Image Classification Using LBP and SVM Classifier

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Abstract - The proposed method classify images, using machine learning-based Support vector machine (SVM) and Local Binary Patterns (LBP) algorithms. This project is capable of classifying different classes of images. Identifying the features of those such as satellite image, the human face, football and rugby is also simple because these other classes have some unique features that can be easily distinguished, allowing for easy classification. The SVM Classifier is used to estimate the noise patterns in the wireless image, and the estimated noise patterns are then removed using the SVM signal classification technique. SVM identifies the test image's class based on the expanded features gathered. The LBP-SVM approach was applied in this study, and the picture correct recognition rate was 95 percent. The results produced using MATLAB 2018a are superior than those obtained using other methods to classify photos.

Index Terms - Local binary patterns, Support vector machine, Machine learning, Feature extraction.

I. INTRODUCTION

Recently, image Processing is growing and becoming a trend among technology developers especially with the growth of data in different parts of industry such as e-commerce, automotive, healthcare, and gaming. The most obvious example of this technology, flowers classification , plant disease detection, soil type recognition and fruit grade classification, are very popular. The solution of these classification tasks is important for tackling various challenges of agricultural production such as environmental impact, productivity, food security and sustainability. The technology itself almost beats the ability of human in image Processing or recognition. One of the dominant approaches for this technology is deep learning. Deep learning falls under the category of Artificial Intelligence where it can act or think like a human. Normally, the system itself will be set with hundreds or maybe thousands of input data in order to make the 'training' session to be more efficient and fast. It starts by giving some sort of 'training' with all the input data Machine learning is also the frequent systems that have been applied towards image Processing. However, there are still parts that can be improved within machine learning. Therefore, image Processing is going to be occupied with deep learning system. Machine Vision has its own context when it comes with Image Processing. The ability of this technology is to recognize people, objects, places, action and writing in images. The combination of artificial intelligence software and machine vision technologies can achieve the outstanding result of image Processing. Image Processing has become a major challenge in machine vision and has a long history with it. The challenge includes a broad intra-class range of images caused by colour, size, environmental conditions and shape. It is required big data of labelled training images and to prepare this big data, it consumes a lot of time and cost as for the training purpose only. In this project, Machine learning model used with components Support vector machine (SVM) Classifier and Local Binary Patterns (LBP) is used for Image classification.

II. LITERATURE SURVEY

In this review [1], the detailed comparison of various image processing techniques for analyzing satellite images .The satellite images are large in size, acquired from long distances and are affected by noise and other environmental conditions .Hence it is necessary to process them so that they can be used by the researchers for analysis. Satellite images are widely used in many real time applications such as in agriculture land detection, navigation and in geographical information systems. Image fusion is a process by which a new image is created which combined two or more images. In this review [2],we are interested to extraction methods and classification in case of image classification and recognition application. We expose the performance of training models on varying classifier algorithms on Caltech 101 images categories. For feature extraction functions we evaluate the use of the classical SURF technique against global color feature extraction. The purpose of our work is to guess the best machine learning framework techniques to recognize the stop sign images. The trained model will be integrated into a robotic system in a future work. Development of Bag of Features (BoF) model is inspired by that of Bag of words (BoW). In document classification fields

(text documents), a BoW is a vector that represents the frequency of vocabulary words in a text document. In this review[3], the framework of image classification where deep neural networks are also applied. There are four (4) phases throughout this process and each of the phases is discussed. Each of the phases is included on TensorFlow as the open source software and Python as its programming language. Then, the process is continued to collect some of the images (inputs), by applying DNN and lastly all images will be classified into their groups. MobileNet is used as the 'trainer' as it consists of small efficient of deep neural networks (DNN). In this review [4], an approach for real-time training and testing for document image classification. In production environments, it is crucial to perform accurate and (time-) efficient training. Existing deep learning approaches for classifying documents do not meet these requirements, as they require much time for training and fine-tuning the deep architectures. Motivated from Computer Vision, we propose a two-stage approach. The first stage trains a deep network that works as feature extractor and in the second stage, Extreme Learning Machines (ELMs) are used for classification. ELM is an algorithm that is used to train Single Layer Feedforward Network (SLFN). The major idea behind ELM is mimicking the biological behaviour. While general neural network training uses backpropagation to adjust parameters i.e. weights, this step is not required for ELMs. An ELM learns by updating weights in two distinct but sequential stages. In this review [5], we propose a Bootstrap kernel diffeomorphism filter (BKDF) to reduce speckle noise in satellite images. We evaluated the performance of the BKDF by comparing it with the extend Kalman filter (EKF) according to the numeric values based on the image signal to noise ratio (ISNR) and peak signal to noise ratio (PSNR). As a result of being based on the Monte Carlo and Bayesian state estimation, bootstrap filter is nonlinear and the noise in the system can be non-Gaussian. The image restoration can be posed as a recursive Bayesian estimation problem based on bootstrap filter. Based on the bootstrap filter, we propose a new filter that we call BKDF to image restoration. The object of the BKDF is to construct the conditional probability density function (pdf) of the state based on measurement information and kernel-diffeomorphism. The conditional pdf can be regarded as the solution of the estimation problem. Non-parametric density estimation allows for estimation of variable densities without the imposition of particular distribution forms. In this review[6], Bag-of-features based approaches have become prominent for image retrieval and image classification tasks in the past decade. Such methods represent an image as a collection of local features, such as image patches and key points with scale invariant feature transform (SIFT) descriptors. To improve the bag-of-features methods, we first model the assignments of local descriptors as contribution functions, and then propose a novel multiple assignment strategy. Assuming the local features can be reconstructed by their neighboring visual words in a vocabulary, reconstruction weights can be solved by quadratic programming. The weights are then used to build contribution functions, resulting in a novel assignment method, called quadratic programming (QP) assignment. We further propose a novel visual word weighting method. The discriminative power of each visual word is analyzed by the sub-similarity function in the bin that corresponds to the visual word. Each sub-similarity function is then treated as a weak classifier. A strong classifier is learned by boosting methods that combine those weak classifiers.

III.PROPOSED METHOD

The proposed method classify images, using machine learning-based Support vector machine (SVM) and Local Binary Patterns (LBP) algorithms. This project is capable of classifying different classes. Identifying the features of those classes, such as the satellite image, human face, football and rugby is also simple because these other classes have some unique features that can be easily distinguished, allowing for easy classification.

LBP Algorithm:

1.convert the image into RGB space.

2. For each pixel(i_p) in the image, select the P neighborhoods that surround the central pixel. the coordinates of i_p are given by,

$$[x_p, y_p] = \left[x_c + R\cos\left(\frac{2\pi p}{P}\right), y_c + R\sin\left(\frac{2\pi p}{p}\right)\right]$$

3. Take the center pixel (i_c) and set it as a threshold for its P neighbors.

4. Set to 1 if the value of the adjacent pixel is greater than or equal to the value of the center pixel, 0 otherwise.

5. Now compute the LBP value: Sequentially counterclockwise, write a binary number consisting of digits adjacent to the center pixel. This binary number (or its decimal equivalent) is called **LBP-central** pixel code and, further, is used as a characteristic selected local texture.

$$LBP_{P,R}(x_c, y_c) = \sum_{P=0}^{P-1} s(i_p - i_c) \times 2^p$$

Where, i_c-the intensity value of the central pixel

i_p-the intensity of the neighboring pixel with index p

the function s can be expressed as

$$S(x) = \begin{cases} 1, & if\ x \geq 0 \\ 0, & if\ x < 0 \end{cases}$$ (threshold step function).

6. Repeat the procedure for all the images to extract LBP features for all the images. To train the SVM classifier.

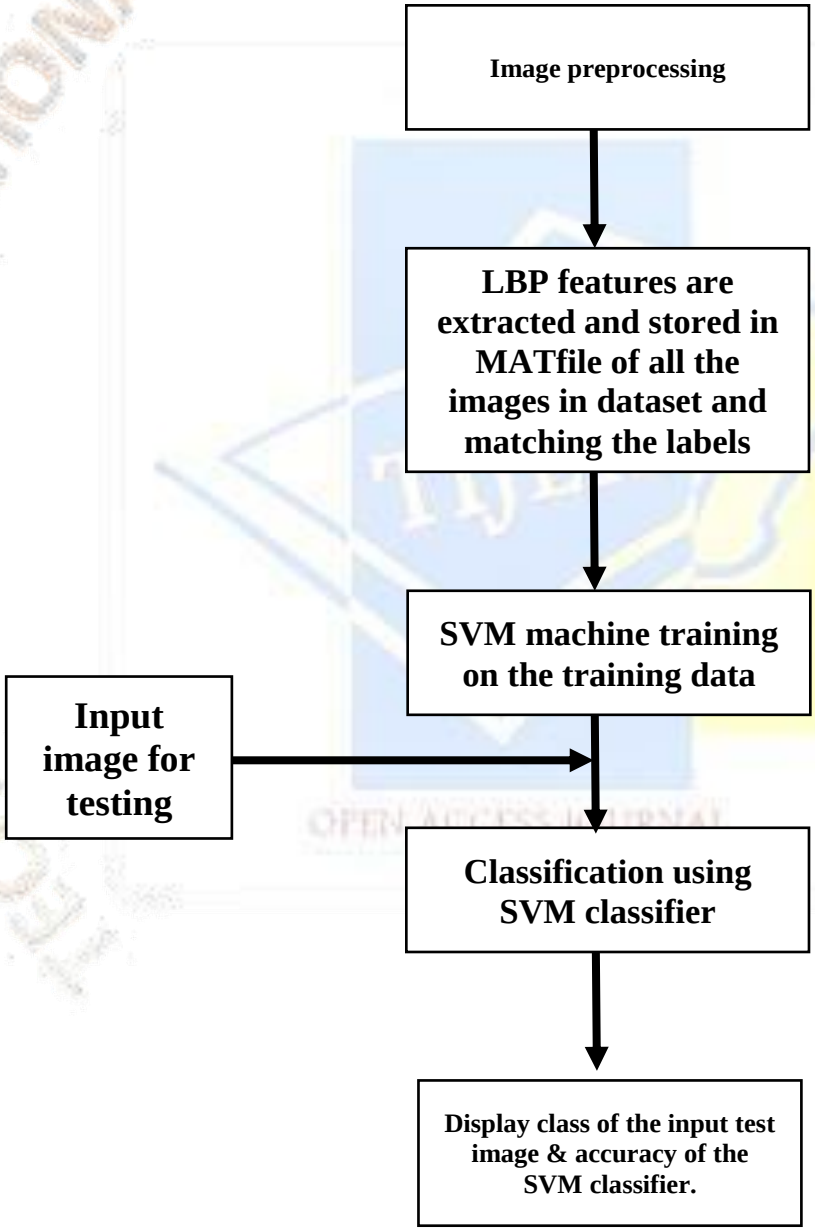

Fig.3.1. Block diagram of the proposed method

Support Vector Machine (SVM): Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane. SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine. Consider the below diagram in which there are two different categories that are classified using a decision boundary or hyperplane:

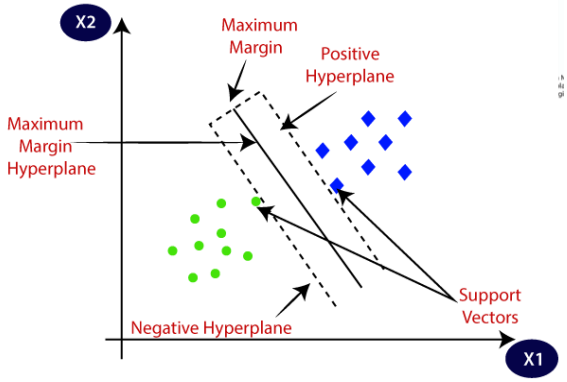

Fig.3.2. Support Vector Machine

IV.RESULTS

FIG.4.1 INPUT IMAGE

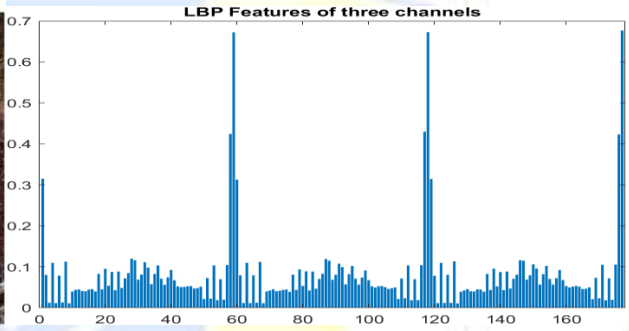

FIG 4.2. EXTRACTED LBP FEATURES

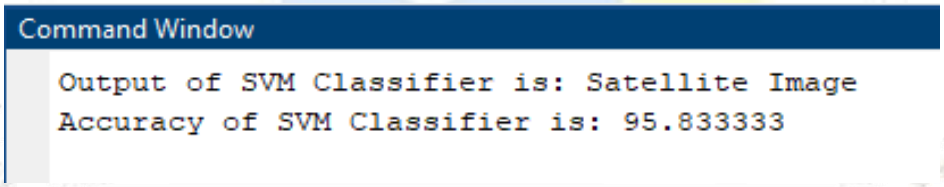

Fig.4.3. Output And Accuracy Of Input Image

V. CONCLUSION

This work relates the technique and algorithms used in the proposed machine learning framework for image classification and introduced AI cutting edge applied to picture order. This work presented the Bag of Features worldview utilized for input picture encoding and featured the Local Binary Pattern as its strategy for picture features extraction. Th rough experimentations, this work sealed that utilizing LBP different channel component extractor technique for picture preparing classifier performs the best expectation of normal precision. In test situations, this zeroed in on pictures as this work task is to apply the prepared classifier in an overall framework.

VI. REFERENCES

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