



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 5, May 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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Bird Species Identification Using Deep Learning

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ABSTRACT: Identification of bird species is a challenging task often resulting in ambiguous labels. Even professional bird watchers sometimes disagree on the species given an image of a bird. It is difficult problem that pushes the limits of the visual abilities for both humans and computers. Although different bird species share the same basic set of parts, different bird species can vary dramatically in shape and appearance. Intra-class variance is high due to variation in lighting and background and extreme variation in pose (e.g., flying birds, swimming birds, and perched birds that are partially occluded by branches). Our project aims to employ the power of machine learning to help amateur bird watchers identify Bird species from the images they capture.

I. INTRODUCTION

Now a day's bird watching is a recreational activity that can provide relaxation in daily life and it's a responsibility to know about our nature because birds are part of our society. Someone who does this is called a birdwatcher or birder. The scientific study of birds is called ornithology. People who study birds as a profession are called ornithologists. We have nearly 18,000 bird species on our beautiful earth by the new research led by American Museum of Natural History. Birds that look similar to one another or thought to interbreed, but actually different species. However, because of observer constraints such as location, distance and equipment, identifying birds with naked eye is based on basic characteristics features and appropriate based on distinct features is often seen as tedious classification. Bird classification can be done manually by domain experts but growing amounts of data leads to time consuming process. Later in this detection of object parts is the challenging task because of Complex variations and fringes of objects.

Our main Aim is about bird identification technology to maintain a data base of birds species like a gallery for the generations because our ancestors history data is given in the form of book and papers but for our future generations we have to give the data by using technology So, that we built this technology for everyone to check the birds thesis easily by the image identification. To classify the aesthetics of birds in their natural habitats, this study developed a method using a convolutional neural network (CNN) to extract information from bird images captured previously or in real time by identifying local features. First, raw input data myriad semantic parts of birds were gathered and localized.

II. EXISTING SYSTEM

It uses the CNN algorithm to identify the bird species from image. In this the data is used directly without any preprocessing and vgg16 model has less layers so it can give accuracy upto 80% only.

Drawbacks:

- No data preprocessing is used.
- It can identify only 200 bird species
- Less accuracy (78%-80%)

III. PROPOSED SYSTEM

Our system employs CNN (Efficient net b3) algorithm to identify the bird species from image and before feeding the data set into the program we use a preprocessing technique called Image data generator for increasing the accuracy of the program.

Advantages:

- It can identify upto 325 bird species.
- Accuracy is above 90%.



Scope:

Overview

The proposed model is used to classify the image identify bird from the image that we uploaded. It will take less time to complete the process. This system gives peculiar results with good accuracy.

Exclusions:

- Displays the name of the specific bird

Assumptions:

- It can only find the bird which is in database.

System Functions:

Example:

Input:

- Image

Model: Model trained on a large number of datasets

Feature Extraction: detecting the features and extracting them

Object detection: Matching the features and confirming the object.

Hardware and Software Requirements

Software Requirements

Programming languages:

- Python
- Deep learning

Deep Learning packages

- Tensor Flow
- Keras

Hardware Requirements

- RAM: 4GB
- Hard Disk: 1TB HD

Detailed software requirements:

Use case model:

Example:

1. Admin
2. User

Actor Name	Admin
Actor Id	ACT-01
Description	Admin
Main Activities	Getting specie of a bird from Image
Work Environment Location	API with the computer system
Number of Users	Only One

IV. SYSTEM DESIGN

Data Dictionary

After understanding the requirements of the candidates, the entire data storage requirements are divided into tables. The below tables are normalized to avoid any anomalies during the course of data entry.

A data dictionary is a file or a set of files that contains a database's metadata. The data dictionary contains records about other objects in the database, such as data ownership, data relationships to other objects, and other data. The data dictionary is a crucial component of any relational database.

Logical database design

A data dictionary is a file or a set of files that contains a database's metadata. The data dictionary contains records about other objects in the database, such as data ownership, data relationships to other objects, and other data. The data dictionary is a crucial component of any relational database. Ironically, because of its importance, it is invisible to most database users.

Typically, only database administrators interact with the data dictionary.

Database Design:

Database design is the process of designation database files, which are the key source of information of the system. The files should properly design, planned for collection, accumulation, editing the required information. The objectives of the database design are to provide effective auxiliary storage and to contribute to the overall efficiency of the computer program component of the system.

Dataset

In Machine learning, we use the data set as the data that is given to the algorithm to create a model. A data set is a collection of related, discrete items of related data that may be accessed individually or in combination or managed as a whole entity. A data set is organized into some type of data structure.

In a database, for example, a data set might contain a collection of business data (names, salaries, contact information, sales figures, and so forth). The database itself can be considered a data set, as can bodies of data within it related to a particular type of information, such as sales data for a particular corporate department.

An example of this type is the data sets collected by space agencies performing experiments with instruments aboard space probes. Data sets that are so large that traditional data processing applications are inadequate to deal with them are known as big data.



Fig No1 Gull Dataset



Fig No 2 Oriole Dataset

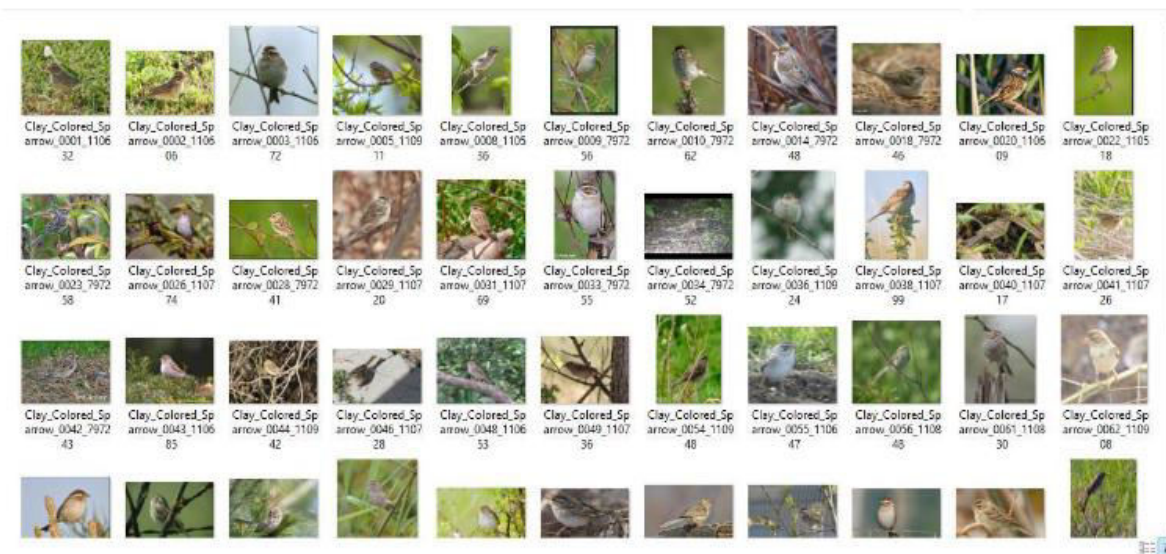


Fig No3 Sparrow Dataset

V. SYSTEM IMPLEMENTATION

Machine Learning:

Machine learning is a field of computer science that gives computer systems the ability to "learn" (i.e., progressively improve performance on a specific task) with data, without being explicitly programmed. Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers to learn automatically without human intervention or assistance and adjust actions accordingly

Machine learning tasks:

Machine learning tasks are typically classified into two broad categories, depending on whether there is a learning "signal" or "feedback" available to a learning system:

1. Supervised learning

The computer is presented with example inputs and their desired outputs, given by a "teacher", and the goal is to learn a general rule that maps inputs to outputs. As special cases, the input signal can be only partially available, or restricted to special feedback.

➤ **Semi-supervised learning:** The computer is given only an incomplete training signal: a training set with some (often many) of the target outputs missing.

➤ **Active learning:** The computer can only obtain training labels for a limited set of instances (based on a budget), and also has to optimize its choice of objects to acquire labels for. When used interactively, these can be presented to the user for labelling.

➤ **Reinforcement learning:** Training data (in form of rewards and punishments) is given only as feedback to the program's actions in a dynamic environment, such as driving a vehicle or playing a game against an opponent.

2. UnSupervised learning

No labels are given to the learning algorithm, leaving it on its own to find structure in its input. Unsupervised learning can be a goal in itself (discovering hidden patterns in data) or a means towards an end (feature learning).

Machine Learning Approaches:

➤ **Decision tree learning:** Decision tree learning uses a decision tree as a predictive model, which maps observations about an item to conclusions about the item's target value.

➤ **Association rule learning:** Association rule learning is a method for discovering interesting relations between variables in large databases.

➤ **Artificial neural networks:** An artificial neural network (ANN) learning algorithm, usually called "neural network" (NN), is a learning algorithm that is vaguely inspired by biological neural networks. Computations are structured in terms of an interconnected group of artificial neurons, processing information using a connectionist approach to computation.

➤ **Deep learning:** Deep learning consists of multiple hidden layers in an artificial neural network. This approach tries to model the way the human brain processes light and sound into vision and hearing. Some successful applications of deep learning are computer vision and speech recognition.

Machine Learning process:

Gathering data: Once we have our equipment and booze, it's time for our first real step of machine learning: gathering data. This step is very important because the quality and quantity of data that you gather will directly determine how good your predictive model can be.

Data preparation (cleaning data): We load our data into a suitable place and prepare it for use in our machine learning training. We'll first put all our data together, and then randomize the ordering. We don't want the order of our data to affect what we learn. This is also a good time to do any pertinent visualization of your data, to help you see if there are any relevant relationships between different variables you can take advantage of, as well as show you if there are any data imbalances.

Choosing a model: The next step in our workflow is choosing a model. There are many models that researchers and data scientists have created over the years. Some are very well suited for image data, others for sequences (like text, or music), some for numerical data, and others for text-based data.

Training: Now we move onto what is often considered the bulk of machine learning the training.

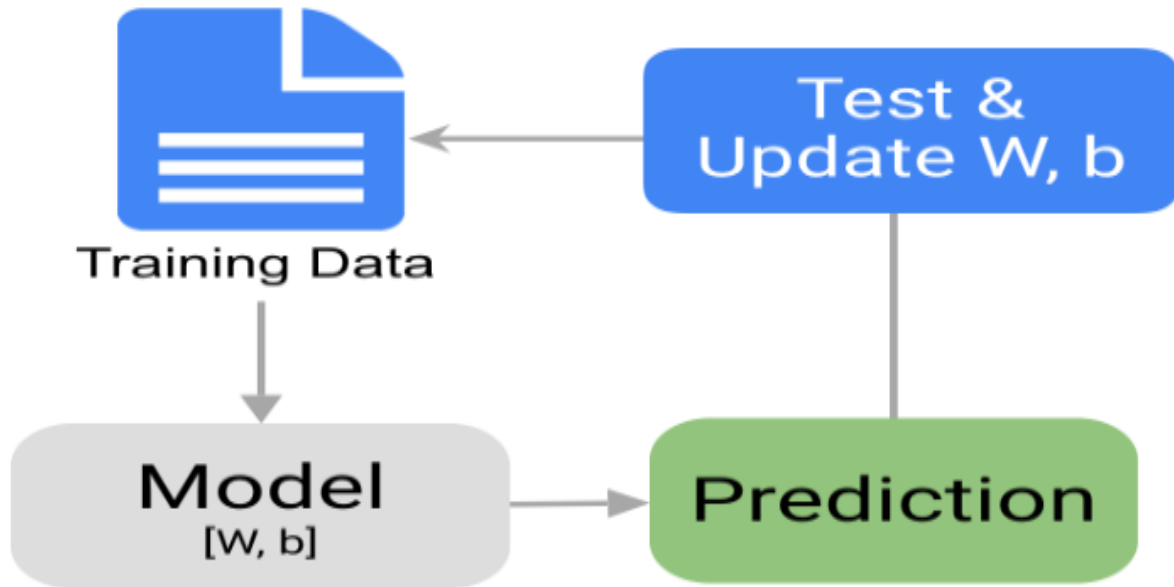




Fig No 4 Training Chart

Evaluation: Once training is complete, it’s time to see if the model is any good, using Evaluation. This is where that dataset that we set aside earlier comes into play. Evaluation allows us to test our model against data that has never been used for training.

Test cases

Test Case ID	Input	Expected Output	Report
TC01		ORIOLE	ORIOLE
TC02		GULL	GULL

VI. CONCLUSION

- To identify bird species using the deep learning methods for classification of image.
- The design CNN algorithm is suitable solution for classification and to get good accuracy.
- The generated system is connected with a user-friendly website where user will upload photo for identification purpose and it gives the desired output.
- Using this project, we can easily identify species of a bird from the image that we captured
- The accuracy of our algorithm is 95.09

VII. FUTURE SCOPE

- By training more objects, the application can be made to detect more objects. By increasing the training dataset, the predicting accuracy can be increased.
- Create an android/iOS app instead of website which will be more convenient to user.
- System can be implemented using cloud which can store large amount of data for comparison and provide high computing power for processing (in case of Neural network)

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