Animal detection using deep learning

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ABSTRACT:

Departments of transportation all across the world are concerned with ever increasing number of Animal-Vehicle Collisions as they cause thousands of human and animal causalities along with billions of economic losses every year. This is one of the few areas of transportation that safety is not improving. As more roads are being built, the areas that animal inhabit is shrinking and thus causing more crashes between vehicles and animals. The human fatalities and injuries, animal fatalities and injuries, and material costs of these crashes emphasize the need for a solution to this problem. Through this paper, new research directions and combination of technologies which are suitable for covering the research gaps are presented..

INTRODUCTION

Having an updated knowledge about different animals will impact our study in managing species in the ecosystem. Identifying animals and their features manually remains a manual and expensive, time-consuming task. Thus, we propose that such identification and classification can be done with utmost accuracy using deep learning neural network techniques. The main purpose of using deep learning neural network techniques is that a neural network framework can automatically learn from the training images by extracting features from the images and predicts the test images with efficient accuracies. This intends to reduce the manual effort and cost and to maintain and conserve the wildlife ecosystem. We will demonstrate that such detection of animal can be done by deep convolution neural network frameworks with high accuracies.

Data Mining is the process of identifying and discovering trends and patterns in the large sets of data which is a combination of multiple fields that include machine learning, statistics and database systems. It focuses on extracting information from the large sets of data and transforming into a interpretable and comprehensible format for the future use. It is mainly used for data pre-processing, data classification and categorization. Image Classification analyses, identifies and discover several properties of an image and organizes the image data into various categories using several algorithms. It mainly employs two characteristic phases of processing: training and testing. In the training phase, a unique 1 identity of each category is obtained. In the testing phase, these unique identities are used to classify the image data into categories. A neural network is a series of algorithms that analyses a set of data and recognizes the underlying relationships within the data. They are the workhorses of deep learning. Deep Learning is an artificial intelligence technology that is used for processing larger sets of data and mainly used in decision making and image classification and pattern creation. It is a subset of Machine Learning that comprises of networks capable of training by unsupervised learning from the unstructured data. The reason why we choose to use deep learning is that it is one of that only methods that can overcome the challenges of feature extraction by learning several different features itself from the large sets of data

FIG 1.1 Labeled Images
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without much effort from the programmer. Generally, in a recognition system, when an input image is provided, features are extracted from the image. These are used by the network to train itself from the training data and organizes the data into
classes. The gained knowledge from the training is used in predicting the test data based on the features and classifies them accordingly. A recognition system can be employed with identification
and verification. Identification is where the given image is compared with all the other images and produces a ranked list of matches while the Verification is where the given image is compared, and the identity of the animal is confirmed or denied.

Literature Survey

This chapter gives the overview of literature survey. This chapter represents some of the relevant work done by the researchers. Many existing techniques have been studied by the researchers on Animal Classification problem, few of them are discussed below.

Animal Detection Using Deep Learning Algorithm Prakash, Banupriya, First
International Conference on Intelligent Digital Transformation ICIDT – 2019

Efficient and reliable monitoring of wild animals in their natural habitat is essential. This project develops an algorithm to detect the animals in wild life. Since there are large number
of different animals manually identifying them can be a difficult task. This algorithm classifies animals based on their images so we can monitor them more efficiently. Animal detection and classification can help to prevent animal-vehicle accidents, trace animals and prevent theft. This can be achieved by applying effective deep learning algorithms . Animal recognition system based on convolutional neural network Trnovszky, Tibor & Kamencay, Patrik & Orješek, Richard & Benco, Miroslav & Sykora, Peter. (2017).

Animal Recognition System Based on Convolutional Neural Network. Advances in Electrical and Electronic Engineering. The author studied the performances of well-known image recognition methods such as
Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Local Binary Patterns Histograms (LBPH) and Support Vector Machine (SVM) are tested and compared
with proposed convolutional neural network (CNN) for the recognition rate of the input animal 3 images. Their experiments, the overall recognition accuracy of PCA, LDA, LBPH and SVM is demonstrated. Next, the time execution for animal recognition process is evaluated. The all experimental results on created animal database were conducted. This created animal database consist of 500 different subjects (5 classes/ 100 images for each class). The experimental result shows that the PCA features provide better results as LDA and LBPH for large training set. On the other hand, LBPH is better than PCA and LDA for small training data set. For proposed CNN we have obtained a recognition accuracy of 98%. The

Object detection with discriminatively trained part-based models. P. F. Felzenszwalb, R. B. Girshick, D. McAllester and D. Ramanan, "Object Detection with Discriminatively Trained Part-Based Models," in IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 32, no. 9, pp. 1627-1645, Sept. 2010. We describe an object detection system based on mixtures of multiscale deformable part models. Our system is able to represent highly variable object classes and achieves state- ofthe-art results in the PASCAL object detection challenges. While deformable part models
have become quite popular, their value had not been demonstrated on difficult benchmarks
such as the PASCAL data sets. Our system relies on new methods for discriminative training
with partially labeled data. We combine a margin-sensitive approach for data-mining hard negative examples with a formalism we call latent SVM. A latent SVM is a reformulation of MI--SVM in terms of latent variables. A latent SVM is semiconvex, and the training problem
becomes convex once latent information is specified for the positive examples. This leads to an iterative training algorithm that alternates between fixing latent values for positive

examples and optimizing the latent SVM objective function.

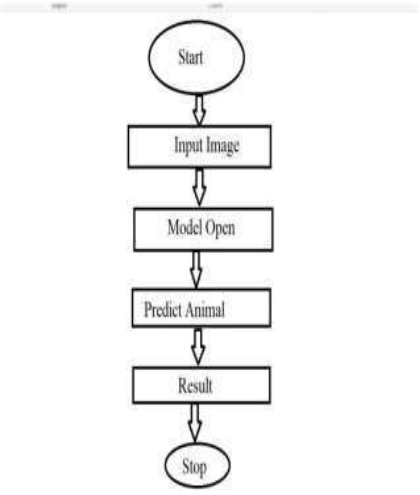
4 Accurate wild animal recognition using PCA P. Kamencay, T. Trnovszky, M. Benco, R. Hudec, P. Sykora and A. Satnik, "Accurate wild animal recognition using PCA, LDA and LBPH," 2016 ELEKTRO, Strbske Pleso, 2016, pp. 62-67.

The author studied performances of image recognition methods such as Principal Component

Analysis (PCA), Linear Discriminant Analysis (LDA) and Local Binary Patterns Histograms (LBPH) are tested and compared for the image recognition of the input animal images. The main idea of this paper is to present an independent, comparative study and some of the benefits and drawbacks of these most popular image recognition methods. Two sets of experiments are conducted for relative performance evaluations. In the first part of our experiments, the recognition accuracy of PCA, LDA and LBPH is demonstrated. The overall time execution for animal recognition process is evaluated in the second set of our

experiments. We conduct tests on created animal database. The all algorithms have been

Architecture



EXISTING SYSTEM

●Animal detection is useful in prevention of animal- vehicle accidents and will increase human and wildlife safety, it will detect large animals before they enter the road and warn the driver

through audio and visual signals. This also helps in saving crops in farm from animals. In this project there is survey of different object detection techniques and for object identification as animal techniques such as object matching, edge-based matching, skeleton extraction. After survey the most appropriate method is selected for animal detection and efficiency is

measured. Proposed system has low false positive rate and false negative rate. Existing study on background ubtraction was done with the assumption of static background. Many models for background segmentation use a base frame that consists of only background explicitly. The challenge of dynamic background is handled by considering the local segmentation

sensitivity using feedback loops at pixel level of images in a video.

PROPOSED SYSTEM

●The aim of the proposed algorithm is to implement animal classification by using two deep learning neural network frameworks – CNN and Faster RCNN and highlight the importance

of deep learning technology in classification problems. The proposed algorithm is consisting of five main steps.

•

Image collection

• Data set splitting

• Train CNN and Faster RCNN algorithm

• Classify using CNN and Faster RCNN algorithm

2.5 ADVANTAGES

The classification done using deep learning models .

The accuracy of classification is high.

SYSTEM ARCHITECTURE

The system comprises of two stages, training and testing. In the training stage, a set of images are provided as visual examples. In the testing stage, a newly captured image i.e. the test image is given as input to the classifier. With the help of the knowledge gained from training, the test

image is accordingly classified into the most favorable class.

METHODOLOGY

Step 1 — Install libraries

For this project you will need following python libraries installed on your machine-

Step 2 — Prepare Dataset

I downloaded photos each for cat, dog, and panda categories. You can download photos in batch using some great chrome extensions. In my case I used Download All Images extension in Chrome.

We go into each directory and go through all the files inside it. Then we read the images using

cv2.imread. After that using Image object from PIL we convert the image into array. Since

while training the convolutional neural network it is required that you have images of same

size we resize the images to width and height of 50px. Then we convert it to numpy array just by passing the image array in the function np.array() and we append the numpy array in our

data array. Also add corresponding label to the image. Eg for cat label is 0, for dog label is 1

and so on. Labels are required as the training is done in supervised manner.

Step 3 — Making Kera's model

It is a very easy process to make your deep learning model. Thanks to the great Keras library.

All you have to do is think about hyper parameters like Filter size, number of filters, which

type of padding to use, which activation functions to use etc.

Step 4 — Train the model

Your all work is over. Now just train the model and wait patiently."epochs" is the number of

steps you want to train the model. Batch size is the size of dataset that is thrown to the model

at a time. It is really important to set this because if you have a lower memory problem in

your computer you cant train the model by throwing all the data at once.

Step 5 — Test the model

Step 6 — Predicting on single images

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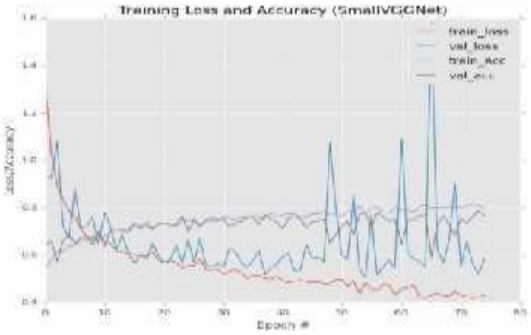
IMPLEMENTATION

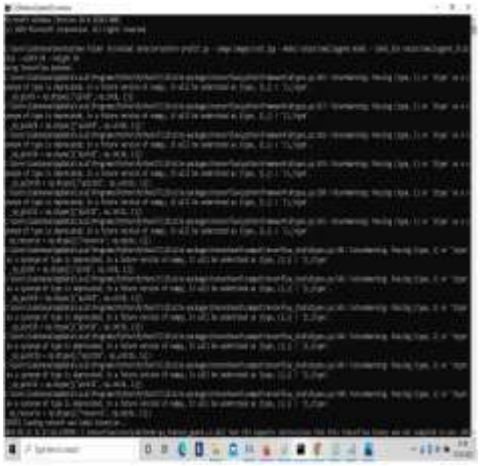
Fig.copy the link and paste it in the browser to open the app

RESULTS:

Path of the folder



LOSS/ACCURACY GRAPH IN (SmallVGGNet)



Conclusion:

In this study, we expressed our idea to automatically classify animal images using the latest deep learning neural network frameworks in order to reduce the human effort and cost. We tested the ability of the neural networks to classify images with high accuracies. The results highlight the importance of the deep learning neural network technology in image classification. Hence, these network frameworks can be used to reduce human effort and cost and extract wildlife information to conserve and maintain the wildlife system.

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