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Handwritten Digit Recognition Accuracy Comparison of Various Techniques

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Abstract*: *Hand written characters and numbers recognition methodology has sought more attention among the various developed learnings and algorithm in today's current scenario. The learnings which are talking about are a machine and deep learning in this paper, we used a calculation of machine learning certain methods like KNN, RFC and SVM and made a comparison with deep learning CNN method calculation with help of utilizing tensor flow, keras and theano. Utilizing the above techniques we get a more accurate result on CNN using theano as contrasted with using SVM, KNN and RFC.

Index Terms: Multilayer CNN, Supervised Vector Machine, K-Nearest Neighbors, Random Forest Classifier.

I. INTRODUCTION

The concept of digits and text recognition has been around since the early 20th century. Text recognition is commonly known as Optical Character Recognition. These devices main approach to help the visually impaired people. With the passing of time and the great advancements in the technology sector, these devices too have seen massive improvements of their own. The devices can now be used to translate printed text and digits into various languages. The system that has been proposed in this paper recognizes hand written digits and converts it to a printed format that can then be viewed on screen. Despite the various advancements in the digit and character recognition sector, studies involving the conversion or recognition of handwritten text or digits have been quite rare. This is mainly because, unlike in the case of printed text or digits conversion, each person has unique handwriting and therefore, each person's handwritten character or digits has to be identified and recognized by the software individually. Since the characters or digits that have to be converted are handwritten texts or digits, it is virtually impossible to create a database that contains the handwritten characters or digits because, as mentioned before, each person have their unique handwriting. The system that has proposed in this paper is finding the accuracy among various machine and deep learning techniques. Certain classification using machine learning are KNN, SVM, RFC etc. eventually these techniques do not show the knowledge and accuracy about any task. A great deal of AI apparatuses has been created like sci-kit learn, scipy-picture, Keras, Theano, Tensorflow by Google and so on. For Deep Learning. These apparatuses make the applications vigorous and subsequently progressively precise.

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II. MACHINE LEARNING TECHNIQUES

[1] The Random Forest Classifier is said to be ensemble method which used for classification or regression. Random Forest Classifier works utilizing a tremendous gathering of de-corresponded choice trees. In this, the preparation information shapes a network as input. Using this matrix, a huge number of countless new matrix with random elements are created. Using every one of these network, a comparing choice tree is shaped for characterization of the testing information at the point when the testing information is input, all these choice trees order the info test information and foresee the class to which the info belongs. The result is found based on the prediction result which has the maximum count as the classifiers outcome.

The image shows below RFC technique:

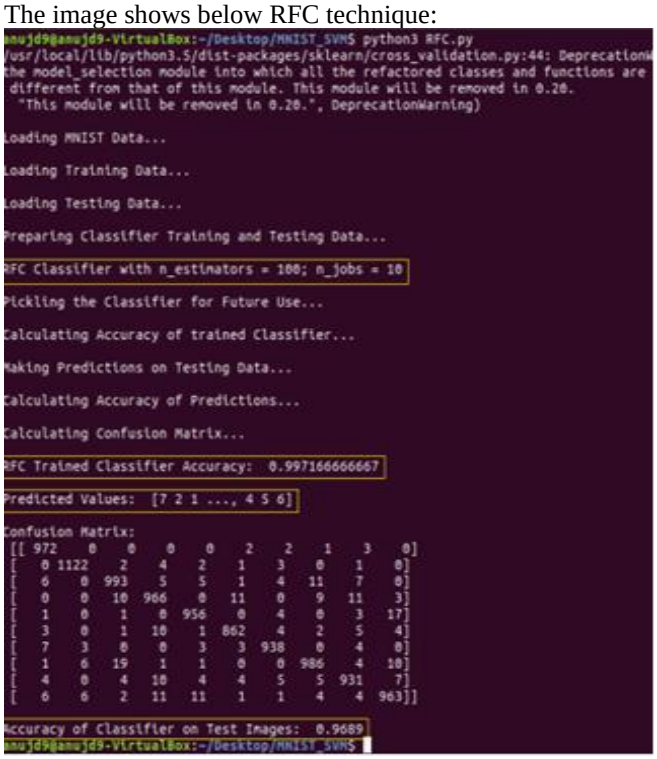

Fig: RFC Digit Accuracy

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[2] K-Nearest Neighbors is a calculation in which the best gauge among every one of the qualities is the esteem that has greatest number of neighbors with littlest Euclidian or Hamming remove. KNN is an occurrence based learning. To function admirably, this calculation requires a preparation dataset which is a lot of well named information focuses. This calculation takes as information another information point and makes the order for this by ascertaining the Euclidian or Hamming separate between the new information point and the marked information point.

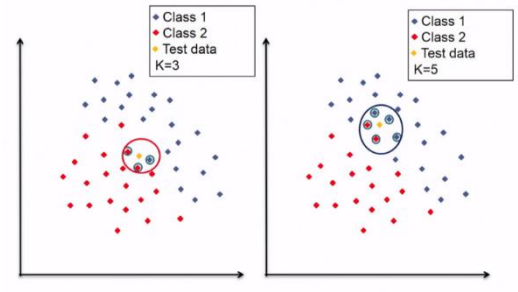

Fig: KNN

The image shows below KNN technique:

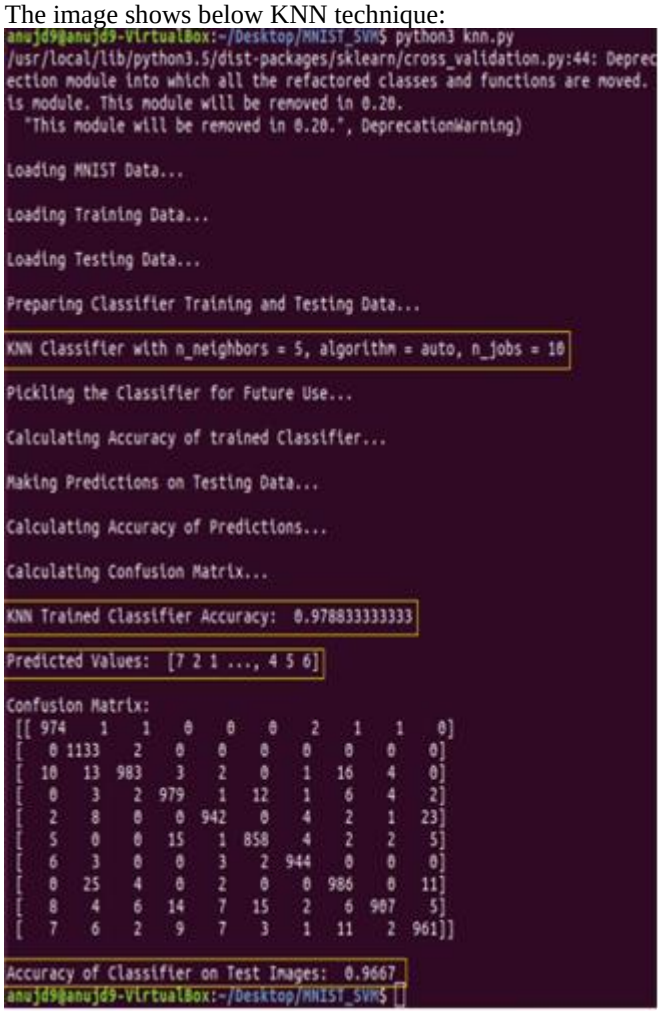

Fig: KNN Digit Accuracy

[3] In AI, support vector machine is an imperative show. It is a managed learning model utilized for arrangement and regression. In this model, a set of training examples given in the system which each one of them is marked to be associated to one of the two classes or categories. A Support Vector Machine model represents a point in space which is mapped such that the two different classes with their elements are separated by as much distance as possible. The image pixels or the input under test is then mapped into this space and predictions are made based on the class or category to which the test input belongs. SVM or Support Vector Machine is a specific kind of supervised ML strategy that intents to characterize the data points by boosting the margin among classes in a high- dimensional space. SVM is a portrayal of precedents as focuses in space, mapping takes place due to the instances of the separate classes which divided by a reasonable space that is as wide as possible. After that new models are mapped into that equivalent space and foreseen to reside to a class dependent on which they fall on the side of the gap. The ideal algorithm is created through a "training" phase in which training information are adopted to build-up an algorithm capable to separate between gatherings prior characterized by the operator (e.g. patients versus controls), and the "testing" organize in which the calculation is received to dazzle anticipate the group to which a another recognition belongs. It also gives a very accurate characterization execution over the preparation records and produces enough search space for the precise arrangement of future information parameters. Hence it always ensures a series of parameter combinations no less than on a sensible subset of the information. In SVM it's smarter to scale the data always because it will incredibly improve the outcomes.

The image shows below SVM technique:

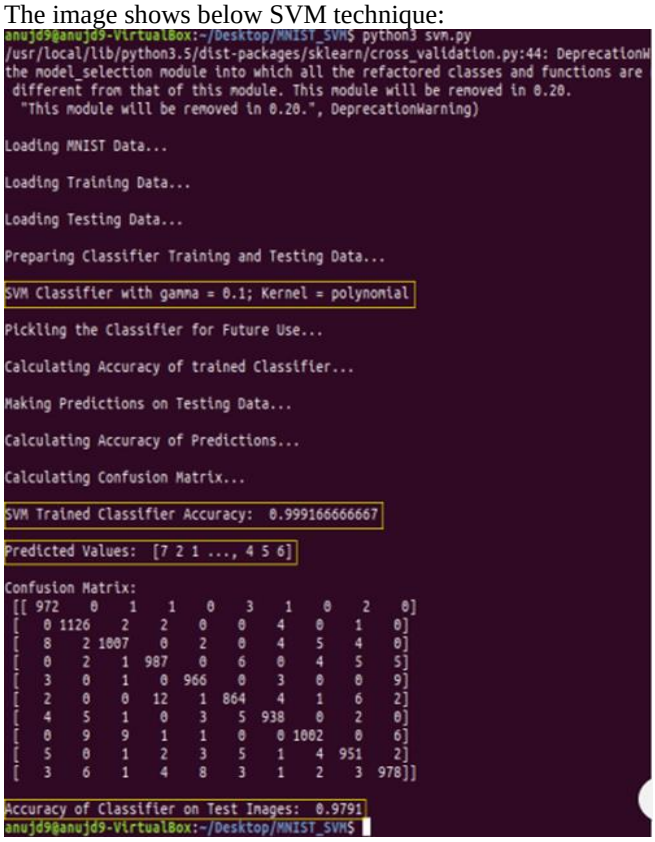

Fig: SVM Digit Accuracy

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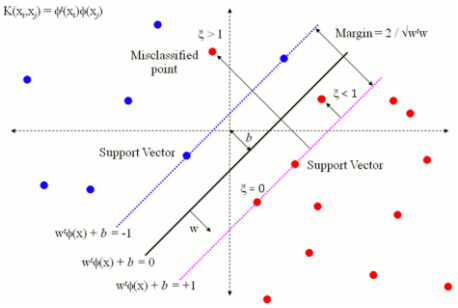

Fig: SVM

III. DEEP LEARNING TECHNIQUES

CNN has emerge to be celebrated among the ongoing occasions. CNN is a piece of profound, feed forward counterfeit neural systems that can play out an assortment of undertaking with shockingly better time and precision than different classifiers, in various utilizations of picture and video acknowledgment, recommender framework and common language preparing. Utilization of CNN have spread as Facebook utilizes neural nets for their programmed labeling calculations, google for photograph scan Amazon for their item suggestions, Pinterest for their home channel personalization and Instagram for pursuit foundation. Picture arrangement or item acknowledgment is an issue is passing a picture as a parameter and foreseeing whether a condition is fulfilled or not (feline or not, speck or not), or the likelihood or most fulfilling condition for a picture. We can rapidly perceive designs, sum up from past data and information.

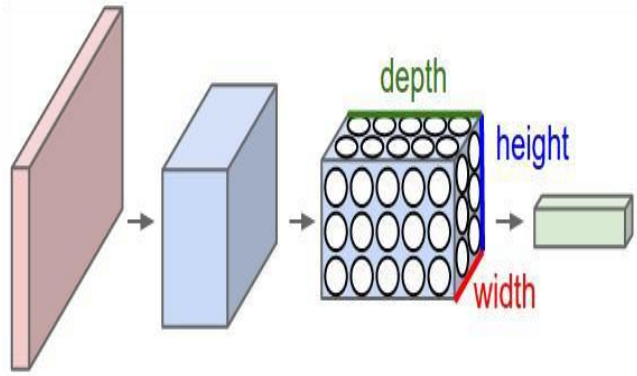

Fig: CNN

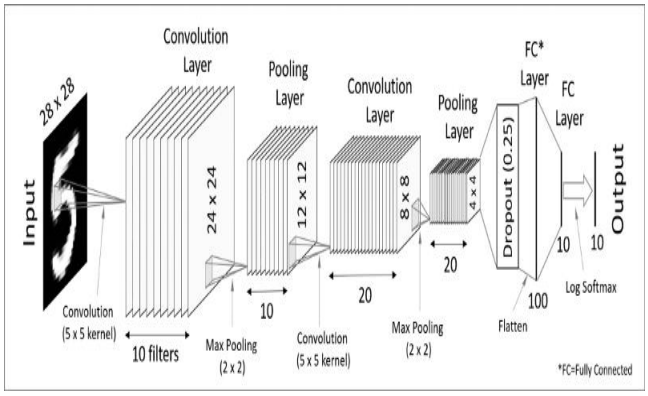

Fig: CNN Layers

Fig: CNN Prediction

IV. SYSTEM ARCHITECTURE

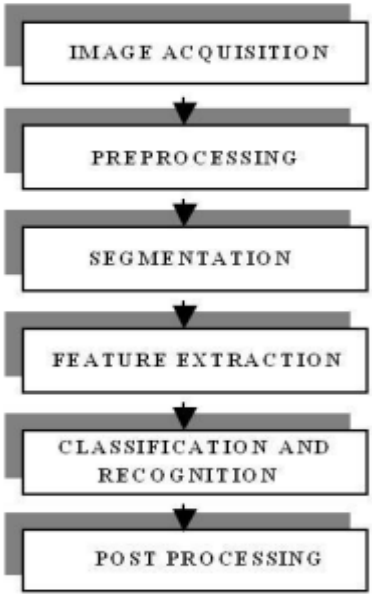

Fig: System Architecture

V. DATASET

Discussing the more current or increasingly changed rendition which is like the standard MNIST, an EMNIST or Extended MNIST have been risen out in the year 2017 with the examples of 2, 40,000 pictures in preparing set alongside augmentation to 40,000 pictures in the testing set comprising of written by hand digits. The MNIST dataset is given in the configuration of IDX. This IDX document design is a straightforward configuration which comes convenient while working with vectors and high dimensional lattices of various numerical sorts. Beginning with the enchantment number in the portrayal segment accessible in the record position. We can characterize an enchantment number as an essential esteem (say MSB first), where the initial 2 bytes are dependably observed to be zero. This gives us the accompanying data:

1) The 0000 (2 bytes) illuminating the start of the document.
2) 08 reveals to us that third byte is of unsigned byte type.
3) The fourth byte, 03 reveals to us that the lattice has three measurements and 01 educating with only one measurement.

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The third byte speaks to whether the information is a whole number, skim, short, long or unsigned sort. The fourth byte tells the element of the vector or network for example the quantity of lines and segments. In the event that it is equivalent to 1, at that point it's a vector else it is a lattice. The quantity of things variable is likewise perused as MSB first.

VI. RESULTS AND ANALYSIS

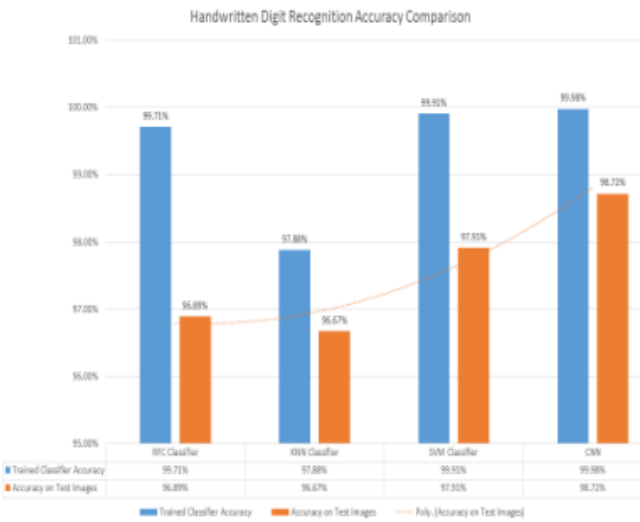

Fig: Comparison Chart

	RFC	KNN	SVM	CNN
Trained Classifier Accuracy	99.71%	97.88%	99.91%	99.98%
Accuracy on Test Images	96.89%	96.67%	97.91%	98.72%

Fig: Table Shows Accuracy Comparison

Model	Test Error Rate
Random Forest Classifier	3.11%
K Nearest Neighbors	3.33%
Supervised Vector Machine	2.09%
Convolutional Neural Network	1.28%

Fig: Error Rate Results

Model	Training Time	Testing Time
Random Forest Classifier	10 min	6 min
K Nearest Neighbors	15 min	9 min
Supervised Vector Machine	14 min	10 min
Convolutional Neural Network	70 min	20 min

Fig: Testing and Training Time Results

VII. CONCLUSION

As utilizing AI calculations are utilized like KNN, SVM, Neural systems alongside various parameters and highlight scaling vectors, we likewise observed the diverse examination among the classifiers as far as the most vital component of precision and timing. Precision can adjust as it relies upon the part of composing and testing information, and this can additionally be improved if the quantity of preparing and testing information is given. There is dependably an opportunity to improve exactness if the extent of information increments. Each classifier has its own exactness and time utilization. We can likewise incorporate the way that if the intensity of CPU changes to GPU, the classifier can perform with better precision and less time and better outcomes can be watched. The execution of the classifier can be estimated regarding capacity to recognize a condition appropriately (affectability), the extent of genuine outcomes (precision), number of positive outcomes from the method of order as false positives (positive expectations) and capacity to prohibit condition accurately (particularity). In this, we saw a short correlation with the classifiers of Machine learning and profound learning. Till now, the calculations of Deep learning have performed better in the use of Handwritten Digit Recognition.

REFERENCES

1. Ramanathan R et a1., "A Novel Technique for English Font Recognition Using Vector Machines", in Advances in Recent Technologies in Communication and Computing, Kottayam,Kerala,2009,pp.766-769.
2. M.D. Ganis, C.L. Wilson, J.L. Blue, "Neural network-based systems for handprint OCR applications" in IEEE Transactions on ImageProcessing, 1998, Vol: 7, Issue: 8, p.p. 1097 – 1112
3. Bertolami, Roman; Zimmermann, Matthias andBunke, Horst, 'Rejection strategies for offline handwritten text line recognition', ACM Portal, Vol. 27, Issue. 16, December 2006.
4. K. Wang, B. Babenko, and S. Belongie, "End-to-end scene text recognition". International conference on computer vision ICCV 2011, vol. 10, Page no.1457 – 1464.
5. Teofilo E. de Campos, Bodla Rakesh Babu, Manik Varma, "Character Recognition In Natural Images",International conf. on Intelligence Science and Big data Engg., pp. 193-200, 2011.

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