ESP-JETA
ESP Journal of Engineering & Technology Advancements
ISSN: 2583-2646 / Volume 3 Issue 1 February 2023 / Page No: 31-38
Paper Id: JETA-V3I1P106 / Doi: 10.56472/25832646/JETA-V3I1P106

Research Article

Personality Prediction Using Machine LearningTechniques- A Review

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Received Date: 14 January 2023 Revised Date: 30 January 2023 Accepted Date: 04 February 2023

Abstract**:** *Platforms like Facebook, Twitter, YouTube, and Instagram, produce enormous amounts of data every second and have emerged drastically over the past 10 years as social network development has accelerated. Important knowledge about social interactions and human behavior is provided by this vast, comprehensive data set. Therefore, by gathering and examining pertinent data from social media, it is possible to determine a person's personality traits. The combination of traits and characteristics that contribute to an individual's unique character, such as thinking, feeling, and conduct, is referred to as their "personality." Cyberbullying, or bullying via electronic messages, has emerged as a result of the exponential rise in social media users. User profiles and historical textual elements can be used to forecast personalities. The Big Five Model, also known as the OCEAN model, the Support Vector Machine (SVM), the Random Forest Classifier, and the K-Nearest Neighbors (KNN) algorithm are used in this research to propose a machine-learning technique for personality prediction.*

Keywords: *Personality, Support Vector Machine, K-Nearest Neighbors, Random Forest Classifier, OCEAN Model.*

I. INTRODUCTION

Businesses and recruiters are already making investments in machine learning-based personality prediction systems. The top candidates may be chosen, and any errors brought on by the manual analysis process can be minimized by creating a machine-learning method. Society has always included bullying. With the advent of the internet, it was only a matter of time before bullies discovered this brand-new, lucrative medium. Bullies developed the ability to carry out their heinous crimes in anonymity and with significant distance between them and their targets thanks to technologies like email and instant messaging. Cyberbullying, as described by Cambridge Dictionary, is the act of using the internet to hurt or intimidate another person, especially through sending them hurtful communications. The impact that cyberbullying has on the victim is what distinguishes it from regular bullying. According to psychology, characteristics like generosity, extroversion, and anger provide a means to characterize a person. The most narrowly concentrated field of psychology literature is the trait-driven approach. Consider them to be crafty, antisocial, and manipulative; just approximately 1% of people fit this description. People that exhibit psychopathic conduct frequently don't experience any discomfort or guilt when engaging in immoral behavior, making immoral decisions, and committing immoral acts.

A. Problem Statement

Nowadays many people are suffering from cyberbullying from social media to predict the personality of a person by taking the OCEAN model. For predicting the personality of the user, Machine Learning plays a crucial role by observing the comments in the chat box, and responses in social media. Developing a machine learning model with the help of algorithms like K-Nearest Neighbors, Support Vector Machine, and Random Forest Classifier for predicting the personality of the users. By observing the accuracies of the above-mentioned classifiers, the best classifier can be chosen.

B. Existed System

Table 1: Proposed Algorithms in Papers

Title of The Paper	Algorithms Used	Benefits	Limitations
Improving Intelligent Personality Prediction using Myers-Briggs Type Indicator and Random Forest Classifier	Myers–Briggs Type Indicator, Naïve Bayes Classifier, Support Vector Machine (SVM) K-Nearest Neighbour (KNN),	It contains many decision trees so highly accurate No overfitting problem It can use for both regression and classification	This algorithm's need for several decision trees makes the process of making predictions slow. This is due to the time-consuming nature of the procedure, which requires identical input to also be forecast and voted on by each of the forests.

Social Media Cyber bullying Detection using Machine Learning	Neural network, SVM, Classifier	By obtaining this accuracy, our work will undoubtedly enhance the ability to detect cyberbullying and assist users in doing so in a secure manner.	Only small data may be detected here. Deep learning allows us to implement enormous data.
Automatic personality prediction from Indonesian users on Twitter using word embedding and neural networks	Big five model, neural network, long short- term memory (LSTM), bi-directional LSTM (BILSTM), and gated recurrent unit (GRU)	It is possible to develop a neural network personality prediction using non-semantic language elements and get a good result.	If simple text is analyzed, conscientiousness is more difficult to predict than other characteristics
Evaluating Efficacy of Classification Algorithms on Personality Prediction Dataset	HEXACO Model, Classification	This work avoids the time and money waste by predicting a person's personality based on their responses to address the questions.	It is difficult to predict for the people who don't use social media
Detection and Classification of Psychopathic Personality. Traits from social media Text Using Deep Learning Model	Machine learning classifiers and proposed model, Bi-LSTM	In terms of precision (85%), recall (85%), f 1- score (85%), and accuracy (85%), the Bi LSTM model outperformed all other comparable models.	The present study focuses on textual material in English. The current study does not make use of many capabilities, such as audio, video, and pictures, which could improve system performance.

C. Proposed System

a) In the proposed system, the dataset contains the details of the social media users which are collected from Kaggle. Then the data is pre-processed which includes data cleaning, and removal of noise i.e., missing data.
b) By considering various inputs to predict the personality of the user by a machine learning algorithm to control the cyberbullying
c) K-Nearest Neighbors, SVM, and Random Forest classification algorithms are performed on the pre- processed data for the prediction of the Personality of the user.
d) The performance of the algorithms is observed by comparing the accuracy between the algorithms.

II. MATERIALS AND METHODS

A. Literature Survey

This Paper **(Abidin et al., 2020)** [1] proposed Myers-Briggs Type Indicator (MBTI) method which investigation focuses on sociologists and psychologists. Analyze users' MBTI types using Term Frequency Inverse Document Frequency based on their social media posts, including videos, photos, and other links (TF- IDF). Machine learning algorithms Here they used the Naive Bayes classifier, support vector machine, and k- nearest neighbors. Utilizing the Big Five Model, which analyses personality traits to forecast a person's personality. LDA algorithms are useful for predicting the personality of people by incorporating SVM. People frequently express their thoughts, feelings, and ideas, which creates a rich and insightful collection of personal data that may be used in many different situations. The Big Five Inventory (BFI) personality test is a recent project that developed a questionnaire to measure personality qualities. It is made up of 44 brief phrases with a Likert scale with five levels, and it may evaluate each of the five personality traits as well as the six underlying facets for each trait. After that, the questionnaire was given to the 26 panelists, who were also requested to provide their Twitter accounts. In the pre-processing stage, user-created textual characteristics like URLs, mentions, and hashtags are removed. The trained model was then given each tweet vector individually to produce a prediction and the average.

This Paper **(Hani et al., 2019) [2]** proposed That the language patterns of bullies can be identified using machine learning, which can then produce a model to identify cyberbullying behaviors. The effectiveness of TFIDF and sentiment analysis feature extraction approach using SVM and neural network classifiers is examined. The proposed strategy consists of three major phases.

a) Pre-processing

b) Proposed model
c) Proposed approach

Pre-processing: It purges the data by reducing text, stopping words and encoding cleaning, word-correcting, tokenizing noise, and lowering unneeded text.

Model: Textual information is transformed into a format that machine learning algorithms can use. TFIDF analyses the text and the word weights relative to the document or sentence. This is also useful for sentiment analysis.

Approach: The collected features are supplied into a classification algorithm to train and test the classifier at the classification stage. SVM and neural networks were two of the classifiers they utilized. Input, hidden, and output layers make up its three layers. There are 128 nodes in the input layer. It has 64 neutrons in the buried layer. A Boolean output is a layer in the output.

This Paper (**Jeremy et al., 2021) [3]** proposed According to the Big Five personality paradigm, there are five primary personality traits: agreeableness (AGR), conscientiousness (CON), extraversion (EXT), neuroticism (NEU), and openness (OPN). Despite measuring personality on a scalar scale, the big five divides each trait into two categories: high and low.

Data set obtained: With the present size of the dataset, down-sampling would result in a smaller dataset, which is not desirable. Upsampling would raise the frequency of some words that represent a particular user rather than the collective user in a particular attribute category.

Data preparation: It excludes the URL, and translates the emoji to text such as "happy" or "sad," Twitter special characters, ASCII symbols, numbers, punctuation, noon alphabetic characters, tokenization, case folding, and stop word removal should all be removed.

This Paper **(William et al., 2020 [4]** proposed the foundation of human personality is depicted in six dimensions by the HEXACO model. Openness to Experience (O), Agreeableness (A), Emotionality (E), Extraversion (X), and Honesty-Humility (H) are the personality traits that are measured (O).

Table 2: Model Attributes with Facts and Adjective Classification

MODEL	FACTS	ADJECTIVES
Honesty-Humility(H)	Sincerity, Fairness, Avoidanceof Greed, and Modesty	Sincere, trustworthy, devoted, respectful, modest/unassuming vs sneaky, deceptive, selfish, pretentious, hypocritical, boastful, pompous
Emotionality (E)	Fearfulness, Anxiety, Dependence, and Sentimentality	Emotional, nostalgic, scared, nervous, and fragile versus courageous, strong, independent, self-assured, and secure
Extraversion (X)	Self-confidence in social situations, social boldness, sociability, and liveliness	Many who are outgoing, vibrant, extraverted, sociable, talkative, enthusiastic, and active contrast with those who are shy, silent, distant, introverted, calm, and reserved
Agreeableness (A):	Forgiveness, gentility,adaptability, and patience	Tempered, quarrelsome, defiant, choleric versus patient, tolerant, calm, reasonable, accommodating,lenient, gentle

Conscientiousness(C)	Organization, diligence, perfectionism, and prudence are some of the facets	Sloppy, negligent, careless, lax, irresponsible, absent-minded versus ordered, disciplined, attentive, cautious, comprehensive, precise
Openness to Experience (O)	Appreciation of the aesthetic inquisitiveness, creativity, and unconventionality	intellectual, inventive, unconventional, and satiricalvs superficial, unimaginative, and traditional

A Paper (**Asghar et al., 2021) [5]** proposed a method that was designed to divide the text into classes of psychopaths and non-psychopaths using a deep learning model called BiLSTM. To save precious data using Backward LSTM and future data using Forward LSTM, BiLSTM was created.

Data collection: Three psychiatrists were given the work, and each was classified as "psychopath" or "non- psychopath." As a result, each tweet garnered three votes. The class label is selected based on a majority voting scheme, i.e., a tweet having two votes for “psychopath” and one for “hhhhhhhhhhhhhh,” is tagged as “psychopath.

Data Cleaning: By using text classifiers on the data, such as case transformation, special character deletion,tokenization, application of the DL Model, embedding layer, dropout layer, BiLSTM, and output layer.

The Proposed System: By applying tokenization, case transformation, special character deletion, DL Modelapplication, embedding layer, dropout layer, BiLSTM, and output layer to the data as text classifiers.

III. METHODOLOGY

The Big Five (OCEAN) personality traits of individuals have been actively predicted by machine learning models employing a wide variety of data. Industries such as Naive Bayes and Support Vector Machines frequently employ supervised machine learning techniques to predict personality traits.

A. Hexaco Model

The foundation of the human psyche is depicted in six dimensions by the HEXACO model. The HEXACO Model is made up of six components: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Consciousness (C), and Openness to Experience (O)are the personality traits that are measured. There are two endpoints for each aspect, where the qualities can be fully described by their extremes. The HEXACO was constructed similarly to other qualities in previous trait taxonomy frameworks. This model has several characteristics in common with other trait models, which encourages the development of trait theory in the area. The HEXACO paradigm, on the other hand, is unique in that it incorporates honesty and integrity notions. Some machine Learning algorithms are needed to identify the personality of the person.

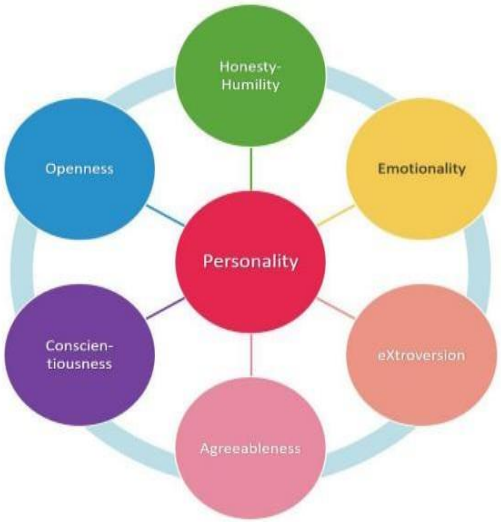


Figure 1: HEXACO Model

B. Support Vector Machine

A help vector is a representation of machine learning (ML) machine data as points in space. The ranking of the new instances is then determined by how many are present in the same space. The algorithm only uses a portion of training points in the judgment in high-dimensional spaces since it does not support five-fold time-consuming cross-validation. It uses algorithms to instruct and classify data according to polarity degrees. Which uses the tags red and blue, along with the data characteristics X and Y, to display. Next, the most- separating hyperplane is discovered by the SVM. The only dimension here is two. Anyone on one side of the red line receives twice as much blue highlighting. There are also "pleasant" and "bad" things. The distance between each tag on the machine learning plane must be the greatest. As databases become increasingly complex, even complexity and precision start to correlate. Apply a Z-axis to what is 3D to create a 2D circle. MLMs, or multidimensional SVMs, enable more precise learning. Classification Algorithms KNN uses training data to determine a trend in the locations of relatives. As a classification algorithm, it can locate data close to its neighbors. It will go to the class having the best chance of being number one.

C. Random Forest Classifier

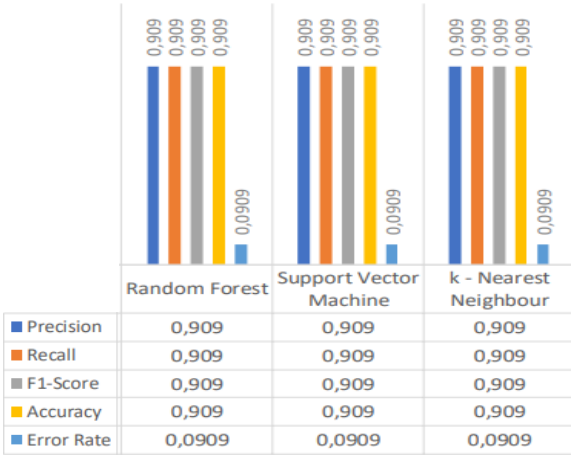
The forest-based estimator uses a variety of decision trees to fit different subsamples, and by taking the average, it avoids overfitting the model. Except by replacement, the subsample nearly always closely resembles the originating sample. It is a challenging and drawn-out project. In some cases, less overfitting and the use of a random forest are more accurate. In that it creates some sort of real-world decision trees from your training dataset and then compares the new results, the random forest algorithm is a variation on the decision tree technique. The distance to connect to the nearest tree is set on the data scale. Since random forests don't force data points into arbitrary categories, they are effective.

D. K- Nearest Neighbors

This subset-based learning method for classification is subset-based since it doesn't try to build an all- encompassing model. A resounding majority of the k nearest points decides on the formation of the regiment. Computing the distance between each instance and the full training set involves a significant computing cost. The technique works well with large amounts of data, is simple to use, and can tolerate noisy data. Using a Personality Prediction Dataset to Assess the Performance of Classification Algorithms

E. Comparative Analysis

All these algorithms show the best accuracies from the set of inputs [4].



	Random Forest	Support Vector Machine	k - Nearest Neighbour
Precision	0,909	0,909	0,909
Recall	0,909	0,909	0,909
F1-Score	0,909	0,909	0,909
Accuracy	0,909	0,909	0,909
Error Rate	0,0909	0,0909	0,0909

Figure 2: A comparative Analysis of Evaluating the Efficacy of Classification Algorithms

F. Attention-based BILSTM for Psychopaths Detection

a) Data Collection

The gathered information is kept in an Excel file for later used hand annotation to categorize each review text and each tweet in the acquisition dataset into a psychopath and non-psychopath classifications. The class labels "psychopath" or "non-psychopath" were given to each of the human annotators (psychiatrists). As a result, each tweet received three votes. The classification label is chosen using a majority voting system, which means that a tweet with two votes for "psychopath" and one or "non psychopath" is categorized

b) Data cleaning

Case transformation: This method uses a Python-based Script to change the input text to lowercase. Elimination of special characters: In this module, characters from the input text, such as "#," "%," and "?" "@,""-," "&," "$," "/," and "," are removed. This aids in overcoming dimensionality reduction.

Tokenization: Tokenization's goal is to break up the input text into manageable tokens or parts. We utilized Kera's tokenizer to perform tokenization.

c) Applying Deep Learning Model

In this section, the author discussed the various layers utilized in the BILSTM deep neural network model, which is a suggested model for identifying psychopaths from input text.

Embedding layer: this layer performs word embedding using Keras. The main purpose of this system is to represent a word level in which word indices are transformed.

Dropout Layer: This layer's purpose is to avoid overfitting. The dropout layer's rate parameter is set to the specified threshold (i.e., 0.7), with a range of 0 to 1. This layer is positioned beneath the embedding layer to regulate the neurons' haphazard activity.

Bidirectional LSTM Layer: The BiLSTM layer functions as a second layer of the suggested model, taking input from the embedding layer and re-encoding it. The BiLSTM achieves 2-way encoding by keeping track of both the past and future data.

Output Layer: Finally, the output layer performs the classification task by using the SoftMax activation function. The input text is divided into sentences from psychopaths and non-psychopaths in this layer.

Integer Encoding via Tokenizer

For the deep learning model to work, the sample input text must be prepared in numerical form. In this regard, the tokenization process is where the numerical representation of the input text that has been provided begins. Each word is given an integer value using the Keras tokenizer method "tokenizer. fit on texts," such as "I:1" "just:2" "wanted:3" "to:4" "see:5" "how:6" "it:7" "felt:8" "to:9" "shoot:10" s"grandma:11"]. Next, the input text is transformed into an integer sequence like [1,2,3,4,5,6,7,8,9,10,11] using the "tokenizer. text to_ sequences" method of the Keras tokenizer.

The input is ready and fed into the first layer of the suggested deep-learning model. Word Embedding Vector via Embedding Layer: The model's foundational layer converts already obtained discrete integers into low-dimensional feature (embedding) vectors that help extract syntactic and semantic information. For instance, the feature vector [0.1,0.3,0.5,0.4] is present for the example word "I" with integer number "1". This layer's output is a word embedding matrix as a result. Dropout Rate via Dropout Layer: The dropout layer, which follows the embedding layer, is the following layer. The dropout rate parameter has values between [0, 1]. Its responsibility is to lessen the overfitting issue.

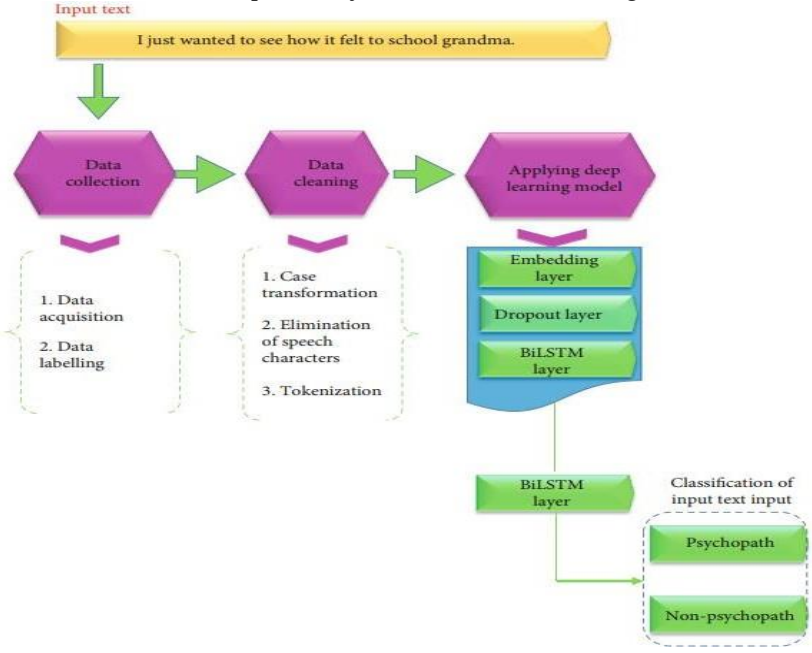


Figure 3: Attention-based BILSTM for Psychopath's Detection

IV. RESULTS AND DISCUSSION

All training scores and losses produce mediocre results, but the exam score appears to be the opposite. It is interesting to note that conscientiousness has a substantially lower score than extraversion given that both conscientiousness and extraversion have unbalanced datasets (74.2% and 71.5% in proportion, respectively). This suggests that conscientiousness is more difficult for a machine to predict purely from textual context. The total performance in the previous table may have resulted in a training in score but a low-test score due to the very low conscientiousness test score.

Table 3: Output Scores of Model Attributes

	Train Score	Train Loss	Valid Score	Valid Loss	Test Score	Test Loss
Agreeableness	0.856	0.3252	0.8	1.4304	0.7333	0.6742
Conscientiousness	0.7866	0.2468	0.7	4.0863	0.5412	0.4087
Extraversion	0.8643	0.4595	0.8621	1.792	0.827	0.5814
Neuroticism	0.8545	0.3539	0.72	1.0307	0.6259	0.7558
Openness	0.7792	0.5048	0.7805	1.6127	0.6185	0.6254

In comparison to other machine learning models, the accompanying table demonstrates that the Random Forest model has higher accuracy (100%) in all four MBTI personality characteristics. For the categories of Introversion (I)-Extroversion (E), Sensation-Intuition (S-N), and Intuition-Sensation, the accuracy of the Random Forest model is significantly greater than the Support Vector Machine (SVM) model. SVM's judgment-perception accuracy is significantly lower than that of the Random Forest model. The Random Forest model performs better overall for this dataset than the other three machine learning models.

Table 4: Overall Score

Model	**E vs I**	**S vs N**	**F vs T**	**J vs P**	**Overall**
Random forest	100%	100%	100%	100%	100%
KNN algorithm	83.66%	88.11%	77.64%	77.74%	40.62%
SVM	77.16%	86.03%	56.54%	47.16%	16.94%

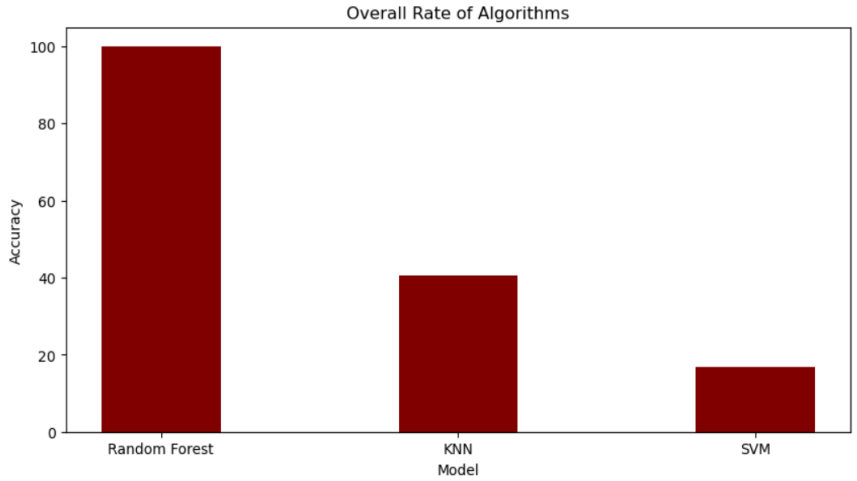


Figure 4: Graphical Representation of Scores

V. CONCLUSION

The on-going research aims to classify text into psychopaths and non-psychopaths using a deep neural network model known as Bi-LSTM. The suggested study is divided into three sections: data collection, preparation, and deep learning model application (BiLSTM). In this paper, an approach to detect the personality of the user through Machine learning algorithms. Here based on the accuracies of the algorithms, Random Forest showed great accuracy ahead of other algorithms. By obtaining this accuracy, future work will undoubtedly enhance the ability to detect cyberbullying and assist users in doing so in a secure manner.

VI. REFERENCES

[1] Abidin, N. H. Z., Remli, M. A., Ali, N. M., Phon, D. N. E., Yusoff, N., Adli, H. K., & Busalim, A. H. (2020). Improving Intelligent Personality Prediction using Myers-Briggs Type Indicator and Random Forest Classifier. International Journal of Advanced Computer Science and Applications, 11(11).

[2] Hani, J., Mohamed, N., Ahmed, M., Emad, Z., Amer, E., & Ammar, M. (2019). Social media cyberbullying detection using machine learning. International Journal of Advanced Computer Science and Applications, 10(5).

[3] Jeremy, N. H., & Suhartono, D. (2021). Automatic personality prediction from Indonesian users on Twitter using word embedding and neural networks. Procedia Computer Science, 179, 416-422.

[4] William, P., & Badholia, A. (2020). Evaluating Efficacy of Classification Algorithms on Personality Prediction Dataset. Ilkogretim Online, 19(4), 3362-3375.

[5] Asghar, J., Akbar, S., Asghar, M. Z., Ahmad, B., Al-Rakhami, M. S., & Gumaei, A. (2021). Detection and classification of psychopathic personality traits from social media text using deep learning model. Computational and Mathematical Methods in Medicine, 2021.

[6] M. Sangeetha, S. Amaresan, 2022. "Line Drawing Algorithms in Computer Graphics 2(1): 12-16.

[7] Kalla, Dinesh and Smith, Nathan and Samaah, Fnu and Polimetla, Kiran, Facial Emotion and Sentiment Detection Using Convolutional Neural Network (January 2021). Indian Journal of Artificial Intelligence Research (INDJAIR), Volume 1, Issue 1, January-December 2021, pp. 1–13, Article ID: INDJAIR_01_01_001, Available at SSRN: https://ssrn.com/abstract=4690960