ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 11| November 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

AUTOMATED BIRD SPECIES IDENTIFICATION USING DEEP LEARNING WITH IMAGEAND AUDIO

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ABSTRACT

Although watching birds is a popular hobby, identifying their species requires the use of bird books. There are more than 9000 species of birds in the world.Some bird species are rarely discovered, and when theyare, prediction is quite challenging.

Additionally, visual recognition of birds by humans is more comprehensible than audible recognition of birds. In order to give birdwatchers a useful tool to appreciatethe beauty of birds, we have utilized Convolutional Neural Networks (CNN) to classify bird species as CNNs are a powerful collection of machine learning techniques that have shown to be effective in image processing and sound processing.

This system uses the Caltech-UCSD Birds 200 [CUB-200-2011] and Kaggle dataset for training and evaluating a CNN system for classifying bird species based on image recognition, and several different soundsources for training the sound recognition model.

INDEX TERMS—***birds, deep learning, image identification, sound identification***

I. INTRODUCTION

The behaviour and population trends of birds have recentlybecome a serious problem. However, compiling and acquiring information about bird species is a labor-intensive and expensive process that demands a lot ofhuman effort. In such a situation, a strong framework that will enable the massive preparation of bird data and serve as a significant tool for scientists, legislative agencies, etc. is needed. In this sense, the ability to identify between different bird species assumes a crucial role in determining which categories a particular bird image belongs to.

Images, audio, and videos can all be used to identify different bird species. It is possible to identify birds by listening for their distinctive sounds thanks to an audio processing technique. However, handling of such data becomes increasingly complicated because to the mixed sounds in the condition, such as creepy crawlies, real-world items, and so forth. Images typically aid in information discovery more so than sounds or recordings. Therefore, utilizing an image rather than voice or video to categorize birds is preferred.

II.LITERATURE SURVEY

Nadimpalli et al. [1] compare several image processing techniques for the identification of two bird species. Local thresholding was applied to the HSV, GRAY, and RGB color spaces. Next, template matching using normal correlation and artificial neural networks (ANN) were developed in addition to image morphology. Experimental results on a dataset of about 1,000 images, shows accuracies between 50% and 100% in bird species recognition, depending on the complexity of the images.

Yao et al. [2] proposed a random forest with discriminative decision trees approach in order to identify image patches and pairs of patches that are highly discriminative for both subordinate categorization and activity detection. Image response features are generated for classification, and template-based methods are employed to align local regions properly. A robust learning strategy with very high accuracy is produced by a recent method that introduces a set of highly discriminative, part-based, and one-vs-one features (POOF). These approaches are where our method comes from, and it takes into account the necessity for both theoretical plausibility and practical performance. Recent techniques include including humans into the process and customising their cognitive functions to the classification scheme. The crowd provides cues that show how people distinguish between bird species that look similar. Some component detectors are created to locate specific areas of a bird chosen by specialists, which is somewhat similar to hand annotation.

Simna Rassak et al. [3] (2016) investigated the existing models used for bird species classification using sound. From their study, it is evident that feature which are extensively used is syllables and the method used for extracting the features are MFCC. MFCC is one of the most common feature extraction method in speech detection process. It was also seen that DTW, HMM and SVMare the most popularly used classifiers. These classifiers show a better performance compared to the other classification algorithms

Marcelo T. Lopes, Lucas L. Gioppo et al [4] (2011) focusedon the automatic identification of bird species from their audio recorded song. Here the authors dealt with the bird species identification problem using signal processing and machine learning techniques with the MARSYAS feature set. Presented a series of experiments conducted in

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A database composed of bird songs from 75 species out of which problem obtained in performance with 12 species.

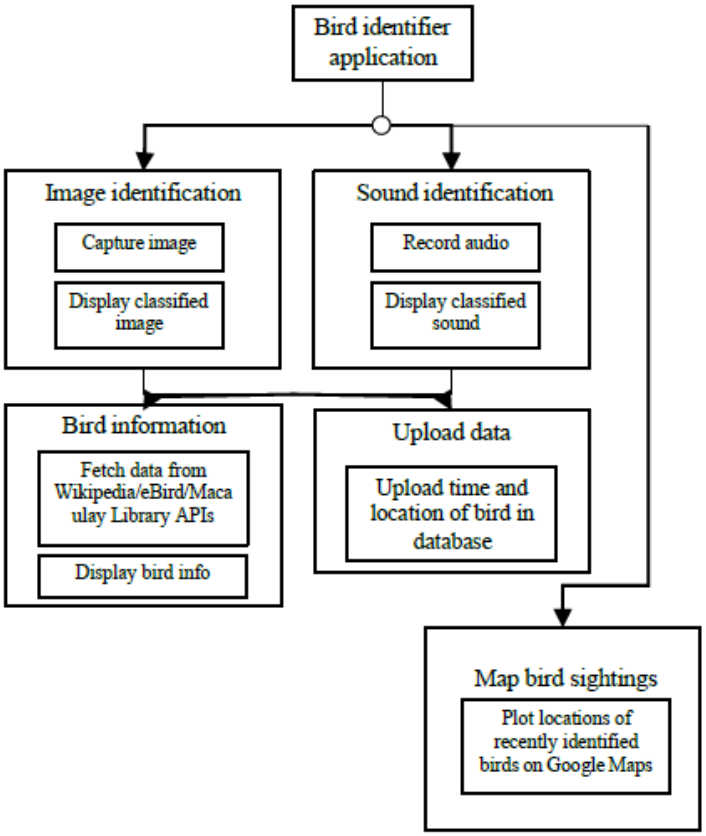
Peter Jancovic and Munevver Kokuer et al [5] (2012) investigated acoustic modelling for recognition of bird species from audio field recordings. Developed a hybrid deep neural network hidden Markov model (DNN-HMM). The developed models were employed for bird species identification, detection of specific species 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%.

III.METHODOLOGY

To achieve the objective stated earlier, an advanced machine learning model called as CNN will be used to identify and categorize both bird images and bird sounds. While the individual steps used in each existing paper differ from system to system, the following are the important processes which are to be done in order to achieve the proper functioning of the machine learning model.

1. Preprocessing
   a. Preprocessing is the removal of systematic noise from data and is usually necessary prior to image classification and analysis. The goal of preprocessing is to attempt to decrease undesirable variety in image due to lighting, scale, deformation etc.
   b. Some of the common preprocessing techniques are:
      i. Image acquisition
      ii. Image enhancement
      iii. Image restoration
      iv. Segmentation
      v. Morphological processing
      vi. Sound noise removal
2. Feature extraction
   a. The technique by which specific elements of interest within an image are found and represented for subsequent processing is known as feature extraction. Extraction of features reveals the key shape characteristics present in a pattern, making it easy to identify the pattern using a formal approach.
   b. For image, colour, shape, size, silhoutte of the bird are important features.
   c. For sound, frequency, amplitude, loudness, etc, of the bird are important features.
3. Input data to machine learning model
   a. CNN machine learning algorithm is used in both instances (image and sound) to train and test the model
   b. The reason why CNN are best suited for image and audio recognition tasks is its built-in convolutional layer reduces the high dimensionality of images without losing its information.

IV.PROPOSED DESIGN



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V.CONCLUSION

The main objective of the identification app is to raise public awareness of bird-watching, identification, and birds. It also satisfies the need to simplify bird observation by streamlining the identification process. In the experimental setting, convolutional neural networks are the technology used (CNN). The process of feature extraction is utilized for voice and picture recognition. It is feasible to extract features from sound and image using the same technique that was used to select images as the primary content for future study.

We picked CNN because it provides excellent numerical precision accuracy and is appropriate for creating complex algorithms. Additionally, it is unbiased and scientific.

VI.ACKNOWLEDEMENT

Ideas, they say often remain ideas. Very few of them, if found the right support are turned into actual working models. No project is ever complete without the guidance of those experts who have already traded this before. Thus, we would like to take this opportunity to thank all those individuals who have helped us in visualizing this project. We express our deep gratitude to our project guide Prof. Satish Kuchiwale, for providing timely assistance to ourqueries and for sharing his pearls of wisdom with us during the course of this project. He has indeed been a lighthousefor us in this journey. We would also like to thank our project coordinator, Prof. Deepti Chandran for her guidancein selecting this project owing to her vast experience in thisfield for the past many years. We are also immensely grateful to our Principal, Dr. Sunil Chavan, our Head ofDepartment, Dr. K.T. Patil, and all the faculty members of the Computer department for their constant support andencouragement.

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