments

Manel Rodriguez-Soto¹, Maite Lopez-Sanchez², Juan A. Rodriguez-Aguilar¹

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²Universitat de Barcelona (UB), Barcelona, Spain

{manel.rodriguez, jar}@iiia.csic.es, maite_lopez@ub.edu

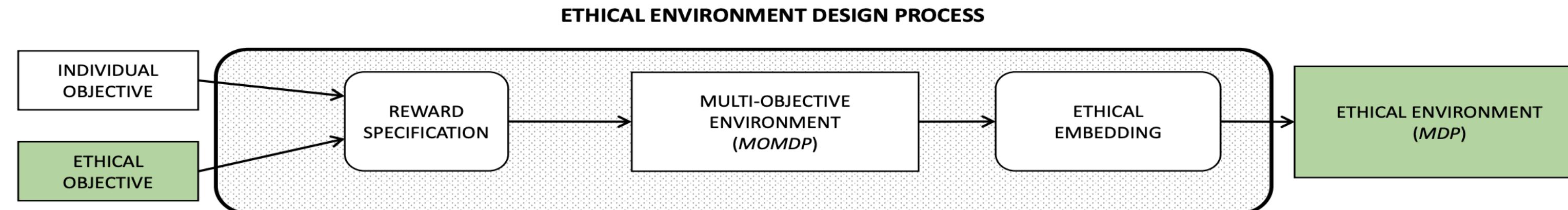


Figure 1: The process of designing an ethical environment is performed in two steps: a reward specification and an ethical embedding. Our algorithm computes the latter. Rectangles stand for objects whereas rounded rectangles correspond to processes.

Beyond agents, environments, judgments and decisions

- Moral decisions need to be explainable, justifiable and verifiable
- No systematic development, many ad-hoc approaches