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A ROBUST BIRD TYPES CLASSIFICATION USING CONVOLUTION NUERAL NETWORKS

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ABSTRACT: In our world, there are above 9000 bird species. Some bird species are being found rarely and if found also prediction becomes very difficult. In order to overcome this problem, we have an effective and simple way to recognize these bird species based on their features. Also, the human ability to recognize the birds through the images is more understandable than audio recognition. So, we have used Convolutional Neural Networks (CNN). CNNs are the strong assemblage of machine learning which have proven efficient in image processing. In this paper, a CNN system classifying bird species is presented and uses the Caltech-UCSD Birds 200 [CUB-200-2011] dataset for training as well as testing purpose. By establishing this dataset and using the algorithm of similarity comparison, this system is proved to achieve good results in practice. By using this method, everyone can easily identify the name of the particular bird which they want to know.

1. INTRODUCTION

Birdbehaviorandpopulacepatternshavebeco measignificantissuenowadays.Bird elute recognize different life forms on the earth effectively as they react rapidly to ecological changes. Be that as it may, assembling and gathering data about bird species requires immense human exertion just as it turns into an extremely costly technique. In such a case, a solid framework that will give enormous scale preparation of data about birds and will fill in as a significant apparatus for scientists, legislative offices, and so forth is required. In this way, bird species distinguishing proof assumes a significant job in recognizing that a specific picture of birds has a place with which categories. Bird species identification means predicting the bird species belongs to which category by using an image.

The recognition of bird species can be possible through a picture, audio or video. An audio processing method makes it conceivable to recognize by catching the sound sign of different birds.Be that a sit may, because of the blended sound sin condition, for example, creepy crawlies, objects from the real world, and so forth handling of such data turns out to be progressively convoluted. Normally, people discover images more effectively than sounds or recordings. So, an approach to classify birds using an image over audio or video is preferred. Bird species identification is a challenging task to humans as well as to computational procedures that carry out such at a skin an automated fashion.

As image-based classification systems are improving the task of classifying, objects are moving into datasets with far more categories such as Caltech-UCSD.Recent work has seen much success in this area.

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Caltech UCSD Birds 200(CUB-200-2011) is a well- known dataset for birdimageswithphotosof200categories. 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, 312BinaryAttributes, 1BoundingBox. In this project, rather than recognizing an oversized number of disparate categories ,the matter of recognizing an oversized number of classes within one category is investigated that of birds.Classifying birds pose an additional challenge over categories a result of the massive similarity between classes. Additionally, birds are non-rigid objects which will deform in many ways and consequently there's also an over sized variation within classes.Previousworkonbirdclassificationh astakencareofalittlenumberofclasses, forthright voice.

Machine Learning

Machine Learning is the most popular technique of predicting or classifying information to help people in making necessary decisions.Machine Learning algorithms are train edover instances or examples through which they learn from past experiences and analyze the historical data. Simply building models is not enough. You must also optimize and tune the model appropriately so that it provides you with accurate results. Optimization techniques involve tuning the hyper parameters to reach an optimum result.

2. LITERATURE SURVEY

John Martinsson et al (2017)[1], presented the CNN algorithm and deep residual neural networks to detect an image in two ways ie., 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.

JuhaNiemi, Juha T Tanttu et al (2018)[2], 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.

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.

MadhuriA.Tayal, AtharvaMagrulkar et al (2018)[4], 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.

Andreia Marini, Jacques Facon et al (2013)[5], proposed a novel approach based on color features extracted from unconstrained images, applying a color segmentation algorithm in an attempt to eliminate background elements and to delimit candidate regions where the bird may be present within the image. Aggregation processing was employed to reduce the number of intervals of the histograms to a fixed number of bins. In this paper, the authors experimented with the CUB-200 dataset and results show that this technique is more accurate.

Marcelo T.Lopes, Lucas L.Gioppo et al (2011)[6], 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 processing and

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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.

Peter Jancovic and Munevver Kokuer et al (2012)[7], investigated acoustic modeling 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 of98.7% and recognition accuracy of 97.3%.

Mario Lasseck et al (2013)[8], presented deep convolutional neural networks 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.

3 EXISTING SYSTEM

- Many previous studies have used large datasets of bird images, often with thousands of images of different bird species.
- Techniques such as transfer learning and data augmentation have been used to improve the accuracy of the models in identifying bird species.

4. PROPOSED SYSTEM

The proposed system of bird species identification uses the Convolutional Neural Network (CNN) concepts to identify the species of the birds being searched for using its images that are uploaded instantly. The system undergoes multiple filtration and series of algorithm to find the match of data of the bird under investigation. The further result that will be displayed consists of information like its scientific name, family, gene and further scientific information. Additionally it displays basic information about the bird like its nativity, food it eats, hotspot places of that particular breed, the climate it lives in, and etc.

5.IMPLEENTATION

1. Data Collection:

- Collecting a large dataset of bird images from various sources, such as bird-watching websites, birding apps, and online birding communities.
- Ensuring that the images are of high quality and include a diverse range of bird species.

2. Data Preprocessing:

- Resizing the images to a standard size, such as 224x224 or 256x256 pixels, to ensure consistency across the dataset.
- Normalizing the pixel values to a range between 0 and 1 to facilitate the training of the neural network.
- Splitting the data into training, validation, and testing sets to assess model performance and prevent over fitting.

3. Data Augmentation:

- Increasing the size of the dataset using techniques like rotation, translation, and flipping to improve the robustness of the model and prevent over fitting.
- Applying random brightness and contrast adjustments to the images to further increase the diversity of the dataset.

4. **Model Training:**

- Training the CNN on the training set using a stochastic gradient descent (SGD) optimizer and categorical cross-entropy loss function.
- Fine-tuning the model by adjusting the hyper parameters based on the results of the validation set.
- Saving the model weights and configuration for future use.

5. Model Evaluation:

- Evaluating the performance of the trained model on the testing set using metrics such as accuracy, precision, recall, and F1 score.

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- Comparing the results with other state-of-the-art models to determine the efficacy of the proposed approach.
- Conducting ablation studies to determine the contribution of each layer and parameter to the overall performance of the model.

6. Application:

- Deploying the trained model in a bird identification web service to facilitate the identification of bird species from images.

6.RESULTS AND DISCUSSIONS

Dataset Details:

S. no	Bird Name	Samplescount	Dimensions ofthe image
1.	Painted_Bunting	250	Any Size
2.	Brewer_Blackbird	175	Any Size
3.	Eared_Grebe	200	Any Size

Table1. Dataset Details

Here we can give any size of the image it will be resized to the dimensions 250x250. The Features considered in this classification are: Beak, Shape, Neck, Color, Tail etc

When we run the code, the data set is divided into training and testing.First, it trains the system then it tests for accuracy then it asks for user input. It gives the label as are with an input image. Following are the step so execution:

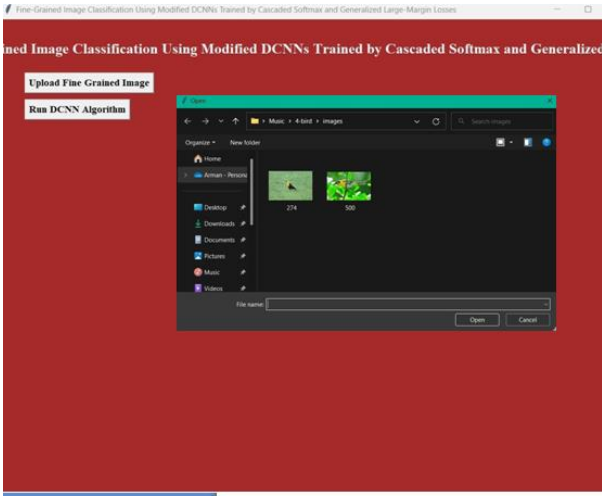

Fig.Inserting User Input

7. CONCLUSION:

The main idea behind developing this identification model 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 Convolutional 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 project 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..

FUTURESCOPE:

Create an android /iOS app instead of model which will be more convenient to user. 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 Network).

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