Animal pain as a matter of technology: Ethical aspects of using automated pain detection for farmed animals

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Abstract

Artificial intelligence (AI) applications are increasingly influential across various socio-ecological domains, including agriculture, where ethical concerns are paramount. One critical area involves using AI for automated pain detection (APD) in farmed animals, a technology aimed at supposedly improving animal welfare by identifying pain through methods such as facial recognition. This short paper addresses the ethical implications of APD, noting its current use and potential expansion in agriculture. Despite its promise, APD's effectiveness and validity remain contentious, with significant ethical issues stemming from data quality, algorithm reliability, and the deep ties between APD development and the animal agriculture industry. Moreover, fundamental philosophical questions about the nature of pain and the limitations of detecting it automatically pose intrinsic ethical challenges. These include the risk of oversimplifying animal welfare. The paper calls for comprehensive ethical evaluations of APD technologies before implementing them increasingly in agriculture.

Keywords: animals, animal agriculture, artificial intelligence

Introduction

Artificial intelligence (AI) spans many different fields of application, AI-based modelling, inferencing, and decision-making will have a major impact across all socio-ecological domains (e.g., agriculture, energy, transport, and health). At the same time, AI comes with various ethical issues, which has resulted in many different operationalisation and regulation efforts. Despite the (potentially enormous) impact AI will have on all socio-ecological domains, the discussion of the impact of AI on the nonhuman world is still underexplored – in the ever-growing field of AI ethics, as well as in sustainability and animal ethics. This under-exploration may prove catastrophic to nonhuman animals, ecosystems, and the environment. AI technologies are already having a massive impact on nonhuman animals worldwide, and their importance will continue to grow in the future. In this short paper, we address a particular use of AI on nonhuman animals, which is being developed for use in the food and agricultural sectors, namely, the ethical impacts of using AI for automated pain detection (APD) in farmed animals.

APD technologies are already used for certain animal species in agricultural practice (McLennan and Mahmoud, 2019; Neethirajan, 2021), with animal facial recognition being the most common method (Roberts, 2023). Note that these technologies are also increasingly used in companion animals (Feighelstein *et al*., 2022, 2023), e.g., in connection with so-called wearables for companion animals that constantly measure various body characteristics to derive if the nonhuman animal is (presumably) feeling well or in pain (Leininger, 2024). While these applications of APD are also interesting and important to analyse from an ethical perspective, the focus of this paper will be on the use of APD on farmed animals. Despite our focus on the use of APD on farmed animals, many of the same issues that arise from our research overlap with the use of APD in non-farmed animals as well (cf. Coghlan and Quinn (2022) for ethical aspects). Despite the overlap of more fundamental ethical questions regarding nonhuman

animals, we nevertheless think it is worth discussing it separately because the socio-economical contexts of farmed and companion animals are very different.

APD technologies are promoted as having great potential to improve animal welfare in the context of animal agriculture. However, the effectiveness and validity of these technologies, regarding animal pain and welfare, are still relatively untested and debatable (DeSario *et al*., 2023; Werner *et al*., 2022). Furthermore, the use of APD is also accompanied by many ethical issues (see below). In this short paper, we examine various ethical aspects of APD technologies. Therefore, we first clarify which premises and assumptions we build on when discussing the topic (see Animals count morally: Premises we build on). We then briefly touch upon the more philosophical questions linked to the automated detection of pain (see The normativity of pain), such as if this endeavour is at all possible in any meaningful sense of feeling pain. We think it is essential to keep them in mind when discussing APD on a more application-focused level, among other reasons because they are linked to the actual validity and effectiveness of using APD. Afterwards, we introduce and discuss different ethical challenges of applying APD technologies in the context of animal agriculture (see Ethical aspects in the context of farmed animals), such as, among others, the effectiveness of the technology (linked to data and algorithm quality) and the close linkage of technology research and development to the animal agricultural industry. We conclude by providing a first step on how such technologies could be responsibly used, and whether they are an ethically sound innovation for the agricultural context. In so doing, we discuss important ethical issues of a currently ever-increasing technology application while also addressing a blind — or at least highly underexplored — spot in AI and animal ethics.

Animals count morally: Premises we build on

In this short paper, we build upon the assumption that nonhuman animals count morally and therefore must be included in ethical evaluations of actions and social practices, such as technology use. Including nonhuman animals in AI ethics is relevant insofar as (at least sentient)[5] animals have interests that should not be ignored in ethical technology assessments when they are affected by the technological system. Failure to consider their interests leads to an incomplete consideration of the interests of those affected. Note that an important line of reasoning in animal ethics argues that taking animals interests seriously must lead to not using them within agriculture anymore, thereby making the discussion about a responsible use of APD technologies within this context obsolete. While we are sympathetic to this view, we nevertheless think it makes sense to discuss the ethical challenges of APD in the animal agricultural context, as the technology is currently applied on farmed animals. Thereby it impacts their lives and wellbeing which is of moral significance.

Further, we build on normative concepts of harm and wellbeing — both closely related to pain, as pain often harms individuals and sets back their wellbeing —, which are normatively demanding in a sense that they go beyond an understanding of harming or of wellbeing that is only linked to what is measurable. There are, of course, aspects important for wellbeing, or for reducing harm, but are very difficult to measure, e.g., existing relationships to other individuals. Only linking harm or wellbeing to measurable units seriously risks perpetuating a simplified perspective on animal wellbeing or harm to animals (Bossert, 2023). While we acknowledge the great importance of measuring various body characteristics to assess the wellbeing, and harm to, individuals; we propose that this type of approach is limiting and needs to be supplemented with a relational approach. Therefore, our understanding of

[5] Sentience is seen as a prerequisite for having interests. Drawing the line between sentient and non-sentient animals is notoriously difficult and needs to be supported by scientific research. While there is agreement that at least all vertebrate animals are sentient, it is controversially discussed for cephalopods (such as octopuses and squids), insects and crustaceans (Crump et al., 2022; Elwood, 2011: pp. 175–184).

wellbeing and harm is closely linked to empirical research on animal wellbeing and harm (for many cf. Fraser 2008); but it goes beyond a pure focus on empirical studies.

Philosophy and ethics of using automated pain detection

The normativity of pain

The use of APD technologies on humans and nonhuman animals raises highly controversial philosophical questions regarding the normativity of pain and if it is at all possible to detect pain automatically. Thomas Nagel's prominent article 'What Is It Like to Be a Bat?' (1974) opened the doors for discussing the subjectivity of individuals' mental states. Nagel argued that attempts to explain consciousness by objective, reductionist means are undermined by the subjective nature of consciousness. According to him, consciousness cannot be fully explained by ignoring the subjective character of experiences, and he argues that every subjective experience relates to a 'single point of view', so that no conscious experience can be seen as 'objective'.

In the context of the paper's topic, it follows that making objective statements about pain is difficult, if not impossible, since pain is a particular mental state and very subjective. If we, as fellow humans, are unable to make substantial claims about how a certain mental state (pain) feels for a fellow human, then automated pain detection seems not to be possible in any meaningful sense. Nagel's point of view has been opposed (e.g., Dennett 1991), and it is not the goal of this short paper to take a stand on that complex discussion. We nevertheless think it is essential to keep this discussion in mind when debating ethical issues of APD because these technologies are accompanied by the risk of taking a (too) reductionist perspective on the wellbeing of other individuals. When focusing on nonhuman animals only (for APD in humans, cf. for many Cascella et al. 2023) other questions exist that are more philosophical (rather than ethical) in nature. These relate to the difficulty of interspecies comparability, species specifics, and the need to be critical of scientific-empirical research results that propose to be objective but implicitly build on normative assumptions.

Interspecies comparability refers to the discussion already mentioned. While Nagel discusses interspecies comparability (regarding the bat's use of echolocation that is not accessible for us humans), the discussion mainly refers to the difficulty of comparing mental states between different humans. If having to compare between different species, it becomes even more difficult. If humans develop and program the algorithms to assess other animals' pain, are there not too many obstacles for such an endeavour to work properly?

Relevant species specifics are, e.g., that certain individuals of certain animal species are evolved to, if possible, never reveal their pain because if they do, they reveal themselves as 'easy prey'. This aspect can be seen as analogous to cultural aspects when discussing APD in humans since, within specific human cultures, people are also culturally trained not to reveal pain.

The last aspect relates to the broader debate about the objectivity of scientific research. While scientists often claim that their research results are neutral, many scholars argue that the researcher's worldview is often implicitly embedded in scientific research questions. In the case of animal pain, worldviews may also influence research questions (e.g., if a researcher holds to an animal-human dualism and believes that nonhuman animals can be used for human purposes or if a researcher opposes such a view). Thus, scientific research on animal pain does not reveal 'true states' but often reflects the dominant worldview of the culture in which the research is conducted.

Ethical aspects in the context of farmed animals

The difficulties mentioned above in reliably determining another individual's pain should be kept in mind. They are closely linked to the actual validity and effectiveness of APD in the first place. Additionally, various ethical issues are associated with applying APD technologies to farmed animals. As Fred Roberts (2023: p. 2) highlights regarding facial recognition (that can be replaced by APD): 'Just as with humans, the issues we discuss stem from numerous cause: the way in which data used in facial recognition are obtained, the quality of that data, the quality of the facial recognition algorithms, the technology that is used to obtain the data and reach decisions, and the procedures for making decisions using the data.' We are not able to discuss all these issues here. The ethical aspects we will briefly address here are (1) the effectiveness and validity of the technology (linked to data and algorithm quality); (2) the close connection to the animal agricultural industry; (3) the risk to perpetuate a simplified perspective on animal pain and wellbeing. This is by no means exhaustive, and we invite ethicists and other scholars, as well as politicians and practitioners, to engage further with the topic. To differentiate between challenges that currently exist but can be overcome and challenges inherent to the technology, we split the ethical issues into extrinsic and intrinsic ones.[6]

We first discuss the extrinsic ethical challenges. These include the scarcity of databases. The effectiveness and validity of APD technologies, with respect to animal pain and welfare, is still relatively untested and debatable (DeSario *et al*., 2023; Werner *et al*., 2022). Much depends on the quality of the data and of the algorithms. It is highly important to consider the potential for error and inaccuracy in pain assessment models, because relying on inaccurate models could lead to inappropriate decisions regarding the affected individual. Regarding the underlying data and the algorithms of the APD technologies questions need to be addressed such as who is developing the algorithms with what intentions or who decides on which data to use? Are the best available options being used or the cheapest ones? Is there enough data to address species specificity or even individual specificity? For example, a young animal may experience pain in a different way than a healthy adult animal. Additionally, differences in sex or age require validation across large data sets (DeSario *et al*., 2023). Therefore, it needs to be investigated whether a 'universal' approach can be meaningfully adopted or whether models not only for each species, but for the categories of age and sex within each species need to be developed (DeSario *et al*., 2023).

Another serious ethical issue is the close connection of research and development of APD for farmed animals with the industry that gains profit from farmed animals. This is accompanied by the risk of power influence, as well as the risk of developing technologies which results might be more in the interests of animal agriculture stakeholders than in the interests of the affected farmed animals. The consequences of this connection on the validity and efficacy of APD require much more research and investigation. At this point, we simply want to highlight the existence of this connection and the need to include them in ethical evaluations of APD for farmed animals.

In addition to the extrinsic ethical issues, there are two ethical challenges regarding APDs that are more related to the fundamental question of whether there is a need to limit their use, to which we refer as intrinsic ethical challenges. First, the risk of applying an oversimplified perspective about the pain of others, which could lead to them experiencing a great deal of pain, must be taken seriously. Animal pain

[6] Thanks to an anonymous reviewer for pointing towards this. Also, please note that we do not discuss these issues from the point of view of any specific ethical theory. Consequentialists would evaluate ethical issues in the context of APD in farmed animals differently than care ethicists, and deontologists have a different stand on it as virtue ethicists. This short paper does not aim to investigate the issues from any specific ethical perspective, but to highlight that these ethical challenges exist and need to be considered in AI research, development, and use, as in AI ethics.

may include facets of pain that are not measurable or not easily measurable. Therefore, a machine trained to recognise only measurable aspects of pain will not recognise these.

Second, APD technologies in animal agriculture leads to an increased automation of this industry. This could be accompanied by an even greater distance between people and the nonhuman animals whose 'products' they consume, which is problematic for different reasons, e.g., because it prevents more respectful human-animal relations, and it distances people from what they eat. One might want to object that it is the goal of APD technologies for farmed animals to prevent them from experiencing pain, thereby demonstrating some 'care' for these animals. Also, one could object that APD, as a form of AI-based 'surveillance' technology, has no interest in hiding the farmed animal's pain and, therefore, could be more honest than human workers. However, as we discussed above, the development and use of APD are closely connected to the industry. In practice, there are various cases of intra-industry documentation of farmed animal mistreatment, but these very rarely have real consequences in favour of the animals (Bülte, 2018). Similar results must be expected if AI-based systems were to reveal that the animals experience pain through the industry's standard practices. It also makes the industry more profitable, while ethical and ecological concerns instead call for a reduction of animal agriculture (Kemmerer, 2015; Weis, 2013) and a shift to more plant-based food systems and agriculture that supports them to be able to address current global crises such as climate change and biodiversity loss (Twine, 2021).

Conclusion

As we discussed here, the philosophical underpinnings of APD regarding the normativity of pain make it challenging to claim if this technology can be used in a responsible way on farmed animals or not. For it being responsible in any meaningful understanding of the term, its effectiveness should be proven. However, regardless of its effectiveness it looks like the technology is going to be used in animal agriculture and its use will rather increase. Therefore, we proposed a — non-exhaustive — number of ethical issues that must be addressed to use APD as responsible as currently possible, such as the quality of the underlying data and algorithms, the necessity that the APD works sensitively regarding species, age, and sex, as well as the risk of perpetuating an oversimplified perspective on animal pain and animal welfare. These ethical issues need to be further considered in science, ethics, and policymaking to spark discussions on this new technology that poses to have a huge impact on the lives and welfare of farmed animals.

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