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Overview of Text Based Personality Prediction Using Deep Learning

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Abstract – *Text-Based Personality Prediction (TBPP) has garnered increasing attention in recent years, particularly within the frameworks of the Myers-Briggs Type Indicator and the Big Five Personality Model. This study presents a comprehensive systematic review of TBPP methodologies, focusing specifically on research published since 2017. Leveraging Google Scholar, a meticulous selection process was employed to identify and analyze papers meeting relevance criteria. The selected studies were analyzed for research design, data collection methods, preprocessing techniques, and modeling approaches. Notably, the study identifies prevalent Natural Language Processing methods utilized in TBPP, such as Recurrent Neural Networks, Convolutional Neural Networks, Long Short-Term Memory networks, ensemble methods, and pre-trained models like BERT. Results indicate that combining knowledge graphs with Bi-LSTM models achieved the highest accuracy for Big Five traits at 71.5%, while a BERT-CNN-RNN ensemble reached 85% accuracy for MBTI. The synthesized findings offer valuable insights into the current landscape of TBPP, with the aim of informing both researchers and practitioners. Furthermore, the study provides recommendations for future research directions, emphasizing the importance of refining methodologies and addressing challenges to foster continued innovation in personality prediction within the TBPP domain.*

Keywords: *Text-Based Personality Prediction; Myers-Briggs Type Indicator; Big Five Personality Model; Natural Language Processing; Systematic Review*

I. INTRODUCTION

Personality assessment and prediction play an important role in the employee recruitment process, but traditional methods using standard tests require significant time and resources. Personality assessments can also improve management skills and communication between individuals, including friends, employees, and families. Enhancing the efficiency and accuracy of personality assessments enables better hiring decisions and helps avoid past hiring mistakes. Recent research has explored personality prediction techniques using AI technology, particularly deep learning, which has significantly advanced fields such as object recognition, speech recognition, and object detection (Lecun et al., 2015; Devlin et al., 2019; Brown et al., 2020).

Fortunately, social media has been used by many people for the last decade and the user number keeps increasing. It is also the main tool for communication mostly using texts which continues to provide dataset. Text Based Personality Prediction (TBPP) using deep learning has attracted many researchers that use various NLP methods. (Ramezani, Feizi-Derakhshi, & Balafar, 2022)uses knowledge graph – enabled combined with a few deep learning models like RNN, CNN, Bi-LSTM, and LSTM by comparing them independently with Big Five Personality. Of the four deep learning models, knowledge graph – enabled + Bi-LSTM gained average accuracy of 71.5% which is the highest. Another research by (Ren et al., 2021)proposes using pre-trained deep learning model called BERT combined with CNN and RNN. This work perform test on MBTI and Big Five Personality. MBTI yields an average accuracy of 85% while Big Five Personality yields

average accuracy of 80.2%.

Most previous works use MBTI or Big Five Personality as the prediction tools. One of the reasons is because both are supported with an abundance of data sets and mostly used around the world. Most MBTI research uses Kaggle MBTI dataset. However, that dataset contains uneven class distribution. Big Five Personality researchers are divided into 2 groups which use myPersonality dataset and the other use Essays dataset.

MBTI categorizes people into 16 personality types, while Big Five rates the 5 dimensions of personality. MBTI test does not mention that each category is better than the other, while Big Five mentions that it is better to have high or low score of each dimension. Big Five is considered more robust scientifically due to more research support, while MBTI faced criticism for lacking test-retest reliability and empirical evidence. The Big Five is more widely accepted in the scientific community than MBTI.

This paper aims to comprehensively review and assess the current research progress in using deep learning algorithms for TBPP, focusing on integrating established personality measurement tools like MBTI and the Big Five. The primary objective is to analyze and synthesize the outcomes of various deep learning algorithms used in TBPP, considering factors such as accuracy, robustness, and limitations. By systematically comparing these outcomes, the study seeks to provide insights into the most effective approaches for accurately predicting personality traits from textual data, and the resources used to achieve these results. The primary objectives of this paper are to:

- Provide a comprehensive overview of research methodologies employed over the years, with a focus on identifying prevalent NLP methods.
- Conduct an in-depth analysis of methodologies and outcomes, contextualized within the datasets utilized, while addressing key research challenges and outlining future directions.
- Transparently document the datasets utilized for extraction and validation processes, ensuring clarity and reproducibility in research endeavors.

By fulfilling these objectives, this paper aims to facilitate informed decision-making and foster continued innovation in the domain of personality prediction.

II. METHODS

This study meticulously selected relevant papers aligning with the topic and criteria of text-based personality prediction within the MBTI or Big Five personality frameworks. The research methodology employed a systematic approach via Google Scholar, filtering papers published no earlier than 2017 to ensure the inclusion of recent advancements in the field.

To identify pertinent literature, keywords such as “text-based personality prediction,” “MBTI,” and “Big Five personality” were utilized. The search process involved screening titles, abstracts, and keywords to ascertain relevance to the research topic. Additionally, citation tracking, and reference lists of selected papers were scrutinized to identify additional relevant studies.

Following the initial screening process, selected papers underwent thorough examination to assess their adherence to the study’s focus on text-based personality prediction methodologies. Papers that met the inclusion criteria were included for further analysis, while those not directly relevant or failing to meet the specified criteria were excluded.

Once the final set of papers was determined, a comprehensive review and synthesis of the methodologies employed in each study were conducted. This involved extracting key details regarding the research design, data collection procedures, preprocessing techniques, and modeling approaches utilized for personality prediction.

Furthermore, the analysis encompassed the summarization and comparison of the most prevalent Natural Language Processing (NLP) methods employed across the selected studies. This included examining the utilization of techniques such as Recurrent Neural Networks (RNNs), Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTM) networks, ensemble methods, and pre-trained language models like BERT.

The synthesized findings were then organized and presented in a structured manner to provide a clear understanding of the methodologies employed in text-based personality prediction research within the MBTI and Big Five frameworks. This methodological approach ensures replicability and transparency while facilitating insights into the evolution and current state of the field.

III. RESULTS AND DISCUSSION

The papers in this section contribute to our understanding of TBPP. To organize these contributions effectively, the papers are arranged in chronological order, with the year of publication indicated in this arrangement allows us to track the progression of research and observe how the field has evolved over time.

In this study, we delve into the application of deep learning methods for TBPP, specifically focusing on personality prediction based on both MBTI and Big Five traits. It’s important to note that each of these research works might involve one or more personality measurement tools. These works adopt various metrics to quantify their predictive performance. Some rely on standard accuracy percentages, while others use metrics like Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Squared Error (MSE), or Area Under the Receiver Operating Characteristic (AUROC).

Additionally, some research explores new methods to improve the accuracy of predicting personality traits. Because there are many different approaches and measures used in these studies, we simplify our discussion by focusing only on the highest reported accuracy achieved in each

study. This helps us to extract the most important insights from the research and highlight the most impactful findings.

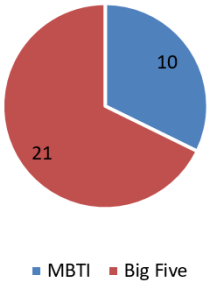

Figure 1. Distribution of paper personality prediction tools

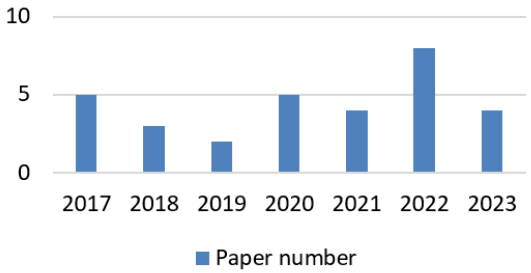

Figure 2. Distribution of paper year

Personality prediction on MBTI mostly use Kaggle MBTI dataset while Big Five either use myPersonality dataset or Essays dataset. This work will discuss papers that cover Big Five Personality and MBTI. Aside from mentioned datasets, this paper also covers research that use alternative datasets. The personality prediction tool distribution is shown in Figure 1. Previous works may cover both MBTI and Big Five or just either one. The paper year distribution is shown in Figure 2.

Our analysis revealed several key findings related to the research questions and objectives of this study. Notably, the use of pre-trained models like BERT and ensemble methods significantly improved the accuracy of text-based personality prediction. For instance, a combination of knowledge graphs with Bi-LSTM models achieved the highest accuracy of 71.5% for predicting the Big Five personality traits. Similarly, the BERT-CNN-RNN ensemble reached an impressive 85% accuracy for MBTI predictions. These findings suggest that sophisticated NLP techniques are highly effective in enhancing the precision of personality predictions.

For instance, in the study by Hernandez and Scott (Hernandez & Scott, 2017), a comparative analysis of various Recurrent Neural Networks (RNNs) such as SimpleRNN, GRU, LSTM, and Bi-LSTM is conducted. Their research involves a meticulous preprocessing stage on the MBTI dataset, comprising selective word removal, lemmatization, tokenization, and padding. Notably, this study predicts 4 binary classes instead of the original 16 classes of the MBTI. Among the two classification methodologies employed, namely Post Classification and User Classification, the latter yields superior results. The approach involves computing the average probability prediction for all user posts and subsequently rounding them to either 1 or 0.

Cui, Qi (Cui & Qi, 2017) also uses LSTM, but instead they use Encoder and Decoder Framework. Encoder uses LSTM while Decoder uses ReLu. They also modify the dataset by performing data duplication and reduction, so no class has twice the number of other classes. For pre-processing, they use convert to lowercase, lemmatization, replace special texts (URLs, numbers, etc) with escape tokens, separate punctuation from text, and assign words on frequency in the training set performed on MBTI dataset. This work predicts both 4 binary classes and 16 classes of MBTI.

Majumder et al (Majumder et al., 2017) use CNN. There are 4 steps of processing flow: word vectorization, sentence vectorization, document vectorization, and classification. For pre-processing, they use convert to lowercase, sentence splitting, data cleaning and unification, and sentence filtering on myPersonality dataset. This work predicts 5 classes of Big Five Personality.

Xue et al (Xue et al., 2018) design a new deep neural network called AttRCNN combined with CNN-based Inception to predict personality. AttRCNN itself is based on existing RCNN. The difference is that AttRCNN has attention mechanics to find informative contextual words and batch normalization. CNN-based Inception is used for document vectorization. For pre-processing, they use text tokenization, and text unification on myPersonality dataset. In text tokenization, they keep the original text without removing punctuation, symbols, etc. however, they still remove unnecessary white spaces between words or emojis. While in text unification, they convert text to lowercase and standardized informal words. They also add Statistical feature extraction which consists of special linguistic statistics features and dictionary-based linguistic features combined with Gradient Boosting Regression (GBR) which further reduces MAE. This work predicts 5 classes of Big Five Personality

Tadesse et al (Tadesse et al., 2018) delve into defining users' personalities through their social activities and language use on social networks. Various approaches have emerged, using diverse machine learning methods, data source, and features. The main goal is to predict personality traits of Facebook users using Big 5-based features. They employ the myPersonality dataset and investigate social network structures and linguistic features. Four machine learning models are compared, and correlations between feature sets and personality traits are examined. Results show the XGBoost classifier outperforms the average baseline, with a max accuracy of 74.2%. Extraversion has the highest prediction accuracy at 78.6% with individual Social Network Analysis (SNA) features. These findings highlight predicting traits through social networks and language.

Previous studies have explored personality prediction using text data from social media platforms. For instance, researchers have used the Big Five Personality Model to predict personality traits such as agreeableness, conscientiousness, openness, neuroticism, and extraversion. In this paper, the authors applied this approach to predict Twitter user's personality using Turkish words. To improve the accuracy of their predictions, the authors developed a

new dictionary that included Turkish words with special word groups. The authors then used machine learning models to predict each personality trait, achieving accuracy values in the range of 0.76 to 0.97 when trained on the latest 50 tweets of users. These findings are consistent with previous studies that have shown the potential of text-based data for predicting personality traits and suggest that this approach can be successfully applied to Turkish language data as well (Ergu et al., 2019).

Khan et al (Khan et al., 2020) uses XGBoost and resampling methods for the approach. The resampling method means rescaling the training dataset for balance. It is necessary because the MBTI dataset is skewed on some classes. For pre-processing, they perform tokenization, deleting stop words, and word stemming. This work predicts 4 binary classes of MBTI.

Marouf et al. (Marouf et al., 2020) employed Naive Bayes and Support Vector Machine (SVM) algorithms, complemented by Pearson Correlation Coefficient (PCC) for feature selection. PCC optimizes learning time by eliminating irrelevant features, focusing solely on those pivotal for classification. Preprocessing steps on the myPersonality dataset involved comprehensive cleaning, including the removal of URLs, names, symbols, unnecessary spaces, and stemming. Their study aimed at predicting the five classes of the Big Five Personality Model.

Expanding the scope to the Philippines Twitter user dataset, (Tighe et al., 2020) delved into Openness and Conscientiousness traits. Their study encompassed various multilayer perceptron configurations, leveraging pre-trained word embeddings from English and Tagalog languages. Findings showcased impressive RMSE values of 0.33 for Conscientiousness and 0.34 for Openness. Additionally, their comparative analysis of methodologies, ranging from TF vector-based to ensemble modeling, highlighted the superior accuracy of the ensemble approach.

In another study, (Jeremy & Suhartono, 2021). utilized word embeddings as input for neural networks, including Long Short-Term Memory (LSTM), Bidirectional LSTM (Bi-LSTM), and Gated Recurrent Unit (GRU) models. Notably, the GRU model, coupled with Rectified Linear Unit (ReLU) activation, achieved an average training score of 0.83, assessed using the F-Measure metric.

Amirhosseini & Kazemian, 2020) proposed a Gradient Boosting Model, implementing XGBoost for MBTI personality prediction. Their method involved individual training of MBTI personalities followed by meticulous configuration and re-evaluation of the XGBoost tree for enhanced performance.

Ren et al (Ren et al., 2021) proposes using a pre-trained model called BERT combined with CNN and RNN. Pre-processing performed on MBTI dataset and myPersonality dataset. This work predicts the 4 binary classes of MBTI and 5 classes of Big Five Personality.

Christian et al (Christian et al., 2021) advocate the utilization of multi-layer deep learning with pre-trained models like RoBERTa, BERT, and XLNet, supplemented by feature extraction methods including sentiment analysis, TF-IGM, and the NRC emotion lexicon database. The investigation employs both the MyPersonality dataset and an independently collected Twitter dataset to forecast the five distinct classes of the Big Five Personality traits.

In 2020, a subsequent iteration of the study involved 250 user data points, diligently collected, and manually annotated. Employing the XGBoost machine learning algorithm, this research achieved commendable results in predicting personality traits, particularly Agreeableness and Openness, with AUROC scores of 0.71 and 0.63 respectively. However, discerning the personality traits of Conscientiousness, Extraversion, and Neuroticism proved to be more challenging, as reflected in their AUROC scores of 0.5, 0.59, and 0.48 respectively (Suhartono, 2021).

Another study also explores Bi-LSTM, showing improved predictions compared to regular LSTM models. This research covers various languages and data sources. The model then applied to process Facebook user data of myPersonality dataset, resulting in mean absolute errors of 0.46 (Leonardi et al., 2020).

Nisha et al (Nisha et al., 2021) compares Naive Bayes, SVM, and XGBoost classifiers for the prediction. for pre-processing, they perform remove URL, extra characters, and punctuation, Tokenization, stop words removal, and stemming. The dataset used is the MBTI dataset. This work predicts 4 binary classes of MBTI.

El-Demerdash et al (El-Demerdash et al., 2022) propose the adoption of an ensemble comprising ELMo, ULMFit, and BERT. Fusion occurs both at the data and classification levels. This approach harnesses the combined myPersonality dataset and essays dataset to forecast the five categories of the Big Five Personality traits. Similarly, another study employs an ensemble model, incorporating multiple pre-trained BERT models like BERT and IndoBERT, which is trained using an Indonesian language dataset (Kelvin et al., 2023). Additionally, a kernel-based ensemble model is introduced, constructed through the implementation of various voting techniques including soft voting, hard voting, and weighted hard voting (Kumar et al., 2023).

Ramezani et al (Ramezani, Feizi-Derakhshi, & Balafar, 2022) proposes using knowledge graph – enabled combined with few deep learning models like CNN, RNN, LSTM, and Bi-LSTM. They combine the graph with each deep learning model and compare them independently using Big Five Personality as the personality prediction. Of the four deep learning models, knowledge graph – enabled + Bi-LSTM gained average accuracy of 71.5%.

Yang et al (Yang et al., 2023) present a novel framework known as DeepPerson, composed of three primary components: CNN-LSTM, wlpHAN, and transfer learning through SPDFiT. In the CNN-LSTM module, two Bi-LSTM components are utilized. The initial Bi-LSTM combines the character encoder and word CNN embeddings, aiming to encompass language usage associated with logical ideational and textual meta-functions. The following Bi-LSTM incorporates the psychological concept encoder

to capture personality traits linked to the experiential ideational aspect. Meanwhile, wlpHAN is employed to capture personality cues using word and layer-level attention mechanisms. Additionally, SPDFiT contributes to an expanded training dataset and enhances the performance of wlpHAN through fine-tuning processes.

Kerz et al (Kerz et al., 2022) combined 10 iterations of a hybrid model that integrates a fine-tuned BERT model with attention based Bi-LSTM model trained on text contours.

Chowanda et al (Chowanda et al., 2022) compares several methods to find the best one. The methods are: Generalized Linear Model, Fast-Large Margin, SVM, Artificial Neural Network, and Gradient Boosted Tree. The neural network consists of 6 layers where the output is 16 classes of MBTI. The input layer consists of 1000 neurons and each hidden layer contains 200 neurons. All layer's use ReLU function except for the output layer which uses SoftMax function. The best method is ANN with average accuracy of 76.3%.

The effectiveness of BERT and ensemble methods is well-documented in recent literature. Studies by (Devlin et al., 2019) have demonstrated the superior performance of BERT in various NLP tasks, which aligns with our findings. Additionally, (Ramezani, Feizi-Derakhshi, & Balafar, 2022) highlighted the benefits of combining knowledge graphs with deep learning models, further supporting our results. These studies collectively underscore the potential of advanced NLP methods in improving the accuracy of personality predictions from textual data.

Our research aligns with the prevailing view in the literature that integrating state-of-the-art NLP techniques with established personality models can lead to more accurate predictions. However, we also identified challenges such as dataset imbalances, particularly in the standard MBTI dataset. This issue has been noted by (Stachl et al., 2020), who emphasized the need for balanced datasets to ensure reliable predictions. Our study suggests corrective measures like data duplication, reduction, or resampling to address these imbalances.

Table I. Overview of TBPP on MBTI

Author	Personality Measurement Tools	Method	Dataset	Accuracy
(Nisha et al., 2021)	MBTI	Comparison of Naive Bayes, SVM, XGBoost (best)	Kaggle_ MBTI dataset	I-E = 86% S-N = 90% F-T = 84% J-P = 80%
(Kerz et al., 2022)	MBTI	ensemble of BERT + Bi-LSTM	Kaggle_ MBTI dataset & Essays dataset	I-E = 85.5% N-S = 92.3% F-T = 85.7% J-P = 82.6%
(Chowanda et al., 2022)	MBTI	Custom Artificial Neural Network	Kaggle_ MBTI dataset	Average Accuracy of 76.3%
(Kumar et al., 2023)	MBTI	Kernel-based ensemble model	Kaggle_ MBTI dataset	I-E = 86.4% S-N = 90.3% F-T = 85.4% J-P = 79.9%
(Ryan et al., 2023)	MBTI	SMOTE + Logistic Regression (best)	Kaggle_ MBTI dataset	(Average F1) .83%

Table II. Overview of TBPP on Big Five Personality

Author	Personality Measurement Tools	Method	Dataset	Accuracy
(Kerz et al., 2022)	Big Five Personality	ensemble of BERT + Bi-LSTM	Kaggle_ MBTI dataset & Essays dataset	OPN = 72% CON = 61.4% EXT = 63% AGR = 60.2% NEU = 61%
(Qin et al., 2022)	Big Five Personality	LDA-BPNN (Latent Dirichlet Allocation Back-propagation Neural Network	Personal dataset mined using Sina Weibo	OPN = 79% CON = 70% EXT = 80% AGR = 70% NEU = 71%
(Ramezani, Feizi-Derakhshi, Balafar, et al., 2022)	Big Five Personality	Ensemble (stacking) of LSA + Bi-LSTM	Essays Dataset	OPN = 56.3% CON = 59.2% EXT = 64.3% AGR = 60.3% NEU = 61.1%
(Kelvin et al., 2023)	Big Five Personality	Transformer, Ensemble of BERT and IndoBERT	Mined Twitter data, annotated by a psychology expert	OPN = 73.3% CON = 82.5% EXT = 78.2% AGR = 77.3% NEU = 80.5%
(Lucky et al., 2023)	Big Five Personality	Ensemble (bagging) of BERT	Mined Twitter tweets and user profile data	OPN = 75.6% CON = 76% EXT = 85.7% AGR = 82.5% NEU = 65.4%

While we review 10 papers on the MBTI and 21 on the Big Five Personality Model, we have chosen to emphasize 5 recent papers for each of these personality measurement tools in Table I and Table II.

This selective approach aims to enhance clarity and understanding regarding the primary focuses and advancements within TBPP research. By spotlighting these select studies, we aim to facilitate a more accessible comprehension of recent findings and methodologies in the context of different personality measurement tools.

Based on previous works, Big Five Personality has bigger research scale than MBTI. One of the factors is that the MBTI dataset itself is skewed and improperly distributed among the classes (Khan et al., 2020). Bad dataset can lead to bad results especially in deep learning because of overfitting.

Table III. Popular NLP methods

NLP Method	Author	Total
BERT	(Keh & Cheng, 2019), (Leonardi et al., 2020), (Ren et al., 2021), (Christian et al., 2021), (El-Demerdash et al., 2022), (Kerz et al., 2022), (Kelvin et al., 2023), (Lucky et al., 2023)	8
CNN	(Majumder et al., 2017), (Tandera et al., 2017), (Xue et al., 2018), (Sun et al., 2018), (Ren et al., 2021), (Yang et al., 2023)	6
XGBoost	(Ong et al., 2017), (Tadesse et al., 2018), (Khan et al., 2020), (Amirhosseini & Kazemian, 2020)	6
Ensemble of models	(El-Demerdash et al., 2022)	5
LSTM	(Hernandez & Scott, 2017), (Cui & Qi, 2017), (Tandera et al., 2017), (Jeremy & Suhartono, 2021)	5
Bi-LSTM	(Sun et al., 2018), (Jeremy & Suhartono, 2021), (Ramezani, Feizi-Derakhshi, & Balafar, 2022b), (Kerz et al., 2022), (Ramezani, Feizi-Derakhshi, Balafar, et al., 2022)	3
SVM	(Ong et al., 2017), (Ergu et al., 2019), (Marouf et al., 2020), (Nisha et al., 2021)	4
GRU	(Jeremy & Suhartono, 2021; Tandera et al., 2017)	2
MLP	(Tandera et al., 2017; Tighe et al., 2020)	2
Naive Bayes	(Marouf et al., 2020), (Nisha et al., 2021)	2
Others	(Ren et al., 2021), (Ergu et al., 2019), (Ryan et al., 2023)	3

Our analysis revealed several key findings related to the research questions and objectives of this study. Notably, the use of pre-trained models like BERT and ensemble methods significantly improved the accuracy of text-based personality prediction. For instance, a combination of knowledge graphs with Bi-LSTM models achieved the highest accuracy of 71.5% for predicting the Big Five personality traits. Similarly, the BERT-CNN-RNN ensemble reached an impressive 85% accuracy for MBTI predictions. These findings suggest that sophisticated NLP techniques are highly effective in enhancing the precision of personality predictions.

The most popular NLP methods are shown in Table III. Pre-trained models such as BERT are preferred among researchers because it is a good model trained using large dataset. BERT (Bidirectional Encoder Representations from Transformers) stands as a language representation model rooted in the Transformer architecture. It undergoes pre-training on extensive textual datasets and is amenable to fine-tuning across various natural language processing undertakings, including sentiment analysis, named entity recognition, and question answering. BERT's exceptional performance in numerous NLP tasks stems from its capacity to capture contextual nuances. Traditional neural networks like CNNs also find prevalent use due to their innate aptitude for feature extraction. CNNs excel in discerning patterns within provided data, in this instance, keywords.

Research methods also progress differently. In the early years of 2017 – 2018, researchers use a single model of machine learning. Since 2019, the method starts to shift into using ensemble models even though some research still sticks to using single model.

In contemporary studies, a prevailing approach involves assembling or fusing multiple models. The strength of ensembles lies in their capability to compensate for individual model weaknesses by collaborating as a cohesive unit. However, these ensemble techniques entail protracted training times and necessitate substantial hardware or resources due to the demand for training multiple models in parallel.

Another often used method is Bi-LSTM and LSTM. LSTM is a modified RNN that covers RNN weakness. RNN cannot remember information in the long term, but LSTM could. LSTM can filter irrelevant information through the forgotten gate and passes the rest of relevant information to the input gate. By filtering irrelevant and relevant data, LSTM ensures more accuracy and reliability than RNN. While Bi-LSTM is a modified LSTM that can take inputs from 2 sides. This works by adding an extra layer of LSTM called 'backward layer'. This means it can obtain past and present information of input sequence components. Simple but effective method that yields high accuracy results such as SVM also preferred. Word patterns in different types of personality are divided by hyperplane depending on the number of features.

After conducting this literature review, utilizing advanced NLP methods, especially pre-trained models like BERT and ensemble approaches, significantly enhances the accuracy and reliability of text-based personality prediction. The research problem focused on identifying the most effective deep learning algorithms for this purpose within the MBTI and Big Five frameworks. Our analysis demonstrates that these advanced models not only improve prediction accuracy, but also address several challenges inherent in personality assessment from textual data, such as dataset imbalances and the complexity of human personality traits. Our findings support the hypothesis that leveraging deep learning and NLP can lead to more precise and efficient personality predictions, providing valuable tools for both researchers and practitioners in the field. Therefore, this study confirms that integrating state-of-the-art deep learning techniques with established personality models effectively answers the research problem, paving the way for future advancements in text-based personality prediction.

IV. CONCLUSION

This study aimed to address the research problem by systematically reviewing and comparing various deep learning algorithms for text-based personality prediction. The findings indicate that BERT models and ensemble methods are particularly effective in improving prediction accuracy, despite the higher resource demands associated with ensemble approaches.

The findings underscore the efficacy of integrating advanced NLP techniques with established personality frameworks like MBTI and Big Five. The extensive use of BERT models in personality prediction tasks, along with the emerging potential of ensemble methods, highlights the importance of sophisticated techniques in overcoming

individual model limitations and improving accuracy.

However, these advanced approaches also come with increased computational costs and longer training times. Additionally, the study highlights the challenges posed by imbalanced datasets, such as the standard MBTI dataset, and suggests corrective measures like data duplication, reduction, or resampling to mitigate these issues. Overall, the research confirms that integrating advanced NLP techniques with established personality frameworks like MBTI and Big Five can significantly enhance the accuracy and reliability of personality predictions from textual data, thus answering the research problem effectively.

The contributions of this study offer valuable insights into the current advancements and future directions in the field of personality prediction. By leveraging deep learning and NLP techniques, researchers and practitioners can achieve more precise and efficient personality assessments from textual data. This study paves the way for future innovations in text-based personality prediction, emphasizing the need for continued exploration and refinement of these methodologies.

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