Animal-Computer Interaction (ACI): a Manifesto

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ABSTRACT:

Although we have involved animals in machine and computer interactions for a long time, their perspective has seldom driven the design of interactive technology meant for them and animal-computer interaction is yet to enter mainstream user-computer interaction research. This lack of animal perspective can have negative effects on animal users and on the purposes for which animal technology is developed. Not only could an Animal-Computer Interaction (ACI) agenda mitigate those effects, it could also yield multiple benefits, by enhancing our inter-species relationships with the animals we live or work with, leading to further insights into animal cognition, rendering conservation efforts more effective, improving the economical and ethical sustainability of food production, expanding the horizon of user-computer interaction research altogether and benefiting different groups of human users too. Advances in both our understanding of animal cognition and computing technology make the development of ACI as a discipline both possible and timely, while pressing environmental, economic and cultural changes make it desirable. But what exactly is ACI about and how could we develop such a discipline? This Manifesto describes the scientific aims, methodological approach and ethical principles of ACI and proposes a research agenda for its systematic development.

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Aims and Approach

ACI aims to understand the interaction between animals and computing technology within the contexts in which the animals habitually live, are active and socialise with members of the same or other species, including humans. Contexts, activities and relationships will differ considerably between species, and between wild, domestic, working, farm or laboratory animals. In each particular case, the interplay between animal, technology, and contextual elements is of interest to the ACI researcher.

ACI aims to influence the development of interactive technology to:

- Improve animals' life expectancy and quality, by facilitating the fulfilment of their physiological and psychological needs; technology that encourages healthy feeding habits in domestic animals, or allows them to modify their housing conditions at leisure, might be consistent with this aim;

- Support animals in the legal functions they are involved in, by minimising any negative effects and maximising any positive effects of those functions on the animals' life expectancy and quality; technology that gives farm animals control over the processes they are involved in, or produces no side effects on the animals involved in conservation studies, or helps working animals communicate with their assisted humans, might be consistent with this aim;

- Foster the relationship between humans and animals, by enabling communication and promoting understanding between the two; technology that allows companion animals to play entertaining games with their guardians, or enables guardians to understand and respond to the emotions of their companion animals, might be consistent with this aim.

ACI aims to develop a user-centred approach, informed by the best available knowledge of animals' needs and preferences, to the design of technology that is meant for animal use. It also appropriately regards humans and other species alike as legitimate stakeholders throughout all the phases of the development process.

Ethical Principles

ACI takes a non-speciesist approach to research and researchers have a responsibility to:

- Acknowledge and respect the characteristics of all species participating in the research without discriminating against any of them.

- Treat both human and nonhuman participants as individuals equally deserving of consideration, respect and care according to their needs.

- Choose to work with a species only if the intent is to advance knowledge or develop technology that is beneficial or otherwise relevant to that particular species.
- Protect both human and nonhuman participants from physiological or psychological harm at all times, by employing research methods that are non-invasive, non-oppressive and non-depriving.
- Afford both human and nonhuman participants the possibility to withdraw from the interaction at any time, either temporarily or permanently.
- Obtain informed consent to the involvement of both human and animal participants, either from the participants themselves (e.g., for adult humans) or from those who are legally responsible for them (e.g., for animals).

Widespread Benefits

The development of ACI as a discipline could have many benefits for both animals and humans. For example, it could have important effects on our inter-species relationships by informing the design of technology that enables the animals we live and sometimes work with to effectively communicate with us, increase their participation in our interactions and constructively influence our environments, giving us a better understanding of those we share our lives with and the possibility to build safer, richer, longer and more productive relationships with them.

ACI could also lead to further insights into animal cognition, for example, by informing the design of interactive technology for behavioural studies that affords optimal usability and creative appropriation for the animals. Or it could support conservation efforts, for example, by informing the design of monitoring devices that produce minimal impact on the animals while maximising the quality and reliability of the data gathered through them.

Moreover, ACI could improve the economic and ethical sustainability of food production, for example, by informing the design of technology that affords farm animals more freedom and autonomy, enabling them to live less unnatural lives, reducing their stress levels and susceptibility to illness without recourse to drugs, increasing their productivity and improving the quality of their produce.

Finally, ACI could expand the horizon of user-computer interaction research by pushing our imagination beyond the boundaries of human-computer interaction. For example, it could help us discover new ways of eliciting requirements from those who cannot communicate with us through natural language or abstract conceptualisations. It could help us explore new modes of interaction for those who do not possess hands, cannot decipher the patterns emitted by a screen or have limited attention spans. Or it could help us find new ways of understanding and evaluating the impact of technology on individuals and social groups, perhaps shedding new light on issues such as identity, privacy or trust, and contributing to our understanding of what it means to be human and who we are in relation to other species.

A Research Agenda

Of course, whether ACI can yield the benefits outlined above depends on our ability to tackle some challenging questions. For example, how do we elicit requirements from a nonhuman participant? How do we involve them in the design process? How do we evaluate the technology we develop for them? How do we investigate the interplay between nonhuman participants, technology and contextual factors? In other words, how on earth are we going to develop a user-centred design process for animals? Here is a possible roadmap:

- First, we could look at what has been done in other areas, what knowledge about animal behaviour and psychology is available, what data has already been collected about animal-computer interactions. We could look at how all that maps onto what we know about user-computer interactions and how it might contribute to ACI as a discipline and design practice.
- Second, we could form collaborations with researchers from disciplines such as ethology, behavioural medicine, animal psychology, veterinary, agricultural and environmental engineering to help us with this mapping effort. Similarly, the expertise and experience of professionals and practitioners who work with animals in environments where animal-computer interactions take place would be important.
- Third, we could study in-the-wild cases of whatever technology is already in use or might be developed in order to understand those domains and contexts, their users and stakeholders, so that we can begin to develop or adapt relevant ACI concepts and models.
- Fourth, we could look at human-centred interaction design protocols and methods in order to assess which may or may not be relevant to an animal-centred design process, which might be adapted, which might be borrowed from other disciplines, and which might need to be developed from scratch.
- Fifth, we could start adapting, developing and integrating animal-centred interaction design protocols and methods, for example, for requirements elicitation, participatory design, contextual evaluation, etc., in a loop between empirical work and theoretical reflection.
- Sixth, we could start developing theoretical models of animal-computer interaction, which would then drive further research. These would take into account pre-ACI research on animals and would be informed by ACI empirical research with animals.