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Automatic Bird Species Identification Using Deep Learning

Ms. B. DIVYA [#1], Mr. A. VENKATA RAJU [#2], Mr. D.D.D.SURIBABU [#3]

[#1]M.Tech Student, [#2]Associate Professor, [#3]Associate Professor & HOD

Department of Software Engineering

International School of Technology and Sciences (Women)

(Affiliated to JNTUK),East Gonagudem, Rajanagaram, Rajamahendravaram,

East Godavari District, Andhra Pradesh, India– 533294.

ABSTRACT

Convolutional Neural Network has lately achieved exceptional success in the field of overall picture classification. Pretrained Convolutional Neural Networks (CNN) have recently been used to provide a far better representation of an input image. One of the top pretrained CNN networks, Inception V3 [1], is frequently utilised in deep learning as a pretrained CNN model. In this article, we suggest a deep learning model that can recognise specific birds from an input image. In order to encode the images, we also frequently use the pretrained Inception V3 model as well as pretrained CNN networks with base model. Birds are typically seen in a variety of situations and can be seen from a human perspective in a variety of sizes, shapes, and colours. Experiments will be performed utilising the entity of various dimensions, cast, and celerity to study recognition performance. We achieved a top-5 accuracy of 97.98% on our classifications.

KEYWORDS:

Convolutional Neural Network, Inception V3, Classification Algorithms, Deep Learning.

1. INTRODUCTION

A group of signs and symptoms brought Monitoring animal populations is a significant issue in ecology, which is the study of interactions between species and their environment, particularly in light of the ongoing threat posed by climate change. There has recently been a lot of interest in the use of acoustics to observe and categorise animals in their natural habitats. For example, classification of animal species based on audio recordings is helpful for observing population dynamics, biodiversity, and breeding behaviour. Birds are a very good ecological indicator because they react fast to environmental changes. Experts in the field can classify birds manually, but as data volumes increase, this procedure becomes arduous and time-consuming. Therefore, this process requires the use of automatic tools. A number of competitions aimed at identifying different bird species, including the Bird CLEF, the Neural Information Processing Scaled for Bioacoustics (NIPS4B) 2013, and the Machine Learning for Signal Processing (MLSP) 2013 Bird Classification Challenge [8], have recently been held. The objectives of these competitions were to develop and test such automatic classifiers on field recordings of bird songs. Deep convolution neural networks have proven to be a promising classification method.

Some bird species are now only sometimes discovered, and even then, it can be challenging to classify them. From a human perspective, it is only natural for birds to appear

in a variety of situations in a variety of sizes, forms, colours, and perspectives. Additionally, photos offer more distinct variants for bird species identification than does audio categorization. Also, it is easier to comprehend how well humans can identify birds from photos. The current study looked into a technique for classifying images utilising the Caltech-UCSD Birds 200 dataset and a deep learning algorithm (unsupervised learning). 11,788 images in 200 categories make up this collection.

2. EXISTING SYSTEM AND ITS LIMITATIONS

In the existing system there was no proper method to identify the bird species identification and hence following are the main limitations in the existing system.

LIMITATION OF PRIMITIVE SYSTEM

The following are the limitations of the existing system.

1. More Time Delay in finding the bird species.
2. There is no prevention technique due to late prediction.
3. There is no early prediction of hearty health disease.
4. There is no method to identify the heart diseases based on ML and DM Methods

3. PROPOSED SYSTEM AND ITS ADVANTAGES

The huge amounts of data generated for prediction of individual birds are too complex and voluminous to be processed and analyzed by traditional methods. Data mining provides the methodology and technology to transform these mounds of data into useful information for decision making. By using data mining techniques it takes less time for the prediction of the disease with more accuracy. In this paper we survey different papers in which one or more algorithms of data mining used for the prediction of heart disease. Result from using neural networks is nearly 100% in one paper [10] and in [6]. So that the prediction by using data mining algorithm given efficient results. Applying data mining techniques to heart disease treatment data can provide as reliable performance as that achieved in diagnosing.

ADVANTAGES OF THE PROPOSED SYSTEM

1) By using data mining techniques it takes less time for the prediction of the disease with more accuracy.

2) In this paper we survey different papers in which one or more algorithms of data mining used for the prediction of bird species..

3) Result from using neural networks is nearly 100% in one paper [10] and in [6]. So that the prediction by using data mining algorithm given efficient results.

4. IMPLEMENTATION PHASE

The step of implementation is when the theoretical design is translated into a programmatically-based approach. The application will be divided into a number of components at this point and then coded for deployment. Google Collaboratory is used for the application's front end.The modules are Gathering data, Pre-Processing, Processing, Interpretation.

1) DATA CLEANING MODULE

The "Caltech-UCSD Birds-200-2011 (CUB200-2011)" dataset [3] was created by Caltech and UCSD through the collection of data. A field guide online was used to find the list of species names. Images were gathered using the Flickr image search feature, and afterward, each image was screened by several Mechanical Turk users.

2) PRE-PROCESSING MODULE

Data pre processing is a technique that is used to convert raw data into a clean dataset. The data is gathered from different sources is in raw format which is not feasible for the analysis. Pre-

processing for this approach takes 4 simple yet effective steps.

Attribute selection: Some of the attributes in the initial dataset that was not pertinent (relevant) to the experiment goal were ignored.

Cleaning missing values: In some cases the dataset contain missing values. We need to be equipped to handle the problem when we come across them. Obviously you could remove the entire line of data but what if you're inadvertently removing crucial information? after all we might not need to try to do that. one in every of the foremost common plan to handle the matter is to require a mean of all the values of the same column and have it to replace the missing data. The library used for the task is called Scikit Learn pre-processing. It contains a class called Imputer which will help us take care of the missing data.

Training and Test data: Splitting the Dataset into Training set and Test Set Now the next step is to split our dataset into two. Training set and a Test set. We will train our machine learning models on our training set, i.e our machine learning models will try to understand any correlations in our training set and then we will test the models on our test set to examine how accurately it will predict. A general rule of the thumb is to assign 80% of the dataset to training set and therefore the remaining 20% to test set.

3) DATA CLASSIFICATION

Classification of data is a two phase process. In phase one which is called training phase a classifier is built using training set of tuples. The second phase is the classification phase, where the testing set of tuples is used for validating the model and the performance of the model is analyzed.

4) DATA INTERPRETATION

The data set used for is further spitted into two sets consisting of two third as training set and one third as testing set. Algorithms applied SVM shown the best results. The efficiency of the approaches is compared in terms of the accuracy. The accuracy of the prediction model/classifier is defined as the total number of correctly predicted/classified instances.

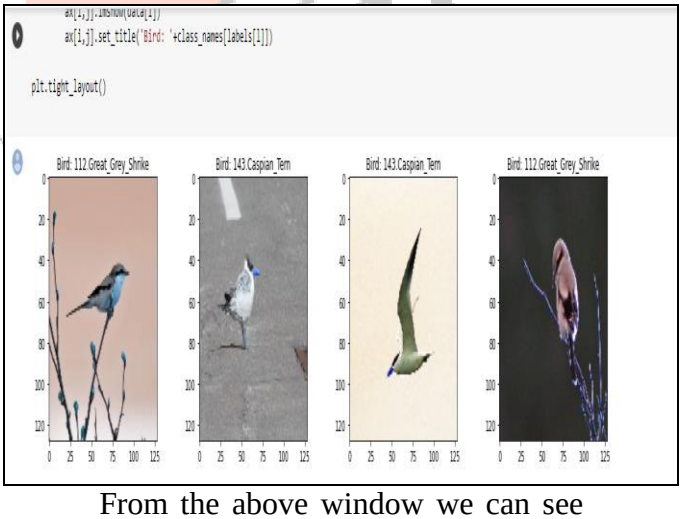
5. EXPERIMENTAL RESULTS

In this section we try to design our current model using Python as programming language and we used Google Collab as working environment for executing the application. Now we can check the performance of our proposed application as follows:

PLOT SAMPLE IMAGE

The above window clearly represents the Sample image.

MATCHED IMAGES



From the above window we can see several bird images are matched for the input.

APPLY INCEPTION V3

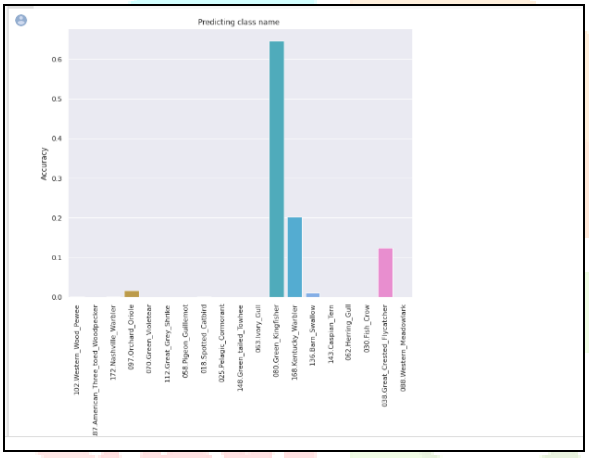
```
from tensorflow.keras.applications.inception_v3 import preprocess_input
X = preprocess_input(data)
print(X.shape)
X[0]

(760, 128, 128, 3)
array([[[-1.       , -0.654902 , -1.       ],
        [-1.       , -0.654902 , -0.99215686],
        [-1.       , -0.64705884, -0.9843137 ],
        ...,
        [-0.96862745, -0.6352943, -0.99215686],
        [-0.9843137 , -0.64705884, -0.99215686],
        [-0.9764706 , -0.6392157 , -0.9607843 ]],

       [[-0.9764706 , -0.6784314 , -0.99215686],
        [-0.47450978, -0.41960782, -0.58431375],
        [-0.49019605, -0.44313723, -0.5686275 ],
        ...,
        [-0.19999999, -0.05882353, -0.1372549 ],
        [-0.16862744, -0.04313725, -0.08235294],
        [-0.99215686, -0.67058825, -0.9764706 ]],
```

From the above window we can clearly see how the inception V3 is applied.

PREDICTION



From the above window we can clearly the family class name of bird species based on input image.

6. CONCLUSION

The current study looked into a technique for classifying images utilising the Caltech-UCSD Birds 200 dataset and a deep learning algorithm (unsupervised learning). 11,788 images in 200 categories make up this collection. The system that is generated is linked to an easy-to-use website where users may input photos for identification purposes, and it produces the desired results. The suggested system operates on the theory of part detection and CNN feature extraction from several convolutional layers. These features are combined before being provided to the classifier for classification. Based on the findings that were generated, the algorithm predicted the discovery of bird species with an accuracy of 80%.

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