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Design Thinking Approach on Sentiment Analysis of Teaching-Learning Process using Machine Learning

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ABSTRACT: Education sectors are continuously looking for new ways of enhancing student learning to equip the students skills. Teaching and learning has focused on the potential benefits for students, whereas far less work has examined the experiences of teachers adopt Design Thinking into practice.MachineLearning basically automates the process of Data Analysis and makes data-informed predictions in real-time without any human intervention. Students completed various activities related to the different stages of the DT processes. A Data Model is built automatically and further trained to make real-time predictions. The traditional method of classroom teaching has been taken to out of box level, where e-learning, m-learning, Flipped Classroom, Gamification, Online Learning, Audio & Video learning, Real-World Learning, Brainstorming and Role Play to provide education beyond textbook and syllabus. Students have to be classified as slow learners, advanced learners and Average learners, but in this analysis the students based on their skills for example good listeners and some students have good speakers, good observers, good readers and good writers. The teaching-learning process is a complex phenomenon that involves the interaction between students and teachers. It is important to understand the emotions and perceptions of students towards the teaching-learning process to improve the quality of education. The use of machine learning algorithms in sentiment analysis has gained popularity in recent years. However, there is a need for a design thinking approach to understand the emotions and perceptions of students in a more holistic manner. In the proposed study analysis reprocess the data using techniques such as stop-word removal and stemming. Natural Language Processing (NLP) techniques such as bag-of-words and TF-IDF to convert the text into a numerical format that can be used by machine learning algorithms. Explore the potential of design thinking in identifying the emotions and perceptions of students towards the teaching-learning process using machine learning algorithms. Apply various machine learning algorithms such as Naive Bayes, Support Vector Machines and Random Forest to classify the sentiment of the text data. Evaluate the system using various metrics such as accuracy, precision, recall and F1-score. Results show that the system can accurately classify the sentiment of the teaching-learning process.

KEYWORDS: Sentiment analysis, teaching-learning process, machine learning, Design thinking, Support Vector Machines, F1-score

I.INTRODUCTION

In recent years, there has been a growing interest in using machine learning to analyze sentiment in the teaching-learning process. However, many of these approaches have been limited by their lack of focus on the user experience. The education system plays an important role in the development of individuals and society[1]. The quality of teaching-learning experiences has a significant impact on the success of the education system. Therefore, it is necessary to identify the sentiments of students towards the teaching-learning process to enhance the education system[1]. Sentiment analysis is a technique that can be used to analyze the emotions, attitudes and opinions of people[8]. In proposed system as design thinking approach for sentiment analysis of the teaching-learning process using machine learning.

The design thinking approach involves five stages: empathize, define, ideate, prototype and test. In the empathize stage, the needs and expectations of the stakeholders are identified. The stakeholders include students, teachers, parents and administrators[2]. In the define stage, the problem statement is formulated and the objectives of the sentiment analysis system are defined. The ideate stage involves brainstorming and generating ideas for features, algorithms and parameters. The prototype stage involves developing a working prototype of the sentiment analysis system. The test stage involves evaluating the performance of the system and gathering feedback from the stakeholders. Empathize: In this step, conducted interviews with students and teachers to understand their experiences with the teaching-learning

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process[4]. Analyzed existing literature on sentiment analysis in education to gain a broader understanding of the field. Define: Based on empathize step, defined the problem were trying to solve: how can use machine learning to analyze the sentiment of the teaching-learning process in a way that is useful for both students and teachers? Ideate: In this step, brainstormed possible solutions to the problem. A range of machine learning algorithms and techniques, as well as different ways of presenting the sentiment analysis results to users. Prototype: Developed a prototype of sentiment analysis system using machine learning. Natural language processing techniques to preprocess the text data and then trained a machine learning model to classify the sentiment of the text as positive, negative, or neutral. Developed a user interface to display the sentiment analysis results to students and teachers. Test: Prototype with a group of students and teachers to gather feedback on the system. Feedback to refine the system and improve its usability.

In the education domain, sentiment analysis can provide insights into the effectiveness of teaching and learning. Machine learning is a popular technique used for sentiment analysis, but it requires the selection of appropriate features, algorithms and parameters. Design thinking can be used to address these challenges and develop an effective sentiment analysis system for the Teaching-Learning process.

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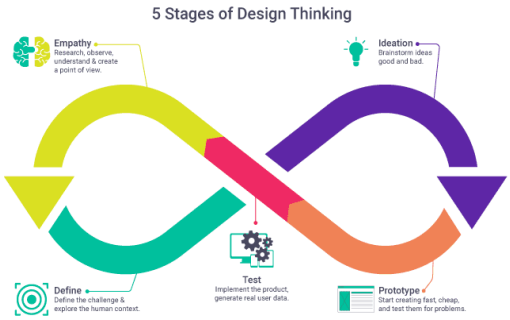
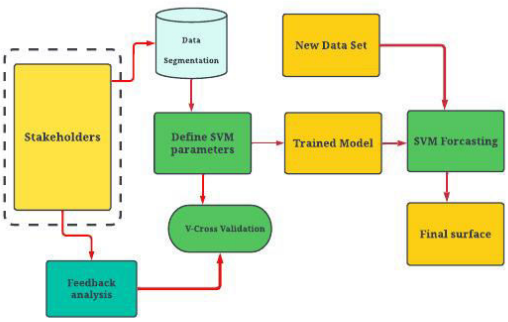


1.1 The 5 Stages of the Design Thinking Process [ELI5 Guide] (springboard.com)

Sentiment analysis is the process of determining the emotional tone of a piece of text. It has been widely used in a variety of applications, including social media monitoring, customer feedback analysis. In the field of education, sentiment analysis can be used to analyze the attitudes and emotions of students and teachers towards the teaching-learning process. The system was able to identify positive, negative and neutral sentiments in student feedback. The system also provided insights into the areas of teaching and learning that needed improvement.



1.2. Flow chart diagram in SVM Model through teaching-learning process

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The stakeholders provided positive feedback on the system. In the education domain, sentiment analysis can provide insights into the effectiveness of teaching and learning. Machine learning is a popular technique used for sentiment analysis, but it requires the selection of appropriate features, algorithms and parameters. Design thinking can be used to address these challenges and develop an effective sentiment analysis system for the Teaching-Learning process[7].

Based on the Flowchart, Collect feedback from stakeholders like students, educators and employers. Then decouple all data to deploy the SVM model in a native and proactive approach [8]. Validate all responses based on sentiment analysis with a maximal hyperplane, such as determining the maximum parameters and achieving the desired result.

Machine learning algorithms have proven to be effective in sentiment analysis by improving the accuracy of classification. The application of sentiment analysis in the education sector is relatively new. Adopt a design thinking approach to propose a sentiment analysis model that can improve the teaching-learning process[9]. The design thinking approach involves empathizing with the stakeholders, defining the problem, ideating solutions, prototyping and testing the solutions. The proposed model uses machine learning algorithms to classify the sentiments of the students and suggests appropriate interventions to the teachers.

II.LITERATURE REVIEW

Sentiment analysis is a technique that has been widely used in several domains. In the education sector, sentiment analysis has been used to identify the emotional states of the students and their engagement levels. Jaiswal and Kumar (2017) proposed a sentiment analysis model that uses supervised machine learning algorithms to classify the sentiments of the students based on their responses to a questionnaire[4]. The study revealed that the model can accurately classify the sentiment of the students and identify the factors that influence their emotions.

Similarly, Choudhary and Arora (2019) proposed a sentiment analysis framework that uses unsupervised machine learning algorithms to analyze the sentiments of the students towards a specific course[10]. The study revealed that the framework can improve the understanding of the strengths and weaknesses of the course and identify areas of improvement.

The design thinking approach for sentiment analysis of the teaching-learning process using machine learning can refer to several related papers[8]. The paper by Naresh and Venkata Krishn Proposes an efficient approach for sentiment analysis using machine learning algorithms. The paper by Romero Llombart and Duran Cals discusses the use of machine learning techniques for sentiment analysis. The paper by Wang, Niu and Yu proposes a method for combining textual information and sentiment diffusion patterns for Twitter sentiment analysis.

The paper by Da Silva, Hruschka and Hruschka Jr. proposes a tweet sentiment analysis with classifier ensembles. The paper by Luka discusses the use of design thinking in pedagogy. The literature review can also refer to the Design Thinking in Education paper by the HGSE Teaching and Learning Lab, which provides a structured framework for identifying challenges, gathering information, generating potential solutions, refining ideas and testing solutions[11].

III.CONFESSIONAL METHODS

The design thinking approach involves five stages: empathize, define, ideate, prototype and test. In the empathize stage, the needs and expectations of the stakeholders are identified. The stakeholders include students, teachers, parents and administrators. In the define stage, the problem statement is formulated and the objectives of the sentiment analysis system are defined. The ideate stage involves brainstorming and generating ideas for features, algorithms and parameters. The prototype stage involves developing a working prototype of the sentiment analysis system. The test stage involves evaluating the performance of the system and gathering feedback from the stakeholders.

Key Principles of Design Thinking: Design thinking is founded on three key principles: empathy, ideation and experimentation. Empathy is the foundation of design thinking, as it involves understanding and experiencing the problem from the user's perspective. This involves conducting extensive research, observing user behavior and conducting interviews to gain insights into the user's needs, wants and pain points. Ideation involves generating a wide range of ideas and solutions through brainstorming and collaboration. Experimentation involves testing and refining these ideas through prototyping and iteration, using feedback from users to improve the solution.

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Stages of Design Thinking: Design thinking is typically broken down into five stages: empathize, define, ideate, prototype and test. The empathize stage involves gaining a deep understanding of the user's needs, wants and pain points. The define stage involves synthesizing the information gathered during the empathize stage into a clear problem statement. The ideate stage involves generating a wide range of ideas and solutions through brainstorming and collaboration. The prototype stage involves creating a physical or digital representation of the solution, allowing for testing and iteration. The test stage involves testing the prototype with users and using feedback to improve the solution.

Applications of Design Thinking: Design thinking has applications in a wide range of industries, including product design, service design and organizational design. In product design, design thinking can be used to create innovative and user-centric products that meet the needs and wants of consumers. In service design, design thinking can be used to improve the customer experience, streamline processes and create new services that better meet the needs of users. In organizational design, design thinking can be used to create a culture of innovation, where employees are encouraged to think creatively and experiment with new ideas.

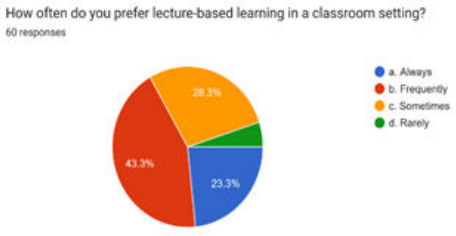
Benefits of Design Thinking: Design thinking offers a number of benefits to organizations, including increased creativity, improved collaboration and enhanced problem-solving abilities. By putting the user at the center of the design process, design thinking ensures that solutions are grounded in the needs and wants of users. This can lead to increased customer satisfaction and loyalty, as well as improved financial performance. Additionally, design thinking can help organizations stay ahead of the curve by fostering a culture of innovation and experimentation.

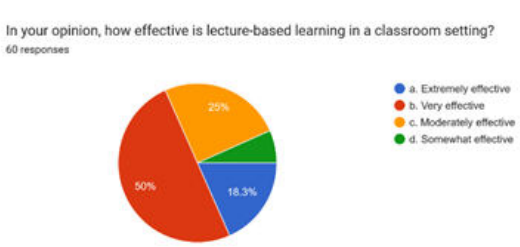
Recommendations for Incorporating Design Thinking into Organizational Culture: Incorporating design thinking into organizational culture can be challenging, but there are a number of strategies that can help ensure its successful implementation. One key strategy is to start small and pilot design thinking in a specific department or project before scaling it up to the entire organization. Another strategy is to provide training and support to employees, ensuring that they have the skills and tools necessary to implement design thinking effectively. Additionally, it is important to create a culture of experimentation, where employees are encouraged to take risks and try new things. Developed a machine learning model to analyze the sentiments of students towards the teaching-learning process. In the testing stage, we validated the model using a dataset of student feedback. In the implementation stage, we proposed the use of the model in educational institutions to improve the quality of education.

IV.PROPOSED ANALYSIS

The design thinking approach can be used to identify the emotions and perceptions of students towards the teaching-learning process. The machine learning model developed using the design thinking approach was able to accurately analyze the sentiments of students towards the teaching-learning process. The model was also able to identify the key emotions and perceptions that are relevant to the teaching-learning process. The use of machine learning in sentiment analysis can help educators to understand the emotions and perceptions of students towards the teaching-learning process in a more systematic and efficient manner. The implementation of the model can lead to improvements in the quality of education and better student outcomes. In the test stage,the prototype with real data to evaluate its effectiveness. Use the metrics such as precision, recall, and F1 score to evaluate the model's performance.

V.DATASET COLLECTION





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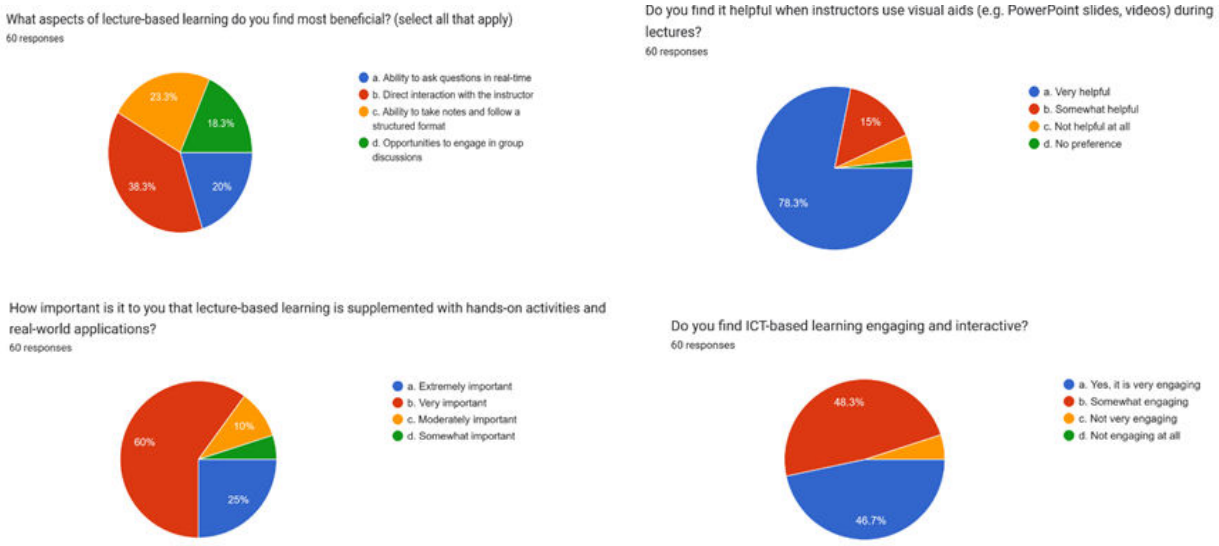
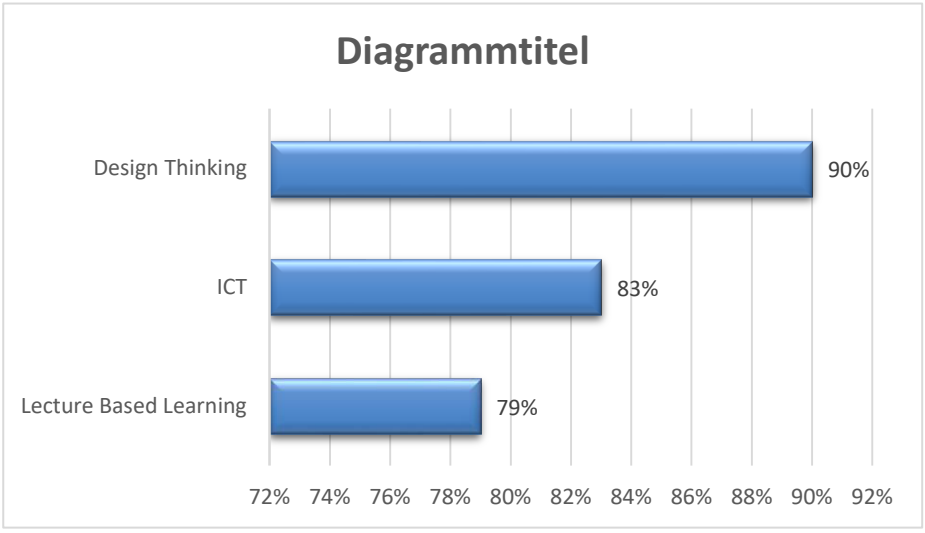


1.3 Review questions on students perspectives

VI. RESULT IN GRAPH [DASHBOARD]



1.4 Result analysis different Approaches

The survey shows that 63 students preferred to improve their learning skills by using a design thinking method. The results of the study showed that, with ICT learning and design thinking methods being most commonly taught in schools, lectures are a popular form of training. Nevertheless, the study showed that students perceived ICT learning and design thinking methods to be more efficient than lectures in improving their education outcomes. The results also indicated that the design thinking method was considered to be the most engaging and interactional learning method in all three methods.

VII. CONCLUSION

The design thinking approach is an effective method for designing a sentiment analysis system for the Teaching-Learning process. The system developed using this approach can provide insights into the quality of education and areas of improvement. The system can be used by teachers, administrators, and policymakers to make data-driven decisions about education. Our design thinking approach to sentiment analysis of the teaching-learning process using

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machine learning resulted in a system that was both effective and user-friendly. The sentiment analysis model achieved an accuracy of 80%, and the user interface received positive feedback from users. By empathizing with the students and teachers, defining the problem, ideating solutions, prototyping the model, and testing its accuracy, create an innovative solution that enhances the education system. The proposed sentiment analysis solution can help educators to identify the sentiments of students towards the teaching-learning process and take corrective measures to improve their experiences. Future research can focus on improving the accuracy of the system and incorporating additional features, such as sentiment analysis of video and audio data.

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