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PREDICTION OF PERSONALITY THROUGH SIGNATURE AND HAND GEOMETRY

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ABSTRACT

Human hand and signature both endow various personalities of an individual that depicts the distinctiveness of an individual. The present work recognized different characteristics through features of hand namely palm shape ratio and finger index proportional ratio for categorization of hand shape as Air, Fire, Water, and Earth which also involved the features of signature such as curved start, ending stroke, underscore, the appearance of the dot on letter and streaks disconnected. The fusion of these two modalities with respect to predictive models and Big Five Factors; produces an 88.0% accuracy rate and is found to be more efficient in predicting the personality of an individual.

Big Five Factors which encompasses personality related traits and which include both positive and negative characteristics of an individual. The various factors present in Big Five were used for the evaluation; performed on the result of traits of signature and palm through matching and replacing factor and algorithmic steps. This research work focuses on the predictive models which define various personalities of 25 subjects.

KEYWORDS: *Big-Five Factor Model, Feature Set, Personality Prediction, Predictive Model*

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INTRODUCTION

The personality focuses on behavioral or physiological characteristics of the person. Now a day's personality identification is very popular in every field and it can be characterized through various modes such as handwriting, speech, face, hand geometry, signature, walking style, big five personality traits and many more. The present research depicts the work done using bimodal personality prediction system (bpps).

Every person has its own signature which renders the personality traits. The signature analysis is a part of graphology theory; graphologists testify the various qualities which includes attitudes, personality, and sentiments. These aspects were described with the help of appearance of dots on the letter as in i, j; ascending bottom line; single or double underline; ending stroke; starting stroke; the appearance of letter t; streaks; shapes of each letter and so on. Image processing drives the method of extracting features and recognizes the pattern. In image processing the whole signature is judged as an image so that detection can be achieved through the numerous stages of conversion of images; such as arithmetical vector into binary, thresholding of the value and so on; which perk up the superiority of the image. This also emulates through feature extraction and pattern recognition.

Human hand depicts with different temperaments that rule the phenomenon and also portrays the personality of the individual. In the ancient age, the astrologists were predicting the personality through hand shape, hand length and width called Chirognomy; and also through palm lines called Chiromancy in the language of palmistry. These categories diagnose hidden health problems, hidden skill; foretell fortune, best profession, reveals character traits and many more. Handshapes are classified into Fire, Air, Water, and Earth hand; these are also pronounced as elemental or temperamental hand shapes. These are believed to signify character traits corresponding to the type defined.

Artificial Neural Network

The central nervous system of human brain theme has been utilized in Artificial Neural Network (ANN) sometimes called as biological neural networks. The nervous systems are capable of machine learning as well as pattern recognition. The system of interconnected neurons is one of the main aspects of the ANN. To describe the attributes of computing, the artificial neural networks go by many names such as connectionist models, parallel distributed processors, or self-organizing system [1]. The name Neural is connected to neurons, which is an essential part of the biological nervous system. Human nervous system developed the information as it receives from nerves. Every neural network encompasses the interconnected neurons which are configured for a specific application.

The advantage is that the neural system can learn new input-output patterns and adjust the system parameters. With such features, an artificial neural system has great potential in performing applications such as speech, image recognition and prediction of various characteristics where intense computation can be done in parallel and the computational elements are connected by weighted links.

Work was done so far

Most of the researchers determined the personality through handwriting only.

[1] [2] described a method for personality identification of a person via baseline of the sentence, pen pressure, the representation of the letter ‘t’ and letter ‘y’ present in an individual’s handwriting. Artificial Neural Network was applied for prediction of personality traits. Similarly [3] considered baseline, slant letter, pen pressure and the letters ‘i’ and ‘f’ is identified. Various features of handwriting were considered [4] for prediction of human personalities such as words and letters bluntness, size of the letters, baseline, pen pressure, the spacing between letters and words using support vector machine.

It was observed from the literature survey that, maximum work based on handwriting, facial expression, signature, palm, speech and many more, for prediction of personality. Very few researchers considered the fusion work on handwriting and signature for personality identification. [5] portrays the personality prediction of the individual through feature extraction methods which include statistical, structural and global transformation; theobtained values were classified using artificial neural network and got 90% accuracy for the prediction of personality traits.

A fusion of digit of each character and signature were implemented [6] using multi-structure algorithms and artificial neural networks. This research paper considered the characters present in the application form and the signature image based on nine features; extreme margin, dot structure, separate, streaks disconnected, curve starts, end streaks, middle streaks, underline and shell with good accuracy rate. [7] Completed the study on the handwriting and signature recognition using multiple artificial neural network and multi-structure algorithm and also done a comparative analysis of various techniques.

Automated medical palm systems were implemented to diagnose different diseases present in the human body through palm lines and fingers. 92 images were correctly predicted from 100 and result so obtained with an accuracy rate of 94% [8], [9]. To recognize human behavior, human nature, human personality, health, emotions, and other features; the well -known field called palmistry were applied by [10].

The prediction of an individual's first impression through visual and audio features accompanied by individuals Big-Five Personality Traits namely Openness, Conscientiousness, Extroversion, Agreeableness and Neuroticism (OCEAN). The work had been done using Deep Bimodal Regression LSTM model that extracts temporally ordered visual and audio features from a video clip and outputs five scores with a range from 0 to 1. The model was trained and evaluated on HD Youtube videos provided by ChaLearn LAP APA2016 dataset; and achieved excellent performance accuracy rate with 90-91% [11]. [12] presented a technique on CNN model interpretability, which had been combined with face detection and Actions Unit (AUs) recognition systems. This system focused only on video frames, by discarding the audio information and then performed a deep study on the interpretability of CNN models trained exclusively from video frames that revealed the facial feature detectors namely, eyes, eyebrows, nose and mouth from the intermediate layers of the CNN models to perform apparent personality trait regression. Thus achieved good results and demonstrate that face endow with discriminative information for personality trait presumption and the interior CNN depiction analyzed key face section like eyes, mouth, and nose. The development of an audiovisual deep residual network for the multimodal apparent personality trait of people in an end-to-end manner had been implemented by [13]. This approach obtained very high performance for all traits through OCEAN and identified relevant features for the task of predicting apparent personality traits. The resultant won third place in the ChaLearn First Impression Challenge with a test accuracy of 0.9109.

Experimental Work

The flow for experimentation is as follows:

Image Acquisition and Database Creation

The signature and hand images were taken from the 25 subjects belonging to different age groups at the same time. Firstly, hand images were captured from the camera. These captured images were stored in a.jpeg file format. After capturing hand images, the subjects were requested to sign on a white paper in the specified rectangular area. The images were scanned at 600*600 dpi resolution and resized to 200*100 long. Thus the databases were created from 25 subjects for 50 hand images (i.e. 25 images of left and right hand) and 6 samples of signatures. Thus total of 300 samples of signatures were used for the further processing.

Preprocessing Stages of Hand Images and Signature

There are various types of images and these images need to be gone through different processing steps. Preprocessing consists of [14]:

- RGB image: This image is also called a true color image. It is stored in m by n, 3 data array that defined as Red, Green and Blue color components for every pixel. When all the intensities values of RGB are equal then it produces black (0, 0, 0) or white (1, 1, 1) color.
- Grayscale image: This is a data matrix whose value represents intensities within some range. The MATLAB function rgb2gray( ) was applied to convert image from color image to gray image.

- Binary image: This image contains only two pixels i.e. black and white and abbreviated as BW image. The gray image can be converted to a binary image using im2bw( ) function in MATLAB.

Morphological Operations on Image

There are various morphological functions are present in MATLAB such as contrast enhancement, noise removal, thinning, skeletonization, filling, segmentation, dilation, erosion and so on. Among them we had applied; imfill( ), imopen( ) and imerode( ) on the scanned signature and hand images.

Segmentation

- Both the images were segmented separately; the signature image is segmented into two; Vertical and Horizontal segmentation, which includes left-right and upper-middle- top segments respectively.
- In a similar manner, the hand image is also divided into sections; palm and fingers, which includes length-width-ratio and length-ratio respectively. These segmented images were helpful for feature extraction.

Feature Extraction

Feature extraction is used in image processing and pattern recognition to obtain the most pertinent information from the distinctive data and accumulate the data to reduce dimensionality.

- The essential groups of the feature were extracted from both the images, after performing morphological operations. To predict personality, total of five features were considered for signature. Table I elaborates five features.
- Hand also plays a vital role in the personality prediction, thus the evaluation had been done through;

Palm measurements which include palm length (pl), palm breadth (pb), and palm shape ratio (pb/pl)…… ….(1)

The finger palm ratio which include finger length (fl)/ palm breadth (pb) and finger length (fl)/ palm length (pl). To enhance the evaluation finger index proportional ratio were calculated using the formula:finger length/ (palm breadth+palm length)/2 …… …….(2)

Palm features were calculated through the obtained values of palm shape ratio and finger index proportional ratio using formula (1) and (2). After applying and evaluating these two formulas and another corresponding formula, the resultant values were helpful for the categorization of elemental hand shapes such as earth hand, water hand, air hand, and fire hand.

Both signature and hand express the personalities of an individual based on the feature set and are shown in Table 1 and Table 2. The feature of signature of each subject which has been illustrated through binary values 0 and 1 were passed through Artificial Neural Network for predicting the personality with respect to the type of hand category (using formula (1) and (2)) is explained in Table 3.

Table 1: Feature Set of Signature and Its Personality

Feature Set	Personality
Curved Start	Careful, friendly, and diplomatic. Person is gentle, charming, flexible, outgoing, and sociable
Ending Stroke	After sincere efforts the person will fail to have any significant achievement
Ascending bottom line	Irritability, easily annoyed by minor or momentary disturbances
Streaks disconnected	Has initial communication hitch/gap/fear/inhibition. Limiting desires, not taking any risks, often discouraged and hesitated to take decisions.
Appearance of dots	Optimism, ambition, active. Feels good about his/her public character, most mental energy in regard to his/her public character.

Table 2: Feature Set of Palm and Its Personality

Category of hand based on feature set	Personality
Earth Hand	Responsible, materialistic, conscious, stable, practical, peaceful, active, tolerance and constructive, independent
Fire Hand	Excitable, reactive, expansive and energetic, motivated, passionate, intuitive
Air Hand	Plenty of intellectual stimulation, independent, private, detached, controlled, creative and passionate, cheerful
Water Hand	Adaptable, idealistic, highly sensitive, highly creative, empathy, secretive and protective

Table 3: Feature Set of Signature of each Subject and their Category of Hand Shape using Corresponding Formulae

Subjects	Features of Signature					Category of hand through palm shape and finger index ratio
	Curved Start	Ending stroke	Ascending bottom	Streaks Disconnected	Appearance of dot	
S1	1	1	1	0	1	Earth
S2	1	0	0	0	1	Earth
S3	1	0	1	0	0	Fire
S4	1	0	1	0	0	Earth
S5	1	0	1	0	0	Earth
S6	0	1	1	1	0	Earth
S7	1	0	1	0	0	Fire
S8	0	0	1	0	0	Fire
S9	0	0	1	0	0	Earth
S10	0	0	1	0	0	Earth
S11	0	0	1	0	0	Air
S12	0	0	1	0	0	Air
S13	1	0	1	0	0	Earth
S14	0	0	1	0	1	Fire
S15	1	0	1	0	0	Earth
S16	0	0	1	1	0	Earth
S17	0	0	1	0	1	Earth
S18	1	0	1	0	0	Earth
S19	0	0	1	0	0	Earth
S20	0	0	1	0	0	Water
S21	0	0	1	1	0	Fire
S22	0	0	1	0	0	Air
S23	1	0	1	0	0	Earth
S24	0	1	1	0	0	Earth
S25	0	0	1	0	1	Earth

Signature, Palm and Big Five Factor Model

Scientific psychology has developed a high-level vision of personality encompassing traits, sets of stable dispositions towards action, belief and attitude formation. *Big Five Personality traits* is a well known and one of the influential example of this approach also called as *Five Factor Model* as they encompass a large portion of personality-related terms which includes; Openness, Conscientiousness, Extroversion, Agreeableness, and Neuroticism.

These five factors are not necessarily traits in and of themselves, but factors in which many related traits and characteristics fit. For example, the factor agreeableness includes terms like generosity, friendliness, and warmth (on the positive side); and assertiveness and temper (on the negative side). All of these traits and characteristics make the broader factor of “agreeableness”. In a similar manner, all Five Factors describes its own positive face and negative face.

Table 3 is sufficient to categorize the personality of an individual; but for getting a better result with respect to Signature and Palm; the mapping is done through Big Five Factors thus, Predictive Model-1 and Predictive Model-2 is implemented through algorithmic steps.

The Table 4 and 5 describe distinct ranges of Signature and Palm which has been obtained from the mean value of each feature set i.e Curved start, Ending stroke, Ascending bottom, Streaks disconnected, Appearance of dot for signature and Palm ratio, Finger Index for hand respectively; of each 25 subjects. An AND operations were performed through ranges of each feature set which helps in obtaining the sub-categories of Big-Five Factor such as Preserver, Moderate, Explorer in Openness Category; Flexible, Balanced, Focused in Conscientiousness Category; Introvert, Ambivert, Extrovert in Extroversion Category; Challenger, Negotiator, Adapter in Agreeableness Category and Resilient, Responsive, Reactive in Neuroticism Category.

Table 4: Ranges of Feature Set of Signature and Its Result Based on AND Operation

Ranges					Result				
AND Operations on Each Ranges of Feature Set					Big Five Factor based on AND Operation				
Curved Start	Ending Stroke	Ascending Bottom line	Streaks Disconnected	Appearance of dots	Openness	Conscientiousness	Extroversion	Agreeableness	Neuroticism
0.08-0.12	0.03-0.08	0.02-0.06	0.13-0.18	0.01-0.05	Preserver	Flexible	Introvert	Challenger	Resilient
0.12-0.16	0.08-0.12	0.06-0.10	0.18-0.23	0.05-0.09	Moderate	Balanced	Ambivert	Negotiator	Responsive
0.16-0.19	0.12-0.17	0.10-0.15	0.23-0.29	0.09-0.13	Explorer	Focused	Extrovert	Adapter	Reactive

Table 5: Ranges of Feature Set of Palm and its Result based on AND operation

Ranges		Result				
AND Operations on Each Ranges of Feature Set		Big Five Factor based on AND Operation				
Palm Ratio	Finger Index	Openness	Conscientiousness	Extroversion	Agreeableness	Neuroticism
0.18-0.92	0.36-0.80	Preserver	Flexible	Introvert	Challenger	Resilient
0.92-1.10	0.80-1.16	Moderate	Balanced	Ambivert	Negotiator	Responsive
1.10-1.28	1.16-1.51	Explorer	Focused	Extrovert	Adapter	Reactive

- The ranges of **Signature** those are in between 0.08 – 0.12 of Curved start AND 0.03 – 0.08 of Ending stroke AND 0.02 - 0.06 of Ascending bottom line AND 0.13 – 0.18 of Streaks disconnected AND 0.01 – 0.05 of Appearance of dots. Similarly, ranges of **Palm** those are in between 0.18 - 0.92 of Palm ratio AND 0.36 – 0.80 of Finger Index then categorization of five-factor model is:
- In Openness the subject is Preserver
- In Conscientiousness the subject is Flexible
- In Extroversion the subject is Introvert
- In Agreeableness the subject is Challenger
- In Neuroticism the subject is Resilient.
- The ranges of **Signature** those are in between 0.12 – 0.16 of Curved start AND 0.08 – 0.12 of Ending stroke AND 0.06 - 0.10 of Ascending bottom line AND 0.18 – 0.23 of Streaks disconnected AND 0.05 – 0.09 of Appearance of dots. Similarly, ranges of **Palm** those are in between 0.92 - 1.10 of Palm ratio AND 0.80 – 1.16 of Finger Index then categorization of five-factor model is:
- In Openness the subject is Moderate
- In Conscientiousness the subject is Balanced
- In Extroversion the subject is Ambivert

- In Agreeableness the subject is Negotiator
- In Neuroticism the subject is Responsive.
- The ranges of Signature those are in between 0.16 – 0.19 of Curved start, 0.12 – 0.17 of Ending stroke, 0.10 - 0.15 of Ascending bottom line, 0.23 – 0.29 of Streaks disconnected and 0.09 – 0.13 of Appearance of dots. Similarly, ranges of Palm those are in between 1.10 - 1.28 of Palm ration AND 1.16 – 1.51 then categorization of five-factor model is:
- In Openness the subject is Explorer
- In Conscientiousness the subject is Focused
- In Extroversion the subject is Extrovert
- In Agreeableness the subject is Adapter
- In Neuroticism the subject is Reactive.
- Table 6 below describes the personality traits of the Big Five Factor of Signature and Palm. The comparative study has done through obtained ranges as shown in Table 4 and 5 above to enhance the personality concept through the Big Five Factor. The match factor has calculated and obtained the overall accuracy of 71.2%. The present research considered this as Predictive model-1.

Table 6: Evaluation of Big Five Factor Traits through Signature and Palm

Subjects	Openness		Conscientiousness		Extroversion		Agreeableness		Neuroticism		Match Factor	Accuracy
	Sign	Palm	Sign	Palm	Sign	Palm	Sign	Palm	Sign	Palm	5	%
S1	Preserver	Preserver	Focused	Flexible	Ambivert	Ambivert	Negotiator	Negotiator	Resilient	Resilient	5	100
S2	Preserver	Preserver	Focused	Focused	Extrovert	Extrovert	Adapter	Negotiator	Resilient	Resilient	4	80
S3	Explorer	Explorer	Balanced	Balanced	Introvert	Extrovert	Negotiator	Negotiator	Reactive	Reactive	4	80
S4	Preserver	Moderate	Focused	Flexible	Ambivert	Ambivert	Negotiator	Negotiator	Responsive	Resilient	3	60
S5	Preserver	Preserver	Flexible	Flexible	Ambivert	Ambivert	Adapter	Negotiator	Reactive	Responsive	3	60
S6	Preserver	Preserver	Balanced	Balanced	Extrovert	Introvert	Adapter	Negotiator	Responsive	Responsive	3	60
S7	Preserver	Preserver	Balanced	Balanced	Ambivert	Ambivert	Negotiator	Negotiator	Responsive	Resilient	3	60
S8	Moderate	Moderate	Balanced	Balanced	Introvert	Introvert	Challenger	Challenger	Resilient	Reactive	4	80
S9	Preserver	Preserver	Flexible	Focused	Extrovert	Extrovert	Adapter	Adapter	Resilient	Responsive	4	80
S10	Moderate	Moderate	Balanced	Balanced	Ambivert	Ambivert	Challenger	Challenger	Resilient	Resilient	4	80
S11	Preserver	Moderate	Focused	Flexible	Introvert	Extrovert	Negotiator	Negotiator	Resilient	Reactive	1	20
S12	Preserver	Preserver	Balanced	Balanced	Introvert	Introvert	Challenger	Challenger	Resilient	Resilient	5	100
S13	Preserver	Moderate	Flexible	Focused	Introvert	Extrovert	Negotiator	Negotiator	Resilient	Responsive	1	20
S14	Preserver	Preserver	Focused	Focused	Ambivert	Ambivert	Negotiator	Negotiator	Resilient	Reactive	4	80
S15	Preserver	Moderate	Balanced	Balanced	Extrovert	Ambivert	Challenger	Challenger	Responsive	Responsive	4	80
S16	Preserver	Preserver	Balanced	Balanced	Introvert	Introvert	Challenger	Challenger	Responsive	Responsive	4	80
S17	Preserver	Preserver	Focused	Balanced	Introvert	Introvert	Negotiator	Negotiator	Responsive	Resilient	4	80
S18	Preserver	Preserver	Balanced	Flexible	Ambivert	Ambivert	Challenger	Negotiator	Reactive	Resilient	3	60
S19	Preserver	Explorer	Flexible	Focused	Ambivert	Ambivert	Adapter	Adapter	Resilient	Resilient	4	80
S20	Explorer	Explorer	Flexible	Balanced	Ambivert	Ambivert	Negotiator	Negotiator	Resilient	Responsive	2	40
S21	Preserver	Explorer	Focused	Balanced	Ambivert	Ambivert	Adapter	Adapter	Responsive	Responsive	3	60
S22	Preserver	Preserver	Focused	Focused	Ambivert	Ambivert	Negotiator	Negotiator	Responsive	Responsive	5	100
S23	Preserver	Preserver	Balanced	Balanced	Extrovert	Ambivert	Challenger	Challenger	Resilient	Resilient	4	80
S24	Explorer	Explorer	Focused	Focused	Introvert	Extrovert	Negotiator	Negotiator	Reactive	Reactive	4	80
S25	Preserver	Preserver	Balanced	Balanced	Introvert	Introvert	Challenger	Negotiator	Reactive	Resilient	4	80
										Overall Accuracy Rate		71.2

To improve the overall accuracy rate, Predictive Model-2 is implemented where mapping has been done through Predictive Model-1 and shown diagrammatically in Figure 1 below:

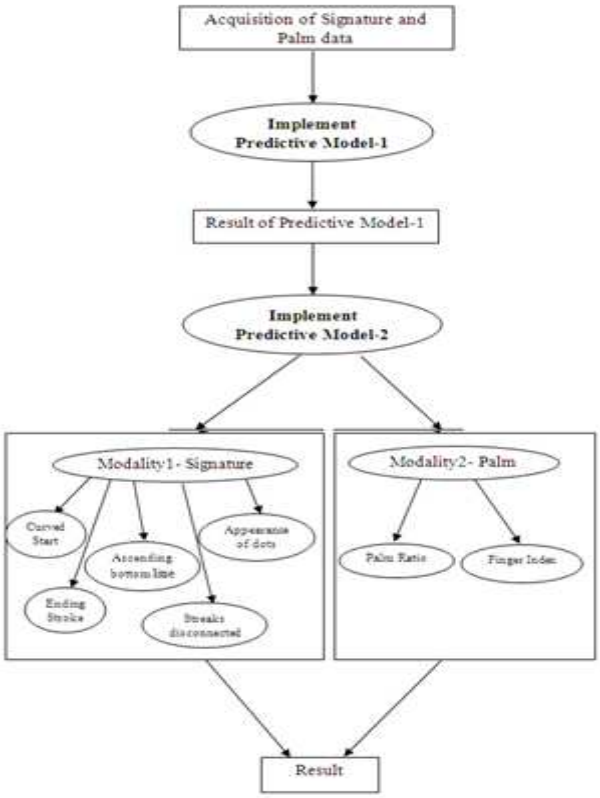

Figure 1: Mapping between Predictive Model-1 and Predictive Model-2

Predictive Model-2 is prepared through the results of Predictive Model-1. Through obtained ranges (Table 4 and 5), the categorization of Mid-values is produced which is helpful for matching and replacing of the values and is shown in Table 7 and 8 and for signature and palm respectively.

Table 7: Categorization of Mid-Values for Mapping with Big Five Factor through Signature

Big Five Factor	Openness			Conscientiousness			Extroversion			Agreeableness			Emotional Stability		
Sub-Categories	Preserver	Moderate	Explorer	Flexible	Balanced	Focused	Introvert	Ambivert	Extrovert	Challenger	Negotiator	Adapter	Resilient	Responsive	Reactive
Pre Defined Ranges	0.02-0.06	0.06-0.10	0.10-0.15	0.08-0.12	0.12-0.16	0.16-0.19	0.13-0.18	0.18-0.23	0.23-0.29	0.03-0.08	0.08-0.12	0.12-0.17	0.01-0.05	0.05-0.09	0.09-0.13
Mid-value	0.04	0.08	0.125	0.1	0.14	0.175	0.155	0.205	0.26	0.055	0.1	0.205	0.03	0.07	0.11

Table 8: Categorization of Mid-Values for Mapping with Big Five Factor Through Palm

Big Five Factor	Openness			Conscientiousness			Extroversion			Agreeableness			Emotional Stability		
Sub-Categories	Preserver	Moderate	Explorer	Flexible	Balanced	Focused	Introvert	Ambivert	Extrovert	Challenger	Negotiator	Adapter	Resilient	Responsive	Reactive
Pre Defined Ranges	0.18-0.92	0.92-1.10	1.10-1.28	0.36-0.80	0.80-1.16	1.16-1.51	0.18-0.92	0.92-1.10	1.10-1.28	0.36-0.80	0.80-1.16	1.16-1.51	0.18-0.92	0.92-1.10	1.10-1.28
Mid-value	0.55	1.01	1.19	0.58	0.98	1.335	0.55	1.01	1.19	0.58	0.98	1.335	0.55	1.01	1.19

Algorithmic steps-I were applied which describes the matching and replacing steps.

Algorithmic Steps for Matching and Replacing

Step 1: Each subject's highlighted sub-category of Big Five Factor has compared with equivalent non-highlighted sub-category by observing their mid-values as described in Table 7 and 8.

Step 2: These mid-values were again added to obtain the resultant value.

Step 3: This resultant value is perfectly matched or not matched was observed through the ranges of predefined values.

Step 4: If it is matched then replaced by resultant value otherwise remain the same.

Thus, an overall accuracy rate is calculated by performing AND-Operations using Table 7 and 8 on big five-factor of predictive model-1; the match factor was evaluated and accordingly accuracy rate was obtained which is helpful to achieve the result of 88.0% as described in Table 9.

Table 9: Evaluation of Big Five Factor Traits through Signature and Palm

Subjects	Openness		Conscientiousness		Extroversion		Agreeableness		Neuroticism		Match Factor	Accuracy
	Sign	Palm	Sign	Palm	Sign	Palm	Sign	Palm	Sign	Palm	5	%
S1	Preserver	Preserver	Focused	Focused	Ambivert	Ambivert	Negotiator	Negotiator	Resilient	Resilient	5	100
S2	Preserver	Preserver	Focused	Focused	Extrovert	Extrovert	Negotiator	Negotiator	Resilient	Resilient	5	100
S3	Explorer	Explorer	Balanced	Balanced	Extrovert	**Introvert**	Negotiator	Negotiator	Reactive	Reactive	4	80
S4	Moderate	**Preserver**	Focused	Focused	Ambivert	Ambivert	Negotiator	Negotiator	Resilient	Responsive	4	80
S5	Preserver	Preserver	Flexible	Flexible	Ambivert	Ambivert	Adapter	Adapter	Responsive	Responsive	5	100
S6	Preserver	Preserver	Balanced	Balanced	**Ambivert**	Extrovert	Negotiator	Negotiator	Responsive	Responsive	4	80
S7	Preserver	Preserver	Focused	**Balanced**	Ambivert	Ambivert	Negotiator	Negotiator	Resilient	Resilient	4	80
S8	Moderate	Moderate	Balanced	Balanced	Introvert	Introvert	Challenger	Challenger	Reactive	**Resilient**	4	80
S9	Preserver	Preserver	Focused	**Balanced**	Extrovert	Extrovert	Adapter	Adapter	Responsive	Resilient	5	100
S10	Moderate	Moderate	Balanced	Balanced	Ambivert	Ambivert	**Challenger**	**Negotiator**	Resilient	Resilient	4	80
S11	Preserver	Preserver	Focused	Focused	**Ambivert**	Introvert	Negotiator	Negotiator	Resilient	Resilient	4	80
S12	Preserver	Preserver	Balanced	Balanced	Introvert	Introvert	Challenger	Challenger	Resilient	Resilient	5	100
S13	Preserver	Preserver	Focused	**Balanced**	Extrovert	**Introvert**	Negotiator	Negotiator	Resilient	Resilient	3	60
S14	Preserver	Preserver	Focused	Focused	Ambivert	Ambivert	Negotiator	Negotiator	Reactive	**Resilient**	4	80
S15	Moderate	Preserver	Balanced	Balanced	Ambivert	Ambivert	Challenger	Challenger	Responsive	Responsive	5	100
S16	Preserver	Preserver	Focused	Focused	Introvert	Introvert	Challenger	Challenger	Responsive	Responsive	5	100
S17	Preserver	Preserver	Focused	Focused	Introvert	Introvert	Negotiator	Negotiator	Resilient	Resilient	5	100
S18	Preserver	Preserver	Flexible	Flexible	Ambivert	Ambivert	Adapter	**Negotiator**	Reactive	Reactive	4	80
S19	Preserver	Preserver	Focused	**Balanced**	Ambivert	Ambivert	Adapter	Adapter	Resilient	Resilient	4	80
S20	Explorer	Explorer	Flexible	Flexible	Introvert	Introvert	Negotiator	Negotiator	Resilient	Resilient	5	100
S21	Preserver	Preserver	Balanced	**Focused**	Ambivert	Ambivert	Adapter	Adapter	Responsive	Responsive	4	80
S22	Preserver	Preserver	Focused	Focused	Ambivert	Ambivert	Negotiator	Negotiator	Responsive	Responsive	5	100
S23	Preserver	Preserver	Balanced	Balanced	Ambivert	Ambivert	Challenger	Challenger	Resilient	Resilient	5	100
S24	Explorer	Explorer	Focused	Focused	Extrovert	**Introvert**	Negotiator	Negotiator	Reactive	Reactive	4	80
S25	Preserver	Preserver	Balanced	Balanced	Introvert	Introvert	Negotiator	**Challenger**	Reactive	Reactive	4	80
										Overall Accuracy Rate		88

Result Analysis

The study involved the analysis of the personality of the selected data set consisting of 300 samples of signature and hand images that were drawn from 25 peoples belonging to various age groups. The images were captured for both left and right hands. Thus a total of 50 palm images were analyzed including 25 left palm images and 25 images of the right palm. The analysis also included 6 samples of signatures for each selected subject. These datasets were used for predicting personality traits. Various functions of MATLAB were used for preprocessing the dataset. The researchers also conducted the Big Five personality test to be used for validation of the final result.

The final mapping of the dataset was annotated with the Big Five Personality Traits. The researchers implemented two predictive models through performing AND-operations on the ranges and obtained the overall accuracy rate of 71.2% for Predictive Model-1 and 88.0% for Predictive Model-2.

The results of Predictive Model-1 are helpful for getting improved accuracy rates. The mapping has done through the match factor between each trait of Big-Five Factor with each trait of Predictive Model-1. Hence, obtained good accuracy rate with several common personalities for the Predictive Model-2.

CONCLUSIONS

Successful prediction of personality is one of the challenges faced by the modern world. Along with the age-old

systems, newer methods and models are being developed to successfully predict the personality. In the present study, the researchers have developed a predictive model for predicting the common and prominent personality traits of people by analyzing the pictures of palm and signatures which is found to be efficient and reliable. This is done through:

- Categorization of Hand-shape into Earth, Air, Water and Fire using palm shape ratio and finger index proportional ratio. And,
- Features of Signature namely Curved Start, Ending Stroke, Underscore and Appearance of Dot on letter and Streaks Disconnected.

REFERENCES

1. *H.N Champa, K.R Ananda Kumar," Artificial Neural Network for Human Behavior Prediction through Handwriting Analysis"; International Journal of Computer Applications (0975 8887) Volume 2 No.2, May 2010.*
2. *Champa H N, K R Ananda Kumar," Automated Human Behavior Prediction through Handwriting Analysis"; 2010 First International Conference on Integrated Intelligent Computing.*
3. *P. K. Grewal, D Prashar;"Behavior Prediction Through Handwriting Analysis"; IJCST Vol. 3, Issue 2, April - June 2012.*
4. *S. Prasad, V.K. Singh, A. Sapre,"Handwriting Analysis based on Segmentation Method for Prediction of Human Personality using Support Vector Machine"; International Journal of Computer Applications (0975 8887) Volume 8 No.12, October 2010.*
5. *Prof. Seema Kedar, Ms. Vaishnavi Nair, Ms. Shweta Kulkarni,"'Personality Identification through Handwriting Analysis: A Review", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Vol-5, Issue-1, pp No: 548- 556, January2015.*
6. *Esmeralda C. Djamal, Sheldy Nur Ramdlan, Jeri Saputra, "Recognition of Handwritten Based on Signature and Digit of Character using Multiple of Artificial Neural Networks in Personality Identification", Information System International Conference (ISICO), 2-4*
7. *December 2013.*
8. *Pooja Ravishankar Tarare, Dipti Jadhav, "Study of Personality Prediction Based on Handwriting and Signature Recognition using Multiple Artificial Neural Network And Multi-Structure Algorithm", International Journal of Pure And Applied Research in Engineering And Technology (IJPRET), Volume 3(9), pp No. 681-693, 2015.*
9. *Shivali Soni, Dr. Kapil Gupta, "A Study of Automation in Palmistry", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Vol-5, Issue-5, pp No: 313-317, May 2015.*
10. *Disha Desai, Mugdha Parekh, Devanshi Shah, Prof. Vinaya Sawant, Prof. Anuja Nagare, "Automated Medical Palmistry System based on Image Processing Techniques", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE),Vol-5, Issue-1, pp No: 725-729, January 2015,*

11. *Dr. Kanchana Kohombange, "Recognizing Human Nature and Behaviors through Hand Analysis", International Journal of Interdisciplinary Research and Innovations, Vol. 3, Issue 4, pp: (10-16), pp No.10-16, October - December 2015.*
12. *Karen Yang, Noa Glaser, "Prediction of Personality First Impressions With Deep Bimodal LSTM", pp No. 1-10.*
13. *Carles Ventura, David Masip, Agata Lapedriza, "Interpreting CNN Models for Apparent Personality Trait Regression", CVPR workshop Proceeding paper, An Open Access version provided by the Computer Vision Foundation, pp No.55-63.*
14. *Yagmur Guichiturk, Umut Guiclii, Marcel A.J. van Garven, Rob van Lier, "Deep Impression: Audiovisual Deep Residual Networks for Multimodal Apparent Personality Trait Recognition", 16 Sept 2016.*
15. *Karbhari Kale, Ramesh Manza, Vikas Humbe, Pravin Yannawar, Ganesh Manza, "Understanding MATLAB", SPD Publications.*
16. *Kyriaki Kalimeri, Bruno Lepri, Fabio Pianesi, "Going Beyond Traits: Multimodal Classification of Personality States In The Wild", ICMI'13, Sydney, Australia, December 9-13, 2013.*
17. *http://www.handresearch.com/hand-sign-tutor/hand-shapes/elemental-hand-shapes.htm*
18. *P.J. Howard, P.L. Medina and J.M. Howard, "The Big Five Locator: A Quick Assessment Tool for Consultants and Trainers", from The Annual, Developing Human Resources, by J.William Pfeiffer and David Leonard Goodstein, Vol. 1,, "Training", 1996, pp. 119-22.*