ISSN 2395-1621

Human Behavior Recognition Algorithm Based on Machine Learning

Vidya Randhe, Ashwini Phad, Sakshi Doshi, Sushant Jha,
Prof. Santosh Waghmode

vidyaaranndhe@gmail.com, ashwiniphad57@gmail.com, sakshiaru143@gmail.com, jhasushant1998@gmail.com

Department of Computer Engineering
Jspm's Imperial College Of Engineering And Research
Wagholi, Pune 412207 Savitribai Phule Pune University.

ABSTRACT

The particular person's handwritten text tells about the personality of a person, as writing is related with signals of neurons and brain, hence it subconsciously leaves a path regarding the traits like optimistic, pessimistic or balanced. The terms which are taken into consideration when analyzing person's handwriting are zones, slant, connection, spacing between the alphabets and spacing between the words, letter size, clarity, pressure, speed, margin, a large middle zone, small middle zone, upper zone. The system's whole operation which is to be perform is divided into six steps. The first step is to take the input of digital image from the user of the system. After which second step is carried out. In the second step, the image is converted into grey scale image using python. In third step, image preprocessing is carried out for the noise removal and sharpening of image. In next step segmentation is carried out to separate the word into characters. Then image is handed to CNN (Convolutional Neural Network) which analyses the input image with the CNN model which is developed by performing CNN on training dataset and the input image is labelled accordingly. In last step, the behavior predicted is displayed as output to user.

ARTICLE INFO

Article History

Received: 30th June 2021

Received in revised form : 30th June 2021

Accepted: 2nd July 2021

Published online : 2nd July 2021

Keywords: Behavior prediction, Image Processing, feature extraction, CNN.

I. INTRODUCTION

Humans have ability to write differently. And one person's handwriting can be differentiable from another person. Handwriting is useful in getting to know the behavior of person. As handwriting in humans is not develop overnight and it is continuous process, thus it is useful in finding the traits in human. Graphology is termed as determining the physical characteristics and patterns of handwriting for knowing the personality characteristics of person.

Writing can indicate personality features like feeling, fear, honesty etc. Identifying the personality of human being by his handwriting is an old technique. Handwriting analysis done by experts on the person's handwritten text samples for determining the traits of person. The experts can do the analysis if the samples are in sufficient amount, if the samples are more, it becomes tedious for experts. Hence, the analysis system can help the graphology experts for predicting the behavior faster and efficient manner.

II. PROPOSED METHODOLOGY

The proposed system task is divided into six steps:
1. In first step the digital image of handwriting is taken from the user through user interface. The user submits the digital image and it is then passed to the system as shown in diagram(a).
In second step, the digital image is converted into the grey scale image in python.
After that, the threshold value of pixel which is higher than the value which is selected is set to '1' in binary image. The threshold value of pixel which is less than the selected value is set to '0' in binary image. Hence, by this task, the digital image is converted into binary image which is useful for neural network to work.
In third step, image preprocessing is carried out for the noise removal and sharpening of image. Preprocessing is basically done for by ground clearance and locating the exact handwriting to be processed without any noise.
In fourth step, the segmentation of words into alphabet letters is done using drop fall algorithm. The flowchart of drop fall algorithm is as shown below. This algorithm

divides the words into alphabet letters and is standard segmentation technique for finding traits from the input.
In fifth step, the dataset is created through the collected data and it is given as a training data to model. Even if the amount of data is not more, Convolutional Neural Network can work well and can perform smoothly on less dataset. If further the amount of data is added to dataset, the CNN can still work without necessary to make any change in model. CNN gives better accuracy and noise resistance is high in CNN and more features can also be added to it.
In sixth step, after the main processing on the input image is complete, the test sample is passed to CNN model. Feature extraction is done and the output label is obtained.

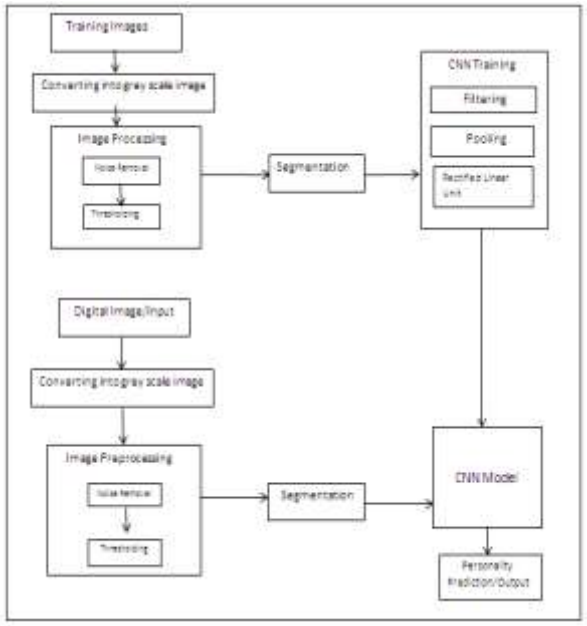

Diagram (fig 1.) Prediction of Human Personality

III. ALGORITHM USED

ALGORITHM CNN:
Step 1: Convolution Operation
Here are the three elements that enter into the convolution operation:

1. Input image
2. Feature detector
3. Feature map

Step 1(b): ReLU Layer
The reason we want to do that is that images are naturally non-linear.
When you look at any image, you'll find it contains a lot of non-linear features (e.g. the transition between pixels, the borders, the colors, etc.). The rectifier serves to break up the linearity even further in order to make up for the linearity that we might impose an image when we put it through the convolution operation.

Step 2: Pooling
Again, max pooling is concerned with teaching your convolutional neural network to recognize that despite all of these differences that we mentioned, they are all images are same. In order to do that, the network needs to acquire a property that is known as "spatial variance." This property makes the network capable of detecting the object in the image without being confused by the differences in the image's textures, the distances from where they are shot, their angles, or otherwise.

Step 3: Flattening
This will be a brief breakdown of the flattening process and how data move from pooled to flattened layers when working with Convolutional Neural Networks.

Step 4: Pooling
What happens after the flattening step is that you end up with a long vector of input data that you then pass through the artificial neural network to have it processed further which is called pooling.
Types of pooling: Mean, Max, Sum

Step 5: Full Connection
In this part, everything that we trained throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

Step 6:Summary
In the end, it will wrap everything up and give a quick recap of the concept covered in the training.

Step 7: SoftMax & Cross-Entropy
Optimization Functions for model file. To calculate final accuracy and losses.

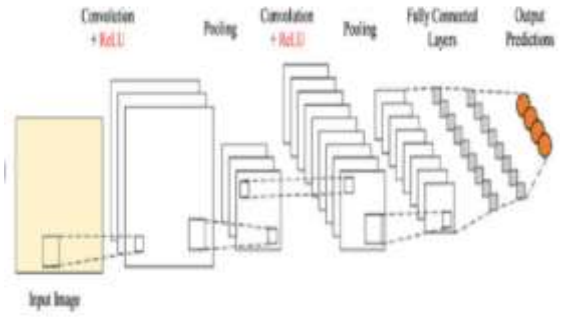

Fig 2. The typical CNN model architecture

IV. RESULT AND DISCUSSION

Fig 3. Sample Images

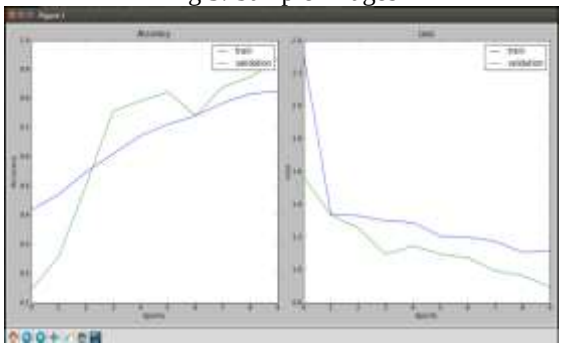

Fig 4. Training Process Graph

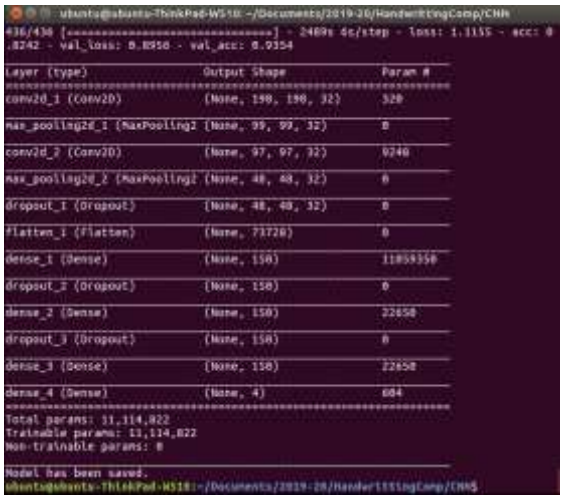

Fig 5. CNN Process Result

V. CONCLUSION

A simpler method has been proposed to predict the personality of a person by exploring his handwriting. In the proposed methodology the system compares the input image with the CNN model which is created after applying the convolutional network on training dataset. The key feature of this proposed system is extracting all the possible traits of human behavior using CNN from handwriting.

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