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Image Based Species Recognition System Using Machine Learning

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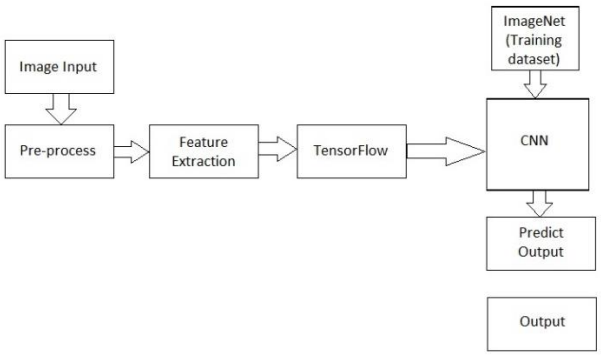
***Abstract*—Studies in the area of animal species recognition have been limited primarily due to the use of primitive technology such as trapping ink footprints on paper to differentiate between species by varying baits in the trap. The goal of this research was to create a species recognition system for traps which would use eigenface based identification technique. This process, usually used in human face recognition, is being applied to feral rodents such as possums, cats, and weasels. After removing the background from the training images, the technique had a 55%, 33%, and 45% success rate for recognizing possums, cats, and weasels respectively..**

Keywords—Image Based Recognition, Species Recognition, Process, approach

I. INTRODUCTION

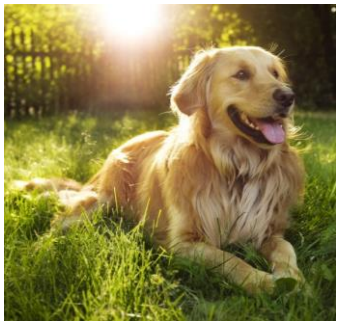
1) Due to its critical role in a wide range of real-world applications, pattern categorization has emerged over the past few decades as one of artificial intelligence's most significant research areas. In contrast to the natural intelligence exhibited by people, artificial intelligence (AI), sometimes known as machine intelligence, is intelligence demonstrated by computers. Both people and animals. In the field of computer science, the term "intelligent agent" refers to any machine that can sense its surroundings and take activities to increase the likelihood that it will succeed in attaining its objectives. When a machine imitates "cognitive" processes that people typically connect with other human minds, such as "learning" and "problem solving," the phrase "artificial intelligence" is used. The Animals Recognizer uses the photos as input to train and recognise the Animals, but deep learning is typically highly slow and complex, requiring a large amount of training data. The classification of the animals is then determined by comparing the similarity between the animals and its template and the retrieved features. Experiments demonstrate that after learning around ten samples of a particular animal, our system can correctly identify the species. Because of the progressive framework based on deep learning, the self-learning system is flexible and applicable in a wide range of situations. Artificial intelligence (AI) is the study of how the human brain functions while attempting to solve issues.This study also produces clever software systems. AI's goal is to make computers do tasks related to human understanding better; for instance, deliberation, education, and problem-solving.

II. BLOCK DIAGRAM



As per above block diagram initially a user must first upload an image, such as one of any animal, including a terrestrial animal. Before being used for learning purposes, the user's raw image must be processed during the pre-processing stage in order to improve the image and enable accurate prediction. Small objects are created from the entire image and features are extracted for each one. The retrieved characteristics are then transformed using Tensorflow into graph values or pb(protobuf) values. Since the ImageNet datasets include the picture as pb values, this conversion is necessary. In order to predict the animal species with a certain degree of accuracy, CNN compares the input data to the training dataset. The output of the acknowledged animal species is converted using a text to speech converter to sound like a human voice.

III. System Design



Training and testing are the two stages that make up the system. A selection of photographs are shown as visual examples during the training phase. A recently obtained image, known as the test image, is provided as input to the classifier during testing. The test image is then put into the most advantageous class using the knowledge learned during training.

A. Receiving an Input Image

1) Getting the image input: The test image is supplied into the proposed system as input, and it is then transformed into a binary pattern. The dataset includes a number of previously classified photos, whose attributes are compared to those in the test image to identify the type of animal that is depicted.

B. Feature Extraction

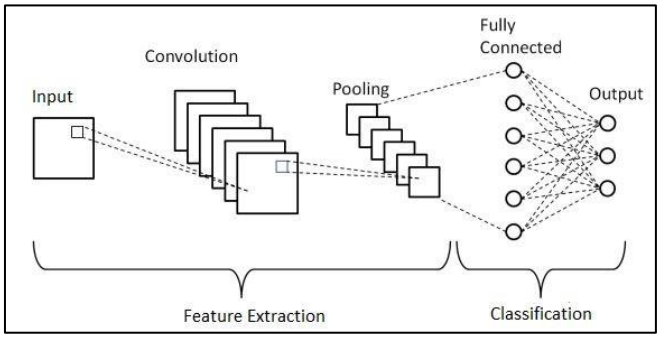
One can reduce the number of characteristics in the test image that is received as input. The desired objective may be accomplished by using this smaller amount of data rather than the original, unaltered data because the selected features may contain substantial information from the input data. High-level features describe more abstract properties of the data, while lower-level features identify features from images and decide several levels of representation.

C. Classifying the species in an image

The matching output layer generates probability that the animal detected in the image belongs to one of the potential classes for the purpose of species classification. Even though delivering such a result would save the amount of time and energy required to identify the right answer, species, human expertise will be needed to evaluate this hypothesis.

IV. Methodologies & Concepts

A. CNN



Convolutional Neural Networks (CNNs) have left all other computer vision techniques in their wake and are now considered the standard. Unlike different kinds of neural networks (such as Recurrent Neural Networks (RNNs), Long Short-Term Memory (LSTM) and Artificial Neural Networks (ANNs)), CNNs are the most commonly used because they are effective at recognizing different forms of images. CNNs are highly successful when it comes to tasks such as image classification, object detection, and image recognition. These deep artificial neural networks are used mainly to classify images, group them by similarity, and perform animal recognition within different scenes. With this module, given the extracted features of an animal image, a CNN will classify the image and then identify the species of the animal (see Figure 1 for an example of a CNN architecture that incorporates three layers, two consecutive convolutions, a pooling layer, and so on). Convolution layers utilize filters to be applied to the initial picture, or to other feature maps in a deep CNN. This layer requires a set of filters that will be used on the input image to generate different activation features. Pooling is analogous to convolution layers, but their purpose is to perform a special task, for instance, max pooling which takes the greatest value in a certain filter area or average pooling which takes the mean value in a filter region. Such layers are generally utilized to minimize the network's dimensionality. The figure above shows that max pooling has been used. Fully connected layers are located before the classification output of a CNN and are used to flatten the outcomes before classifying.Feature Extraction

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B. Keras

Keras is a powerful yet user-friendly deep learning library for Python programming. We will construct a straightforward Convolutional Neural Network (CNN) and utilize it to tackle a real problem with Keras. A straightforward but effective deep learning library for Python is called Keras. Here, using Keras, we'll create a straightforward Convolutional Neural Network (CNN) and train it to resolve a practical issue.

C. TensorFlow

TensorFlow is an open-source, free software library for differentiable programming and data flow that may be used for a variety of purposes. It is an open-source artificial intelligence package that constructs models using data flow graphs. It enables the development of multilayered, large-scale neural networks. Classification, perception, understanding, discovery, prediction, and creation are the key uses of TensorFlow. The preprocessed animal image will be transformed into a graph value in this module so that the animal species can be determined.

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