Emotion Detection and Recommender System using Machine Learning

Alen Wenish J[1], Sathishkumar K[2], Kishore R[3], Anitha Julian[4]

{alenwenish@gmail.com[1], sathishprakash233@gmail.com[2], kishorechand473@gmail.com[3]}

EmbedUR Systems, Chennai, Tamil Nadu, India[1,2], Light & Wonder, Chennai, Tamil Nadu, India[3], Saveetha Engineering College[4]

Abstract. With the expansion of online community, textual data has emerged as the primary medium for human-machine and human-human interaction. Recognizing emotions existing in the communication or emotions of the engaged users to enhance the user experience is one such crucial foundation in humanizing such interaction. Humans are capable of expressing their feelings through speech, writing, and facial expressions. The endeavor of identifying emotions in text texts is primarily a classification problem that incorporates principles from machine learning and natural language processing. In applications like chatbots and customer service forums identifying emotions from a text authored by a human is crucial. In our proposed method, we used web development, where text was accepted from the user through website, and machine learning was used to classify the text supplied to determine emotion. The system suggests websites, video links, motivational quotations, etc. based on emotion that the machine learning algorithm has identified.

Keywords: Emotion Detection, Machine Learning, Recommendation System, Emotion Analysis.

1 Introduction

A human may generally convey his or her feelings through any form, including the face, gestures, voice, and written words. Social media postings, microblogs, news pieces, and other types of writing are all common in today's world, and the content of these posts may be a valuable source for text mining to uncover and reveal hidden characteristics, such as emotions.

Machine learning algorithms are used to analyze the causes and forecast various text-based emotions, such as happiness, rage, sorrow, surprise, love, and fear. Based on textual data, an emotion recognition system using supervised classification machine learning is utilized. A recommendation system is then used to provide helpful content, such as movies, music, motivational quotations, and videos, etc. once the emotions have been anticipated.

IACIDS 2023, November 23-25, Lavasa, India

DOI 10.4108/eai.23-11-2023.2343260

Here is the arrangement for the remaining portion of the paper. With regard to the emotion detection method, Section 2 examines the literature review and the current systems. Our suggested work utilizing machine learning methods is presented in Section 3. The statistical data associated with the suggested methodology are assessed and looked at in Section 4. The paper is finally concluded in Section 5.

2 Literature survey

The authors of [1] used brain activity to investigate the limitations of emotion detection. They suggested a system based on the human face, which also displays human brain processes or emotions.

The authors of [2] describe the research trends in Text Emotion Detection (TED). This paper explains text emotion detection and its applications, affective computing, sentiment analysis, and multidisciplinary and its existence in TED problems and describes the status of TED.

The authors of [3] describe how understanding human emotions is crucial for building strong interpersonal bonds. From the beginning, researchers have been interested in the automated identification of emotions.

The authors of [4] categories an expression's feelings into good or negative emotions using deep learning algorithms. They explored and assessed a technique on three distinct datasets that combines neural networks and short-term memory to demonstrate how to get high emotion classification accuracy.

The authors of [5] approach the multi-label training problem of multiple emotions identification from the user viewpoint. After combining emotion tag connections, social ties, and temporal linkages into a generic framework, they employ an element of the emotion categorization model to identify a wide range of emotions using a multilabel training technique.

The authors of [6] give students a platform where they may post pictures of the many academic activities, they participate in. This portal enables students to learn about a variety of activities taking place inside the university.

3 Proposed system

A division of sentiment analysis called emotion detection focuses on the extraction and study of emotions. The proposed system does detection of such emotions followed by a recommender system to get various recommendations for motivation based on what a person is feeling or going through. The potency of four distinct computational methods for machine learning, Logistic Regression, Naive Bayes, Random Forest and Support Vector Machine (SVM) has been compared in the proposed study.

The classification techniques Logistic Regression, Naive Bayes Classifier, Random Forest Classifier and Support Vector Machine (SVM) function well with the emotion detection problem. Logistic Regression is mainly used to predict the output of categorical dependent variables with the help of independent variables. To quickly classify future data points, the SVM

algorithm seeks to identify the optimal line or decision boundary that divides the space with n dimensions into classes.

Naive Bayes classifiers are an aspect of method of classification based on the Bayes theorem. In essence, the Bayes Theorem establishes the probability of an event occurring based on the statistical of an earlier event. Using several classifiers to tackle a challenging problem and improve the model's accuracy is known as collective learning, and it forms the foundation of the Random Forest Classifier.

The proposed system detects and analyse emotions from a text, or a sentence entered by the user and recommend links, quotes, songs based on the detected emotion as shown in Figure 1. The input given by the user is then pass into a machine learning classification algorithm where the algorithm is trained and the corresponding emotion is given as output. After the output was generated, there will be some links given as recommendations those links will move on to some videos, quotes etc which will motivate oneself.

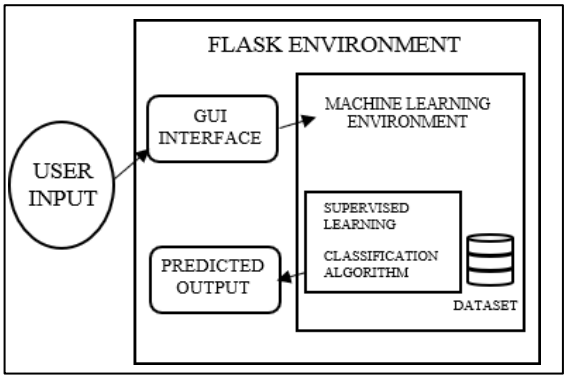

Fig. 1. System Architecture

For a website to meet user expectations and maintain effective performance, the user experience is essential. To put the developed machine learning computations into practise, a user interface is produced. JavaScript, CSS, HTML and flask technologies are used to make websites. Figure 2 depicts the system implementation.

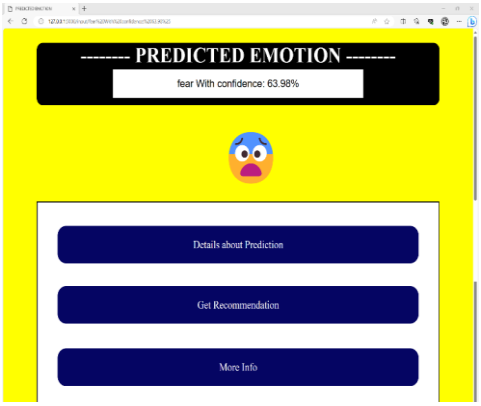

Fig. 2. System Implementation

4 Implementation and Result

The proposed work is evaluated using the three metrics namely, confusion matrix, log loss, classification report and AUC-ROC curve. One method for describing the performance of a classification system is to use a confusion matrix. Figure 3 depicts the confusion matrix for Logistic Regression.

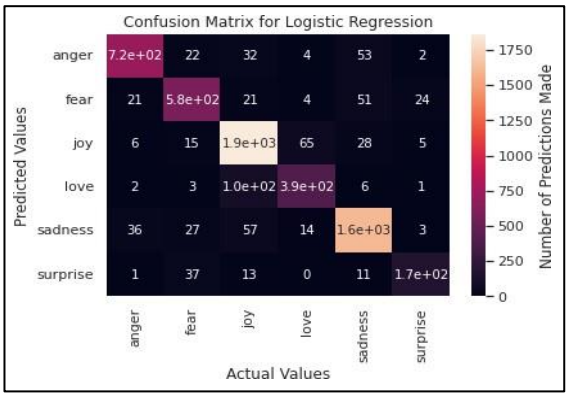

Fig. 3. Confusion matrix for Logistic Regression

The most significant classification measure based on probabilities is the Log Loss or Cross-Entropy Loss. To get log loss, the updated predicted statistical information log for each occurrence is averaged negatively. Support Vector Machine (SVM), Random Forest Classifier, Logistic Regression, and Naive Bayes Classifier's Log Loss have all been computed as 0.3422, 0.6335, 0.5972, and 0.6741 respectively indicating the least loss for Logistic Regression.

A machine learning measurement of performance information is a classification report. The classification report for the machine learning algorithms under study is illustrated in Table 1.

Table 1. Classification Report for Logistic Regression

Emotions	precision	recall	F1-score	support
anger	0.92	0.86	0.89	831
fear	0.85	0.83	0.84	697
joy	0.89	0.94	0.91	1980
love	0.82	0.77	0.79	507
sadness	0.92	0.92	0.92	1755
surprise	0.83	0.73	0.78	230
accuracy			0.89	6000
macro avg	0.87	0.84	0.85	6000
weighted avg	0.89	0.89	0.89	6000

The results of the implementation shows the accuracy in detecting the emotions ranging from 80% for Naïve Bayes, 86% for Support Vector Machine (SVM), 87% for Random Forest and 89% for Logistic Regression respectively. At different criterion values, outcomes for

classification tasks may be evaluated using the AUC-ROC curve. For a multi-class classification problem, like emotion detection in the proposed work, the AUC – ROC curve for the classification model is shown in figure 4.

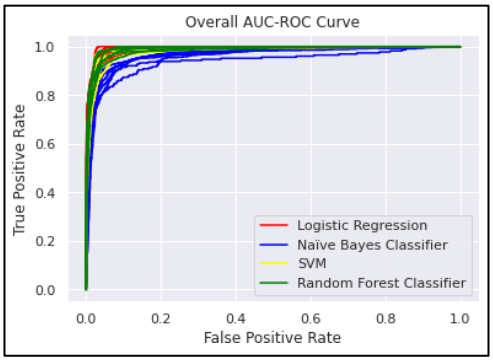

Fig. 4. AUC-ROC Curve

5 Conclusion and future work

For every machine learning algorithm, it has its own advantages and disadvantages over the other algorithms, especially for a classification problem, each algorithm behaves differently. The proposed work has shown greater accuracy for Logistic regression with an accuracy of 89% over other algorithms used. The accuracy of the other machine learning techniques is 87% for Random Forest, 86% for Support Vector Machine, and 80% for Naive Bayes. However, a detailed study in future could cover other parameters which will also require the application of natural language processing as an additional module to the recommender system.

References

[1] D. Singh, "Human Emotion Recognition System", 2012 International Journal of Image, Graphics and Signal Processing, vol. 4, pp. 50-56 doi: 4.10.5815/ijigsp.2012.08.07.

[2] Rusul Sattar B. Sadkhan and Sattar B. Sadkhan, "The Status of Research Trends in Text Emotion Detection", in Global Proceedings Repository – American Research Foundation, ICCIIDT London, in Shaping the Future of ICT, 1st ed., Jul. 2017, ch. 23, pp. 309-320, doi: 10.1201/9781315155241-23.

[3] A. Varghese, J. P. Cherian and J. J. Kizhakkethottam, "Overview on Emotion Recognition System", 2015 International Conference on Soft-Computing and Networks Security (ICSNS), 1st ed., Oct. 2015, pp. 1-5.

[4] P. C. Shilpa, R. Shereen, S. Jacob and P. Vinod, "Sentiment Analysis Using Deep Learning", 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), Tirunelveli, India, 2021, pp. 930-937, doi: 10.1109/ICICV50876.2021.9388382.

[5] X. Zhang, W. Li, H. Ying, F. Li, S. Tang and S. Lu, "Emotion Detection in Online Social Networks: A Multilabel Learning Approach", in IEEE Internet of Things Journal, vol. 7, no. 9, pp. 8133-8143, Sept. 2020, doi: 10.1109/JIOT.2020.3004376.

[6] A. Julian, K. Sathishkumar, J. Alen Wenish and R. Kishore, "Socializing Platform For Educational Institutions", 2023 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, 2023, pp. 1-4, doi: 10.1109/ICCCI56745.2023.10128535