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DEEP LEARNING FOR BIRD SPECIES IDENTIFICATION

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ABSTRACT:

Now a day some bird species are being found rarely and if found classification of bird species prediction is difficult. Naturally, birds present in various scenarios appear indifferent sizes, shapes, colors, and angles from human perspective. Besides, the images present strong variations to identify the bird species more than audio classification. Also, human ability to recognize the birds through the images is more understandable. So this method uses the Caltech UCSD Birds 200 [CUB-200-2011] dataset for training as well as testing purpose. By using deep convolution neural network (DCNN) algorithm an image converted into gray scale for mat to generate autograph by using tensor flow, where the multiple nodes of comparison are generated. These different nodes are compared with the testing data set and score sheet is obtained from it. After analyzing the score sheet it can predicate the required bird species by using highest score.

Keywords **:** Autograph, Caltech, DCNN, grey scale, pixels, Tensor flow

[1] INTRODUCTION

Bird behavior and population trends have become an important issue now a day. Birds help us to detect other organisms in the environment (e.g. insects they feed on) easily as they respond quickly to the environmental changes. But, gathering and collecting information about birds requires huge human effort as well as becomes a very costlier method. In such case, a reliable system that will provide large scale processing of information about birds and will serve as a valuable tool for researchers, governmental agencies, etc. is required. So, bird species identification plays an important role in identifying that a particular image of bird belongs to which species. Bird species identification means predicting the bird species belongs to which category by using an image. The identification can be done through image, audio or video. An audio processing technique makes it possible to identify by capturing

the audio signal of birds. But, due to the mixed sounds in environment such as insects, objects from real world, etc. processing of such information becomes more complicated. Usually, human beings find images more effective than audios or videos. So, an approach to classify bird using an image over audio or video is preferred. Bird species identification is a challenging task to humans as well as to computational.

Birds allow us to search certain organisms within the environment as they respond quickly to changes in the atmosphere (for example, the insects on which they feed) But collecting and gathering bird information requires huge efforts by humans as well as being a much more expensive method. In such situations, a robust system must be in place that will provide large scale bird information processing and serve as a valuable resource for scholars, government agencies and soon. Consequently, naming bird species plays a significant role here for determining which species belongs to a specific image of birds. Generally; the identification of birds has done using the image, audio or video. In 2013, the IEEE International Machine Learning Workshop for Signal Processing (MLSP) declared a challenge to identify bird species. The audio processing technique allows for the detection of birds by recording the audio signal. But the processing of such information becomes more complicated because of in the environment; the mixed sounds like insects, real world objects, etc. Usually, people are more effective at find images than audios or videos. So, it is preferable to use an image over audio or video to classify birds ornithologists have been facing problems in identifying bird species for many decades. They have to learn all the specifics of birds, such as their climate, genetics, distribution, environmental impact, etc. Normally, bird identification is conducted by an ornithologist based on the classification suggested by Linnaeus based on criteria such as State, Clade, Rank, Order, Family and Species.

The rest of the paper will be arranged as below. First, brief over views of a general introduction to the images for species and then their classification methods. The identification can be done through image, audio or video. An audio processing technique makes it possible to identify by capturing the audio signal of birds. But, due to the mixed sounds in environment such as insects, objects from real world, etc. processing of such information becomes more complicated. Usually, human beings find images more effective than audios or videos. So, an approach to classify bird using an image over audio or video is preferred. Bird species identification is a challenging task to humans as well as to computational algorithms that carries out such a task in an automatic fashion.

Since many decades, ornithologists are facing problems in bird species identification. Ornithologists require studying all the details of birds such as their existence in environment, their biology, their distribution, their ecological impact, etc. Bird identification is usually done by ornithology experts based on classification proposed by Linnaeus: Kingdom, Phylum, Class, Order, Family, and Species. As image based classification systems are improving the task of classifying, objects is moving into data sets with far more categories such as Caltech-UCSD. Recent work has seen much success in this area. Caltech- UCSD Birds 200(CUB-200-2011) is a well-known dataset for bird images with photos of 200 categories. The dataset contains birds that are mostly found in Northern America. Caltech-UCSD Birds 200 consists of 11,788 images and annotations like 15 Part Locations, 312 Binary Attributes, 1 Bounding Box.

In this paper, instead of recognizing a large number of disparate categories, the problem of recognizing a large number of classes with in one category are investigated that of birds. Classifying birds pose an extra challenge over categories, because of the large similarity between classes. In addition, birds are non-rigid objects that can deform in many ways, and consequently there is also a large variation with in classes. Previous work on bird classification has deal with a small number of classes, or through voice.

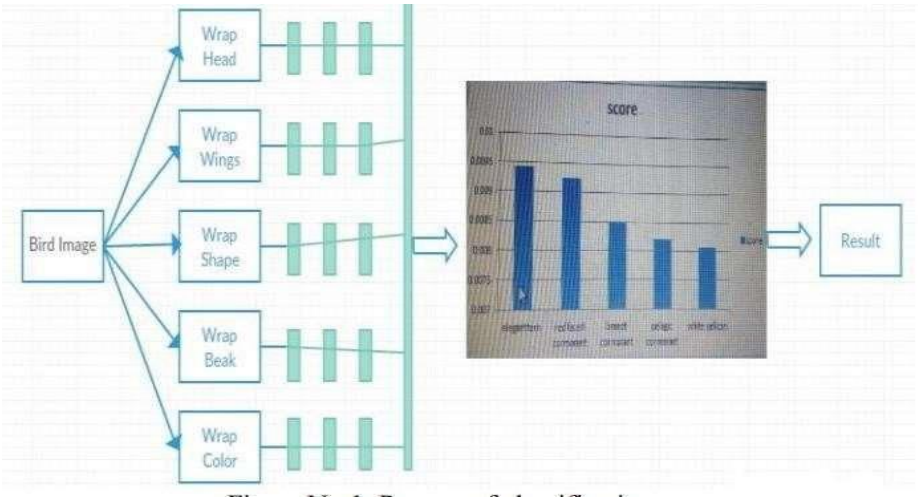

Fig. 1 Process of detecting the bird from image

The figure 1 represents the process of detecting the bird from image. The image is getting up load first then from that image the various alignments will be considered such as head, body, color, beak and entire image. Further, each alignment is given through deep convocational network to extract features out from multiple layers of network. After that representation of the image will get consider. Then on the basis of it the classifying result will get generated (i.e. features are aggregated to transfer it to classifier) and the bird species will get found.

[2] LITERATURE SURVEY

Basically bird identification is done visually or acoustically. The main visual components comprise of bird's shape, its wings, size, pose, color, etc. However, while considering the parameters time of year must be taken into consideration because bird swings changes according to their growth. The acoustics components comprise the songs and call that birds make. The marks that distinguish one bird from another are also useful, such as breast spots, wing bars which are described as thin lines along the wings, eye rings, crowns, eye brows. The shape of the beak is often an important aspect as a bird can recognized uniquely. The characteristics of bird such as shape and posture are the mostly used to identify birds.

Mostly experts can identify a bird for its silhouette because this characteristic is difficult to change. A bird can also be differentiated using its tail. The tail can be recognized in many ways such as notched, long and pointed, or rounded. Sometimes legs are also used1 for recognizing an image in format long, or short. By considering a single parameter will not yield an accurate result. So, multiple parameters are to be considered in order to get appropriate output. The size of a bird in an image varies depending upon factors such as the resolution, distance between the birds and the capturing device, and the focal distance of the lens. Therefore, based on a practical observation for large number of images, images are differentiated on the basis of color which consists of various pixels.

In depth it is found that greater the image quality greater is its accuracy. The automatic bird species identification for bird images project present a series of comparison conducted in a CUB200 dataset composed of more than 6,000 images with 200 different category. In this paper, they have considered two different color spaces, RGB and HSV, and a different number of species to be classified. If the image consists of more than 70% of the pixels the accuracy of output was ranging from 8.82% to 0.43%. The methodology is for developing the system certain methodologies have been used. They are as follows: Dataset (Caltech-UCSD Birds 200), Deep Con volitional Neural Network, Un supervised learning algorithm, etc. Birds Identification System using Deep Learning Suley man A. AlShowarah1, Sohyb T. An l-q bail at 2 Faculty of Information Technology Mutah University, KarakJordan

Identifying birds is one of challenging role for bird watchers due to the similarity of the birds' forms/image back ground and the lack of experience for watchers. So, it needs a computer system based images to help birdwatchers in order to identify birds. This study aims at investigating the use of deep learning for birds' identification using convolution neural network for extracting features from images. The investigation was performed on database contained 4340 images that collected by the paper author from Jordan. The Principal Component Analysis (was applied on layer 6 and 7, as well as on the statistical operations of merging the two layers like: average, minimum, maximum and combine of both layers. The data sets were investigated by the following classifiers: Artificial neural networks, K-Nearest Neighbor, Random Forest, Naïve Bayes and Decision Tree. Whereas, the metrics used in each classifier are: accuracy, precision, recall, and F-Measure. The results of investigation include and not limited to the following, the PCA used on the deep features does not only reduce the dimensionality, and therefore, the training/testing time is reduced significantly, but also allows for increasing the identification accuracy, particularly when using the Artificial Neural Networks classifier. Based on the results of classifiers; Artificial neural networks showed high classification accuracy (70.9908), precision (0.718), recall (0.71) and F-Measure (0.708) compared to other classifiers.

Identification of bird species is a challenging task often resulting in ambiguous labels. Even professional bird watchers sometimes disagree on the species given an image of a bird. It is a difficult problem that pushes the limits of the visual abilities for both humans and computers .Although different bird species share the same basic set of parts, different bird species can vary dramatically in shape and appearance. Intra class variance is high due to variation in lighting and background and extreme variation in pose (e.g., flying birds, swimming birds, and perched birds that are partially occluded by branches). Our project aims to employ the power of machine learning to help amateur bird watchers identify bird species from the images they capture.

Survey of different classification methods: John Martinsson et al (2017), presented the CNN algorithm and deep residual neural networks to detect an image in two ways i.e., based on feature extraction and signal classification. They did an experimental analysis for datasets consisting of different images. But their work didn't consider the background species. In Order to identify the background species larger volumes of training data are required, which may not be available. Juha Niemi, JuhaT Tanttuetal(2018), proposed a Convolutional neural network trained with deep learning algorithms for image classification. It also proposed a data augmentation method in which images are converted and rotated in accordance with the desired color. The final identification is based on a fusion of parameters provided by the radar and predictions of the image classifier. 13 Li Jian, Zhang Lei et al (2014)[3], proposed an effective automatic bird species identification based on the analysis of image features. Used the database of standard images and the algorithm of similarity comparisons.

Madhuri A. Tayal, Atharva Magrulkaretal (2018), developed a software application that is used to simplify the bird identification process. This bird identification software takes an image as an input and gives the identity of the bird as an output. The technology used is transfer learning and MATLAB for the identification process.

Aggregation processing was employed to reduce the number of interval soft he histograms to a fixed number of bins. In this paper, the authors experimented with the CUB200 data set and results show that this technique is more accurate. Marcelo T.Lopes, LucasL. Gioppoet al (2011) , focused on the automatic identification of bird species from their audio recorded song. Here the authors dealt with the bird species identification problem using signal process inland machine learning techniques with the MARSYAS feature set. Presented a series of experiments conducted in a database composed of bird songs from 75 species out of which problem obtained in performance with 12 species. Developed a hybrid deep neural network hidden Markov model (DNN-HMM). The developed models were employed for bird species identification, detection of specifics pieces and recognition of multiple bird species vocalizing in a given recording. In this paper, the authors achieved an identification accuracy of 98.7% and recognition accuracy of 97.3%. Mario Lasseck etal (2013), presented deep convolutional neural net works and data augmentation techniques for audio-based bird species identification. In this paper, the author used the Xeno-Canto set of audio recordings of bird species.

In this paper Existing System , to identify the bird species there are many websites produces the results using different technologies. But the results are not accurate. For suppose if we will give an input in those websites and android applications it gives us multiple results instead of single bird name. It shows us the all bird names which are having similar characteristics. So, we aimed to develop a project to produce better and accurate results. In order to achieve this, we have used Convolutional Neural Networks to classify the bird species. The disadvantages is due to the mixed sounds in environment such as insects, objects from real world, etc. processing of such information becomes more complicated. By using Computational Algorithm technique will not give accurate result as audio may contains background or other animal voices.

In this paper the Proposed System is, Convolution neural network algorithm is a multilayer perception that is the special design for the identification of two-dimensional image information. It has four layers: an input layer, a convolution layer, a sample layer, and an output layer. In deep network architecture, the convolution layer and sample layer may have multiple. CNN is not as restricted as the Boltzmann machine, it needs to be before and after the layer of neurons in the adjacent layer for all connections, convolution neural network algorithms, and each neuron doesn't need to experience the global image, just feel the local region of the image. In addition, each neuron parameter is set to the same, namely, the sharing of weights, namely each neuron with the same convolution kernels to the de convolution image.

The key era of CNN is the local receptive field, sharing of weights, sub sampling by using time or space, with a purpose to extract features and reduce the size of the training parameters. The advantage of CNN algorithm is to avoid the explicit feature extraction, and implicitly to learn from the training data. The same neuron weights on the surface of the feature mapping, thus the network can learn parallel, and reduce the complexity of the network. Adopting sub-sampling structure by time robustness, scale, and deformation displacement. Input information and network topology can be a very good match. It has unique advantages in image processing. The Convolution Neural Network involves these steps. In this paper advantage is data set is validated with an accuracy of 75% to increase the performance of system.

[3] SYSTEM ARCHITECTURE

3.1 Architecture for Bird Species Identification

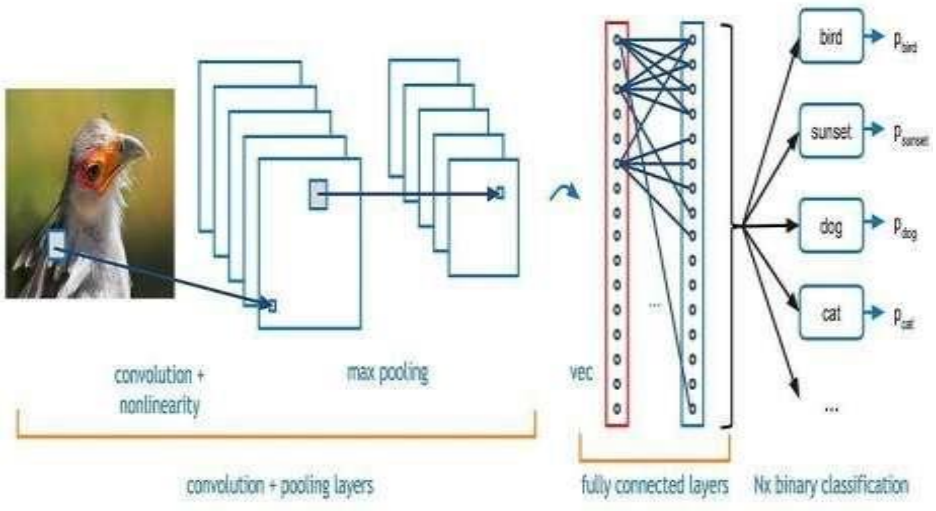

Fig.1 Architecture of Bird Species Identification

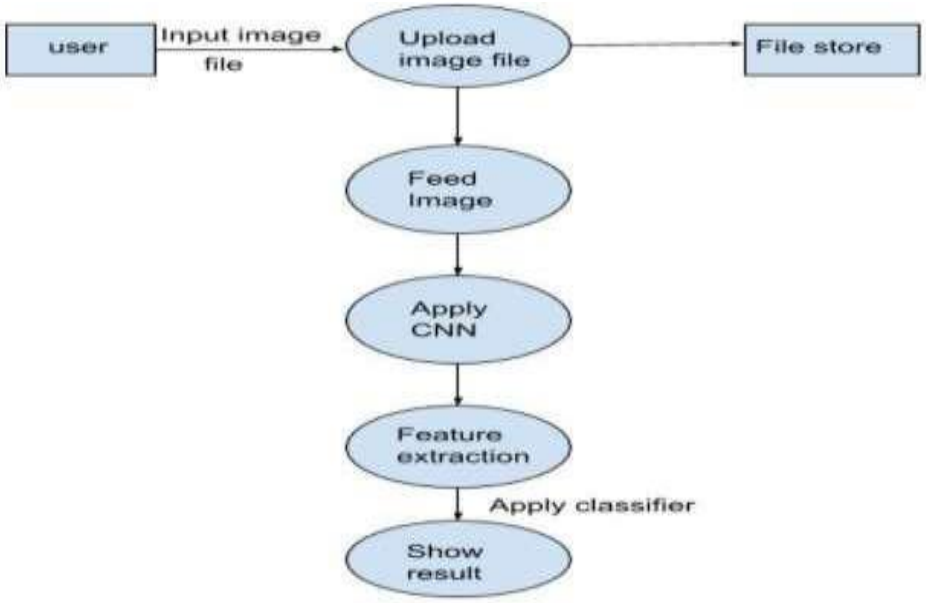

Fig. 2 Applying Classifiers for Bird Species Identification

3.2 SOFTWARE ENVIRONMENT

In this paper we are implemented source code in Python Programming language. Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. An interpreted language, Python has a design philosophy that emphasizes code readability (not able using white space indentation to delimit code blocks rather than curly brackets or keywords), and a syntax that allows programmers to express concepts in fewer lines of code than might be used in languages such as C++or Java. It provides constructs that enable clear programming on both small and large scales. Python interpreters are available for many operating systems. C Python, the reference implementation of Python, is open source software and has a community-based development model, as do nearly all of its variant implementations. C Python is managed by the non-profit Python Software Foundation. Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and has a large and comprehensive standard library.

3.3 IMPLEMENTATION

In this paper implementation, Depth, deep learning models used to find vast number of neurons. Deep learning algorithms learn more about the image as it goes through each neural network layer. For classifying Neural Network is used. Figure 5 represents layers of neural networks for feature extraction. The neural network is a frame work for many machine learning algorithms. Neural networks consist of vector of weights (W) and the bias (B).

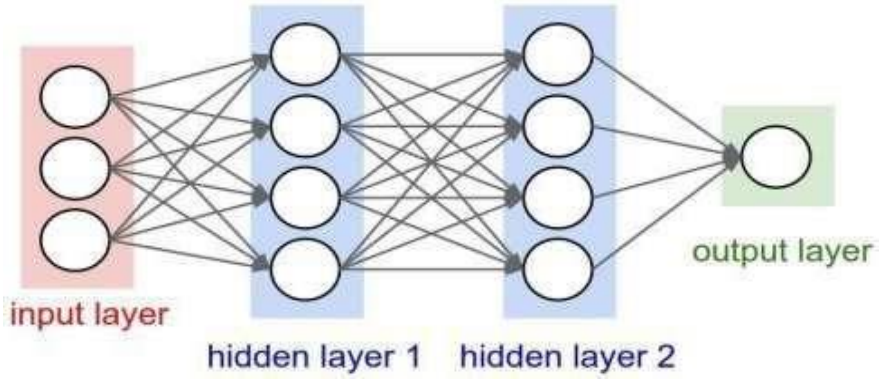

Fig. 3 Three layers of Neural Network

In deep learning, convolution neural network (CNN) is a class of deep neural network mostly used for analyzing visual images. It consists of an input layer and output layer as well as multiple hidden layers. Every layer is made up of group of neurons and each layer is fully connected to all neurons of its previous layer. The output layer is responsible for prediction of output. The convolution layer takes an image as input, and produces a set of feature maps as output. The input image can contain multiple channels such as color, wings, eyes, beak of birds which means that the convolution layer perform a mapping from 3D volume to another 3D volume. 3D volumes considered are width, height, depth. The CNN have two components.

[4] RESULTS

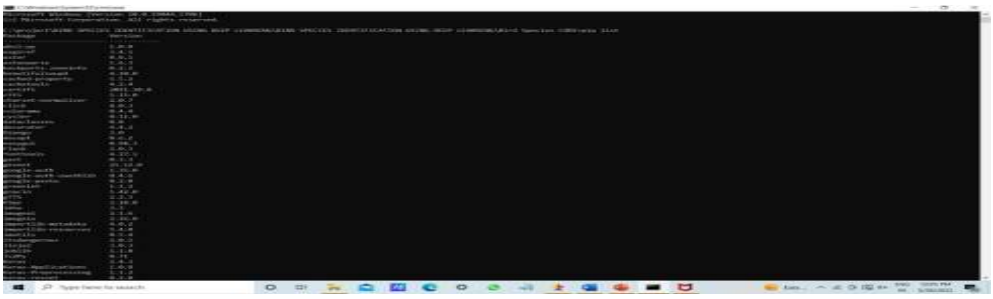

Fig. 4 User login screen

In this screen, we will get the list of installing modules

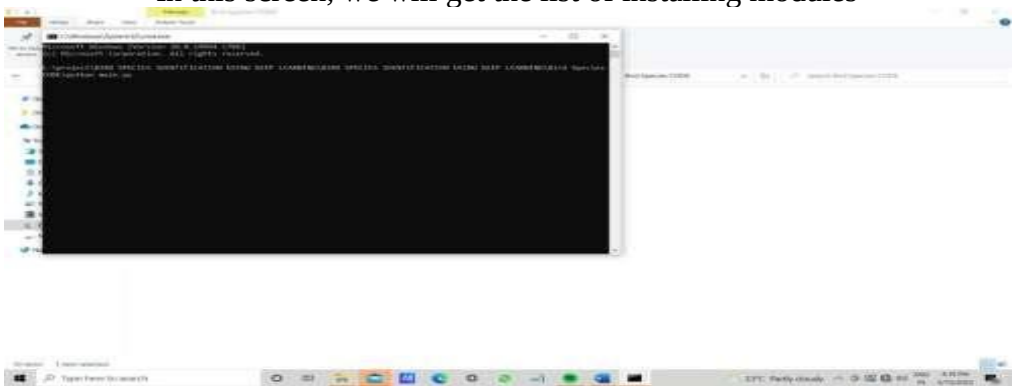

Fig. 5 Run Program screen

Here, we can run the main program python main .py.

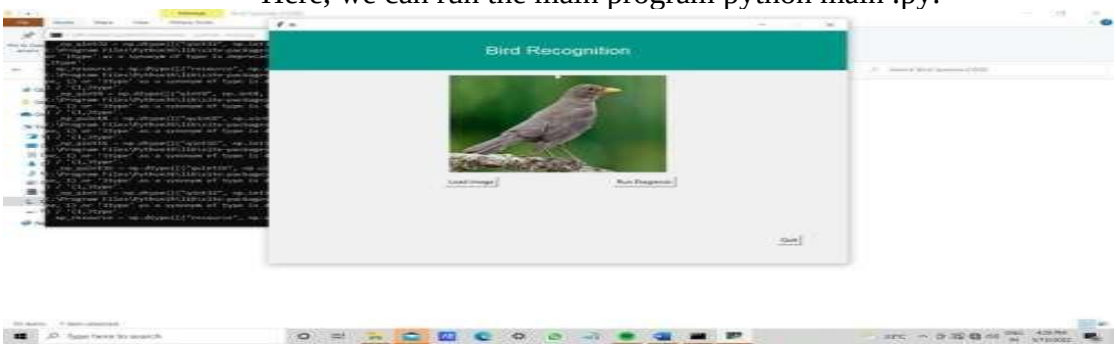

Fig. 6 Run Main Program screen and Recognition Bird Image

After running the main program, we will get this screen

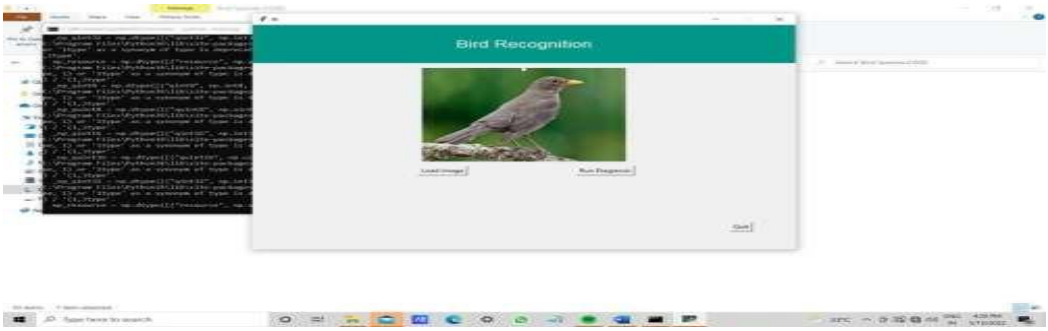

Fig. 7 Load –Upload Image

In the above screen click on load image button to upload the bird image

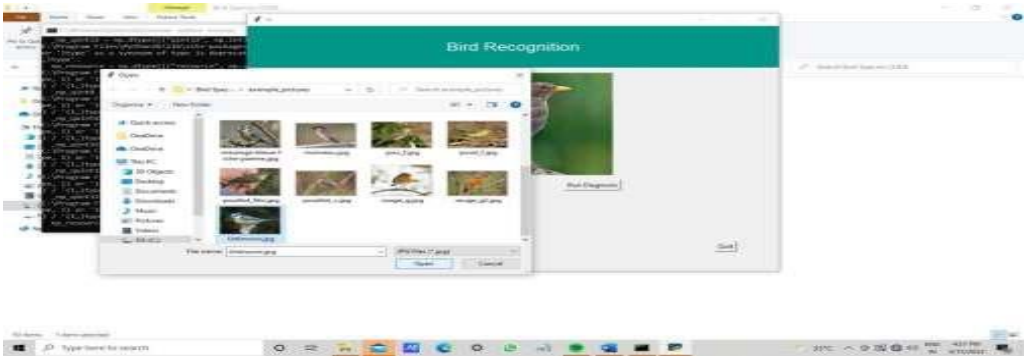

Fig. 8 finding species name

In the above screen some bird's images are there but we don't know species name. So by uploading this image to application we can get their species name.

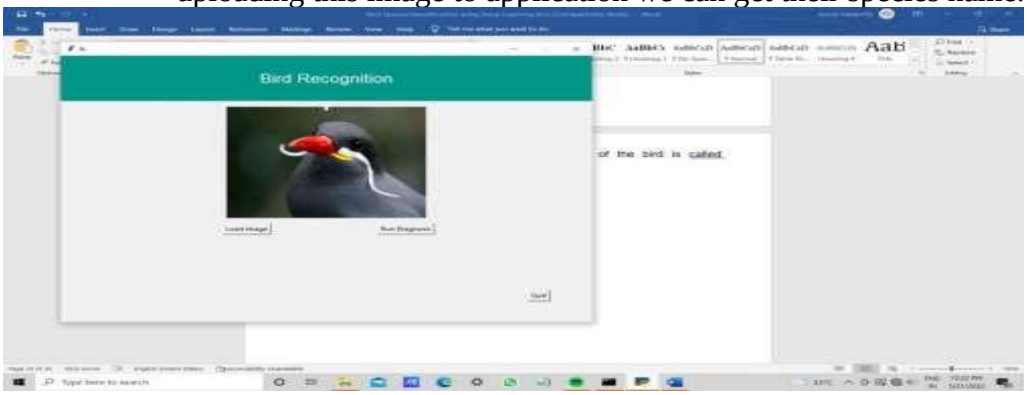

Fig. 9 Uploading Image

In the above screen uploaded one image of the bird is called '6.jpg'

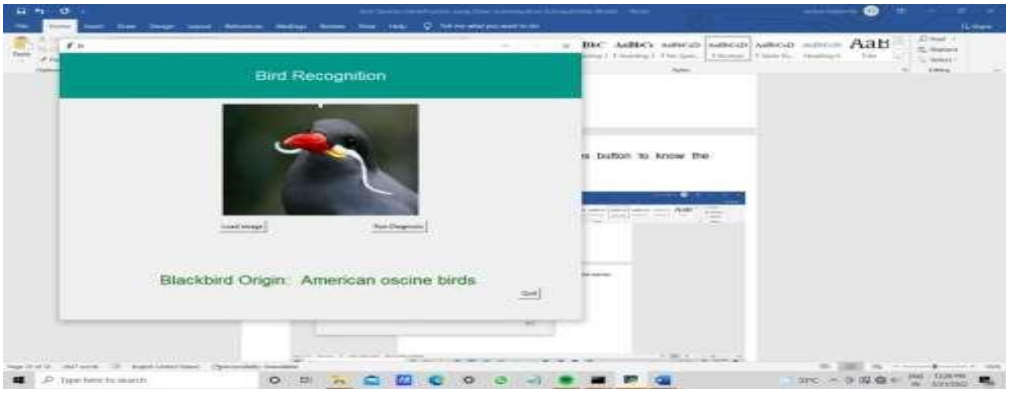

Fig. 9 Origin of Bird Image

After uploading the image 6.jpg we will get the bird name is Blackbird Origin: American Oscine birds

[5] CONCLUSION AND FUTURE ENHANCEMENT

The main idea behind developing the identification website is to build awareness regarding bird-watching, bird and their identification, especially birds found in India. It also caters to the need of simplifying the bird identification process and thus making bird-watching easier. The technology used in the experimental setup is Convolution Neural Networks (CNN). It uses feature extraction for image recognition. The method used is good enough to extract features and classify images.

The main purpose of the paper is to identify the bird species from an image given as input by the user. We used CNN because it is suitable for implementing advanced algorithms and gives good numerical precision accuracy. It is also general-purpose and scientific. We achieved an accuracy of 85%-90%. We believe this project extends a great deal of scope as the purpose meets. In wild life research and monitoring, this concept can be implemented in camera traps to maintain the record of wildlife movement in specific habitat and behavior of any species.

In this paper, the Future Enhancement is to create an android/iOS app instead of website which will be more convenient to user and System can be implemented using cloud which can store large amount of data for comparison and provide high computing power for processing (in case of Neural Networks).

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