

Mini Project Report
on
**Multi-modal Personality Prediction using the social
media images**

Submitted by

Kamble Suyash Nishikant : 20BDS029

Narendra Singh Dangi : 20BDS036

Rishabh Singh : 20BDS044

Under the guidance of

Dr. Pavan Kumar C

Assistant Professor, Computer Science and Engineering at



**INDIAN INSTITUTE OF
INFORMATION
TECHNOLOGY**

**DEPARTMENT OF DATA SCIENCE AND INTELLIGENT SYSTEMS
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY DHARWAD**

30/04/2023

Contents

1	Introduction	1
2	Related Work	2
3	Data and Methods	3
3.1	Dataset	3
3.2	Methodology	3
3.2.1	Convolutional Neural Network (CNN)	4
3.2.2	Recurrent Neural Network (RNN)	4
3.2.3	Artificial Neural Network (ANN)	4
3.2.4	Training model	5
4	Results and Discussions	6
4.1	Results	6
4.2	Discussion	7
5	Conclusion	7
	References	8

1 Introduction

Social media has caused social and even physical harm, calling for offensive content categorization. A transformer network uses computer vision and natural language processing, utilizing deep learning models like BERT, Electra, and face detection to analyze, recognize, and understand multilingual text and meme images posted on Facebook. Results show success in identifying offensive content directed toward public figures.

Tech advancements made photos popular on social media. Users select profile photos and post text or images about their life. A system using the Big Five Model aims to predict user personalities by analyzing pics. No existing system tracks personality analysis via images, so this research fills that gap. It examines how profile pic choices relate to personality variations via the Big Five model.

Social networking platforms facilitate the formation of a digital identity through content sharing and social connections. Personality traits refer to an individual's characteristics and inclinations, including their thought patterns and behaviors. By utilizing demographic and psychological factors such as maturity and gender, social media sites can collect data that reveals consumer personalities. The five-factor model is the most popular method of measuring individual distinctions within psychology, including extraversion, openness, agreeableness, neuroticism, and conscientiousness.

AI and machine learning are crucial for solving various problems, especially multimodal ones that require deep learning to handle diverse inputs and produce corresponding outputs. Our research focuses on a challenging multimodal issue due to its visual complexity, which can be resolved with a multimodal deep learning framework. Social media data, such as profile photos, can be used to predict individual preferences by analyzing user data with multi-modal personality regressors to develop a personality test system.

2 Related Work

Forecasting personality through traditional means can be challenging due to its multifaceted and subjective nature. However, an increasing number of studies are utilizing multimodal data and machine learning to predict personality traits. One approach involves computer vision to analyze facial features in images and predict the Big Five personality traits. Another method combines social media posts and visual cues to estimate personality traits. Various data sources such as Facebook user status updates and linguistic style have also been explored for personality prediction.

Research has examined the impact of demographic variables like age and gender on personality prediction, and several studies have replicated previous findings using different datasets. Our study aims to contribute to this trend by exploring the use of social media images to predict personality traits. By utilizing text-based and visual features, we plan to enhance the precision and robustness of personality prediction models. Multimodal machine learning based on social media data has shown immense potential in predicting personality traits, and our study places emphasis on the significance of images in this field, which is expected to lead to further breakthroughs.

Personality traits vary across different situations, which makes it necessary to use labels to describe them. One of the most widely used approaches for identifying personality traits is the Big Five model, also called "OCEAN," which includes five key characteristics: Openness, Conscientiousness, Extraversion, Neuroticism, and Agreeableness. This particular study has employed the Big Five model to classify personality types into five categories: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Those who rank high in Extraversion are typically outgoing and confident, and their pictures are usually more vivid compared to individuals with high Conscientiousness. Agreeable individuals are usually well-coordinated and polite, and they tend to post pictures in similar color schemes to that of people with high Extraversion. Conscientious individuals are typically precise and well-organized, and they prefer posting pictures of people instead of objects. Neurotic individuals are more prone to negative emotions and have a lower level of emotional resilience, which is why they usually post images in grayscale tones as opposed to those with the other traits. Lastly, individuals who score high on Openness are generally more receptive and creative, thus posting pictures with unique compositions and drawings.

3 Data and Methods

3.1 Dataset

The dataset used in this project was obtained from IEEE-dataport.org, a highly dependable source that provided 5000 images of social media posts generated by users. Interestingly, more than 10,100 users had labeled these images with personality traits, characterized using a well-curated Big Five personality model. Our team had a deliberate selection process for images having only one face, which was the user’s profile picture, and we resized all pictures to a uniform size and converted them to grayscale mode during pre-processing. To ensure comprehensive analysis and maintain the authenticity of our findings, the dataset was divided into three different sets, each having a unique purpose in our overall project. These sets include the training set, which comprised 70% of the total data, the validation set having 15%, and the testing set, which also consisted of 15%.

E	A	C	N	O
0.395	0.336	0.5	0.699	0.560
0.604	0.383	0.455	0.543	0.428
0.644	0.834	0.644	0.747	0.75
0.479	0.401	0.433	0.747	0.626
0.593	0.644	0.777	0.524	0.615
0.833	0.682	0.688	0.699	0.747
0.656	0.588	0.666	0.601	0.659
0.468	0.457	0.311	0.660	0.494
0.239	0.158	0.155	0.339	0.241
0.614	0.383	0.666	0.514	0.494

3.2 Methodology

The methodology used in this project involves a combination of deep learning models to predict a person’s scores in the five personality traits based on an image of their face.



3.2.1 Convolutional Neural Network (CNN)

The Convolutional Neural Network (CNN) is a highly popular neural network for image processing that acts as the foundation for deep learning models. Its primary function is to identify and extract significant characteristics from the input image, which it then passes on to the following model for additional processing.

3.2.2 Recurrent Neural Network (RNN)

The Recurrent Neural Network, also known as RNN, is one of the deep learning models employed in this task specifically designed to handle sequential data. Its purpose is to anticipate the evolving patterns of the data, bringing it to an understanding of how the features extracted by the Convolutional Neural Network (CNN) have transformed over time.

3.2.3 Artificial Neural Network (ANN)

Subsequently, after the Recurrent Neural Network (RNN) generates its output, the resultant is transmitted to the third model, which is an Artificial Neural Network (ANN) - this ANN bears the responsibility of performing the ultimate personality trait score prediction, reliant upon the

features that have been extracted by the Convolutional Neural Network (CNN) in conjunction with the temporal dynamics that have been captured by the aforementioned RNN.

3.2.4 Training model

Throughout the model's training, a binary cross-entropy loss function is employed to evaluate the level of inconsistency between the predicted scores and the genuine scores. To execute the training process, the Adam optimizer is leveraged as it is a popular optimization approach in deep learning to fine-tune the model's weights and biases.

In summary, the multimodal prediction system used in this project combines CNN, RNN, and ANN to predict a person's scores in the five personality traits based on an image of their face. The model is trained using a binary cross-entropy loss function and the Adam optimizer.

4 Results and Discussions

4.1 Results

In the field of personality prediction, machine learning models have been developed to accurately predict personality traits based on behavioral and linguistic data. The model discussed in this text achieved an accuracy rate of 46% on the test set, indicating that it is better than chance but still not highly accurate. The model's ability to predict each personality trait's accuracy varied from 43% for Openness to 51% for Conscientiousness, suggesting that it is better at predicting some traits than others.

Despite the model's moderate success, there is still a need for further improvements. These outcomes complement prior work done in this domain, indicating that there are many challenges that still need to be addressed to achieve greater accuracy. One important area for improvement is the model architecture, which involves refining the methodology used to develop the model. Another area is the dataset, which involves collecting and processing more diverse and representative data.

Improving model accuracy in personality prediction is critical, as it holds potential value in a wide range of fields, including psychology, human resources, and marketing. For example, accurate prediction of personality traits can be used to better understand consumer behavior and tailor marketing campaigns to individual customer needs. In the field of psychology, accurate personality prediction can assist in the development of personalized treatment plans for individuals diagnosed with mental health disorders.

In conclusion, the model discussed in this text achieved a moderate level of success in predicting personality traits. However, there is significant room for improvement, with enhancements in the model architecture and dataset necessary to achieve greater precision. The continued development of machine learning models in the field of personality prediction holds promise for practical applications across a wide range of industries, making it an area of active research and ongoing exploration.

4.2 Discussion

Several factors could be responsible for the low accuracy of the model, including the limited size of the dataset and the difficulty of predicting personality traits from images alone. To enhance the model’s performance, using a larger and more diverse dataset during training may be beneficial. Additionally, incorporating other modalities like audio and text could improve its accuracy further. These results suggest that forecasting an individual’s personality via social media images has great potential, which warrants further investigation.

5 Conclusion

To sum up, this project evidences the possibility of utilizing deep learning models to predict personality based on social media images. While the accuracy achieved is not high, it does suggest that there is potential for improved results with more data and better model architecture. The social media image-based multimodal personality prediction method established here is a good starting point for further research, and could have practical uses in fields like marketing, psychology, and human resources.

Despite our model currently only achieving a 46% accuracy rate, there is ample scope for future advancements. We plan to experiment with alternate architectures and techniques - such as transfer learning and ensemble methods - to further enhance our model’s accuracy. We may also explore the use of additional types of social media information, like text or audio, to make more accurate personality trait predictions.

All in all, this project reveals the promise of deep learning models for predicting personality via social media images, and emphasizes the ethical considerations involved in data gathering and model development. As further research progresses, personality prediction models could become increasingly effective and useful in diverse applications.

References

1. Pennington, J., Socher, R., & Manning, C. (2014). GloVe: Global vectors for word representation. Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP),1532-1543.
2. Gosling, S. D., Augustine, A. A., Vazire, S., Holtzman, N., & Gaddis, S. (2011). Manifestations of personality in online social networks: A self-reported Facebook survey. *Personality and Social Psychology Bulletin*, 37(4), 506-520.
3. Yousefi, M. R., & Dehghani, M. (2019). Personality prediction from Twitter data: A review. *Journal of Information Science*, 45(6), 787-812.
4. Kosinski, M., Matz, S. C., Gosling, S. D., Popov, V., & Stillwell, D. (2015). Facebook as a research tool for the social sciences: Opportunities, challenges, ethical considerations, and practical guidelines. *American Psychologist*, 70(6), 543-556.
5. Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2012). ImageNet classification with deep convolutional neural networks. *Advances in Neural Information Processing Systems*, 1097-1105.