Correspondence

AI behaviour: don't reinvent the wheel

The call of Iyad Rahwan and colleagues for a science of "machine behaviour" that empirically studies artificial intelligence (AI) "in the wild" (*Nature* **568**, 477–486; 2019) is an example of 'columbusing'. That is, what they claim to have discovered is, in fact, an existing field of study that has been producing vibrant, engaged research for decades. Cybernetics, the science of communications and automatic control systems in machines and living things, has been flourishing since the 1940s.

In our view, this prior art exposes serious ethical and scientific problems with the authors' proposal. Studying AI agents as if they are animate moves responsibility for the behaviour of machines away from their designers, thereby undermining efforts to establish professional ethics codes for AI practitioners.

The authors' idea that those who create machine-learning systems and study their behaviour cannot anticipate their "downstream societal effects" is false. Sociologists and anthropologists have long contributed to research on AI. For example, social scientists have described how AI can embed human intentions in material infrastructures (W. E. Bijker *et al.* (eds) *The Social Construction of Technological Systems*; 2012). Most would foresee AI agents' societal outcomes.

Columbusing fails to give due credit. It rides roughshod over long-fought struggles to centre science and technology's ethical implications for crucial issues such as inclusivity and diversity. All too often, those struggles have been fought by women and individuals of colour, who have laid much of the overlooked intellectual foundations of their disciplines.

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'Productivity' can be twisted: it's political

Oliver Hauser and colleagues' model of economics and game theory uses a technical parameter that they call 'productivity' (*Nature* **572**, 524–527; 2019). This introduces an ambiguity that has political implications because it does not align with the usual meaning of productivity when applied to income inequality.

In the model, individuals can each contribute some portion of their allocated resources to public goods that pay out to all participants. The twist is that the multiplier between donated resources and societal payout can vary from individual to individual. This multiplier is referred to as 'productivity', a term that, with respect to income inequality, conventionally implies individuals with large economic output. The multiplier in Hauser and colleagues' model refers instead to returns on the portion of invested resource — and only if they are donated back to create public goods.

Hauser *et al.* conclude that the optimal configuration of endowments, which results in the largest societal benefit, relies not just on inequality but on the unequal distribution of endowments to specifically favour "more productive individuals". In other words, the term productivity is used to mean 'effect of donation to public goods' but seems designed to imply 'productive' in its conventional sense.

The inference is that inequality is a path to optimality, whereas productivity is intrinsic and not related to individuals' endowments. Such ambiguous use of terminology risks compromising political impartiality and the goals of social equality and welfare.

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Anonymity calls for extreme caution

Confusion over data anonymization and privacy can have serious consequences when sensitive medical data are being collected for research. Anonymity cannot be achieved merely by dispensing with direct identifiers (see N. Seeman *Nature* **573**, 34; 2019).

People are identifiable in large data sets even in the absence of personal information (L. Sweeney *J. Law Med. Ethics* **25**, 98–110; 1997). For example, a few attributes such as demographic information can uniquely identify 99.98% of US subjects in any dataset (L. Rocher *et al. Nature Commun.* **10**, 3069; 2019). That is why recital 26 of the European Union's General Data Protection Regulation and section 1798.140 (h) of the California Consumer Privacy Act consider data as anonymous only when the subject cannot be re-identified.

Health research needs access to patient data to determine the precise patterns of signs and symptoms that indicate the onset of disease, and to monitor how these change in response to treatment. Because the mere absence of obvious identifiers does not protect privacy, it is imperative that such data continue to be collected, accessed and processed with caution and with strict security measures in place.

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Don't pull punches in peer review

Holding reviewers to a code of conduct would be a mistake in my opinion, because it implies that the peer-review process should facilitate an author's research (see L. J. Beaumont *Nature* **572**, 439; 2019). Reviewers volunteer their time to judge the validity of a paper as a favour to the scientific community, not to the authors.

A code of conduct typically works best in situations that rely on volunteering and mentoring, where outcomes are not clear cut. For a research paper, this could preclude outright rejection by the reviewer, whose mandate would instead be to offer only constructive criticism to the authors. The role of a reviewer is to advise journal editors on a paper's suitability for publication, not to advise authors on how to make their work more acceptable to the journal. We already have mechanisms for providing some measure of constructive criticism — for example, when reviewers require major revisions.

Asking referees to keep their criticism positive could exacerbate the overall shortage of researchers willing to review manuscripts, particularly if they feel uncomfortable about reining in negative comments. The onus should instead be on the authors — to make their results clear and compelling in the first place.

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