



## International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

# Inspection of Prediction and Identification of Personality through Multiple Traits

Vaishali R. Lokhande, Bharti W. Gawali

Ph. D Student, Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada  
University Aurangabad, Maharashtra, India

Professor, Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada  
University Aurangabad, Maharashtra, India

**ABSTRACT:** Graphology includes handwriting analysis which is a pseudo-scientific study of handwriting in relation to human psychology. It also includes signature analysis which describe specific behavioral feature of a person. By examining the modalities like handwriting, signature, hand geometry or fusion of these modalities can generate a sketch of writers personality traits, social style and many more. Implementation of pattern recognition system will play an instrumental role in evaluating these modalities. The investigation revealed that personality identification can be presented Unimodally with handwriting, signature and hand geometry and Biomodally through Palm lines and fingers, signature and handwriting etc. It is observed that Image processing and neural network are the computational techniques which are widely used for such type of research.

**KEYWORDS:** Graphology, Signature, Hand Geometry, Personality Traits, Neural Network, Image Processing.

### I. INTRODUCTION

In the modern world, human personality recognition is becoming more and more important. As it solves many important and complex tasks and thus helps in simplification in jobs or in other relevant opportunities.

When we used to describe personality, we focus on how individuals stand out as above or below average in their mental and behavioral characteristics. In general one can say, personality is a dynamic and organized set of characteristics possessed by a person that uniquely inferences by a person whereas trait is a distinguishing characteristic, feature and quality of a person. The personality traits is mirror of people's distinguishing features of thoughts, feelings, and behaviors. Neurological brain pattern represents the personality trait of a person which implies consistency and stability [1].

Scientific psychology has developed a high level vision of personality encompassing traits, sets of stable dispositions towards action, belief and attitude formation.

A well-known and very influential example of this approach is the Big Five personality traits, which debt its name to the five traits it takes as constitutive of people's personality: Extraversion vs. Introversion (sociable vs. reserved); Emotional stability vs. Neuroticism (calm vs. anxious); Agreeableness vs. Disagreeable (cooperative vs. faultfinding); Conscientiousness vs. Un- conscientiousness (organized vs. careless); Openness to experience (intellectual vs. unimaginative) [2].

Personality identification can be reflected by patterns of signature, hand writing, face, speech, hand and palm, walking giant and sleeping style. This research article focuses on the work done with signature and palm geometry with respect to behavior prediction.

### II. WORK DONE SO FAR

Automatic recognition of characteristics such as face, voice, finger prints, iris, etc. referred as biometrics. The recent work has been done in biometrics using the concept of pattern recognition for identification and verification for authentication purpose. There are enormous systems has been designed and implemented for authentication but there is a scope for personality prediction and identification system.



# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

Most of the researcher focused on unimodal pattern and few on bimodal. For instance, in unimodal- signature, handwriting, face, hand analysis, palmistry and many more is applied. In bimodal, the combination of signature and handwriting, palm and finger print are considered.

## A. Unimodal Traits

The handwriting is used for identifying personality traits, by most of the researcher, among them only few analyzed the traits using signature.

[3][4] focused on the features such as size, baseline, pen pressure, slant of words and letters, breaks, word spacing, margins, speed of the writing using support vector machine (SVM) with Radial basis function (RBF) and got 90% accuracy result. In similar manner [5][6] considered baseline, letter slants, pen pressure, formation of letter such as f, i and t by using Artificial Neural Network (ANN). [7] used same type of features but calculated the result by using AHWAS (Automated Handwriting Analysis System) and got more than 80% accuracy rate. Different features such as base line, pen pressure, slant of letters, spacing in letters and the formation of letter t for handwriting has been described by [8] using fuzzy logic and got 94% result.

Using Artificial Neural Networks (ANN), the personality of the person can be predicted from the features extracted from his handwriting using three parameters baseline, size of the letter and slant of the letter has been proposed by [9].

Few researchers focused on forgery or original signature verification of the person's signature. [10] described a process of handwritten signature verification with the help of neural network approach which could classify all genuine and forged signature correctly with accuracy rate of 82.66%. Similarly [11] and [12] considered Off-line Signature Recognition and Verification System based on image processing, moment invariants, some global properties and neural networks and demonstrate 100% success rate by identifying correctly all the signatures that it was trained for. [13] got 80% success rate by recognizing all signature patterns correctly for all the signature of training for signature verification using pixel based approach, here researcher considered the stored image and entered image are matched and if the matching factor is high or nearer to threshold value then the signature is accepted otherwise rejected.

A novel approach has been introduced by [14] to extract features from handwritten signature and recognition of handwritten signature which helps in the field of signature verification, signature analysis and signature recognition using image clustering process based on k-nearest neighbors approach enables to handle clusters of different sizes and shapes. This method can indeed differentiate forgery with actual ones and got result of 70% cluster acceptance percentage. [15] implemented multi structural algorithm for the features such as extreme margin, dot structure, separate, streaks disconnected of the signature for identifying different traits with the accuracy of 100%, 100%, 100%, 87% respectively. And also considered Artificial Neural Network (ANN) using Back-propagation approach for Curve starts, end streaks, middle streaks, underline, shell of the signature and got 63%, 58%, 75%, 70%, 56% accuracy rate respectively. [16] considered whole signature and extract different traits such as Good, normal, aggressive, emotional using back propagation neural network, and uses mean square error for recognizing the accuracy.

The science of the hand is based on the shape of the hand and this concept had been illustrated by [17]. They also focused on medical assessment on the basis of the hand analysis which includes nail, Dermatoglyphic, fingers, hand lines. And concluded that hand analysis can be used to identify the personality.

## B. Bimodal Traits

[18] and [19] considered palm lines and fingers square measure which are helpful for identifying the characteristics of a person and to predict his future. These papers focused on Automatic Medical Palm System (AMPS) as an application of digital image processing and analysis technique. AMPS allow users to diagnose the various diseases in human body by considering image of users palm as input. Paper, prediction is made on several symbols for 100 palm images. Among 100 images, 94 images predicted correctly, thus got accuracy rate of 94%.

[20] emphasized that palmistry can be applied in order to recognize human nature, behaviors, one's personality, health, emotions and some of the special situations of the person. Researcher considered the hand prints of famous Adolf Hitler and obtained results on the basis of Chirognomical Observations, Chiromantical Observations, Dermatoglyphic Observation, Gesture Observation and Other Observation which actually focused on Signature and handwriting.

# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

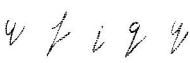
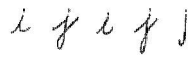

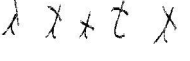
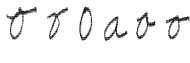
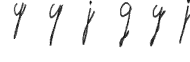
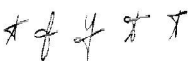
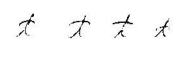
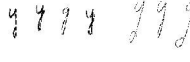

## III. ASSESSMENT OF PERSONALITY WITH HANDWRITING, SIGNATURE AND HAND GEOMETRY

### A. Handwriting:

Handwriting is a skill that differs from person to person. It helps in understanding personality character through the various strokes and patterns revealed through handwriting. Many aspects belongs to handwriting can serve as scheme to predict personality traits such as baseline, size of letters, loop formation in letters, connecting strokes, space in between letters, lines and words, start strokes, end strokes, word-slant and speed of handwriting, width of margin and many more[21].

Some letters which describes different personality traits and are shown in Table 1 below [22]:

Table 1. Personality Traits related with Handwriting

Sr. No.	Formation of Letters	Personality Traits	Explanation
1.		Aggressiveness	Shown by hard right upstrokes that replace a lower loop. The aggressive person pushes forward into the future asserting himself physically.
2.		Attentive to details	Revealed by the dots on the <i>i</i> and <i>j</i> being placed close to the stem. The closer the dot is to the stem, the more attention the writer pays to details. This trait contributes to a good memory.
3.		Diplomacy	Down slanted humps toward the right on <i>m</i> 's and <i>n</i> 's. This person has the ability to say things in a way that other people want to hear.
4.		Dominant	Down slanted <i>t</i> -bar, to the right, with a blunt ending. The dominant person tends to be in control and likes it. He takes charge, making people follow directions without angering them.
5.		Frankness	Shown in the letter <i>o</i> that has no inner loops and is relatively wide. This person will be honest and blunt when asked her opinion. If the <i>o</i> is open, then she will volunteer her frank opinion without being asked.
6.		Lack of trust/fear	Shown when the lower loops of <i>y</i> 's, <i>g</i> 's, and sometimes <i>j</i> 's are retraced completely. The anti-social person does not trust anyone and rarely lets people get close enough to really know him. He fears getting hurt emotionally.
7.		Persistence	Strokes that double back over the letter and end toward the right. Usually located in the <i>t</i> and <i>f</i> . This person has the quality of not giving up when confronted with temporary setbacks.
8.		Self Control	A <i>t</i> -bar that is curved in a concave shape. The stronger the curve, the more self-control is being implemented. An umbrella shape signifies the person is obsessively controlling an action.
9.		Socially Selective	Long, narrow loops usually in the <i>y</i> or <i>g</i> . The narrow loop reveals some trust, but they are very selective of whom they allow in their inner circle of friends.
10.		Fear of success	Shown by a down-turned <i>y</i> or <i>g</i> that doesn't cross the baseline. The closer it comes to the baseline, the closer the person will come to success, then turn away. This person gets very close to success, then fails.

### B. Signature Analysis

In Graphology theory, graphologists used to identify the traits, attitudes, qualities, sentiments or postures that can be seen through handwriting and also it includes writing in the form of signatures too. These are used for recognizing the personality of the writer which may include emotional outlay, fears, honesty, defenses and much other individual

# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)



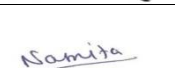
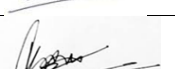


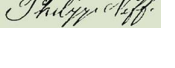
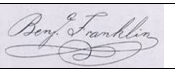

Vol. 4, Issue 8, August 2016

personality attributes. Graphology contains two major approaches, one is graphical analysis of the structure type of writing and the second is analysis of the type of symbol or letter. The signature analysis includes the first [23].

Signature consists of minimum set of letters which gives maximum information about a person. It also shows the flow and consistency of our thoughts. Signature reflects individual nature. This is unique to every individual as this is indication of personality characteristic represented by neurological patterns in the brain which represents the mental status, public character, self-possession, insensitivity, inflections, diversity and imagination of the person [24]. Signature actually gives idea of how one behaves in public, how one picture around people. It is said that while lettering a sentence, we leave on the pages our information and belief. But whenever we sign, we represent our name, our self, and our public character on the page. By matching one's signature with the rest of writing, we can notify whether one is the same in community as well as in personal life [25].

The use of signatures is usually used to identify certain personality with formation of dots on the letter i and j, streaks, shapes or shell, thickness, orientation, letter spacing and ascending or descending bottom line has described by [26] and [27]. The handwriting and signature trait goes hand in hand for identifying human personality. Table 2 presents different types of signature with related personality traits:

Table2. Personality Traits with Signature

Sr.No	Sample	Type of Signature	Personality
1.		Ascending Signature	Optimism has Ambition. Most mental energy in regard to his/her public self-image. Feels good about his/her public character.
2.		Descending Signature	Depression, pessimistic, fatigued, disappointment, negative feelings associative with public image
3.		Single underscore	Have unique ideas and thinking, need support to make decisions, and have reliability in the lead.
4.		Double Underscored Signature	Healthy self-confidence, Reaffirmation. The more underscores the more the person is lacking in self public worth.
5.		Over scored Signature	Defensiveness, insecurity with the public self image. Egotistical type of signature.
6.		A period after Signature	Such kind of person says in a shrill voice that also implies that "the final word has been said and there is no more" means, the end or word stops here.
7.		Creative Signature	Creative, smart and active, dramatically express him / herself.
8.		Encircled Signature	Wants to hide or shelter from society, protective behavior, not able to utilize entrepreneurship.
9.		Streaks Disconnected	Don't want to take any risks, often discouraged and hesitated to take decisions.

### C. Hand Geometry

Chiromancy is another name of Palmistry and is defined as a study of the characteristics of the hands, including lines, markings, skin tone and fingernails in order to tell the truths and myths about the past, present and future. These characteristics can be able to diagnose latent health problems, expose character traits and guide future actions [28]. Palm gives us a step by step movement for the individual's life from birth to death. Palm has unique characteristics such as the shape, the color, the texture, the size and the eminent of the knuckles, plays an important role in personality identification [29].

The Fig.1 below describes the information about finger. The fingers are like antennas. They both send and receive information by feel and touch. They also point and gesture to signal information to others.

# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

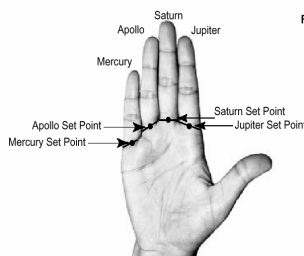


Fig. 1. Finger and Finger Set

The point where the finger meets the palm is called the set point. Locating the set point is somewhat arbitrary because the set point may or may not fall exactly on an actual crease line on the skin. Jupiter and Apollo set points usually are at the same level, and are set slightly lower than Saturn's set point. Mercury's set point is slightly below the Apollo and Jupiter set points [30]. Each finger's length shows some characteristics of a person as described in Table 3 below:

Table 3. Finger length and related Characteristics

Name of the Finger	Length			
	Long	In Excess	Short	Crooked
The finger of Jupiter	Love of power, Command over people, Extreme egotism	Tyrannical	Non-aggressive, Dislike of responsibility	Lack of principle in rule and ambition
The finger of Saturn	Prudence, Love of solitude	Morbid desires	Frivolity (Especially if pointed)	Morbid Sensitiveness
The finger of Sun	Love and worship of Art, Desire for celebrity	Desire of speculation, craving for notoriety	Dislike to publicity, Less love of art	Lack of principle in their desire for notoriety
The finger of Mercury	Mental power, power of expression especially in speech	Extreme diplomacy, A desire to cover actions by deceptive language etc.	Slow in grasp of ideas, Less love of art, Easily failed in plans	Lack of expression, Easily influenced by people

The hand, according to palm reading is made of different temperaments or elements that rule the happenings of a person's life. The hands are a reflection of the mind. By the time the child is born, it brings a map of the life in its hands. This map is a recording of the life till death. Hand reading is divided into two separate branches that make up the whole study

1. Chiromancy – This deals with size and shape of palm
2. Chiromancy – This deals with lines on palm

Basically hand is divided in to four types major types, sometimes corresponding to the classical elements or temperaments. Variations may abound. Generally we consider four types:

**a. Earth hands are wide/broad:**

They have ruddy and coarse skin. The length of the wrist to the end of the fingers is usually equal to the length of the fingers.

**b. Air hands are Square:**

They have long fingers. They also tend to have knuckles that protrude and have low set thumbs. They usually have dry skin.

**c. Water hands are Oval:**

They have short and stout alms. They have sometimes oval shaped hands. They have likewise different traits as well. They have traits like cool nature and a relaxed attitude.



# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

## d. Fire hands are rectangular:

They have short fingers. They have flushed hands. Their length from the wrist to the end of the palm is usually smaller than the length of the fingers. They have the traits like ambition, creativity, short temper and energy.

Each human hand consists of Mounts namely, Venus mount is under Thumb, Jupiter mount is under Index Finger, Saturn mount is under Middle Finger, Sun mount is under Ring Finger, Mercury mount is under Little Finger, Moon mount walk along the outside of palm. Hand also has six chief lines and fourteen main lines like Life line, Head Line, Heart Line, Fate Line [31]. The number and quality of lines, the mounts in the palm can also be included in the hand shape analysis for predicting human behavior.

## IV. COMPUTATIONAL TECHNIQUES

Various computational techniques have been implemented to predict the personality based on signature and hand geometry.

### A. 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.

Artificial Neural Network can be created by using different algorithms, among them Back Propagation Neural Network, Feed forward Neural Network and Multilayer Perceptron Neural Network are commonly used.

Most of the researcher chosen Back Propagation Neural Network because it is probably the easiest to implement as it uses more than one input layers. It consists of three layers input, intermediate hidden, target output layer. Each layer is fully connected to each other i.e. input layer to hidden layer and hidden layer to output layer. The connection weights and thresholds of a network are initialized randomly. The MSE is the difference between target output value and actual value. When the MSE achieves the goal that has been set by user, the connection weights and thresholds are determined, the iteration is continue until the value of error reaches to its MSE value and the training process of the network completes. To minimize the mean square error (MSE), the connection weights and threshold value of the network are adjusted by considering training sample values.

[8] and [33] considers scanned images of signature and applied Back Propagation Neural Network (BPNN) for training. The calculated MSE value in between 0 to 1 for training and testing of samples are used for prediction of personality.

### B. Image Processing

Image Processing is the learning of the algorithm that considers an image as input and returns an image as an output. It includes image display, image printing, image editing and manipulation, image enhancement, image compression, edge detection and feature detection. In real time applications this technique is used in Biology, Astronomy, Medicine, Security, Satellite Imagery, Personal photos and many more. Image Processing includes some feature such as noise removal, contrast adjustment, detection of an edge, detection of the region, compression of an image, segmentation of the image, and restoration can be done by using mathematical concepts. This includes probability and statistics, differential equations and differential geometry, harmonic analysis (Fourier Transform, Hough Transform, wavelet etc.).

Using Image Processing and Analysis (IPAA) techniques, [18] and [34] developed a system to overcome the limitations of palm reader. Image processing is able to detect the line and curve by using Hough Transform algorithm. Because this easily extracts outlines of hand and lines on palm from the hand print with the help of Canny-Edge Algorithm. They match input palm image pattern with the palm image templates those are present in the database and taking difference between both the images pixel by pixel. The result is in the form of match that can be categorized less, more and exact match. The pattern matching has been done for finding the boundaries of palm. The ratio of palm width- palm length has calculated for positive and negative characteristics, and the finger length to predict various types of personality of a person those are ruled by planets.



# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

## V. CONCLUSION

There are various handwriting and signature styles which describes various personality traits of an individual. In similar manner, the Hand Geometry also reveals some important aspects of personality. This investigation revealed that there is a wide scope for research in the area of bimodal personality prediction and identification.

## REFERENCES

1. Edward Diener and Richard E. Lucas, "Personality Traits", University of Utah, University of Virginia, Michigan State University.
2. 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.
3. A. McNichol, "Handwriting Analysis Putting It to Work for You", Contemporary Books, 1994.
4. Vikram Kamath, Nikhil Ramaswamy, P. Navin Karanth, Vijay Desai and S.M. Kulkarni, "Development Of An Automated Handwriting Analysis System", ARPN Journal of Engineering and Applied Sciences Vol. 6, No. 9, September 2011.
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, January 2015.
6. P.D. Sunar, "Read the full review-Graphology Personality through Writing His handwriting", Yogyakarta: DivaPress, 2010.
7. Taufik M, Rosette, "Step By Step to analyzed personality through handwriting", Jakarta, 2010.
8. Rohit R. Prabhu, C.N. Ravikumar, "A Novel Extended Biometric Approach for Human Character Recognition using Fingerprints", International Journal of Computer Applications (IJCA), Vol. 7, No. 1, pp No: 37-44, September 2013.
9. Sanjay Bensaali, "Palmistry", the complete Jotidh (Hindi word For Palmistry) guide
10. Pradeep Kumar, Shekhar Singh, Ashwani Garg, Nishant Prabhat, "Hand Written Signature Recognition & Verification using Neural Network", International Journal of Advanced Research, pp No: 558-565.
11. O.C. Abikoye, M.A. Mabayoje, R. Ajibade, "Offline Signature Recognition & Verification using Neural Network", International Journal of Computer Applications (0975-8887), Volume 35, No. 2, pp No:44-51, December 2011..
12. Cemil OZ, Fikret Ercal, Zafer Demir, "Signature Recognition and Verification with ANN".
13. Rinku N. Patel, Suman P. Chauhan, Khushbu C. Panwala, Hardi D. Prajapati, Prof. Swati L. Kariya, "Dynamic Signature Recognition and Verification Using Pixel Based Approach", International Journal of Computer Science and Information Technologies, Volume 6 (2), pp No: 1497-1499, 2015.
14. Samit Biswas, Tai-hoon Kim, Debnath Bhattacharyya, "Features Extraction and Verification of Signature Image using Clustering Technique", International Journal of Smart Home, Vol. 4, No. 3, July, 2010.
15. Esmeralda C. Djamal, Sheldy Nur Ramdhan, 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 December 2013.
16. Sandeep Dang, Prof. Mahesh Kumar, Mahesh, "Handwriting Analysis of Human Behavior Based on Neural Network", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 9, pp No: 227-232, September 2014.
17. C.N. Ravi Kumar, P. Girish Chandra & R. Narayana, "Future Path Way to Biometric", International Journal of Biometrics and Bioinformatics (IJBB), Vol. 5, Issue 3, pp No. 180-190, 2011
18. 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,
19. 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,
20. 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,
21. N.Mogharreban, S. Rahimi, M. Sabharwal, "A Combined Crisp and Fuzzy Approach for Handwriting Analysis", Southern Illinois University Carbondale, Open SIUC, publications-Department of Computer Science, IEEE Annual Meeting of the Fuzzy Information Processing Society, NAFIPS'04, 351-356, Jun 2004.
22. Terri Seymour, "Read Between The Lines-Palmistry Simplified", Jan 1970.
23. Ankur M. Bobade, Prof. Nikko N. Khalsa, "Character Revealing Handwriting Analysis based on Segmentation Method using Support Vector Machine", Special Issue of International Journal of Electronics, Communication & Soft Computing Science and Engineering, pp No. 203-207, 2015.
24. Anike A. Raut, Ankur M. Bobade, "Prediction of Human Personality By Handwriting Analysis Based On Segmentation Method Using Support Vector Machine", International Journal of Pure And Applied Research In Engineering And Technology (IJPRET), Vol No. 2 (9), pp No. 159-166, 2014
25. Parmet Kaur Grewal, Deepak Prashar, "Behavior Prediction Through Handwriting Analysis", International Journal of Computer Science And Technology (IJCSST), Vol. 3, Issue 2, pp No. 520-523, April-June 2012.
26. Champa H.N, Dr. K.R. AnandaKumar, "Artificial Neural Network for Human Behavior Prediction through Handwriting Analysis", International Journal of Computer Applications (0975-8887), Vol. 2, No. 2, pp No. 36-41, May 2010
27. Vikram Kamath, Nikhil Ramaswamy, P. Navin Karanth, Vijay Desai and S.M. Kulkarni, "Development Of An Automated Handwriting Analysis System", Asian Research Publishing Network (ARPN) Journal of Engineering and Applied Sciences, Vol. 6, No. 9, pp. No. 135-140, September 2011.
28. Ms. Aarti B. Valsang, Mr. C.M. Jadhav, "Human Character Recognition by Handwriting using Fuzzy Logic", International Journal of



# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

- Engineering Sciences & Research Technology (IJESRT), Vol 3 (6), pp No. 513-517, June, 2014.
29. Kanchana V, Bhavya Ottapurakkal, Silpa Suresh, Sajini RS, "Personality Identification Based on Handwriting", International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS), pp No. 231-235, 2015.
  30. Indrakumar S.S, Dr. M.S Shashidhara, "Study on Eye Troubles Using Palm Print And Image Processing Technique", International Journal of Recent Trends in Engineering and Research (IJRTER), Vol. 02, Issue 05, pp No. 198-201, May 2016.
  31. Bart A. Baggett, "Handwriting Analysis Quick Reference Guide for Beginners", Empresse Publishing.
  32. Sadhana, Er. Ankita Sharma, "Human Behavior Modelling and Analysis Using Artificial Neural Network", International Journal of Advanced Research in Computer Science and Software Engineering(IJARCSSE), Vol 05, Issue 5, pp No. 946-952, May 2015,
  33. Ruchi Gupta, "Human Behavior Modelling and Analysis Using Artificial Neural Network", International Journal of Engineering Research – Online, A Peer Reviewed International Journal , Vol 04, Issue 3, pp No. 531-538, May-June 2016.
  34. Vishwaratana Nigam, Divakar Yadav, "A Novel Approach for Hand Analysis Using Image Processing Techniques", International Journal of Computer Science and Information Security (IJCSIS), Jan-2010.

## BIOGRAPHY

**Vaishali Rustam Lokhande** is a Ph.D Student in the Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, MS, India. She received Master of Philosophy (M.Phil) degree in Computer Science 2015 from Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, MS, India.

**Prof. Bharti Gawali** is presently working as Professor in Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, MS, India. She is a Fellow and Hony. Secretary of IETE Aurangabad Center. She is Member of IEEE, IACSIT and ACM. She is reviewer and editor of several journals and Conferences at National & International level. She has organized several technical workshops and conferences. She sanctioned two major research projects. She got DST Fast Track Young Scientist Award and Shikshak Pratibha Puraskar . Her areas of specialization are Speech Processing, HCI, Pattern Recognition, Brain Computer Interface, Networking, Data mining, Biometric, Neuroscience and GIS etc.