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Deep Convolutional Neural Network (DCNN) Algorithm to Identify Birds Species

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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 in different sizes, shapes, colours, 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 convolutional neural network (DCNN) algorithm an image converted into grey scale format to generate autograph by using tensor flow, where the multiple nodes of comparison are generated. These different nodes are compared with the testing dataset and score sheet is obtained from it. After analysing the score sheet, it can predicate the required bird species by using highest score.

I. INTRODUCTION

The Bird behaviour and population trends have become an important issue now a days. 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.

CNN is mainly designed to recognize visual features from images and it requires a minimum level of preprocessing. In addition, the exponentially expanded amount of online data has gotten to be less demanding to gather as the learning information for the neural networks, and the refined information has been easily shared for the convolutional neural network learning. These intuitive driven to a convolutional neural network approach beyond the capabilities of the existing approaches. The convolutional neural network has become one of the leading architectures for most of the image recognition, classification, and prediction processes. In image recognition, video analysis, natural language processing, and drug discovery applications the convolutional neural network can be used for better performances. And the CNNs performance rates are progressing yearly.

II. RELATED WORK

Bird species identification using deep learning has seen remarkable progress and interest in the research community. The Bird CLEF competition has been a prominent platform for researchers to develop advanced methods for identifying bird species based on their vocalizations, using Convolutional Neural Networks (CNNs) and Recurrent Neural Networks

(RNNs) to analyse audio recordings and classify species based on unique calls and songs. Institutional efforts, such as the Cornell Lab of Ornithology's Merlin Bird ID app, have played a significant role in advancing the field. These applications allow users to upload bird images for real-time species identification using deep learning models, making bird watching more accessible and engaging for enthusiasts and researchers alike. The integration of citizen science platforms like iNaturalist and eBird has been a valuable resource for training deep learning models. Researchers have harnessed the vast amount of bird images and associated species labels available on these platforms to create more robust and diverse datasets for training, enhancing the model's ability to recognize various bird species across different regions. Transfer learning has emerged as a powerful technique in bird species identification, leveraging pre-trained CNN models like Inception, Resnet, and VGG. Fine-tuning these models on bird image datasets allows them to adapt their learned features to the specific task of identifying bird species, enabling more efficient and accurate classification. To overcome challenges posed by limited data, data augmentation techniques have been employed to artificially expand the dataset size. By applying transformations such as rotations, flips, and shifts to existing images, deep learning models are better equipped to generalize to different scenarios and variations in bird poses and orientations. Attention mechanisms have also been explored to enhance the interpretability and accuracy of bird species identification models. These mechanisms allow the model to focus on the most relevant regions of the image for making predictions, providing insights into the visual cues that contribute to species classification. Ensemble methods, such as model averaging and stacking, have been used to boost the performance of bird species identification systems. By combining multiple deep learning models, researchers can mitigate individual model biases and improve overall accuracy. It is essential to acknowledge that the field of deep learning for bird species identification continues to evolve rapidly. Since my last update, new techniques, models, and datasets may have emerged, further enhancing the capabilities and applications of bird species identification systems. Researchers are likely continuing to explore innovative approaches to improve the accuracy, efficiency, and scalability of these systems, making strides towards better understanding and conservation of avian biodiversity. It is important to note that the field of deep learning for bird species identification is continuously evolving. New techniques, models, and datasets are likely to have emerged since my last update. Researchers continue to explore novel approaches to improve accuracy, efficiency, and scalability of bird species identification systems using deep learning methods. Bird species identification using deep learning has been an active area of research, and several studies and projects have made significant contributions to this field. Here are some notable examples of related work in bird species identification using deep learning.

III. METHODOLOGY

Identifying bird species using deep learning involves training a neural network model to recognize and classify different species based on their visual features

1. DATA COLLECTION

Gather a diverse and comprehensive dataset of bird images. You can use online sources like eBird, Flickr, or specific bird image databases. Make sure to have a wide variety of angles, lighting conditions, and backgrounds to ensure the model's robustness.

2. DATA PREPROCESSING

Clean and preprocess the images to standardize the format, resolution, and colour. You might also need to crop or resize the images to a consistent size. It's important to label each image with the correct bird species as well.

3. DATA AUGMENTATION

Augment the dataset to increase its diversity and help the model generalize better. Apply techniques like rotation, flipping, cropping, and adjusting brightness/contrast. This prevents overfitting and improves the model's ability to handle real-world variations.

4. MODEL SELECTION

Choose a deep learning architecture suitable for image classification tasks. Convolutional Neural Networks (CNNs) are commonly used due to their ability to capture spatial features. You can start with well-known architectures like VGG, Resnet, or Inception, or even explore more recent architectures like Efficient Net.



5. TRANSFER LEARNING

Leverage pre-trained models on large image datasets like ImageNet. These models have learned general features that can be valuable for your bird species classification task. Fine-tune the pre-trained model's layers on your bird dataset, adjusting the last few layers for the number of bird species you're classifying.

IV. EXPERIMENTAL RESULTS

To test this application, I am using below images in below screen some bird's images are there but we don't know its name or species name. Fig 1. User open screen you can see the bird images in home page. Fig 2. In the above screen click on upload image button to upload image Fig. 3 In the above screen I am uploading the one bird image 457.jpg after get upload it will get in below screen. Fig.4 Now click on "Run DCNN Algorithm" and view identify species buttons to know the species names of uploaded bird. Fig 5. In above screen we got five related bird species images of bird on tittle bar of image so by uploading any image we can know the name of bird. Fig 6. In the above graph we got matching score of five related birds and in above graph X-axis represents name of bird and Y-axis represents matching score. Fig 7. In the above screen in selected text, you can see accuracy value. Fig 8. finally with name of species and species of birds will be shows in the final results.

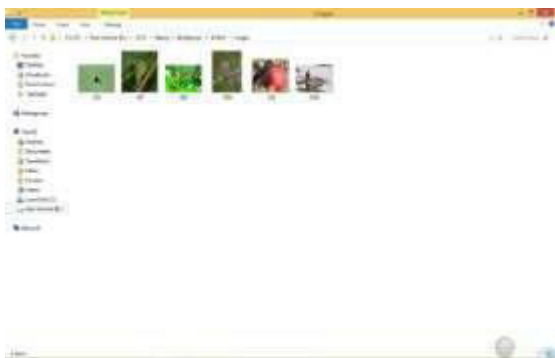


Fig.1.Home Page



Fig. 2. Run. Bat



Fig. 3. Open bird image



Fig 4. Run DCNN Algorithm



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