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Automatically Counting and Identifying Breeds of Different Animals using Neural Networks

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Abstract: ***There are many studies carried out in the field of animal recognition using image processing by many researchers which are implemented in various applications like electronic medical record for animals that helps to identify dogs using image processing. Some researchers have worked on detection of fiducial points on faces that have increased progress in the field of machine learning also some researchers have made application which helps to find missing puppies by extracting the facial feature by using convolutional neural networks. These papers have major focus on image processing but according to these proposed systems the process is complex and pre-processing maybe not be accurate if the animal in the image is partially hidden. Also, if there are many different animals in the image the proposed system does not recognize all the animals in the image. Through this study, we are trying to overcome shortcomings of these systems.***
Keywords: Machine learning, deep convolutional neural networks, face biometrics

I. INTRODUCTION

To efficiently detect road-animals before their collisions with vehicles, camera-based systems seem to be the best option, compared to the aforementioned solutions. For this purpose, we present in this section the main idea behind the detection and recognition of animals either by images. Animal detection, especially in nighttime, is an extremely challenging problem due to the surrounding conditions such as illumination changes and cluttered background; and, on the other hand, the large intra-class variability between different types of animals, and between animals of the same category. Surprisingly, animal detection systems for collision mitigation have not received high interest by computer-vision community. In this study, we represented the following stages for classification and identification.

A. Detection

A natural way to detect animals using cameras is through one of the existing detection schemes, especially those applied for the detection such as detection through texture features, color features or gradient features.

B. Texture Features Based Detection

Some texture features such as Haar-like features are widely used in object detection. Historically, one of the most famous and pioneering works to human-face detection is based on Haar-like features adopts a kind of cascade AdaBoost classifier. This also present a very fast method to calculate the Haar features called integral image.

C. Gradient Features-Based Detection

Gradient features, such as Scale-invariant Feature Transform (SIFT) or Histogram of Oriented Gradient (HOG), can describe the object's edge and contour appropriately. One major breakthrough in object detection is occurred in a gradient feature domain.

D. Color Based Detection

Besides texture and shape features, color descriptor can be used to detect animals especially in day time. Color extraction can be performed using segmentation methods, which allows to intensify certain colors, and to ignore unsuitable regions or noise.

E. Recognition

The recognition stage receives a list of ROIs that possibly contains one or more animals. In this stage, ROIs are classified as animal or non-animal, with minimal false positives and false negatives. Animal recognition is usually performed using template matching or machine learning techniques such as Neural Network (NN), Support Vector Machine (SVM) and AdaBoost. The choice of the suitable recognition algorithm depends essentially on the training sample statistics (e.g., class distribution and size), the features used and the output of the detection algorithm.

F. Image Features Extraction

Features are functions of the original measurement variables that are useful for classification and/or pattern recognition of an image. Features extraction is the process of defining a set of features, or image characteristics, which will most efficiently or meaningfully represent the information that is important for detection analysis and classification. The purpose of features extraction is to enhance the effectiveness and efficiency of object detection and classification.

II. LITRATURE SURVEY

As typical ask is fine-grained classification, identification and classification have been addressed in multiple studies. However, fewer results have been reported on the specific breed identification.

A. Transfer learning on convolutional neural networks for dog identification by Xinyuan Tu, Kenneth Lai, Svetlana Vanushkevich in 2015

ILSVRC posted on going deeper with convolutions in which mentioned feature extraction of hidden animals from the different datasets using K-NN and SVM. At that time the system has given an accuracy of 70%.

B. Where is my puppy? Retrieving lost dogs by facial features by T.P. Moreira, Mauricio Lisboa Perez, Rafael de Oliveira Werneck, EdXuardo Valle In 2017

Human facial recognizers are not much efficient for dogs showing that dog facial recognition is not a trivial task than human facial recognition. They proposed about facial feature extraction with BARK attaining up to 81.1 % accuracy, and WOOF, 89.4 % for a labeled dataset.

C. Fast Human-Animal Detection from Highly Cluttered Camera-Trap Images Using Joint Background Modelling and Deep Learning Classification by Hayder Yousif in 2017.

They proposed a system using Deep convolutional neural networks for normalizing image size for an efficient segmentation improvement for the labeled dataset. The 83.78% accuracy was reported. The optimized DCNN was able to reduce the classification time by 14 times and maintain high accuracy.

D. Wild Animal Detection using Discriminative Feature-oriented Dictionary Learning by Pragya Gupta and Gyanendra K. Varma in 2017

For Animal detection, implemented a method with 92% accuracy. In 2017, they have done wild animal detection using discriminative feature-oriented dictionary learning where there was a class-specific dictionary for each class. Discriminative features of positive images and negative images were calculated.

E. A two-step learning method for detecting landmarks on faces from different domains by Bruna Vieira Frade, Erickson R. Nascimento in 2018.

The most relevant to our work is paper that describes an approach to identify dogs using a coarse-to-fine grained method. There were two important stages after data processing. First one was the coarse stage for breed classification and the second one was a fine stage for dog identification with an accuracy of 70.94% using their approach

III.METHODOLOGY AND ARCHITECTURE APPROACH

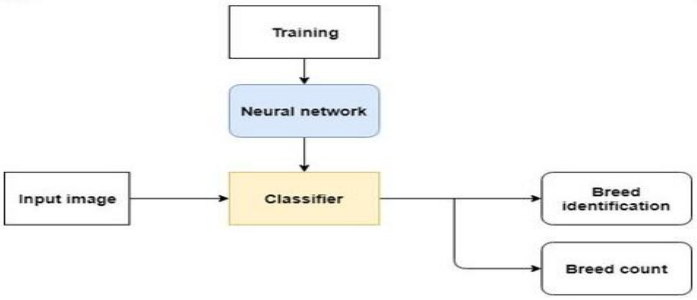

Figure1: Structure of the proposed manifesto.

To implement our proposed system in identifying the animal and detecting count of it we have designed a manifesto as shown in figure 1

The input is the image and after comparison with the trained dataset, the output is the predicted value of animal along with its count. Here initially a labeled dataset is been taken and training of dataset is done. This trained dataset is passed to CNN (Convolutional Neural Network). This CNN will extract features of different animals such as eyes, nose, shape and size, Hair, etc.
After that, the data is passed to the classifier. Now to test the trained dataset an input image is passed to the classifier. Here in this phase classifier will compare the input image with a trained dataset image and finally, it will give output as identification of animal breed and count of it.

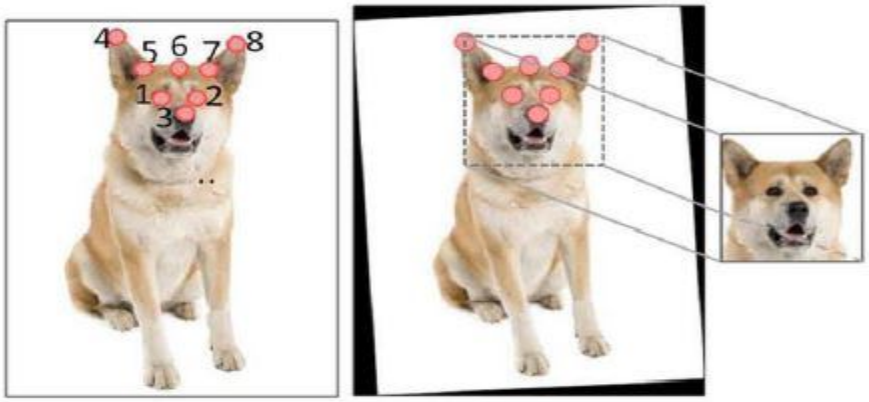

Figure 2: Depicts the feature extraction process (Image processing is done)

Figure 2 will depict the feature extraction of the dataset that can be possible. How those feature points are plotted on the above image is done. This comes under image processing.
To better understand there is a brief working of the above-mentioned terminologies is shown in Figure 3.

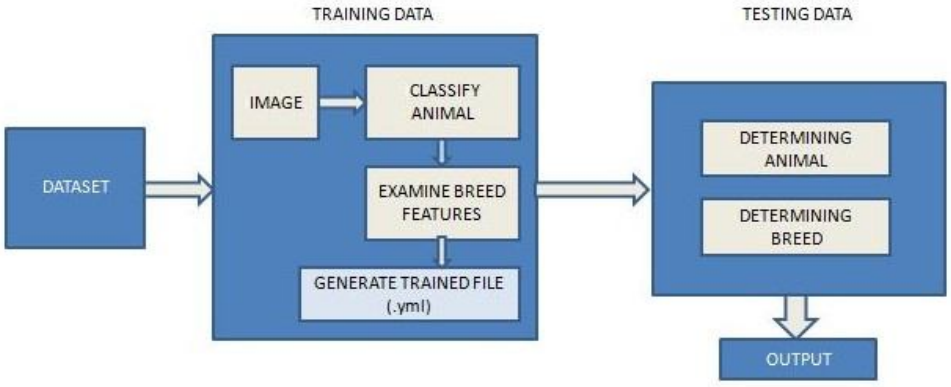

Figure 3: Brief idea about the proposed system

In figure 3 firstly labeled dataset is taken and passed in the training and classification module of the project.
In the training phase, the sample image is taken and then the classification of image is done. After that features extraction is done it will generate trained file in extension(.yml) format.
In the testing phase, simply a sample image is given to test all the modules that are working as predefined. Here finally we will get the output as determining animal and breed of it.

IV. CONCLUSION

In this paper the advanced technology is used for animal identification with their count of breeds. The proposed method was tested via a case study on publicly available animals' dataset. As an ecologist are having more interest in identifying individual animals with their count of breeds. Thus, the different local and textual features were extracted from image by using CNN (Convolutional Neural Network).
The proposed system uses labeled dataset for training and classification to evaluate breeds of animals with accurate count. The accuracy of the system is good because of discriminative positive image and negative image calculation.

V. ACKNOWLEDGMENT

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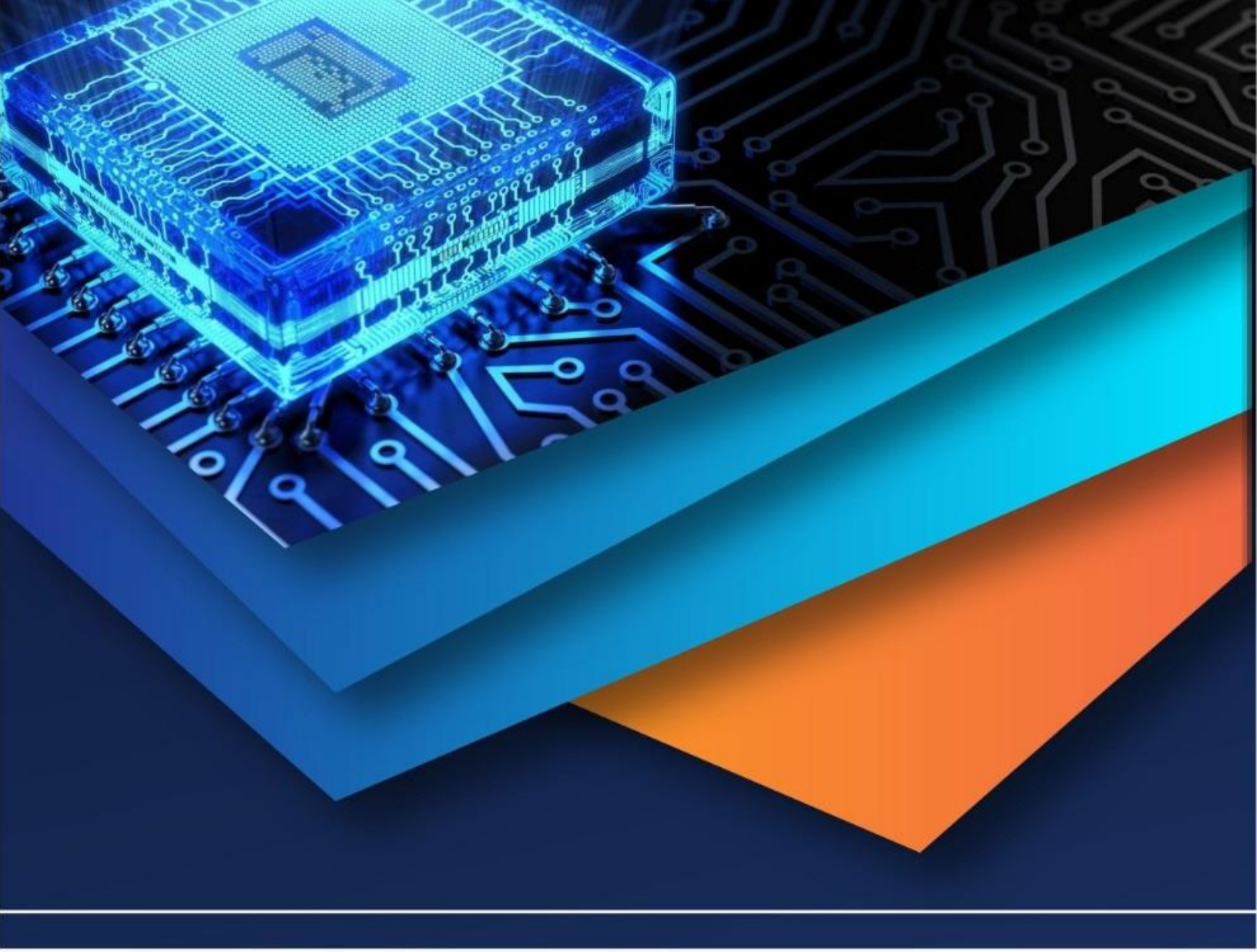

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