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IMAGE PROCESSING: RECOGNIZATION, MACHINE LEARNING AND MINING TECHNIQUES

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Abstract
The technology has been considered as an advanced field for discovering information related to the images. The main issues in analyzing images are the effective identification of features and another one is extracting them. Image mining is one in which, it involves general application where the focus is on the process of generating image patterns that may be helpful in the understanding of the interaction between high-level human perception of images and low-level features. Image recognition is an application of computer vision that often requires more than one computer vision task, such as object detection, image identification, and image classification. Image recognition technology is also divided into the following steps: information acquisition, pre-processing, feature extraction and selection, classifier design and classification decision

Keywords: Image recognition, Machine Learning, Mining.

Introduction

Image recognition is an application of computer vision that often requires more than one computer vision task, such as object detection, image identification, and image classification. Image recognition technology is also divided into the following steps: information acquisition, pre-processing, feature extraction and selection, classifier design and classification decision. The acquisition of information refers to the conversion of information such as light or sound into electrical information through sensors. That is to obtain the basic information of the research object and transform it into information that the machine can recognize by some means. Pre-processing mainly refers to operations such as de-drying, smoothing, and transforming in image processing, thereby enhancing important features of the image. Feature extraction and selection means that in pattern recognition, feature extraction and selection are required. The simple understanding is that the images we study are various. If we need to distinguish them by some method, we must identify them by the characteristics of these images. The process of acquiring these features is feature extraction. Features obtained in feature extraction may not be useful for this recognition. At this time, useful features are extracted, which is the choice of features. Feature extraction and selection is one of the most critical techniques in the image recognition process, so the understanding of this step is the focus of image recognition .Image recognition with machine learning uses algorithms to learn hidden knowledge from a dataset of good and bad samples. Machine learning is a process of extracting useful information from unordered data. It spans multiple disciplines such as computer science, engineering, and statistics and requires multidisciplinary knowledge. In the Internet age, people create and collect a large amount of data. How to extract valuable information from these data is a topic worth studying.

Image Mining deals with the extraction of image patterns from a large collection of images. Also deals with extraction of knowledge, image data relationship and other required patterns and uses ideas from image processing, image retrieval and machine learning, databases. The focus of image mining is on the extraction of knowledge patterns from a large collection of images. The goal is to discover image patterns that are significant in a given collection of images and the related

alphanumeric data. Image mining normally deals with the study and development of new technologies that allow easy analysis and interpretation of the images. Mining Image is not only the simple fact of recovering relevant images but is the innovation of image patterns that are noteworthy in a given collection of images. The main issues in analyzing images are the effective identification of features and another one is extracting them. Image mining is one in which, it involves general application where the focus is on the process of generating image patterns that may be helpful in the understanding of the interaction between high-level human perception of images and low-level features.

Discussions, Materials and Methods

Image Recognition Work

Image recognition involves the creation of a neural network that processes the individual pixels of an image. These networks are fed with as many pre-labeled images as we can, in order to "teach" them how to recognize similar images. Image recognition process has following simple steps:

1. We need a dataset containing images with their respective labels. For example, an image of a dog must be labeled as a dog or something that we can understand.
2. Next, these images are to be fed into a Neural Network and then trained on them. Usually, for the tasks concerned with images, we use convolution neural network. These networks consist of convolution layers and pooling layers in addition to Multi perception layers (MLP).
3. We feed in the image that is not in the training set and get predictions.
4. By following these simple steps, below Fig.1 shows an example of classifier that can recognize RGB images of different kinds of animals

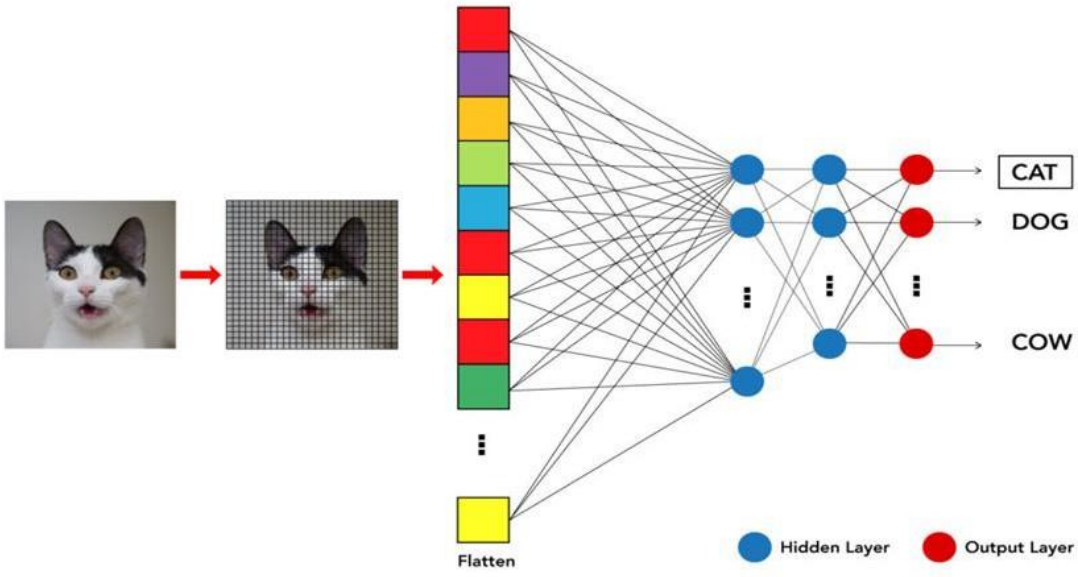

Fig.1

Machine Learning: The most popular machine learning models areas below:

Support Vector Machines: SVMs work by making histograms of images containing the target objects and also of images that don't. The algorithm then takes the test picture and compares the trained histogram values with the ones of various parts of the picture to check for matches.

Bag of Features Models: Bag of Features models like Scale Invariant Feature Transformation(SIFT) and Maximally stable external regions (MSER) workby taking the image to be scanned and a sample photo of the object to be found as a reference. The model then tries to pixel-match the features from the sample photo to various parts of the target image to see if matches are found.

Viola-Jones Algorithm: A widely-used facial recognition algorithm from pre-CNN (Convolutional Neural Network) times, Viola-Jones works by scanning faces and extracting features that are then passed through a boosting classifier. This, in turn, generates anumber of boosted classifiers that are used to check test images. For a successful match to be found, a test image must generate a positive result from each of these classifiers.

Mining

In the field of images, features might be raw pixels for simple problems like digit recognition of well-known mining dataset. Feature extraction based on these attributes may be performed at the global or the local level. There are obvious trade-offs between global and local descriptors. Global descriptors are generally easy to compute, provide a good representation, but they tend to integrate and therefore are often unable to discover subtle patterns or changes in shape.

The edge detection operator returns a value for the first derivative in the horizontal direction and the vertical direction. One of the relevant hand engineered method is SIFT (Scale-invariant feature transform). SIFT starts by detecting edges and corners in the image. On the resulted image, SIFT tries to find interesting points which is refers to high frequency pixel values which differentiating that image from the others.

Text data present in images contain useful information for, keyword additions, Standard titles of content, caption indexing, etc. There are differences in text style, text size, text orientation and alignment and all these can be used for image indexing. In text feature extraction, initially, only foreground of the image is considered by removing background pixels. Gradient vector is applied to determine the center position of the image.

A more common approach to comparing the color content of a query image to that of database images is that of comparing color histograms. The methodology relies on the fact that images are generally represented as a series of pixel values, each corresponding to a visible color. Color histograms are computed for each image so as to identify relative proportions of pixels within certain values. A most basic form of color retrieval involves specifying color values that can be searched for images from a database. Computers represent all visible colors with a combination of some set of base color components, generally Red, Green and Blue. The image retrieval utilized during their experimentation computes similarity based on three different histograms, one for each component of a RGB pixel. Histogram is a demonstration of sharing of color in an image. With the help of color histogram method, the images that have been matched with text and shape feature can be compared.

Conclusions

In this paper image recognition technology based on machine learning is discussed. Image recognition technology is divided into different steps such as information acquisition, pre-processing, feature extraction and selection, classifier design and classification decision. Also popular machine learning algorithms are discussed. This field is very promising and is also a hot research area.

The performance can be evaluated by the four possible outcomes of a prediction. The outcomes are True Positives (TP),True Negatives (TN), False Positives (FP) and False Negatives (FN), where TP are those extracted regions that are correct, TN are the regions that are incorrect and are not retrieved, FP are regions that are actually incorrect, but have been extracted and FN are regions which were supposed to be extracted but were missed. Only based on this performance ratio the accuracy been calculated.

Image Mining is the advanced field of Data Mining technique. It is a promising field for research. Image mining research is still in its infancy and many issues remain solved. Specifically, it believes that for Image Mining research to progress to a new height, the following issues need to be investigated. Design semantically powerful query languages for image databases. Exploring new discovery techniques that take into account the unique characteristics of image data. Incorporating new visualization techniques for the visualization of image patterns. The process model represents about storing the various type or level of information already present in image dataset and pointing the issues of analyzing and retrieving useful patterns or knowledge from each level. In this paper, the need for image mining due to boom in growing image datasets been specified. And also pointed the unique features in the area of image mining that brings a whole new set of challenging research issues to be resolved. Finally, it ensures that the applications of image mining have a very dynamic and deep future scope.

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