A Study on Advancing the Assessment of Teaching Effectiveness for Postgraduate Students through Sentiment Analysis Utilizing Deep Learning Technology

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Abstract— This study assists in identifying the faculty's strengths and weaknesses based on positive and negative comments from students in English or Hinglish. The suggested system extracts qualitative data from teachers' quantitative data and emotional scores from numerical response scores during evaluation. It graphically depicts the evaluation results, including the percentage of favorable and negative input from the pupils. This will raise awareness among school officials and teachers about their students' thoughts and worries. This feedback not only benefits university administrators and instructors, but it also has a significant impact on students' decisions about which institutions to attend and which courses to take. Our suggested sentiment analysis approach improves teaching and learning quality by addressing transient emotions and feelings while assessing multilingual students' views of teacher effectiveness and course satisfaction.

Keywords- Sentiment Analysis, Deep Learning, Natural Language Processing, Teacher Performance Evaluation, Machine Learning

I.   INTRODUCTION

Sentiment analysis is a method of identifying sentiments expressed in texts. With the situation people are facing in the world today, the need for text analysis has become more important. Generally, there are three approaches to sentiment analysis. They are based on lexicon, machine learning and hybrid approaches. Among machine learning techniques, it uses unsupervised learning or supervised learning. Classification problem can be done using many lexicon based algorithms like Support Vector Machine, Naive Base, Random Forest etc. Sentiment polarity of text content can be detected using sentiment lexicon (Ahmad, Singla, & Nikita, 2019). A glossary is a list of terms associated with a sentiment poll, sentiment analysis is the process of analytically tracking people's moods about a particular topic. In general, opinion can be the result of people's personal feelings, beliefs, emotions and preferences. This research work focused on students' perceptions. Student comments can highlight various problems students encounter with the lecture. Sometimes students don't understand what the lecturer is trying to explain, so students can let the lecturer know by giving feedback. The inputs we take are qualitative data rather than quantitative data. Implementing qualitative data analysis is important and can improve the effectiveness of teacher evaluations. Performance appraisal of faculty members is an integral part of the

academic management system. It only helps to improve the study content and quality but is often used during the annual evaluation process of faculty members (Duong & Nguyen-Thi, 2021). Assessment is usually grouped into a set of questions to be answered at the end of each lesson. However, evaluation forms also provide space for open-ended feedback that is not typically included in performance appraisals/evaluations due to the lack of automated text analysis methods. Textual data can contain useful insights into a teacher's subject knowledge, discipline and presentation skills and provide recommendations. The quality of education should be improved. Students provide feedback with quantitative ratings and qualitative comments related to product, content, delivery method, timeliness, skill, appreciation, and learning experience.

II. OBJECTIVE

Paper based data collection is obsolete in today's age. This takes time and labor costs. Also, it is difficult to analyze all the feedback data, especially for a university with a large number of students. Therefore, we used a web-based application form to collect student feedback data. For analysis, we used various machine learning algorithms for clustering and classification on rating scores and text comments. In the rating score analysis, we categorize them into five levels such as excellent, good, neutral, bad and poor. However, when analyzing comment text, we classify comments into only two categories, positive and negative. According to Chhattisgarh culture, students refrain from giving negative feedback about their teachers. Although they have some difficulty in their learning activities, they are generally quiet. So, there are a lot of positive comments, but very few negative comments in the data we collect. Although some students give negative responses, it is common to write many positive things with one negative word at the beginning and end. As a result, the classifier may actually classify a positive response but a negative response as a positive response. In this paper, we study about machine learning based model for sentiment analysis the feedback of students in Chhattisgarh state.

- Identify the most appropriate model to predict polarization and sentiment, identify the best combination of preprocessing methods, features, and machine learning techniques.
- Explore different ways of representing results and create visualizations that facilitate understanding of sentiment analysis model results.
- The system can work on both English and Hinglish feedback datasets.

III. RELATED WORKS

Over the past few decades, sentiment analysis has been on the rise. Various applications of sentiment analysis have been explored. Sentiment analysis on text (SMS, Tweets) is a very difficult task. Because short text includes various soundless words like (abbreviation, abbreviation). Many solutions have been suggested in the past to solve the above problem (Li, Fan, Jiang, Lei, & Liu, 2019). The meaning of the word is positively defined by three different classes, negative or neutral. To determine sentiment analysis, firstly there are two approaches, one is an unsupervised approach, i.e. a dictionary-based

approach (which estimates the sentiment of a text based on the polarity of the generated word/phrase), and the second is a supervised approach given a dataset. , then classify it).

The authors (Dang, Moreno-García, & la Prieta, 2020) used different machine learning techniques: polynomial naive basis, stochastic gradient descent, support vector machine, random forest and multilayer perceptron classifier dataset approach. A data set of student responses was collected through a Google survey form in late 2018 from various universities located in Karachi. The results are compared to find the best performance for different algorithms.

The paper (Ying, Zabidi, Ramli, & Sheikh, 2020) explains sentiment analysis on Twitter data using Naïve Bayes. Their research was modeled on a dataset consisting of tweets using the Natural Language Toolkit (NLTK). The concept of bag of words is used to distinguish both positive and negative words. The results show the probability of each tweet whether the tweet is positive or negative.

The paper (Khattak, et al., 2021) proposed sentiment analysis of tweets based on topics in tweets using NLP methods with the following steps: subjectivity, semantic association and polar classification classification. (Bhargava, Arora, & Sharma, 2019) proposed an NLP-based sentiment analysis on Twitter data, which takes data from the Twitter social networking site, processes the data using NLP methods and highly randomized tree methods to obtain feature vectors. uses it.

Sentiment analysis about products has become an important requirement today to facilitate consumer buying behavior and analyze trends for companies to improve their business. The two main approaches in mining notions of SNS are dictionary-based (DB) and machine learning-based (MLB) (Duong & Nguyen-Thi, 2021). The DB technique refers to a pre-built dictionary for sentiment classification, where the robustness of the classification depends on the reference dictionary used. On the other hand, MLB systems achieve domain-based sensory classification due to domain-specific training data and the learning ability of classification algorithms.

IV.   SENTIMENT ANALYSIS IN EDUCATION

In the field of education, the role of teachers has changed dramatically over the years with the advent of Big Data. Not only are today's teachers in demand get used to using new tools, but use the latest technologies. Teachers are the backbone of any education system (Kaur & Mangat, 2017). A teacher's competence is measured not only by his/her academic qualification but also by his/her dedication, skill and commitment. One of the most effective ways for a teacher to improve his teaching methods is to get timely feedback from students. Feedback can be open and/or closed. The open-ended text is full of feedback, observations, and insights, making it difficult to draw conclusions from manual observation. Sentiment analysis can be used to gain useful information about a teacher's teaching style and curriculum. Sentiment analysis identifies the learning curve of students, understands the needs of students, predicts their performance and makes effective changes in teaching methods. A burst student dataset should be effectively pruned only with respect to the required dataset. The results of sentiment

analysis help teachers and organization to take appropriate action. Rewards and appreciation can be given to teachers who demonstrate positive student sentiment. Employee satisfaction plays a very important role in the development of an educational institution (Hussein, 2018). To get an answer to the age-old problem of teachers' mindset, mining of teachers' sentiments can be done at regular intervals as a result of motivation from teachers, good teaching tools and equipment, recognition, appreciation at institutional level etc.

V. SENTIMENT ANALYSIS APPROACHES

Sentiment analysis is one of the most popular tasks of Natural Language Processing (NLP). Sentiment analysis is the task of determining the sentiment value of a given expression in natural language (Shelke & Deshmukh, 2020). It is basically a multilevel text classification system where a given input text is classified as having positive, neutral or negative sentiment. The number of classes may vary depending on the nature of the training dataset.

A. *Lexicon Based Approach*

A sentiment lexicon approach is emotion dictionary which have positive and negative words. Examples of positive words can be "happy", "great", etc., while examples of negative words can be "terrible", "disgusting". Count the presence of positive and negative words in your text and assign positive words. or negative sign for it depending on the number. There are many open source free dictionaries. The advantages of the approach are that it is easy to implement and does not require expensive training data. The disadvantages are that it is not very specific, for example, the positive word "joy" in front of "no" indicates a negative emotion, and words can be used sarcastically, for example: "Great. ! So now I have to. Face ..."

B. *Rule Based Approach*

Rule-based sentiment analysis is one of the fundamental techniques for measuring text sentiment. It requires only a little initial work and the idea is so simple that the method does not use any machine learning to detect the sentiment of the text (Boudad, Faizi, Thami, & Chiheb, 2018). For example, we can determine the meaning of a sentence by counting how often a user uses the word "bad" in their review.

C. *Machine Learning Approach*

Machine learning models rely on feedback data that has already been analyzed by humans. Each answer section is written by a human reader who can categorize the answer into a specific category. Categories can be as simple as positive, negative or neutral. As long as the data is labeled, machine learning models can often identify complex concepts. For example, a car manufacturer may want to categorize feedback from past buyers into "budget conscious", "eco conscious", "technology driven", "luxury driven", "performance driven", etc. Assuming there is enough labeled training data. For each of these categories, a machine learning model can assign a score for each category. By answering questions about what customers like or dislike about a particular car, it can help analysts better understand the brand.

D. *Corpus Based Approach*

A corpus-based approach aims to provide a dictionary related to a specific domain. These dictionaries are built from a set of seed word ideas that are developed by searching for related words using statistical

or semantic techniques. Corpus linguistics is a research method developed over the past few decades to support the rigorous investigation of language diversity and use, leading to more general and relevant research findings than would otherwise be possible. Corpus research uses two main research methods: 'corpus-based' and 'corpus-based'. Corpus-based research considers the validity of linguistic patterns and structures derived from linguistic theory. The main objective of the study is to study the variation and systematic patterns of use of previously defined linguistic features. Corpus-driven research is more practical, so language development stems from corpus analysis. This chapter illustrates the types of language use analysis and insights that are possible through corpus-based and corpus-driven approaches.

VI.   PROPOSED METHODOLOGY

Previous literature suggests that manually analyzing the reaction is time-consuming and stressful. In this paper, this problem is addressed by proposing a system that can automatically analyze student feedback and provide it to the lecturer in real time. To build the system, sentiment analysis is used to analyze opinion. Previous literature has not revealed a suitable sentiment analysis model for analyzing students' opinion. Therefore, this research explores the different characteristics of sentiment analysis models to identify new patterns. There is also a lack of research on visualizing such data, so this research examines different ways to present the data in a meaningful way.

Our proposed sentiment analysis system helps to improve teaching and learning by conducting temporal sentiment and sentiment analysis of student response in multiple languages based on teacher performance and subject satisfaction. Real-life systems were used to evaluate the entire system, combining sentiment analysis models with visualization of results. Computer input consists of pupil response, and computer output consists of polarization and emotion recognition results. To evaluate a system, applicability, applicability and suitability of the system are evaluated. Usability testing of a system is done to assess how users understand and use it. This includes lecturers' interactions with computers and whether they can use them and integrate them into their lectures. This includes knowing how many students have given feedback on the lecture. Usability was evaluated to measure how useful the tool was to the lecturers. This includes how useful they find polarization and sentiment prediction models and visualizations in general. Adaptability testing is used to check whether the lecturer/student system is adaptable or not. This was to ascertain whether the lecturers could integrate the system into their daily lectures and whether they would use the system again. It tests students' willingness to respond and do so in subsequent lectures. Questionnaires were used to assess all the above factors because their results are easy to calculate and can be distributed to a large number of people. Questionnaire is a quantitative method and was used earlier to evaluate educational methods.
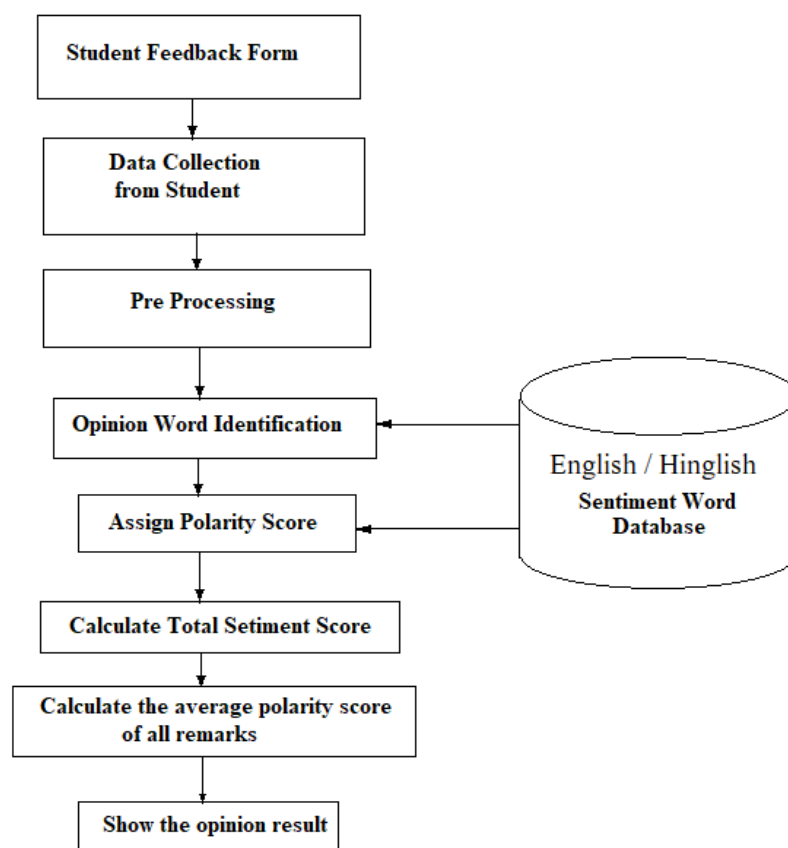
Figure 1: System Architecture of Sentiment Analysis System

We collected data from university students. More than 500 students are studying their masters in this university. We designed a feedback form with a web-based application and sent a link to students. The feedback form has several questionnaires. Questions are set up to collect assessment values and write comments on the teacher and course. Students usually write notes in English or Hinglish. Some students use Devanagari font and some create unicode font for Hinglish language. So comments written in font should be converted to Unicode font. Then, we translated these comments into English using Google Translate. However, most senses are lost in the process of translation. Therefore, we cannot rely on Google Translate. We tried translating them manually or as a third-party API-based service. Due to time constraints, we have only translated a few sentences. Most of the dataset is basic English sentences written by students. Finally, we received an Excel file containing the students' comments. We have converted this file to database file format. We import the database into our sentiment analysis system to get positive, negative and neutral scores.

VII.   EXPECTED OUTCOMES

At present, we hope that the purpose of sentiment analysis in education is to discover the hidden knowledge of concepts that are open-ended questions. Typically, these comments are provided as

student feedback during the final assessment of learning. Student feedback is very important in the learning process to know the reactions of the students towards the lecture. Its purpose is to help teachers/lecturers to understand the learning behavior of students.

VIII.   CONCLUSION

In this paper, we have discussed sentiment analysis in detail. Sentiment analysis analyzes whether the opinion expressed about a teacher is positive or negative. The problem of sentiment analysis has been of research interest in recent years. Sentiment analysis is a growing field of data mining used to derive knowledge from student opinions, comments and reviews about any course or topic. Sentence and feature-level sentiment analysis. In future, there may be sentiment analysis a set of feature exposure findings derived from the reviews was presented. Sentiment analysis has become a very interesting research area in the sentiment analysis and natural language processing community. There is a need to find a more innovative and effective way to meet the current challenges faced by sentiment analysis. Despite many significant works in this field, a fully automated and highly efficient system has not yet been introduced. This is due to the unstructured nature of natural language. The larger the natural language vocabulary, the more difficult things get. These issues should be addressed separately, and those solutions can be used to improve sentiment analysis methods.

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