

# DEPRESSION DETECTION USING EMOTIONAL ARTIFICIAL INTELLIGENCE IN PYTHON

Ch. Nagaraju sir, P.Jyothi prasanna lakshmi, E.Nagavamsi, P.Praveen kumar, K.Vamsi  
krishna

Assistant Professor, Priyadarshini Institute of technology & Science, AP, India.  
Under Graduate, Priyadarshini Institute of Technology & Science, AP, India.

## ABSTRACT

Depression is a prevalent mental disorder that can have a significant impact on people's mental health as well as their day-to-day lives. Depression and mental illness are a key problem in society nowadays. It can cause a loss of interest in general activities that can lead to suicidal thoughts. Hence, the need of an automated system that can help in detecting depression in people of various age groups is being realized. In order to detect depression, Researchers have been looking for approaches to effectively identify depression. A number of studies have been proposed in this regard. Here, In this study, we are analysing various existing studies based on Artificial Intelligence (AI) and diverse Machine Learning (ML) techniques being used to detect depression. Apart from it, different approaches used to detect emotion and mood in an individual are discussed. This study analyses how facial expressions, images, emotional chatbots and texts on social media platforms can be effectual in detecting one's emotions and then depression. Naive-Bayes, Support Vector Machines (SVM), Long Term Short Memory (LSTM) – Radial Neural Networks (RNN), Logistic Regression, Linear Support Vector, etc. are the various ML techniques used to recognize emotions from text processing; Artificial Neural Network (ANN) is used for feature extraction and classifications of images to detect emotions through facial expressions. This paper aims to provide the survey of various AI and ML techniques which help in the detection and analysis of emotion and hence depression along with their related research issues

## INTRODUCTION

Depression can occur in people of all ages. It can be very risky and can lead to anxiety attacks, death after a heart attack and problems like blood pressure and diabetes. Therefore, it is very important to detect it and find causes of the same that can lead to appropriate treatment. There is also a need to remove stigma around depression and mental health therefore Social Network Mental Disorder Detection can be performed which can help in de-stigmatizing it. Tests can be performed based on various artificial intelligence and machine learning algorithms under different scenarios to detect emotional imbalance. With the rise in technology, various AI-based approaches are evolved to make machines emotionally

intelligent to detect emotions in human beings. Text-based emotion recognition, for example, sentiment analysis of tweets and posts on various social media platforms can help in detection of the mood and emotion of the user, also help in prediction of suicidal thoughts in user and prevention of suicide by warning the users or their closed ones. For this, various machine learning algorithms like Naive-Bayes, Support Vector Machines (SVM), etc. can be used and results can be evaluated through confusion matrix. The algorithm which performs well will have high precision score and helps in correctly predicting sentiment that can be either positive or negative.

Emotions can be detected through facial expressions, various gestures, speech, text analysis, etc. To cite an example, an AI based driving application which can alert the driver in car if he sleeps while driving and therefore can prove to be a life-saving application. All of this can be done through facial expression detection of the person which captures facial image by camera and identifies that the person is sleeping or not. Similarly, with the help of various gestures of eyes, mouth, nose and hands moods like anger, happiness, sadness, neutral, etc. can be detected via emotion detection systems using image and video processing. Emotions can also be detected by chatbots with the help of analysis of text and emoticons user exchanges with the chatbots. If a user is sad then the system will automatically generate a joke or play music to lighten the mood of the user. For this, ML, AI and data mining techniques are being used.

Hence, in order to identify opportunities or to avoid potential risks, the machine learning model requires additional time and adequate resources to train it properly. Combining machine learning with AI and cognitive techniques can make a model even more effective while processing large volumes of data. Classification algorithms and regression algorithms are types of supervised machine learning algorithm. The Classification algorithms are used when the output is restricted to a fixed set of values. For example, for a classification algorithm that filters spam emails, the input would be an incoming email of the respective user, and the output would be the name of the folder in which to email has to be stored, namely inbox or spam folder. This algorithm that identifies spam emails, can even have a output of either spam or not, represented by the Boolean values true and false. Such as in our case, where the classification algorithm predicts the output as very depressed, mildly depressed or not depressed. Regression algorithms are identified for their continuous outputs, which means that the output generated can be any value within a given range. Examples of these continuous values are temperature, length, or price of an object with specific fixed units. Active learning algorithms access the desired outputs (using training labels) for a limited set of given inputs based on the budget, and optimize the range of inputs for which it will acquire

sample labels. When used interactively, these are presented to a human user for labeling and classification purpose.

## **RELATED WORK**

The literature review of this paper is divided into three subsections as per the detection of emotions with respect to different sources. The first sub-section discusses about the studies conducted to detect depression through sentiment analysis of twitter tweets. The second sub-section converse about detection of depression using facial expression (image and video processing). The last sub-section deals with the use of chatbots, emotional AI and combined inputs (text, audio, image and video) for detecting depression. All these sources to detect depression are discussed in the terms of various machine learning techniques.<sup>4</sup>

Twitter sentiment analysis and various ML techniques (Text processing) NLP is a branch of AI that employs the aforementioned computational tools, but it focuses on how computers handle and analyse human language in the form of unstructured text, including language translation, semantic comprehension, and information extraction. Due to the large amount of raw input data in the form of text and conversation, mental health treatment will rely significantly on NLP before being able to undertake other AI approaches. The ability of a computer programme to automatically interpret the meanings of underlying words, despite the ambiguity of human language, is a significant technological achievement that is critical for mental health applications.

The study discussed in [2] talks about the feasibility of consistently identifying, and pursuing the diagnosis of individual tweets is established. A bag of words approach is used to quantify depression through an analysis of word frequencies. Four different types of binary classifiers are used namely decision trees, LSV Classifier, a Logistic Regressive approach and Naïve Bayes algorithm. By using a collection of 2.5 M tweets, 81% accuracy rate in classification is achieved, with a precision score of 0.86. The performance of the proposed system is evaluated through precision, recall and F1- Score. The study claims that their proposed method may be helpful in developing tools to estimate the risk of an individual being depressed. The study found to preferably make use of linear Support Vector Machine experimentally. The method proposed in [5] makes use of emotional artificial intelligence to detect depression in individuals. It uses Natural Language Processing and sentiment analysis of tweets to detect depression. First the data is collected from Twitter using Twitter APIs. Then keyword search based on wordlist occurs, tweets are filtered in JSON format and then the text element is extracted from the JSON format. Further, the data is

cleaned and csv file is generated for train and test set for which the ratio is 80:20. Second step in the training phase is Data Pre-Processing in which training csv file is read for inputs. Tokenisation, Stemming, Stop Words Removal, POS Tagger are the pre-processing methods applied on the data. Then a bag of words model is created which calculates the number of occurrences of each term and it is used as a feature to train a classifier. The trained classifier and count vectorizer objects are dumped to pickle file. Third step is testing phase in which pre-trained model is loaded from the pickle file and text is pre-processed in the same manner as the training data. Then the test tweets are classified into positive or neutral and confusion matrix is computed. It is observed that Multinomial Naïve Bayes algorithm worked better than SVM in terms of accuracy.

## METHODOLOGIES

### **Dataset:**

The problem we'll solve is a binary classification task with the goal of predicting an individual's health. The features are socioeconomic and lifestyle characteristics of individuals and the label is 0 for poor health and 1 for good health

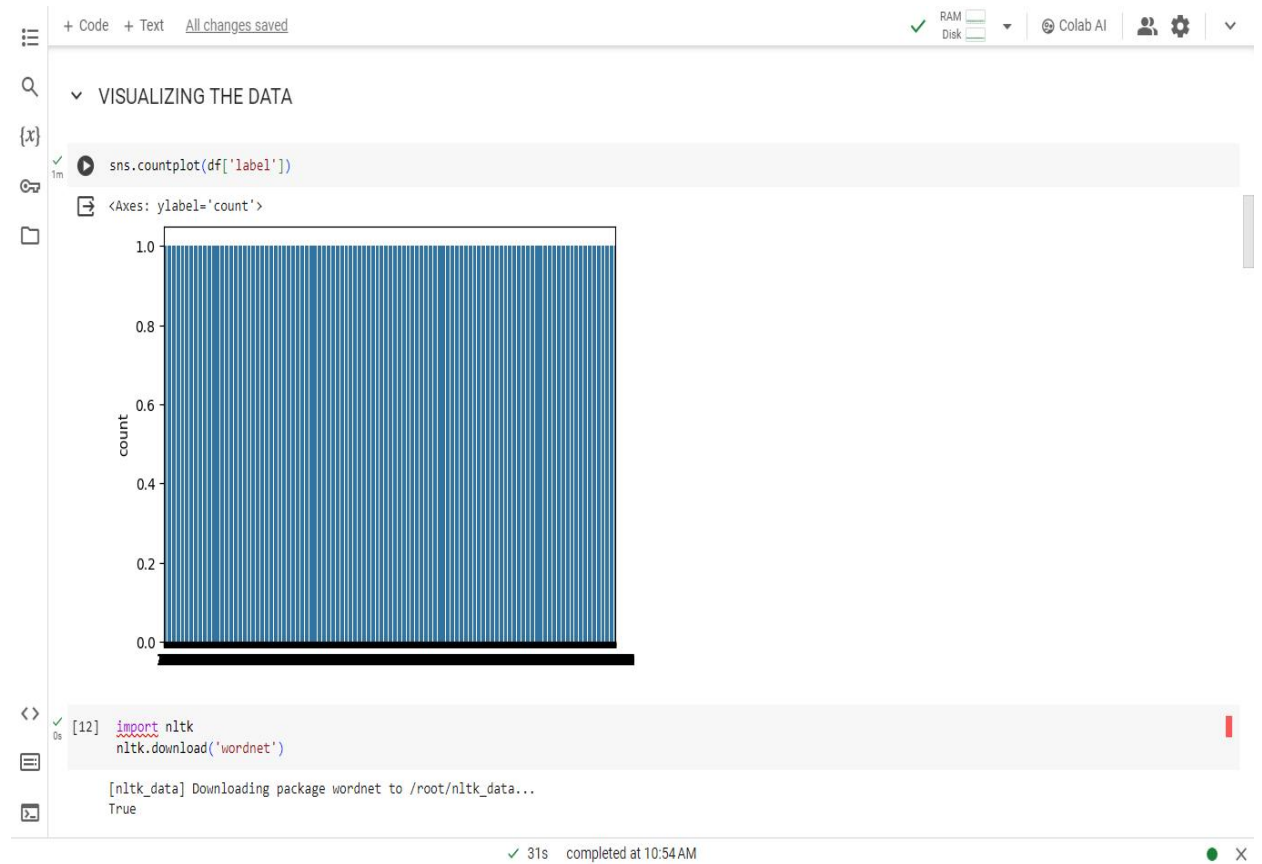
### **Preprocessing:**

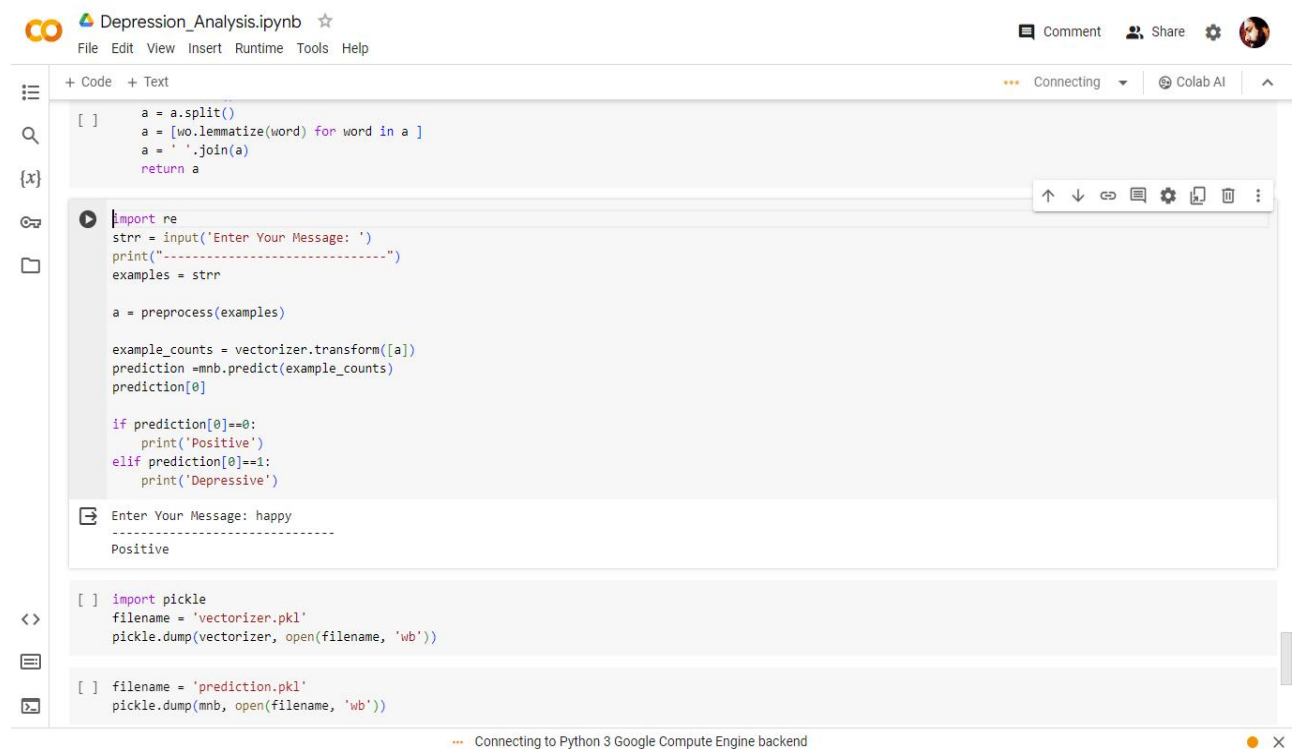
Generally, 80% of a data science project is spent cleaning, exploring, and making features out of the data. However, for this article, we'll stick to the modeling. an imbalanced classification problem, so accuracy is not an appropriate metric.

### **Feature Importance:**

Random forest algorithm is that it is very easy to measure the relative importance of each feature on the prediction. Sklearn provides a great tool for this that measures a feature's importance by looking at how much the tree nodes that use that feature reduce impurity across all trees in the forest. It computes this score automatically for each feature after training and scales the results so the sum of all importance is equal to one.

## RESULTS





```
Depression_Analysis.ipynb ☆
File Edit View Insert Runtime Tools Help

+ Code + Text
[ ] a = a.split()
    a = [wo.lemmatize(word) for word in a ]
    a = ' '.join(a)
    return a

import re
strr = input('Enter Your Message: ')
print("-----")
examples = strr

a = preprocess(examples)

example_counts = vectorizer.transform([a])
prediction =mnb.predict(example_counts)
prediction[0]

if prediction[0]==0:
    print('Positive')
elif prediction[0]==1:
    print('Depressive')

Enter Your Message: happy
-----
Positive

[ ] import pickle
    filename = 'vectorizer.pkl'
    pickle.dump(vectorizer, open(filename, 'wb'))

[ ] filename = 'prediction.pkl'
    pickle.dump(mnb, open(filename, 'wb'))

Connecting to Python 3 Google Compute Engine backend
```

## CONCLUSION

Depression is becoming an epidemic disease that affects people of all social classes, cultures, and countries on a frequent basis. Due to the inherent nature of solitude, finding those who seek for help because of mental condition but are unable to express their desire is difficult, and often goes overlooked even by those who are depressed. Since textual sentiment analysis is a non-invasive technique that can be constantly monitored and controlled, it can help diagnose the disease. This is a big support in the combat against depression since it allows us to distinguish times of happiness and melancholy without visiting a psychologist, allowing us to fight back quickly when needed. Depression is detected, analysed and prevented through twitter sentiment analysis (textprocessing), facial expressions (image and video processing) and use of chatbots, emotional AI and combined inputs (text, audio, image, video). Various artificial intelligence and machine learning techniques like Naïve-Bayes, LSTM – RNN, Logistic Regression, Linear Support Vector, PCA, KNN Classification, etc. are being used to recognize emotions and hence to detect depression. Efficiency and performance of various algorithms like SVM, Multinomial NaïveBayes are analysed to see which works better to detect emotions and hence depression through tweets. Interactive technologydriven AI-based solutions are also discussed. For example, Chatbot detects depression and responds back with a joke or song to lighten the mood of the user. Such kind of emotional AI and MLBased solutions can prove to be beneficial in detecting,

analysing and preventing depression and also provide a cure to it. In future, these approaches can be integrated into a vast system to clinically categorize patients suffering from depression on the basis of discovering their emotional profiles. To conclude, depression, mood and emotion can be detected through text, images, videos, speech, gestures, etc. through different AI and ML techniques for each of them.

## REFERENCES

- [1] A. Savadi, C.V. Patil, Face Based Automatic Human Emotion Recognition, *IJCSNS Int. J. Computer Sci. Network Security* 14 (7) (2014) 79–81.
- [2] M. Nadeem, Identifying depression on Twitter. arXiv preprint arXiv:1607.07384, 2016.
- [3] S. Oak, Depression Detection and Analysis, in: 2017 AAAI Spring Symposium Series, 2017 March.
- [4] A Mercy Rani, R. Durgadevi, Image Processing Techniques To Recognize Facial Emotions, *Int. J. Eng. Adv. Technol. (IJEAT)* 6 (6) (2017).
- [5] M. Deshpande, V. Rao, Depression detection using emotion artificial intelligence, in: 2017 international conference on intelligent sustainable systems (iciss), 2017, pp. 858-862.
- [6] M.M. Aldarwish, H. Farooq, Ahmad Predicting depression levels using social media posts, in: 2017 IEEE 13th international Symposium on Autonomous decentralized system (ISADS), 2017, pp. 277-280.
- [7] D.S. Thosar, Varsha Gothe, P. Bhorkade, V. Sanap, Review on Mood Detection using Image Processing and Chatbot using Artificial Intelligence, *Life* 5(03) (2018).
- [8] A. Biradar, S.G. Totad, Detecting depression in social media posts using machine learning, *International Conference on Recent Trends in Image Processing and Pattern Recognition*, Springer, Singapore, 2018, pp. 716–725.
- [9] M. Gavde, Comparative Study on Mood Detection Techniques, *Int. J. Res. Appl. Sci. Eng. Technol.* 6 (2018) 1456–1457, <https://doi.org/10.22214/ijraset.2018.4245>.
- [10] Md R. Islam, A.K. Muhammad, A. Ahmed, A. Raihan M. Kamal, H. Wang, A. Ulhaq, Depression detection from social network data using machine learning techniques, *Health Inform. Sci. Syst.* 6(1) (2018) 1-12.
- [11] Md R. Islam, A. Raihan M. Kamal, N. Sultana, R. Islam, Mohammad A. Moni, Detecting depression using k-nearest neighbours (knn) classification technique, in: 2018 International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC4ME2), IEEE, 2018, pp. 1-4.

- [12] H. Kumar, A. Latha, Depression detection with sentiment analysis of tweets, *International Research Journal of Engineering and Technology (IRJET)*, 06 (05) e-ISSN: 2395-0056 p-ISSN: 2395-0072; (2019, May).
- [13] D. Ramalingam, V. Sharma, P. Zar, Study of depression analysis using machine learning techniques, *Int. J. Innov. Technol. Explor. Eng.* 8(7C2) (2019) 187-191.
- [14] E. Victor, M.A. Zahra, A.R. Sewart, R. Christian, Detecting depression using a framework combining deep multimodal neural networks with a purpose-built automated evaluation, *Psychol. Assess.* 31 (8) (2019) 1019.
- [15] T.M. Fonseka, Venkat Bhat, S.H. Kennedy, The utility of artificial intelligence in suicide risk prediction and the management of suicidal behaviors, *Aust. N. Z. J. Psychiatry* 53 (10) (2019) 954–964.
- [16] S.N. Shephali, A.V. Patil, G.S. Patil, S.P. Patil, B.D. Jitkar, AI Therapist Using Natural Language Processing, *International Journal of Research in Engineering, Science and Management (IJRESM)*, 3(2) (2020, February).
- [17] N. Rajaraman, A. P. R, Bhujja. G Depression Detection of Tweets and A Comparative Test. In *International Research Journal of Engineering and Technology (IRJET)* 09 (03) (2020, March) ISSN: 2278-0181.
- [18] B. Zohuri, S. Zadeh, The Utility of Artificial Intelligence for Mood Analysis, Depression Detection, and Suicide Risk Management, *J. Health Sci.* 8 (2020) 67–73.
- [19] Prasadu Peddi (2019), "Data Pull out and facts unearthing in biological Databases", *International Journal of Techno-Engineering*, Vol. 11, issue 1, pp: 25-32.