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Automated Bird Species Identification using Audio Signal Processing and Neural Networks

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ABSTRACT

This research explores approaches for bird identification and develops an automated system for recognizing bird species. Significant study on taxonomy and other subfields of ornithology has been a challenging and difficult endeavour for automatic identification of bird sounds without physical involvement. A two-stage identification approach is used in this work. The first step was creating an ideal dataset that included all of the bird species' sound recordings. The sound snippets were then put through a variety of sound preprocessing procedures, including pre-emphasis, framing, silence removal, and reconstruction. For each reconstructed sound clip, spectrograms were produced. In the subsequent stage, a neural network was set up and given the spectrograms as input. The Convolutional Neural Network (CNN) categorizes the sound sample and determines the species of bird based on the input features. For the aforementioned, a real-time implementation model was also created and used.

I. INTRODUCTION

On broad scale, accurate bird recognition is essential for biodiversity preservation. It helps to measure the impact of land utilization and land management on bird species and is rudimentary for bird watchers, conservation organizations, park rangers, ecology consultants, and ornithologists all over the world. So we present an idea that help ornithologists to recognize bird species

According to the International Union for Conservation of Nature (IUCN), there are nearly 10,000 known species of birds scattered among a vast range of ecosystems, from the rainforests of Brazil to the icy shores of Antarctica These species exhibit amazing diversity in terms of behavior and morphology and normal functioning of an ecosystem. But this enormous biological diversity has been threatened the recent human activities which range from intrusion into their habitats to complete annihilation of their habitats and this coupled with natural phenomenon likeglobal warming and climate change has driven many species to extinction.

LITERATURE SURVEY

Automated Bird Species Identification usingAudio Signal Processing and Neural Networks Author:Chandu B, Akash Munikoti, Karthik S Murthy, Ganesh Murthy V, Chaitra Nagara his research explores approaches for bird identification and develops an automated system for recognizing bird species. Significant study on taxonomy and other subfields of ornithology has been a challenging and difficult endeavor for automatic identification of bird sounds without physical involvement. A two-stage identification approach is used in this work. The first step was creating an ideal dataset that included all of the bird species' sound recordings. The sound snippets were then put through a variety of sound preprocessing procedures, including pre-emphasis, framing, silence removal, and reconstruction.

For each reconstructed sound clip, spectrograms were produced. In the subsequent stage, a neural network was set up and given the spectrograms as input. The Convolutional Neural Network (CNN) categorises the sound sample and determines the species of bird based on the input features.

For the aforementioned, a real-time implementation model was also created and used.

2.Automated Bird Species Identification Using Neural Networks:Vemula Omkarini : There are almost 10,000 extant species of birds in the world, each having a unique set of traits and looks. Birds are warm-blooded vertebrates belonging to the Aves class. In the natural world, people frequently find bird watching to be an engaging activity. The ability to identify a species of bird properly needs extensive knowledge in the science of ornithology, which is beyond the scope of human understanding.

This study provides a deep neural network-based automated model that can recognise the species of a specific bird from the test data set. The model was trained and tested for 253 species of birds, with a total of 7637 and 1853 photos for train and test, respectively. When evaluated with the test datasets, the model demonstrated a promising accuracy of 98.

3:Audio-based Bird Species Identification with Deep Convolutional Neural Networks MarioLassec This research proposes deep learning methods for very large-scale audio-based bird identification. In order to categorise 1500 species, Deep Convolutional Neural Networks (DCNNs) are refined. To avoid overfitting and further increase model accuracy and generalisation, several data augmentation strategies are used. The suggested strategy offers the optimum system for each subtask in the BirdCLEF 2018 campaign. On the official BirdCLEF Subtask1 test set, it outperforms prior state-of-the-art by 15.8 when identifying foreground species and 20.2 while taking background species into account.

3. Automatic bird species recognition based on birds vocalization Jiri Stastny1,2*Michal Munk3 and Lubos Juranek he project of Automatic Bird Species Recognition Based on Bird Vocalisation is the subject of this study. Six distinct bird families, totaling 18 species, were examined. At initially, specific recordings were used to generate the human component cepstral coefficients that represented the supplied signal. The voice activity detection system was used to identify segments of bird vocalisations in the next stage, from which individual hidden Markov models were used to determine the likelihood that the given code value belongs to the provided model. One specific hidden Markov model was trained for each type of bird. It has now achieved interspecific success of 81.2

5:Deep Learning Based Audio Classifier for Bird Species Author:1Aarti Madhavi, 2Rajni Pamnani Abstract: It is now vital to monitor the consequences of human activity on the environment before it results in the ecosystem suffering irreversible harm. Monitoring animal breeding behaviour, biodiversity, and population dynamics is one approach to keep tabs on these consequences. Birds are among the greatest species to observe since they are frequently the most responsive to environmental changes, such as deforestation or forest fires. Up until now, tracking the birds was done manually by professionals, which is time-consuming and not a practical way.

In order to solve this problem and help the ecologists, we are suggesting a machine learning technique to identify the species of bird based on the audio recordings. We want to apply the most advanced convolutional neural network design, known as deep residual neural networks, to accomplish this aim as opposed to more conventional classifiers like SMACPY, SVM, and other less advanced techniques. To demonstrate the efficacy of our approach, we make use of tools like data augmentation and the already meticulously created datasets from Neural Information Processing Scaled for Bioacoustics.

6. Bird Call Identification using Dynamic Kernel based Support Vector Machines and Deep Neural Networks :Deep Chakraborty, Paawan Mukker†, Padmanabhan Rajan†and A. D. Dileep In this study, we classify species present in the lower Himalayan areas and analyse bird vocalisations using speech and audio processing techniques. From each recording, mel frequency cepstral coefficients (MFCC) are extracted. As a result, the recordings are now shown as feature vector sets of various lengths. Deep neural networks (DNNs) and dynamic kernel-based support vector machines (SVMs) are frequently utilised for the categorization of these patterns of various lengths derived from voice signals. In this study, we suggest using dynamic kernel-based SVMs and DNNs to classify collections of feature vectors that represent bird sounds. Our research's findings indicate that the performance of both strategies is equivalent

II. SYSTEM ARCHITECTURE

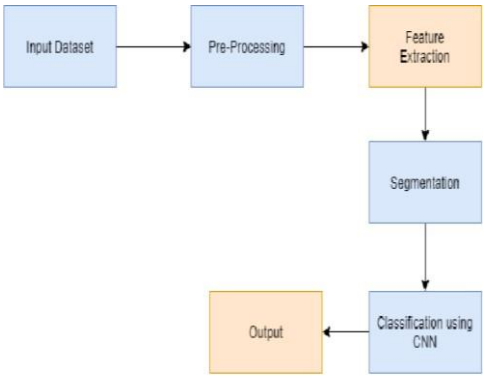

Figure 4.1: system Architectural

IV. MODULES

• Input Dataset- input data set can be used to specify the premier values of the parameters defined in a PARMS statement as well as boundary constraints and the more general direct constraints which could be assessed on these parameters.

• Preprocessing- preprocessing is put in the speech signal according to a phonetic transcript of language, in order to reduce the quantum of data supplied to the input of the neural network, which broadly improves its input data acuity. 2.

• Feature Extraction- In speaker independent speech recognition, a premium is placed on rooting features that are fairly steady to changes in the speaker. So feature extraction involves analysis of speech signal.

• Segmentation- Audio segmentation (frequently called audio classification) is a preprocessing step in audio analysis that separates distinct types of sound, for illustration, speech, music, environmental sounds, silence, and combinations of these sounds.

• Classification Using CNN- Experimental results show that CNNs reduce the error rate by 6- 10% and the voice search large vocabulary speech recognition tasks.

V .MOTIVATION

The primary goal of creating the identification website is to increase public awareness of bird-watching, identification, and particularly the identification of birds found in India. It also meets the need to streamline the process of bird identification, making birdwatching simpler.

VI. OBJECTIVE OF THE SYSTEM

The project's main goal is to determine the species of birds by listening to a vocal note. Some professionals, such as ornithologists, struggled to accurately identify a bird's species from an image.

• Although bird classification can be done manually by subject-matter experts, the amount of data available makes this procedure increasingly laborious and time-consuming. Therefore, using this model, we can quickly and reliably identify the species of birds.

VII. SYSTEM REQUIRMENT

Software Requirement

Operating System: Windows 10(64 Bit) •IDE: Spyder • Programming Language : python version 3.7,3.8 • Libraries: TensorFlow, OpenCv, Keras,Numpy

Hardware Requirements • Hardware : intelcore • Speed : 2.80 GHz • RAM : 8GB • HardDisk : 500 GB • Key Board: StandardWindows Keyboar

VIII. CONCLUSION

Four different bird species were found in this investigation. The method entailed preprocessing the bird sounds before generating spectrograms of them, which were then used to train the classification model. Real bird sounds that were captured in their natural habitat among other noises made up the training set. The results were seen for various learning rates, epoch counts, and data splits. Based on the spectrogram image created from the birds' noises, the system was able to categorise different types of birds.

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