Machine Learning: An Animal Tracking Algorithm For Sanctuaries and Conservationists

(technical research project in Computer Science)

The Impacts of Social Media Platforms on Animal Conservation

(sociotechnical research project)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

How can animal conservation efforts be improved through the use of modern technology?

In the modern day, animal conservation efforts have grown, especially online through digital platforms. These new digital platforms have helped boost public interest in protected animals specifically through the use of live cameras in habitats, social media, and other digital media. These allow audiences worldwide to observe animals in real-time and form emotional connections with them. This new, improved visibility can lead to heightened awareness, encourage donations, and generate support for conservation programs. Organizations like Alveus Sanctuary, which operates as a nonprofit sanctuary in Texas, leverage video and streaming platforms like Twitch and Youtube to fund their sanctuaries through live streams and videos involving the animals under their care, generating nearly one million dollars in 2023 (Alveus Sanctuary 2023). Similarly, virality on social media sites like twitter, such as Moo Deng the baby pygmy hippopotamus, who garnered hundreds of millions of views which translated to increased traffic for the sanctuary she lives at, has underscored the potential of digital platforms to rally public support for conservation.

However, the commercialized use of wildlife on these platforms raises ethical concerns regarding the extent of human interference in animals' lives. When animals become commodities for public engagement, it can blur the lines between conservation and exploitation, especially if the content being created prioritizes viewership and financial gain over protecting the animals in their care. This research, therefore, will explore whether conservation efforts can coexist with social media in a world where public engagement is increasingly tied to financial incentives. A machine learning tracking algorithm will also be developed to address some of the existing challenges within animal conservation, specifically the difficulty of monitoring animals. It is

very difficult and tiring to have someone watching and tracking animals through cameras 24/7 so an algorithm that could automate this would be a benefit. This is especially true when considering how the tracking data can be used to monitor the animals' health and activity as well as providing data on their natural behaviors. The goal is to support conservation work by providing tools that enhance monitoring capabilities without disrupting animal behaviors or compromising their welfare. In tandem with this, I will be exploring what we know about animal ethics and how we can use what we know to answer questions about the ethicality of these modern conservation systems that utilize social media and have greater public visibility.

Technical Research Problem

How can an object tracking algorithm be used to monitor and gather data on animals in sanctuaries for the benefit of conservation efforts?

There is a notable gap in the availability of continuous, unobtrusive animal tracking systems that can operate through live camera feeds. Current animal conservation efforts often use tracking systems that require direct human observation or physically tagging animals, which can be intrusive and may alter the animals' natural behaviors. There is an abundance of object tracking and object identification algorithms and datasets, the key difference is very few of these are designed for use on animals in an enclosed environment which is a gap that can be filled. This algorithm would be designed for use on animals in captivity since they are often under camera monitoring already.

To develop this solution, I will utilize existing computer vision techniques and object tracking technologies as well as existing datasets used for identifying animals. These datasets containing various animal types exist to train AI on identifying different animals but can be repurposed to help an algorithm both recognize and track the activity and movement of animals in different

settings. Since many live feeds of animals are already publicly available, the algorithm's effectiveness can be evaluated in terms of accuracy on these live cams by comparing the algorithm's results to the results of a manual observation by a human. A very important metric of animals in captivity being healthy is how active and engaged they are so a human can watch a specific habitat's cameras to see how many hours an animal spends engaged in physical activity inside their habitat each day and the algorithm could do the same thing. The two measurements would be checked to see which is more accurate and both accuracy and amount of effort would be compared between the two to potentially show the usefulness of the algorithm.

STS Research Problem

What can we learn about the impacts of live cams and social media platforms on animal conservation?

While live cams and social media platforms are increasingly valuable for raising public awareness and financial support for conservation, they also prompt ethical concerns. Specifically, this research will examine the consequences of using wild animals to garner public engagement. This can come from disrupting the animals' natural behavior if the sanctuary is open to the public or if the caretakers are overusing the animals to create media to promote their sanctuary. It is important for sanctuaries to find a safe balance that allows the animals to live undisturbed while also making enough money to run the sanctuary itself if relying on donations is not sustainable.

Alveus Sanctuary, for instance, provides an interesting case study. As a nonprofit, it generates revenue through live streams and content involving its animals and puts this money back into the sanctuary, similarly to most animal sanctuaries(Alveus 2023). However, it also restricts public access to their animals whereas some sanctuaries might allow paid public visitation. This brings

into question why different sanctuaries choose different practices and what benefits and disadvantages there are to them. By comparing various sanctuaries and how they are run as well as examining ethical standards used by international organizations such as The Wildlife Society and The Association for Animal Welfare, we will gain an understanding of the nuances surrounding monetized animal conservation in an era of rising digital media.

Conservation Ethics in an Age of Rising Digital Media

Animal conservation is a long standing practice with dozens of organizations dedicated to it, each with their own ethical codes or standards. Generally, most of these organizations share similar key points in their codes with minor differences depending on the specific goal of the organization. However, with the rise of video, streaming, and social media platforms in recent years, many conservation organizations have taken to social media to use the animals in their care to educate the public on conservation and help raise money for conservation efforts. Before the rise of social media, there was little to no public exposure of protected animals, keeping in mind that we are talking specifically about animal sanctuaries here and not zoos. The key difference between a sanctuary and a zoo is the purpose behind them, sanctuaries being designed to protect the animals whereas zoos exist for public entertainment. There have been more recent research papers on the use of live cams and public engagement which examine how, while this does benefit conservation, it can also serve to desensitize the public to the importance of these animals if the animals are improperly used(Richardson 2022). This becomes especially true when considering the difference between using the animals to create educational content and creating content for entertainment. This line between the two has become more blurred with the rise of live cams and some sanctuaries allowing limited public visitation. Although the specific situation is different, we can conflate existing studies and research on ethical standards around

human interference with protected wild animals to animals in captivity. Some animals, such as Northern White Rhinos, must live in captivity for their own safety because of how highly sought after they are on the black market, but despite the necessary protection, conservationists do their best to allow the animals to still live natural lives. This can be similarly applied to animals in captivity because they lack the ability to take care of themself, either because they were raised by humans to the point of dependence or injuries.

Two key frameworks that will inform this study are utilitarianism and deontology. Utilitarian ethics emphasize the consequences of actions, suggesting that the value of an action is determined by its overall benefit to society. In this context, public engagement through live cams and social media could be seen as ethically justified if it leads to significant positive outcomes, such as increased conservation funding and heightened public awareness. However, deontological ethics prioritize moral duties and principles, which means that actions are deemed right or wrong based on adherence to specific ethical standards rather than their consequences regardless of the situation. From a deontological perspective, the use of animals in public engagement must respect the intrinsic rights of animals and not interfere in their lives, regardless of the financial or educational benefits. Since these are two of the most used frameworks in conservation ethics, this paper will examine the main points of increased usage of live cams and public engagement material that use protected animals to appeal to the public for monetary benefit as well as the line between this engagement being beneficial to the animals and being exploitative from a utilitarian and deontological perspective to determine how these two frameworks see these issues and the balance between them.

Research Methods and Approach

The main sources of data I will analyze are anecdotes by conservationists or journalists on their

practices and how it benefited or hurt animals, many of which are published as journals, publicly available information on existing conservation facilities that use the digital platforms described, and research papers on ethics surrounding animal conservation as a whole.

Finding direct anecdotes is a great way to see direct impacts of conservation efforts while also learning about the ethical systems employed by that person which will help inform on the inner workings of conservation. Public information on existing conservation facilities serves a similar purpose but will likely require more detailed research to verify the information we see publicly is actually accurate to what happens behind the scenes. Because of how long standing the field of animal conservation and conservation ethics is, there have been countless researchers that have looked at various elements of it and drawn their own conclusions or suggestions on the ethics of conservation such as Cinkova and Bicik's paper(2013) on the harm of captivity to the reproductive behaviors of critically endangered animals or Richardson and Lewis' paper(2022) on the benefits of live cams to conservation funding. I think any number of these would be good to look at and understand, especially since many researchers don't share the exact same views and it is important to understand the differences between them and why they differ. Through analyzing all these sources, I aim to identify the differences between existing conservation practices, the reasons these practices differ, and observe how the two different frameworks of utilitarianism and deontology apply to these issues.

Conclusion

Through this STS research, I hope to gain a detailed understanding of the ethical dilemmas, nuances, and societal impacts of the rising use of digital media for animal conservation. In examining how different sanctuaries and conservationists use different platforms for educational purposes or to raise money for conservation, I will explore the line between media for the benefit

of the protected animals and exploitation of those animals. My research will inform audiences on the benefits and disadvantages of social media driven public engagement designed to help conservation and help them draw their own informed conclusions on the ethics of it.

While doing this research, I hope to develop a robust machine learning algorithm that can continuously track and monitor animals in sanctuaries, which could serve as a non-intrusive alternative to traditional human observation methods. This project will address the technical gaps in animal tracking by adapting object tracking algorithms for use on live camera feeds. This algorithm would help reduce the need for human interaction with the animals which in turn helps animals live more natural lives.

The overarching issue of how animal conservation can be improved with modern technology without going too far to the point of exploiting the animals is very nuanced and involves many ethical considerations on what defines right and wrong when it comes to conservation and who makes those decisions. While laws surrounding conservation do exist, they often only serve to protect animals that are extremely endangered to the point of needing special conservation statuses so beyond lawmaking, what can be done to help protect animals, and what standards exist for sanctuaries to ensure they are protecting their animals first and foremost.

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