Panchhi – The Bird Species Identifier

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Abstract - Identifying bird species through image analysis poses a formidable challenge, often resulting in ambiguous labels even among seasoned bird watchers. This difficulty arises from the diverse shapes and appearances exhibited by different bird species, despite sharing a common set of basic features. Factors such as lighting variations, background differences, and the wide range of poses (e.g., flying, swimming, perched with occlusions) contribute to high intraclass variance. Our project seeks to leverage the capabilities of deep learning to assist amateur bird watchers in identifying bird species from the images they capture. To conduct this experiment, we utilized the Caltech-UCSD Birds 200 [CUB-200-2011] dataset, employing 500 labeled data for training and 200 unlabeled data for testing purposes.

Index Terms - Deep Neural Network, Convolutional Neural Network (CNN), Image Classification, Image Recognition, Machine learning, TensorFlow.

I. INTRODUCTION

Now a day's bird watching is a popular recreational activity that offers relaxation and connects us with nature. Individuals who engage in this are called birdwatchers or birders, while the scientific study of birds is known as ornithology, with professionals in the field being ornithologists. Recent research from the American Museum of Natural History reveals Earth is home to around 18,000 bird species. Distinguishing similar-looking birds, often thought to interbreed, has proven challenging due to observer limitations like location and equipment. To address this, a technology for bird identification aims to create a comprehensive database of bird species, accessible through image recognition. This technology employs convolutional neural networks (CNNs) to analyze bird images, aiding in quick and accurate identification, bridging the gap between historical data in books and papers and modern tech-savvy generations.
Machine learning has emerged as a promising approach in the field of Image detection. By leveraging algorithms and statistical models, machine learning enables systems to learn and recognize patterns, anomalies, and characteristics associated with Image.
The objective of this project is to develop an accurate and efficient machine learning-based system for Identifying Bird Species. By training the system on labeled datasets comprising both known and unidentified bird species, the model can learn to differentiate between them.
Through the development of an effective bird species identification system, users can be informed about potential bird species they encounter, enabling them to appreciate the diversity of avian life and enhance their knowledge of the natural world. Moreover, researchers and conservationists can better understand and protect bird populations, contributing to the preservation of biodiversity.
By harnessing the power of machine learning, this project seeks to contribute to 1 the advancement of intelligent bird species identification systems, ultimately creating a more informed and environmentally conscious society.
With the increasing complexity of bird species identification, traditional methods alone are insufficient in providing accurate information. The application of machine learning in bird species identification offers the potential to stay ahead of evolving species recognition challenges and enhance our understanding of the avian world.

II. LITERATURE SURVEY

Paper 1: PakhiChini: Automatic Detection of Brain Tumor in Magnetic Resonance Imaging using Convolutional Neural Network
Author: Kazi Md Ragib,Raisa Taraman Shithi, Shihab Ali Haq, Md Hasan, Kazi Mohammed, Sakib, Tanjila Farah
Publication and Year: IEEE-2020.
Description: The paper you provided is titled "PakhiChini: Automatic Bird Species Identification Using Deep Learning" by Kazi Md Ragib, Raisa Taraman Shithi, Shihab Ali Haq, Md Hasan, Kazi Mohammed Sakib, and Tanjila Farah, affiliated with the Department of Electrical and Computer Engineering at North South University in Dhaka, Bangladesh. The paper discusses the use of deep learning techniques, specifically Convolutional Neural Networks (CNN), for the automatic identification of individual bird species from input images.

Paper 2: Bird Species Identification using Deep Learning on GPU platform
Author: Pralhad Gavali, J. Saira Banu
Publication and Year: ETITE -2020.
Description: The paper titled "Bird Species Identification using Deep Learning on GPU platform" was presented at the 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE). The authors of the paper are Pralhad Gavali and J. Saira Banu, affiliated with the Computer Science & Information Technology Department at the Rajarambapu Institute of Technology in Sakharale, Maharashtra, India, and Vellore Institute of Technology in Vellore, Tamil Nadu, India, respectively.

Paper 3: Image based Bird Species Identification using Convolutional Neural Network.
Author: Satyam Raj, Saiaditya Garyali, Sanu Kumar, Sushila Shidnal
Publication and Year: IJERT - 2020.
Description: The paper "Image based Bird Species Identification using Convolutional Neural Network" by Satyam Raj, Saiaditya Garyali, Sanu Kumar, and Sushila Shidnal, discusses the development of a Deep Learning model to identify 60 bird species from images using Convolutional Neural Networks (CNN). Here's a summary of the paper.

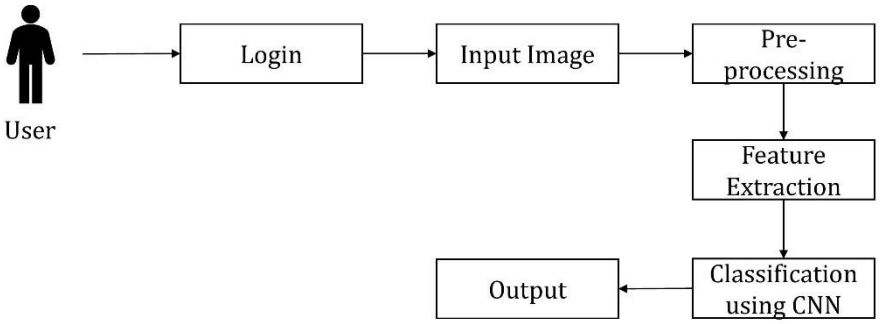
Paper 4: Bird Species Identifier using Convolutional Neural Network.
Author: Ashmita Jange, Deepika Kattimani, Prof. Jyothi Patil
Publication and Year: IJRASET - 2022.
Description: The identification website developed in this paper aims to build awareness regarding bird-watching and bird identification, especially in India. It simplifies the bird identification process, making bird-watching easier. The technology used, Convolutional Neural Networks (CNN), is suitable for implementing advanced algorithms and provides good numerical precision accuracy. The project achieves an accuracy of 85-90%, making it a reliable tool for identifying bird species from images. This concept can be implemented in wildlife research and monitoring, such as using camera traps to maintain records of wildlife movement and behavior in specific habitats.

Paper 5: Bird Species Identification and Prediction Analysis of Endangered Species.
Author: Kajol Achhra, Priyanka Ahuja, Pooja Kamrani, Parth Mangtani, Pallavi Saindane
Publication and Year: IJRASET - 2021
Description: This paper throws a light on the comprehensive survey on machine learning applications in bird identification and prediction analysis of endangered bird species. Machine learning is an application of Artificial Intelligence that provides the system with the ability to automatically learn and improve from experience rather than explicit programming. Nowadays some bird species are being found rarely and if found classification of bird species prediction is difficult. Machine learning techniques can be used for identifying the birds using classification models. The paper highlights attributes which will reduce the risk of endangerment of such birds and predict the improvement in chances of their survival.
Paper 6: Image-based Bird Species Identification Using Convolutional Neural Network.
Author: Surendhiran Tamilalagan
Publication and Year: IJIRT - 2022.
Description: This research paper focuses on bird species identification using a neural model, aiming to contribute to the protection of these species, which has positive impacts on the environment.Their goal is to create a program that accurately identifies bird species in uploaded images, benefiting conservation efforts and bird enthusiasts.

III. ALGORITHM

Importing all Dependencies
Start by importing necessary libraries and packages (e.g., NumPy, OpenCV, TensorFlow, Matplotlib) to set up your image processing environment.
Loading Dataset
Import image dataset and Ensuring data integrity, structure, and consistency.
Pre-Processing
Resize, Rescaling, or normalize images to prepare them for analysis.
Apply noise reduction, color correction, and feature extraction as needed.
Prepare data augmentation if necessary (e.g., flipping, zooming).
Creating Model
Create a Sequential model.
Add a Convolutional layer.
Add a MaxPooling layer.
Flatten the output from the previous layers.
Add a Dense layer.
Compile the model.
Training Model
Train your model on the pre-processed image data.
Monitor training progress and tune model parameters as needed.
Evaluation
Assess model performance using test data.
Report evaluation metrics (e.g., accuracy, precision, recall).
Visualize results with graphs.

IV. SYSTEM ARCHITECTURE



V. CONCLUSIONS

The Bird Species Identification System serves as a valuable tool for birdwatchers, researchers, and conservationists by facilitating accurate bird species identification. This system addresses challenges related to visually similar species and geographical constraints, bridging the gap between traditional identification methods and modern technology. As the system advances, there is substantial potential for improvement and expansion, including increased identification accuracy, geospatial integration, audio-based identification, and a growing user community. These developments aim to enhance the system's utility for bird enthusiasts and scientific research. With its capacity to contribute to biodiversity conservation and environmental awareness, the Bird Species Identification System underscores the transformative role of technology in deepening our understanding of the avian world.

VI. REFERENCES

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