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Application Of Student Feedback Using Machine Learning Model

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Abstract: Student feedback analysis is one of the major factor for any institution to grow. Recent advancements in machine learning models enable institutions to collect and analyze feedback in an efficient manner. This paper explores the collection of student feedback using questionnaires that are sent to students using google form. The data collected from students include some topics on curriculum, assessment, teaching learning process, placement, infrastructure and co-curricular activities. The questions are then evaluated using the exploratory analysis. The algorithms used in this work are naïve bayes and random forest. On analyzing the model accuracy naïve bayes gives best accuracy as 95% compared to random forest as 30%.

Index Terms **- Feedback, Machine Learning, Naïve Bayes, Random Forest.**

I. INTRODUCTION

The purpose of academic institutions is to improve the college environment by collecting feedback from students on their experiences with the institution's courses and facilities. The student feedback analysis and evaluation is to collect the feedback responses from the students. This student feedback collects student's feedback responses and then classify them using the ML algorithms. Once the student submits feedback through google form, the feedback is analyzed using ML techniques. Feedback then classified into a strongly agree, partially agree and disagree responses using the machine learning algorithms. This responses helps to calculate the mean and standard deviation by the responses as strongly agree, partially agree and disagree so that they can improve the way of teaching, learning and other facilities. The process provides a graphical representation of the student's responses using feature extraction and classification. The goal of this system is to help teacher to improve method of teaching as per the responses received from the feedback. The system is developed to provide feedback in a quick and efficient manner to the academics institution. Students can only view their feedbacks which are presented in form of graphs. The students can see all the feedbacks submitted in graphical forms like teaching learning process, infrastructure and curriculum. Overall, this system will help to improve in academics institute and way of teaching by collecting feedbacks from students.

II. EXISTING SYSTEM

In the existing system, If a student has to provide feedback under the manual system it is difficult and requires paperwork and are time consuming to overcome this problem, the google form feedback is provided to the students now in place of educational institutions, they are expected to do so via the provided URL and a google form to the students. By collecting the responses through google form the task becomes easy and saves time and paper work. The responses collected from the students are saved as a .csv file in Google Forms.

III. PROPOSED SYSTEM

In the proposed system of student feedback, an evaluation that would keep student feedback in the form of a csv file and assess questions that were written based on the academic resources offered to students using ML algorithms. Following that, the feedback is categorized as strongly agree, partially agree, and disagree. This system's objective is to collect student feedback and analyze it using machine learning techniques. We require methodologies like machine learning-based approaches as well as other approaches like data analysis and model building to reach the goal of student feedback. The technology aids in graph visualization of the output of feedback data.

3.1 Module 1: Data Collection

Google Form is used to distribute the questions to the students, and a Microsoft Excel comma separated values file is used to gather and store the student responses. The dataset which is collected is used for analysis and evaluation purpose.

3.2 Module 2: Data Understanding and analysis

For each topic, the student-collected dataset is analyzed and evaluated using the mean and standard deviation. The mean and the standard deviation is calculated for each question for evaluation purpose to know how many students have given responses on strongly agree, partially agree and disagree. The purpose of the mean and the standard deviation is to calculate the student feedback responses to analyze and evaluate the dataset for data understanding.

3.3 Module 3: Model Building and evaluation of the test data

The training data that are gathered for each question and utilized to train the model are the student responses that are collected. The accuracy of the model is tested using the whole set of data using the naive bayes and random forest algorithms. In terms of accuracy comparisons between these two algorithms, naive bayes performs better than the random forest algorithm. The frequency of the terms included in the responses is one of the features used by the classifier. The evaluation of data collection and analysis, with the goal of identifying the dataset that is successfully carrying out the student feedback dataset. This is equivalent to the last assessment the model analyses the following training and the testing phase. This stage is to determining whether the model is generalizable since it allows us to determine the model's operational accuracy using a testing set of the data.

3.4 Module 4: Data Visualization

The data visualization, which is the graphical presentation of data, is used to illustrate the analysis and evaluation of the student feedback. The visualization displays the student data in graphical representation on each topic like curriculum, assessment, teaching learning process, infrastructure, placement and co-curricular activities. The question are also displayed in the chart for better view for students.

IV. RELATED WORK

U. Verma al. [1], proposed learning tool based on teaching approaches. The teaching/learning process should support both the assimilation of knowledge and the development of skills in this method. Previous studies showed that a continual evaluation-based technique might accomplish both goals. However, the additional work needed to execute such solutions was either evaluated or measured in those analyses.

P. Rana et al. [2], proposed a matrix factorization and multi-regression approach based analyzer to predict the student's performance. Initially, it was designed for analyzing e-commerce applications. But it can be used to analyze students' performance. It uses a degree planner, which predicts about the students who have very poor performance and may not be able to pass the course. It also forecasts about the future courses by analyzing the past performance.

A. Jain et al. [3], proposed a data mining approach based performance analysis tool. It analyses the student's learning and produces the semantic rules that can be used further in analyzing the overall performance of the student for that particular course. It uses the decision tree approach for the production of semantic rules. This system uses semantic web and ontology techniques for increasing the quality of study material.

C. Kurniawan et al. [4], developed a method for evaluating the performance of teachers using sentiment analysis and opinion mining. They gathered student feedback and determined the particular teacher's strengths and weaknesses. They assessed the qualitative and quantitative data and offered a teacher's sentiment score for a school and performance by providing them with customized and appropriate academic tools and coaching.

G. Sanuvala et at. [5], to reduce the time and stress associated with reviewing student feedback while teaching. They processed automatically using sentiment analysis to get around it. In order to provide a higher level of pre-processing, they used Support Vector Machine (SVM).

F. Dalipi et al. [6], proposed a sentiment analysis-based automated evaluation system. Real time text feedback is gathered, and using supervised and semi-supervised machine learning approaches, sentiment analysis is done to identify key features.

S. Katragadda et al. [7], According to the concept, sentiment analysis is a science that examines attitudes, views, sentiments, evaluations, judgments, attitudes, and emotions regarding a service, a company, a person, a topic, an issue, an event, and its attributes. Subjectivity and Polarity are the two components of sentiment analysis. In contrast to polarity, which displays emotions that might have either a positive or negative value, subjectivity is a statement that expresses feelings, ideas, or beliefs.

V. METHODOLOGY

The student feedback data has been collected using a google form and is used as training data to train the system. On receiving test samples, the trained system uses machine learning techniques to classify the text into classes that strongly agree, partially agree, and disagree. This result is shown graphically. Six processes make up the suggested methodology: collecting student feedback, preparing training data, feature extraction, training the model, analyzing test results, and graphical representation.

Unsupervised and supervised learning are the two types of machine learning. In contrast to unsupervised learning, where labels are not provided, supervised learning provides the sentences with class labels. Each question receives training data that is used to enhance the algorithm. The responses provided by the students in the form of sentences make up this training data.

The google form with feedback questions is used to distribute the questions to the students, and a Microsoft Excel comma separated values file is used to gather and store the student responses.
This process involves extracting features from datasets made up of responses in a format needed by machine learning algorithms. The feature extraction process is applied to both train and test data. Tools for data classification and feature extraction are available in the Scikit-learn library.

There are many different algorithms for text classification with machine learning those are naïve bayes and random forest classification technique is to find the classes probabilities assigned to texts by using joint probabilities of classes and words. The features/predictors used by the classifier are the frequency of the words present in the feedback file.

Machine learning text classification algorithms come in a wide variety. These are naive Bayes and random forest classification techniques that use the joint probabilities of classes and words to determine the class probabilities assigned to texts. The frequency of the terms present in the feedback file is one of the features/predictors that the classifier uses. An approach to supervised learning is Random Forest. It can be applied to tasks involving classification and regression. A forest with many trees is produced using the random forest algorithm. Accuracy increases along with features and labels for classification of the data.

The data visualization uses matplotlib for graphical representation of the data for better view of the students. The results are represented in chart which questions and responses as strongly agree, partially agree and disagree.

VI. RESULTS AND DISCUSSION

A Student feedback for academic institutes using ML includes modules like data collection which collects student feedback, data understanding which is evaluated using mean and standard deviation and model building for finding the accuracy, and data visualization which represents the data in form of chart.

6.1 Data Collection

The questions are prepared using google form. This module collects feedback from the students using google forms. All the responses are stored and saved in Microsoft excel comma separated values.

Figure 6.1: Data Collection of student feedback

6.2 Data understanding and analysis

The characters are changed to number from the collected responses for data analysis, those feedbacks were pre-processed using machine learning techniques. The pre-processing is done to analyze the data for calculation of mean and standard deviation on each questions for evaluation.

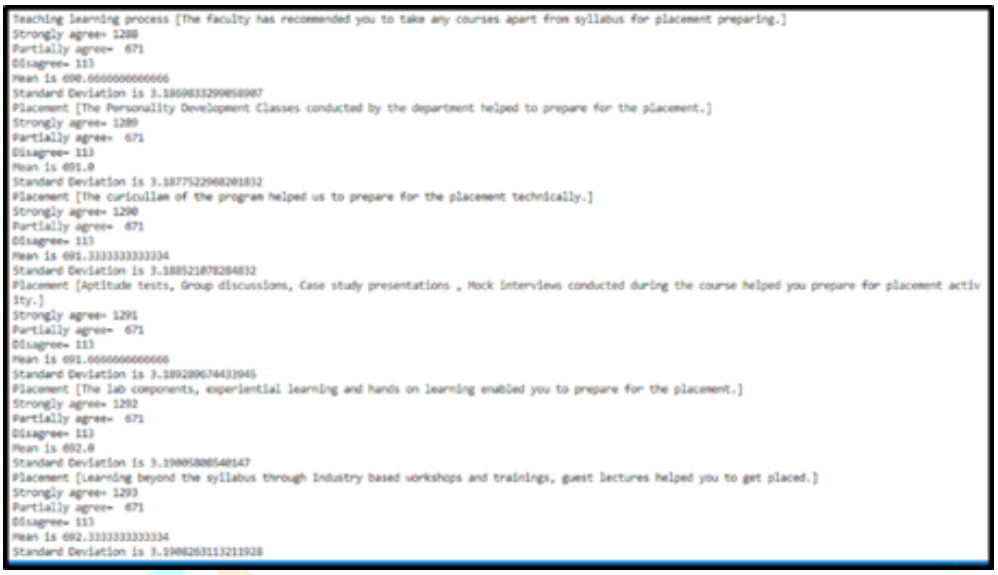

Figure 6.2: Mean and standard deviation result

6.3 Model Building

The dataset is classified using the machine learning models to analyze and evaluate the student feedback data and the model is build using the naïve bayes and the random forest to find the best accuracy of the algorithm. Where the naïve bayes gives the best accuracy than random forest as naïve bayes is suitable for large dataset which is fast, reliable and efficient.

```
PS C:\Users\home\Desktop\FinalProjectCode\StudentFeedBack> python randomforest.py
Training Features: (2, 45)
Training Labels: (2,)
Testing Features: (1, 45)
Testing Labels: (1,)
Accuracy of the model is: 30.63
PS C:\Users\home\Desktop\FinalProjectCode\StudentFeedBack> python naivebayes1.py
Total number of responses are:  69
Out of these, training responses are:  48
Test responses  are:  21
Accuracy of your model is:  95.23809523809523
```

Figure 6.3: Naïve bayes and random forest accuracy

6.4 Data visualization

The data visualization represents the data in graphical format. The Matplotlib is used to visualize the data for student views and questionnaires are prepared on each topic which is graphically presented, to see how student has given responses on each topic the data is analyzed and visualization is done for better understanding of the student feedback.

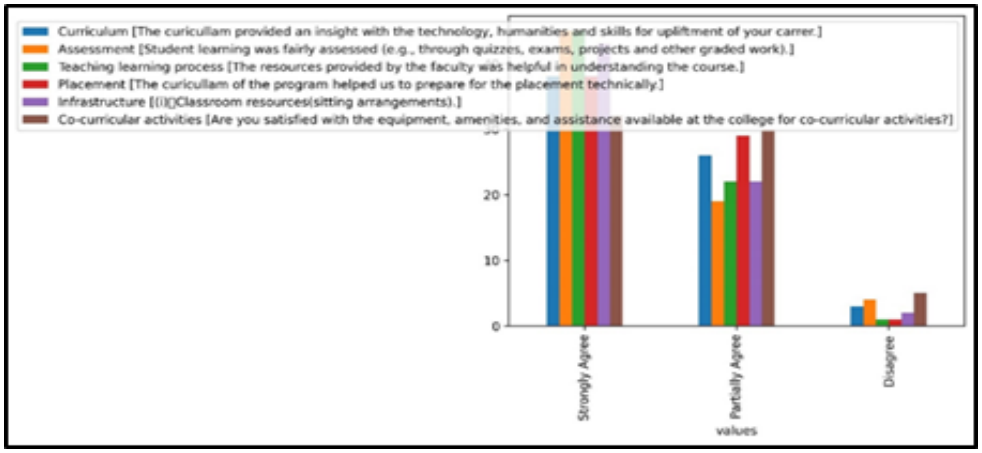

Figure 6.4: Graphical representation of student feedback

How does a student feedback system is useful for academic institutes using ML?

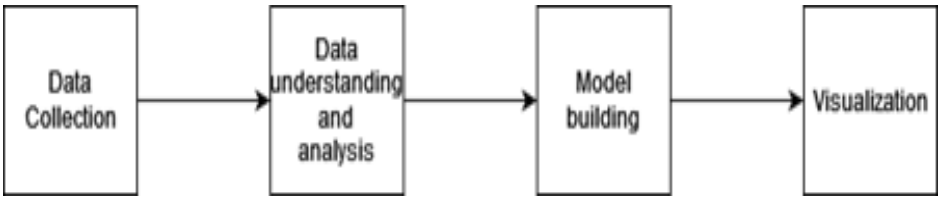

Figure 6.5: Block Diagram of Student feedback

The figure 6.5 shows the student who will give the feedback for curriculum, assessment, teaching learning process, placement, infrastructure and co-curricular activities as strongly agree, partially agree and disagree on submitting the feedback. The model uses machine learning algorithms for finding the accuracy and evaluation is done on mean and standard deviation. The student can view the analysis of data in form of charts.

VII. CONCLUSION

The student feedback project assists in gathering input from students in order to learn about their responses about the academic institute, how they teach, and what facilities are provided in the college and department. This feedback assists the college in enhancing the curriculum, teaching and learning process, assessment, infrastructure, placement, co-curricular activities, and so on. The question are also displayed in the chart for better view for students. The collected student responses are into the trained model, and the responses were categorized. By comparing the algorithms, the naive bayes classifier is more accurate than the random forest approach. Based on the results of the analysis, we can conclude that the naive bayes classifier method gives highest result than the random forest approach. Based on the results of the analysis, we can conclude that the naive bayes classifier method gives highest result than the random forest approach, the naive bayes accuracy gives 95% and random forest accuracy gives 30%.

VIII. FUTURE WORK

The future work will concentrate on implementing more algorithms in order to identify the best accuracy among the models. The user interface can be improved to be more accurate based on the needs of the user. Feedback can be gathered from instructors, department heads, staff, alumni, and others to learn their thoughts on student performance and evaluation based academic institutions. Staff, faculty, and HOD modules can be included to analyze and evaluate using ML algorithms. The cognitive modelling used to create the knowledge-base. So they can get better outcomes and conduct more experiments utilizing larger real-time feedback datasets containing thousands of responses of student performance and survey data.

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