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A Deep Active Learning Methodology to Identify Animal Species Using Camera Trap Images

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Abstract: *As we all know that wildlife ecosystem is in a critical situation, like various species in ecosystem have increased in the list of endangered species. So, not only preserving the species but also, we need to detect the location of those animals in order to protect and prevent them from poaching and it becomes easier to provide them the certain medication and also priorly alerting the nearby locality in case of any animals around the certain village. So, we as a human beings have a responsibility to save the animal species as well as to maintain the balanced wildlife ecosystem. The conservation of biodiversity depends on precise accurate time to time information. All this data about the forest ecosystem is obtained through motion activated cameras which are placed in certain areas of the forest which covers almost all animals. These cameras are also known as camera traps because it clicks the image of the animals at every instant periodically. These camera traps or motion activated cameras play an important role in fetching the data of forest biodiversity. The reason for using this motion activated cameras because its cheap, an effective method to fetch the data and non-intrusive. The data that is generated from camera traps are collected through the computers which are poised to dramatically increase the efficiency of the image based on the data collected through survey.*

Keywords: *Camera Traps, Deep Learning, Image Processing, Object Detection, Yolov5.*

I. Introduction

To better understand the complexities of the nature and animal ecosystems and to protect them, a detailed knowledge of animal behaviour, their location and the total number of them is helpful to protect and track them. The wildlife studies as mentioned in the above statement need tracking as well as location devices to record them. To record them we make use of motion activated cameras which are also known as camera traps since they are cheap and compare to other detection devices the data can fetched easily through this device in an efficient way. This motion activated cameras have revolutionized wildlife ecology study and conservation study over the last few years. These cameras have also become an important essential tool for ecologists which enables them to study about the animals or nature like distribution of species over wildlife ecosystem. Although this motion activated camera collect the images in a large volume and turn those images into useful information. The information from the images are extracted through computer vision which is done by humans manually. Humans review all the images manually and label each image this burden of reviewing each and every image is time consuming as well it is much costlier because there is a chance of missing a valuable knowledge from the image. This time consuming is the major disadvantage of this manual reviewing of data. To eradicate this major problem, we use Deep Learning Techniques to ease the process of reviewing the large-scale data.

II. Problem Statement

Checking of wildlife species in their environment is important to study their movements. The detailed and accurate information about wildlife behaviour and their location across the geographical areas helps us to transform our ability to manage, study and conserve the species as well as the biodiversity ecosystems. Here we investigate the data collected by camera traps and recognize the type of species and its location using Deep Learning Technique.

III. Objective

Advances in Artificial Intelligence and Image Processing are changing/challenging the way people interact with digital images and video. Animals involve or attack into human settlements primarily for the need of food which in turn may cause conflicts that results into injury to humans, animals, or both. A fully automated

monitoring system that helps in detecting animal movements and notifies that is through the location unit to the concerned authorities can help to reduce causalities. Computer Vision is one of the easiest and best choice of technology that can help in solving These kinds of associated problems. The system that is referred here is in context of a network of cameras running image processing software.

Detects animals in the image: Our Project detects animals in image. Though there are many challenges in capturing the image all the challenges are eradicated using the Machine Learning Technique i.e., using Deep Learning Methods like CNN.

Classifies Animals based on their species: After detecting the animals, the image processing is done where the animals are segregated into their kind of species and the result of which species they belong is displayed.

Manual work is reduced by providing automated reliable detection system: The manual monitoring would consume more time, tiring and may not accurate too. Therefore, it is the suitable automated model for easy monitoring and detecting.

Challenges in the dataset is removed: In this project, we mainly focus on classification of animal species, which is a challenging work for humans. Images that are taken from motion activated cameras are not always perfect, and many images may contain animals that are too far away, sometimes close to the camera, or animal may visible partially. In addition, different weather conditions like lightning, rainy, shadows, or foggy can make the identification process difficult.

IV. Related Work

[1] Animal Detection Using Template Matching Algorithm (2020): Animal-vehicle accidents can be prevented using an animal detection technique which will increase human and animal safety; it will detect the animals location within the radius of road and alerts the vehicles travelling in that direction through audio, video signals. This survey proposes to use template matching for animal detection. This method identifies small parts of an image and relates that to the template image. This paper uses normalized cross co-relation in order to carry out template matching. In signal processing, this is used to measure the similarities between two waveforms as a component of time-slack applied to one of the waveforms. The most common use of template matching is to identify a particular feature in a long duration signal. Using template matching, they found that the method was effective in detecting animals. Therefore, the false positive rate for animal detection is 13.3 percent. The proposed technique has given an accuracy of 84.81% for animal detection.

[2] Identifying, Counting, and Describing Wild Animals in Camera Trap Images with Deep Learning (2018): A deep learning algorithm is used here to determine the locations and behaviour of wild animals. The purpose of this paper is to collect the movements of wildlife by gathering camera trap image data accurately along with the ability of involuntarily and also a motion sensor is used. Here they extract the data or the data is preprocessed using deep learning techniques. In deep convolutional neural networks, counting, recognizing, and categorizing are taught to demonstrate the Activities of different varieties of breed from Serengeti dataset of 3.2-million image Snapshot. The accuracy calculated by Deep Learning Algorithm is the effectiveness in highlighting and automating the extraction of data from camera trap images by using deep neural networks has great importance. Here, they present two pipeline stages to improve their model: first they pre-process the empty data from the dataset and in second pipeline extracting the dataset that contains animals without empty label. They used the multi-task learning technique to train the model. The goal of this study was to test state-of the-art computer vision techniques called deep neural networks (DNNs) to extract information from the SS dataset automatically, There are a large number of labelled datasets of wild animals. In the first experiment, the researchers showed that DNN's algorithm performs well against SS datasets, but for rare classes it performs worse. The system will classify only self-confident images, and also it automates animal identification data is accurate to 99.3% of the given data. Performance is equally accurate at 96.6% of data accuracy, 3.2 million images were labelled with less effort than 8.4 years would require by human labour.

[3] Context R-CNN: Long Term Temporal Context for Per-Camera Object Detection (2020): The Context R-CNN model is indexed using an attention-based approach, which can be built for each camera, and can be accessed on a long-term basis also includes object detection performance boosting the contextual features. The R-CNN context is applied to two methods: one is vehicle detection in traffic cameras and species detection using camera traps. Moreover, based on intuition that moving objects exhibit periodic behaviour, Context R-CNN is built upon single-frame detection models and By conditioning their predictions on instance level features derived from contextual frames, they hope to hone in on similar

behaviour in similar locations. In order to meet the most recent requirement, faster R- CNN architecture was chosen where it is competitive highly as their base detection model and provides suitable choices for extracting newFeature levels. Any two-stage detection framework can be applied to their method. An image returns a collection of class agnostic bounding box proposals This is done by first passing it through a region proposal network (RPN), then running non-max suppression. Following this, the box proposals are passed to the second stage, where ROI Align is used to extract instance-level features, which are then classifiedand refined. with this process, they will contribute a implement model that shows temporal context of a camera, and it also shows that static camera setting is important, beneficial is attentionbased temporal context. Context R-CNN is effective and capable data streams with low frame rates are generated by passive-monitoring sampling strategies.

[4] Deep learning improves acoustic biodiversity monitoring and new candidate forest frog species identification (genusPlatymantis) in the Philippines (2021): In this Paper Monitoring devices are used for detection of certain specific-species which show a good results in overcoming the challenges that are associated for discovering the species rates of lagging frog. Data is being generated at a faster rate than it can be analyzed by these devices. They have a TensorFlow Inception v3 method for designing a robust, which is a automated species identification system for frog species of Philippine, using a single-note spectrograms audio. Specifically, they examined two concepts: (1) how our deep learning model can differentiate closely related species based on advertisements that represent call notes, and (2) how this platform could be used to discover new species. The methods used for implementing is CNN method.Pattern recognition and image classification tasks are accomplished using Convolutional Neural Networks (CNNs), which are also members of the Deep Neural Network class. In CNNs, the ability to automate the feature extraction process eliminates the need for manualeffort. CNNs are constructed using layers of convolutional, pooling, and fully connected functions. This technique involves transferring experience between two tasks. Transfer learning occurs when task A acquires experience from task B. Inception v3 is one of the most successful models of transfer learning —a CNN, implemented in Tensor Flow. The ImageNet Inception v3 method produces greater results than other models when attempting to classify images into different categories, with 48 layers and trained for more than 1 Million images in this CNN. TensorFlow identified species results of 94% accuracy for overall correct identification rate. To find the optimal TensorFlow training settings for training correct identification rate and processing time, they calibrated models for classification challenges using different numbers of training steps.

[5] Deep Convolutional Neural Network Based Species Recognition for Wild Animal Monitoring (2018): This paper discusses how our society is less concerned about wildlife species and what we can do to change that Since camera-trap technologies are available at a reasonable cost, are easily deployable, and can be maintained, they are commonly used for wildlife monitoring. To segment out the moving foreground, the sequence technique used on the camera trap images is used first to analyze the data images. They have implemented two image classification algorithms:(1) An image classification algorithm that follows the Bag-of-Words model to classifya given image is used for species recognition. The BOW algorithm is very easy to use and quite robust when deformed. As a classifier, linear SVM was used to classify the image based on the histogram, then the image was characterized by the histogram. K-means clustering is used to train code books and for training image we have sampled 1000000 features from the images. (2) DCNN-based image classification based on deep convolutional neural networks algorithm for classification of wild animals In the case of these difficult camera-trap imagery data and the block was represented with three convolutional layers and three maximum pooling layers in a DCNN. Layers have kernels with different sizes, with convolutional layer having a kernel of 9 * 9 while layer with pooling layer has a kernel of 2 * 2. With DCNN based image classification, superior performance can be achieved over the majority of industry-standard algorithms The BOW model for species recognition was compared to our DCNN algorithm for camera-trap data derived from the collected camera-trap data. DCNN performs well when compared with other networks and has greater Accuracy compared to BOW mode. we can predict that the recognition algorithm Species based on DCNN are capable of rapid improvement as it can Identify species automatically from camera trap data after achieving automatic species recognition and large learning capacity.

[6] Wildlife Spotter Project (2017): Australia is a vast country and has several varieties of wildlife species. An ongoing science project is Wildlife Spotter undertaken by many organizations and universities in Australia, taking help from citizens as volunteers to classify species from millions of images captured by

camera traps. Over three million high-definition colour images have been captured by these cameras, placed in the rainforests, dry rangelands, and in cities across the country. The tremendous amount of images needs to beclassified and processed they invites them for joining for image analysing, the project invites volunteers to citizens as a scientists to classifythe image. In order to preserve ecosystems and save threatened species, the project analyzes captured images in order to assist researchers in studying Australian wildlife populations, behaviours and habitats Wildlife Spotter is composed of six sub-projects, based on six natural areas separated from each other in Australia: New South Wales that has Central mallee lands, South-central Victoria Queensland far north, Tasmanian nature reserves, coastal forests in New South Wales, Northern Territory arid zone . By signing up for online accounts, logging into a web-based image classification system, and manually labeling displayed images, volunteers participate in the project. By selecting the appropriate animal category from the list of animals, the user can assign an image to a specific species The user labels the animal viewif there is a defective problem, for example, because the image is blank or has an image problem. It is important to process each image inthe dataset several times and check each label by a different user in order to achieve reliable classification accuracy. For example, A majority of the classifications in the Victoria dataset were done by five individuals each. Camera traps collect more datasets in less quality which ultimately takes longer to process and results in inconsistent labeling, which can ultimately lead to inaccurate results. The purpose of this work is to develop an automatic framework for recognizing wildlife for their Wildlife Spotter project, Reducing considerably the amount of time spent on manual labelling while liberating scientists.

[7] Orientation Robust Object Detection In Aerial Images Using Deep Convolutional Neural Network (2019): Aerial image object detection is difficult and challenging for a number of reasons such as the color of objects, aspect ratios, unclear images, etc. A robust aerial object detection method is implemented here using DCNN features from a combination of layers. The object detection is important in image identification to know where to place the particular image. An SVM classifier is then trained on orientation invariant features to identify object candidates based on image segmentation. For orientation robust DCNN feature extraction, they utilize AlexNet architecture. With the use of selective search, the region proposals are effectively reduced by about 60% without compromising performance. Based on the results of this experiment, DCNN features obtained from combined layer features are efficient for detecting aerial objects. Moreover, the t-SNE analysis and visualization were also used as tools to identify the proper DCNN layers.

[8] Animal species classification using machine learning techniques (2019): Machine learning is widely used in animal detection using camera traps, especially to find animal predators that are of great threat to the humans. The machine learning techniques used in this paper are like Support Vector Machine(SVM) and Multilevel perception(MLP) to classify them as predators or pet based on the database that contain features like ears, eyes. The major problem in this research is image classification and because it can achieve strong generalisation with a small number of samples, SVM is one of the best linear algorithms in picture classification and pattern recognition. First the dataset was added having images of 10 animals (5 predators, 5 pet). Then statistical information was collected by methods like Mean, Standard Deviation and perimeter. dataset was divided into 2 sets one was training set which had 150 images and the other was testing dataset that had 50 image information in which 25 of them were predators and the rest were prey. The SVM accuracy rate for both the classes is 78% whereas of MLP is 82%. This proves that the neural network have a better potential to learn and work for nonlinear data. Finally this paper concentrates on the unique characteristics of the predator which help the nearby community to be aware of the presence of the predator as well as help farmers to protect livestock from animal attacks.

[9] Deep Residual Learning for Image Recognition (2020): This paper shows Deep residual nets are easy to optimize than 'plain nets' and Deep residual networks can easily obtain accuracy gain from greatly increased depth providing better results compared to old works. Two kinds of networks which are networks plain and residual networks. In Residual network, shortcut connections are used which inturn the network into residual version which can be used when both input and output have the same dimensions. Their work uses batch normalization immediately after each convolution and before activation. Fitting linear classifiers and regressors under loss functions is done using Stochastic Gradient Descent (SGD), which is a simple and effective method. This method on the ImageNet test set achieves 3.57% error. The paper also go through various other techniques like Identify and projection shortcuts, Deeper Bottleneck Architecture, object detection using state-of-theart algorithms on PASCAL and MS COCO. This work proves deep residual learning is efficient and more reliable for image recognition and helps to find the content in the image as it

uses residual networks.

[10] Edge Machine Learning for animal detection, classification and Tracking (2020): Prevention and maintaining the existing bio diversity is the most crucial part as we hear every time that a particular animal species are added into the endangered species list. The use of machine learning and camera traps will have great advantage as the system require minimum human works and low latency and also generate alarms in case of any danger. Transfer training is used to utilize pre-trained data and thereby reducing training time and amount of training data. Model SSD mobileNet V2 is employed which has the ability to detect more images per second makes it more accurate in object tracking. The concept of deep machine learning like CNN (convolutional Neural Network) is used for better object detection as well as tracking. The input given to the CNN model is tensor, which is a generalization of matrix in higher dimensions. Activation function is the output value which is calculated by each neuron by applying a non-linear function. This represents a neural output as function of its input. Sigmoid and Softmax are common classification functions used for loss computation. Other methods like Localization loss, Regularization loss are used to increase the ability of the network to locate the object in image. The training data typically contains classes of labels that contain how to handle all other objects that may appear, this is referred as open set recognition. In tracking, objects can be assigned with unique ID and extra information can be retrieved such the time duration and location and a tracking model generally consist of detector and a tracker. Finally this paper provides proof based on the efficiency of the deep machine learning techniques and the models they have used as well the datasets they have employed. It also helps to understand different frameworks like edge machine learning which leads to maximum output of the image captured.

[11] Quantum-soft QUBO Suppression for Accurate Object Detection (2020): Object detection algorithms have used non- maximum suppression for decades. They start by removing duplicate detections from the Quadratic Unconstrained Binary Optimization (QUBO) framework, which is made up of the detection score from each bounding box and the overlap ratio between pairs of bounding boxes. Redundant object detections are removed by QUBO framework. Tabu Search like classical algorithms reduces time complexity at the cost of reduced accuracy and shows the accuracy rate of 87.87%. The QUBO problem is solved using the Quantum-soft QUBO Suppression (QSQS) technique, which uses quantum computing capabilities to provide quick and accurate detection. The results show thatthe QSQS approach improves map for PASCAL VOC 2007 by two levels, from 74.20 percent to 75.11 percent.

[12] Fauna Image Classification using Convolutional Neural Network (2020): For image recognition, processing, and classification, a Convolutional Neural Network is the ideal choice. This paper employs a CNN-based fauna image classifier to accurately categorize photos of diverse animals collected in forest settings, assisting researchers in neural networks and artificial intelligence. This paper employs the D-CNN denoiser, which filters the signal supplied by the receiver. The Dn-CNN denoiser can also deal with blind Gaussian noise with unknown quantities of noise. It is required to give an input image with increased characteristics as a training sample in order to achieve the best results for object recognition and CNN training. The training algorithm's goal is to train a neural network to reduce the error between the network output and the desired output. Their model has successfully trained with the accuracy rate of 91.84%, and classified images with the accuracy rate of 99.77.

[13] Validating the practicality of utilising an image classifier developed using TensorFlow framework in collecting corrugation data from gravel roads (2021): By gathering data from gravel roads, this article makes use of technologies such as deep learning and image classifiers. The image classifier used in this research is created by Tensorflow framework. The image classifier will classify the severity of corrugation on gravel roads into five levels. The data will be evaluated in two sections: visual inspection and the other one is developed image classifier. The main purpose is to provide a Smartphone detector for gravel roads corrugation. This classifier will enhance the data collection process and provide the local agencies with a cost-effective data collection tool. A confusion matrix determines the achieved accuracy by using gravel roads. Confusion matrics are used to visualize important predictive analysis like recall, accuracy etc. The confusion matrix showed the accuracy level of 83% in the developed image classifier of practical field.

[14] Analyzing and Improving the Image Quality of StyleGAN (2020): This paper utilizes StyleGAN architecture which yields better results in generative image modeling. In addition to enhancing image quality, this path length regularizer has the added benefit of making the generator much easier to invert. It's

tough to provide a quantitative analysis of image quality. Frechet inception distance is used to calculate the difference in density between two distributions in an InceptionV3 classifier's high-dimensional feature space (FID). Precision and Recall (P&R) provides further transparency by quantifying the percentage of generated images that are similar to training data and the percentage of training data that can be created. In order to stabilise highresolution picture synthesis, progressive growth has been very helpful. Finally this configuration has achieved 40% faster than original StyleGAN. This is because of weight demodulation, lazy regularization, and code optimizations.

[15] Deep Learning Object Detection Methods for Ecological Camera Trap Data (2018): In this Paper They are discussing about the ecologists in the Population uses camera traps as a basic approach for the monitoring of animal populations and for managing ecosystems at a global level. Due to the more usage of camera Traps As camera traps respond to motion, they have become increasingly popular as they typically capture an animal when it enters the frame and therefore capture images of it. They have used Identification, characterization, quantification, and identification of wildlife species using deep learning techniques based on object detection in camera trap images. Images of animals positioned at varying distances from each other are often obstructed and chaotic, rendering this method ideal for species classification from the camera, the image has been cropped or the subject is too close to the camera. Two deep learning object detection classifiers have been trained and compared to implement their capabilities:(1) Faster Region-Convolutional Neural Network It's the first approach where an image is taken and by using an A series of different sized boxes is used to segment the images, and each box is then divided by a CNN algorithm. With the faster R-CNN framework, you can now write near-cost-free region proposals via a Region Proposal Network (RPN)(2) As a second approach for object detection, YOLO divides a picture into squares, with each square acting as a pre-defined anchor for larger categories of interest. The output classifications for every anchor are returned after every iteration when training and using YOLO the dataset that is used for classification is Reconyx Camera Trap dataset along with the SnapshotSerengeti data set with self-labelled Gold Standard. Technology and advances in the areas of computer vision and deep learning have led to reliable methods of detecting objects in the recent past. Camera trap data can be analyzed more accurately and efficiently with R-CNN using a faster The anchor boxes used in the YOLO algorithm are generally static, making it less accurate than the other algorithm This R-CNN overperformed YOLO v2.0 on the two given data sets with a good accuracy rate of 93.0% and 76.7%.

[16] Deep CNNs for large scale species classification (2019): The world contains several thousands of species of animals Computer vision presents a very challenging field of large scale image classification. In order to apply popular techniques and models to real world problems, understanding how they perform is essential. The real world consists of billions of varieties with the recent advances and Technologies by using deep learning, and with the availability of large datasets, we can attempt to solve this problem in a feasible way. We will adopt the best performance of a CNN architectures along with the methods like transfer learning and data pruning for evaluating classification performance and discovering the best work. They have implemented appropriate techniques and most efficient CNN based deep learning architectures on the dataset from iNaturalist 2019 Challenge Classification of species at a large scale. A dataset used above can be suitably categorized into Amphibians, Reptiles, Birds, Insects, Fungi and plants with a total of many different species. Methods that are using the data pruning technique and the transfer learning technique outperform models that aren't trained using either of them. The dataset was undergone for Preprocessing to remove unwanted image and then resizing of images was done such that they are of the suitable size for the CCN architecture we use. We split the train/validation images set into 90% train and 10% validation Transfer Learning has been a popular technique used to improve the performance of classifiers over image classification tasks. There have been many popular CNN architectures that have been known to perform well on image classification tasks. Some of them are AlexNet was the first widely popular CNN architecture that beat traditional image classification techniques. Densenet was built on top of networks proposed earlier to address the vanishing gradients problem. ResNext is an extension of the original ResNet deep residual network architecture. The standard residual block will replace with another one which uses split-transform Merge strategy method that is used in inception modules. ResNextperforms the best for large scale classification compared to other architectures. ResNext has the least validation error and greater efficiencyamong other architectures.

[17] Image Classification using Convolutional Neural Network (2020): Computer vision involves many common and basic tasks, including image classification, and it has been drawing increasing attention in

recent years. Management and conservation decisions regarding migration patterns, habitat protection, and preservation of wild animals are highly dependent on monitoring their natural habitats efficiently and effectively wildlife species and grouping species of same animals together and also rehabilitation. Today, with the growth of technologies and with necessity applications of Artificial Intelligence, with different fields Deep Learning, Machine Learning and Neural Networks, and its subsets have Increased their momentum. The neural network developers are "training" the network in such a way to be "intelligent" and "independent" and has become a data centric model. To conduct training successfully, it requires appropriate tools and software, such as classifiers with the ability to analyze, extract useful features and feed huge amounts of data. The above features are then used next time it is fed and pattern is observed and a network is trained based on the data. Artificial neural networks and deep learning use convolutional neural networks so that an input image can be analyzed, the importance of varying aspects in the image can be assigned, and these aspects can be differentiated from one another Aiming to recognize, process, and classify images effectively. Using convolutional neural networks, the classifiers in this paper are designed to classify images of different animals using an image classifier for fauna In dense forest environments, species which are captured with high precision can be captured, We will be studying further the findings of the artificial intelligence, zoological domains, and neural network researchers in order to improve the environment, habitat, and extinction patterns. An artificial neural network (CNN) is designed for efficiently classifying images with greater accuracy based on the convolutional neural network (CNN) developed and trained. An accuracy of 91.84 % is achieved by the proposed method using convolutional neural networks to classify images and classified images with 99.77% accuracy. For the purpose of training the model technologies like Leaky ReLU, Tensorflow,VGG16, etc have been used. It uses Leaky ReLU for Classification of images using convolutional neural networks. A comparison was done between different activation functions and convolutional neural networks, and we noticed for the classification of images using the ReLU activation function and VGG16 model, the results have been most accurate and appropriate.

[18] A Systematic Review About Use of TensorFlow for Image Classification and Word Embedding in the Brazilian Context (2020): Due to the recent Advancement of Technologies, there is huge demand for Artificial Intelligence (AI). Some Machine Learning applications include image recognition, natural language processing, speech recognition, search engines, , handwriting recognition and robot locomotion we can find several frameworks for Machine Learning applications, such as TensorFlow which uses Google's framework , Azure that uses Microsoft framework and AWS TensorFlow. The popularity among developers who are intending to apply machine learning to overcome challenges, such as to provide personalized and real-time feedbacks and preparing teachers to use intelligent tools in order to anticipate interventions. Thus, this paper intention is to present results of a systematic review that Brazilian papers use Google's AI framework to identify and analyze, known as TensorFlow. There are many varieties of applications that TensorFlow can be used for, such as word embedding, image classification, recommendation systems, chatbot building and stock prediction. However, the systematic review many focused only on applications such as image recognition and word embedding because they are the two which was most used by TensorFlow. These two types of applications have transformed basic everyday actions such as writing a faster message on WhatsApp, unlocking a mobile screen through facial recognition or Email by proposing a set of words according to the context presented. Image classification applications serve to unlock a cell phone screen, to find a suspect, or even to identify an unknown object. Basically, the image classification process uses algorithms that search, compare, and try to find relationships among a given image and also other stored images in a database. Word embedding applications are other tasks that can be implemented by TensorFlow when you are writing a message, this type of application suggests some words according to the meaning presented, reducing the user's time and effort. The systematic review model proposed was adapted, which consisted of 3 phases: (1) Input – definition of one or more research questions, search engine, search string, and inclusion and exclusion criteria; (2) Processing- search for papers according to criteria and it defined search location and (3) Output – list of filtered papers with your relevant information. The systematic review of papers is made about word embedding and image classification applications with the TensorFlow framework written in Brazilian context. After a systematic search, 12 papers were researched in this area, 2 for word embedding applications and 10 being for image classification.

[19] Deep Learning methods for Animal Recognition and Tracking to Detect Intrusions (2020): The number of recorded human- animal conflicts has been steadily increasing over the last few years. The major reason for this condition is due to increased rate of forest reduction and also reduction of different species. They stray close to humans mainly for food As a result they perform this type of activity. Hence it is necessary to have a automated system to detect any animal sighting in the nearby locality. Recent

technologies like artificial intelligence, Machine Learning and deep neural network have made easier to tackle and understand these problems in an easy and effective way. For the detection of animals or humans, this research proposes to employ the YOLO object detection approach. This model is trained to identify 6 different entities; in which 1 is human and the other 5 entities are elephant, zebra, giraffe, lion and cheetah. The animal is monitored using CSRT to establish its intents after the object is identified, and alarms are given to the authorities depending on the information acquired. The device used in the project is Raspberry Pi devices equipped with cameras. The Techniques involved for implementing the above must be understood and learned as possible by using analysis method. In the task of image classification, DCNN are recognised to be accurate and surpass all other methods. Object detection systems classify entities inside images by predicting zones of interest. YOLO is a DCNN object detection model that is fast and accurate. Because of its speed and accuracy, the CSRT tracker is used to successfully track animals. This tracker is dependable, and it eliminates the need for expensive and time-consuming continual object detection. Finally, this approach was able to distinguish animals and humans with an accuracy of 98.8 percent and 99.8 percent, respectively.

V. Methodology

The dataset collected is the input of our project. This dataset undergoes pre-processing technique where the unwanted data or the empty data are removed from the dataset. After pre-processing of data, the images in the dataset are passed to the segmentation process where the background as well as foreground is formatted using the clustering techniques. The most used clustering technique for image processing is K means clustering method. The segments of the image are passed to the Deep learning method which is a supervised technique where the outcome of the task is known and the model is trained in the similar way.For image processing the suitable method is Deep CNN Algorithm which checks each pixel of the image and predicts the model this model is the output of the CNN algorithm. The predicted model of undergoes image classification method where several images are converted into pre-determined classes it's like predicting and classifying the probability that an image belongs to each class. The model also undergoes object detection technique where the classified images are used to locate the instances of predefined object classes within images. Finally, according to the user input in the front end the model processes the task in the backend the displays the output of the animal.

VI. General Procedure

A web app can be developed to display the prediction for providing a smooth user interface. The Overall procedure for identifying and classifying the animal Species is depicted in Fig. 1

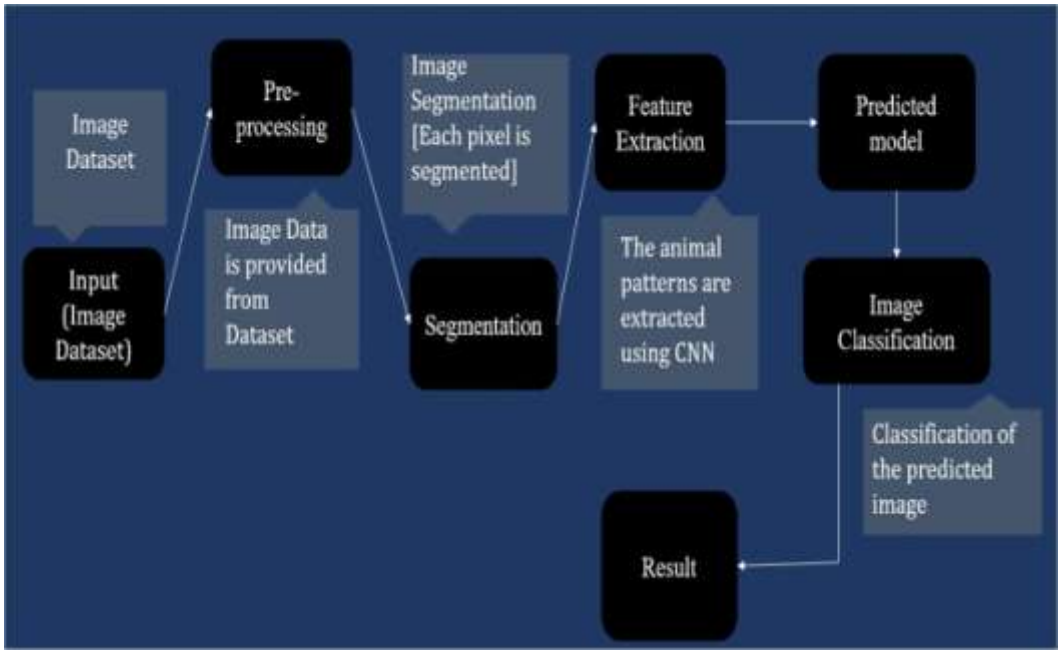

Fig. 1: General Procedure

A model Trained with a suitable dataset should be identifying the animal Species. After identification, the model should classify the animal by specifying the name of the animal. Fig. 2 represents an expected output.

Fig. 2: Expected Outcome

VII. Conclusion

We have proposed an approach of detecting the animals in the image of the camera traps which helps to avoid them from poaching, prevent them from extinction and also through the images of the camera traps we can prevent all the illegal activities done in the forest areas. This approach helps to conserve and maintain balanced ecosystem. In this phase of the project, we reviewed the literature on the automatic detection and classification of Animal Species. This literature helps us understand the challenges that we face in the image dataset to identify the animals in a particular image. According to the literature experimental results we came to know that convolutionalneural network helps in Animal Identification and helps to eradicate the challenges that we have mentioned in the dataset thet comes in the dataset and also the accuracy rate of this neural network is far better than other neural networks. This helps the ecologists to study about wildlife ecosystem and the forest officer to keep track on the activities that go throughout the forest areas.

VIII. Acknowledgment

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