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Digital Naturalist Using Deep Learning

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Abstract: ***A naturalist is someone who studies the patterns of nature identify different kingdom of flora and fauna in the nature. Being able to identify the flora and fauna around us often leads to an interest in protecting wild species, collecting and sharing information about the species we see on our travels is very useful for conserving groups like NCC. Deep-learning based techniques and methods are becoming popular in digital naturalist studies, as their performance is superior in image analysis fields, such as object detection, image classification, and semantic segmentation. Deep-learning techniques have achieved state of-the -art performance for automatic segmentation of digital naturalist through multi-model image sensing. Our task as naturalist has grown widely in the field of natural-historians. It has increased from identification to saviours as well. Not only identifying flora and fauna but also to know about their habits, habitats, living and grouping lead to fetching services for protection as well.***

Keywords: Image Segmentation, Naturalists and Deep Learning

I. INTRODUCTION

A naturalist is someone who studies the patterns of nature, identifies a different kind of flora and fauna in nature. Being able to identify the flora and fauna around us often leads to an interest in protecting wild spaces, and collecting and sharing information about the species we see on our travels is very useful for conservation groups like NCC.

When venturing into the woods, field naturalists usually rely on common approaches like always carrying a guidebook around everywhere or seeking help from experienced ornithologists. There should be a handy tool for them to capture, identify and share the beauty to the outside world. Field naturalists can only use this web app from anywhere to identify the birds, flowers, mammals and other species they see on their hikes, canoe trips and other excursions.

In this work, we are proposing a web application which uses a deep learning model, trained on different species of birds (3 classes) and get the prediction of the bird when an image is been given. For our work we use deep learning technique.

Deep learning is a type of machine learning and artificial intelligence (AI) that imitates the way humans gain certain types of knowledge. Deep learning is an important element of data science, which includes statistics and predictive modelling. It is extremely beneficial to data scientists who are tasked with collecting, analysing and interpreting large amounts of data; deep learning makes this process faster and easier. At its simplest, deep learning can be thought of as a way to automate predictive analytics. While traditional machine learning algorithms are linear, deep learning algorithms are stacked in a hierarchy of increasing complexity and abstraction.

A. Problem Statement

To create a web application which uses a deep learning model, trained on different species of birds (3 classes) and get the prediction of the bird when an image is been given.

B. Objectives

1) To pre-processes the given image.
2) To segment the image for accurate examination.
3) To classify the image using CNN classifier algorithm.

C. Proposed System

We propose a web application to predict the given images from dataset using CNN. The segmentation refers to the process of partitioning a digital image into multiple segments. So here we come up with the system, where system will detect (Robin, Dove, Peacock) from given images. User has to select the image system which will process the image by applying image processing steps. We applied image processing algorithms to detect the classes from given image. Here we proposed image segmentation process for accuracy. In this firstly we train the model with some of the Birds images which predict that which bird is present. Based on the extracted features our model detects the type of bird.

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II. LITERATURE SURVEY

"Bird classification using CNN" by Simon Haykin: This work presents a scenario with classification of birds using CNN technique based on color features. They used color images of birds with almost similar types. Image segmentation is carried in various stages. At first, the pixels are arranged and segmented on the basis of edges and spatial segmentation, where clustering is done. Next, the blocks are segmented using edge detection. The computational efficiency increases for image and training becomes easier. This approach provides with better and robust results for different images. Here they took sparrow for the case study and evaluated the features of it using the steps up listed. The experimental results classify the effectiveness of proposed approach to improve the segmentation quality in aspects of precision and computational time [1].

"Adapted approach for Species Classification" by Schmid Huber, J.: In this work, an adaptive approach for the identification of species is proposed and experimentally validated. Image processing technique is followed. In the first step K-Means clustering is used for image segmentation, in the second step some state of art features is extracted from segmented image, and finally images are classified under one of the classes by using multi-class support vector machine. The classification accuracy is achieved up to 89% [2]. "Detection And Classification of images using Detection Line" by Haibing Wu and Xiaodong Gu: In this study, they present an application of neural networks and image processing techniques for detecting and classifying images. Images were segmented by a detection line (DL) method. Six geometric features (i.e., the principal axis length, the secondary axis length, axis number, area, perimeter and compactness of the image), 3 color features (i.e., the mean gray level of image on the R, G, and B bands. The methodology presented herein effectively works for classifying image to an accuracy of 90.9% [3].

"Texture Classification from Random Features" by Gary Bradski and Adrian Kaehler: presented an approach for texture classification based on random projection, suitable for large texture database applications. A small set of random features are extracted from local image patches and those features are embedded into a bag-of-words model to perform texture classification [4].

"Classification and Grading of Image Using Texture Based Block-Wise Local Binary Patterns" by Paul Viola, Michael Jones: They proposed approach makes use of global textural feature viz., Local Binary Pattern for feature extraction. Initially, an image is divided into k number of blocks. Subsequently, the texture feature is extracted from each k blocks of the image. The k value is varied and has been fixed empirically. For experimentation purpose, the bird dataset is created using 4 different classes and experimentation is done for whole image and also with different blocks like 2, 4 and 8. Grading of Bird is done using Support Vector Machine classifier. Finally, the performance of the grading system is evaluated through metrics like accuracy, precision, recall and F-measure computed from the confusion matrix. The experimental results show that most promising result is obtained for 8 blocks of the image [5].

III.SYSTEM DESIGN

System design thought as the application of theory of the systems for the development of the project. System design defines the architecture, data flow, use case, class, sequence and activity diagrams of the project development.

A. System Architecture

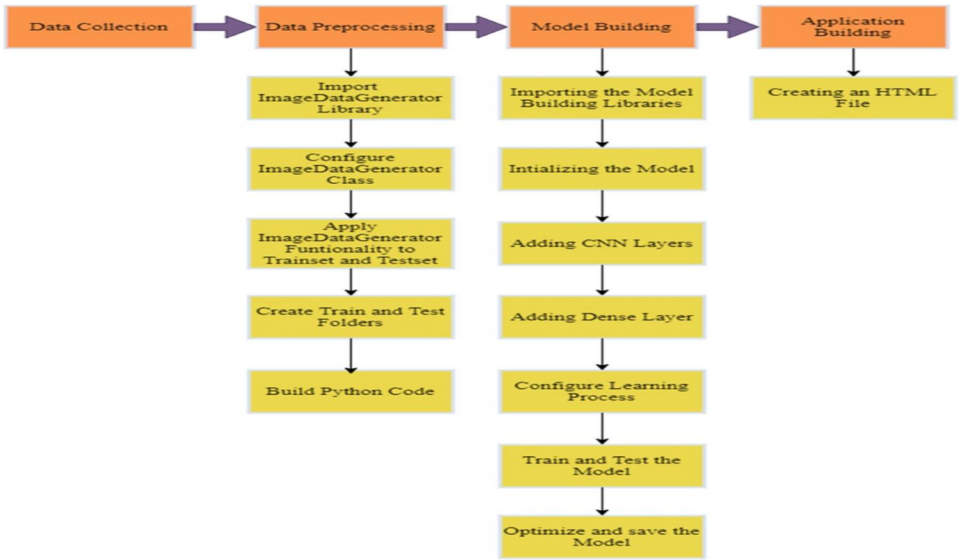


Fig. 1 Architecture Diagram

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The entire architecture of proposed work in figure 1 be categorized into four main segments.

1) *Data Collection:* Here data set used is the Digital Naturalist Dataset. This dataset contains two folders: test set and training set. In test set folder, we have three categories called dove, peacock and robin, where, dove has the images having dove bird, peacock has the images having peacock bird, robin has the images having robin bird. Similarly, in the training set folder. Having 309 images belonging to 3 classes and 134 images belonging to 3 classes.
2) *Data Pre-processing:* Images are converted into grayscale image. System will process the image by applying image processing steps. A unique algorithm is applied to detect images from the specified image. But edges of the image are not sharp in early stage of specification. So, image segmentation is applied on image to detect edges of the images. In this method image segmentation is applied to detect the species. Here the proposed image segmentation process many image filtering techniques for accuracy. Importing the ImageDataGenerator Library and configure the class. Now applying ImageDataGenerator Functionalities to Train set and Test set and building the Python Code.
3) *Model Building:* Firstly, importing the Model Building Libraries. Now initializing the Model and adding the CNN Layers Max Pooling layer, Flatten layer and Dense layers. Configuration of the Learning Process is done and after that model is trained and tested. Finally, optimization of the Model is done and lastly it is saved.
4) *Application Building:* Application Building is done by using the Flask Interface and for Documentation and design to be displayed HTML is made used. Thereafter loading of the Model in the Web Application is done. Finally, the Clicked Images are sent to the Trained Model and the result is displayed through the prediction made by the Model in the form of text and information is obtained.

B. Flowchart

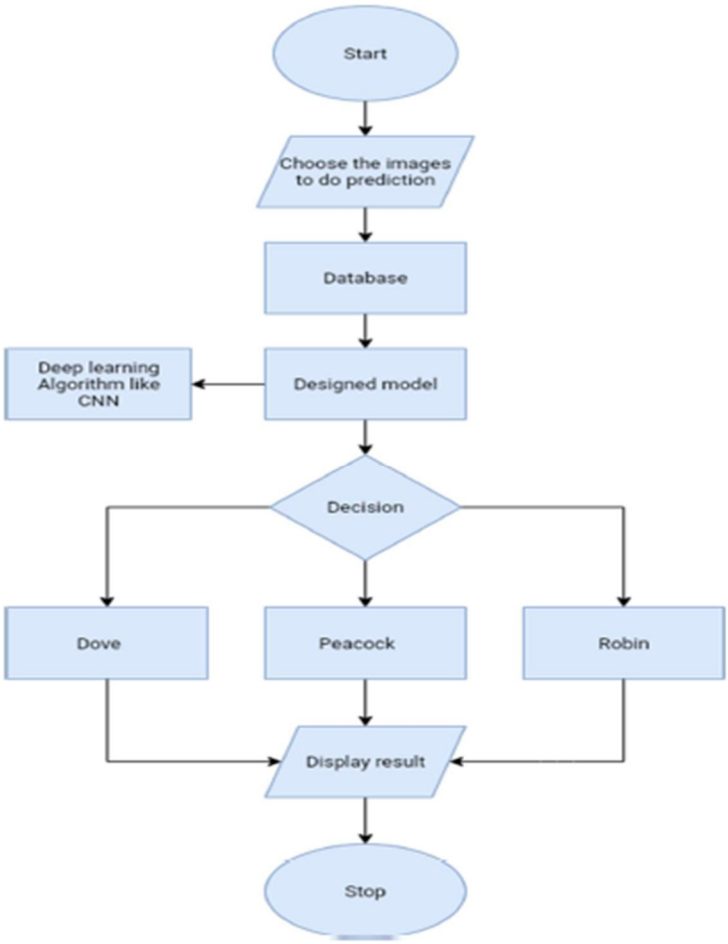


Fig. 2 Flowchart

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IV. RESULTS

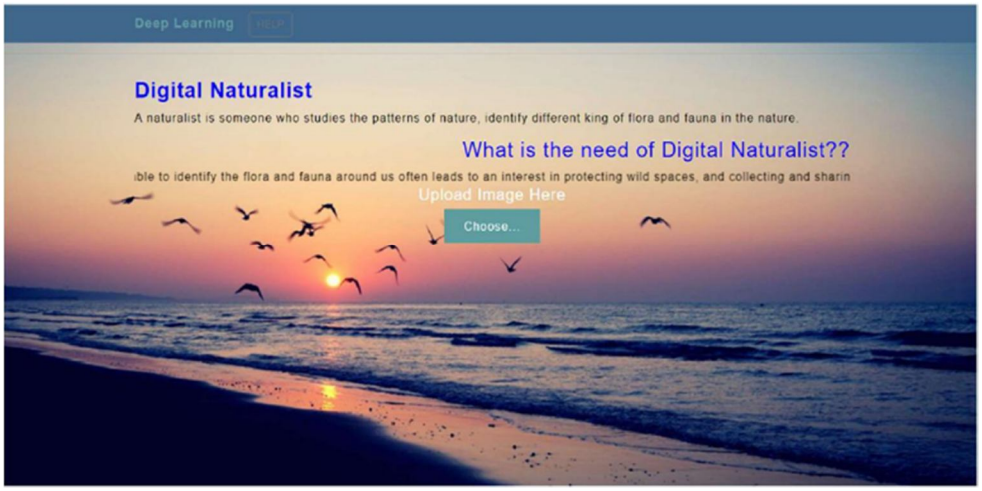


Fig. 3 Home Page

The above figure 3 represents the home page of the proposed web application.

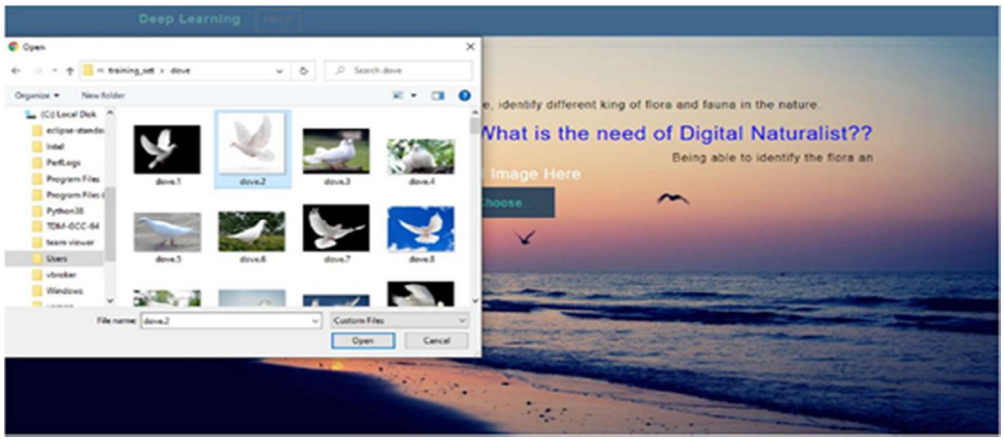


Fig. 4 Input Image

The above page is displayed when the choose button is pressed. It will ask you to choose a file from the dataset folder.

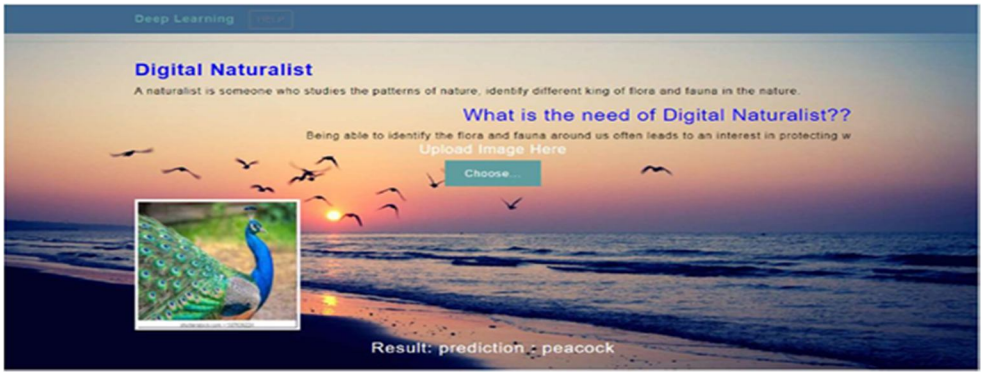


Fig. 5 Input image is predicted as peacock

The above figure 5 displays the output when we click on predict button. If the selected image is that of dove it displays “peacock”.

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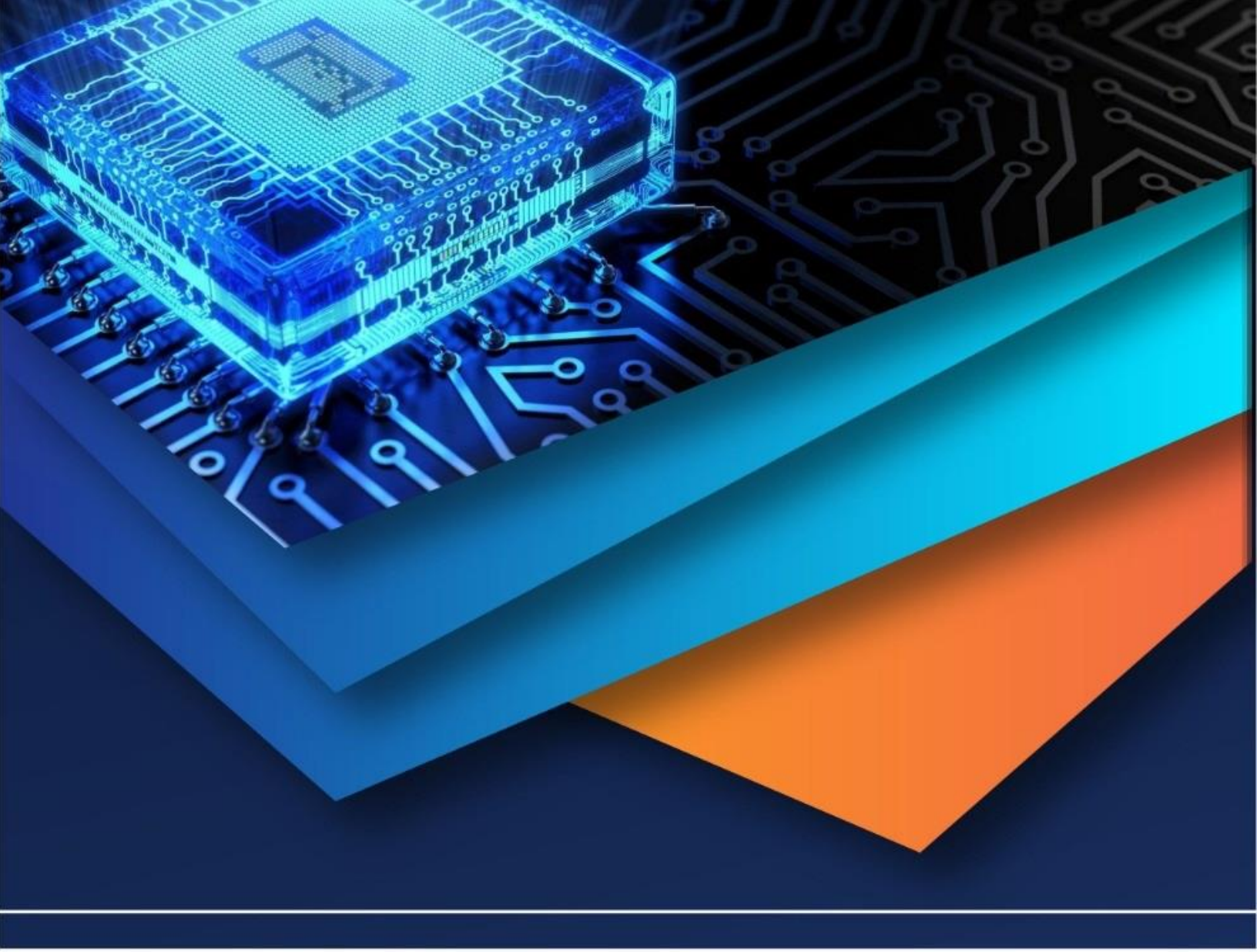
V. CONCLUSION

This paper consists of the details about the model which was used for the detection of digital naturalists using the species images from the wild life and the species with flora part and with fauna part will be displayed as well. From the resultant graphs, it is proven that the accuracy of the model has reached good level; if it is deployed in the real-time scenario then it will help many people in distinguishing between both without wasting the money on various machines. If the image is confirmed by the model, then the person can know the feature of the species. It can be the best way of practice for people to save money. As we know that the data plays a crucial role in every deep learning model, if the data is more specific and accurate about the species then that can help in reaching greater accuracy with better results in real- time applications.

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