SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

SCHOOL OF COMPUTING

DEPARTMENT OF DATA SCIENCE AND BUSINESS SYSTEMS

18CSC305J ARTIFICIAL INTELLIGENCE

MINI PROJECT REPORT

Bird Species Detection

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ABSTRACT

In our world, there are above 9000 bird species. Some bird species are being found rarely and if found also prediction becomes very difficult. In order to overcome this problem, we have an effective and simple way to recognize these bird species based on their features. Also, the human ability to recognize the birds through the images is more understandable than audio recognition. So, we have used Convolutional Neural Networks (CNN). CNN's are the strong assemblage of machine learning which have proven efficient in image processing. By using this method, everyone can easily identify the name of the particular bird which they want to know

Chapter 1 : Introduction and Motivation [Purpose of the problem statement (societal benefit)

Bird behaviour and populace patterns have become a significant issue nowadays. Birds help us to recognize different life forms on the earth effectively as they react rapidly to ecological changes. Be that as it may, assembling and gathering data about bird species requires immense human exertion just as it turns into an extremely costly technique. In such a case, a solid framework that will give enormous scale preparation of data about birds and will fill in as a significant apparatus for scientists, legislative offices, and so forth is required. In this way, bird species distinguishing proof assumes a significant job in recognizing that a specific picture of birds has a place with which categories. Bird species identification means predicting the bird species belongs to which category by using an image. The recognition of bird species can be possible through a picture, audio or video. An audio processing method makes it conceivable to recognize by catching the sound sign of different birds. Be that as it may, because of the blended sounds in condition, for example, creepy crawlies, objects from the real world, and so forth handling of such data turns out to be progressively convoluted. Normally, people discover images more effectively than sounds or recordings. So, an approach to classify birds using an image over audio or video is preferred. Bird species identification is a challenging task to humans as well as to computational procedures that carry out such a task in an automated fashion. As image-based classification systems are improving the task of classifying, objects are moving into datasets with far more categories such as Caltech-UCSD. Recent work has seen much success in this area. Additionally, birds are non-rigid objects which will deform in many ways and consequently there's also an oversized variation within classes.

Problem Statement:

Identifying a bird can be a challenge, even for experienced birders. And if you're new to using field guides, it can be daunting to figure out where to even begin searching in the hundreds of pages of species. By some features like size, shape and colour birds can be classified. By using CNN, we can classify the species of the birds.

Chapter 2: Review of Existing methods and their Limitations

Background noise- especially while using data recorded in a city. Multi-label classification problem-when there are many species singing at the same time. Different types of bird songs. Inter-species variance-there might be differences in bird song between the same species living in different regions or countries. Data set issues-the data can be highly imbalanced due to bigger popularity of one species over another, there is a large number of different species and recordings can have different length, quality of recordings. The main objective of the project is to identify the species of the birds by analysing an image. Some of the experts like ornithologists couldn't identify species of the bird correctly by looking at an image. Although bird classification can be done manually by domain experts, with growing amounts of data, this rapidly becomes a tedious and time-consuming process. So, by this model we can identify the species of the birds accurately and in less time.

Chapter 3 : Proposed Method with System Architecture / Flow Diagram

Proposed method:

Convolution neural network algorithm is a multilayer perceptron that is the special design for the identification of two-dimensional image information. It has four layers: an input layer, a convolution layer, a sample layer, and an output layer. In a deep network architecture, the convolution layer and sample layer may have multiple. CNN is not as restricted as the Boltzmann machine, it needs to be before and after the layer of neurons in the adjacent layer for all connections, convolution neural network algorithms, each neuron doesn't need to experience the global image, just feel the local region of the image. In addition, each neuron parameter is set to the same, namely, the sharing of weights, namely each neuron with the same convolution kernels to the deconvolution image. The key era of CNN is the local receptive field, sharing of weights, subsampling by using time or space, with a purpose to extract features and reduce the size of the training parameters. The advantage of CNN algorithm is to avoid the explicit feature extraction, and implicitly to learn from the training data. The same neuron weights on the surface of the

feature mapping, thus the network can learn parallel, and reduce the complexity of the network Adopting sub-sampling structure by time robustness, scale, and deformation displacement. Input information and network topology can be a very good match. It has unique advantages in image processing. The Convolution Neural Network involves these steps:

Convolution Layer: The convolutional layer is the core constructing block of a CNN. The convolution layer comprises a set of independent feature detectors. Each Feature map is independently convolved with the images.

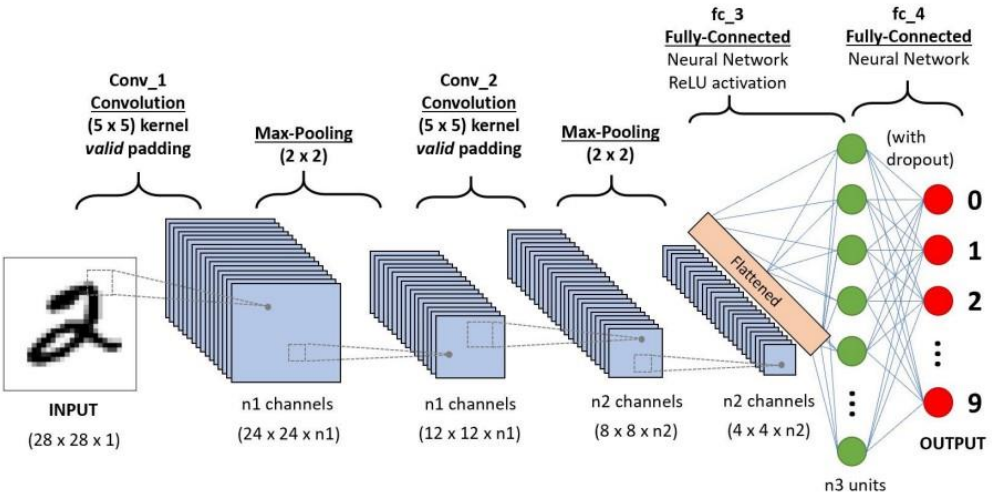
Pooling Layer: The pooling layer feature is to progressively reduce the spatial size of the illustration to reduce the wide variety of parameters and computation in the network. The pooling layer operates on each function map independently. The pooling layer summarises the features present in a region of the feature map generated by a convolution layer. So, further operations are performed on summarised features instead of precisely positioned features generated by the convolution layer. This makes the model more robust to variations in the position of the features in the input image.

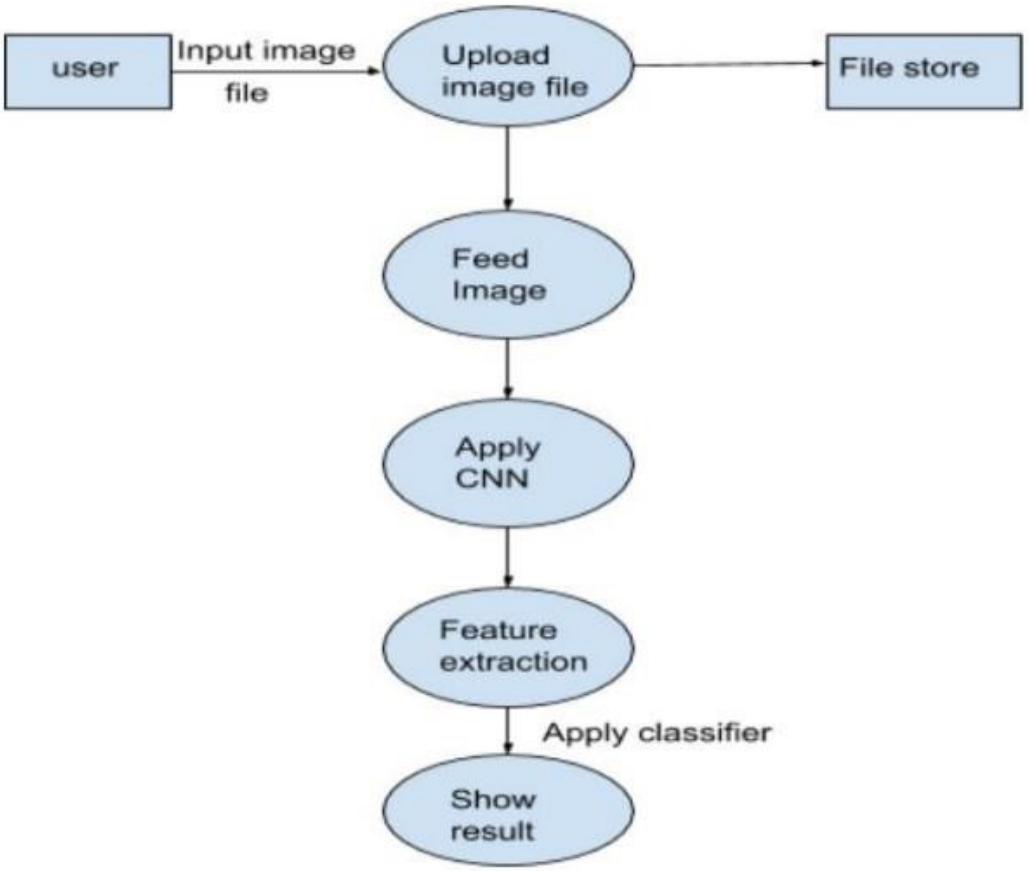
Fully Connected Layer: Neurons in the fully connected layer have full connections to all activations inside the preceding layer. In this, the output obtained from max pooling is converted to a one dimensional array and that should be the input layer and the process continues the same as the ANN model.

Architecture:

A CNN Sequence A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The preprocessing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics. A ConvNet is able to successfully capture the Spatial and Temporal dependencies in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset due to the reduction in the number of parameters involved and reusability of weights. In other words, the network can be trained to understand the sophistication of the image better. The role

of the ConvNet is to reduce the images into a form which is easier to process, without losing features which are critical for getting a good prediction.





Chapter 4: Modules Description

Module 1: data processing

Input data for the identification system consist of digital images and parameters from the radar. All images for training the CNN are of wild birds in flight and they have been taken manually at the test location. There are also constraints concerning the area where the images have to be taken. Here, the area refers to the air space in the vicinity of the pilot wind turbine. We have used the wind turbine swept area as a suitable altitude level constraint for taking the images, because birds flying below or above the swept area are not in danger. The bird species used in this dataset are: American Goldfinch, Barn owl, downy woodpecker, carmine bee-eater.

Module 2: Feature extraction

Feature extraction starts from an initial set of measured data and builds derived values intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction.

When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection.The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data.

Module 3 :

CNN model

CNN consists of four layers: convolutional layer, activation layer, pooling layer and fully connected. Convolutional layer allows extracting visual features from an image in small amounts. Pooling is used to reduce the number of neurons from the previous convolutional layer but maintaining the important information. Activation layer passes a value through a function which compresses values into range. Fully connected layer connects a neuron from one layer to every neuron in another layer. As CNN classifies each neuron in depth, so it provides more accuracy. 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 grayscale. In the grayscale algorithm, 29 computers will assign values to each pixel based on how the value of the pixel is. All the pixel values are put into an array and the computer will perform operations on that array to classify the data.

Chapter 5: Implementation requirements

Software Requirements:

Programming Language : Python

Operating System : Windows or Linux Tools

: Tensorflow,Keras

Hardware Requirements:

Processor : Intel Multicore Processor (i3 or i5 or i7)

RAM : 4GB or Above

Hard Disk : 100GB or Above

Conclusion

The main idea behind developing the identification website is to build awareness regarding bird-watching, birds and their identification, especially birds found in India. It also caters to the need of simplifying the bird identification process and thus making bird-watching easier. Helps in Taxonomy The technology used in the experimental setup is Convolutional Neural Networks (CNN). It uses feature extraction for image recognition. The method used is good enough to extract features and classify images. The main purpose of the project is to identify the bird species from an image given as input by the user. We used CNN because it is suitable for implementing advanced algorithms and gives good numerical precision accuracy. It is also general-purpose and scientific. We achieved an accuracy of 87%-93%. We believe this project extends a great deal of scope as the purpose meets. In wildlife research and monitoring, this concept can be implemented in-camera traps to maintain the record of wildlife movement in specific habitat and behaviour of any species.

References

1. Bird Watching Apps: Five Useful Apps to Get Started With Birding [Online] https://gadgets.ndtv.com/apps/features/bird-watching-apps-five-usefulapps-to-getstarted-with-birding-1640679
2. Transfer learning using Alex Net [Online] https://in.mathworks.com /help /nnet /examples / transfer-learning-using- alexnet.html
3. Feature extraction using AlexNet [Online] https://in.mathworks.com /help /nnet /examples / feature-extraction-using-alexnet.html # d119e4167
4. Dipta Das, Sourya & Kumar, Akash" An Exploration of Computer Vision Techniques for Bird Species Classification", December 15, 2017.