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CENTRE FOR ARTIFICIAL INTELLIGENCE RESEARCH

THE PHILOSOPHY & ETHICS of CITIZEN SCIENCE

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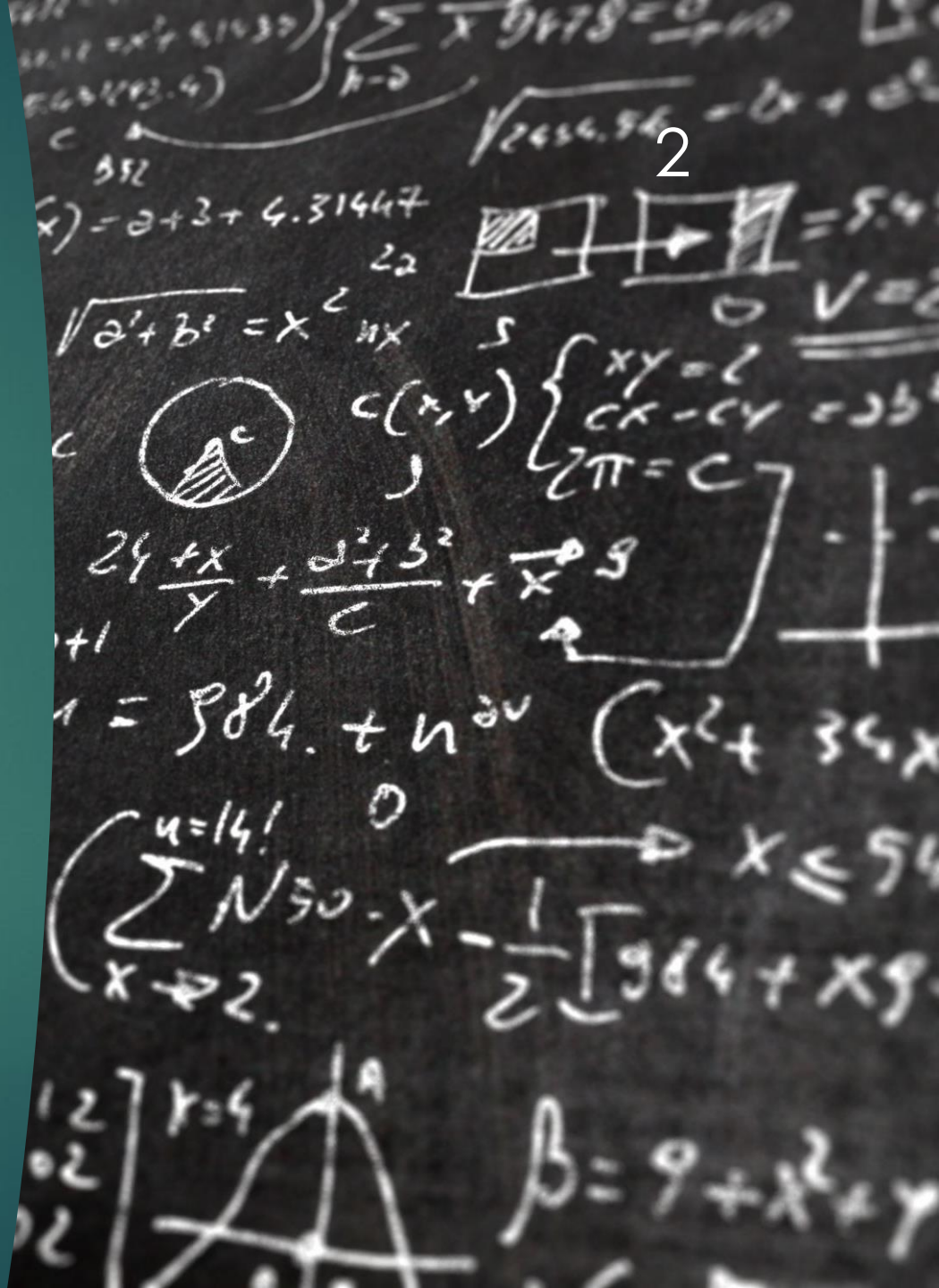
Structure of Talk

What is citizen science (brief reminder)

3 Kinds of ethical reflection

- The place of Citizen Science in the fact/value debate
- Philosophical reflection on the nature of knowledge generated through Citizen Science
- Values driving Citizen Science
- Ethical concerns related to Citizen Science

The way forward & take-aways



Citizen Science

An agreement between scientists and members of society to collaborate

Typically, citizens will help collect data, but they could also help design experiments, analyse data, and construct solutions for shared problems such as sustainability

Reason: Changing relationship between science and society

Kinds: Contributary; collaborative; co-creating

Goals

- Democratising science (help citizens learn and understand the processes and methodology of science)
- Equal access to scientific data and information

Impact of emerging technologies: Expand involvement

- E.g., crowdsourcing

Europe

A Citizen Science green paper was published in 2013

- ‘Citizen Science for Europe’
- ‘Towards a better society of empowered citizens and enhanced research’

European Commission policy directives include CS as one of five strategic areas

Funding allocated to support initiatives e.g., through the ‘Science With and For Society (SwafS)’ strand of the Horizon 2020 programme

- The EU-Citizen Science project , which is creating a hub for knowledge sharing, coordination, and action

Emerging Technologies & Citizen Science

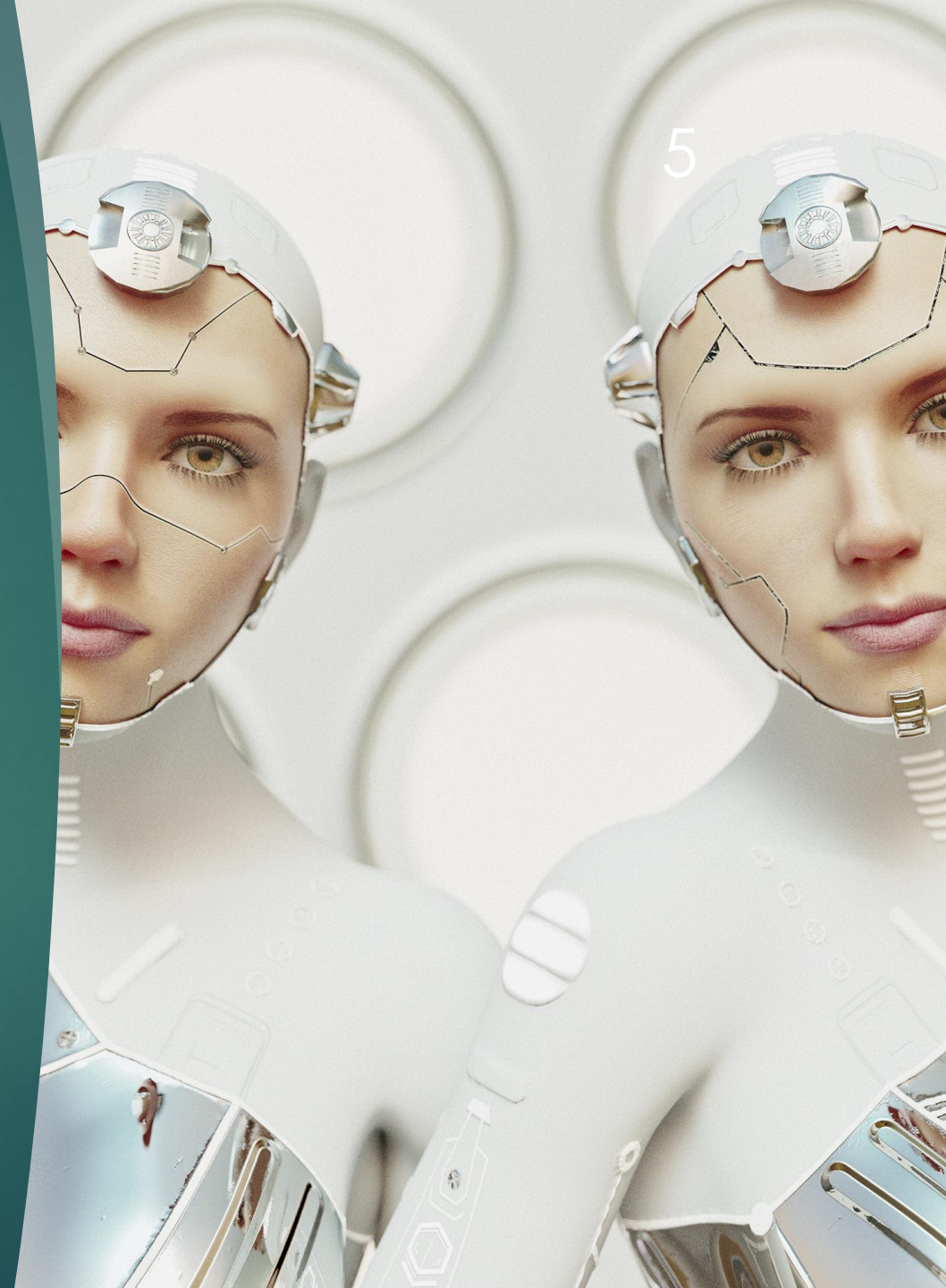
Digital science

"refers to the ICT-enabled radical transformation of science and innovation within a culture of openness and sharing.

Digital Science is more open, global, collaborative, creative and closer to society"

Citizen science supports the objectives of mainstreaming Digital science (Horizon 2020)

Using technology for civic purposes (open governance, community projects, participatory science (Palacin et al 2021))



Acceptance of Citizen Science

"Trans-disciplinary approaches represent an opportunity for cutting-edge research but the involvement of the public in scientific research still faces some resistance and scepticism in the scientific world.

In the case of Citizen Science, the wide range of heterogeneous stakeholders with different motivations and objectives tends to challenge the fundamental mechanisms of scientific evaluation systems" (GP)

Focus on peer reviewed publications vs. focus on actions and practical outcomes

- How can the awareness of potential scientific value be improved and compared to established scientific approach?
- How should Citizen Science be addressed in the scientific value systems?

Fact / Value Distinction & Science

This is a debate in the philosophy of science between 'what is' (fact) and 'what ought to be' (value)

It points to the (wavering) line between what is true and what is right, which is core to the debate between science and ethics but also to the debate on what it is that makes a knowledge set 'scientific'

'Fact' relates to what we perceive of the material world through our senses – which supposedly offers us 'inarguable truths' of the physical world

- Verifiable through empirical work and logical analysis and leads to creation of 'scientific knowledge'

'Value', on the other hand, can only be accessed or derived subjectively, by reasoning about moral dilemmas and what the right thing to do is in a given context

- Not verifiable empirically or logically – or objectively … not 'scientific knowledge'

But … is this line so clear? Many think not …

Shattering the Notion of 'Pure' Facts

How sharply can we distinguish between analytic statements – those that can be true or false based only on the meanings of the words involved, like 'vixens are female foxes' – and synthetic statements – those that can be true or false on the basis of the relevant empirical facts, like 'the flower is in the yellow vase'?

What kind statement is 3 + 6 = 9?

- Factual and conceptual statements are intertwined and far harder to untangle than empiricists pretend to be the case (Quine 1951; Putnam 2002: 2)
- Thus, the question whether there are any 'purely' factual statements arises

What is scientific truth? (*are* facts inarguable truths?)

No Role for Values in Science

‘Value’ is “… one of those weasel words that slip in and out of the nets of the philosopher” (McMullin 1982)

Indeed, “there is every reason, historically speaking, to view emotive values, as Bacon did, as potentially distortive ‘Idols’, projecting in anthropomorphic fashion the pattern of human wants, desires and emotions on a world where they have no place” (McMullin 1982)

Yes… but … is this the only possible perspective on how values and science interact?

Epistemic Virtues, Epistemic Values, & Morally Charged Decisions

Ethical values or epistemic virtues in science

- Honesty, integrity, accuracy, transparency
- Science as a communal enterprise needs these values for success

Epistemic or 'characteristic' values in science (theory choice)

- Predictive ability, internal coherence, external consistency, unifying power, fertility, simplicity
- These are values that are desirable for a theory, as an objective characteristic serving to make the theory function better as a scientific theory (McMullin 1983)

Epistemic values influence theory choice, while epistemic virtues contribute to trust within scientific communities as does …

Morally charged reasons for accepting hypotheses

- The acceptance of a hypothesis that a toxic ingredient of a drug is not present in lethal quantity is morally charged in the sense that making a mistake in accepting the hypothesis will have grave consequences by common human standards

Philosophical Reflection on Citizen Science

"A cultural change is happening at global scale through inspirational success stories of collaborative open-minded approaches breaking the walls of disciplines with transdisciplinary strategies. The combination of the distributed knowledge of the citizens with the systemic methodologies of the researchers represents a ground-breaking driving force when addressing global challenges" (EU Green Paper)

Are Citizen Science experiments faultless and reproducible?

How can we promote the values of Citizen Science compared to established scientific approaches?

The Social Turn

The reality scientists come to know is constructed, theories are social (and political and economic) constructs

- Empirical facts are the result of human activities in specific labs (no universally available neutral criteria or facts)

The Science Wars

- A movement intent on defending the right to context-free (objective) knowledge claims (e.g., "Mercury is poisonous for all people" (Tosh 2006))

vs.

The view that "scientific claims on objectivity served as an ideological smokescreen for domination and oppression'" (Harris 2019)

- Sokal (1996) warned almost 30 years ago already that "... many of the central political issues of the coming decades — from health care to global warming to Third World development — depend … on subtle (and hotly debated) questions of scientific fact
- But they don't depend only on scientific fact: they depend also on ethical values and ... on naked economic interests"

Sketching tension between the credibility and trustworthiness of science …

Mode 2 Science

Mode 1 science = driven by discovery of empirical facts, replicability, internal workings of science

Mode 2 science = a socially distributed, application-oriented, inter- and trans-disciplinary paradigm

Under Mode 2, knowledge production involves reflection on guiding research priorities by public policy (Gibboons et al 1994)

Leads to new challenges for scientific knowledge as an open and public good (see e.g., Nowotny et al. 2003).

Post-Normal Science

Funtowicz and Ravetz (1993) developed the notion of “post-normal science” in the 1990s

Needed in the face of complex issues where "facts [are] uncertain, values in dispute, stakes high and decisions urgent" (Funtowicz & Ravetz 1993: 744)

This approach involves “extended peer community” that reaches beyond individual disciplines and includes knowledge and experience of “lay” actors who remain unheard in traditional research and development practice (ibid.)

‘Post-normal science’ refers to a need for scientific methodology to address problems where scientific research activities must extend beyond the peer community and include lay people and other stakeholders (Whyte & Crease 2010)

Citizen Science is post-normal science –

Is it mode 2 science too?

And social constructivist?

Post-Normal Trust in Science

Whyte & Crease (2010) write that "trust means deferring with comfort and confidence to others, about something beyond our knowledge or power, in ways that can potentially hurt us"

According to Whyte & Crease (2010) considering trust in 'post-normal' science in fact means ensuring science is both credible and trustworthy:

1. Credibility: Analysing and mitigating "public controversies where issues of trust and distrust impede deliberative decision making and limit the public bene**fi**ts that can be provided by scientists and scientfic research activities" (ibid.) – the 'public' face of trust
2. Trustworthiness: Scientists have to put trust in the data and products of others' research, in their colleagues' testimony (e.g., Hardwig 1991), which points to confirming the role of both ethical and epistemic values and the internal evaluative processes of science – the 'private' face of trust

(Post-) Pandemic Science

The pandemic made it clear that our world has become irrevocably shaped by scientific research and innovation, and vice versa

- This raised public awareness for quests to establish science as a global public good https://council.science/what-we-do/) and
- Made clear a need to refocus scientific aims to align with calls for the universal benefit of science and "goals of sustainability, inclusivity and resiliency" (https://www.oecd.org/sti/science-technology-innovation-outlook/)

Against this background, there is a NEW RESPONSIBILITY on the shoulders of scientists and members of society: to take accountability for the fact that science, in the face of global crises, is an enterprise that interacts with values in a way that points to core epistemic functions of TRUST

- Establishing / confirming / validating expertise – no-one can be fully informed about everything (e.g., knowing when food exposed to toxins is safe) (relates to trustworthiness)
- Recognising that distrust in science hinders the realisation of the public benefits of science (relates to credibility)
- On the one hand it is more important than ever that the integrity of science should be upheld above all costs given high stakes; but on the other, the evidence of inescapable entwining of the aims of science and society necessitates urgent reflection on the public role of science in new contexts
- Motivate acceptability of Citizen Science!

Values of Citizen Science

- Interconnectedness (Ubuntu, Daoism)
- Science as a public good
- Protection of environment and ecosystems
- Sensitivity for trans-disciplinary goals
- Curiosity & epistemic justice
- Integrity & collaboration
- Self-transcendence & tolerance
- Open-to-change values

Why necessary?

- Guide design of incentives
  - Evaluate CS

Ethical Concerns related to Citizen Science

- Scope of activities
- Should Citizen Science only use open-source software?
- Define 'volunteer'
- Inclusivity of citizen science teams
- Who should make citizen science actors aware of the potential and risks when determining the engagement level and suitability of this participatory approach for any given scientific problem? (Green Paper)
- Awareness of rights
  - IPR
  - Privacy
  - Data owenership

Barriers to Successful Citizen Science (GP)

Reliability of data

- Access and interoperability of Citizen Science data sets should be improved in many cases
- Large data sets based on Citizen Science data have been created by scientists for their own needs and are often difficult to be used by other groups, like citizens or other researchers
- Opening up datasets raises questions of ownership and IPR issues
- Concerns about awareness among volunteers re IPR
- Concerns about third party sharing

Questions

- Should there be open access and interoperability between Citizen Science datasets and/or public data?
- Is there a need for standards in terms of used technology and interoperability?
- Is there a need to improve privacy regulations and IPR issues with regards to data usage and ownership
- Is there any effective anonymization technique for privacy data sharing?

Way forward for Citizen Science

Awareness and motivation for active engagement

- How to increase awareness and linkages among all the actors considering their roles and motivations?
- How to make the most of the differences in conditions not only in Europe but across the world (investments, social culture, technologies adoption, legislation…)?
- How to avoid that those citizens who don't have access to technology are excluded?
- How should Citizen Science be addressed in the academic curriculum at different levels (primary and secondary education, undergraduate and graduate level, etc.)?
- Who should evaluate the outcomes of Citizen Science?
- Who should protect the rights of citizens in Citizen Science?

Different partnerships

- How to promote private partnerships / industry innovations?
- How to include non-scientific disciplines approaches (politics, arts, amateurs…) into Citizen Science?
- How could Citizen Science decrease the perceived distance between policymakers and volunteers?

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