IMAGE PROCESSING USING MACHINE LEARNING

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ABSTRACT:

Much attention has been paid to the usage of handwritten mathematical equations and symbols, including pattern recognition industry consolidation Using a novel and sophisticated algorithm, it is now possible to identify the handwritten characters, a more diverse variety of handwritten digits is now visible. A number of machine learning algorithms, including conventional Neural Networks, Support Vector Machines, and Multilayer Perception. Finding the most effective and efficient approach for pattern recognition is the key goal or objective. Paper displays the accuracy of various classification methods varies. The Bayesian Network makes a "rough" classification of a binary image. The use of neural networks for classification contents.

Keywords**:** *pattern recognition, digit recognition, machine learning algorithms, neural network, classification algorithms.*

Introduction:

Handwriting is one of the many means we have for connecting with others that have been around for ages. However, as technology has advanced, computers and the Internet have become the most appealing means of modern communication, turning the world on its side and condensing back into a small village. In order to make machines more intelligent and engaging, developers are taking similar to how a human learns to accomplish a certain task by practising it, take into account numerous machine learning and deep learning ideas. Repeatedly until it has mastered the task.

However, there are still issues with handwritten digit recognition. It typically includes three phases. A series of input strokes are first divided into fictitious symbols (symbol

segmentation). Then a symbol classifier recognises hypothetical symbols (symbol recognition). Last but not least, structural resslationships between the recognised symbols are identified, and the expression's structure is examined by a parsing algorithm to offer the most likely the interpretation of a signal OHME (structural analysis).

It considers various neural models utilised as tools for various types of issues. The primary motivation for pattern reorganisation is the development of practical software and applications using digital images. Over the years, academics have done excellent work developing the ideas of machine learning and data mining to arrive at a logical method for approximate mathematical equation recognition. In the present, pattern restructuring is It is frequently used as a tool for interpersonal communication and information-related purposes.

Existing System

Among all the existing system, none of the solution use computer vision technology in order to alert or track an wild animals movement. Most advance solution is mostly likely a real time video stream that has to monitored by a person in order to make sure that the wild animals and humans do not enter areas they are not supposed to enter.

Proposed System

To resolve these issues, we propose an image-based animal detection system using method based on eigenface and using the PCA algorithm.

The proposed system is better mainly due to the use of animal features rather than the entire animal. Its advantages are in terms of:

- Recognition accuracy and better discriminatory power Computational cost because smaller images (main features) require less processing to train the PCA.

because of the use of dominant features and hence can be used as an effective means of authentication

Literarture survey:

This section of our study will cover a few of the papers listed below that are used as references to show the many methods that researchers in the field of handwritten digit recognition have employed.Using machine learning, Zeeshan Khan, Sandeep Kumar, and Anurag Jain presented a work titled "Content-Based Image

Classification." Learning Approach, where they discussed various image classification approaches as KNN, DT, and SVM and give a thorough comparison of the aforementioned methods. They concluded that SVM produces better outcomes.SVM still has some issues with feature outliers and the core problem when compared to other algorithms, it turns out

K.Gaurav, Bhatia P. K. [3] , this paper deals with assorted pre-processing techniques used for handwritten recognition which consists of different images starting from a simple handwritten document and extending its radius to complex background and diverse image

intensities. The pre-processing techniques that were included are contrast stretching, noise removal techniques, normalization and segmentation, binarization, morphological processing techniques. They came to the conclusion that no technique for preprocessing can single handedly can be used to produce an image.

All the techniques goes hand in hand. Even though after applying all the said techniques, the accuracy of the image in not upto the mark. Salvador España-Boquera, Maria J. C. B., Jorge G. M. and Francisco Z. M. [4], this paper outlines the hybrid Hidden Markov Model (HMM) is used to conceive the unconstrained offline handwritten texts. The main characteristics of the recognition systems is to produce a new way in the form of preprocessing and recognition which are both based on ANNs. The preprocessing is used to clean the images and to enhance

the non-uniform slant and slope correction. Whereas the recognition is used to estimate the emission probabilities.

P N V and Sai Abhishikth Ayyadevara This study by Sai Ram Teja and Rajesh Kumar M [7] discusses two distinct machine learning technique proposals. The first was a brand-new feature extraction method that included elements of three other feature extraction methods already in use. The second one, however, also examines the effectiveness of three distinct neural networks for two Geometric and gradient feature techniques are different. They came to the conclusion that Convolutional neural network by using the Levenberg- Marquardt method, is most effective.

Block diagram:

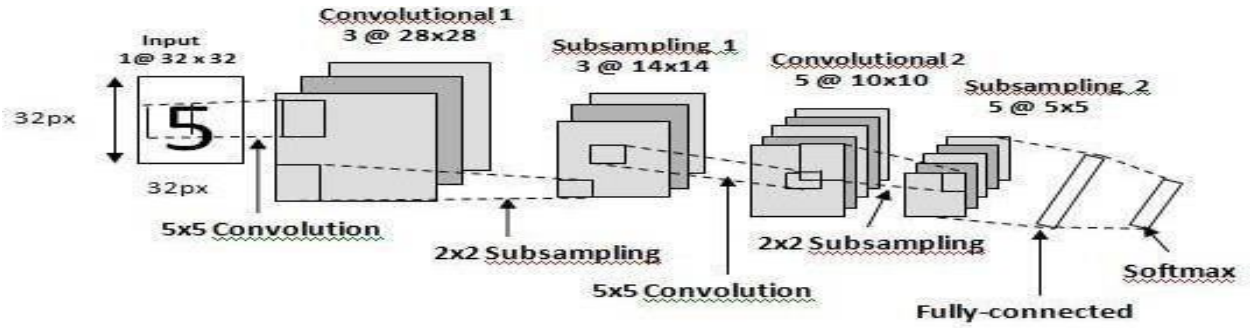
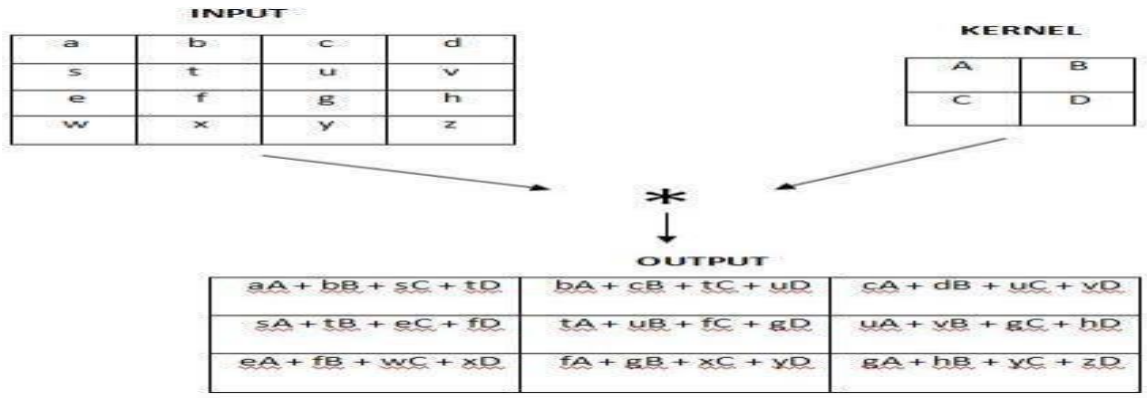


Figure1. Architecture of CNN

Convolution

A convolution, in general, is a mathematical operation on two functions that yields a third function that expresses how the shapes of the first and second are changed by the first and second. It is a type of image processing that alters an input image to display a certain feature, such as edge detection, image sharpening, or image blurring. By creating kernels or filters that encircle the input image and the matrix.



Subsample selection

An input feature is transformed into another feature depending on its statistical representation in this procedure. The pooling method is another name for it. Reducing susceptibility to invariance, such as input translation, rotation, and distortion, is another advantage of pooling. This functionality is performed in non overlapping neighbourhoods. It also reduces the size of the input image. Researchers found out that there are different types of pooling but the most accurate are the max pooling and an average pooling.

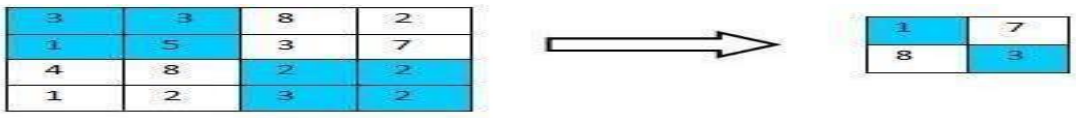


Figure 3.CNN

There are five different layers in

Convolutional Neural Network. They are

1. Input- In this layer, raw pixels are provided as input.
2. Convolutional Layer- In this, the input layer changes the result of the neuron layer. The filter that are going to be used should be defined beforehand.
3. Rectified Input unit [ReLU] layerDuring back propagation , this function prevents the values of pixels from changing. It also provides activation function on the image.
4. Pooling layer- It performs a down sampling operation along the height and width of the image.
5. Fully connected layer-In this layer, focus is on score class and who has the maximum score of the

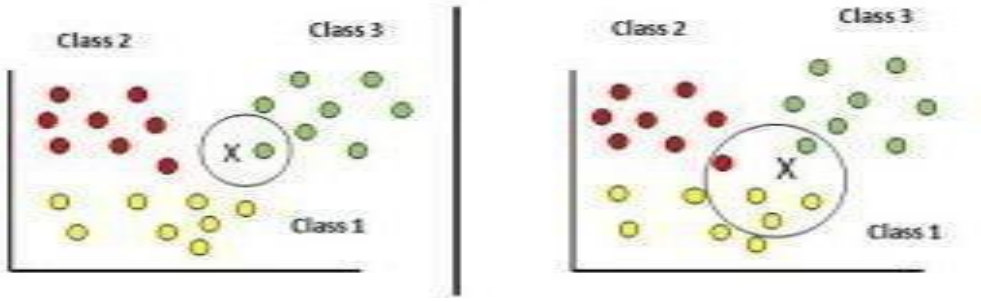
   input digit is found.

K nearest neighnors (knn)

KNN is a non parametric, lazy learning algorithm .KNN method classification is based on the nearest distance of neighbor classes. It only selects the knearest neighbor depending upon the distance. Then we calculate the majority weight to calculate the best for the point. The word distance plays a key or vital role in this algorithm.KNN image classifier provide good image classification when the suspicious images is similar to one of the stereotyped images in the class. Moreover the NN method is considered to be the most competitive among all the other method based on the domains of other algorithms, where the number of labeled database images is very high relative to the class complexity. However the NN method classifier cannot deduce much beyond the labeled classified image. In real time evaluation, total number of trials are very small relation to its class complexity. There is very large discrepancy in object shape and appearance when there are only images that are identified from a class, due to which bad classification is obtained. Nowadays this method is widely used for regression and classification of multiclass images. Classification is completely based on the distance from its neighbors. If k = 1, the algorithm can be considered as the nearest neighbor algorithm and the object is classified to the class of its nearest neighbor. Euclidean formula is most commonly used to calculate the distance between the neighbors. Euclidean squared, cityblock, Hamming, Chebyshev are some distance measuring methods used in knearest-neighbor.

$$d(r,s) = \sqrt{(r_1 - s_1)^2 + (r_2 - s_2)^2 + \cdots + (r_n - s_n)^2}$$

$$= \sqrt{\sum_{i=1}^{n} (r_i - s_i)^2}$$



KNN method classifier is generally consists of different steps[15]. These include

1. First step include providing the input image to the classifier picked from the given database. Size of the image is not defined , hence we can pick any pixel sized image.
2. In this step resizing of the images is done as the image selected from the database may be very large, and hence large size images increases the complexity of the classifier.

3. The third step is based on RGB color band. For success extraction we have to find the RGB color band of the image. The RGB color band of each resized image is determined and then each band is degrade into six decomposition level by using discrete wavelet transform.
4. In this step we find the color moment of first order from each decomposed color band and then normalized each color band. Normalization changes the pixel information of each decomposed image.
5. Image features of each band is obtained. Image feature contains all the important information about the classification and used as input for algorithm.
6. This step consist of KNN classifiers. The result obtained in the step 5 is provided as the input to the classifier and used as an important information.

SUPPORT VECTOR MACHINE (SVM)

Like KNN, Support Vector Machine (SVM) is used for the classification as well as the regression problem and this method is used for supervised learning proposed by Vapnik. In this method, SVM draws an optimal hyper plane which classifies into different categories[15].In simple terms , SVM is a linear binary hyper plane classifier and it gives as output the linear feature space from a non-liner input by indirect mapping, where the maximum margin decision function is calculated . SVM aims to group the data points by exaggerating the gap among classes in high dimensional space. Based on the risk minimization, SVM can improve its generalization ability of the machine learning as much as possible. In recent years, SVM is used in digit recognition, pattern recognition, and regression analysis and feature extraction. The only factors that can affect the performance of the SVM model are kernel function parameters and penalty coefficient.

in a neverending list which include – elearning, handwritten character recognition, image clustering, speaker verification, land cover classification, forecasting, fraud prediction, intrusion detection, cancer prognosis and many more.

Generally empirical risk minimization are used in NN and is the most common common optimization criteria used to estimate classifiers. But this method is not unique. On the other hand, SVM method is based on structural risk minimization. We use SRM in SVM because there is a need to identify a classifier which has the least expected risk on the test set.The following database set like - : IRONOFF, UNIPEN and the mixture IRONOFF-UNIPEN databases has been used to compare the preliminary results obtained during the SVM process with those with the result using NN reported by Poisson [10].Also , SVM in its basic form handles only a two class classification. Over the years, different new approaches of the SVM model have been developed to improve on approximation accuracy, memory requirement and training time. Initial experiments were done to look over the usage and importance of SVM in character recognition. The above mention database set have been used for these purpose. Starting with IRONOFF, which contain both the collection of online and offline handwritten information collected by IRCCyN in Nantes, France. It contain 4096 lonely digits, 10685 lower case characters,

10679 upper case characters and 410 EURO signs and a total of 31346 isolated words. While in UNIPEN online database, there are 16000 isolated digits, 28000 lower case character and 61000 upper case character. After testing of IRONOFFUNIPEN databases shows that higher than lower case since handwritten lower case characters differs significantly from person to person.

Detail Recognition performance of SVM on IRONOFF- UNIPEN datasets.

Data Set	Training Set	Test Set	Test Set (%)	nSV	Training Time(s)
Digit	13450	6270	98.60	3014	497
Lowecase	42775	20170	93.70	15690	5897
Uppercase	25660	11620	95.10	10030	2805

Fig 5. Detailed Recognition performance of SVM on IRONOFF-UNIPEN datasets.

	MLP		SVM	
Data Set	Free par.	Rec Rate	nSV	Rec Rate
Digit	3610	98.00	3014	98.60
Lowercase	37720	91.30	15690	93.70
Uppercase	37720	93.00	10030	95.10

Fig 6. Recognition rates and parameters

IV. CONCLUSION

Machine learning algorithm CNN, KNN and SVM along with different framework and applications Scaling vectors, we found different variation among the classifiers in terms of their accuracy and timing. Accuracy can be reformed as it depends on the training and tested of data and there is always a chance to improve the accuracy of these models if the size of data set is increases. Every algorithm as its own accuracy and time consumption. If the power of CPU changes to GPU different algorithm can perform with better accuracy and less time and better result can be obtained. The performance of the classifier can be measured in terms of ability to identify a condition properly, the proportion of true results, number of positive results from the procedure of classification as false positives and ability to exclude.

REFERENCES

[1] Zeeshan Khan, Sandeep Kumar, Anurag jain, “A Review of Content Based Image Classification using Machine

[2] Learning Approach ”, International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 22777970) Volume2 Number-3 Issue-5 September-2012, pp 55- 60.

[3] J. C. Burges, “A tutorial on support vector machines for pattern recognition,” Data Mining Knowl. Discovery, vol. 2, no. 2, pp. 121–167, Feb.1998 .

[4] K. Gaurav and Bhatia P. K., “Analytical Review of Preprocessing Techniques for Offline Handwritten Character Recognition”, 2nd International Conference on Emerging Trends in Engineering & Management, ICETEM, 2013.

[5] Salvador España-Boquera, Maria J. C. B., Jorge G. M. and Francisco Z. M., “Improving Offline Handwritten Text Recognition with Hybrid HMM/ANN Models”, IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 33, No. 4, April 2011.

[6] P. Hong, Q. Tian, and T. S. Huang, “Incorporate support vector machines to content-based image retrieval with relevant feedback,” in Pro. IEEE Int. Conf. Image Processing, Vancouver, BC, Canada, Sep. 2000, vol. 1, pp. 750–75.

[7] L. Zhang, F. Lin, and B. Zhang, “Support vector machine learning for image retrieval,” in Proc. IEEE Int. Conf. Image Processing, Thessaloniki, Greece, Oct. 2001, vol. 2, pp. 721–724.

[8] Information & Communication Technology (RTEICT-2018), MAY 18th & 19th 2018.

[9] Dharmendra Patidar, Manoj R. Mishra, Bhavin C. Shah,” Performance Analysis of K Nearest Neighbors Image Classifier with Different Wavelet features”.

[10] Tina Vaz , Nagaraj Vernekar,”A Survey on Evaluating Handwritten Iterative Mathematical Expressions”, International Journal for Research in Applied Science & Engineering Technology (IJRASET) Christian Viard-Gaudin, Abdul Rahim Ahmad, Marzuki Khalid,, Emilie Poisson,”Online Handwritten Machine”, Universiti Tenaga Nasional,Jalan- KajangPuchong, 43009 Kajang, Selangor,Malaysia.

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