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Activity recognition of wild animals

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ABSTRACT: In this paper, we try to explore convolution neural network to classify animals in animal videos. Convolution neural network is a powerful machine learning tool which is trained using large collection of diverse images. In this paper, we combine convolutional neural network and SVM for classification of animals. In the first stage, frames are extracted from the animal videos. The extracted animal frames are trained using VGG19 pre-trained convolution neural network. Further, the extracted features are fed into multi-class SVM classifier for the purpose of classification. To evaluate the performance of our system, we have conducted extensive experimentation on our own dataset of 15000 images, each class containing 1000images. From the results we can easily observed that the proposed method has achieved good classification rate compared to the works in the literature.

KEYWORDS: Animal classification, Activity recognition, Wild animals, Facial expression.

I. INTRODUCTION

In recent days convolution neural network has got a great success in object recognition.Implementing of convolution neural network has becoming more and more in the computer vision field to make an attempt of improving the original architecture of the system toachieve better accuracy. In this paper, we tried to classify animals using convolution network. Identification and classification of animals is a very challenging task. In early days thebiologist used to manually classify the animals to study their behaviour, which is a tedious and time-consuming task. Also, animalclassification hasgot various applications like, avoiding animal-vehicle collisions, anti-theft system for animals in zoo, restricting animal intrusion in residential areas, etc.

Designing an automated system foranimal classification is an effortful job since theanimals possess large intra and inter classvariations. Also, the videosconsidered are in real time with complexbackground, different illumination, differentpostures, occlusion, and different viewmakes the problem of animal classificationa complex job. Further the usage of high-resolution cameras increases the size of thedataset which also increase the complexity inprocessing frames.

Traditional methods involve some of the major steps in any object recognition problem: pre-processing steps like enhancement, segmentation, feature extraction, and classification. Since the animals often covered with more greenery, complex background which makes the task of fully automatic segmentation a difficult one. Without performing of segmentation,extracting features and classification leads to inefficiency. All these challenges made us to implement convolution neural network to classify animals.

II. LITERATURE SURVEY

Every software development requires the survey process. This survey process is required to get the main requirements to the software. The Survey also includes studying the current system and also studying about the tools that are needed for the development of a software. A proper understanding of these tools is very much essential. An extract of the information of material collected during literature survey are as follows:

In paper [2] author tells deep neuralnetworks automatically identify animals with >93.8% accuracy, and they expect that number to

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improve rapidly in years to come. More importantly, if our system classifies only images, it is confident about, our system can automate animal identification for 99.3% of the data while still performing at the same 96.6% accuracy as that of crowdsourced teams of human volunteers, saving >8.4 y (i.e., >17,000 h at 40 h/wk.) of human labelling effort on this 3.2 million-image dataset. Those efficiency gains highlight the importance of using deep neural networks to automate data extraction from camera-trap images, reducing a roadblock for this widely used technology. Our results suggest that deep learning could enable the inexpensive, unobtrusive, high-volume, and even real-time collection of a health of information about vast numbers of animals in the wild.

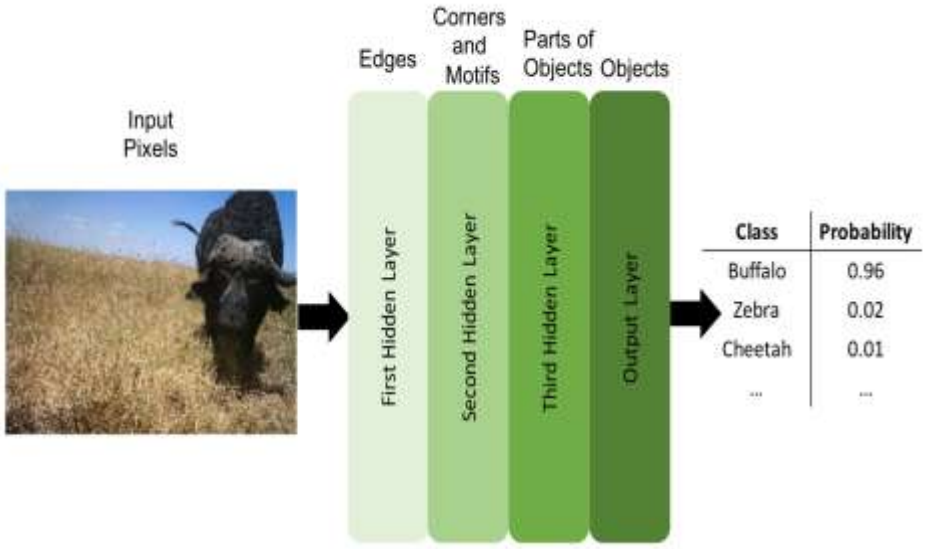

FIG: DNN FEATURE EXTRACTION

III. METHODOLOGY

In our proposed model, methodology consists of multiple technologies for multiple platforms and multiple type of classifications.

As we are implementing our system also in android platform, we had to use different convolutional neural network architecture apart from the original one.

Coming to the classifications, our model deals with multiple classifications

1. Classification of wild animal.
2. Facial expression of that classified animal.

Firstly, coming to the main system. The classification technique used for the animal classification is VGG19. As the VGG19 is pre-trained convolutional neural network it easily classifies which is that wild animal.The only pre-processing that will be done is that they subtracted the mean RGB value from each pixel and convert it to BGR, computed over the whole training set. Convolution layer is the first layer to extract features from an input image. Fully connected layer is simply, feed forward neural networks which forms the layers in network.

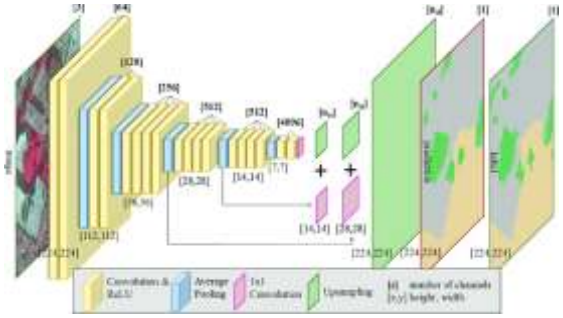

Fig: Architecture of VGG19.

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Pooling layers are used to reduce the dimensions of the feature maps.

Coming to the next biggest part that is classification of facial expression (Normal or Angry). In order to achieve this, we have used the superior classification that is SVM (Support vector machines). In this part as there are only two classes to classify SVM works very well and gives the appropriate result for every single frame of the video with quite good accuracy. Even in paper [10] they have used the same classification technique.

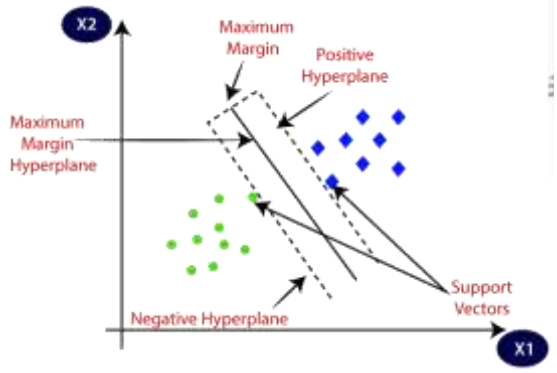

Fig: Architecture of SVM.

Secondly, moving to the android platform. Here, main classification technique to classify the animal, we have used MobileNet V2 CNN architecture.

MobileNet V2 is a convolutional neural network architecture that seeks to perform well on mobile devices. As a whole, the architecture of MobileNetV2 contains the initial fully convolution layer with 32 filters. The first layer is 1×1 convolution with ReLU6. The second layer is the depth wise convolution. The third layer is another 1×1 convolution but without any non-linearity. Global pooling layer helps in fixing the image size. The SoftMax regression is a form of logistic regression that normalizes an input value into a vector of values.

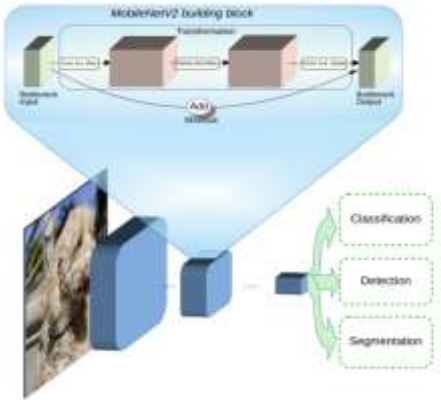

Fig: Architecture of MobileNet V2.

IV. RESULT ANALYSIS

Snapshot 1: Classification of animal.

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accuracy = accuracy_score(ytest, ypred) * 100
print("\nAccuracy: %.2f" % accuracy + "%")
<
[1 1 0 0 1 0 0] [0 1 0 0 1 1 0]

Accuracy: 71.43%
```

Snapshot 2: Classification of facial expression.

Snapshot represents the result of our model. In the first snapshot we can see our system successfully classifying the type of wild animal. Our model has been trained for 15 different classes including 14 land animals and 1 aquatic and land animal that is crocodile. In the second snapshot we can observe that our proposed system going to classify the facial expression of that classified animal where the classification is happening for every single frame of the video which is fed as the input to the system.

V. CONCLUSION

Looking back on this project, the overall outcome of results to be observed. This can be evaluated by looking at how well our objectives were met. Our first objective is to make the model to classify the wild animal successfully, A huge dataset of 15000 images comprised for 15 classes are fed into the VGG19 convolutional neural network architecture for the purpose of data training, and construct asystem. VGG19 is a pre-trained system so it gives very good accuracy in classifying the wild animal successfully. Our system could able to make this thing possible with an accuracy of 96% with the help of VGG19 CNN. Then our model will start the next phase called sub classification, that is classifying the facial expression of that classified wild animal. For this purpose, we have used support vector machine (SVM) classifier. As there are only two classify, our system will go well with the classification at the accuracy rate of 73%. Meanwhile, the classification will apply for every single frame of the video.

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