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Popular Article

Role of AI in Wildlife Conservation: An Overview

Dr. Vinay Kumar[1], Dr. Udit Jain[2], Dr. Tanmay Shukla[3], Dr. Tejaswi Baronia[4], Dr. Iruvar Singh[5]
M.V.Sc.[1,3,4,5]. Scholar, Veterinary Public Health and Epidemiology, CoV.Sc. & A.H., DUVASU
Associate Professor & Head, Department of Veterinary Public Health, CoV.Sc. &A.H., DUVASU
corresponding author: *vinaykumarmundhera@gmail.com*
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Abstract

In the recent years, Global biodiversity decaying rapidly. We need to conserve this global biodiversity. Among this conservation of global biodiversity, few steps are taken on international level for the conservation of wildlife. Wildlife conservation efforts have increasingly turned to technological solutions to mitigate threats to animal populations and their surrounding environment. In this article, various challenges related to wildlife conservation discussed. These challenges are like habitat destruction, climate change, illegal wildlife trade and poaching, human-wildlife conflict and lack of public awareness. Then use of artificial intelligence (AI) in wildlife conservation and advantages of integration of AI in conservation practices discussed. Various examples of use of these new technologies in wildlife conservation in India are mentioned. At last, challenges in use of artificial intelligence in wildlife conservation with a suitable solution and future of artificial intelligence in these conservation strategies are discussed along with their solution.

INTRODUCTION

Wildlife is a broad term in itself. According to wildlife protection act 1972 of India, wildlife means any animal, bees, butterflies, crustacea, fish and moth; and includes any aquatic or land vegetation which forms part of any habitat. In simple words wildlife includes all kinds of wild animals, insects and even plants that are part of natural ecosystem.[7]

In this article, Conservation of especially wild animal in their natural ecosystem discussed. Varity and variability of all living organisms is very much important. So, to maintain this biodiversity conservation is required. Various steps are taken time to time to conserve biodiversity and wildlife like enforcement of strict law, declaring wildlife

conservation area, prevention of illegal poaching, reforestation etc. In the recent years these conservation efforts turned into the technological solution. Among the most promising modern solutions is the use of artificial intelligence (AI). AI-based tool such as camera traps, drone surveillance, movement prediction models and early warning system is being used to monitor wildlife movements, their activities and preventing human-animal conflicts. These technologies not only help in protecting endangered species but also play a crucial role in ensuring human safety.

AI have also some challenges and limitation. We have to work on these challenges and find their solution so that we can use this technology better. Also, innovative strategies should be planned out for use of AI efficiently in future.

CHALLENGES IN WILDLIFE CONSERVATION

1. Habitat Destruction

It is the one of important issue in wildlife conservation. Human activities like urbanization, agriculture, deforestation and infrastructure development trigger this. This will lead reduction of the available space for wildlife.

2. Climate Change

Climate change impacts wildlife by altering temperature patterns, rainfall distribution and the frequency of extreme weather events. These changes can shift natural habitat, breeding and migration cycles and affect food sources. As a result, many species face severe survival challenges and population declines.

3. Illegal Trading, Hunting and Poaching

Illegal wildlife trade, hunting and poaching reduce number of wild animal and continued exploitation may pushes them closer to extinction. The illegal trade can be of wildlife products like ivory, rhino horn and exotic pets. It is a profitable business but destructive practice.

4. Human-Wildlife Conflict

Conflicts often arise from livestock predation, damage to crops, and threats to human safety. In many cases, these incidents lead retaliatory killing of wildlife, worsening conservation efforts and disturbing ecosystem stability.

5. Lack Of Public Awareness and Involvement

A major obstacle to effective wildlife conservation is the limited awareness among the public. Many people are unaware of the importance of biodiversity and the long-term consequences of wildlife loss. Adequate education and community involvement important for wildlife conservation.

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USE OF ARTIFICIAL INTELLIGENCE IN WILDLIFE CONSERVATION

Artificial intelligence plays an essential role in protecting and managing wildlife. By utilizing advanced technologies such as machine learning and computer vision, AI systems help in identify and classify species, monitor biodiversity and assist in preventing poaching and other illegal practices.

Modern AI techniques such as Convolutional Neural Networks (CNNs) and transformer models enable precise recognition and tracking of species that are most vulnerable to extinction. These tools support both real-rime and non-real time monitoring, allowing faster and more effective decision-making.

Consequently, AI significantly enhances the overall success and efficiency of wildlife protection and management programs.

ADVANTAGES OF INTEGRATION OF AI IN CONSERVATION PRACTICES

1. **Non-Invasive And Continuous Monitoring-** AI enables ongoing observation of wildlife without disrupting their natural habitats.
2. **Efficient Data Processing-** AI powered system can analyse vast amount of data quickly.
3. **Early Detection of Poaching and Threats-** advanced image recognition and sensor-based AI tools can promptly detect illegal poaching or unusual activities, allowing authorities to take timely preventative measures.
4. **Enhanced Decision-Making-** AI provides predictive insights that help conservationists make data driven decisions.
5. **Real-Time Monitoring and Alerts-** through satellite imagery and camera traps integrated with AI, conservation teams can receive instant alerts about wildlife movements or habitat changes.
6. **Collaboration And Adaptation-** AI systems evolve continuously, learning from new datasets and integrating feedback from conservation groups to improve efficiency and accuracy.
7. **Species Identification and Tracking-** AI-based image recognition helps identify and track individual animals or endangered species.

EXAMPLE OF USE OF ARTIFIAL INTELLIGENCE IN INDIA

1. Ai – Enabled Intrusion Detection System (Ids)

It is an AI driven system launched by Indian Railways for preventing elephant and wildlife death on railway track. This system detects the presence of elephants and other wildlife animals on railway tracks. This will alert loco-pilot, station master and control room

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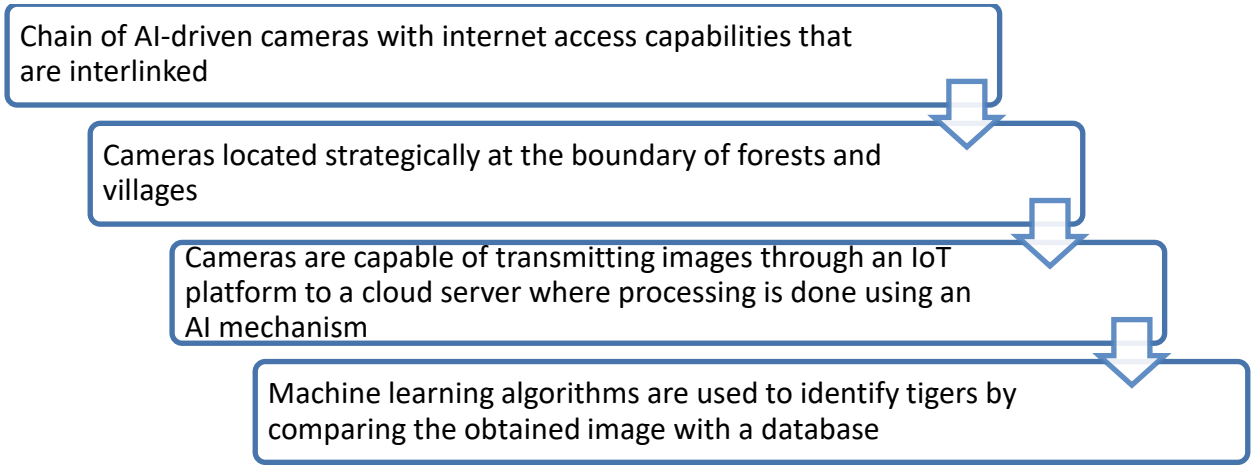
for taking preventative measures. This system work on Distributed Acoustic Sensors (DAS).[6]

2. Virtual Wall

It is Commissioned by Pench Tiger Reserve (PTR), Maharashtra. It is Mobile AI-based system. It prevents tiger attacks on villagers by providing Early Warning System.[5]



3. Trail guard AI

It mitigating human-wildlife conflict. With the help of TrailGuard AI monitoring of endangered tigers can be done. It uses a Real-time camera-based alert system. Images captured using TrailGuard AI of poachers help in identifying and preventing illegal poaching.

Trail Guard AI is developed by RESOLVE, US- based NGO & Nightjar Technologies Gurgaon based impact enterprise in India.[1]

4. Ele-Fence

It is an AI- Based smart fence. It is under way in Kerala's Wayanad district. It helps to mitigate the burgeoning cases of human-wildlife conflict. It is implemented by white elephant technologies, a Kochi based R&D firm, with support from Kerala Forest Department.[2]

CHALLENGES IN USE OF ARTIFICIAL INTELLIGENCE IN WILDLIFE CONSERVATION AND THEIR SOLUTION

CHALLENGE	SOLUTION
I. Data Accuracy and Accessibility	Strengthen data collection, storing and sharing system
II. High Implementation Expenses	Encourage the creation of cost-effective AI models, funding from NGO and government

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III. Need for Skilled Personnel	Training workshops organization and providing online learning resources
IV. Moral and Privacy Issues	Ethical guidelines, local community engagement, and data privacy protocols
V. Environmental Limitations	Design approaches customized to suit various ecological and climatic conditions

FUTURE OF AI IN WILDLIFE CONSERVATION

Future of artificial intelligence in wildlife conservation depends on continuous innovations. Future innovations and collaboration advancements in sensor technology, IoT devices, edge computing and interpretable AI models will drive further progress, enabling real-time, global-scale analysis and more informed conservation actions. The future hinges on multidisciplinary collaboration among scientists, engineers, policymakers and communities to ensure ethical, inclusive, and effective AI deployment for wildlife protection.

The coming years will likely see hyper-efficient, proactive conservation strategies, where AI greatly amplifies human capacity.

CONCLUSION

Application of AI in wildlife conservation plays an important role. It helps in prevention of wild animal death, prevention of human death in case of conflict with wild animals, prevention of illegal poaching, help in species identification, wildlife monitoring etc. However, these advancements come with inherent challenges. Challenges like large data requirement, expenses, need of trained personnels, privacy issues, environmental limitations etc. We have to overcome these challenges with a suitable solution so that we can use these advanced technologies fully. Efficiency of AI in wildlife conservation and future depends on continuous innovations and overcome of challenges faced with a suitable solution.

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