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Project Review

on

BIRD SPECIES DETECTION USING VGG-16 ALGORITHM

ABSTRACT

Birds are an integral part of an environment and they are of the utmost importance to nature. Considering this, it is clear how necessary it is to be able to identify birds in the wilderness. Nowadays some bird species are being found rarely and if found classification of bird species prediction is difficult. Ornithologists who often work on reporting bird activity need some kind of assistance to deal with the reporting. Numerous bird books have been published to assist birdwatchers and ornithologists in order to determining the correct species. However, the identification of birds is an impractical piece of work to be done manually. Image-based bird species identification involves various techniques like Open CV, CNNs and few more which are the most important image processing techniques to predict the type of bird species. Deep learning techniques can be used for identifying the birds . We developed a model by using VGG(visual Geometry Group)-16 which is a deep convolution neural network for easily identifying bird species.

Introduction

Nowadays, Identification of bird species is a difficult activity sometimes leading to uncertainty. Birds allow us to search certain organisms within the environment as they respond quickly to changes in the atmosphere (for example, the insects on which they feed). But collecting and gathering bird information requires huge efforts by humans as well as being a much more expensive method.

In such situations, a robust system must be in place that will provide large-scale bird information processing and serve as a valuable resource for scholars, government agencies and so on. Consequently, naming bird species plays a significant role here for determining which species belongs to a specific image of birds. Generally the identification of birds has done using the image, audio or video. In 2013, the IEEE International Machine Learning Workshop for Signal Processing (MLSP) declared a challenge to identify bird species. The audio processing technique allows for the detection of birds by recording the audio signal. But the processing of such information becomes more complicated because of in the environment, the mixed sounds like insects, real world objects, etc. Usually, people are more effective at find images than audios or videos. So, it is preferable to use an image over audio or video to classify birds.

Ornithologists have been facing problems in identifying bird species for many decades. They have to learn all the specifics of birds, such as their climate, genetics, distribution, environmental impact, etc. Normally, bird identification is conducted by an ornithologist based on the classification suggested by Linnaeus based on criteria such as State, Clade, Rank, Order, Family and Species.

LITERATURE SURVEY

Aditya Bhandari, Ameya Joshi, Rohit Patki [2012] used data set Caltech UCSD 200 bird species. The entire design was based on a python library Scikit and algorithms **like Naive Bayes, Support Vector Machines** (SVM), **KNN**, were tried out. The final observation was that the highest accuracy obtained was for **Logistic Regression** method using **Mturks** as an extraction method. The accuracy obtained is higher compared to modules when SVM or SVM+CNN - Learning method but lower when compared Logistic Regression-Learning method. The proposed model generates output with an accuracy rate of **53.65 %** where Mturks is the feature extraction method and Logistic Regression is Learning method**. [1**]

Andreia Marini, Jacques Facon and Alessandro L. Koerich [2013] used Caltech UCSD-200 dataset in this module. First, a **colour segmentation method** for removing background elements and possible locations where the bird might be present. Thereafter, the image is split into planes, and normalised histograms are generated for each plane. The number of bins is then reduced via aggregation processing. An algorithm uses these histogram bins as feature vectors to discriminate between the number of species. The proposed module achieved a segmentation accuracy rate of **75%**. **[2]**

Saundarya Junjur, Punam Avhad, Deepika Tendulkar [2013] used **Deep Learning algorithm** victimization with CNN architecture. After transforming the image uploaded into grey scale this method was applied. The main goal of the application is to identify the name of the bird with image as an input. The dataset used here is Caltech-UCSD with across 200 different types of bird species. The architecture consists of five

convolution layers, one activation layer ,one pooling and one dense layer. The accuracy of predicating the bird's name given image is about **83.3%. [3]**

Suleyman A. Al-Showarah, Sohyb T. Al-qbailat [2015] used **ANN (**Artificial Neural Network) algorithm and the various operations were performed like combine, max, min and average between the f6/g7. Based on the result of classifiers: The classification accuracy of ANN was **70.9908%,** the recall was 0.71%, and the f-measure was 0.708. The highest accuracy of image identification of about 70.9908% with ANN algorithm**. [4]**

Bhandare, Amit Tambade[2017] developed an application that utilizes Deep Convolution Neural Network **(DCNN)** and Unsupervised learning calculation respectively. The data set preparation is completed by Google-Collab. The architecture consists of five convolution layers, one activation layer ,one pooling and one dense layer. The result of the application has the range of exactness between **80% to 90%** respectively which utilized Tensor Stream library**.[5]**

Huang(author):[2021] designed an automatic model which was made to classify the **27 endemic birds** of Taiwan by skipped **CNN** (Convolution Neural Network) model. The purpose behind skip connection was to give an uninterrupted gradient flow from the first layer to last layer, so it can solve the disappearing gradient problem. The proposed model was able to identify the uploaded image of a bird as bird with **95%** accuracy**.[6]**

Nadimpalli(author): [2012] focuses on bird detection and analyzes the motion detection with image subtraction, bird detection with template matching and bird detection with the **Viola-Jones Algorithms.** Out of all the methods, bird detection

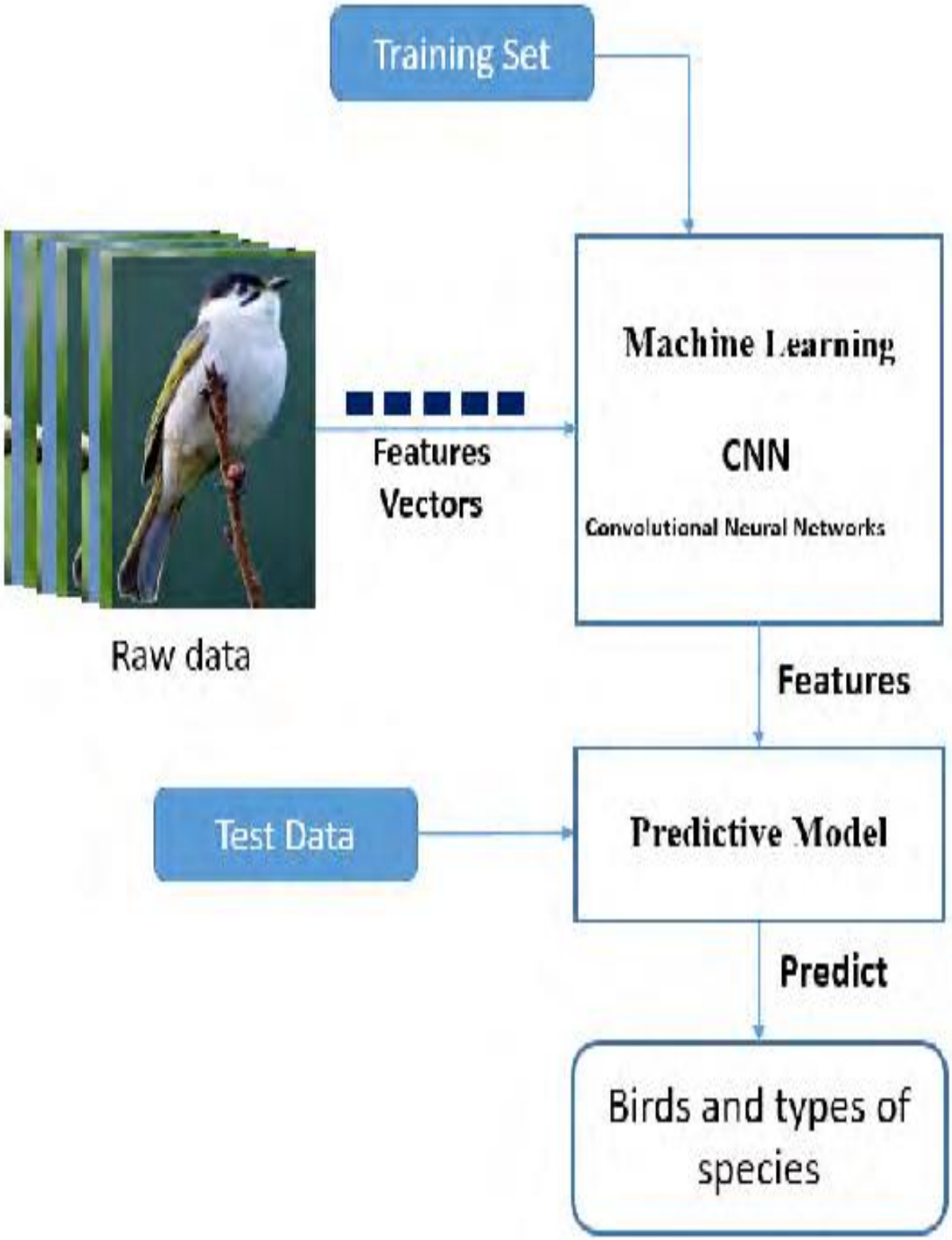
with Viola Jones Algorithm had the highest accuracy (**87%**) with a low false positive rate. The Viola-Jones algorithm can be trained for almost any object as long as there are many similar positive images that can be used for training the classifier.**[7]**

Marcelo T. Lopes, Lucas L. Gioppo et al (2011): 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 **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.**[8]**

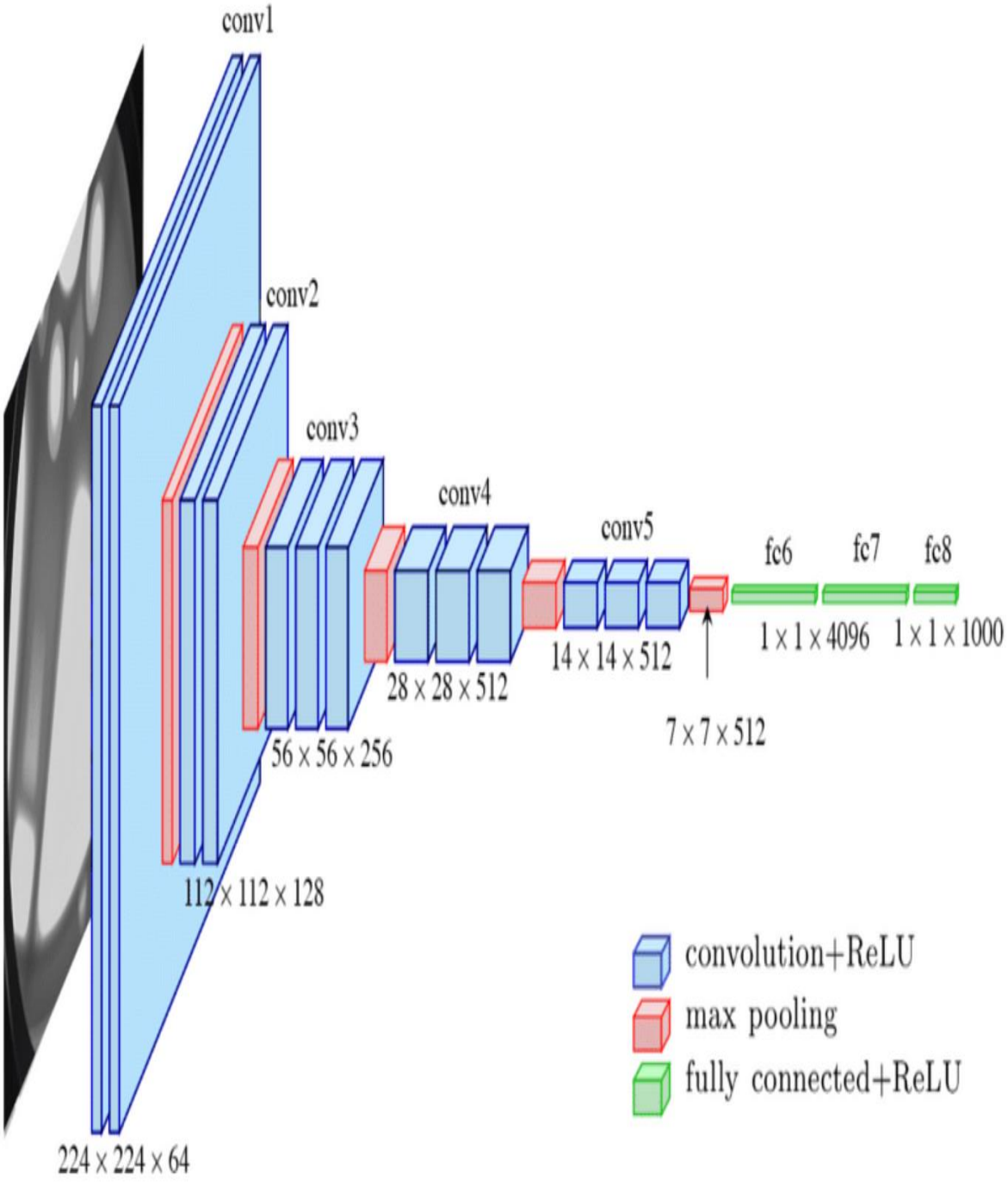
Peter Jancovic and Munevver Kokuer [2012] (model-2) Investigated acoustic modelling for recognition of bird species from audio field recordings. Developed a hybrid deep neural network hidden Markov model (**DNNHMM**). The developed models were employed for bird species identification, detection of specific species and recognition of multiple bird species vocalizing in a given recording. In this paper, the authors achieved an identification accuracy of **92.7% . [9]**

Nyaga,G.M **[2019](Model-1)** A Mobile-based image recognition system for identifying bird species in Kenya indicates that **a Machine Learning Algorithm** is used to classify images to detect bird species and to predict behavioral patterns. An image classification algorithm used to detect the bird species. The accuracy of this model is around **87%. [10]**

Architecture of Project



Architecture of VGG-16



Comparing with Existed Systems

Models	Bird prediction	Description about bird	Dataset Size	Bird Voice	Result
Model-1	Yes	No	350	No	87%
Model-2	Yes	No	225	Yes	92%
Newly Generated Model (BCC.h5)	Yes	Yes	525	Yes	95%

Proposed System

Our project leverages the VGG-16 algorithm, a deep learning approach, to discern bird species from images. Utilizing a pre-trained VGG-16 model as a feature extractor, we refine its capabilities through tuning on a specialized bird species dataset, allowing adaptation to specific avian characteristics. Employing an 80:20 ratio for training and testing data, our model achieves an impressive accuracy rate of up to 95%.

Improved accuracy: The proposed system increases the accuracy (95%) of bird species detection comparing with all other systems because we use the VGG-16 algorithm.

Scalability : The proposed system supports huge images comparing with all other systems .This work on 525 bird species consists of 84,635 training images and consists of 2,622 testing images.

Features : This proposed system not only predict name of the bird and also gather the complete information about bird like location, voice of bird.

Research and Education: The proposed system contribute to scientific research by generating data for studies on avian behavior, migration patterns, population dynamics, and evolutionary biology. Additionally, these projects offer opportunities for public education and engagement in citizen science initiatives.

Ecological Balance: Birds play crucial roles in ecosystems such as seed dispersal, pollination, insect control, and nutrient cycling. Detecting bird species helps in assessing ecosystem health and promoting ecological balance.

Output Interface