

Decoding Sentiments: A Comprehensive Exploration of Real-time Emotion Recognition from Text Through Deep Learning

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Abstract—Emotional state of a person can be found out through various modalities such as using facial expressions, voice of the person, text and so on. Our study is solely based on the emotion extracted through the text. Past research focused on categorizing texts into sentiments like positive, negative, or neutral, our novel approach shifts to predicting specific emotional states like angry, sad or happy. Our study covers the previous researches done in this field which are ranging from deep learning models, natural language processing, and machine learning models. Recurrent neural networks and its variants are mainly studied for recognizing the emotion in text. The integration of emotion detection in the customer feedback enhances organizational insights, enabling proactive measures to elevate customer satisfaction.

Keywords—Deep Learning, Emotion Recognition from text, Machine learning, Natural Language Processing, Recurrent Neural Networks, Emotion detection

I. INTRODUCTION

Emotion expression and emotion understanding plays a very crucial role in effective communication between living beings. These emotions can be expressed using many ways, such as expressing the emotions using face, text or voice. In every field emotion and interest of a person are correlated. This can be considered as a deciding factor for a successful implementation of an idea, whether it is for the social welfare or implementation of a product and its associated features.

Modern day information is mostly in the textual format which can be observed from the tweets in the social media platforms, knowledge sharing through websites or web articles and reviews of the products from customers. Understanding what people say in text is not just about figuring out if they're positive, negative, or neutral. It's more about picking up on the subtle emotions hidden in their words.

Traditional sentiment analysis is good at sorting sentiments broadly but struggles to grasp the detailed range of emotions expressed in written language.

The field of emotion recognition has emerged as a key component within the broader landscape of natural language processing and computational linguistics. Emotion recognition strives to go beyond conventional sentiment analysis by predicting specific emotional states, encompassing a diverse range of feelings such as joy, sadness, anger, and others [1]. This shift in focus is effective, especially in applications where a detailed comprehension of human emotions is critical, such as customer feedback analysis and reputation management.

The main problem of modern-day business is that they are unable to properly utilize the customer care manpower much effectively. Most of the man power is being utilized in the responding to each and every query of the customer because of which lot of essential feedbacks and issues, which needs to be addressed are being piled up and eventually missed. By leveraging the emotions of the product reviews one can easily save time and know the required issues to be addressed.

II. LITERATURE SURVEY

Yanrong Zhang, Jiayuan Sun, Lingyue Meng, Yan Liu [2] The objective of the model is to define a sentiment dictionary-based method to mine e-commerce text reviews, by building a reverse sentiment dictionary for sentiment analysis. Constructing a reverse emotion dictionary instead of just an emotion dictionary shows higher accuracy. However, part-of-speech tagging can be wrong in some cases and must be corrected manually, and it has lower accuracy for mobile reviews.

Ghamya Kotapati, Suma Kamalesh Gandhimathi, Palthiya Anantha Rao, Ganesh Karthik Muppagowni, K Ragha Bindu, M Sharath Chandra Reddy [3] Main objective of the model proposed in the paper is to understand the context of the sentence and categorize the sentence into the correct emotion. BERT models are excellent at identifying context and

interpreting sentiment [4], it can also interpret different degrees of emotions. But the model only classifies the emotion into three types of categories (positive, negative and neutral) and it's computationally expensive so it requires high end systems.

Aljoharah Almjawel, Sahar Bayoumi, Dalal Alshehri, SoroorAlzahrani, Munirah Alotaibi [5] The authors developed a model that provides a practical way to visually analyze customer feedback sentiments using various visualization techniques. The model helps the customers to make the decision of choosing the correct book for them, it also has an interactive interface. But the problem is, it uses a lexicon-based approach for sentiment analysis which is not efficient and has lower accuracy.

Raghavendra Reddy, Ashwin Kumar U M [6] The proposed approach's objective is to find the emotion using text and emoji-based features. It can easily recognize the emotion in the text containing emojis which improves the classification accuracy [7]. But one of the disadvantages with it is that different OS has different types of emojis, this can make it difficult for the model to predict the emotion from different styles of emojis.

Habib Izadkhah [8] The purpose of this paper is to detect multiple emotions in texts using a X-module. The proposed model has high accuracy in detecting multiple emotions from text, it creates a modified dataset for higher accuracy [9]. But the problem is, it requires a large and balanced dataset of multi-labelled emotions, which may not be easily available.

Qi Wang, Lei Sun, Zheng chen [10] Authors of this paper focused on reviewing different deep learning models like recurrent neural networks and its variants, which are Gated recurrent networks and long short term memory networks. A new approach was also introduced known as the fusion model which is the combination of the different models [11]. It helps in understanding different algorithms or models and their limitations for emotion recognition in text. But the main problem observed is that all the models discussed are resource intensive.

Gourank Jain, Satyam Verma, Honey Gupta, Saloni Jindal, Mr. Mukesh Rawat, Mr. Kapil Kumar [12] The approach used by the authors of this paper is BERT but the key takeaway from this paper would be the focus and keen interest on the dataset. They showed that a proper dataset can help in achieving better results. They have used an undersampling technique to make an equal number of records for each classification. This allowed them to reduce the biased predictions. They also used dropout regularization technique to avoid the overfitting problem.

Asiya U A, Mr Kiran V K [13] This paper uses an entirely different modality, it shifts its focus from the unimodal approach to multimodal approach [14][15]. Now the proposed solution also takes voice input along with the text. This approach is not feasible in many use cases as it leads to privacy concerns. Although this approach is able to give the best results but it takes a lot of computation power for the processing of audio input and as well as there is no proper dataset for training.

Dr. Shailendra Narayan Singh, Twinkle Sarraf [16] The proposed solution is an impressive use case of sentiment analysis in text. The proposed work has an interface to interact with the buyer. The buyer or user will enter the name

of the product which they want to buy and will get the quantity of favorable, unfavorable reviews and final review of the product. The main key takeaway from this is, using web scraping technique to extract the real time product reviews for giving final review.

Arik Pamnani, Rajat Goel, Jayesh Choudhari, Mayank Singh [17] The authors of this paper focused and explained all the possible issues which needed to be addressed. They provided solutions to some of the problems using a flowchart. This paper also compares the long short-term memory and convolutional neural networks using the glove preprocessing technique. The key takeaway is all the different problems and their solution.

Priyanka Awatramani, Rucha Daware, Hrushabhsingh Chouhan, Anmol Vaswani, Sujata Khedkar [18] The proposed solution focused on code mixed text i.e Hinglish text and also provides a solution to, how to tackle the lack of resources here a novel romanized Hindi dictionary is created using sentiment scores from HindiSentiWordNet. Here is the primary benefit of this strategy, text which is present in the other languages that can be converted into english language using translation API'S.

Mahima M A, Nidhi C Patel, Srividhya Ravichandran, Aishwarya N, S. Maradithaya [19] The main objective of this paper is to detect multiple emotions present within a single text by splitting using rule-based techniques. It also employs similarity techniques to find most similar sentences for emotion assignment. Although this approach helps in detecting numerous emotions expressed in the single text, the rule based and resemblance techniques have limitations for handling very complex language use cases.

Juyana Islam, Sadman Ahmed, M. A. H. Akhand, N. Siddique [20] The proposed solution focused on detecting the emotions from text and as well as considering the emoticons instead of eliminating them from the text such that the emoticons can also be helpful in predicting the emotions from the text accurately here the the main advantage is that here Long Short Term Memory is considered to detect emotions from text [21] and along with dictionary based approach is used in order to use the emoticons for detecting emotions even other approaches can be used like NLTK [22].

Ashish V C, Somashekar R, Dr. Sundeep Kumar [23] The goal of this paper is to appropriately identify the emotion in text and analyze various approaches that are helpful in recognizing the emotions. Some of the approaches that have been discussed here support multilingual emotion detection across languages. Also suggestions have been given to how to deal with spelling corrections. Although the approaches discussed here are totally based on keywords which turns out to be unreliable because meanings of keywords could be multiple and vague.

Mahmud Hasan Munna, Md Rifatul Islam Rifat, A. S. M. Badrudduza [24] The proposed solution focuses on developing the two Deep Neural Networks for review based classification and sentiment analysis. Here proper understanding has been provided for choosing proper activation functions, Optimizers like Adam can be efficient and amount of neurons at the layer of input and output. Along here the issue can be addressed that the usage of Deep Neural Network can be computationally expensive.

Vikas Goel, Amit Kr. Gupta, Narendra Kumar [25] This paper discusses the application of sentiment analysis on multilingual Twitter data using natural language processing (NLP) and machine learning techniques. It tells the importance of classifying sentiments expressed in tweets, such as positive, negative, favorable, and unfavorable, and proposes solutions for multilingual sentiment analysis. The proposed methodology involves data gathering from Twitter, pre-processing the tweets to remove noise and irrelevant data, and using the Google Translator API for multilingual translation.

Reema Goyal, Navneet Chaudhry, Mandeep Singh [26] This paper presents a model for personalized emotion detection from text using machine learning. It addresses the limitations of existing emotion detection models by proposing an unsupervised method for becoming used to the system to a specific user. The model integrates an Automated Speech Recognizer (ASR) and text analysis based on K-means clustering, the Word2Vec model, and the Term frequency-inverse document vectorizer. The model aims to extend emotion classification to encompass all user emotions as additional user data strengthens the collection. The paper also provides a detailed review on emotion detection techniques and discusses the challenges and limitations of existing models.

Madhavi S.Darokar, Dr. Atul D. Raut, Dr. Vilas M. Thakre [27] The proposed solution focuses on the importance of emotion recognition and sentiment analysis in social media, mainly in the context of user behavior and e-commerce. It highlights the use of various algorithms and methodologies for facial expression analysis and emotion recognition and significance usage of deep learning and artificial intelligence in this field. In this we can understand the importance of feature extraction and classification in facial emotion recognition, and it also shows the importance of accuracy and testing in the proposed system.

Yuxin Huang, Shaidah Jusoh [28] The paper presents a study on sentiment detection through emotion classification using the ERNIE Tiny deep learning model for Chinese text. In this we can identify limitations, such as the lack of consideration for punctuation marks within remarks and the need to compare the ERNIE Tiny model's performance with other machine learning methods. The research aims to determine sentiment by employing emotion classifications, utilizing the ERNIE Tiny deep learning model to classify emotions in Chinese texts and detect sentiments through certain rules and finally it improves the overall output.

Amal Shameem, Ramesh babu, Vigneshwaran Sundar, Mrs. K. Veena [29] The document discusses the use of machine learning and natural language processing (NLP) for text emotion detection, mainly focusing on social media data. In this we focus on using deep learning to analyze texts and identify human emotions from large amounts of data, highlighting the role of NLP and machine learning in this process. And in this we use Support Vector Classifier, LinearSVC, and RandomForestClassifier for emotion classification in English sentences [30]. The paper also discusses model creation, data pre-processing, feature extraction, and classification techniques.

TABLE I. Brief Description About Different Research

Authors	Year	Approach	Description
Yanrong Zhang	2020	Sentiment dictionary, Reverse sentiment dictionary	The proposed solution builds its own sentiment dictionary for computers and phones and shows better results.
Ghamya Kotapati, Suma Kamalesh Gandhimathi	2023	Bidirectional Encoder Representations from Transformers	The proposed model considers relationships between the words and context of the sentences to determine sentiment of the given input.
Aljoharah Almjawel, Sahar Bayoumi	2019	Lexical based approach-sentiment analysis Tableau-Visualization	The solution gives the information about a book of interest and helps comparing the books by visual analysis.
Raghavendra Reddy, Ashwin Kumar U M	2022	ECNN - with text and emoji based emotion recognition	The model uses both text and emoji-based features to learn patterns in the data. This allows the model to recognize multiclass emotions.
Habib Izadkhah	2022	X-module using 1-D CNN	Generally the datasets contain very less multi labeled texts in comparison to single labeled texts due to which accuracy of the model decreases. But here a new dataset is created with multi label emotions for better accuracy.
Qi Wang, Lei Sun, Zheng chen	2019	Deep Learning Models (RNN,LSTM,G RU)	This solution combines both Convolution Neural Networks (CNN) with Bi-LSTM which shows that fusion models can help in achieving better accuracies.
Gourank Jain, Satyam Verma, Honey Gupta, Saloni Jindal, Mr. Mukesh Rawat, Mr. Kapil Kumar	2022	BERT	The paper is not only focussed on the usage of BERT algorithm but also focuses on importance of proper dataset.
Asiya U A, Mr Kiran V K	2022	MultiModality Approach	This paper's aim is to explain the tremendous change in the accuracy by shifting our idea from uni modality to multi modality which is an important and useful

			feature of this solution.
Dr. Shailendra Narayan Singh, Twinkle Sarraf	2020	Random Forests	The proposed work has the best feature of using live data extracted from websites rather than using existing dataset for training.
Arik Pamnani, Rajat Goel	2019	Logistic Regression, CNN, LSTM	The proposed approach mainly focuses on how to solve the problems during preprocessing of textual data.
Priyanka Awatramani, Rucha Daware, Hrusha bhsingh Chouhan, Anmol Vaswani, Sujata Khedkar	2021	Lexicon based approach, Rule based approach, ML algorithms (SVM, Logistic Regression, KNN, Random Forest)	Discusses the different approaches to process the Hinglish text.
M. A. Mahima	2020	A new hybrid methodology for the detection of many emotions from text using sentence embeddings also with rule based techniques.	To detect the numerous emotions present in the text, also if emoticons are used in text how can they be used in detecting the emotions.
Juyana Islam, Sadman Ahmed, M. A. H. Akhand, N. Siddique	2020	Long Short-Term Memory	To improve emotion recognition of microblog by keeping semantic relation among texts and emoticons here, fused into text embeddings.
Ashish V C, Somashekar R, Dr. Sundeep Kumar	2016	Keyword spotting method, Lexical Affinity Method, learning based method and hybrid methods	Aims for appropriately identifying the emotion in text and analyzing various approaches to detect the six different emotions.
Mahmud Hasan Munna, Md Rifatul Islam Rifat, A. S. M. Badrudduza	2020	Deep Neural Network and Natural Language Processing	To develop two Deep Neural Network (DNN) based models for review based classification and sentiment analysis.
Vikas Goel, Amit Kr. Gupta, Narendra Kumar	2019	Recurrent Neural Networks (RNN) and Naive Bayes algorithm	The solution aims in solving the problem of understanding feelings and opinions of users expressed in different languages on Twitter.
Reema Goyal, Navneet Chaudhry, Mandeep Singh	2023	PocketSphinx for automated speech recognition, Word2Vec for text analysis, K-means clustering	Utilizes the OCC model for connecting semantic analysis results to detect emotions.
Madhavi S.	2022	Deep CNN	Able to detect multiple

Darokar Dr. Atul D. Raut Dr. Vilas M. Thakre		C-means clustering algorithm	emotions present within an image by using rule-based techniques.
Yuxin Huang Shaidah Jusoh	2023	ERNIE Tiny	This proposed approach focuses on relationship between emotion and sentiment analysis and presents a prototype for Chinese text emotion and sentiment analysis.
Amal Shameem Ramesh babu Vigneshwaran Sundar Mrs. K. Veena	2023	K-NN classifier, and Adaboost classifier	The system aims to improve the accuracy and effectiveness of emotion classification which can be used in text-based applications such as chatbots

III. PROBLEM FORMULATION

In the field of sentiment analysis and emotion recognition, the existing methodologies primarily focus on categorizing sentiments as positive, negative, or neutral. However, these traditional approaches often fall short in providing an understanding of the diverse emotional states embedded within textual data. The challenge at hand is to develop an effective and robust model capable of moving beyond the limitations of conventional sentiment analysis and accurately predicting specific emotions expressed in written text. Therefore, the problem formulation revolves around bridging the gap between conventional sentiment analysis and the need for a more refined emotional analysis model. Therefore, the problem formulation revolves around bridging the gap between conventional sentiment analysis and the need for a more refined emotional analysis model.

For this we have considered the following issues, which are considered as the objectives of our work:

- Majority of the approaches focused just on classifying the text into sentiments, and remaining approaches which focused on the emotions, were not that robust.
- We face many issues in predicting proper emotion especially when spelling mistakes are present. We can avoid this by using spelling corrector approaches.
- A proper analysis, done after the emotion is recognized, can help the organizations for effective decision making in solving customer problems at large scale.

IV. SOLUTION TO THE PROBLEM

The proposed solution presents an integrated architecture for analyzing customer reviews through deep learning models, with a focus on emotion recognition and feedback processing. The architecture encompasses a user-friendly

frontend interface, a backend for emotion analysis and data storage, and additional components for customer care alerting, automated responses, and geographical analytics. The proposed model can be an innovative solution that can be helpful for responding to the sentiments of the customers. For detailed architectural understanding refer Fig. 2.

The functioning of the model begins by taking reviews of the customers, then followed by the preprocessing of the customer feedback for easy evaluation by the model. Conversion of preprocessed data to numerical vectors is done to capture the semantic meaning, so that the deep learning model can efficiently analyze the given texts.

Deep learning architectures like Recurrent Neural Networks(RNN's) and its variants are the foundational structures of the proposed solution. The model is trained on labeled data to analyze the various emotions and classify the customer feedback into predefined emotional categories.

Based on the detected emotion, predefined templates generate context-aware responses tailored to the specific emotion. These responses, ranging from encouraging for joy to apologetic for sadness or anger, form the final output presented to the user. Simultaneously, customer executives are alerted about dissatisfaction.

The innovation integrates data analytics, providing product/service insights to owners based on age and location parameters. Visual representations are generated, segregating users by age groups and geographical location, empowering owners to make informed, area-oriented decisions for customer satisfaction. This invention primarily focuses on responding to customer reviews and enhancing customer experience. Refer Fig. 1 to understand the flow of the proposed solution.

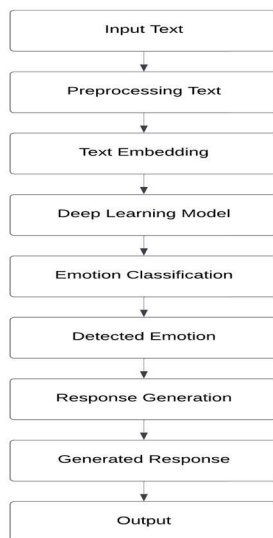


Fig. 1: Workflow of the suggested model

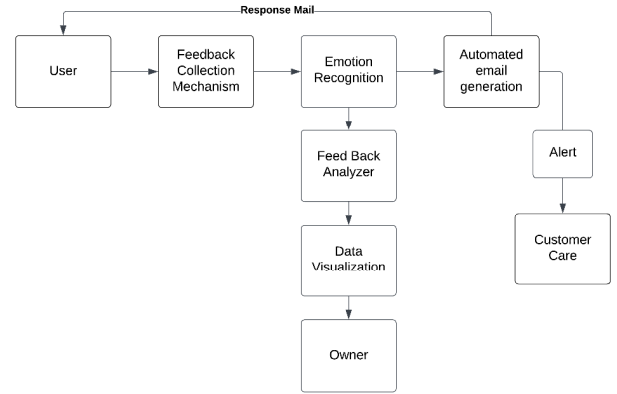


Fig 2: Proposed System Architecture

V. CONCLUSION

To conclude, a study of different papers or research have been presented in this paper. By prioritizing the prediction of distinct emotional states over conventional sentiment categorizations, we can study wide-ranging applications of text-based emotion recognition, with a particular and keen focus on customer feedback analysis and reputation management. This emphasize the potency of text-based emotion detection as an aid for organizations seeking to enhance their understanding of their customer satisfaction and refine products and services. This paper provides an overview of the approaches that can be used for recognizing emotions in text.

REFERENCES

- [1] P. Chandra et al., "Contextual Emotion Detection in Text using Deep Learning and Big Data," 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), Gunupur, India, 2022, pp. 1-5, doi: 10.1109/ICCSEA54677.2022.9936154.
- [2] Y. Zhang, J. Sun, L. Meng and Y. Liu, "Sentiment Analysis of E-commerce Text Reviews Based on Sentiment Dictionary," 2020 IEEE International Conference on Artificial Intelligence and Computer Applications (ICAICA), Dalian, China, 2020, pp. 1346-1350, doi: 10.1109/ICAICA50127.2020.9182441.
- [3] G. Kotapati, S. K. Gandhimathi, P. A. Rao, G. K. Muppagowni, K. R. Bindu and M. S. Chandra Reddy, "A Natural Language Processing for Sentiment Analysis from Text using Deep Learning Algorithm," 2023 2nd International Conference on Edge Computing and Applications (ICECAA), Namakkal, India, 2023, pp. 1028-1034, doi: 10.1109/ICECAA58104.2023.10212127.
- [4] V. S. Kodiyala and R. E. Mercer, "Emotion Recognition and Sentiment Classification using BERT with Data Augmentation and Emotion Lexicon Enrichment," 2021 20th IEEE International Conference on Machine Learning and Applications (ICMLA), Pasadena, CA, USA, 2021, pp. 191-198, doi: 10.1109/ICMLA52953.2021.00037.
- [5] A. Almjawel, S. Bayoumi, D. Alshehri, S. Alzahrani and M. Alotaibi, "Sentiment Analysis and Visualization of Amazon Books' Reviews," 2019 2nd International Conference on Computer Applications & Information Security (ICCAIS), Riyadh, Saudi Arabia, 2019, pp. 1-6, doi: 10.1109/CAIS.2019.8769589.
- [6] R. Reddy and A. K. U M, "Multi-class Sentiment Analysis Over Social Networking Applications Using Text and Emoji-based Features," 2022 International Conference on Applied Artificial Intelligence and Computing (ICAAIC), Salem, India, 2022, pp. 829-834, doi: 10.1109/ICAAIC53929.2022.9792786.
- [7] M. Redmond, S. Salesi and G. Cosma, "A novel approach based on an extended cuckoo search algorithm for the classification of tweets which

- contain Emoticon and Emoji," 2017 2nd International Conference on Knowledge Engineering and Applications (ICKEA), London, UK, 2017, pp. 13-19, doi: 10.1109/ICKEA.2017.8169894.
- [8] H. Izadkhah, "Detection of multiple emotions in texts using a new deep convolutional neural network," 2022 9th Iranian Joint Congress on Fuzzy and Intelligent Systems (CFIS), Bam, Iran, Islamic Republic of, 2022, pp. 1-6, doi: 10.1109/CFIS54774.2022.9756494.
- [9] S. S. Majd, H. Izadkhah and S. Lotfi, "Detection of Multiple Emotions in Texts Using Long Short-Term Memory Recurrent Neural Networks," 2022 8th International Conference on Web Research (ICWR), Tehran, Iran, Islamic Republic of, 2022, pp. 29-33, doi: 10.1109/ICWR54782.2022.9786225.
- [10] Q. Wang, L. Sun and Z. Chen, "Sentiment Analysis of Reviews Based on Deep Learning Model," 2019 IEEE/ACIS 18th International Conference on Computer and Information Science (ICIS), Beijing, China, 2019, pp. 258-261, doi: 10.1109/ICIS46139.2019.8940267.
- [11] D. E. Cahyani, A. P. Wibawa, D. D. Prasetya, L. Gumilar, F. Akhbar and E. R. Triyulinar, "Emotion Detection in Text Using Convolutional Neural Network," 2022 International Conference on Electrical and Information Technology (IEIT), Malang, Indonesia, 2022, pp. 372-376, doi: 10.1109/IEIT56384.2022.9967913.
- [12] G. Jain, S. Verma, H. Gupta, S. Jindal, M. Rawat and K. Kumar, "Machine Learning Algorithm Based Emotion Detection System," 2022 Fifth International Conference on Computational Intelligence and Communication Technologies (CCICT), Sonapat, India, 2022, pp. 270-274, doi: 10.1109/CCICT56684.2022.00057.
- [13] U. A. Asiya and V. K. Kiran, "A Novel Multimodal Speech Emotion Recognition System," 2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICT), Kannur, India, 2022, pp. 327-332, doi: 10.1109/ICICT54557.2022.9917655.
- [14] S. Singh Rauthan, N. Rathore, Y. Kumar, Y. Kumar Singh and D. Birari, "Emotion Detection Using Speech and Text Recognition: An Overview," 2023 International Conference on Data Science and Network Security (ICDSNS), Tiptur, India, 2023, pp. 1-5, doi: 10.1109/ICDSNS58469.2023.10245618.
- [15] S. B. Shah, S. Garg and A. Bourazeri, "Emotion Recognition in Speech by Multimodal Analysis of Audio and Text," 2023 13th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2023, pp. 257-263, doi: 10.1109/Confluence56041.2023.10048872.
- [16] S. N. Singh and T. Sarraf, "Sentiment Analysis of a Product based on User Reviews using Random Forests Algorithm," 2020 10th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2020, pp. 112-116, doi: 10.1109/Confluence47617.2020.9058128.
- [17] Arik Pamnani, Rajat Goel, Jayesh Choudhari, Mayank Singh, "IIT Gandhinagar at SemEval-2019 Task 3: Contextual Emotion Detection Using Deep Learning", Proceedings of the 13th International Workshop on Semantic Evaluation (SemEval-2019), (pages 236-240) Minneapolis, Minnesota, USA, 2019.
- [18] P. Awatramani, R. Daware, H. Chouhan, A. Vaswani and S. Khedkar, "Sentiment Analysis of Mixed-Case Language using Natural Language Processing," 2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2021, pp. 651-658, doi: 10.1109/ICIRCA51532.2021.9544554.
- [19] M. A. Mahima, N. C. Patel, S. Ravichandran, N. Aishwarya and S. Maradithaya, "A Text-Based Hybrid Approach for Multiple Emotion Detection Using Contextual and Semantic Analysis," 2021 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICES), Chennai, India, 2021, pp. 1-6, doi: 10.1109/ICES52305.2021.9633843.
- [20] J. Islam, S. Ahmed, M. A. H. Akhand and N. Siddique, "Improved Emotion Recognition from Microblog Focusing on Both Emoticon and Text," 2020 IEEE Region 10 Symposium (TENSYP), Dhaka, Bangladesh, 2020, pp. 778-782, doi: 10.1109/TENSYP50017.2020.9230725.
- [21] M. -H. Su, C. -H. Wu, K. -Y. Huang and Q. -B. Hong, "LSTM-based Text Emotion Recognition Using Semantic and Emotional Word Vectors," 2018 First Asian Conference on Affective Computing and Intelligent Interaction (ACII Asia), Beijing, China, 2018, pp. 1-6, doi: 10.1109/ACIIAsia.2018.8470378.
- [22] N. K. Jha, "An Approach towards Text to Emoticon Conversion and Vice-Versa Using NLTK and WordNet," 2018 2nd International Conference on Data Science and Business Analytics (ICDSBA), Changsha, China, 2018, pp. 161-166, doi: 10.1109/ICDSBA.2018.00036.
- [23] Ashish V C, Somashekar R, Dr. Sundeep Kumar K, "Keyword Based Emotion Word Ontology Approach for Detecting Emotion Class Text", International Journal of Science and Research (IJSR), Volume 5 Issue 5, May 2016, pp. 1636-1639, https://www.ijsr.net/get_abstract.php?paper_id=NOV163818.
- [24] M. H. Munna, M. R. I. Rifat and A. S. M. Badrudduza, "Sentiment Analysis and Product Review Classification in E-commerce Platform," 2020 23rd International Conference on Computer and Information Technology (ICCIT), DHAKA, Bangladesh, 2020, pp. 1-6, doi: 10.1109/ICCIT51783.2020.9392710.
- [25] V. Goel, A. K. Gupta and N. Kumar, "Sentiment Analysis of Multilingual Twitter Data using Natural Language Processing," 2018 8th International Conference on Communication Systems and Network Technologies (CSNT), Bhopal, India, 2018, pp. 208-212, doi: 10.1109/CSNT.2018.8820254.
- [26] R. Goyal, N. Chaudhry and M. Singh, "Personalized Emotion Detection from Text using Machine Learning," 2022 3rd International Conference on Computing, Analytics and Networks (ICAN), Rajpura, Punjab, India, 2022, pp. 1-6, doi: 10.1109/ICAN56228.2022.10007248.
- [27] M. S. Darokar, A. D. Raut and V. M. Thakre, "Methodological Review of Emotion Recognition for Social Media: A Sentiment Analysis Approach," 2021 International Conference on Computing, Communication and Green Engineering (CCGE), Pune, India, 2021, pp. 1-5, doi: 10.1109/CCGE50943.2021.9776385.
- [28] Y. Huang and S. Jusoh, "Sentiment Detection through Emotion Classification Using Deep Learning Approach for Chinese Text," 2023 15th International Conference on Electronics, Computers and Artificial Intelligence (ECAI), Bucharest, Romania, 2023, pp. 1-6, doi: 10.1109/ECAI58194.2023.10194174.
- [29] Amal Shameem, Rameshbabu G, Vigneshwaran L, Sundar K, Mrs. K. Veena, "Text Emotion Detection Using Machine Learning And NLP, International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 9, Issue 3, pp. 361-365, May-June-2022.
- [30] R. R. Malagi, Y. R. S. P. T. K. A. Kodipalli, T. Rao and R. B. R., "Emotion Detection from Textual Data Using Supervised Machine Learning Models," 2023 4th International Conference for Emerging Technology (INCET), Belgaum, India, 2023, pp. 1-5, doi: 10.1109/INCET57972.2023.10170212.