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Study On Handwriting Features Of Ambidextrous Persons

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Abstract

Handwriting Features of Ambidextrous Persons have been classified as a multi-class classification issue in the deep learning framework, where image recognition task is effectively to test a classifier who can efficiently discriminate each line of paragraph of handwriting. This is very common for a single classifier to be performed on different data sets with a standard deep learning algorithm. It may also be that the same classifying system performs differently with highly differing image instances due to the various manuscript styles of various people on the same numbers. In order to address this problem, it was crucial to develop ensemble learning approaches to enhance overall effectiveness and make the performance highly stable in various datasets. In this text, we are proposing a system involving the CNN-based removal of the data set from an image and algebraic fusion of various words in images to classifies for trained in different sets of edges, which are prepared by means of feature selection applied to the original CNN feature set. Experimental results show that a fusion of classification images can achieve a descriptive word.

Keywords: Handwriting Features, Ambidextrous Persons, Deep Learning and Convolution Neural Network.

1. Introduction

Ambidexterity is defined as the ability to use both hands equally skilled. It can also mean the ability to simultaneously use both hands. Just 1% of the term population is ambidextrous according to study. So, it's a very unusual talent to possess. But it is surprising that few prominent actors and historical figures were still ambidextrous. India's first President, Dr. Rajendraprasad, Albert Einstein, LeBron James, Benjamin Franklin, Leonardo Da Vinci, and Nikola Tesla are the most well recognized individuals with the same ability. The inventor of AC current Nikoa Tesla and the man who made the world such powerful and effective electric motors that Tesla's designs are still used today. Nikola Tesla wrote in his autobiography about being ambidextrous. He said, "I'm ambidextrous now, but I was then left and my right arm had relatively little strength" [1]. Ambidextrous Leonardo Da Vinci

was one of the many talents Florentine artists possessed. He used both his hands to make paintings because he hurt his dominant right hand in childhood. On 4 Aug 1473, when the artists were only 21 years old, theOpificio delles Pietre Dure (OPD) art conservation and research institution in Florence, Italy carried out diagnosticexaminations of a painting made by da Vinci [2].

One inscription the date written in the top left-hand corner on the front of the drawing is a reverse inscription written by a reflection in a mirror, the Uffizi said. Da Vinci used this so-called mirror writing several times, even though it's vague. The other note was usually drawn from left to right on the back of the page. Frosinini and her colleagues studied in high resolution images and infrarot illumination the inscription and painting under amicroscope. They often use a fluorescent X-ray device and a handheld computer for organic matter identification. They determined that the inscriptions were written by da Vinci, that the writing was done in the drawing with the same hue, and that da vinci samples were written according to the sentence. But the contrast between the two inscriptions suggests that da Vinci had composed them with opposite hands. Since examining da Vinci 's traditional penmanship in a variety of texts, the conservators concluded that his left hand had to compose the text inverted to the fore of the drawing, while his non-dominant right hand wrote the back of the text [3].

The distinctive handwriting of each individual has been intuitively observed for a long time. Methods have been developed for several decades for human handwriting knowledge. However, studies of the quantitative evaluation of the discriminatory authority of handwriting are important, especially in view of the acceptance of proof by courts presented by challenged examiners (QDE) [4]. The handwriting segregation of a diverse group from around the United States has been confirmed. Students of veena vadini have this ambidextrous capacity to write in their school notebook with equal strength to both hands. The singularity of the Veena Vadini School children is not only written with both hands. Yes, besides that there are many other wonders for children in this school that are very simple. Simultaneously, children who write with both hands simultaneously can write in six different languages, including Hindi, English, Urdu, Sanskrit, Arabic and Roman [5].

2. Literature Review

(Rahman et al., 2020) identified the author's use of disguise features, which are slant shift, printing process, use other hands to copy handwriting, artificial hesitations, pen-lifts, alterations in letter formation, lengths and height, etc. Nevertheless, inconsistency is the key attribute that suggests camouflage. To determine the most popular disguise techniques, 100 authors were picked and told to copy a text using some disguise. The majority of authors have been noted to alter the tendency to write, use grotesque letter types, alter the image presentation and the writing skills, and use pen-lettersas an effective disguise [6].

(Firdaus et al., 2020) analyse to classify different attributes of left handedness and identified those features in a motion in writing that were found essentially opposite to those found in right-hand writers' writing. Based on these attributes, whether a person is left or right may be determined. This study concluded that writing with opposite hand demonstrates typically a lower degree of writing abilities due to unregulated retaining of writing instruments as well as sudden lateral strokes, uncertain stroke motions, the absence of smooth writing and the uncustomary style of letters etc [7].

(Jemimah et al., 2019) analyse the request for writings from 135 individuals to ascertain the most common camouflage strategies used by authors to change their prose, such as pitching, uncomfortable hand, hand printing, scale, layout, angularity, spacing, approach and terminal lines, upper and lower extension, capital and lower case songs, etc. In case of odd camouflage, only 8 people out of 135 used clumsy hands to mask their face. Unusual handwriting did not resemble standard writing similarly. It seems like many authors would follow this form, but few used it awkwardly because they struggled to deliver unaccustomed hand writing. The frequency of shift occurrence was calculated in each feature. The findings have shown that disguise is not reliable or effective. Elements such as alteration or replacement were found to be primarily used to modify and dramatically influence the imagery of the text [8].

(Kalita et al., 2019) analyse that representing 4000 specimens written with the right and left hand. Everything topics completed the penalty for forgery. It has been found that 9 per cent of the left-hand writing and the other hand-writing is characterized by usual hand-writing, as flat r, d, l and other looped letters, vertical slant, fines or odd shaking, open T and d base, t-bar crossing, sudden direction changes, very little executions ability. It was pointed out that if major variations are carefully measured, uncomfortable writing can be found at the roots [9].

(Cilia et al., 2019) analyse that the pen movements of particularly left-handed writers who keep left-handed images of up-side-down strokes and explains some features such as I colon and other punching points, which render forms like bowls or sloping vertically while writers compose rapidly. T-bar indicates that the left-hand writer alone used the hand base for a finger movement that was immoveable. Is the right-hander found? The hand is free to step ahead while the t is crossing from left to right while the left hand is crossing? S side, when passing over previously written lines while writing, smudge patterns may occur. Impressions of tin from the hand base are moved to the paper while the hand moves down to the next line of writing [10].

3. Problem Statements

The main problems are to classify each word of handwriting feature. Overfit data works not well. During the testing and training process, it doesn't predict results. Handwriting paragraph feature data is not easy to predict and implement the results. Data for this modelling issue consists of structured data from multiple sources so pre-processing of data. The main problems are to implement and find each line with boundary rectangle with the main important feature of the datasets as it is difficult to analyse.

4. Objectives

- Classify and implement the handwriting features of ambidextrous persons.
- Predicting the images of handwriting features of ambidextrous persons.
- Analyze the images data of handwriting features of ambidextrous persons with each line of paragraph.

5. Methodology

We have used python and deep learning programming language for implementation. We have used Anaconda software. Python is an effective programming language for the creation of a deep recurrent model of neural network. It supports in addition, a version of Python 3.7.1 used for this study is used. In the code creation process, Anaconda jupyter notebook python IDE is used; it is

intended for operations in data analysis. A variety of science libraries, including Pandas, Numpy, Scipy, Matplotlib, sklearn and more, are available at Jupyter Notebook. It also provides advanced analysis, debugging, and editing capabilities in many apps, ("Jupyter Notebook: Anaconda Cloud"). The following libraries have been used such as numpy, pandas, matplotlib, scipy, seaborn and tensorflow etc.

5.1. Convolution Neural Network

Deep learning is a machine learning tool that provides multiple linear and non-linear processing devices with a high level of abstraction in a deep architecture. A variety of applications currently use numerous deep learning techniques. It included auto coders, stacked automobile encoders, Boltzmann restricted machines and deep faith networks. In recent years, both vision systems and medical image analysis have gained in popularisation in the CNN-based methods [11]. CNN are micro perceptron evolutionarily inspired variants. In raw image pixels, visual patterns are also immediately identified. The pre- processing of CNN images is limited in many cases. These deep networks are explored by means of multiple layer neurons by small patches of the input image called receptive fields [12]. In order to ensure some variance for dimension, shifted and distortion, CNN combines three architectural ideas. It presents the first CNN model to recognise manually developed characters [13]. The local associations of patterns among CNN neurons in adjacent layers are taken as subsets in layer m1, units that have spatially adjacent convolution layers to exploit the local spatial correlation, for input from hidden units of layer [14]. Each CNN filter hello is further replicated across the entire field of vision. These filters share a characteristic map weight and bias vectors. The common weight gradient is the sum of the common parameter frames. A function model is obtained in sub-regions of the entire image, when the convolutions are rendered [15]. This process includes converting the image or function map of the input with a linear philtre and adding a bias followed by a non-linear philtre application [16]. Abias data is assigned to be irrespective of the classification layer output. The bias values enable us to move either the node's activation function left or right [17]. The weights, for example for a sigmoid function, regulate the steepness of the output, while the distortion is used to offset the curve and allow the model to suit better. The bias values are formed from the testing set and can be controlled by a variable [18]. The kth philtres are indicated as hk in a given layer and their philtres are determined by the weights Wk and bias bk. Where tanh is the hyperbolic function of the tan and is used for convolution. There are two secret CNN layers where m 1 and m both contain 4 and 2 maps, i.e. h and h1 referred to as w1 and W2. Figure. The calculated using a 2*2 window in the following layer as shown in Figure.3 on coloured squares from the pixels of the m1-level [19]. The weights of these philtre maps are 3D tensors, where there are indices for input characteristics, while pixel co-orders are given by the other two dimensions. In combination, Wk1 represents the sum associated with each pixel in a hidden layer m with the hidden layer m1 map and with i-j, j, and j coordination [20].

6. Results and Discussion

In this evaluation, we divide the entire feature set of three dataset into different categories. It is intended to assess the number of variables who apply for testing and testing process. Every experiment was performed on the same computer with 1.6 GHz processor and 8 G memory configurations. Evaluation was performed for all study classifiers and four algorithms were implemented for training and testing or model assessment.

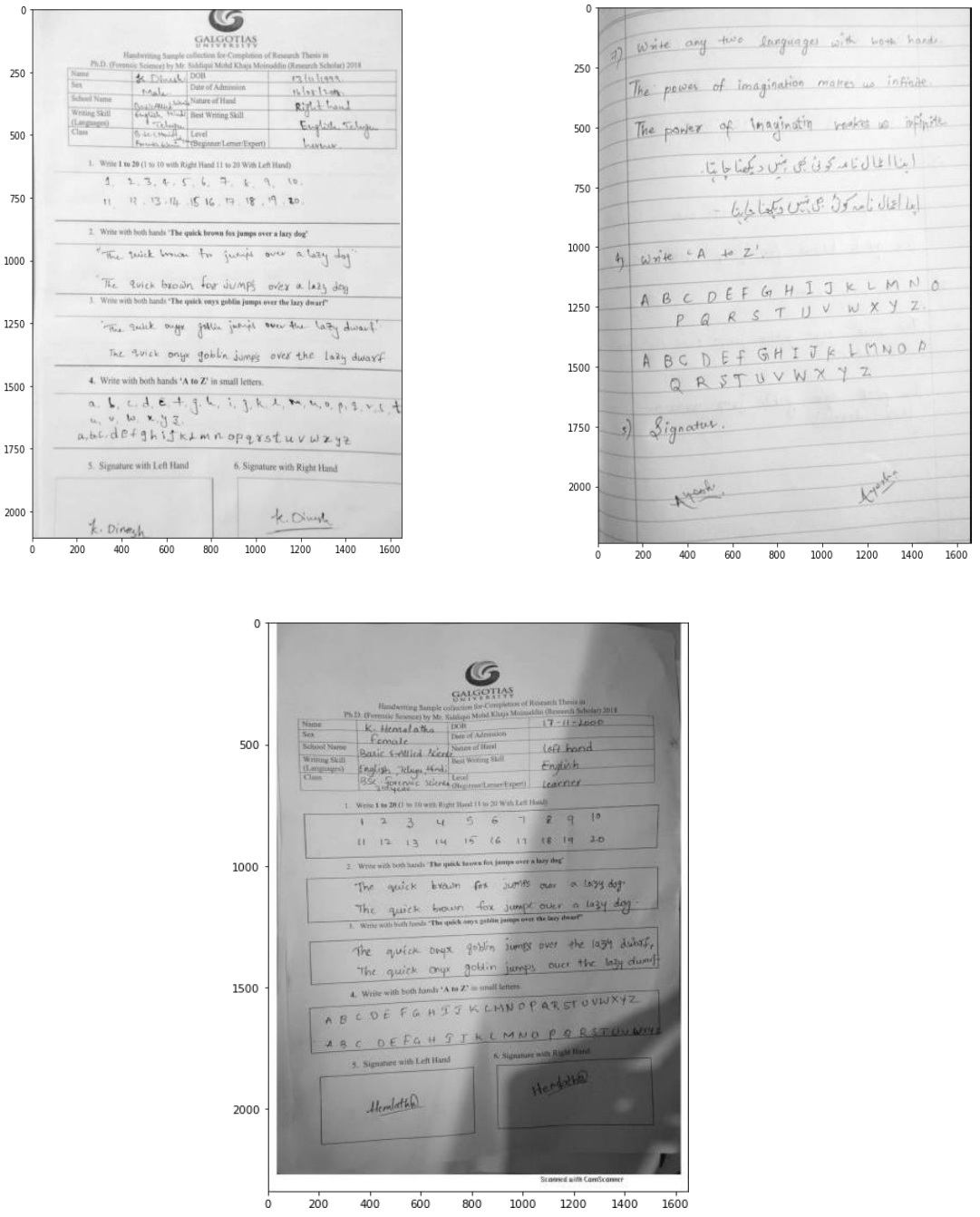


Figure.1 handwriting paragraph with edges of images

Fig.1 analyse the handwriting paragraph with the edges of images. Total number of images in dataset is 108. There are five outputs from images dataset. These images are the handwritten notes. These handwritten notes written from left hand side. The aim of this study is to analyse that left-hand side can right proper word in comparison of right-hand side. The dataset is divided into two sets: the exercise set (70%) and the validation set (30%). Firstly, we have import original images. Fig.1 analyse the images result with edges. We have pre-processed the images with edges. For classify images data, there are aims to implement handwriting paragraph. Images Data used for Predictive handwriting paragraph in structured or unstructured form. Structured data is usually pre-process during testing and training steps.

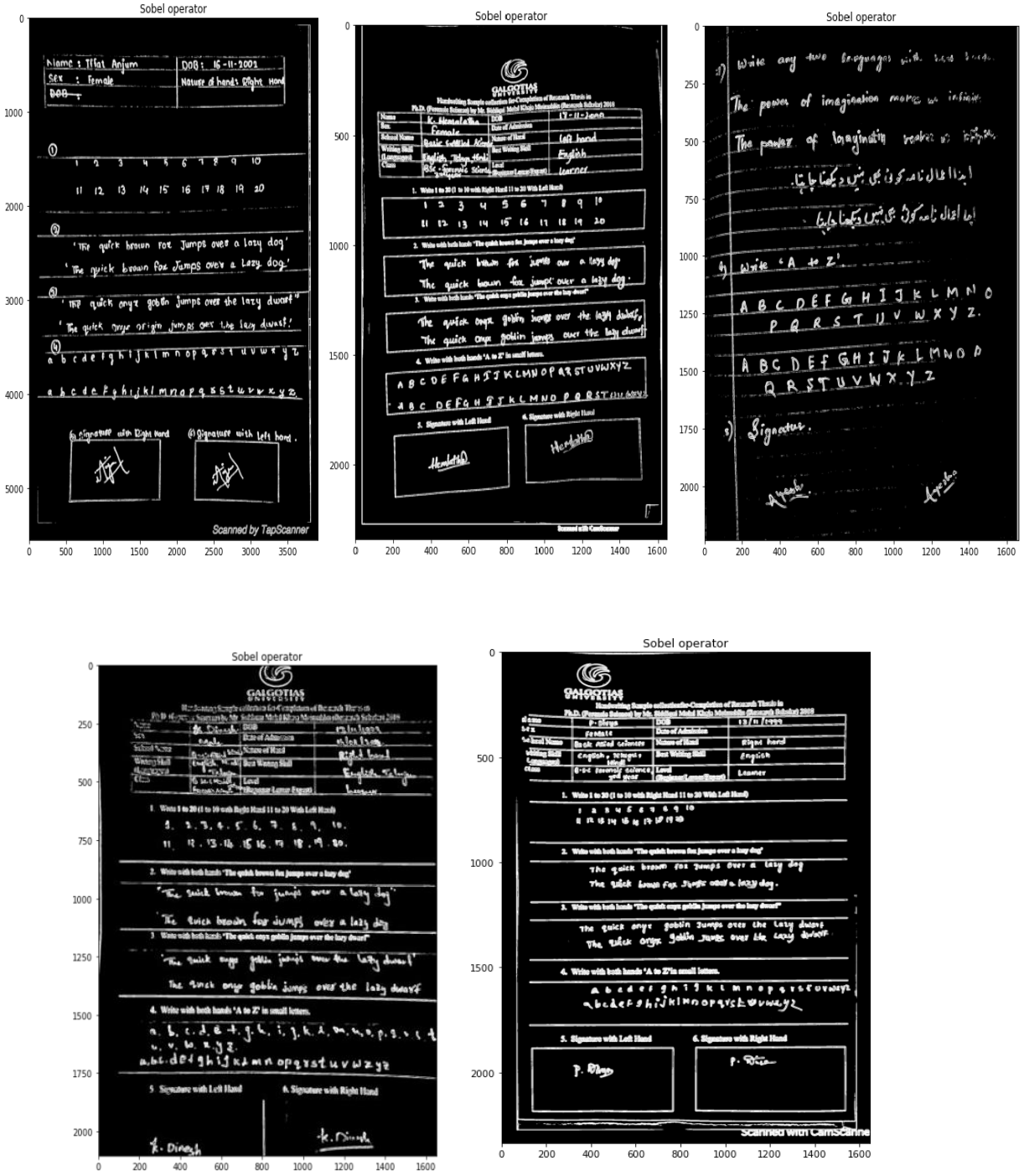
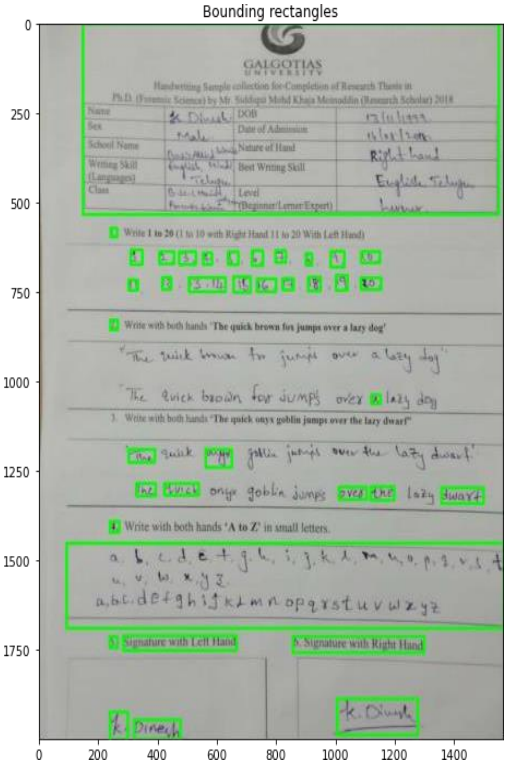


Figure.2 Sobel Operators Outputs with Dark Background

Fig.2. analyse the handwriting paragraph images with dark images. After pre-process the images. We have converted the images into dark images. Here from this result, the words of paragraph are clear. Here we have converted background into dark. Unstructured data is a critical issue for image classification, unshaped and dispersed. Unstructured data is hard to categorize and to choose relevant attributes from it. We have resolve unstructured data.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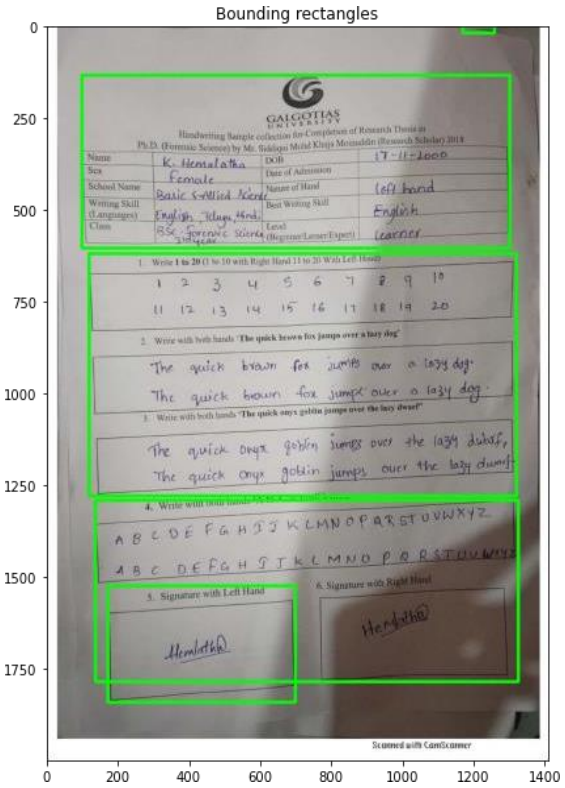
1400


Bounding rectangles
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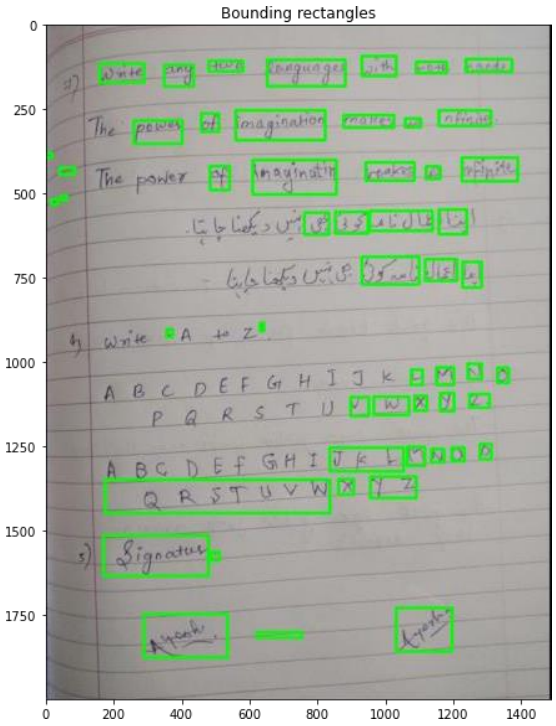
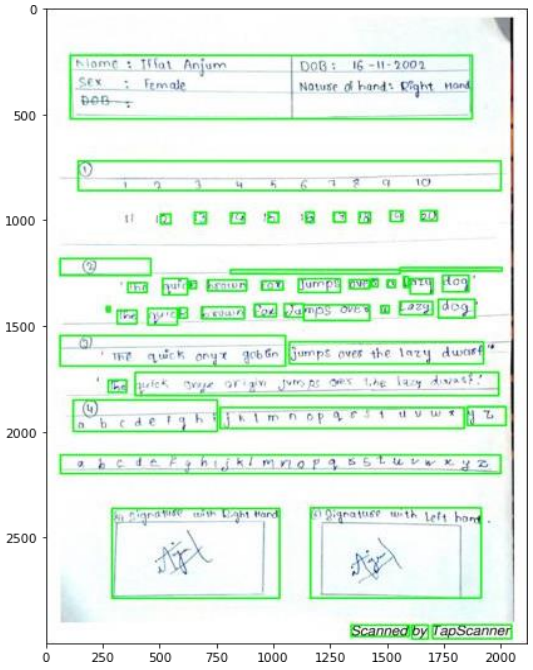


Figure.3 Bounding Rectangles Outputs with Dark Background

Fig.3 analyse the handwriting paragraph with boundary rectangles. Total number of images in dataset are 108. Here we are showing five results of the images. These results showing that the word with bounding rectangle is giving clear identification of words. But words without bounding rectangle is not clearly understandable words. The text inside the bounding showing accustomed and the text outside the bounding analysing unaccustomed. Here we have pre-processed the words of the images. Dataset images size is high-cardinality field for data identification. In redundant data, other highly correlated variables that carry the same information should be removed. If one predictor variable can be linearly predicted by other with a substantial to highly correlated. Collinearity can cause some regression coefficients to have wrong edges.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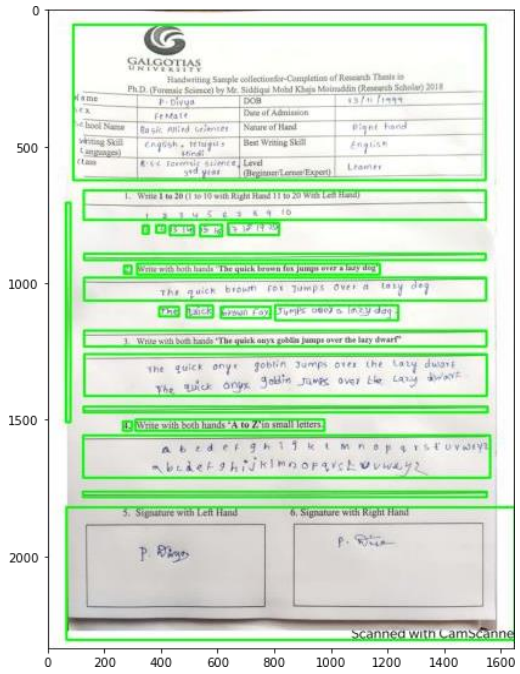
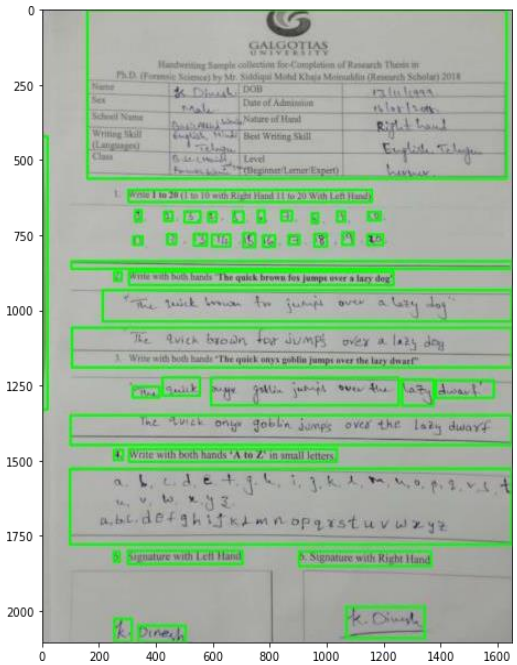
Sex : Female
Natuse of hand: Right Hand
Scanned by TapScanner


GALGOTIAS UNIVERSITY
Handwriting Sample collectionfor-Completion of Research Thesis in
Ph.D. (Forensic Science) by Mr. Siddiqui Mohd Khaja Moinuddin (Research Scholar) 2018
P. Divya
Female
Basic Allied Sciences
Right hand
English
Learner
5. Signature with Left Hand
6. Signature with Right Hand
Scanned with CamScanner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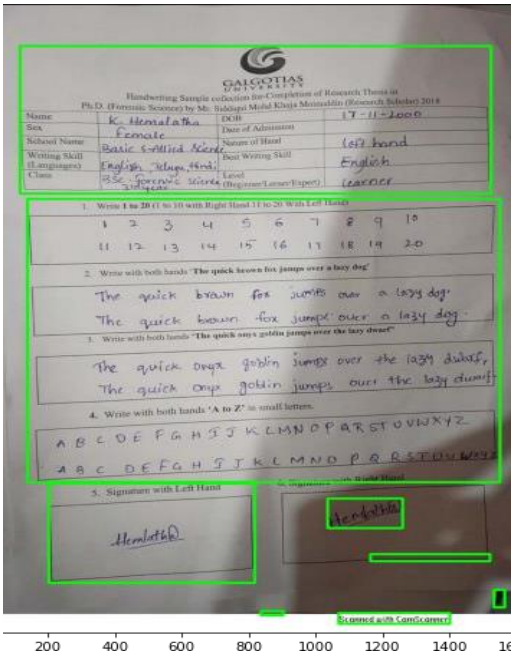
Male
Right hand
English, Telugu
Learner
5. Signature with Left Hand
6. Signature with Right Hand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K. Hemalatha
Female
Basic Allied Science
left hand
English
Learner
5. Signature with Left Hand
Scanned with CamScanner

Figure.4 Analyse the handwriting features of ambidextrous persons

Fig.4. analyse the handwriting features of ambidextrous persons. This is the final step to analyse that left hand can write proper words in comparison of right hand. From the result, we can analyse that many words are not clear. We cannot read them clearly. We can write left hand but it's not predicting clear identification in comparison of right hand. Here each line of paragraph is underline with green colour. The text inside the bounding showing accustomed and the text outside the bounding analysing unaccustomed. The data is divided into two parts such as testing and training for each model. Here, our aim to take only content inside the box. We have used convolution neural network technique to classify handwriting paragraph. We have taken 11 images ofhandwriting. The results classify the proper content distribution inside boundary. With this output texts are clear and understandable.

7. CONCLUSION

This study concludes that handwriting paragraph is able to classify and implement with each line. In this study, we have used Anaconda software for implementing the code with python and deep learning programming language. Anaconda is a provisional free distribution of deep language and Python programming language for computation code, aimed at optimising package administration and deployment. Anaconda, which was created by Travis Oliphant and Peter Wang established it and supported in 2012. We have used python and python programming language. It works well on image datasets. It can work with small and big dataset. We have taken convolution neural network algorithm to classify each line of handwriting paragraph. From the results, it is concluded that all CNN algorithm is more efficient and good in classification of handwriting paragraph. CNN algorithm requires a detailed fine tuning of the edges and a considerable number of situations for the data collection. It constructs the algorithm model only with precision and accurate classification. Therefore, the CNN algorithms for images data to classify each word and each line. However, from

the results, it is clear that CNN algorithm works efficient with images dataset to predict word to understand clearly and linearly.

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Declaration of interests

☑ The authors declare that they have no known competing financial interests or personal relationshipsthat could have appeared to influence the work reported in this paper.

☐ The authors declare the following financial interests/personal relationships which may be consideredas potential competing interests:

Siddiqui Mohd. Khaja Moinuddin, Dr. Suneet Kumar, Dr. Sayeed Ahmed, Dr. (prof) A.K.Jain

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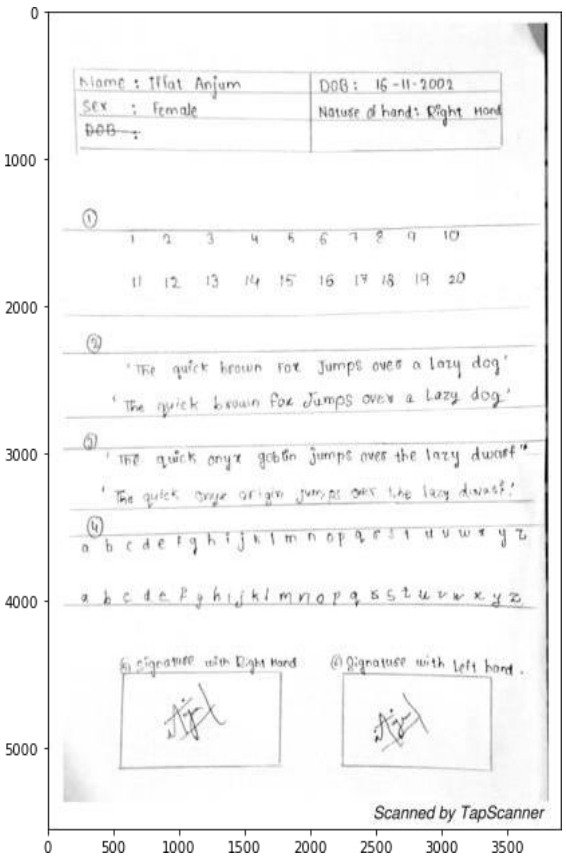
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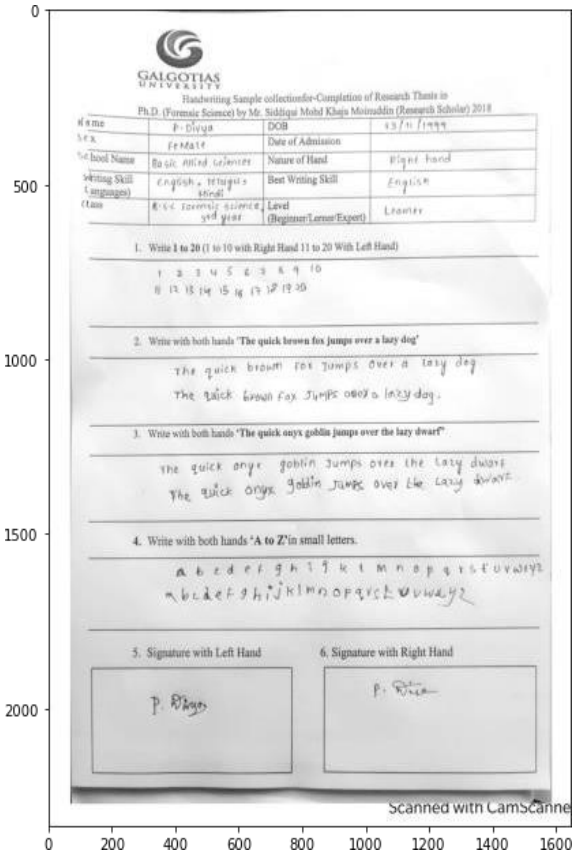
DOB : 16-11-2002
Sex : Female
Natuse of hand: Right Hand
DOB :
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
'The quick brown fox jumps over a lazy dog'
'The quick brown fox jumps over a lazy dog'
'The quick onyx goblin jumps over the lazy dwarf'
'The quick onyx origin jumps over the lazy dwarf'
a b c d e f g h i j k l m n o p q r s t u v w x y z
a b c d e f g h i j k l m n o p q r s t u v w x y z
Signature with Right Hand
Signature with left hand.
Scanned by TapScanner


GALGOTIAS UNIVERSITY
Handwriting Sample collectionfor-Completion of Research Thesis to
Ph.D. (Forensic Science) by Mr. Siddiqui Mohd Khajo Moinuddin (Research Scholar) 2018
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DOB 13/11/1999
Sex Female
Date of Admission
School Name Basic Allied Sciences
Nature of Hand Right hand
Writing Skill (Languages) English, Telugu & Hindi
Best Writing Skill English
Class B.Sc Forensic Science, 3rd year
Level (Beginner/Lerner/Expert) Learner
1. Write 1 to 20 (1 to 10 with Right Hand 11 to 20 With Left Hand)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
2. Write with both hands 'The quick brown fox jumps over a lazy dog'
The quick brown fox jumps over a lazy dog
The quick brown fox jumps over a lazy dog.
3. Write with both hands 'The quick onyx goblin jumps over the lazy dwarf'
the quick onyx goblin jumps over the lazy dwarf
The quick onyx goblin jumps over the lazy dwarf
4. Write with both hands 'A to Z' in small letters.
a b c d e f g h i j k l m n o p q r s t u v w x y z
a b c d e f g h i j k l m n o p q r s t u v w x y z
5. Signature with Left Hand
6. Signature with Right Hand
Scanned with CamScanner

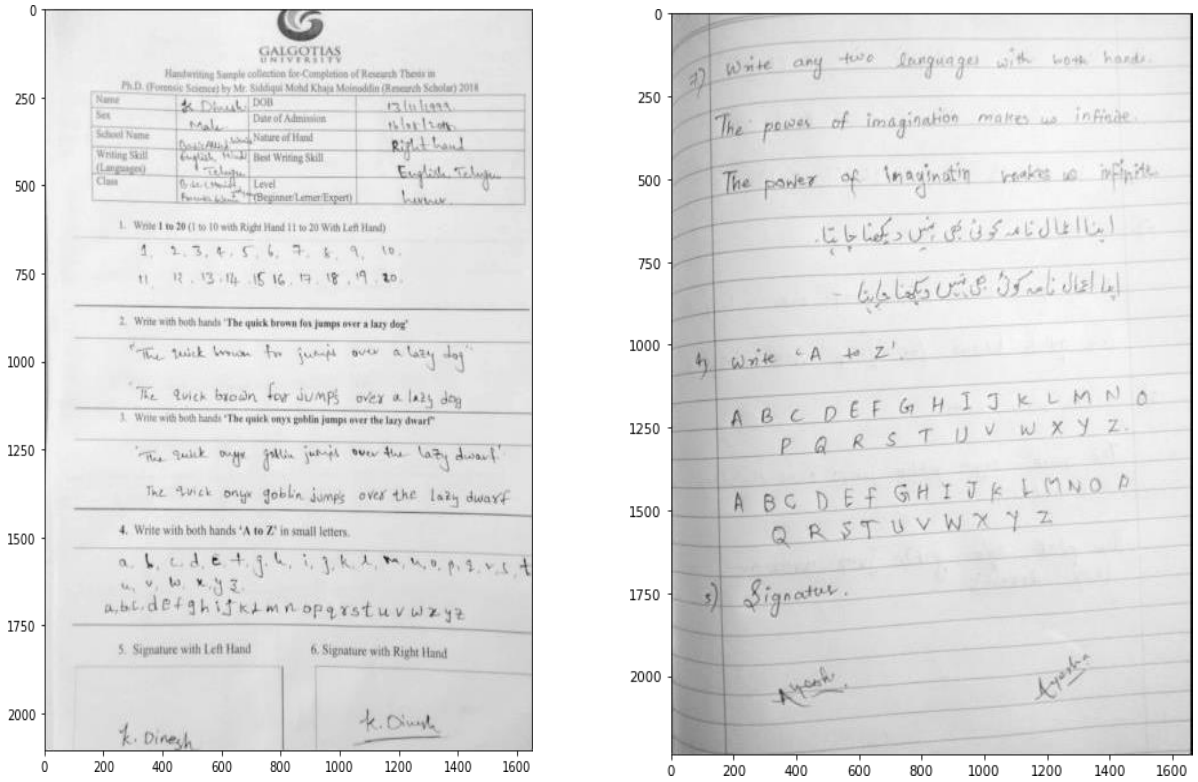

Figure.1 handwriting paragraph with edges of images

Figure.2 Sobel Operators Outputs with Dark Background

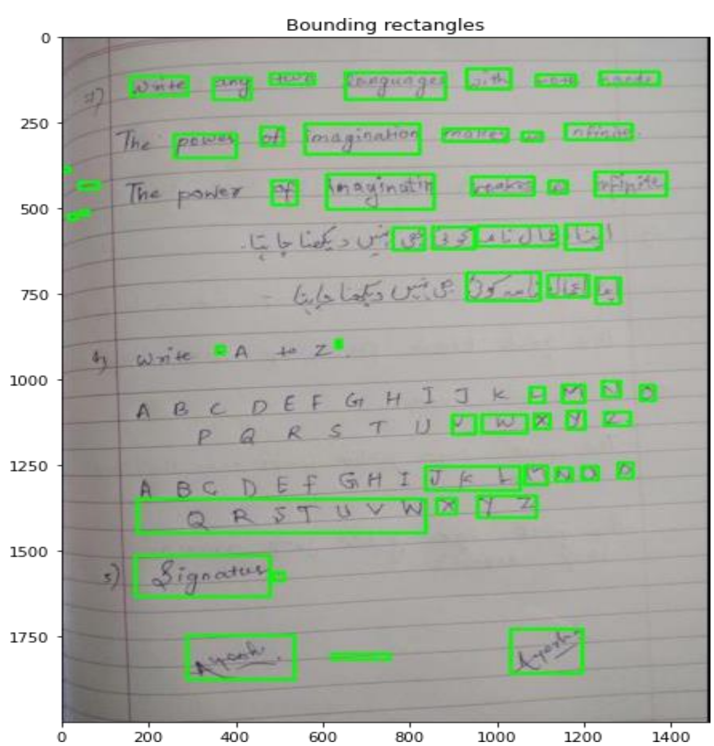
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Figure.3 Bounding Rectangles Outputs with Dark Background

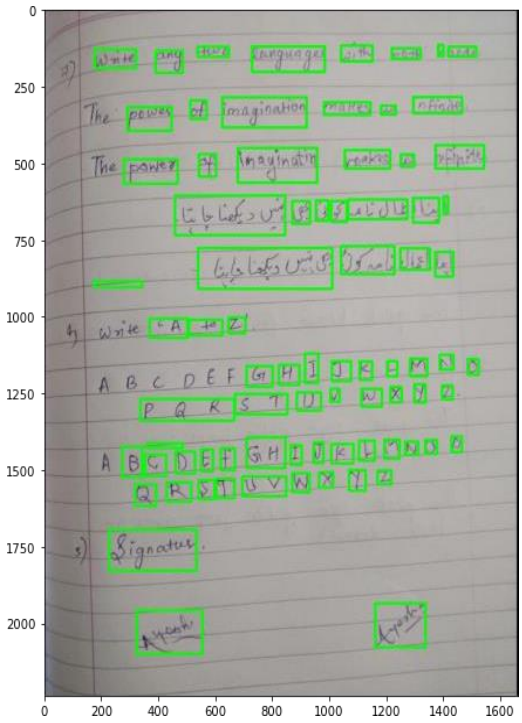

Figure.4 Analyse the handwriting features of ambidextrous persons