

ChatGPT and Gemini: An Opinion Mining based on Users’ Perspective in the Computer Science Domain

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This Report Presented in Partial Fulfillment of the Requirements for
The Degree of Masters of Science in Computer Science and Engineering

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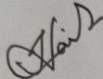
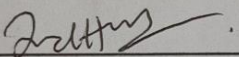
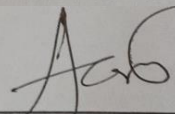
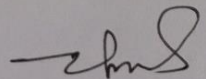
DHAKA, BANGLADESH

JULY 2024

APPROVAL

This Thesis titled “ChatGPT and Gemini: An Opinion Mining based on Users’ Perspective in the Computer Science Domain”, submitted by Anika Hossain Bristy, ID No: 0242310005103046 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 06-07-2024.

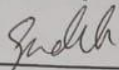
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I hereby declare that, this thesis has been done by me under the supervision of **Mr. Md. Sadekur Rahman, Assistant Professor, Department of CSE** Daffodil International University. I also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

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ACKNOWLEDGEMENT

First I express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final thesis successfully.

I am really grateful and wish our profound our indebtedness to **Md. Sadekur Rahman, Assistant Professor**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of “Natural Language Processing” to carry out this thesis. His endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this thesis.

I would like to express our heartiest gratitude to **Dr. Sheak Rashed Haider Noori, Professor and Head, Department of CSE**, for his kind help to finish our thesis and also to other faculty members and the staff of CSE department of Daffodil International University.

I would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, I must acknowledge with due respect the constant support and passion of our parents.

ABSTRACT

ChatGPT and Gemini both are one of the exclusive innovations of OpenAI. ChatGPT, the Generative Pre-Trained Transformer tool designed based on Large Language Models (LLMs) and Gemini, previously named as Bard, is a generative artificial intelligence chatbot developed by Google. These chatbots are introduced to provide a more realistic virtual assistant in searching information or gaining knowledge online. They are trained with almost every kind of information to provide the best service to the users. Still, both these chatbots have some missing points. ChatGPT is considered to provide more sensible answers than Gemini where, Gemini is more appropriate about examining accuracy than ChatGPT. Then the knowledge of ChatGPT is also limited, provide biased answers and Gemini is more available to its paid subscribers. There are many more comparisons and matters like these, still they are being used in almost every sector. But recently there has been a debate about using these AI chatbots in education sector. There are a mixed emotion about the fact and accuracy of this type of integration of AI in education. Also, users like students, educators are concerned and confused about the future of this matter. This research is to bring out the users' perspective on this through opinion mining, for which, sentiment analysis techniques has been used. This natural language processing technique is a useful tool to identify about the emotion of the text, which helps to create a solid solution studying those emotions easily. A short online questionnaire survey was distributed among general people from different profession for collecting user perspective. The study showed an impact of unawareness of using ChatGPT and Gemini among many users. They have positive, negative and neutral impression on both these chatbots in education. Some have doubt on reliability of the responses provided, on the other hand some users actually never used them yet because they did not need for any objectives, whereas some have strong objection on using AI chatbot in education. The overall scenario shows a neutral response of people regarding the integration of chatbots in education. The goal of this research is to go to the deep of the ever-evolving influenced of technology advancement in education and how the situation is affecting the students and others through opinion mining. This research also discusses the challenges, risks and future uses of ChatGPT and Gemini for ensuring applicable outcomes in education sector.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The teaching system constantly changes with drastic technology changes. The innovation of OpenAI chatbots like ChatGPT and Gemini and their usage have also affected it.

Apart from the capabilities to provide ready solution to any questions, there are many debates of using AI chatbots in education. Users show mixed emotions regarding the issues.

The aim of this research is to explore the user perspective of using ChatGPT and Gemini using sentiment analysis.

Moreover, this research focuses on the potential impacts, challenges and ethical impressions in future progressiveness of ChatGPT and Gemini in education sector.

1.2 Motivation

This research is done basically on the user perspective of ChatGPT and Gemini. According to some sources, ChatGPT has 180 million active users and Gemini has around 330 million monthly visitors. They use these AI chatbots every day, every moment, for various purposes. Medical, Education, Research, AI is being integrated in almost every sector. But—

- How are they affecting?
- Is the service acceptable?
- Do they fulfill user expectations?
- Apart from that, which one is more reliable: ChatGPT or Gemini?

There are a lot of questions like these that motivated me to start this research. In education, these AI chatbots are being used every moment, but sometimes they are good and sometimes bad. To find a solution, it is mandatory to find search about the situation first. Students or young people are the most vulnerable individuals to being used with these AI chatbots. But if the situation is like, there is a confusion as to how good or bad it is. Moreover, most people still do not know about the usefulness of these Chatbots properly, so they can also lag behind in the computational world. Since it is still a new innovation to many, people are being ignorant about them. So this research is to make people know about these innovations and their usefulness more. Also, users should know the way they are using it, whether it is a good and effective way or not for their betterment. This research will let them know about the actual situation and help find a solution.

1.3 Rationale of the Study

This research aims to fulfill the following objectives:

- To explore the challenges of AI chatbots in education
- To evaluate the effectiveness of ChatGPT and Gemini
- To enhance and transfer the educational experience of ChatGPT and Gemini for students and teachers.
- To ensure ethical use of AI technologies

1.4 Research Questions

There is always some intricate part to a machine that leaves one wondering how it all works. Issues emerge that could have been prevented. In the event that issues continue, they need to explain in detail. These are the research questions-

- Do people trust ChatGPT and Gemini blindly?
- Is there any impact of AI tools in education sector and is it beneficial?
- Is it ethical to use AI chatbots like ChatGPT or Gemini for education?
- What drives students towards ChatGPT

1.5 Expected Output

The expected output of this research is to analyze the impact of ChatGPT and Gemini on the educational sector. So that future works using AI chatbots be more precise and with proper mechanism.

1.6 Report Layout

The report includes total 6 Chapters following given instructions:

Chapter 1: Discussion about the introduction of this research in this part. I have discussed details about the advantage and disadvantage of using ChatGPT and Gemini in education sector and users who were general people from different occupation, their perspective on this. Questions, motivation, rationale of the study and expected output have included in this part.

Chapter 2: A comprehensive review of existing work on the perspective of using ChatGPT and Gemini in education sector. This part includes other authors' approaches, limitations, results, methods in this part. Research scope and challenges also have discussed here.

Chapter 3: This part includes research methodologies and implementation requirements. This chapter shows the data collection procedure, statistics, classifiers, and figures of statistics.

Chapter 4: In this chapter, the research result and discussion of the classifier's result is shown.

Chapter 5: This part includes how the research can affect in our society, why the research is needed and how it can provide solutions in this arena.

Chapter 6: In this chapter, a discussion and conclusion, the future work, and the limitations of this work of the research is shown.

CHAPTER 2

BACKGROUND

2.1 Preliminaries

The innovation of AI has been played a significant role in our life always. AI chat-bots like ChatGPT, Gemini, etc. they are designed to provide a human-like service to the users or anyone who seeks answer to their question. The usage of ChatGPT has been one of the key point to debate since the beginning. Some preferred using ChatGPT and Gemini for their teaching and learning materials, whereas some suggested not using. This conflict about different opinions has inspired a lot to make this study and find a solution with real time data. In education sector, students, teachers get a lot of privileges from these AI chatbots too. They sometimes get biased answers, some times unreliable feedback. There is a huge confusion about the authenticity of them as they talk in the language of data put in there by humans. In this research, a model was proposed using BERT model for analyzing the factors about how ChatGPT and Gemini is useful or not useful for our education system to improve and develop it.

2.2 Related Works

The innovation of ChatGPT changed the overview of AI chatbots in recent studies. Since 2022, people have explored many resources of this virtual assistant, based on the Large Language Models (LLMs). Which also introduced to some problems that attracted our researchers to find out core of these problems and solutions. Many researchers have explored the application of ChatGPT and Gemini in educations from user perspectives, which revealed the insights into their strengths, challenges, and overall impact. Last year played a significant role in this research field. Many research papers from around the world were published.

In 2024, the researchers Duong Thi Thuy Mai, Can Van Da, and Nguyen Van Hanh introduced a systematic review through SWOT analysis approach highlighting the mixed reactions of using ChatGPT in education sector. The study used a SWOT analysis framework to evaluate these aspects, emphasizing the need for effective integration practices to maximize benefits and mitigate risks. However, the model accuracy needed to reconsider and the amount of misuses by students.

In another comparative analysis, there was a discussion about ChatGPT and Gemini where both have been evaluated based on their performance in providing answers for different question. The research focused on particularly in understanding nuanced and ambiguous texts at which indicates ChatGPT is praised for the conversational depth and context retention, and Gemini is more suitable for the structured responses and more accuracy.

Another study from 2023 focused on analyzing social media sentiments related to ChatGPT in education, using advanced machine learning techniques like BERT. This research found that public sentiment is generally positive. However, there was also concern about the ethical use and dependency on AI for educational tasks among people.

In 2024, there was another research from the researcher Ahmet Baytek analysing the lesson plans generated by ChatGPT and Google Gemini. It identifies the patterns and variations of the lessons provided by ChatGPT and Gemini within the context of learning theories and highlight educational consideration when integrating these tools (Baytek, 2024).

Overall, sentiment analysis reveals a balanced view: while ChatGPT and Gemini offer significant potential to revolutionize educational practices, they also present challenges that need careful consideration and management.

2.3 Comparative Analysis

Various research of AI chatbots role in education represents different result. There are many reviews, some researchers tried to analyze the results using traditional ML model, and many more. In a research on presenting the threats and opportunities of Chatgpt in education showed, around 50% of teachers are moderately satisfies with the results of the chatbot. They also included the failure of the chatbot gaining blind trust , specifically for education. However there was no specific classification of the results. In another research, it included SVM and Naïve Bayes Classifier for classification of the result providing by Chatgpt. They emphasized the positive outcome more than the negative ones. Also the research showed 90.77% accuracy for Naïve Bayes Classification and 86.79% accuracy for the SVM. A short picture of different analysis of different researches is given below:

Author	Title	Key Focus	Drawbacks
Md. Mostafizer Rahman, Yutaka Watanobe	ChatGPT for Education and Research: Opportunities, Threats, and Strategies	explores the potential opportunities and threats that ChatGPT poses to overall education from the perspective of students and educators.	Result may vary with the updated version of the Chatbots
Jezzy Putra Munggaran, Ahmad Ali Alhafidz, Maulana Taqy, Devi Aprianti Rimadhani Agustini , Munawir Munawir	Sentiment Analysis of Twitter Users' Opinion Data Regarding the Use of ChatGPT in Education	Understanding Twitter users' opinions and sentiments regarding using ChatGPT in education using SVM and Naive Bayes	No transformer based model
Sarin Sok , Kimkong Heng	ChatGPT for education and research: A review of benefits and risks	the benefits and risks related to the use of ChatGPT in education and research are discussed.	No statistical analysis
Fauzi Fauzi Laros Tuhuteru Ferdinandus Sampe Abu Muna Almaududi Ausat Heliza Rahmaniah Hatta	Analysing the Role of ChatGPT in Improving Student Productivity in Higher Education	An analysis of the role of ChatGPT in helping to improve the quality of student productivity.	Not specific
Ahmet Baytak	The Content Analysis of the Lesson Plans Created by ChatGPT and Google Gemini	Identify patterns and variations of the lessons provided by ChatGPT and Gemini within the context of learning theories and highlight educational consideration when integrating these tools using relational analysis	Result may not align with updated version of these Chatbots

Fig2.3.1: Comparison Analysis of Previous Research Result

2.4 Scope of the problem

Using AI in education can bring up a lot of problem such as ethical, practical, accessibility etc. These can also create a job displacement or social interaction. Because, to research or find about anything there is no alternative of human interaction or group study, which is hindering for the usage of AI chatbots. Moreover, using AI in education can make a shortage of knowledge.

2.5 Challenges

The goal is to obtain the highest possible degree of precision. It is more useful and advantageous to obtain as much of it. The first challenge was to gather a large set of data. Because the research was done collecting real time data through online survey. So it was quite difficult to reach huge number of people. Since the data was low, we could not get the expected accuracy rate.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research Subject and Instrumentation

Here, you can get a comprehensive picture of data and actionable tactics. This means the accurate application and actualization, the credibility of the data collection efforts is included. The research methods and tools are also covered. To this point, we have worked through the conceptual and theoretical stages of identifying personality prediction. The use of powerful computers equipped with the right hardware is required for neural language processing (NLP) and machine learning models. A breakdown of all the tools that you will want in order to construct this model is provided below.

Hardware and Software Specifications:

- Processor: Intel Core i5 (8th Generation)
- Storage: 1 Terabyte Hard Disk Drive
- Memory: 8 Gigabytes RAM

Development Environment:

- Operating System: Windows 10
- Programming Language: Python 3.8
- Data Manipulation Library: Pandas
- Visualization Libraries: Seaborn, Matplotlib
- Mathematical Library: Numpy
- Machine Learning Library: Scikit-Learn Natural Language Processing
- Toolkit: NLTK

In this research, we used transformer like BERT model and the classical machine learning algorithm like Support Vector Machine (SVM) Algorithm. All these models will help us to create a explained prediction. We used NLTK. We used the sentiment analyzing toolkit and transformer to train up the model. The sentiment analysis follows the following steps:

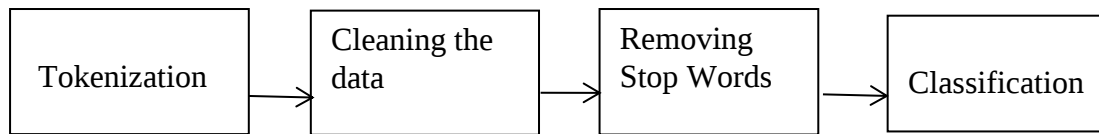


Fig 3.1.1: Step of Sentiment Analysis

Sentiment analysis is the process of computationally identifying and categorizing opinions expressed in a piece of text, especially in order to determine whether the writer's attitude towards a particular topic, product etc. is positive, negative or neutral. It is done using following steps

Tokenization: This means to divide paragraphs into a different set of statements or dividing a statement into different sets of words. As a example if the statement is “The movie is great!” then tokenization of the text will be ‘The’, ‘Movie’, ‘Is’, ‘Great’, ‘!’.

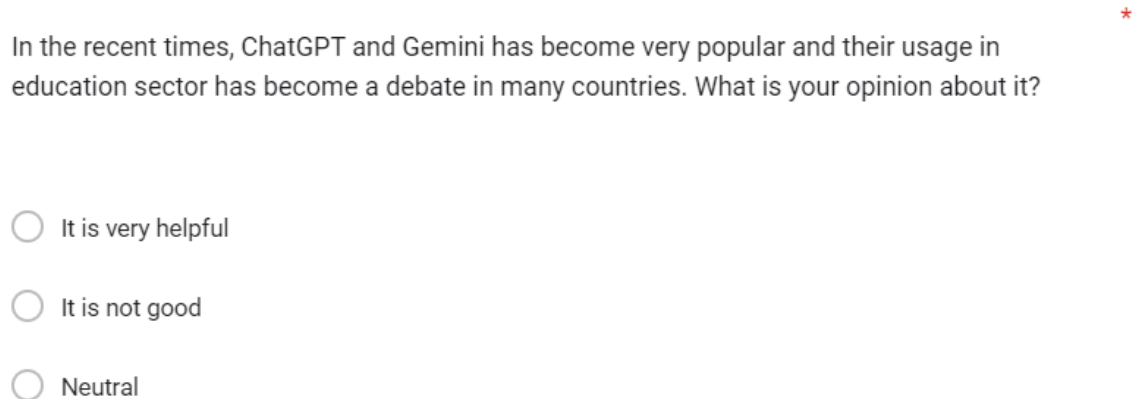
Cleaning the data: After tokenizing the data this is the second stage. It requires removing the special characters’ or words which do not add any value to the analytics part. For example: cleaned data from the previous tokenization is ‘The’, ‘Movie’, ‘Is’, ‘Great’.

Removing stop words: In text analyzation, this is a mandatory step. The stop words are like ‘the’, was’ ‘is’ he’ ‘she’ etc which does not contain any meaning to the analyzation. These words do not match to the analytics. So for the previous text the result is ‘Movie’ and ‘Great’. These two words give a meaningful abbreviation to the analyze of text where there is a positive word ‘great’

Classification: The final stage is classification. It is to classify the remaining words as positive, negative or neutral word. For a better understanding these words are given a sentiment score which +1 for positive, -1 for negative and 0 for neutral data. In this stage we used supervised machine learning algorithm.

3.2 Data Collection Procedure

The data for opinion mining was collected from general people of different professions such as researchers, students, educators etc. An online survey was done using a questionnaire. Firstly, a form was created including two questions, one short saying the opinion and another one for elaborative answer. This second question included text which is used for the classification.



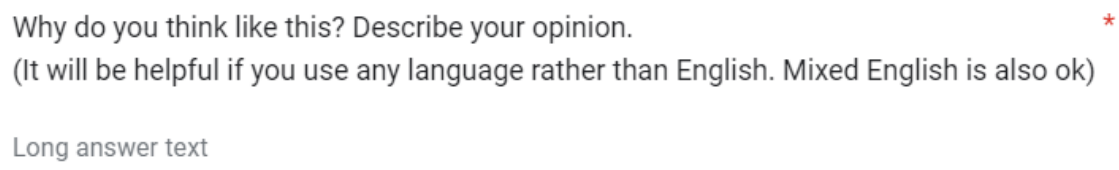
In the recent times, ChatGPT and Gemini has become very popular and their usage in education sector has become a debate in many countries. What is your opinion about it? *

☐ It is very helpful

☐ It is not good

☐ Neutral

Fig. 3.2.1. The Short Question



Why do you think like this? Describe your opinion. *

(It will be helpful if you use any language rather than English. Mixed English is also ok)

Long answer text

Fig. 3.2.2. The Broad Question

These 2 questions are the main focus questionnaire to collect the desired data. The opinion mining was done from the text answers of the broad question. We have collected 253 responses till now.

Id	Name	Age	Opinion	Text
1.0	Afrin	NaN	It is very helpful	I think it makes my work easier.
2.0	Iqra Muntaha	26.0	It is very helpful	In terms of doing any assignment or to find in...
3.0	Aysha Akter Nila	24.0	It is very helpful	I think it is helpful because it helps to incr...
4.0	Syed Shahariar Akash	28.0	It is very helpful	Time and cost benefit
5.0	Md. Hossain Shahariar Shovon	31.0	It is very helpful	amra onk shojei onk kisu korte pari\n

Fig. 3.2.3. The Dataset

3.3 Statistical Analysis

253 responses

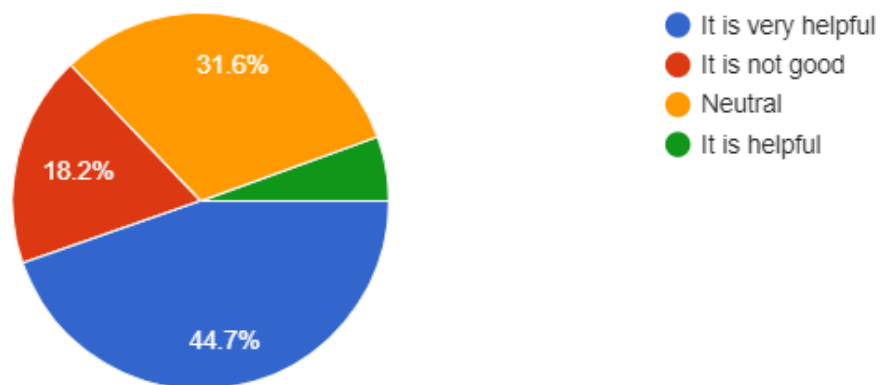


Fig. 3.3.1. The Pie Representation of the Results

We see the result was taken in 3 classes, implying positive, negative and neutral result. To represent positive users gave 'It is very helpful' or 'It is helpful', and from the pie chart we can see it is covering almost more than the half of the whole dataset. Negative opinion was implied by the class 'It is not good' and another one was just neutral.

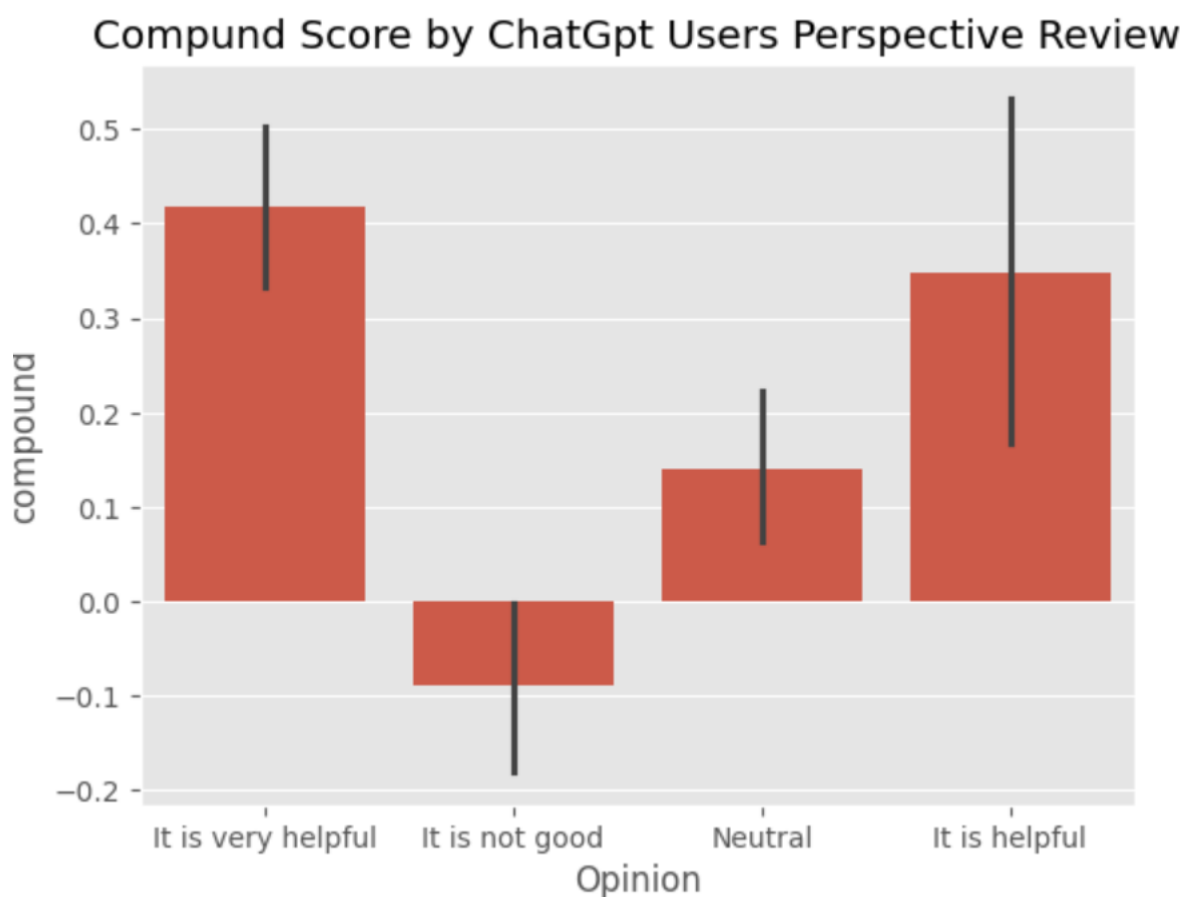


Fig. 3.3.2. The Graphical Representation of Compound Score by ChatGPT Users Perspective Review

3.4 Applied Mechanism

3.4.1 SVM Model

In the realm of Supervised Learning, SVM is a technique that is frequently employed to address problems pertaining to classification as well as regression. Nevertheless, the majority of its applications are found in machine learning, namely for classification problems. Identifying the optimal line or decision boundary for classifying n-dimensional space into classes is the objective of the support vector machine (SVM) algorithm. This is done with the intention of facilitating the placement of more data points in the appropriate category in the future. The boundary that represents the optimal decision is referred to as a hyperplane. An SVM is used to choose the extreme points and vectors that contribute to the formation of the hyperplane. The technique that is used is referred to as a Support Vector Machine. Take into consideration

the following figure, which illustrates the utilization of a boundary decision to classify 2 unique category:

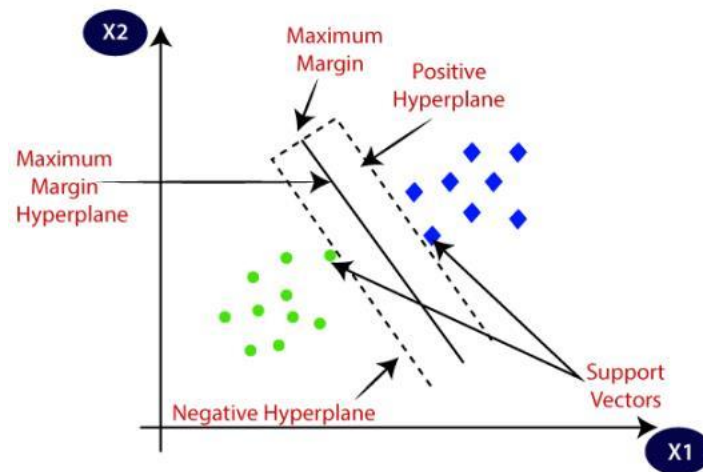


Figure 3.4.1.1: SVM Model

There are two types of SVM: A linearly separable dataset is one that can be divided into two groups by a single straight line; this type of dataset is known as linearly separable data, and the classifier used to classify it is known as linear support vector machine (SVM). If a dataset cannot be classified using a straight line, it is considered non-linear data, and the classifier used is known as Non-linear SVM. Non-linear SVM is applied to non-linearly separated data. Then SVM takes use of a kernel strategy to elevate the establishment space. Feature space in three dimensions, as shown on the right. The x- and z-axes are used to plot the data points. Here are the given values: $(z=x^2=y^2)$ where Z is the squared value of x and y. The advent of linear segregation has changed all of that. There is no mistaking their features.

SVM is implemented using the kernel. Data input space can be formatted by a kernel. SVM uses kernel tricks. Here, the kernel expands a small input area. So, it's conceivable. Proponents say adding dimensions to non-linear separation problems makes seemingly connected circumstances separable. Kernels enable more thorough classification. Standard dot products can employ any two processes as linear kernels. The two vectors' product equals the input data pairs' sum multiplied. The math looks like this: $K(x, x_i) = \sum (x \times x_i)$ The polynomial kernel is a linear kernel structure that is more commonly used. Differentiating between nonlinear and curved input spaces is the job of the polynomial nucleus. $K(x, x_i) = 1 + \sum (x \times x_i)^d$ ©Daffodil International University 21 In practice, $d=1$ is a close approximation to the polynomial stage, which is represented by d. The learning approach must clearly state the degree. Vector machine classification is made easier with the use of the famous radial

functional kernel. The input space can be remapped to an infinite dimensional space by RBF. $K(x, y) = \exp(-\gamma \times \text{sum}(x - y)^2)$ The gamma function spans from 0 to 1. A bigger gamma value matches the training dataset, producing unnecessary adaptation. Gamma=0.1 is a good predicted value. Gamma must be specified throughout learning. Separately. Comparing SVM categories to Naive Bayes yields decent results. Improved precision and predictions.

3.4.2 Bert Model

BERT stands for Bidirectional Encoder Representations from Transformers. This is language model based on deep learning which follows the methodology where every output is connected to every input.

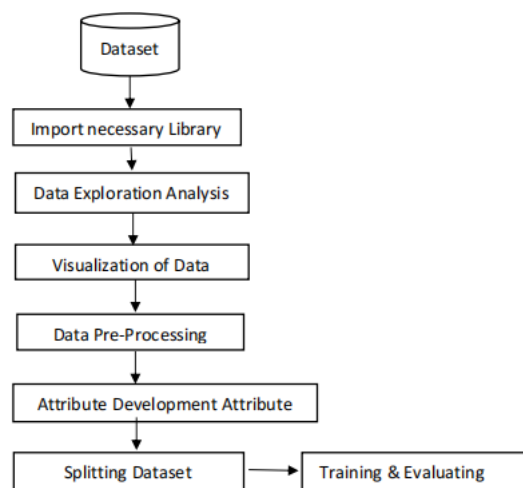


Figure 3.4.2.1: BERT Model Methodology

3.5 Implementation Requirement

The requirements implemented in this project.

Hardware or Software Requirements

- Windows 7 or above operating system
- Portable or in-built Hard Disk above 300 GB
- Minimum 2 GB RAM
- Google Chrome or Mozilla Firefox

Developing Tools

- Google Colab

You can also use

- Jupiter
- Notepad++

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Introduction

In particular, this chapter 4 focuses mostly on the experimental results of our project and the descriptive analysis of the data used in the research. It is crucial to try every approach or thought that is available. There is nothing like using good judgment and testing it. Through the implementation of my recommended approach as a flexible framework, we have successfully tested our concept. The report's internal and external importance of the framework we employed is managed in this part. The starting and ultimate construction restrictions of the casing are also shown in this section.

4.2 Experimental Results

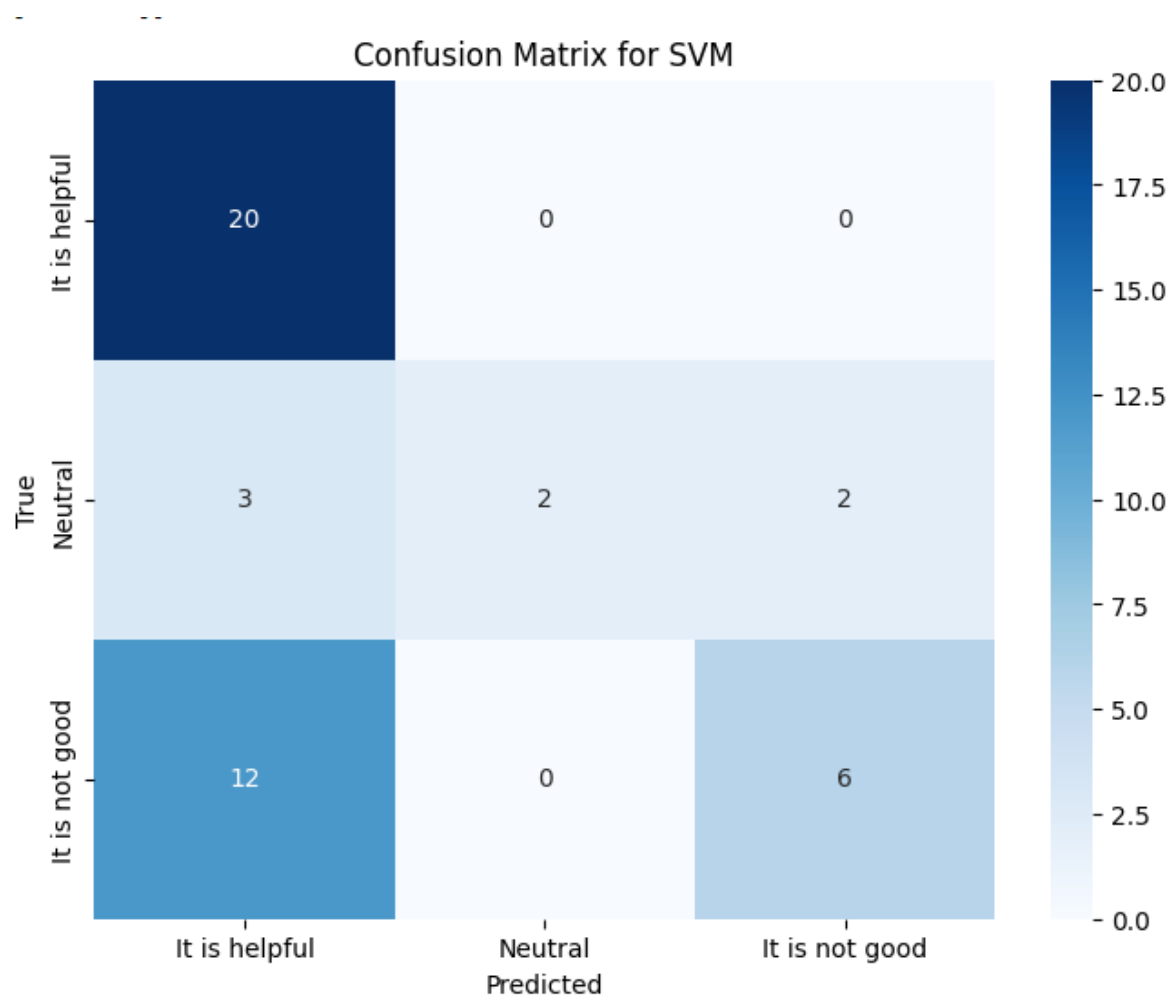


Fig. 4.2.1. The Confusion of the Results for SVM

Classification Report:				
	precision	recall	f1-score	support
It is helpful	0.61	1.00	0.75	20
Neutral	0.75	0.43	0.55	7
It is not good	0.88	0.39	0.54	18
accuracy			0.67	45
macro avg	0.74	0.61	0.61	45
weighted avg	0.74	0.67	0.64	45

Fig 4.2.2: Result of SVM

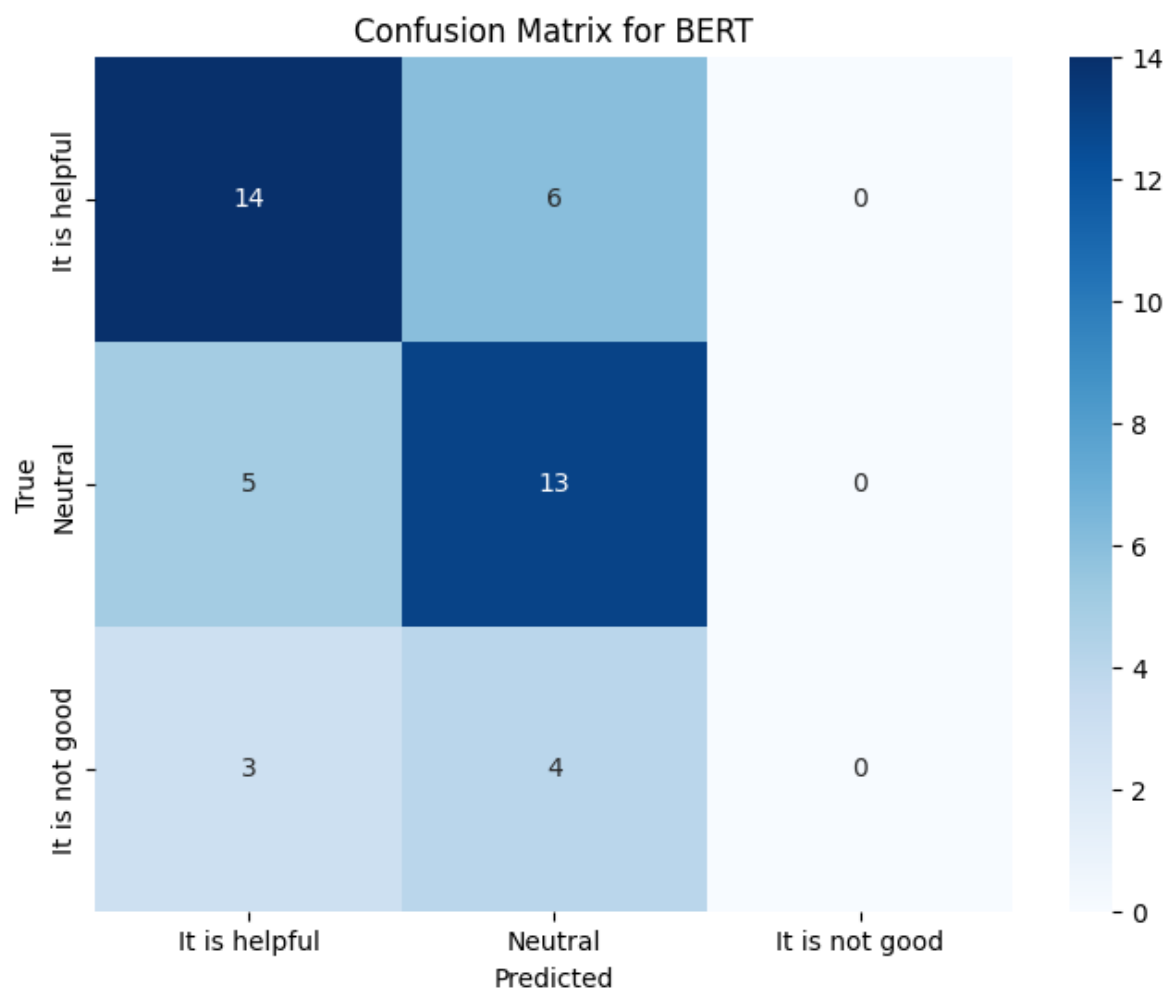


Fig 4.2.3: The Confusion of the Results for BERT

```

Classification Report:
              precision    recall  f1-score   support

It is helpful      0.64      0.70      0.67        20
   Neutral         0.57      0.72      0.63        18
It is not good      0.00      0.00      0.00         7

   accuracy              0.60        45
  macro avg              0.40      0.47      0.43        45
 weighted avg              0.51      0.60      0.55        45

```

Fig 4.2.2: Result of BERT

4.3 Discussion

In term of transformer model Machine learning model work gave more accurate result. For the classification SVM is more accurate than BERT, as the accuracy of SVM is 67% and BERT is 60%

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT, AND SUSTAINABILITY

5.1 Impact on Society

Sentiment Analysis provides a balance view of how the ChatGPT and Gemini are playing a significant role in education sector every day. It also presents the challenges, assumptions, fears, or considerations regarding the usefulness of the chatbots in future which is helpful to find a more impactful and balanced solution for the betterment of this generation.

5.2 Impact on Environment

This research has both the positive and negative impact on society. The energy consumption due to carbon emission of data centers is big issue in this case. The research also required some updates of equipments like hardware and software, which leads to e-waste. But if researchers and educators is known the accurate condition about the AI innovation and using chatbots for education, this can lead to a useful application in education that includes efficient resource utilization and reduced paper consumption, which has positive impact without any doubt.

5.3 Ethical Aspects

All users' privacy and security must be respected in this study project. Every piece of data was personally gathered. This study used no data that had already been published. The presented results are accurate. Regarding this research, there is no misinformation. During the research, no animals suffered any injury. Under the supervisor's supervision, the entire study has been completed.

5.4 Sustainability Plan

This research has to be helpful to the researchers, educators and student in order to avoid the inconvenience regarding the AI chatbots. It will provide them a clear vision of current situation and how to response with it. I want to enhance the accuracy and the data range. In the future, more algorithms will be used to compare and determine the highest level of accuracy.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Summary of the study

Following the study methods, we come to a conclusion that the Open-AI chatbots - ChatGPT and Gemini are useful in many ways to people, but regarding the use in education they do not prefer these Chat-bots to make the young generation used to it. Moreover, some people also suggest making a manual, or study about how to use ethically these chatbots as the CEO of Open-AI also advise not to depend on them blindly. There already launched latest version of ChatGPT, GPT-4 which is available through plus subscription. People will be able to make their own model using it, and if students and educators use it for learning and teaching materials is there any chance it can affect negatively their future, these things should be considered first when integrating AI into human lives. This research is about to bring out that redundancy of general people regarding integration of these AI innovations into their live, how they feel about it, and their concerns, so that researchers can enable the best solution to them to make human life easier effectively with no fear.

6.2 Conclusion

The goal for the study was to create a model with Naive Bayes Classifier for sentiment analysis of users' perspective on AI chatbots about the use in education sector. ChatGPT and Gemini both have the potential to play a significant role in education and research area. But some misguided uses can make it devastating if not used with proper knowledge and more importantly ethically. Despite having so many advantages they have some limitations too, such as biased answer, lack of authenticity, limited knowledge etc.

However, if we can establish an ethical way of using these chatbots and the risks discussed in the research is made a consideration before making it available for young people, the situation can be managed with positivity. Also, people can enjoy using AI too in their daily life.

6.3 Implications of Further Study

Machine learning classification is being used in my work for developing accuracy of the model. For a large number of datasets there are many algorithms and methods, datasets. In future, I will -

- Improve accuracy.
- Apply ML models
- Improve Dataset

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