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FOSSILS IDENTIFICATION OF BIRD USING DEEP LEARNING

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ABSTRACT

The rapid and accurate taxonomic identification of fossils of bird species is of great significance in paleontology, biostratigraphy, and other fields. However, taxonomic identification is often labor-intensive and tedious, and the requisition of extensive prior knowledge about a taxonomic group also requires longterm training. Moreover, identification results are often inconsistent across researchers and communities. Accordingly, in this study, we used deep learning to support taxonomic identification of birds. We used web crawlers to collect the Fossil Image of bird Dataset (FID) via the Internet, obtaining 415,339 images belonging to 50 fossil clades. Then we trained three powerful convolutional neural networks on a high-performance workstation. The Inception-ResNet-v2 architecture achieved an average accuracy of 0.90 in the test dataset when transfer learning was applied. The clades of microfossils and vertebrate fossils exhibited the highest identification accuracies of 0.95 and 0.90, respectively. In contrast, clades of sponges, bryozoans, and trace fossils with various morphologies or with few samples in the dataset exhibited a performance below 0.80. Visual explanation methods further highlighted the discrepancies among different fossil clades and suggested similarities between the identifications made by machine classifiers and taxonomists. Collecting large paleontological datasets from various sources, such as the literature, digitization of dark data, citizen-science data, and public data from the Internet may further enhance deep learning methods and their adoption.

I. INTRODUCTION

Birds are an alternate and fascinating gettogether of animals that have captured human interest for a seriously significant time-frame. As people from the class Aves, they are portrayed by their exceptional changes for flight, including feathers, void bones, and a strong, lightweight mouth. With in excess of 10,000 acknowledged species saw as across every central area, beside Antarctica, birds have successfully colonized many circumstances, from thick rainforests to dried deserts and taking off peaks. Bird species show an unfathomable display of assortments, sizes, shapes, and approaches to acting, making them a wellspring of wonder and inspiration for scientists, birdwatchers, and nature fans something similar. Each specie has unquestionable physical and direct qualities that engage them to thrive in their particular surroundings and fulfill different normal positions. The universe of bird species is strikingly varying, going from the little Bumble bee Hummingbird, which measures around 2.4 inches (6.1 centimeters) long and weighs basically 1.6 grams, to the solid Ostrich, the greatest living bird, staying at more than 9 feet (2.7 meters) tall and checking as much as 320 kilograms. Birds have fostered a brilliant extent of changes for perseverance and duplication. Their noses have changed in accordance with suit different weight control plans, from the specific nectardealing with noses of hummingbirds to the strong, twisted bills of flying hunters. They have similarly developed various procedures for movement, for instance, bobbing, walking, running, swimming, and, clearly, flight.

Correspondence is fundamental in the domain of birds, and various species are popular for their unpredictable tunes, calls, and shows, used for sentiment, local protect, and social holding. The charming tunes of songbirds and the incredible mating moves of birds like the Unique Topped Grebe are examples of the astonishing assortment of bird correspondence. Birds accept basic natural parts, including seed dispersal, preparation, and bug control. They are also huge signs of natural framework prosperity, and changes in bird masses can reflect greater environmental changes. In this convoluted weaving of avian life, each bird species is an original string, adding to the rich biodiversity of our planet. Understanding and observing bird species isn't only principal for safeguarding their customary living spaces yet moreover for staying aware of the touchy balance of organic frameworks on which individuals and normal life depend. As we dive further into the examination of bird species, movements in advancement, for instance, the proposed "Picture Based Bird Species Conspicuous evidence Using Significant Learning" project, continue to open new horizons by they way we could decipher these spellbinding creatures and plan for additional created security attempts and energy for the normal world.

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II. LITERATURE REVIEW

[1]Bird classification, a fine-grained categorization task, is a complex task but crucial in improving and identifying the best computer vision algorithms to use in the broader image recognition field. Di culties like lighting conditions, complex foliage settings, and similarities in subspecies of birds are just some of the challenges faced by researchers. We implemented softmax regression on manually observed binary attributes, a multi-class SVM on HOG and RGB features from photos, and finally a CNN using transfer learning to classify birds. The pre-trained CNN with fixed feature extraction proved to be the best method for classification with computer vision. [2]The monitoring of bird populations can provide important information on the state of sensitive ecosystems; however, the manual collection of reliable population data is labour-intensive, time-consuming, and potentially error prone. Automated monitoring using computer vision is therefore an attractive proposition, which could facilitate the collection of detailed data on a much larger scale than is currently possible. A number of existing algorithms are able to classify bird species from individual high quality detailed images often using manual inputs (such as a priori parts labelling). However, deployment in the field necessitates fully automated inflight classification, which remains an open challenge due to poor image quality, high and rapid variation in pose, and similar appearance of some species. We address this as a fine-grained classification problem, and have collected a video dataset of thirteen bird classes (ten species and another with three colour variants) for training and evaluation. We present our proposed algorithm, which selects effective features from a large pool of appearance and motion features. We compare our method to others which use appearance features only, including image classification using state-of-the-art Deep Convolutional Neural Networks (CNNs). Using our algorithm we achieved an 90% correct classification rate, and we also show that using effectively selected motion and appearance features together can produce results which outperform state-of-the-art single image classifiers. We also show that the most significant motion features improve correct classification rates by 7% compared to using appearance features alone.

[3] In this paper, we investigated the performance of bird species recognition using neural networks with different preprocessing methods and different sets of features. Context neural network architecture was designed to embed the dynamic nature of bird songs into inputs. We devised a noise reduction algorithm and effectively applied it to enhance bird species recognition. The performance of the context neural network architecture was comparatively evaluated with linear/mel frequency cepstral coefficients and promising experimental results were achieved.

[4]Bird species classification has received more and more attention in the field of computer vision, for its promising applications in biology and environmental studies. Recognizing bird species are difficult due to the challenges of discriminative region localization and finegrained feature learning. In this paper, we have introduced a Transfer learning based method with multistage training. We have used both Pre-Trained Mask-RCNN and a ensemble model consists of Inception Nets (InceptionV3 net & InceptionResnetV2) to get both the localization and species of the bird from the images. we have tested our model in an Indian bird dataset consist of variable size, high-resolution images are taken from camera in various environments (like day, noon, evening etc.) with different perspectives and occlusions. Our final model achieves an F1 score of 0.5567 or 55.67% on that dataset. [5]The advances in information technology of both hardware and software have allowed big data to emerge recently, classification of such data is extremely slow, particularly when using K-nearest neighbors (KNN) classifier. In this article, we propose a new approach that creates a binary search tree (BST) to be used later by the KNN to speed up the big data classification. This approach is based on finding the furthest-pair of points (diameter) in a data set, and then, it uses this pair of points to sort the examples of the training data set into a BST. At each node of the BST, the furthest-pair is found and the examples located at that particular node are further sorted based on their distances to these local furthest points. The created BST is then searched for a test example to the leaf; the examples found in that particular leaf are used to classify the test example using the KNN classifier. The experimental results on some well-known machine learning data sets show the efficiency of the proposed method, in terms of speed and accuracy compared with the state-of-the-art methods reviewed. With some optimization, the proposed method has a great potential to be used for big data classification and can be generalized for other applications, particularly when classification speed is the main concern.

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III. METHODOLOGY

Step 1: Collecting the Dataset.

Step 2: Image Preprocessing.

Step 3: Model used.

Dataset:

The first module is "Bird Species Identification from Fossil Images." Using Deep Learning," we created a system that accepts a set of input data. The data collection process is the first real step in developing a machine learning model. This is a crucial phase that will alter as we collect more and better data, based on how well the model performs. improves model performance. There are several methods for data collection, including web scraping and manual interaction. The datasets are contained within the project and located in the model folder.

Importing the necessary libraries:

We will be using Python language for this. First we will import the necessary libraries such as keras for building the main model, sklearn for splitting the training and test data, PIL for converting the images into array of numbers and other libraries such as pandas, numpy, matplotlib and tensorflow.

1. FLOW CHART

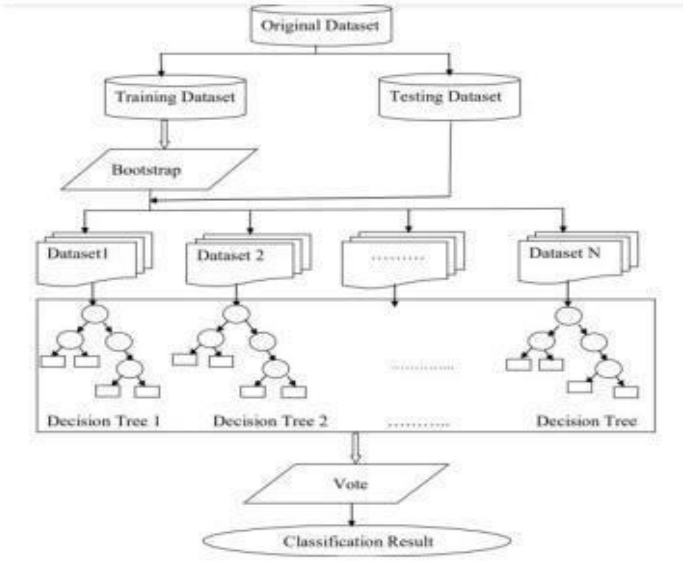
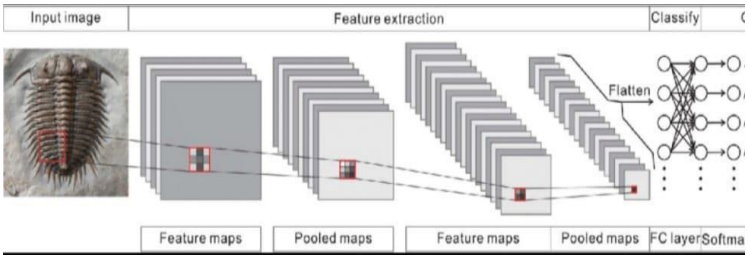


Image Preprocessing:

In this module we will retrieve the images from the dataset and convert them into a format that can be used for training and testing the model. This involves reading the images, resizing them, and normalizing the pixel values. We will retrieve the images and their labels. Then resize the images to (299,299) as all images should have same size for recognition. Then convert the images into numpy array.

2. Model used:



CNN Model:

Xception builds upon the inception module and architecture, making changes to both. A ResNet-34 can be closely compared to this design, which contains 36 convolutional stages. However, compared to Inception V4, the model and code are far more understandable and as straightforward as ResNet. This network may be seen

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implemented using Torch7 here. This is a Keras/Timplementation that is available. Interestingly, our work on separable convolutional filters also served as inspiration for the new Xception architecture.

IV. RESULTS AND DISCUSSION

Table 1: Results

DATASET	EXTRACTED FEATURE	TECHNIQUE	TRAINING	ACCURACY
KAGGALE	Length, width, shape	CNN	Multi layer	99%

Dataset Extricated highlights Method Preparing Exactness Kaggle dataset Length, width and shape. CNN Multi-Layer Perceptron 99% Dataset is collected from Kaggle. Length, width, shapes are the parameters.

Image preparing employments cv2 demonstrate to raise the quality of the picture. CNN demonstrate accomplished way better result Compared to other models[5], [6], [9] appeared in the over table 1.Which is utilized in deliver exact comes about. CNN demonstrate accomplished 98 percent precision is there in this framework. When yield is put into the rectify category, the method is wrapped up.

V. CONCLUSION

The errand "fossils Picture Based Bird Species Recognizing confirmation Using Significant Learning" presents a bleeding edge and particularly strong solution for modernizing the affirmation of bird species from pictures. By using the power of significant learning and the Xception plan, the system has shown remarkable execution in definitively describing grouped bird species, outflanking standard procedures in precision, efficiency, and adaptability. The errand's thriving can be credited to the utilization of the Xception designing, which considered automated incorporate learning and different evened out depiction of bird pictures. These results give testimony regarding the feasibility of significant learning techniques in fossils picture based portrayal tasks and spread out the proposed structure as a state of the art reply for avian affirmation. With its applications crossing untamed life conservation, regular investigation, and bird watching, the endeavor holds immense potential for sincerely committing to how we could decipher avian biodiversity and lifting attempts to defend and proportion bird masses. With everything taken into account, the endeavor "Fossils Picture Based Bird Species Conspicuous evidence Using Significant Learning" addresses a pivotal and leading attempt that sets new benchmarks in the space of bird species affirmation.

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