Bird Species Classification using multi-scale Convoluted Neural Network with Data Augmentation Techniques

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***Abstract* - Bird predation is a major problem in aquaculture. Nowadays bird Species are becoming rare, so we need to recognize them. Image recognition software can improve their efficiency in chasing birds. We proposed the System for Bird species Classification is a challenging problem due to the variation and different viewpoints of the camera. In the existing system, there are some disadvantages. We tried to overcome it by integrating the new feature into the multi-scale Convoluted Neural Network with Image Segmentation for Indian bird species classification, an algorithm is proposed to get the final classification result. Three recognition techniques were tested to identify birds i.e., image morphology, artificial neural networks, and template matching have been tested. We proposed a new feature that can improve the correct classification rate of the model as well as the accuracy of the model in the prediction of Birds classification. In this challenge, the bird image classification task, especially for Indian birds, is based on a limited but diverse set of crowd-sourced data. Especially, the present challenge involves a low amount of labelled data to build good classification approaches for effective classification. Up to now a lot of research has been done to identify bird species. Finally, we have proposed a methodology to improve accuracy in the identification of bird species.**

***keywords* - Data Augmentation, Dropout, TensorFlow, Keras, DT, CNN, Multiscale**

1.Introduction

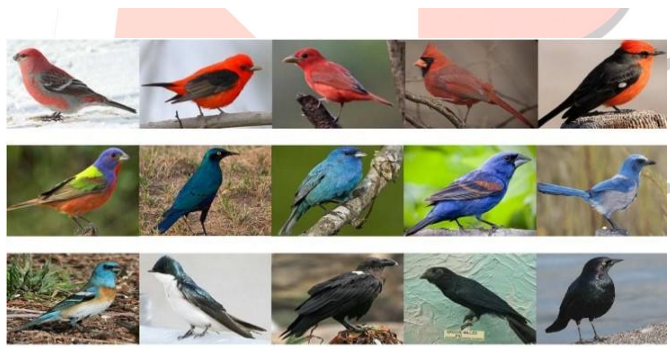

Figure 1: All type of Birds Species

Science and technology have improved our quality of life, but the rapid development of some industries has given up people's future living environment and causes an adverse impact on the survival of some wild animals. Taking measures to protect the environment and endangered animals is an urgent task. Because birds are numerous and sensitive to environmental changes; also, and are easier to monitor than other species, observing the behaviour of birds allows us to better evaluate our living environment. Therefore, it is particularly important to identify the birds. With the development of image identification technology, using modern technology to identify birds has become an effective research method. Although pattern recognition has been more than half a century of history, identification for birds is still rare and several approaches have been proposed to recognize the bird. Using birds for bird recognition has achieved interesting correct classification rates but bird recognition based on image signals is facing the challenge because of illumination, a different point of the camera, background, and so on.

Birds Species are part of Biological Species and a subset of life science. While bird monitoring is a well-established process, the observation is largely carried out manually which is time-consuming, and hence the scalability is low. This has motivated the use of machine learning methods to analyse bird images. Especially, the present challenge involves a fairly low amount of labelled data and may require transfer learning-based approaches for effective classification. We will develop a deep learning platform to assist users in recognizing what type of species it is. So, we are doing "Bird Classification" by using Convolution Neural Network, Multistage, and Data Argumentation.

2. Literature Review

In the paper [1] Bird populations are identified as important biodiversity indicators, so collecting reliable population data is important to ecologists and scientists, there are predication classification birds from video, her they used Combined with Normal

Bayes classifier and a Support Vector Machine classifier, experimental evaluations of our appearance and motion features across a data set comprising 7 species. To increase the number of training samples per class and reduce the effect of class imbalance, data augmentation is used. Relevant image augmentation techniques are chosen according to the bird type of each class. Here, they have used a transfer learning-based approach to learn both micro and macro-level features extracted from bird images for classification. We have used ImageNet pre-trained weights to initialize our Deep net model for training. ImageNet contains 1.2 million images belonging to 1000 classes. Training using pre-trained ImageNet weights helps us learn fine-grained and global level features beforehand and learn the deep net more specific & discriminative features for each bird species, leading to increased accuracy of the model. They have used InceptionResNetV2 & InceptionV3 deep net architectures to create an ensemble model as our classification model. The prediction vectors from Inception V3 and Inception ResNet V2 weights are generated for each image at the time of testing.

Disadvantages:

1. As the support vector classifier works by putting data points above and below the classifying hyperplane there is no probabilistic explanation for the classification.
2. Feature Extraction Has to Been Done Manual by using Sickie-image.
3. In cases where the number of features for each data point exceeds the number of training data samples, the SVM will underperform.

In the paper [2] Birds captured in these images are at relatively low resolution and are hierarchically labelled by experts for fine - grained species classification. We conducted evaluations of state - of - the - art image recognition methods by using this dataset. The evaluations revealed that a deep - learning - based method and a simpler traditional learning method were almost equally successful at detection, while the former captures more generalized features. The most promising results were provided by the deep - learning - based method in classification.

In the paper, [3] A dataset from CVIP 2018 Bird Species challenge. It consists of only 150 images with 16 species of birds. In this paper [4] they have used four models i.e.; Data Augmentation is used to increase the number of training samples per class and reduce the effect of class imbalance. Bird ROI (Region of Interest) Detection is used to eliminate background elements or regions and also extract features from only the body of the birds, Transfer Learning is used to learn both micro and macro-level features extracted from bird images for classification and Ensemble Model Architecture i.e., InceptionResNetV2 & InceptionV3 Deep net architectures is used to create an ensemble model as our classification model. Their final model achieves a score of 55.67% or 55.67%

In the paper [4] certain methodologies like Deep Convolutional Neural Network, Unsupervised learning algorithm, and datasets have been used. In this paper [5] Deep Convolutional Neural Network, an Unsupervised learning algorithm. CNN consists of four layers: convolutional layer, activation layer, pooling layer, and fully connected. The convolutional layer allows extracting visual features from an image in small amounts. Pooling reduces the number of neurons from the previous convolutional layer but maintains the important information. The activation layer passes a value through a function that compresses values into a range. An unsupervised learning algorithm has been used to develop the system because the inputted image defined is unknown. Also, the data which is given to unsupervised learning algorithms are not labelled, 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 the Paper [5] presents a unique approach for bird species classification supported colour options extracted from free pictures. This suggests that the birds could seem different in several and numerous situations additionally could give different poses, sizes, and angles of reading. Besides, the pictures give robust variations in illumination and components of the birds could Bird Species Identification Mistreatment Image Mining and CNN algorithmic rule be occluded by different parts of the.

In the paper [6] Bird populations are identified as important biodiversity indicators, so collecting reliable population data is important to ecologists and scientists, there are predication classification birds from video, her they used Combined with Normal Bayes classifier and a Support Vector Machine classifier, experimental evaluations of our appearance and motion features across a data set comprising 7 species. To increase the number of training samples per class and reduce the effect of class imbalance, data augmentation is used. Relevant image augmentation techniques are chosen according to the bird type of each class. Here, they have used a transfer learning-based approach to learn both micro and macro-level features extracted from bird images for classification. We have used ImageNet pre-trained weights to initialize our Deep net model for training. ImageNet contains 1.2 million images belonging to 1000 classes. Training using pre-trained ImageNet weights helps us learn fine-grained and global level features beforehand and learn the deep net more specific & discriminative features for each bird species, leading to increased accuracy of classification model. The prediction vectors from Inception V3 and Inception ResNet V2 weights are generated for each image at the time of testing. There are two cases with Mask R-CNN.

3. Proposed System

We have proposed a System for Bird species Classification which is a challenging problem due to the variation and different viewpoints of the camera. We are going to use a multi-scale Convoluted Neural Network with Data augmentation Techniques (Zoom, rotation, Flip) for Indian bird species. We will build a model that may give an accuracy rate of up to 85-95%.

To provide birdwatchers a handy tool to admire the beauty of birds, we will develop a deep learning platform (web application) to assist users in recognizing bird species. Using a Web app named “Birdwatching”, bird’s images will be recognized by a convolutional neural network (CNN) to localize prominent features in the images. First, we will establish and generate a bounded region of interest to refine the shapes and colors of the object granularities and subsequently balance the distribution of bird species. Then, a skip connection method will be used to linearly combine the outputs of the previous and current layers to improve feature extraction. Finally, we will apply the softmax function to obtain a probability distribution of bird features. The learned

parameters of bird features will be used to identify pictures that are going to upload. The proposed CNN model with skip connections may achieves higher accuracy.

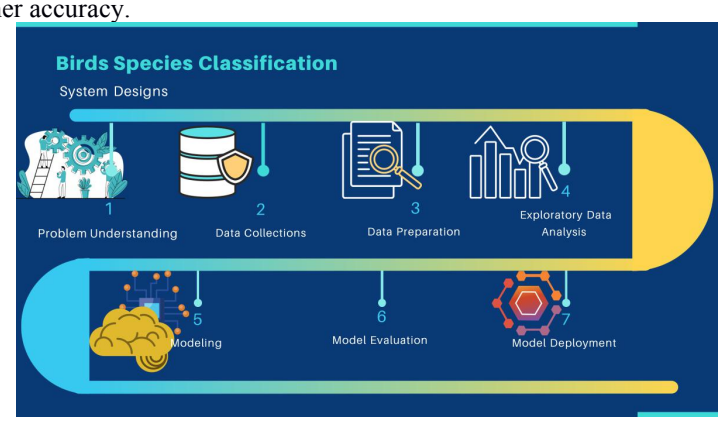

Fig.3.1.System Design

Data Collection: Collection of data from the Cornell Lab and also we will collect our data from google image and other websites and we will have to arrange it properly according to bird's classes or their species. Images will be in JPG format

Data Preparation: Converting non-numerical data into a numerical form known as Data preparation (images will convert into arrays format). All the images will be in the same format. For example, all images will have the same dimensions.

Exploratory Data Analysis: Exploratory Data Analysis we will visualize the data i.e in this data analysis we will choose and develop an appropriate predictive model for our target. How well connected the data is to the target then determine whether there is sufficient data to move forward with the next modeling steps.

Modeling: Determine the optimal data features for the machine-learning model. We will create an informative machine-learning model that predicts the birds most accurately.

Model Training: In this process, we will split the input data randomly for modeling into a training data set and a test data set.

Model Evaluation: In this process, the model will learn from training data and the test model with test data by using metrics.

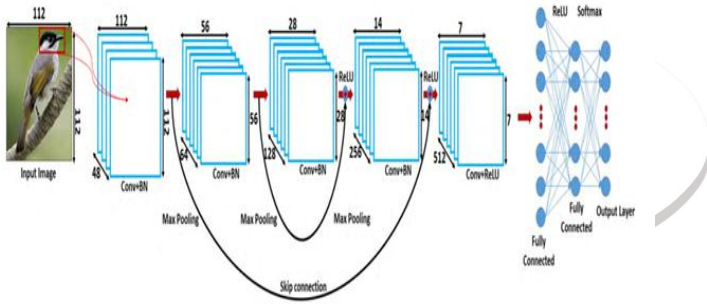

Fig.3.2. System Architechture

4. Conclusion

Nowadays bird Species are becoming rare and also after seeing it is difficult to identify which type of bird it is. To identify which type of bird it is. We are going to use a multi-scale Convoluted Neural Network with Data augmentation Techniques. As mentioned in the literature review, we have gone from techniques/methods to identify which type of bird. And we have discussed the disadvantages of existing systems to overcome that we have proposed a method so that accuracy may be increased up to 85-95%.

5. References

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