Predicting Bird Species Using Convolutional Neural Network

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Abstract: This project aims to assist amateur birdwatchers in identifying bird species through images by leveraging a multimodal machine learning system. Using Convolutional Neural Networks (CNNs) for image classification, the system overcomes challenges like high intraclass variance, diverse poses, lighting conditions, and backgrounds. The user-friendly interface enhances accessibility for birdwatchers, researchers, and conservationists, contributing to ecological monitoring and conservation efforts.

Keywords— Bird Species Identification, Convolutional Neural Networks (CNNs), Image Classification, Machine Learning

I. INTRODUCTION

In recent years, deep learning techniques, like convolutional neural networks (CNNs), have caught the attention of environmental researchers. Deep learning techniques and methods are implemented in the field of ecology and research to successfully identify the animal, bird, or plant species from images. A lot of importance is given to bird species classification because of its attention in the field of computer vision and for its promising applications in environmental studies. The identification of bird species is a challenging task in the research field as it may sometimes lead to uncertainty due to various appearances of birds, backgrounds, and environmental changes. Recent development in the deep learning field made the classification of bird species more flexible.

Birds play an essential role in the ecosystem by directly influencing food production, human health, and ecology balance. Various kinds of challenges have been faced by ornithologists for decades regarding the identification of bird species. Ornithologists study the characteristics and attributes of birds and distinguish them by their living within the atmosphere, and their ecological influence. on bird species have led to the development of applications that can be used in tourism, sanctuaries, and additionally by bird watchers.

II. PRIOR WORK

[1] In these nine features of color-based mare measures of mean, standard deviation, and skewness of red, green, and blue (RGB) planes are found in bird images. SVM algorithm was implemented for feature extraction and classification. A fast detection model known as SDD was used for predicting the locations of the multiple category objects in an image. The stochastic gradient descent (SGD) algorithm was used to train the SVM classifiers. In [3], a CNN- based architecture had been proposed for bird species classification. Histogram of Oriented Gradient (HOG) had been utilized for feature extraction and the LeNet model was chosen for the classification process. [4] This paper proposed a Machine Learning approach to identify Bangladesh birds. The VGG-16 network was applied for feature extraction and SVM was applied for the classification of bird species

III. ALGORITHM

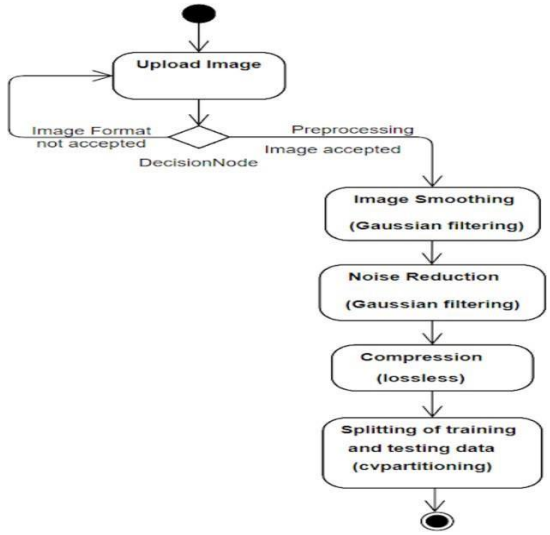
This paper discusses the implementation of CNN to identify bird species. A convolutional neural network (CNN) is a class of deep learning algorithms that utilize machines to take in input images, assign weights and biases to various aspects and objects in the image and identify patterns in the image. CNN's consist of the input layer, which is a grayscale image; the output layer, which is a binary or multi-class label; and the hidden layers, which are convolution layers, ReLU layers, pooling layers, and a fully connected neural network. In the field of image processing, CNN is a powerful algorithm. These algorithms are currently the best available for automating the processing of images. Images are made up of RGB combinations.

IV. IMPLEMENTATION

After preprocessing the images, that is after splitting the images into training and validation datasets. Next, a network architecture for the model will be created. The different types of layers are used according to

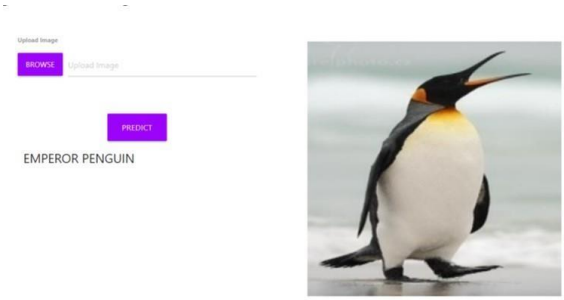
their features namely

1. Conv_2d: It is used to create a convolutional kernel that is convolved with the input layer to produce the output tensor
2. Max_pooling2d: It is a down sampling technique that takes out the maximum value over the window defined by pool size.
3. Flatten: It flattens the input and creates a 1D output.
4. Dense: Dense layer produces the output as the dot product of input and kernel.
5. In the last, a SoftMax layer will be used as the activation function because it is a multi-class classification problem.



V. RESULT

A bird image will be given as input to the model and the species of the bird will be displayed along with the image.

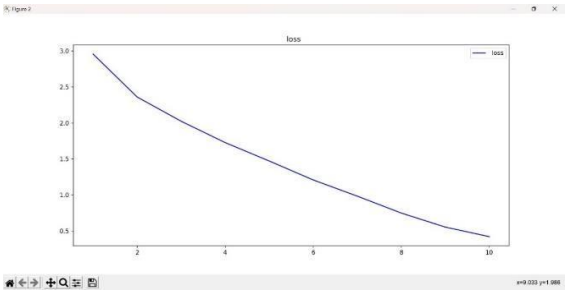


The following graph shows the model accuracy and was plotted with epochs along the x-axis and accuracy rate along the y-axis.

VI CONCLUSION AND FUTURE SCOPE

Identifying bird species from an image input by the user is the main goal of the project. The Convolutional Neural Network was used as it provides good numerical precision accuracy.

The accuracy was about 87%-92%. Wildlife researchers can use this to keep track of wildlife movement and behavior in specific habitats.



Various deep learning techniques can be applied in the future to enhance the accuracy and performance of the model. The future work also includes developing a mobile application for more convenient use. Also, this can be implemented in real-time monitoring of bird species in sanctuaries.

REFERENCE

[1] D. T. C. Cox and K. J. Gaston, ‘‘Likeability of garden birds: Importance ofspecies knowledge & richness in connecting people to nature,’’ PloS one, vol. 10, no. 11, Nov. 2015, Art. no. e0141505.

[2] O.Russakovsky , J.Deng, H.Su, J.Krause, S.Satheesh, S.Ma, Z.Huang, A.Karpathy, A. Khosla, M.Bernstein, A.C.Berg, and L. Fei-Fei, ‘‘ImageNet large scale visual recognition challenge,’’ Int. J. Comput. Vis., vol. 115, no. 3, pp. 211–252, Dec. 2015.