Bird Species Detection Using Sound

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Abstract – India has gained international attention as a result of its air pollution, cutting down of trees etc. And also major attention of environment degradation due to which many wildlife and bird species getting extinct or some are in the verge of extinction. So for protection there species government set up many organization and also setting up wildlife and Bird sanctuary. Identifying a bird can be challenging, so even for experienced birders or bird watcher its very difficult and if you're new to using forest guides, it can be formidable to figure out where to begin searching in the hundreds of species. By some features like size, shape and colour and different body types birds can be classified. By using KNN AND KCHH algorithm, we can classify the species of the birds. Main problem is that the recognition of birds by their images is not effective at that level or sometime determine wrongly. so our main problem remain same and there is no change, so thus we need to add some additional requirements in it or enhance some properties in it. Two-layer authentication provides improved protection. which is essential for online banking security, voting system, secure transactions, secure virtual meetings, etc.

Key Words**: Audio Analyzer, VAD, Markov model, KCHH, Deep Learning, k-nearest Neighbours, Audio Processing, librosa , Acoustic classification, audio .wav file.**

1. INTRODUCTION

India currently ranks second in the world for pollution levels. Recently, bird behavior and population patterns have become an important issue. Birds respond quickly to ecological changes, which helps them to effectively perceive different life forms on Earth. In any event, compiling and collecting data on bird species requires a great deal of human effort and is a very expensive technology. In such cases, we need a robust framework to process wild bird data at scale and become an important tool for scientists, legislators, and others. In this way, bird species identification tests play an important role in recognizing which category a picture of a bird belongs to. Bird species identification is the prediction of which bird species belong to which category from an image. Bird species identification is possible through images, sounds, or videos.It is conceivable to recognize phonetic symbols by catching different birds, depending on the speech processing method However, working with such data is increasingly confusing due to mixed sounds in conditions such as spooky crawls and real-world objects. People usually discover images more effectively than sounds or recordings. Therefore, approaches to classify birds using images are preferred over audio and video. Bird species identification is a daunting task, both for humans and for computer processes that perform such tasks in an automated fashion. Like India, which has a population of about 1.4 billion. Typical urbanization and industrialization. For this reason, vacant land is needed to build houses, cities and factories. Therefore, cutting trees means practicing deforestation. Deforestation has led to environmental degradation and disruption of ecological balance. It also led to the destruction of the Bird Kingdom. reserve or forest. The Many Worlds Organization and naturalists and birdwatchers find it very difficult to identify words from photographs or photographs, in order to accurately count birds belonging to any category or species. This helps maintain ecological balance. So many experiments and innovations have been made in this regard, but they cannot provide accurate or correct results. This means that they are missing and do not provide exact accuracy. To solve this problem, we add some additional requirements. So add a sound device analyzer or sound detector. Counting birds inevitably suffers from imperfect perception. This involves imperfect recognition across species.

2. LITERATURE SURVEY

Professor Pralhad Gavali, Prachi Abhijeet Mhetre, Neha Chandrakhant Patil, Nikita Suresh Bamane, Harshal Dipak Buva: Bird Species Identification with Deep Learning. In this paper, they have either solved the problem or are trying to solve the problem of use. They use a lower version of the algorithm i.e. DCNN. We use the Caltech-USCD Birds 200 [CUB-200-2011] dataset because it is very difficult and inaccurate to identify bird species from images. So I try to solve the problem with precision to some extent, but this approach is not good at all. not very accurate [1]

Ms.SatyaSai, Prof.Sivaranjani, Mr.Apuroop, Ms.Mounika, Mr.Sai Kumar Anil Neerukonda, Bird Identification Using CNN: Various machine learning algorithms were used in this study and are used in this article. One of the algorithms we are working on is an algorithmthat identifies bird species from CNN images. They use advanced targeting algorithms, but the main problem Reviews remains the same. And they don't get the exact accuracy they need to get it -- they get about 80% accuracy. However, this precision never exceeds the specified mean line. Therefore, advanced algorithms or additional approaches are required.[2]

Ameya Joshi, Rohit Patki , Bird species identification from an image: This study is almost same as but they are using different datasets that have around 11000 approx birds images of around 200birds .That make great variety of identification techniques that compare input images from the images and pics present in the datasets.in this they are taking some modern datasets that carry some additional data and pics of birds in it. There is around 11000 approx of 200-250 birds with different species and sub- species present there. so there is need some another type ofalgorithm who determine such large variety of distinguish and give some more accurate results. [3]

J Niemi, JT Tanttu, Deep Learning Case Study on Automatic Bird Identification - This study shows that the same cnn algorithm is used. One advance, however, is the use of automated techniques to extract images from datasets without the use of manual techniques. Using automation technology makes this a lot easier and the predictions and analysis are highly accurate even in the absence of human error. How to add automation technology to give some edge to paper [4]

easy to use

- takes less time
- more accuracy
- analyzing wide variety of images at one go

Franceco Renna Hanja, Lilana R.silva, Hanja B.Brandl Deep learning-based method for individual recognition of small birds:- In this article, we also used the same deep learning algorithm, but we mainly focused on images of small birds. .And they try to solve the accuracy problem. For this reason, they mainly focus on small birds that do not have the desired accuracy or favorable results.Deep learning-based models have similar body shapes and wing shapes to some extent, so model-based efficiency Bird species can be predicted by facilitating the prediction of small birds using a method.This one has the same eye color and head shape and is smaller. [5]

Adnan Mohsin Abdulazeez, Dather Abs Hasan :- This paper uses machine learning algorithms to classify, store and classify bird calls.As an additional requirement, they used some bird-calling techniques to help birdwatchers predict each type of bird and its subcategories, or some bird species. I use some conventions to do this. The system also features species classification techniques, but accuracy is still a major concern when using all of these techniques.[6]

Yogesh Kumar, Surbhi Gupta: They are using automated technology to classify bird species, which is beneficial for surveillance environments. They use some modern or efficient automation techniques in their sound. After using , current research shows that deep learning models such as ResNet50, InceptionV3, Xception and Efficient Net can effectively extract, process, analyze and recognize speech signals of various bird species with considerable predictions. Confirmed for accuracy. [7]

Arti Bang, Pritin P Rege: In these methods, bird species are classified based on voice recordings, a number of perceptron methods, and a number of extraction methods used in data extraction. In doing so, we use data reduction techniques. Classification is performed by a special type of algorithm, the K nearest neighbors algorithm. •PCA: The algorithm is thenappliedto both training and test data images to extract all features from each image. Then the eigenvalues or core values are calculated from his PCA components to get 90% of the variance. • Classification engine: The matrices obtained from PCA are input to a machine learning engine for

training called the classification process. • Modules: Comparing the recognition accuracy of ANN and test data set, CNN, we find that CNN provides higher accuracy compared to other algorithms. [8] Kuan Qian, Alice Baird: - These articles demonstrate an active learning method for bird species classification. Bird song taxonomy is a very important tool for ecologists and ornithologists. Introducing active learning and active algorithms for classifying bird species for the first time. Passivelearning method, achieving acceptable performance Unweighted mean recall >85% [9]

Kevin Gunman-William, Bens Pardeman: This article focuses on just one species of bird, the owl, which is classified in a number ofdifferent ways. They used the same algorithm, but only focused on one bird: the owl and its subspecies. Focus on only one word to get accuracy higher than the specified threshold. So it's verysimple and easy, just using one word. A drawback of this experiment, however, is that it may not be useful to birdwatchers or ecologists, as each output yields only one result of his [10].

3. PROBLEM STATEMENT

Firstly, we see as a problem to identify or recognise bird species and its sub –species. for normal human being its very difficult to identify the bird and its sub species even the experts and the wildlife watcher can't recognise easily .so we need some special type of application that can identify bird species easily using its sound variations. its mainly pre process the data and analyze its. the need of this project is need of hour because due to urbanization, deforestation etc. Due to this development the many birds loosing their natural habitat .and this led to extinction of bird species and many birds are getting on the verge of extinction .so for maintaining ecological balance and keep a watch over the birds and its sub species. because for maintain the ecological balance in food chain we need solution with utmost accuracy.

4. METHODOLOGY

The method is simple we take .wav file which maximum size will be 16 mb not more than that as a input file after that using KCHH algorithm we process the sound file and get important sound after filteration The sound we get is noise free, its doesn't have any difference between frequency and its pitch. then for further process we have to download several modules like librosa, ffbef, tenserflow, flask etc and also we have to define the path of every module in environmental variables. This web application using frontend as Html,,Css, Javascript and flask .so for running project efficiently we need these modules. The .wav files we can download from xenon websites where we find different files with different wave lengths and sizes, only we have to download that. By using voice activity detection we catch the sound and after purification or pre processing the sound we get raw data that can be use in further process. this divides our dataset into train, validation and test set in ratio 8:1:1. We can't use pre programmed functions to do that, because we have divided each of our files into other smallers. Putting images made out of same mp3 file or .wav file might lead to the data loss and make our results not biased. The data should be prepared. Each song is cut into 5 second recordings and pre processed into mels pectrograms. The purpose is to normalize dataset to have same size along the whole dataset in one run, and to de noise recordings. Morover , the data is filtered with a high-pass filter. Data can be pre processed using some vs code extension or jupyter notebook file. We approached the problem of song classification with Convolutional Neural Networks. We have tested it with: Xception, Mobile Nets, Efficient Nets, Handcrafted CNN's, Other. It was designed to be a training project & collaboration on a real-life problem which machine learning can help to solve. after all the things and feature extraction then HMM masrkov model differentiate bird feature on the basis bird species likelihood. after the selection the actual sound then its goes to final stage selection of bird speceies and give result utmost accuracy. By the using of spectrogram we get visual representation of the spectrum of the different cfrequencies of a sound and how much its varies with time and also the mel scale is known as an audio scale of sound pitches that seem to be equal distance from every listeners.
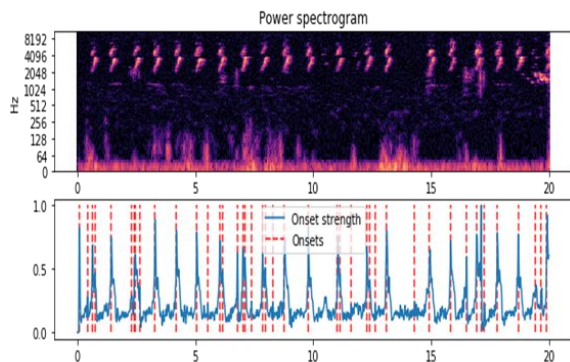
4. IMPLEMENTATION

This project was designed to be a collaboration on a real-life problem which machine learning help to solve with a structure of a data science and machine learning project including data research, data analysis, data preparation, creation of models, analysis of results and the final presentation or final result. After the weeks of work and months of hardwork , the group has managed to build a solution that predicts the right bird's name with good and better accuracy on the test sample. The birdsong and its call analysis and classification is very interesting problem to tackle Birds that have many types of voices and the different types of functions or different pitch of sounds. The most common are song and 'different voices'. The song or call is the "prettier" — melodic type of voice, thanks to which the birds mark their territory and get partners for mating. It is usually much more complex and longer than " various call".Call-type voices include contact and alarm voices. Bird voices and magnetic type of calls are used to keep birds in a group during flight or foraging, for example in the treetops, alarm ones to alert ,when a predator comes. Most often these are short and simple voices but are more effective and efficient. Each sound we hear is composed or a mixture of multiple sound frequencies and amplitude at the same time. That is what makes the audio sound very "deep". There is a different trick of spectrogram to visualize those frequencies in one plot, instead of visualizing only the amplitude and pitch as in the waveform. Mel scale is known as an audio scale of sound pitches that seem to be in equal distance from each listeners
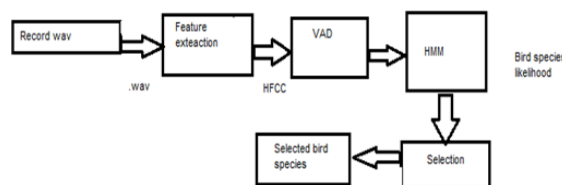
5.CONCLUSION

This study investigated how to identify bird species using a deep learning algorithm on a dataset (Caltech-UCSD Birds 200) to classify images. It consists of different categories or 11,788 of his photos. The generated system is connected to his user-friendly website where the user proposed system works on a principle based on partial uploads a photo for identification purposes and provides the requested output. The recognition and extraction of his CNN features from multiple convolutional layers. These features are aggregated and passed to the classifier for classification. Based on the results obtained, the system provided 87% accuracy in predicting bird species locations. As a main conclusion, we found that adding some additional sound analyzers to the process solved some of the problems to some extent.

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