



DATA7002:Responsible Data Science 2021



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Welcome to DATA7002



- Gathering, understanding, interpreting and making decisions based on collected data is an invaluable tool for science, business and governments. Concerns about privacy, consent, confidentiality, discrimination, ownership, commercialisation, intellectual property and the importance of fair benefit sharing are known. Being aware of conflicts of interest and the need to ensure equity, reciprocity and respect for cultural diversity are increasingly seen as important. What is less recognised is the nature of the roles of those who access and make decisions about collected linked personal information. The emerging global banked data that has become a key part of contemporary decision-making raises questions about the role of the data scientist.

Course Description:

In this course students will critically analyse the ethical and legal foundations of data science governance that are relevant to the technical processes of data collection, storage, exchange and access. Issues covered will include the ethical dimensions of data management, legal and regulatory frameworks in Australia and in relevant jurisdictions, data policy, data privacy, data ownership, legal liabilities regarding analytical decisions, and discrimination.

The course should equip students to identify the ethical and legislative requirements that underpin the technical processes of data science and to apply ethical and legal considerations to the core processes of data analytics.

It will also introduce algorithms and technical approaches to minimise the risk of data identifiability and disclosure. A range of case studies will be used to explore these issues in applications of data science, including the use of government administrative data for informing social policy, to integrate ethical, legal and technical considerations.

Aims and Objectives

After successfully completing this course you should be able to:

- 1** Identify the key ethical, legal and technical considerations that are intrinsic to integrity in data science practice.
- 2** Gain practical skills in predicting, identifying, assessing, evaluating and responding to the ethical conflicts and dilemmas that are likely to occur within data science.
- 3** Explain the different legal and ethics approaches that underpin the application of data science
- 4** Apply relevant Australian and international privacy law and ethics theory to contemporary data science problems
- 5** Evaluate the effectiveness of different legal and ethics approaches relevant to the application of data science
- 6** Ability to identify relevant ethics and legal aspects of data science and apply appropriate techniques and algorithms for data de-identification to ensure privacy and non-disclosure when required.

ECP

https://learn.uq.edu.au/webapps/portal/execute/tabs/tabAction?tab_tab_group_id=_1_1

Ethics and Data Science: Outline

Week One: Introduction

1. Thinking about Data Science – key questions and definitions
2. Introduction to practical ethics and the nature of moral inquiry and philosophical analysis (dilemmas and conflicts)

Week Two: The theoretical tools of philosophical analysis

3. Approaches to philosophical ethics

Week three: Case study activity

Week Four: Data science governance and regulation

4. What is data and what is information?
5. Collection use and management of data and information
6. Australia's data landscape

Week Five: Decision-making and problem solving in data science case analysis

7. Domain analysis: Research data, Non research data, Algorithm development (machine learning, AI, robotics) and The Practice/s of Data Science.

Data Science case analysis in 4 areas

- a) Research **Data**;
- b) Non-Research Data
(Collection, Storage and access);
- c) **Algorithms** (in machine learning, AI, robotics)
and;
- d) Data Science **Practices** (responsibilities of data scientists, organisations, data science code of ethics, the characteristics of good data science practice, surveillance)

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1. Thinking about Data Science

Allan Turing raised a key question in 1950



CAN
MACHINES
THINK?



"The good news, Dave, is that the computer's
passed the Turing test. The bad news
is that you've failed."

The Chinese room argument

John Searle



Imagine a native English speaker who knows no Chinese locked in a room full of boxes of Chinese symbols (a data base) together with a book of instructions for manipulating symbols (the program). Imagine that people outside the room send in other Chinese symbols which, unknown to the person in the room, are questions in Chinese (the input). And imagine that by following the instructions in the program the man in the room is able to pass out Chinese symbols which are correct answers to the questions (the output). The program enables the person in the room to pass the Turing Test for understanding Chinese but he does not understand a word of Chinese.

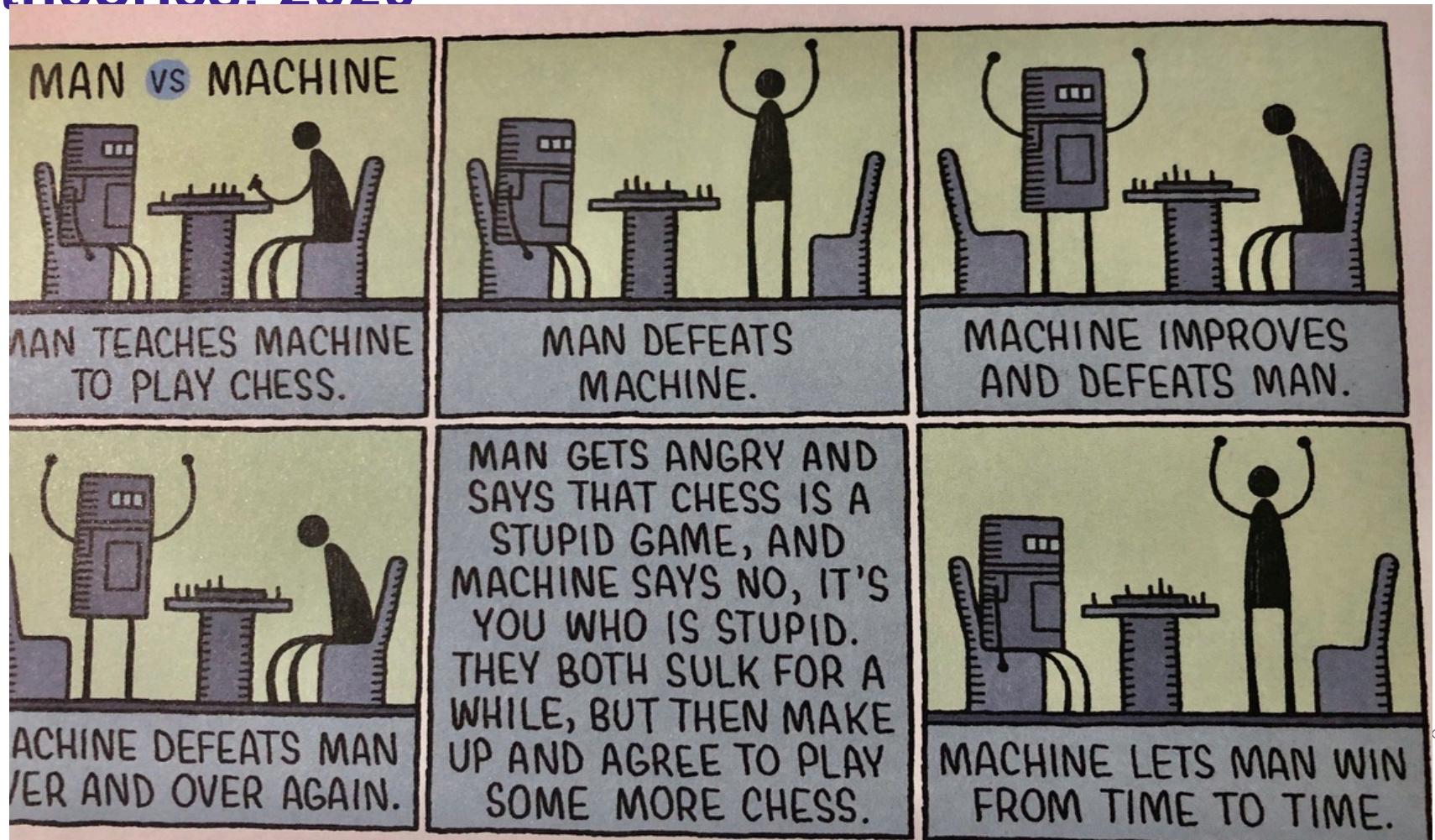
The broad conclusion of Searle's argument is,

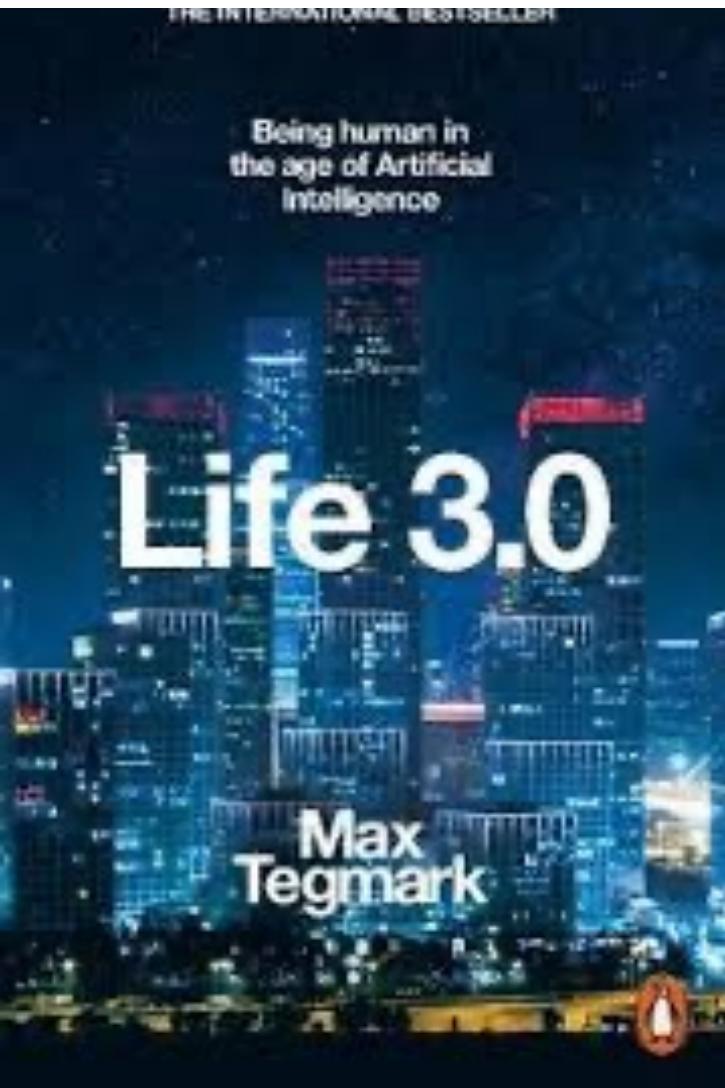
that understanding is not built up through descriptions of external reality

However Google's Duplex chat on the phone with a waiter whilst booking a restaurant table has convinced some observers that machine intelligence has finally arrived.

Has machine intelligence arrived?

Tom Gauld, Department of mind blowing theories. 2020

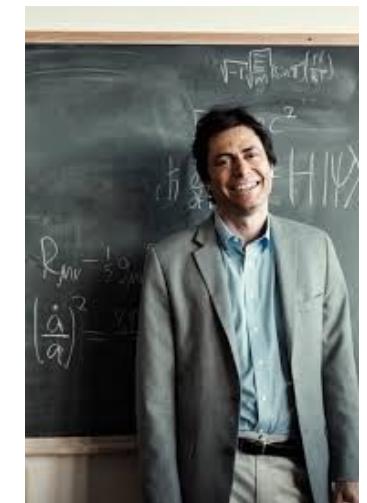




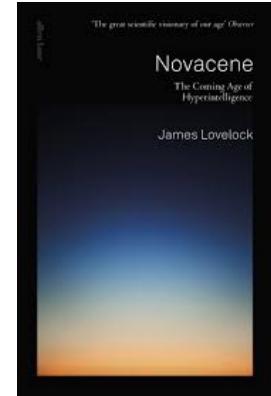
Life (Max Tegmark, 2017)

Life, defined as a process that can retain its complexity and replicate, can develop through three stages

- (1.0) **Biological**: hardware and software are evolved
- (2.0) **Cultural**: can design software through learning
- (3.0) **Technological**: can design hardware as well, becoming master of its own destiny



James Lovelock



The coming age of the Novacene (age of hyperintelligence) follows the Anthropocene.

The Novacene is when our technology moves beyond our control, generating intelligences far greater and, crucially, much faster than our own.

(Lovelock Novacene, Penguin, 2019)

Views on potential futures

- “The natural continuation to the advancement trends is using nanobots, intelligent biofeedback systems, and other technology to replace first our digestive and endocrine systems, our blood and our hearts by the early 2030s, and then move to upgrading our skeletons, skin, brains and the rest of our bodies during the next two decades” (Ray Kurzweil, 2005).
- Cyborgization would go beyond merely improving our DNA “eliminate the human body entirely and upload minds creating whole brain emulation in software” (Hans Moravec 1998).
- To be fit for the future we will also need to enhance - the moral dispositions of our citizens, extend their moral concerns beyond a small circle of personal acquaintances and further into the future. Otherwise, human civilization is jeopardized. It is doubtful whether this moral enhancement could be accomplished solely by means of traditional moral education. Therefore, we should explore, in addition, the prospects of moral enhancement by alternative, biomedical means the moral bio enhancement of human minds (Ingmar Persson & Julian Savulescu, 2012).

The merger of biotech and infotech confronts us with the biggest challenges humankind has ever encountered

(Yuval Noah Harari, 2018)

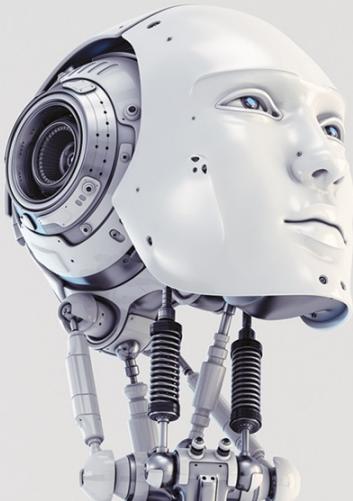
While the integration of data science into all planetary activities aspects confront us with some of the biggest challenges humankind has ever encountered

(Crowden 2020)

THE CULTURE OF AI

everyday life and the digital revolution

ANTHONY ELLIOTT

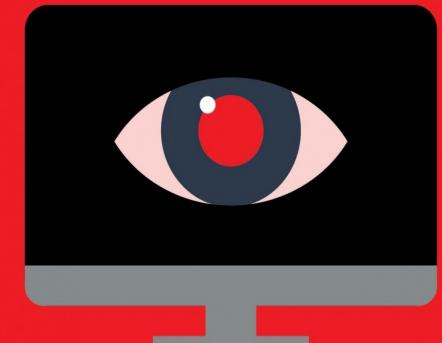


Bookseller website algorithms will recommend this book because they know what you like.
I'm recommending this book because I like it. SHAUN MICALEFF, SATIRIST

Net Privacy

HOW WE CAN BE FREE
IN AN AGE OF SURVEILLANCE

SACHA MOLITORISZ



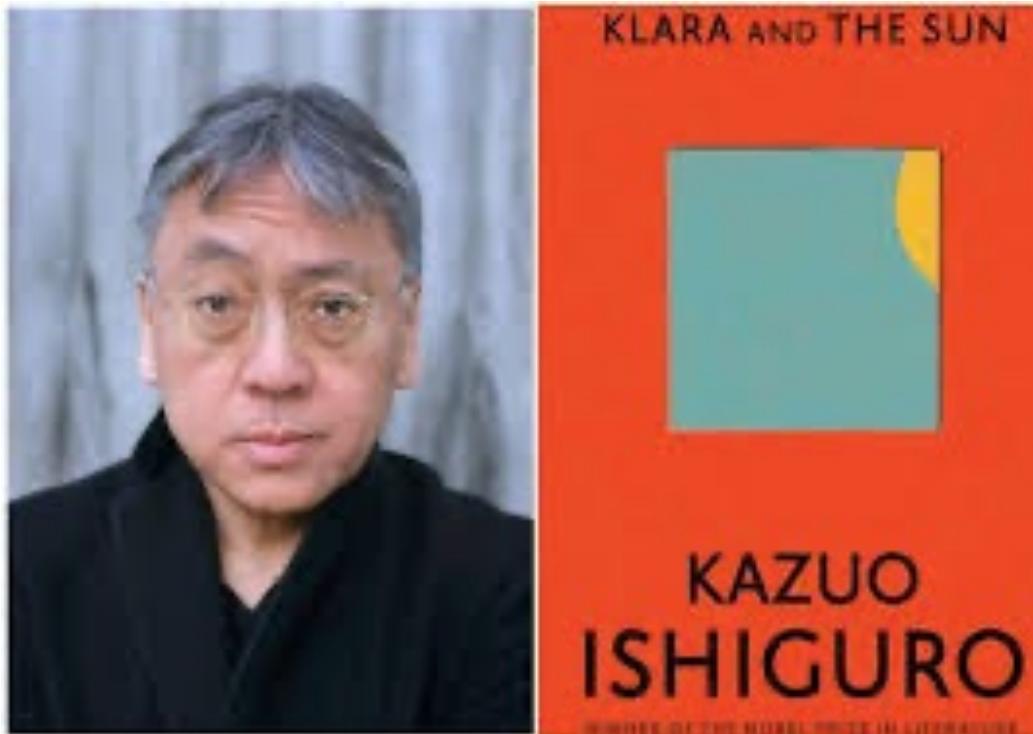
WHY
WHAT YOU DON'T KNOW
MATTERS

DARK DATA

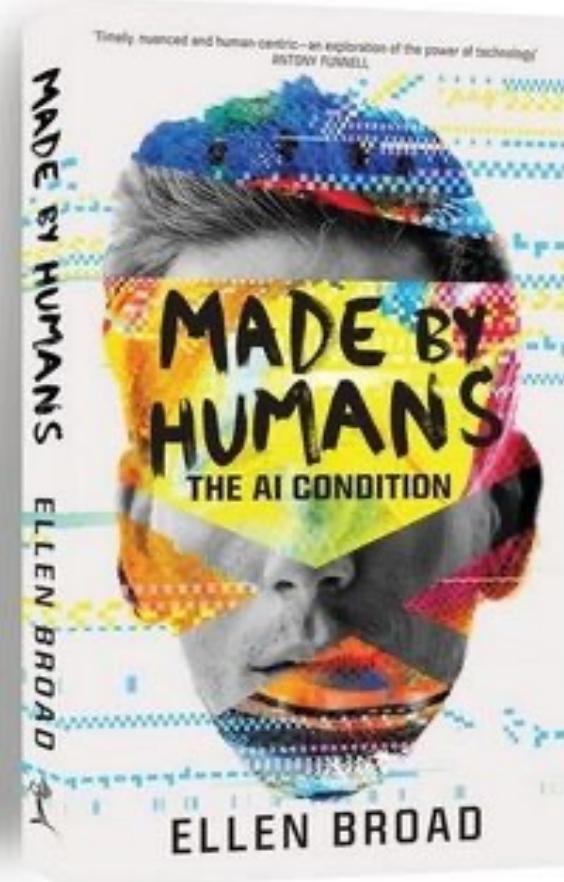
DAVID J. HAND

In *Klara and the Sun*, Ishiguro leaves us suspended over a rift in the presumptive order of things. Whose consciousness is limited, ours or a machine's? Whose love is more true? If we ever do give robots the power to feel the beauty and anguish of the world we bring them into, will they murder us for it or lead us toward the light?

Judith Shulevitz review in the Atlantic March 2 2021



A good Australian book



Algorithm

```
mirror_mod = modifier_obj
# set mirror object to mirror
mirror_mod.mirror_object = selected_obj
operation = "MIRROR_X":
mirror_mod.use_x = True
mirror_mod.use_y = False
mirror_mod.use_z = False
operation == "MIRROR_Y":
mirror_mod.use_x = False
mirror_mod.use_y = True
mirror_mod.use_z = False
operation == "MIRROR_Z":
mirror_mod.use_x = False
mirror_mod.use_y = False
mirror_mod.use_z = True

selection at the end - add
modifier.select= 1
modifier.select=1
context.scene.objects.active = modifier
("Selected" + str(modifier))
modifier.select = 0
bpy.context.selected_objects.append(modifier)
data.objects[one.name].select = 1
print("please select exactly one object")
- OPERATOR CLASSES ---
```

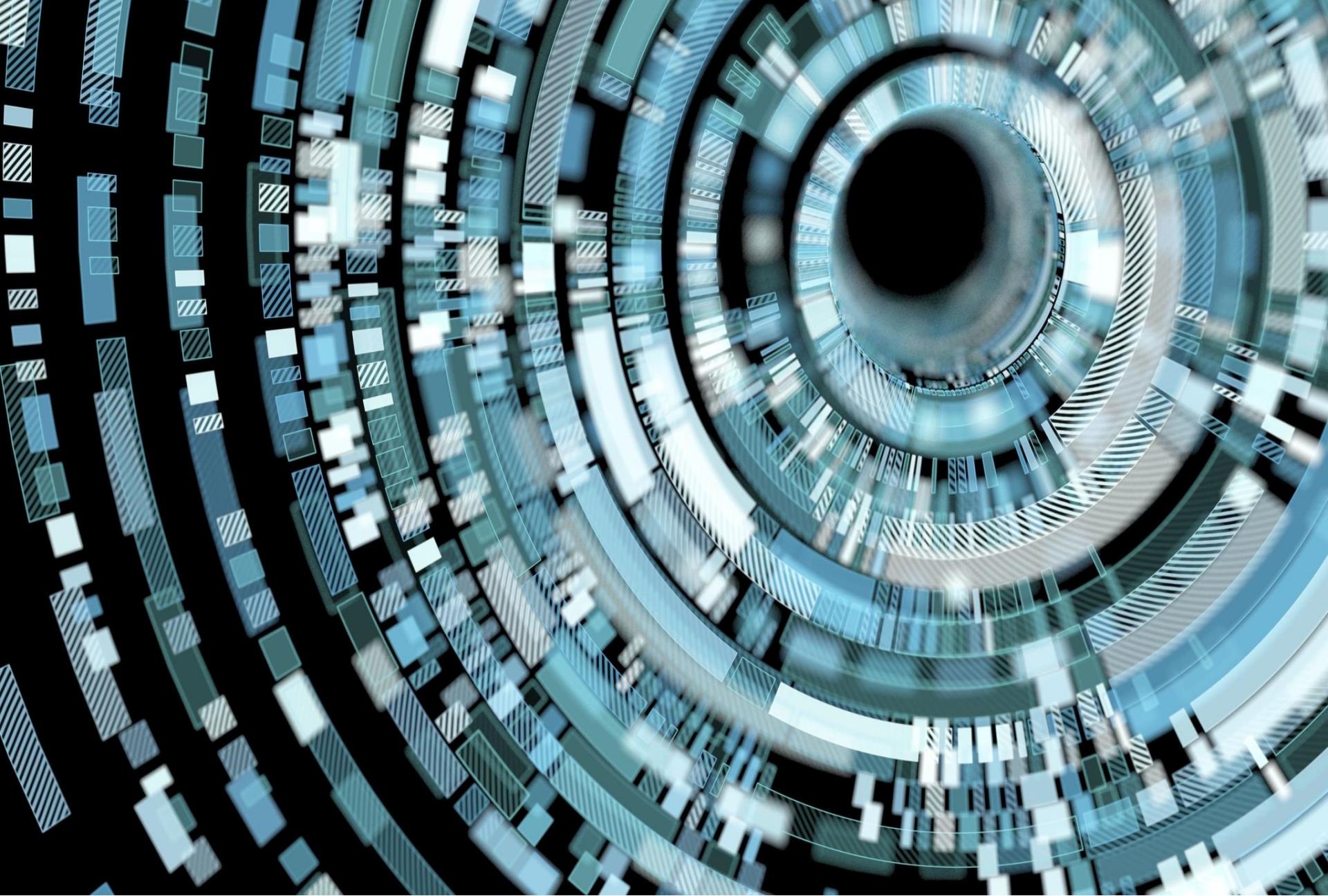
```
types.Operator):
    X mirror to the selected object.mirror_mirror_x"
    "mirror X"
```

```
context):
    context.active_object is not None
```

Algorithm

A set of instructions or rules that result in an outcome

“ we use a statistical formula to calculate credit risk”

A complex, abstract graphic design featuring a central circular motif. The center is a dark, solid black circle. Surrounding it are several concentric rings, each composed of numerous small, semi-transparent blue squares. These squares are arranged in a radial pattern, creating a sense of depth and motion. The overall effect is reminiscent of a stylized eye or a futuristic interface element.

Machine learning

Machine learning

Enables a computer to pick its own parameters to solve a problem. From lots of different parameters.

Most is supervised machine learning

AI



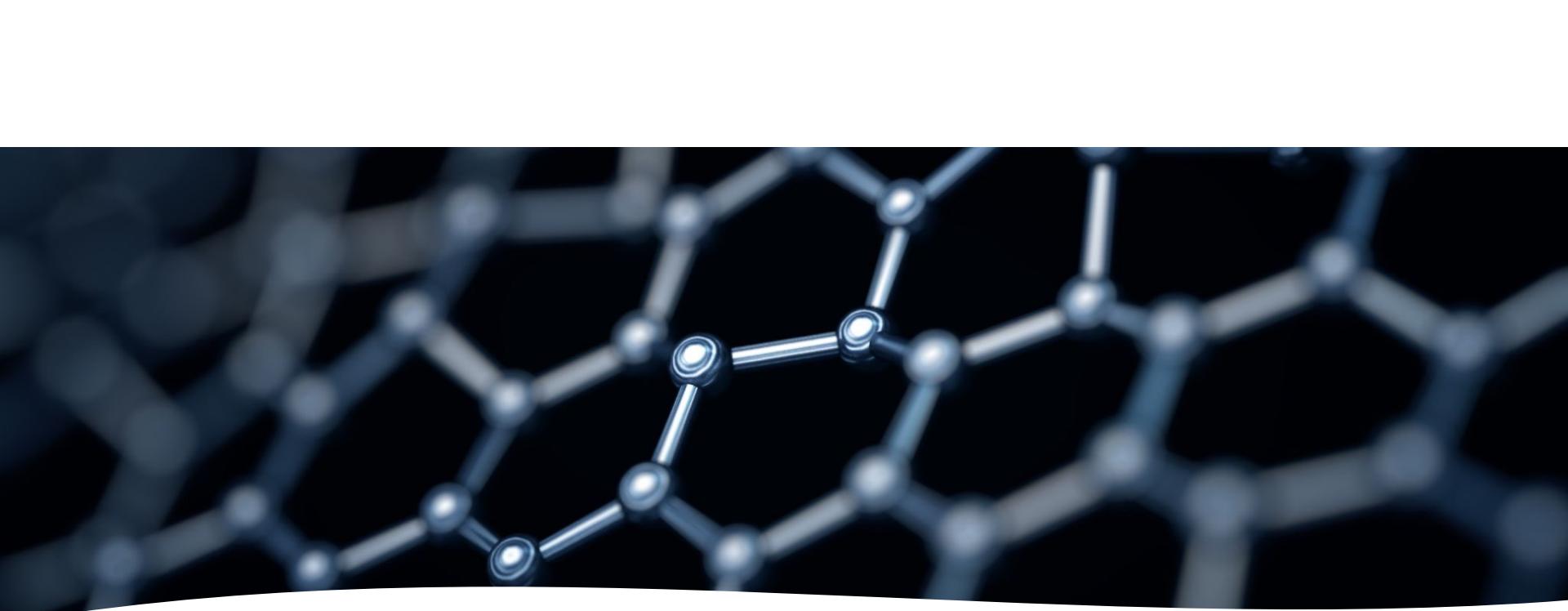
AI

Covers many things

Usually refers to machine learning specifically with respect to automated decision-making.

Automated system is most accurate but AI is a cool term!





Health care example

Artificial intelligence (AI) in healthcare is primarily the use of algorithms and software to approximate human cognition in the analysis of complex **medical** data.

Specifically, **AI** is the ability for computer algorithms to approximate conclusions without direct human input.

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Gathering, understanding, interpreting and making decisions based on collected data is an invaluable tool for, science, business and governments.

(Data Availability and Use, Australian Productivity Commission, March 2017)

there are good reasons for having open data. It speeds research, allowing others to build promptly on results. It improves replicability. It enables scientists to test whether claims in a paper truly reflect the whole data set. It helps them to find incorrect data. And it improves the attribution of credit to the data's originators.

(Nature editorial 12 June, 2017)

Data is potential information prior to anyone being informed by it

(Jeffery Pomerantz, 2015, p. 26)

‘data’ is intended to refer to bits of information in their raw form, whereas ‘information’ generally refers to data that have been interpreted, analysed or contextualised (NS 3.1 Element 4: Collection, Use and Management of Data and Information - p.33)

Data refers to bits of information in their raw form. Data can refer to raw data, cleaned data, transformed data, summary data and metadata (data about data). It can also refer to research outputs and outcomes (NS Glossary defines data).

Collection use and management of data and information





AIATSIS Code of Ethics
for Aboriginal and Torres
Strait Islander Research and
the guide.



National Statement
2007 (updated 2018)

NHMRC (National Health and Medical Research Council) (2010).
Biobanks Information Paper 2010, NHMRC, Canberra.

The identifiability of information is a characteristic that exists on a continuum. This continuum is affected by contextual factors, such as who has access to the information and other potentially related information, and by technical factors that have the potential to convert information that has been collected, used or stored in a form that is intended to protect the anonymity of individuals into information that can identify individuals. Additionally, contextual and technical factors can have a compound effect and can increase the likelihood of re-identifiability and the risk of negative consequences from this in ways that are difficult to fully anticipate and that may increase over time. (NS) pp 33-34

The de-identification of data is a process where data is coded or encrypted. It does not describe data per se. Using the term “de-identified data” to describe how data is stored is inaccurate, misleading and is probably best avoided.

Reading:

What is data ethics? Luciano Floridi and Mariarosaria Taddeo

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How can we ensure that the intelligibility, fairness, openness and diversity dimensions of automated decision-making are met?

“transparency of methodologies, data, assumptions: diligence and care resolving issues and errors before deployment and meaningful ways for people to engage and challenge automated decisions”

(Broad, 2018, p.260)

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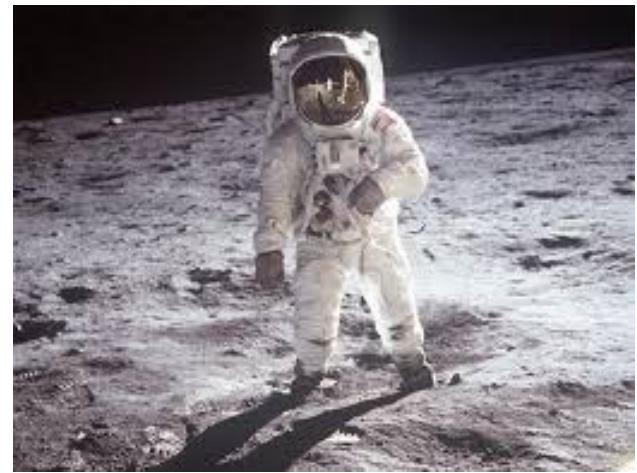
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2. Introduction to practical ethics and the nature of moral inquiry and philosophical analysis (dilemmas and conflicts)



the starry firmament above and the moral law within

The Eighteenth Century German philosopher Immanuel Kant wrote:

“Two things fill the heart with ever renewed and increasing awe and reverence, the more often and more steadily we meditate upon them: the starry firmament above and the moral law within”



Practical ethics and the nature of philosophical inquiry

The unexamined life is not worth living.

(Socrates in Plato's *Apology*)

It is not living, but living well which we ought to consider most important.

(Socrates in Plato's *Crito*)

Ethics

Ethics is a natural phenomenon that arises in the course of the evolution of social, intelligent, long lived mammals who posses the capacity to recognise each other and to remember the past behaviour of others.

(Singer P., (ed) *Applied Ethics*, Oxford University Press, 1986)

Ethics and the search for a moral compass has always been part of human experience. From the beginnings of the philosophical tradition to the latest thoughts on neuroscience, the questions of right and wrong have been inextricably bound in an ethical knot. Part of the story about the philosophical quest for a moral compass lies in attempts to untie that knot, to understand it, to live with it.

(Malik K., *The Quest For a Moral Compass: a global history of ethics*, Atlantic Books London, 2014, p. 5.)

Examining and understanding moral life in order to create a coherent sense of what is good and right in human experience informs how we actually live our lives

Philosophical ethics

- ***Descriptive ethics*** – involves describing how people behave or what moral standards they claim to follow (incorporates research from other fields).
- ***Metaethics*** – is analytical, a primary concern on the most abstract questions regarding ethics in general, reflecting on the nature of ethics, ‘thinking about ethics’. Well developed metaethical theory will offer an account of the subject matter of ethics, an explanation of ethical judgement’s practical action-guiding role in peoples’ lives, and an account of how we come to know what it is we do know about ethics.
- ***Normative ethics*** – thinking and talking about what is right and wrong, good and bad, valuable and disvaluable – (what one ought to do, what should the HREC, the clinical ethics committee (CEC), governments, the data scientist anyone, recommend?)

Ethical thinking

- (1) People can be ethically virtuous without the aid of philosophy. They act for genuine normative reasons, and work out what they do on the basis of considering such reasons
- (2) Philosophers engage in the project of articulating and defending normative ethical theories and search after theories which cannot be discovered or, at least, justifiably accepted in a direct fashion through non-philosophical thinking, and which (among other things) specify the reasons that justify the acts that virtuous people do (when they are acting rightly), as well as provide criteria for determining what people ought to do.

Daniel Star, *Knowing Better, Virtue, Deliberation and Normative Ethics*, OUP, 2015. Also see RM Hare (two levels of moral thought) on intuitive and critical thinking and K Kahneman, D., Tversky, A. including Thinking Fast and Slow 2011.

Ethical action

Starts from:

1. a recognition that things could be different, possibly better
2. a recognition of others – ‘the other’, empathy, compassion
3. accepting that there may be different views

We can begin to reflect on the ethical dimensions of particular situations . . .

Crash Dive

You are the commander of a submarine. In the reasonable belief that you are fairly safe, you surface and send a small group of sailors onto the deck in order to make some much needed repairs. After the repairs have begun, your first officer reports that enemy aircraft have been spotted only seconds from your position. Unless you perform a crash-dive the aircraft will almost certainly do great damage to your submarine, and it is likely that you and your entire crew will be killed as a result. But if you do perform a crash-dive, then the sailors on the deck will, with certainty, drown.



Crash dive

Believing that the right course of action is for a few of your crew to die than for all of them to do so, you order the crash dive

*You have responded to a **moral conflict** and will likely feel **regret**.*

the greater moral importance of preventing harm does not nullify the moral force of intentional and foreseen harm done to some who are under your command. The relationship is one of outweighing – not cancelling.

Crash-dive and regret

Even the dead sailors, if asked in some ‘original position’, would surely have agreed to saving the ship and most of the crew at a cost of a few lives. However the captain is eaten up with guilt, self loathing, and begins to engage in heavy drinking and self-destructive behaviour.

*Those who respond **moral conflicts** will likely feel
regret.*

Is crash-dive a moral dilemma?

Crash-dive is a moral conflict and not a moral dilemma

- in philosophical debate the phrase ***moral dilemma*** is usually used to denote a set of circumstances in which an agent ought to do two (or more) actions which are mutually exclusive and so both cannot be done.
- as a result the agent cannot avoid acting wrongly, or at least cannot act rightly –there is no best alternative
- in a philosophical sense moral dilemmas are ***tragic***

Is this important ?

Most of the practical ethics situations that we come across are not dilemmas they are conflicts, they are not tragic and they are resolvable.

I see it all perfectly. There are two possible situations – one can do either this or that. My honest opinion and my friendly advice is this: Do it or not do it – you will *regret* both.

Kierkegaard, Either/Or, 1842

The commander experienced a ***moral conflict*** made the *right decision* and felt ***regret***.

(Kahn L., Conflict regret and modern moral philosophy,
Chapter one in *New Waves in Ethics*, 2011, pp 7 – 27)

Moral agents face demands not only on their actions but also on their emotional lives.

the case of the trapped truck driver

A driver is trapped in a burning truck. There is no way in which he can be saved. He will soon burn to death. A friend of the driver is standing by the truck. The friend has a gun and is a good shot. The driver asks the friend to shoot him dead. It will be less painful for him to be shot than to burn to death.

Should the friend shoot the driver?

What are the reasons for the friend not to shoot the driver?

What are the reasons for the friend not to shoot the driver?

Reasons for the friend not to shoot the driver

1. Might wound the driver
2. Driver might not burn to death
3. Not fair to the friend (guilt)
4. Sliding down the slippery-slope
5. Let Nature take its course
6. Wrong to ‘play God’
7. Killing is in principle a (great) wrong.

(ref Hope Tony, *Medical Ethics*, Oxford University press, 2004)

What are the reasons for the friend to shoot the driver?

Reasons for the friend to shoot the driver

1. It will lead to less suffering
2. It is what the driver wants

For now . . .

The development and analysis of such various arguments in response to situations where there is a moral conflict (sometimes a moral dilemma and often regret), is the terrain of practical ethics.

Next week we will learn how to do this, then we will apply such analysis to data science cases.

Tutorial activity week one

- please **reflect on what ethics is, what does ethics mean for you?**
- **Is ethics relevant to my work in data science? Why is ethics relevant? Why is ethics not relevant**
- **Read Luciano Floridi and Mariarosaria Taddeo**