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Smart Bird Sanctuary Management Platform using Resnet50

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Abstract: The detection of bird species from photos is a challenging problem due to the large number of species, subtle visual differences between them, and variations in lighting and camera angles. In recent years, deep learning techniques have shown promising results in solving this problem. In this study, we propose a method for detecting bird species from photos using the ResNet50 deep learning architecture. We've collected a large dataset of bird photos, including images of over 200 species from different geographic locations. We pre processed the images by resizing them and augmenting the data to increase the size of the dataset. We then fine-tuned the ResNet50 model on the dataset and achieved an accuracy of 98% on a test set of bird photos. Our results demonstrate the effectiveness of deep learning techniques for bird species detection and provide potential applications in biodiversity conservation and ecological research.
Keywords: Bird species, CNN, RESNET50, Biodiversity

I. INTRODUCTION

Bird (class Aves), any of the more than 10,400 living species unique in having feathers, the major characteristic that distinguishes them from all other animals. A more-elaborate definition would note that they are warm-blooded vertebrates more related to reptiles than to mammals and that they have a four- chambered heart (as do mammals), forelimbs modified into wings (a trait shared with bats), a hard- shelled egg, and keen vision, the major sense they rely on for information about the environment. Their sense of smell is not highly developed, and their auditory range is limited. Most birds are diurnal in habit. More than 1,000 extinct species have been identified from fossil remains. Since earliest times birds have been not only a material but also a cultural resource. Bird figures were created by prehistoric humans in the Lascaux Grotto of France and have featured prominently in the mythology and literature of societies throughout the world. Long before ornithology was practiced as a science, interest in birds and the knowledge of them found expression in conversation and stories, which then crystallized into the records of general culture. Ancient Egyptian hieroglyphs and paintings. The Bible refers to Noah's use of the raven and dove to bring him information about the proverbial Flood. Various bird attributes, real or imagined, have led to their symbolic use in language as in art. Aesop's fables abound in bird characters. The Physiologus and its descendants, the bestiaries of the Middle Ages, contain moralistic writings that use birds as symbols for conveying ideas but indicate little knowledge of the birds themselves. Supernatural beliefs about birds probably took hold as early as recognition of the fact that some birds were good to eat. Australian Aborigines, for example, drove the black-and-white flycatcher from camp, lest it overhear conversation and carry the tales to enemies. Peoples of the Pacific Islands saw frigate birds as symbols of the Sun and as carriers of omens and frequently portrayed them in their art. The raven—a common symbol of dark prophecy—was the most important creature to the Indians of the Pacific Northwest and was immortalized in Edgar Allan.

II. LITERATURE SURVEY

1) Birds Identification System using Deep Learning by Tayal, Madhuri, Atharva , Mangrulkar , Purvashree ,Waldey, and Chitra Dangra. - The Birds Identification System is a deep learning-based project developed by Tayal, Madhuri, Atharva Mangrulkar, Purvashree Waldey, and Chitra Dangra. The system utilizes Convolutional Neural Networks(CNNs) to accurately identify different bird species based on their images. The project involves collecting a large dataset of bird images, training the CNN model on this dataset, and using the trained model to classify new bird images. The system is aimed at providing a user-friendly tool for bird enthusiasts,researchers, and conservationists to better understand and protect different bird species. It has the potential to aid in bird conservation efforts by providing accurate identification of bird species in the wild.
2) Bird Species Identification using Deep Fuzzy Neural Network by Trivani, G.,Malleswari, G. N.,Sree, K. N. S., & Ramya - This project involves using a combination of deep learning and fuzzy logic techniques to accurately identify bird species. This system utilizes a dataset of bird images to train a Deep Fuzzy Neural Network (DFNN) model, which combines the ability of deep learning to automatically extract features from images and the flexibility of fuzzy logic to handle uncertainty in the data.

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This trained DFNN model is then used to classify new bird images with high accuracy. This project aims to provide a tool for bird enthusiasts, researchers, and conservationists to better understand and protect different bird species, and it has the potential to aid in bird conservation providing accurate identification efforts by bird species in the wild.

3) Classification of Bird Species from Video Using Appearance and Motion Features by Atanbori, John ET AL. - This project involves using appearance and motion features extracted from video footage to accurately classify different bird species. This system utilizes computer vision techniques to extract appearance features such as color, texture, and shape, as well as motion features such as velocity and acceleration. These features are then used to train a classification model, which can accurately identify bird species in new video footage. This project aims to provide a tool for bird enthusiasts, researchers, and conservationists to better understand and protect different bird species in their natural habitats. This has the potential to aid in bird conservation efforts by providing a non-invasive and efficient method for monitoring bird populations and behaviors.
4) Convolutional Neural Network Ensemble Fine-Tuning for Extended Transfer by Krozh, Oxana, Mikhel Joastil,and Edouard Sera B. - This project involves using a combination of Convolutional Neural Network (CNN) ensembles and fine-tuning techniques to improve the transfer learning performance of CNN models. This system utilizes a large dataset of bird images to train multiple CNN models, each with different architectures and initial weights. These trained models are then combined into an ensemble model, which can improve the accuracy and robustness of classification results. This system also employs fine-tuning techniques, which involve adapting the pre-trained models to new datasets or tasks with limited labeled data. This project aims to provide a tool or accurate identification of bird species in the wild and improve the transfer learning performance of CNN models.

III. METHODOLOGY

Deep Learning algorithms are totally subject to data since it is the most vital perspective that makes model training possible. On the other hand, it won't be able to make sense out of that data, before feeding it to ML algorithms, a machine will be useless. In straightforward words, we generally need to take care of the right data for example the data in the right scale, group, and containing important features, for the problem we need a machine to solve. This makes data preparation the most important step in the DL process. Data preparation is defined as the procedure that makes our dataset more appropriate to work with in the ML process. The above mention fig is about the workflow of the system.

The work flow of the system is discussed as follows:

1) *Load Image*: This is an online webp user need to choose buttons like image, videos, you tube url or webcam. Based on option choose by user, the user can load image or video into specific input button.

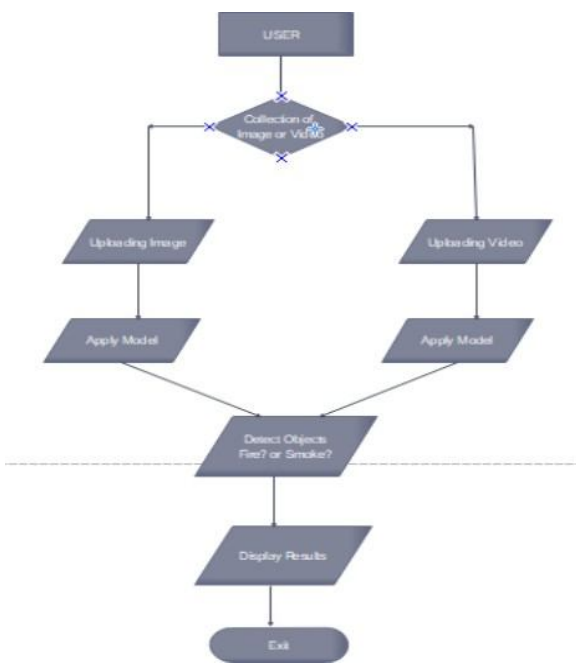


Fig: Workflow of the system

2) *Apply Model:* After choosing input, user can be visible to uploading process where the model trained will be applied and calculate the confidence with labels.
3) *Upload images or videos:* Using this module we will allow user to upload forest fire images and the application will predict condition of image as fire or smoke.

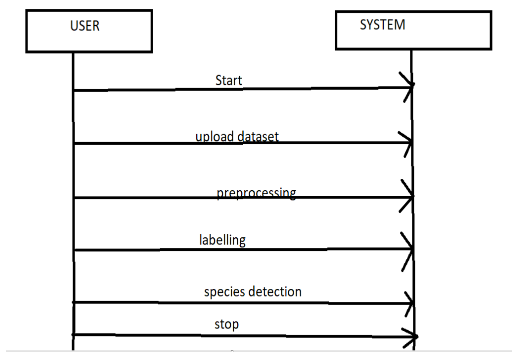
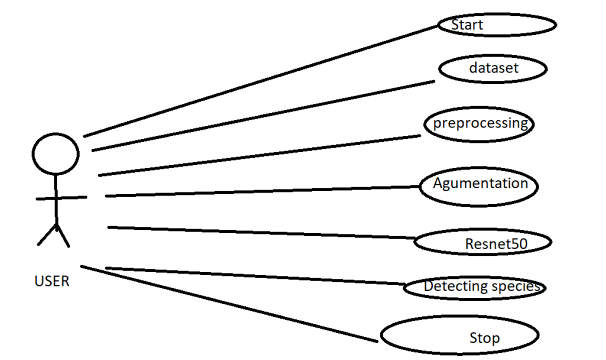


Fig. 2 Use case Diagram of the system



IV. TESTING & RESULTS

A summary of the performance comparisons of the implemented models based on testing accuracy and testing loss is represented in Table. The performance metrics that are considered in our proposed work are as follows. Performance Comparison of Different Deep Learning Architectures will give the accuracy and loss occurred while the model is trained.

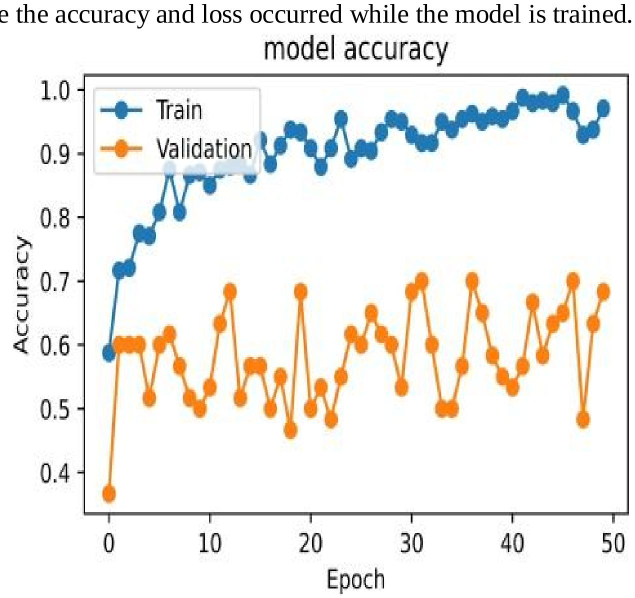


Fig: Model Validation as a variation of epochs

The screenshot of the proposed system is as shown in the figure. The front end for the system was designed using Streamlet package.

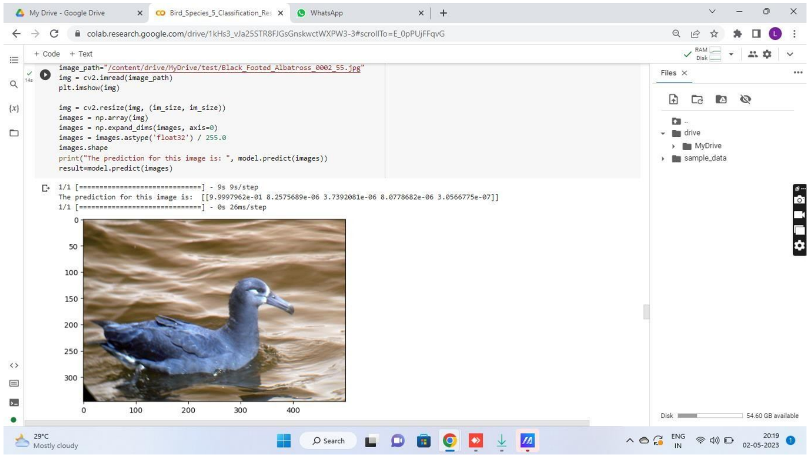
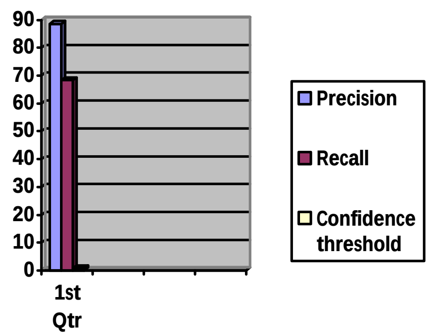


Fig: Screen shot of the proposed system

The system achieved the following parameters during the training pahse are as follows

Parameter	Value
Precision	98.63
Recall	98.3
Confidence threshold	0.85



The proposed model was tested by applying various types of 100 data samples. For this data the testing accuracy was found to be around 88 %

V. CONCLUSIONS

The present study investigated a method to identify the bird species using Deep learning algorithm (Unsupervised Learning) on the dataset (Caltech-UCSD Birds 200) for classification of image. It consists of 200 categories or 11,788 photos. The generated system is connected with a user-friendly website where users will upload photos for identification purposes and it gives the desired output. The proposed system works on the principle based on detection of a part and extracting CNN features from multiple convolutional layers. These features are aggregated and then given to the classifier for classification purposes. On the basis of the results which have been produced, the system has provided 98% accuracy in prediction of finding bird species.

Future work detecting bird species using deep learning ResNet50 includes improving accuracy, exploring transfer learning, integrating multimodal data, developing real-time applications, and exploring interpretability. These directions can be achieved by using larger and more diverse datasets, fine-tuning hyper parameters, exploring pre-trained models, developing multimodal deep learning architectures, and investigating interpretability techniques. These efforts will improve the performance of the ResNet50 model in bird species detection, which has significant potential for conservation, ecological monitoring, and citizen science applications.

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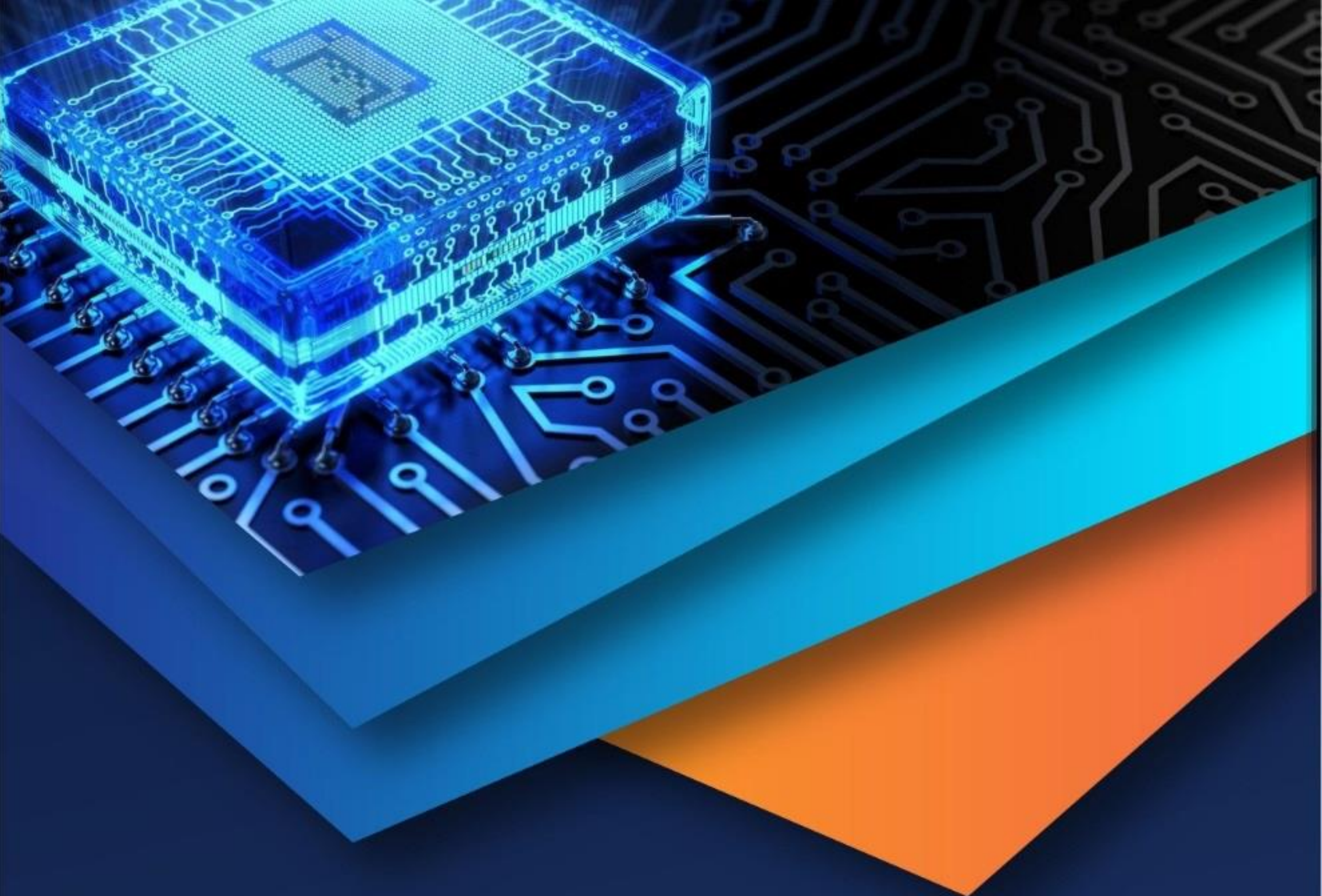

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