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Animal Species Identification using Deep Learning

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Abstract **: Bird identification is a difficult undertaking that frequently results in ambiguous labeling. Even skilled bird watchers dispute the species of a bird when presented with an image of one. It's a demanding task that tests both people and computers' visual talents. For example, for different scenarios, animals come with different sizes, forms, colors and from a human viewpoint with different angles. Indeed, the images show different differences that need to be recorded as image recognition of bird & snake species. It is also easier for people to identify animals in the pictures.**

Identification of animal species is a challenging task often resulting in ambiguous labels. Even professional Wildlife watchers sometimes disagree on the species given an image of animals.

I. INTRODUCTION

Nowadays, Identification of animal species is a difficult activity sometimes leading to uncertainty. Birds and Snakes allow us to search certain organisms within the environment as they respond quickly to changes in the atmosphere. But collecting and gathering their 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 animal information processing and serve as a valuable resource for scholars, government agencies and so on. Consequently, naming animal species plays a significant role here for determining which species belongs to a specific image of animal species.

The model of CNN consists of three layers, that is, input layer, hidden layer, and output layer. A neural network is a series of algorithms that tries to recognize underlying relationships in a set of data through a process in the exact way the human brain works. In this way, neural networks refer to systems of neurons, either organic or artificial in nature.

algorithms that carry out such a task in an automatic fashion.

For many years biologists have faced problems regarding identification of animal species.

In this research paper we have tried to come up with a solution to rectify this problem with a web application. Through this anyone could predict an animal species through images of species.

Figure No.1: Classification

This figure represents a set of birds species that are involved in the training dataset of the model. These images are used to train the dataset through supervised learning algorithm.

II. BACKGROUND

To get an accurate result, the usage of a single parameter will not be much effective. Thus for this case, multiple parameters need to be considered so as to get an accurate output.
Different species of animals will be having different characteristic traits. Thus the image size of the bird in the image will vary which in turn depends on the distance between birds, focal distance of the lens, etc.
After extended analysis its found that higher accuracy could be generated by using animal images with greater quality
CNN is a neural network that extracts input image features and another neural network classifies the image features. The input image is used by the feature extraction network. The extracted feature signals are utilized by the neural network for classification. It has two main components:

1. A convolution tool that separates and identifies the distinct features of an image for analysis in a process known as Feature Extraction
2. A fully connected layer that takes the output of the convolution process and predicts the image's class based on the features retrieved earlier.

Convolutional layers apply a convolution operation to the input and this passes the resulting information on to the next layer. The most popular neural network model being used for image classification problems is Convolutional Neural Networks

III. METHODOLOGY

In this experiment, unsupervised learning algorithm has been used for developing the system, because the inputted image defined is not known. Also, the data which is given to unsupervised learning algorithm are not labeled, i.e. only the input variables(X) are given with no corresponding output variables. In unsupervised learning, algorithms discover interesting structures in the data themselves. In detail, clustering is used for dividing the data into several groups [4].

In depth, deep learning models used to find vast number of neurons. Deep learning algorithms learn more about the image as it goes through each neural network layer. For classifying **Neural Network** is used. Figure 2 represents layers of neural networks for feature extraction. The neural network is a framework for many machine learning algorithms. Neural networks consist of vector of weights

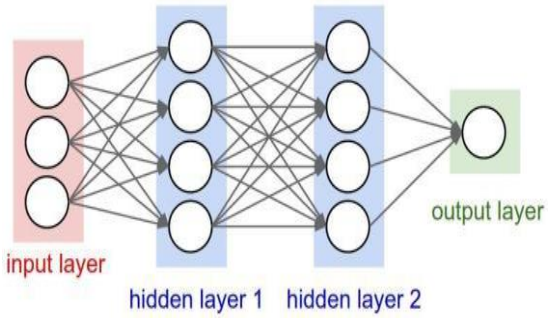

Figure No. 2: Three layers of Neural Network

Deep Learning is a subset of Machine Learning Algorithms that is very good at recognizing patterns but typically requires a large number of data.
Deep learning excels in recognizing objects in images as it's implemented using 3 or more layers of artificial neural networks where each layer is responsible for extracting one or more feature of the image
The input image can contain multiple characteristic traits such as color, wings, eyes, size of animals which means that the cnn layer performs a mapping from 3D volume to another 3D volume. The 3 dimensions are generally considered to be depth, width and height.
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2. A fully connected layer that takes the output of the convolution process and predicts the image's class based on the features retrieved earlier.

A CNN typically has three layers: a convolutional layer, a pooling layer, and a fully connected layer.
The convolution layer is the core building block of the CNN. It carries the main portion of the network's computational load. This layer performs a dot product between two matrices, where one matrix is the set of learnable parameters otherwise known as a kernel, and the other matrix is the restricted portion of the receptive field. The pooling layer replaces the output of the network at certain locations by deriving a summary statistic of the nearby outputs. Neurons in fully connected layer have full connectivity with all neurons in the preceding and succeeding layer as seen in regular FCNN. This is why it can be computed as usual by a matrix multiplication followed by a bias effect.

Image classification: image classification in machine learning is commonly done in two ways:
1) Gray scale
2) Using RGB values
Normally all the data is mostly converted into gray scale. In gray scale algorithm, computer will assign values to each pixel based on how the value of the pixel is it**.** All the pixel values are put into an array and the computer will perform operation on that array to classify the data.

Library:

TensorFlow is an open source software library for high performance numerical computation. Its flexible architecture allows easy deployment of computation across a variety of platforms (CPUs, GPUs, TPUs), and from desktops to clusters of servers to mobile and edge devices.

Alongside Many other python libraries are used in the model that help in multiple operations.

Dataset:

A dataset is a collection of data**.** For performing the deep learning operations and training of the model, we have used the two datasets : BIRDS 500 SPECIES- IMAGE CLASSIFICATION and SNAKE SPECIES Dataset from kaggle platform.

IV. PROPOSED APPROACH

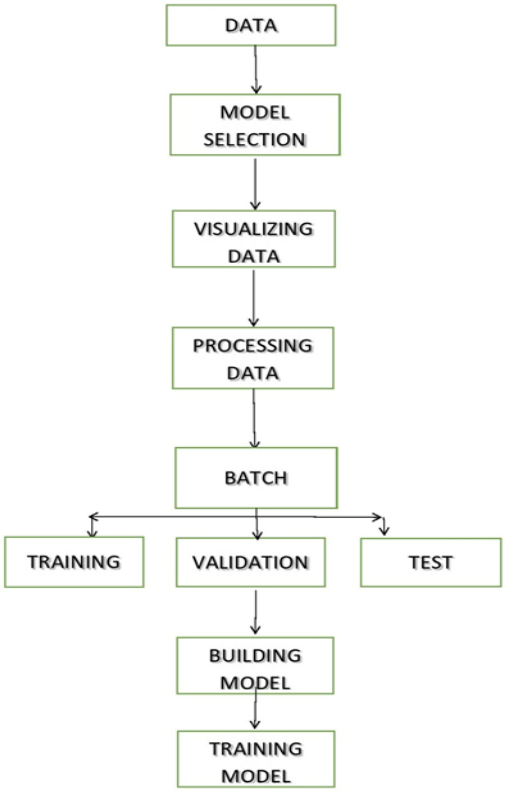


Figure No.3: Flow of System

The most popular neural network model being used for image classification problems is Convolutional Neural Networks. The CNN model conjuration for bird species identification utilized a stack of convolution layers comprising an input layer, two fully connected layers, and one final output softmax layer.. Convolutional layers apply a convolution operation to the input and this passes the resulting information on to the next layer.

Whenever a user will upload an image of any bird/snake species on the web application, the model detects the patterns and key features from the image. Further, the characteristic traits of that species is identified and compared with the set of various species present in 500 species dataset.

In case if the traits and features of the unknown species gets matched with any of the existing species in the dataset, then the model will predict and return the corresponding species information.

If in case, the species does not match with any of the trained images in the dataset, then the model will predict and return the closest one similar to the unknown species.

Grayscale is used for assessing the color shading in between products and the customer's approval sample or among pieces in production. Grey scaling has grades 1-5 and increases by half of the grade (1, 1 1/2, 2, 2 1/2, and so on.) with 5 being the greatest.

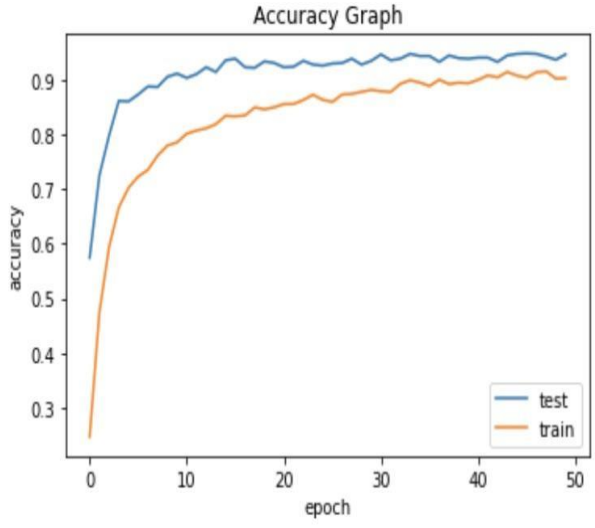
V. EXPERIMENTAL ANALYSIS

After the training phase, the dataset is ready to be tested against a variety of testing images of animal species.

For example, the below image of the northern american bird Blue Jay is used for testing purpose to test the model against unknown birds not present in the dataset.

The system generates probabilities about the unknown image with respect to its similarities with the trained images.

Below shows the scoresheet based on the result generated by the system. After analysis of these result it has observe that,the species those are having the highest score has been predicted as a required species. this result can be shown in the follwing graph.



VI. CONCLUSION

Through an analysis of the data set we also found that the relative number of training samples for each bird species is quite uneven, which seems to lead to a favoritism, from the model of bird species, and that some bird species are difficult to classify than others.The trained dataset is created using 50000 steps, higher the number of steps higher its accuracy. The accuracy of the trained dataset is 93%. The testing dataset has nearly 1000 images with an accuracy of 80%.

To develop such a system a trained dataset is required to classify an image. Trained dataset consists of two parts: trained result and test result. The dataset has to be retrained to achieve higher accuracy in identification.

VII. FUTURE SCOPE

1) It is important to common people and even fresher's of the department of ornithology to identify a bird they encounter in their day-to-day life.

2) Through this system we can discover more new species of birds & snakes and can identify those that are on the verge of extinction and save them. smooth and faster operations at all levels.

3)Bird species identification is a challenging task to humans as well as to computational algorithms that carries out such a task in an automatic fashion

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