

Personality Prediction from Social Networks text using Machine Learning

Mamta Bhamare , K. Ashok Kumar

Abstract: *Personality, a typical way of thinking, feeling, and behaviour. Personality embraces moods, attitudes and views and is expressed most obviously in relationships with others. It involves both intrinsic and acquired behavioural features that differentiate one individual from another and can be found in the relationships of people with the surroundings and with the social group. With the development of social networks, a broad variety of techniques have been developed to identify user personalities based on their social activities and language usage practices. In terms of distinct machine learning algorithms, information sources and function sets, particular methods vary. Personality prediction has been an important research topic for describing user profiles and person not only in psychology but also in computer science. This paper presents a systematic survey of current work done of personality prediction from social networks. We also prepared a Comparison chart of existing techniques for personality prediction on the basis of relevant parameters. Based on this survey, we finally presented a few future research directions related to personality prediction.*

Keywords: *Big five personality , Machine learning ,Personality prediction, Social networks.*

I. INTRODUCTION

Social media or "social networking" has almost become part of our daily lives and being tossed around over the past few years. Social media is the collective of online communications channels dedicated to community-based input, interaction, content-sharing and collaboration. It has become a prominent platform for opinions and thoughts. Researchers have made the use of this data to predict the personality of a person .Personality can be identified through their status and posts on social media like Facebook, Twitter etc. Personality has been shown to be relevant to many types of interactions. It has been shown to be useful in predicting job satisfaction, professional and romantic relationship success, and even preference for different interfaces. Personality relates to the long-standing characteristics and patterns that propel people to believe feel and act constantly in particular ways. What makes us distinctive people is personality. Each individual has an idiosyncratic pattern of enduring, long-term features and a way of interacting with other people and the world around them. It is believed that personalities are long-term, stable and not readily altered [1]

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* Correspondence Author

Mamta Bhamare, School of Computer Engineering and Technology, MITWPU, Pune , India. Email: mamta.bhamare@mitwpu.edu.in

Dr. K. Ashok Kumar, School of Computing , Sathyabama University, Chennai, India. Email: ashokkumar.cse@ sathyabama.ac.in

In predicting personality, most of the researcher have used Big five, MBTI (Myers Briggs Type Indicator) personality models. Some researcher have used DISC (Dominance ,Influence, Compliance ,Steadiness) framework .Personality prediction is a task where information about an individual's personality trait is identified from a given a set of data .To date, various research have been done to predict the personality of a person from publically available information on social media. Researchers have used the made literary accessible in on-line social networking profiles in style of standing updates to predict users personalities utilizing customary PRT procedures [23,24,25].

The main objective of this paper is to review the assorted studies reported in literature toward identification of personality prediction of on-line social networks. In this paper we have done precise and relative investigation of various systems utilized for personality prediction .To the most effective of our data, this is often the primary review paper on latest trends used for personality prediction at the time of submission. We trust that our commitment helps in distinguishing the headings for future research here.

This paper is structured as follows: Section 2 explores current research work related to personality prediction. Section 3 includes discussion on different methods used for personality prediction from online social media. Section 4 focuses on future research directions related to personality prediction methods and Section 5 gives concluding remarks

II. CURRENT RESEARCH WORK REVIEW

A. Research review

In addition to the explosive popularity of social media, online social networks have conducted numerous studies for personality recognition[2-6].Author Tommy Tandra[2] has developed a prediction system that can automatically predict user personality based on their activities on Facebook. This study utilizes the personality of Big Five. The dataset used in this study is sample data for myPersonality project and the second dataset is made up of 150 clients collected manually. The Facebook API Graph is used in the process of gathering data. Personality branding is then carried out manually by entering user emails in the Apply Magic Sauce application. Author Majumder[3] developed a novel technique for modeling documents based on an extractor of CNN features. James Pennebaker and Laura King's stream-of-consciousness s dataset was used.To obtain the sentence model in the form

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of vectors with n-gram features, the essay sentences are used to convert filters.

each single essay was represented by aggregating the vectors of phrases, and the obtained vectors were concatenated with Mairesse's stage of features. To improve the results, the essays discarded emotionally neutral input sentences.

A neural network completely linked with one hidden layer is used for classification purposes. Author D. Xue[4] suggested a technique of microblog character recognition with a fresh machine learning paradigm called label distribution learning (LDL). One hundred and thirteen characteristics are obtained from the profiles and microblogs of 994 active Sina Weibo clients. Three categories of characteristics are obtained from user profiles, including profile-based static characteristics, profile-based dynamic characteristics and content-based microblog characteristics, and their posted microblogs are extracted from users' profiles.

Author N. Alsadhan [5] drew up and applied a technique to predict personality From tiny amounts of text, just like inter-human contracts, with precision and considerably higher than earlier algorithmic ways. Dataset used is four types of corpora, three of which are labeled with personality traits of Big Five, and one labeled with personality types of Myers Briggs. Python is utilized to acquire archive word grids, picking the 1000 most regular words in every corpus, and requiring at any rate multiple times each word to occur. Words to stop are not erased.

Author M. Tadesse[6] used the myPersonality project information set to examine the existence of social network structures and language characteristics related to personality relationships. They also analyzed and compared four models of machine learning and performed the correlation between each of the feature sets and character traits.

Author Chaowei Li[7] extracted Weibo's social information and set of survey form. They focused on the way to predict their personality traits by exploitation the user text information. They used the correlation analysis and principle part investigations to pick out the usage info and so used the multiple correlation models, the grey prediction model and therefore the multitasking model to predict and analyze the results. Author A. Laleh[8] suggested model that gets the users Facebook likes and predicts their Big five trait ratings of personality. The LASSO algorithm was used to pick the finest characteristics of Facebook users and predict the Big five model.

Author Prantik Howlader[9] studied the use of Linear Regression(LR) and Support Vector Regression(SVR) to predict Big Five Personality ratings, providing quantitative measurement of user .They also compared the efficiency of regression models on subjects from the status of Facebook users and Facebook status subjects along with characteristics obtained using the Linguistic Inquiry and Word Count(LIWC) instrument.

Author Xiao-Feng Zhong[10] proposed a framework for personality prediction, consisting of outer elimination, selection of data set training and prediction of personality. Distance from Mahalanobis and Z-value are used to calculate the sample distance and recognized outliers. Maximum

Margin Criterion is used to select the training dataset and SVM algorithms applied to predict personality.

Author Farnadi[12] has suggested a deep learning strategy that extracts and utilizes data in various ways. Hybrid user profiling structure uses a shared representation between modalities to incorporate three information sources at the feature level and combines decision-making by distinct networks operating at the decision level on each pair of information sources. Author Y. Wang[12] researched the connection between linguistic characteristics and each personality trait and the extent to which personality traits can be predicted from language. A fresh language instrument was intended to extract three categories of characteristics, namely n-grams bags, POS tags, and word vectors. The use of language for distinct characters was noted by evaluating these characteristics.

Author Gjurkovic [14] launched a large-scale dataset marked with MBTI kinds, obtained and analyzed a wealthy collection of characteristics from this dataset , trained and assessed benchmark models for predicting personality. Three distinct classifiers supporting vector machine (SVM),2-regulated logistic regression (LR), and a multilayer perceptron of three layers were used.

Author Daniel Ricardo Jaimes Moreno[15] proposed the personality of users on Twitter using textbased features and compared the performance of multiple techniques.

Author Derwin S[20], in Bahasa Indonesia, suggested an automatic twitter-based personality identification method. Machine learning algorithm namely Stochastic Gradient Descent(SGD),two ensemble learning algorithms, Gradient Boosting and stacking is used.

Author Lei Zhang[16] suggested a new interaction learning model based on the situation. In this technique, the situation obtained is characterized by the DIAMONDS lexicon and the interaction calculated. The author Hassanein[13] combined several depictions of user texts with several semantinal measures in their Facebook status updates to predict their users ' personality. Author Ahmad[19], analyzed tweets using the framework of DISC(Dominance, Influence, Compliance, Steadiness). They have clustered and more than 1 million tweets and analyzed it for sentiment.

B. General framework for personality prediction

Based on the above survey, we have developed general framework for personality prediction which is presented in figure 1.

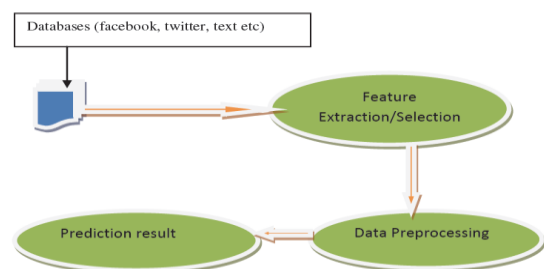


Fig 1 General Framework for Personality prediction



C. Features extracted from the text

Different types of features extracted from the text data that have been used in literary papers is shown in fig 2.

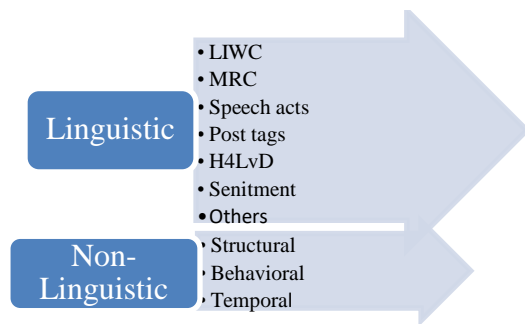


Fig 2 Types of characteristics taken from the text

III. DISCUSSION OF VARIOUS METHODS USED FOR PERSONALITY PREDICTION FROM SOCIAL MEDIA

Analyzing the text generated by him is one of the primary sources of identification of the person's character. Researchers have begun to explore the option of anticipating the personality of a use based on its social media. People pay longer on social networking sites like Twitter, Facebook, and so on. This social media provides plenty of useful data. Researchers have published various papers on personality prediction. Figure 4 demonstrates the recent amount of personality prediction papers that are regarded in this article in different Journals / Conferences.

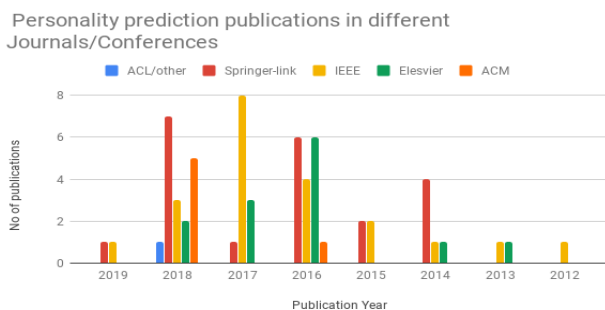


Fig 3 Publication on personality used for literature survey

Language-autonomous technique was developed using separate

languages for the model, the Big Five and the MBTI. Four information set kinds have been used, of which three are marked big 5 and one is marked MBTI. A set of essays written by faculty learners regarding their way of life and concepts, a collection of Facebook articles gathered by Stillwell and Kosinski employing a Facebook application, Youtube vlog transcripts discussing subjects like personal issues, food, films, Tweets from seven distinct languages, 6 (Spanish, German, Dutch, Italian, Portuguese, French) gathered by Verhoeven using the Plank. Predictive precision is highest for the Big Five characteristics to experience openness across all datasets. Longer papers have more stable feature-based forecast accuracies. For the characteristics of Myers-Briggs,

the forecast precision for the dichotomy of sensing-intuition is constantly higher, followed by the dichotomy of introversion-extroversion. In some languages such as English, Dutch and Portuguese, character detection is simpler and more difficult in others such as Spanish and Arabic[5]. The presence of social network structures and linguistic features related to interactions of personality using the project information set of myPersonality was examined. In order to quantify the importance of each feature, Pearson correlation coefficient analysis was conducted between three sets of features and figures. Three machine learning algorithms were used to compare with the primary classifier, namely Support Vector Machine (SVM), Logistic Regression and Gradient Boosting. The XGBoost classifier-based personality prediction scheme exceeds the average baseline for all function sets, with a maximum forecast precision of 74.2 percent [6]. The user's behavioral traits are linked to their personality. For the selection of the function, the correlation and main component analysis are used. Multiple model of regression, gray model of prediction and model of regression of multitasks are used for prediction. Gray prediction model is more appropriate for predicting and researching social network user personality traits[7]. Facebook users' personality forecast from their facebook status is made using SVR and LR. These methods are more robust when language characteristics are considered. SVR with better outcomes in predicting Big 5 personality characteristics with Polynomial and Radial Base function kernel suppliers. LR method performance rises with the incorporation of LIWC characteristics[9].

A personality forecast based on distance calculation is made to control the template for filtering outliers and choosing the most suitable Facebook dataset. Dataset is classified by personality inventory score as high and low. Sample dataset in which profiles and labels are inconsistent, called outliers are filtered out of the dataset in advance. Using SVM this framework improves the accuracy on an average by 14 percent[10]. It has been shown to be useful to filter and add the document level (Mairesse) characteristics. The Mairesse baseline is underperformed by the CNN alone without the document-level features[21]. To predict facebook users' personality, traditional machine learning algorithm with closed vocabulary and deep learning method with open vocabulary was used. MLP, LSTM, GRU and CNN 1D architectures were used for profound learning application. Openness has the greatest average precision with deep learning application in myPersonality dataset. In myPersonality dataset, MLP architecture has the lowest average precision and LSTM+CNN+1D architectures have the lowest precision in manually collected data set. Deep learning can enhance system accuracy[2]. With the ensemble learning algorithm, all prediction models perform badly without optimization. With hyper parameter tuning, the performance of the model SGD, XGB is slightly enhanced. Hyper parameter tuning, choice of features and sampling was used to address the data set's imbalance and noise. System with all the algorithms of optimization FS, HPT and sampling produces the greatest performance of all the models implemented [20].

Personality can be evaluated by means of tweeter tweets using evaluation of DISC (Dominance, Influence, Compliance, Steadiness). Word tags help to generate the top ics [19]. A new AttRCNN neural network framework was created to comprehend the OSN user's single text message's distributed semantic representation. They proposed that a new hierarchical deep neural network called AttRCNNs should understand deep semantics. They proposed a methodology for character recognition, efficiently applying deep learning techniques to OSN users' text corpora for character tasks representing each OSN user's aggregation of text posts [17]. The situation characteristics were extreme in accordance with the DIAMONDS lexicon, and the interaction values between these characteristics of the situation and the frequently used post-level n-gram characteristics were calculated. They looked at two features and used the interactions between them to be predicted. Two types of features - N-gram reflecting the behaviors and situation characteristics of Facebook users describing the condition of Facebook users when sending emails. They implemented hierarchical constraints to the interaction learning issue [16] in order to achieve sparsity and stop over fitting.

The similitudes between the user created vector and the character characteristics were assessed using semantic metrics. After preprocessing, three separate representations of vectors to discover the most suitable representation for trait prediction. Working on the entire text of the user was superior to working on nouns alone and, as expected, removing neutral nouns improved the results rather than all nouns [5]. In deep neural networks, a hybrid user profiling architecture was introduced to better integrate user data into social media for multi-target learning assignments, using two simple yet effective features, namely stacking and combination power set approaches [12].

IV. FUTURE DIRECTIONS

Personality identity is an evolving study field composed of automatic inference on the user's personality from publicly accessible data on internet social platforms. Automatic character identification from the online social network (OSN) is receiving enhanced study attention because of its potential in many computational applications [18]. A considerable quantity of job has been performed on prediction of personality leading to many directions in the future.

In order to enhance the predictive precision of personality identification methods, profound linguistic characteristics can be taken as an input to a specially constructed regression algorithm [4]. The dataset could be enhanced by raising the amount of consumers by looking for MBTI statements in comment text rather than just the flairs. It is possible to use information set with self-reported demographic information including age, ethnicity and location [14]. Examining Facebook profile status personalities may enable recommended schemes to enhance their forecast precision by recommending items such as TV shows, music or sports events intended in compliance with the user's personality. Based on the scores of mutual links, the items could be suggested to an individual customer. Using a collaborative filtering method, users with comparable tastes could be

chosen and recommended for the items [6]. Fuzzy logic could be used to convert each personality trait score to actual terms in natural language in the proposed model so that output of the model would be more informative [8]. The suggested framework could use distinct machine learning algorithms other than SVM and separate domain datasets to enhance precision. Various other techniques can be used to remove outliers [10].

Analysis of sentiment or classification of mood can be applied to the method of modeling documentation. To build both the sentence vector from a sequence of word vectors and the document vector from a sequence of sentence vectors, recurrent Long Short Term Memory (LSTM) network can be developed. [20]. Accuracy for personality prediction can be enhanced with deep learning techniques and XG Boost algorithm for certain characteristics of personality prediction. Resampling method can be used to considerably enhance precision [2]. To improve the performance of the framework, combinations of descriptive features with latent features could be applied. Facebook users could use the same structure to verify system efficiency [15]. Demographic details, IQ scores can be regarded with distinct regression models to boost system efficiency [9]. Geolocation parameters (latitude and longitude) can be introduced using DICS framework with twitter tweets [19]. Most studies in identification of personality using profiles of social networking have regarded Big Five the standard model for modeling of personality. However, Big 5 has its own limit [24, 25].

Future research should subsequently consider evaluating distinct models as decisions regardless of the Big Five characteristics. LIWC has its very own constraints. Studies can be carried out in the social network on other (word-based) content of a user's profile. The standard personality lists of questions can also serve as a valuable understanding of deep things by creating new features that may be removed or removed from the online social networking profile of the user [22].

V. CONCLUDING REMARKS

The purpose of this paper was to present a review of current work related to personality identification using online social networks or user written text and to identify future directions for personality prediction research. As a result of our survey, we have performed analysis of various methods or techniques that are used for personality predictions. We given an overview of the multiple researches carried out from social networking profiles to automatically identify personality. We mentioned the dataset and methodology used for each of the research, followed by a debate of their main findings. We have also presented different future directions that could be useful for research

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Table 1 Overview of current research work on personality prediction

Author	Summary	Dataset	Methodology
N. Alsadhani (2017)	A way to predict personality from small amounts of text was implemented	Four types of corpora, three of which are marked with Big Five traits of personality, and one marked with MBTI.	Python -to obtain a document word matrices,choosing the 1000 most common words in each corpus, and requiring at least 40 times each word to happen. Stop word are not removed
Ahmad N (2017)	Analyzed twitter tweets using DISC framework	Tweeter Tweets	Text mining and sentiment analysis were performed for each user tweets. Clustering is used for social network analysis.
Derwin S (2018)	Implemented choice of features and sampling hyper parameters to enhance machine algorithms.	Twitter in Bahasa Indonesia with Big five model	Selection of features to enhance interpretability, tuning of hyperparameters to optimize the algorithm and to solve imbalances Five classifiers one for each feature.
Tommy Tandra (2017)	Constructed a scheme to predict Facebook users personality through deep learning architectures.	myPersonality with Big five model.150 facebook users status- Manual datasets	For machine learning-closed vocabulary .For deep learning -open Vocabulary.MLP,LSTM,GRU ,CNN+1D and LSTM with CNN 1D deep learning architectures are used.
MICHAEL M (2018)	Reviewed Facebook user predictability personality traits on the basis of various Big 5 model features and measurement s.	myPersonality with Big five model	LIWC and SPLICE -for feature selection. Popular machine learning workbench,10-fold cross-validation with 10 iterations.SVM, Logistic Regression and Gradient Boosting as a baseline for comparison with the primary classifier.
Chowei Li (2017)	Focused on the characteristics of the social network and user behaviour, and established three comparative prediction models.	Weibo users, social data and questionnaire with Big five model	Correlation analysis and principal Component analysis to select useful information and then to predict and analyze the results using the multiple regression model, the gray prediction model and the multitasking model.
Laleh (2017)	The LASSO algorithm is used to choose the finest characteristics and to predict big five personality characteristics for facebook users.	myPersonality with Big five model	R is used for implementation After standardizing the data, model receives XT rain, YTrain to train the model. To find the optimized value of the hyper-parameter λ in LASSO model, the cross validation method has been used.
Praetika Holwader (2017)	Addressed the issue of predicting the personality of Facebook users using	myPersonality with Big five model	Used aggregated Facebook status and LIWC characteristics of each user after cleaning, followed by the following LR regression method (Linear Kernel SVR, Polynomial Kernel S

8)	SVR and LR		VR, RBF Kernel SVR).
Xiao-Feng Zhong (2018)	Proposed a model consisting of outlier elimination, training dataset selection	myPersonality with Big five model	Mahalanobis distance and Z-value are chosen to compute the distance of the samples and to identify the outliers. The Maximum Margin Criterion is used to select the training dataset and the SVM algorithm is applied.
Eric F. M (2018)	Proposed a new methodology of young adults involved in a network using hyper optimization algorithms.	Big-5 questionnaire	A social contagion model based on differential equations Methods consisted grid search algorithm to compute the best weights and running a grid search algorithm to find the personality traits of each person directly.
Jie Tang (2018)	Proposed a deep learning approach that extracts and uses data across completely different modalities	myPersonality with Big five model	The hybrid user profiling structure uses a shared representation between modalities to incorporate three information sources at the feature level and combines decision making by distinct networks operating at the decision stage on each mix of information sources.
Yilun Wang (2015)	Studied the relationship between human language on Twitter and personality traits.	MBTI-Twitter data	Different prediction models using both individual features and combined features-concatenate features within or across categories. Logistic Other machine learning models such as Random Forest and SVM are used.
Marham Hasanain (2018)	Represents an inference method to personality traits based on semantic text assessment.	myPersonality with Big five model	The three Vector representations to assess the efficacy of the suggested semantic-based trait prediction strategy
Matěj Gjurković (2018)	Extracted a number of language and user activity characteristics and conducted a preliminary MBTI dimension analysis.	MBTI9k with MBTI type	Three different classifiers:SVM,2-regularized logistic regression (LR), and a three-layer multilayer perceptron (MLP).
Lei Zhang (2018)	Proposed a situation-based interaction regression model where n-gram and situation features are extracted.	myPersonality with FFM	n-gram features,the Facebook posts are scanned and n-grams used by more than 5% users are kept. Situation features-per category usage percentage is computed based on a predefined DIAMONDS lexicon S8-LIWC.
Di Xue (2018)	Proposed a deep learning primarily based approach for personality recognition from text posts.	myPersonality with Big five type	Separated the 50-dimensional yields Relapse calculations used to assemble distinctive expectation models Fabricated the five distinctive neural systems with the equivalent

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AUTHORS PROFILE



Mamta Bhamare received her master's Degree in Computer Engineering from Pune University in 2010. She is currently working as Assistant Professor in School of Computer Engineering and Technology, MITWPU, Pune. Her area of interest includes machine learning, social networking and big data. She has published many papers in reputed journals and conference proceedings. She is a member of CSI. She has been presently teaching a wide variety of courses at undergraduate levels and has 16 years of teaching experience. She has guided many undergraduate and postgraduate students projects.



Dr. K. Ashok Kumar received his Masters's Degree in Computer Technology -Applied Science and Engineering from KSR college of Technology (2002) and Master's Degree in Computer Science and Engineering, Sathyabama University (2005), Ph.D from Sathyabama University (2016). He is currently working as Associate Professor in Computer Science and Engineering Department, in Sathyabama Institute of Technology, Chennai, India. His area of interest includes Grid Computing, Cloud Computing, Distributed systems. He has published more than 45 research papers in reputed journals and conference proceedings. He is member of IEEE and life time member of ISTE and presently teaching a wide variety of courses at both undergraduate and postgraduate levels and has 16 years of teaching experience. He has guided more than 45 undergraduate and postgraduate students projects and 5 Ph.D research scholars till date.