Endangered Species Conservation

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Abstract - *In recent years, the biodiversity of the planet has been disappearing at an unprecedented rate. Several species are close to going extinct, thus it's important to protect the populations that still exist. It is possible to consistently observe animals in their natural settings and determine the effect of temperature in animal conservation. The use of automatic hidden cameras for wildlife monitoring has increased dramatically in the modern world due to its efficiency and dependability in capturing data on animals in large volumes, more effectively, and without operator interference. Yet, it can be time-consuming and exhausting to manually analyze and extract information from such enormous datasets obtained by camera traps. challenging procedure. For ecologists and biologists who want to watch wildlife in its native habitat, and make conclusions about the future state of animals. This presents a substantial obstacle. We have reviewed all recent works on deep learning-based animal detection and identification in the field. By examining numerous publications, authors have discovereda method of compiling all the data on all the endangered species and how temperature affects them, and then making predictions to determine the count of animals with changein temperature over future years.*

Keywords: Automatic hidden cameras , Natural settings, Temperature, Future count.

1.INTRODUCTION

As our planet continues to face the challenges of climate change, habitat loss, and human activity, many animal species are struggling to survive. Endangered species are those that are at risk of extinction, and their conservation is a critical priority for scientists, policymakers, and conservationists around the world. Machine learning is a powerful toolthat can help us better understand the threats facing endangered species and develop effective strategies for their protection. By analyzing large datasets of species populations, habitat characteristics, and environmental variables, machine learning algorithms can identify patterns and relationships that may not be apparent to human analysts.

However, monitoring and protecting endangered species can be a daunting task, especially for species that are rare, elusive, or inhabit remote areas. Traditional methods of monitoring, such as field surveys, can be time-consuming, expensive, and may not provide accurate or real-time data. In recent years, there has been a growing interest in using machine learning algorithms to monitor and protect endangered species. Machine learning is a subfield of artificial intelligence that allows computers to learn from data and make predictions or decisions without being explicitly programmed.

Machine learning algorithms can help overcome some of the challenges of monitoring endangered species. Machine learning algorithms can analyze large amounts of data from various sources, including satellite imagery, acoustic recordings, andcamera traps, to identify, track and monitor endangered species. Machine learning algorithms can also be trained to recognize patterns and anomalies in data, which can be useful for detecting changes in species populations or habitats.

Also the importance of Temperature change in Animal disappearance cannot be ignored. By building this project we are also emphasizing the effect of temperature change on animal counts in the future years. Using the CNN approach we are also providing the much needed User interface for recognition and classification of these animals.

In this analysis of endangered species using machine learning, we will explore the potential of this technology to improve our understanding of these species and their habitats. We will look at case studies of successful machine learning applications, examine the challenges and limitations of this approach, and discuss future directions for research and conservation efforts.

Ultimately, we hope to demonstrate how machine learning can be a valuable tool in the fight to protect endangered species and preserve biodiversity for future generations.

2. LITERATURE SURVEY

Michela Pacifici et al.[1] proposed a paper where summarization of different currencies used for assessing species' climate change vulnerability is done. They describe three main approaches used to derive these currencies (correlative, mechanistic and trait- based), and their associated data requirements, spatial and temporal scales of application and modelling methods. Identified strengths and weaknesses of the approaches and highlight the sources of uncertainty inherent in each method that limit projection reliability. Also provided guidance for conservation practitioners in selecting the most appropriate approach(es) for their planning needs and highlight priority areas for further assessments

Tanishka Badhe et al.[2] proposed a paper in which different research papers were studied and a comparison table was made to study the accuracy of various techniques using diff datasets. CNN ,YOLO SSD were the main focused group of algorithms. These algorithms can be used for animal identification and localization and further these animals can be classified as endangered or not. After the survey, it is concluded that VGGNET was the best algorithm for animal classification By combing SSD and YOLO we can use it accurately for object detection. These algorithms can be combined to be used for analysis and classifying the endangered species. Albin Benny et al.[3] introduced a blockchain-based electronic voting system that utilizes smart contracts to enable secure and cost- efficient elections while guaranteeing voters privacy. This project explores the potential of blockchain technology and its usefulness in the e-voting scheme. The blockchain will be publicly verifiable and distributed in a way that no one will be able to corrupt it.

Gabriel Spadon et al. [3] proposed a system where they presented a methodology to detect and recognize animal species observed in wild conditions. They used deep convolutional neural networks trained to distinguish between eight different animal species. The training of the network was based on images extracted from the IMAGENet dataset. For testing, they constructed a dataset with regular RGB images and images taken with a thermal camera. By combining regular RGB images and thermal images, we surpassed the results of the method Fast RCNN, which had limitations in detecting the regions of a given image in which animals were present. In our approach, they selected regions from the thermal images using the segmentation algorithm SLIC; then, we used the regions of interest, as indicated by their thermal signatures, to identify the corresponding regions as seen in the RGB images. These regions were input to a neural network capable of tracing theprobability of finding a given species in each region of interest. they directly compared thier method to the Fast R-CNN method over metrics precision (PR), recall (RE), f-measure (FM), and average precision (AP). Their method outperformed the Fast R-CNN results in all the tests concerning the recognition of the animal species. As future works, they expect to increase the number of animal species and improve the success in large-scale animal recognition by using camera-trap images. In addition, they intend to compare with different methods, including Faster- RCNN and Yolo2.

John Alfred et al.[4] Developed a web application to record camera data and assign timestamps. The setup consisted of a Raspberry Pi 3B+ and a Raspberry Pi camera module powered by a solar power bank. The model can label the categories and surrounding boxes on an image. It then uses a CNN to calculate each region's attributes. It predicts its categories and bounding boxes by using the characteristics of each defined region. It detects the endangered species using YOLOv5 model using the dataset provided as input to the model.

Hung Nguyen et al. [5] proposed a framework to build automated animal recognition in the wild, aiming at an automated wildlife monitoring system. In particular, we use a single-labeled dataset from Wildlife Spotter project, done by citizen scientists, and the state-of-the- art deep convolutional neural network architectures, to train a computational system capable of filtering animal images and identifying species automatically. Our experimental results achieved an accuracy at 96.6% for the task of detecting images containing animal, and 90.4% for identifying the three most common species among the set of images of wild animals taken in South- central Victoria, Australia, demonstrating the feasibility of building fully automated wildlife observation. This, in turn, can therefore speed up research findings, construct more efficient citizen sciencebased monitoring systems and subsequent management decisions, having the potential to make significant impacts to the world of ecology and trap camera images analysis.

Sazida B. Islam et al.[6] This paper proposes an automated wildlife monitoring system by image classification using computer vision algorithms and machine learning techniques. The goal is to train and validate a Convolutional Neural Network (CNN) that will be able to detect Snakes, Lizards and Toads/Frogs from camera trap images. The initial experiment implies building a flexible CNN architecture with labeled images accumulated from standard benchmark datasets of different citizen science projects. After accessing satisfactory accuracy, new camera-trap imagery data (collected from Bastrop County, Texas) will be implemented tothe model to detect species. The performance will be evaluated based on the accuracy of prediction within their classification. The suggested hardware and software framework will offer an efficient monitoring system, speed up wildlife investigation analysis, and formulate resource management decisions.

Ritwik Dilip Kulkarni et al.[7] formed end to end pipeline is constructed that begins from searching and downloading news articles about species listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora(CITES) along with news articles from specific Twitter handles and proceeds with implementing natural language processing and machine learning methods to filter and retain only relevant articles. A crucial aspect here is the automatic annotation of training data, which can be challenging in many machine learning applications. A Named Entity Recognition model is then used to extract additional relevant information for each article.

Convolutional layer:

The majority of computations happen in the convolutional layer, which is the core building block of a CNN. A second convolutional layer can follow the initial convolutional layer. The process of convolution involves a kernel or filter inside this layer moving across the receptive fields of the image, checking if a feature is present in the image.

Over multiple iterations, the kernel sweeps over the entire image. After each iteration a *dot product* is calculated between the input pixels and the filter. The final output from the series of dots is known as a feature map or convolved feature. Ultimately, the image is converted into numerical values in this layer, which allows the CNN to interpret the image and extract relevant patterns from it.

Pooling layer:

Like the convolutional layer, the pooling layer also sweeps a kernel or filter across the input image. But unlike the convolutional layer, the pooling layer reduces the number of parameters in the input and also results in some information loss. On the positive side, this layer reduces complexity and improves the efficiency of the CNN.

Fully connected layer.

The FC layer is where image classification happens in the CNN based on the features extracted in the previous layers. Here, *fully connected* means that all the inputs or nodes from one layer are connected to every activation unit or node of the next layer.

All the layers in the CNN are not fully connected because it would result in an unnecessarily dense network. It also would increase losses and affect the output quality, and it would be computationally expensive

How our CNN works?

A CNN can have multiple layers, each of which *learns* to detect the different features of an input image. A filter or kernel is applied to each image to produce an output that gets progressively better and more detailed after each layer. In the lower layers, the filters can start as simple features.

At each successive layer, the filters increase in complexity to check and identify features that uniquely represent the input object. Thus, the output of each convolved image -- the partially recognized image after each layer -- becomes the input for the next layer. In the last layer, which is an FC layer, the CNN recognizes the image or the object it represents

With convolution, the input image goes through a set of these filters. As each filter activates certain features from the image, it does its work and passes on its output to the filter in the next layer. Each layer learns to identify different features and the operations end up being repeated for dozens, hundreds or even thousands of layers. Finally, all the image data progressing through the CNN's multiple layers allow the CNN to identify the entire object.

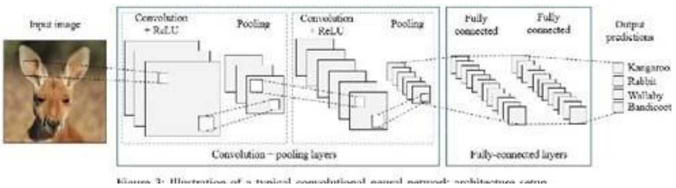


Fig 1. CNN PROCESS

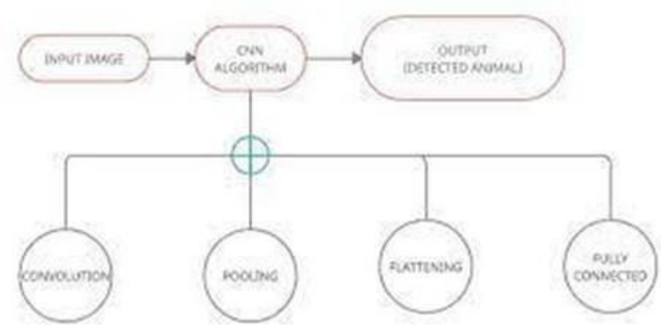


Fig 2. CNN FLOWCHART

In our system, when you input the picture of the Endangered animal it is able to recognize which animal it is and displays the information related to that animal. The information displayed may include the scientific name, Their habitat etc.

4.5 Animal Count Prediction:

The second feature that we are providing Endangered animal count prediction.

Basically the idea lies in the fact that temperature change affects the habitat of the animal. As the habitats of the animals are affected the count of the animals gets in turn affected. Thus, our model will be able to show you the approximate Endangered animal count wrt. to the temperature in that range of year.

The inputs required will be:

- The starting year
- The ending year
- The Endangered animal name

4.6 User Interface

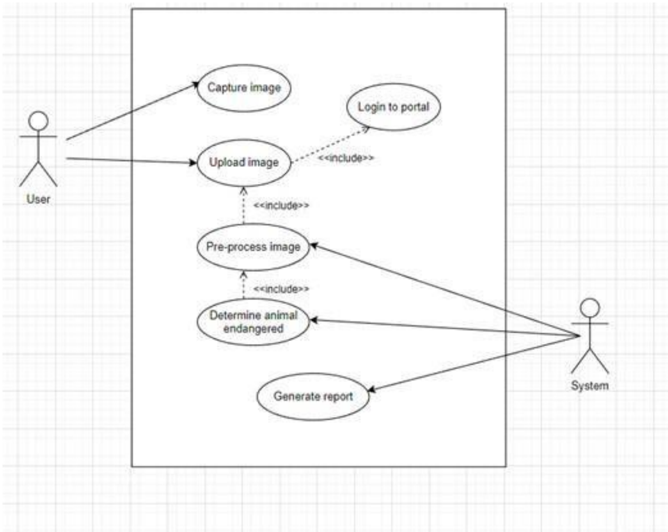
User interface is needed to ensure that the user can interact with the system. User is done using languages like HTML, CSS and flask as a framework. It will be useful to provide users better interaction with the system.

5. ANALYSIS OF ALGORITHM

5.1 CNN Model

A convolutional neural network (CNN or convnet) is asubset of machine learning. It is one of the various types of artificial neural networks which are used for different applications and data types. A CNN is a kind of network architecture for deep learning algorithms and is specifically used for image recognition and tasks that involve the processing of pixel data.

5.2 Use Case Diagram



6. RESULT AND ANALYSIS

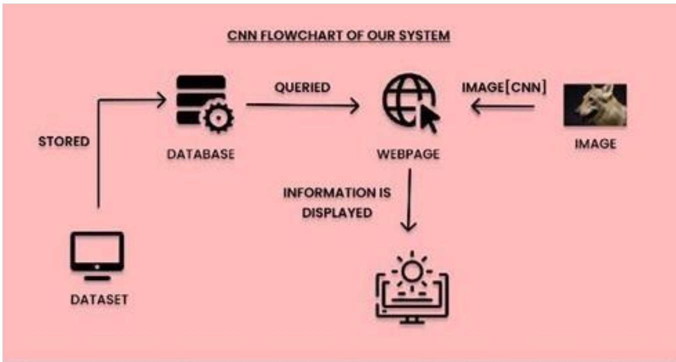


Fig.3 (CNN Flowchart)

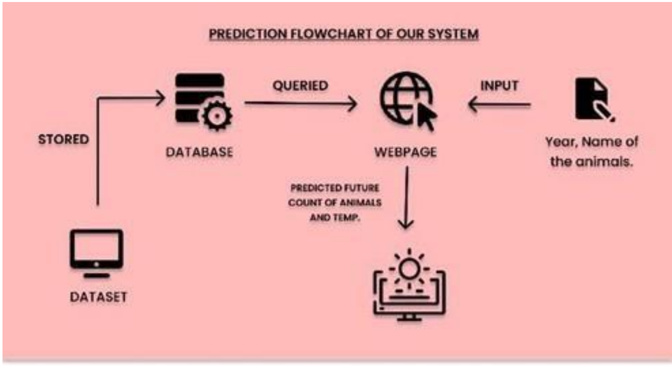


Fig.4 (Prediction Flowchart)

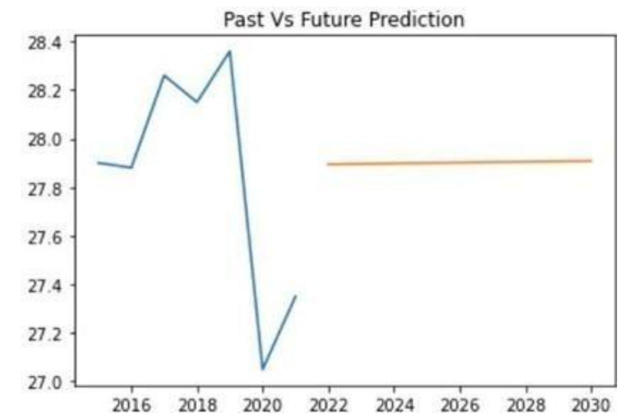


Fig. 5 (Past vs Future Prediction Graph)

This is past and future prediction where the fluctuations in the temperatures are represented in the form of a graph.

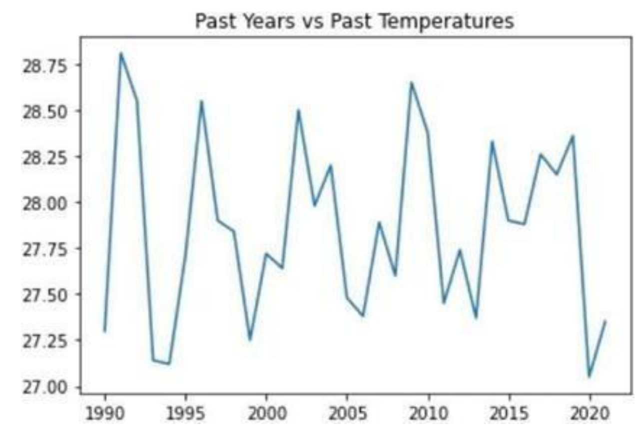


Fig .6 (Past Year vs Past Temperature) Here, past temperature with respect to past year isplotted in the form of a graph.

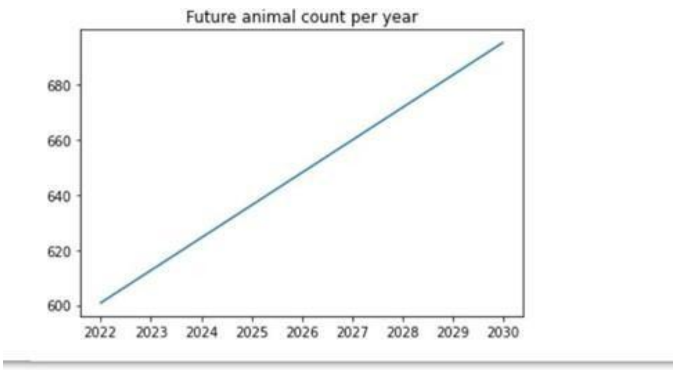


Fig. 7 (future animal count per year)

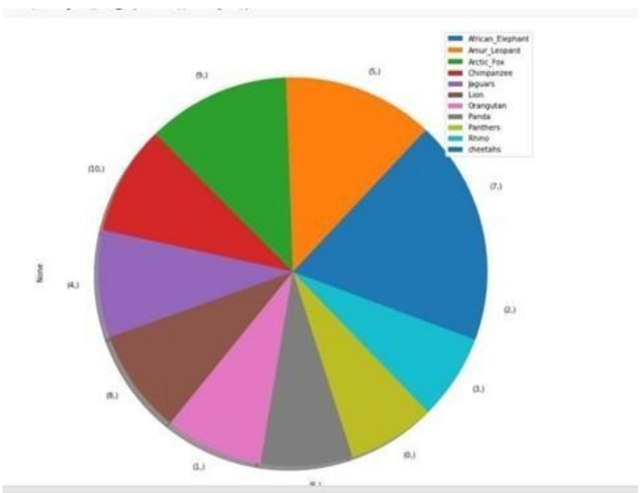


Fig. 8 (Number of animals according to theirgroups)

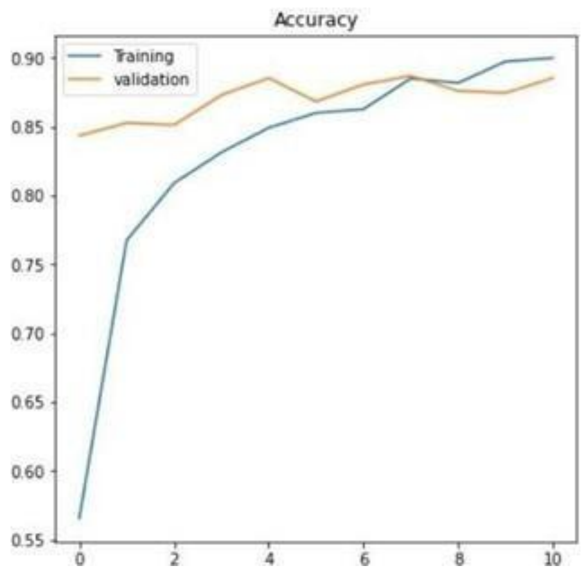
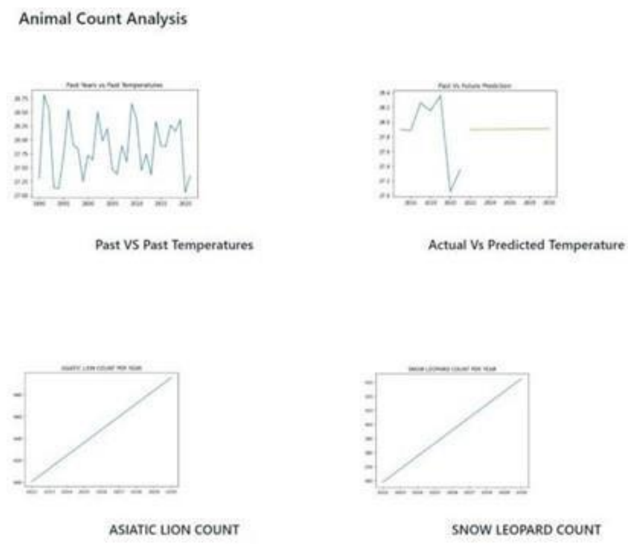


Fig. 9. ACCURACY (CNN)

Fig. 10. (Landing Page)

Fig. 11. (Prediction Page)



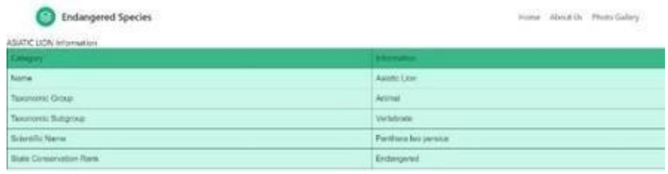


Fig. 12. (Animal Information)

7. CONCLUSION

So our project basically predicts the future count of animals based on the future temperature and provides relevant information about the Endangered animals based on just their images. Our project is basically very useful for the environmentalists who wish to save our endangered animals. By knowing how the animals might be affected by this temperature change and what is the ideal temperature to be maintained , thus they can tunnel their efforts in the right direction. This project also can be very useful to spread awareness among peopleas they get to know a good amount of information about the endangered animals and hence can also be motivated to save them.

8. FUTURE SCOPE

So, our project is basically very useful for the environmentalists who wish to save our endangered animals. By knowing how the animals might be affected by this temperature change and what is the ideal temperature to be maintained , thus they can tunnel their efforts in the right direction. This project also can be very useful to spread awareness among people as they get to know a good amount of information about the endangered animals and hence can also be motivated to save them. In future ,alerts can be issued if the count of animals is likely to have asignificant decrease in the coming years. Instead of temperature other factors like precipitation, humidity etc can also be added which may impact theanimal's survival.

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