

Sentiment Analysis of Social Media Content Marketing Optimization

Thesis/Report submitted in partial fulfillment of the requirements for the degree of

Bachelor of Technology

in

Information Technology

by

Rishikesh Ranjan

(Roll No.: B418037)

Vikalp Kumar Prasad

(Roll No.: B218052)

under the guidance of

Prof. Suraj Sharma



Department of Computer Science
International Institute of Information Technology Bhubaneswar
Bhubaneswar, Odisha, 751003, India
May, 2022

With the blessings of almighty.
To my beloved parents, family members,
and my mother



Information Technology

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This is to certify that the work in the thesis/report entitled “Sentiment Analysis of Social Media” by Rishikesh Ranjan, bearing roll number B418037, is a record of an original research work/work carried out by him under my supervision and guidance in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Information Technology. Neither this thesis/report nor any part of it has been submitted for any degree or academic award elsewhere.

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Professor

Department of Computer Science

International Institute of

Information Technology Bhubaneswar, Odisha, India



Department of Computer Science
International Institute of Information Technology Bhubaneswar
Bhubaneswar-751003, Odisha, India.

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Roll: B418037

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We the below signed, after checking the thesis/report mentioned above and the official record book (s) of the student, hereby state our approval of the thesis/report submitted in partial fulfillment of the requirements of the degree of Bachelor of Technology in Information Technology at International Institute of Information Technology, Bhubaneswar. We are satisfied with the volume, quality, correctness, and originality of the work.

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Department of Computer Science
International Institute of Information Technology Bhubaneswar
Bhubaneswar-751003, Odisha, India.

Declaration of Originality

I, Rishikesh Ranjan, bearing roll number B418037, hereby declare that this thesis/report entitled "Sentiment Analysis of Social Media", presents my original work carried out as a bachelor student of International Institute of Information Technology, Bhubaneswar, and to the best of my knowledge, contains no material previously published or written by another person, nor any material presented by me for the award of any degree or diploma of International Institute of Information Technology, Bhubaneswar or any other institution. Any contribution made to this work by others, with whom I have worked at International Institute of Information Technology, Bhubaneswar or elsewhere, is explicitly acknowledged in the thesis/report. Works of other authors cited in this dissertation have been duly acknowledged under the sections "Reference" or "Bibliography". I have also submitted my original research records to the scrutiny committee for evaluation of my thesis/report.

I am fully aware that in case of any non-compliance detected in future, the Senate of International Institute of Information Technology, Bhubaneswar may withdraw the degree awarded to me on the basis of the present dissertation.

Date: 13/05/2022

Place: Bhubaneswar

Rishikesh Ranjan

Roll: B418037

Department of Computer Science
International Institute of Information Technology
Bhubaneswar, Odisha, India

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I take the opportunity to express my gratitude to all who have directly or indirectly made this thesis possible. This dissertation, though an individual work, has benefited in various ways from several people. Whilst it would be simple to name them all, it would not be easy to thank them enough.

*Rishikesh
Ranjan.*
Rishikesh Ranjan

Sentiment Analysis of Social Media Content for Marketing Optimization.

B.Tech Final Year MID Semester Report

Rishikesh Ranjan

B418037

Vikalp Kumar Prasad

B218052

Under the Guidance of

Prof. Suraj Sharma



**Department of Information Technology
International Institute of Information Technology Bhubaneswar
Bhubaneswar – 751003, India
March, 2022**

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Abstract

This Literature survey is done for the project named “Sentiment Analysis of social media (Twitter) content using ML/AI techniques. This survey document was compiled for the intention of sentiment analysis or opinion mining, which is really the computerized evaluation of people's opinions, sentiments, behaviors, and emotions expressed in written language. It has recently emerged as one of the most active research areas in natural language processing and text mining. Its popularity arises from two sources. For instance, it has a variety of applications since views are central to almost all human activities and are significant sources of motivation for our behavior. When we need to make a choice, we like to hear other people's viewpoints. Second, it raises a variety of challenging research topics that had not been explored until the year 2000. One factor for the scarcity of previous research was the absence of authoritative writing in electronic content. It's no wonder, therefore, that the program's birth and rapid development parallel the advent of social media on the Internet. Because of its relevance to business and society as a whole, study has expanded past computer science and even into management and social sciences. This survey report has been done to understand the people’s opinion better in order to make marketing decisions easy and inexpensive.

Keywords: People’s Opinion, Marketing Decision, Machine Learning, Sentiment Analysis.

1. Introduction

The sentiment analysis is used for many purposes to understand many things, one among the most crucial uses of sentiment analysis is to understand the virality of a social media content. Meaning in easy-to-understand language is that when someone posts a content on social media will it go viral or not, and analyze already viral content to get a better understanding of what psychological reasons might have helped in making it viral. Firstly, we are going to extract a social media post, mainly LinkedIn, through the public link. Then we are going to find out the emotions which best suit the written content posted by the author. Then we are going to analyze the comments and reactions on the post and how people are reacting to it. Showing a general view of hate or love for the content. In doing so it will give us a better idea if we do enough testing with different viral posts, it will help us understand the key components and necessities of a viral content. We have read almost 30 papers and many google websites to understand how this whole process is going to work.

2. Motivation & Objective

2.1 Motivation of the Project

Doing internships in the marketing field and working on our own startups for almost 4 years (from our first year), we have faced this issue from the start. We create social media content to post on LinkedIn and make everything perfect, thinking that this content will certainly go viral and it fails. And sometimes some of our content on which we have not even worked that hard goes viral and breaks all records. We couldn't seem to put our finger on the main key components which makes a content viral. After searching on the internet for as many articles as we could find on the topic, we stumbled upon some of many expensive sentiment analysis tools which were not even that expensive. So, we decided to make our own tool.

2.2 Objective of the Project

<Objectives of the work in bullet points>

- Understanding people's opinion about any piece of content.
- Understanding the components of viral contents.
- Helping struggling marketers with the solution of expensive Content Campaigns.
- Providing a virality detecting free tool to everyone who is starting on social media.

2.3 Organization of the Report

- Chapter 1 includes Introduction to the project
- Chapter 2 includes Motivation & Objective of the project
- Chapter 3 includes Research Plan and Timeline

- Chapter 4 includes Literature Survey
- Chapter 5 includes Conclusion & Future Work
- Chapter 4 includes References

3. Research Plan and Timeline

Sl. No.	Activity	First 40 Days			Second 40 Days			Third 40 Days		
		15	30	40	55	70	80	95	110	120
1.	Rewriting a Research Paper on a similar topic given by the guide, with <10% plagiarism.									
2.	Literature Survey from 30 research papers on similar topics related to the project.									
3.	Making a Survey report to submit for the MID sem.									
4.	Coding and creating the tool for the project.									
5.	Working on ppt and project research paper for END Sem.									
6.	Testing and validation									
7.	Further Improvements and Final Deployment on the internet for Free Use.									

4. Literature Survey

Properties Used:

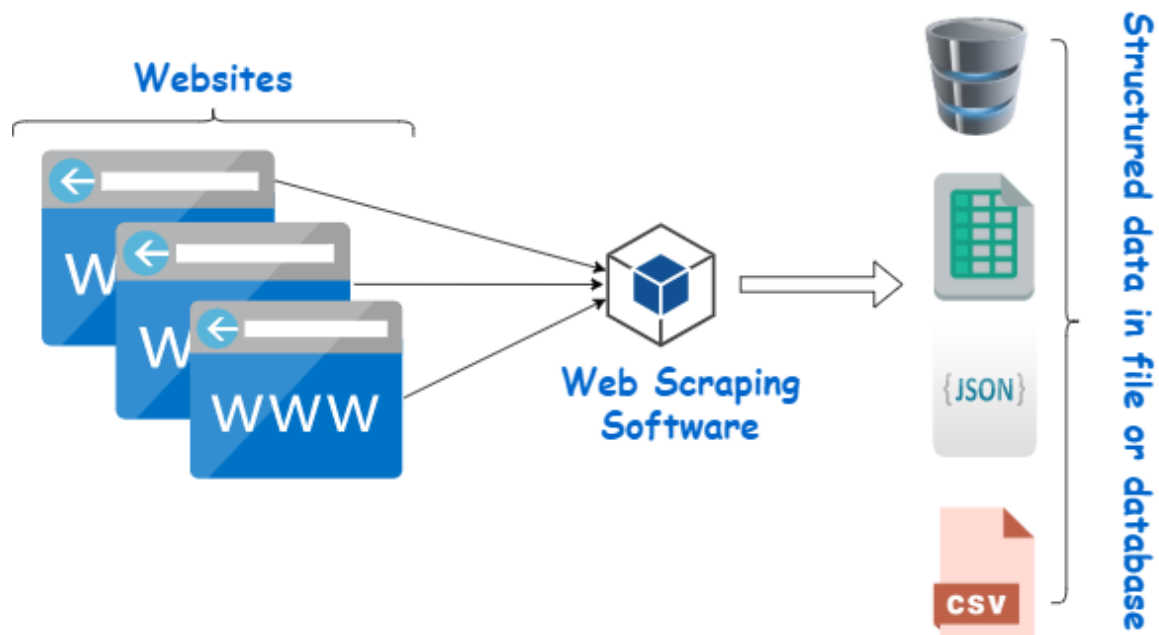
Web Scraping:

It is the automatic retrieval of huge amounts of information from the internet. The vast majority of this material is unprocessed HTML code which is transformed into structured data in a spreadsheet or database before use in a variety of applications. Web scraping may be accomplished in a number of ways to collect data from websites. These alternatives include using internet services, particular APIs, and even building your own web scraping programs from the ground up.

Many large websites including Facebook, Twitter, Google, Stack Overflow, as well as others, have APIs that allow us to retrieve source data in an organized manner.

This is the best alternative, but other websites either do not let users access large amounts of data in an organized fashion or are not sophisticated enough. In that instance, web scraping the website for data is the best alternative.

Web scraping necessitates the use of a crawler and a scraper. It is a machine intelligence program that scans the web for specified content by following connections. On the other hand, a scrapper is a program that gathers data from web pages. The scraper's architecture might differ widely depending on the complexity and scope of the project in order to retrieve data fast and reliably.

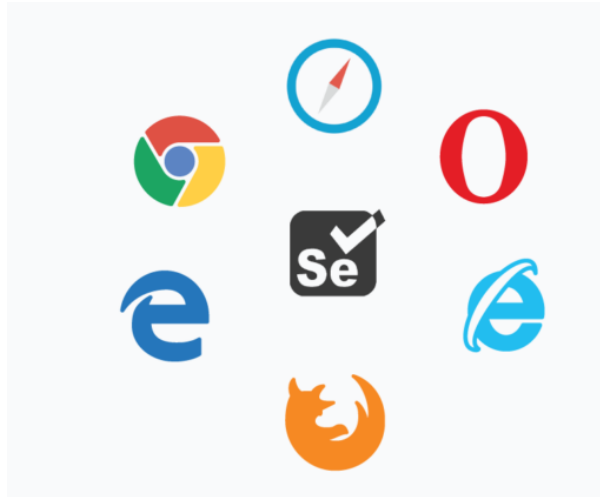


We are going to use **Beautiful Soup** for web scraping data from LinkedIn.

Selenium Browser Automation:

We will be using Selenium. Selenium is a strong tool for using a program to control a web browser. It is compatible with all major browsers, runs on all major operating systems, and has scripts written in a variety of languages, including Python, Java, C#, and others; we will be using Python.

In just 15-30 lines of Python code, we can automate our day-to-day operations like controlling our tweets, texting on WhatsApp, and even Google without ever opening a browser. With selenium, the possibilities for automation are unlimited.



Selenium for browser automation

Natural Language Processing:

We are going to use NLP. NLP refers to a computer program's capability to read spoken and written natural speech, otherwise called as natural language. It is an element of AI (Artificial Intelligence).

NLP has linguistic roots and has been in existence for 50 years. It has several practical applications, including medical science, online services, and business intelligence.

NLP allows computers to comprehend natural language in the same way that people do. Natural language processing, whether spoken or written, utilizes AI to consume actual data, evaluate it, and synthesize it into a machine-readable format.

Computers have reading algorithms and mics to acquire sounds, just as humans possess various sensors such as ears for hearing and eyes for sight. Furthermore, much like humans 've got mind to process data, computers have programs to do the same. At a certain point during the processing, the data is converted to instructions that system needs.

Businesses handle huge amount of unorganized, word data that really should be processed fast. Natural human words make up a major amount of the data produced online & kept in databases, and until recently, companies have been

unable to properly assess this information. Here, natural language processing becomes helpful.

"Cloud computing insurance should be part of every service-level agreement," & "A good SLA ensures an easier night's sleep — even in the cloud," are two examples of the advantages of natural language processing. If a person uses NLP to search, the software would recognize whether cloud technology is different entity and also that cloud is a shorthand for cloud services. The industry abbreviation for service-level agreement is SLA.



Scikit-Learn:

Scikit-learn (Sklearn) is by far the most practical and efficient ML library in Python. It provides a suite of effective tools for machine learning and statistical modelling, including as classification, clustering, regression, and dimensionality reduction, via a Python consistency approach. The underpinnings of this module, which again is largely written in Python, are NumPy, Matplotlib and SciPy.

Bag of Words:

A bag-of-words model, or BoW in brief, is a method of extracting textual characteristics for use in modelling, such as ML techniques.

The approach is simple and versatile, and it can be utilized obtain information from texts in a number of ways. A bag-of-words is a textual description which specifies the rate with which words occur in a text. It comprises two steps: a list of very well known terms and a measure for establishing the existence of well-known phrases.

The content is described as a "bag" of words since all data about the order or organization of words in the document is removed. The model only concerns if known phrases occur in the document, not where they appear. Documents having equivalent content are assumed to be similar. Moreover, we may infer something about the relevance of the text just from its material.

The bag-of-words might be as basic or as complicated as we like. The complexity comes from determining how to build a vocabulary of known words (or tokens) and how to score the availability of known terms.

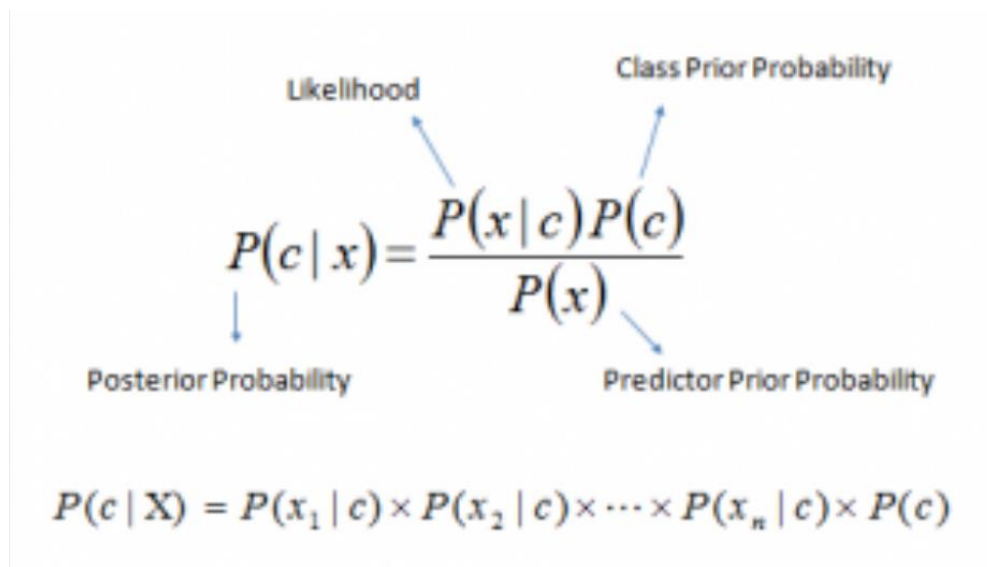
Naive Bayes Algorithm:

It is a categorization approach that is based on the Bayes' Theorem and the condition of predictor independence. In basic terms, a Naive Bayes classifier asserts that the presence of one feature in a class is independent to the existence of any other feature.

For instance, an apple is a fruit that is red, spherical, and about 3 inches in diameter. Although these features are dependent on each other or even on the existence of advanced features, these together contribute to the chance that such a fruit is indeed an apple, thus the name 'Naive.'

The Naive Bayes model is simple to build and works well with large data sets. Because of its simplicity, Naive Bayes is known to surpass even for the most sophisticated classification algorithms.

We may compute posterior probability using the Bayes theorem, $P(c|x)$ from $P(c)$, $P(x)$, and $P(x|c)$ using $P(c)$, $P(x)$, and $P(x|c)$. Consider the following equation:



The diagram shows the Bayes' theorem equation with labels for its components:

$$P(c|x) = \frac{P(x|c)P(c)}{P(x)}$$

- $P(c|x)$ is labeled "Posterior Probability".
- $P(x|c)$ is labeled "Likelihood".
- $P(c)$ is labeled "Class Prior Probability".
- $P(x)$ is labeled "Predictor Prior Probability".

$$P(c|X) = P(x_1|c) \times P(x_2|c) \times \dots \times P(x_n|c) \times P(c)$$

Above,

- $P(c|x)$ is the posterior probability of class (c , target) given predictor (x , attributes).
- $P(c)$ is the prior probability of class.
- $P(x|c)$ is the likelihood which is the probability of the predictor given class.
- $P(x)$ is the prior probability of the predictor.

Logistic Regression:

This type of statistical analysis (which is also called a logit model) is widely utilized in predictive analytics, modelling, and ML applications. In this analytics technique, the dependent variable is either finite or categorical: either A or B (binary regression) or a range of finite possibilities A, B, C, or D (multiple regression) (multinomial regression). It is used in statistical software to understand the correlation between the variables and one or more independent variables by calculating probabilities using a logistic regression equation.

This type of study may help researchers forecast the likelihood of an event or choice happening. For example, you might want to know how probable it is that a customer will select a deal on your website – or not (dependent variable). In our study, we may investigate the visitors' known features such as the websites from which they arrived, return trips to our website, and activity on our site (independent variables). We may use logistic regression models to determine which visitors are also most willing to approve — or decline — our proposal. As a consequence, we'll be able to make more informed evaluations regarding how to market our offer or the deal overall.

Support Vector Machine (SVM) Algorithm.

SVM or Support Vector Machine is a type of supervised ML approach which can be used for classification as well as regression. While we may disagree about the challenges of regression, classification is indeed perfectly suited. The SVM algorithm's aim is to look for a hyperplane in an N-dimensional space which unambiguously categorises data points. The selection of attributes defines the size of the hyperplane. The hyperplane is really just a line if there's only two input features. The hyperplane converts into a 2D plane when the number of input characteristics approaches three. It gets hard to visualise when the number of characteristics reaches three.

The Process:

We have defined almost everything that we are going to use in this project from the knowledge that we acquired from the survey research. Now, we are going to discuss exactly how we are going to achieve the goal of the project.

As we first need some data to analyze, which we will call from LinkedIn public posts of people. We will first copy the link of the LinkedIn post under analysis feed the link to the program. The program will then pre-process the text present in the post using NLP, the program will then break down the texts into smaller units to work with (Tokenization {NLP}). We will then shorten the texts to the program by removing the most common words and unique words that provide the maximum knowledge about the content remains. Then we reduce the words

to their root forms to process. (Lemmatization {NLP}). After those words are marked based on the part of speech which they are, such as nouns, verbs and adjectives.

The model will then be updated. The program learns to do objectives based on training data and modifies its techniques as new data is analyzed, using statistical approaches. Natural language processing algorithms refine their inherent regulations via repetitive analysis and training using only a combination of ML, deep learning, and neural networks.

Then we will use the model Word of Bags Model mentioned above on the program. Naive Bayes, Logistics Algorithm and SVM will be used for Model Training. At the end it will tell us the nature of the text as if it is happy, sad, confident, informal, formal etc.

This is the best explanation of the process that we are going to use for the project. We have created a pipeline for the whole process explained above.

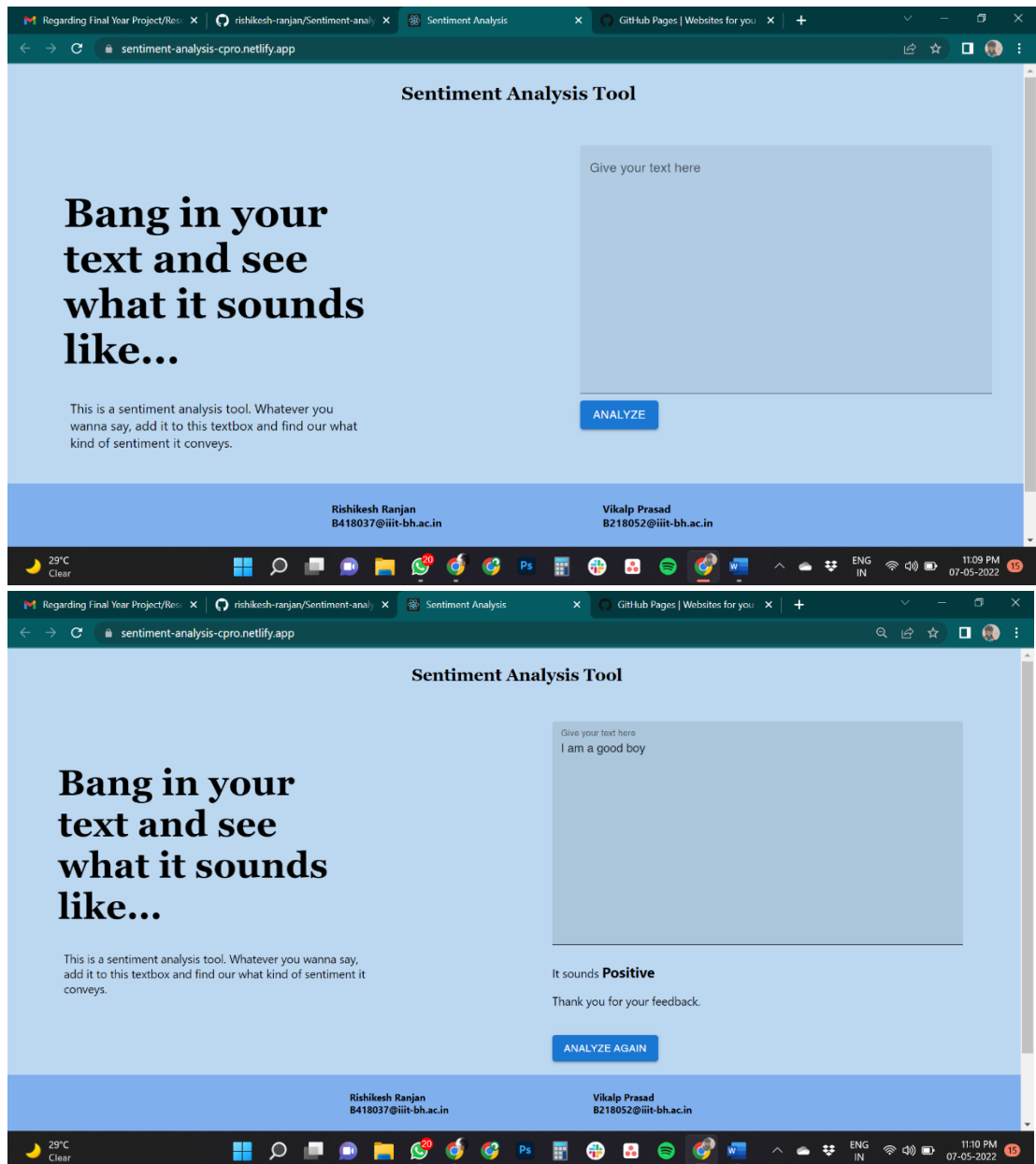
5. Result Discussion

5.1 Results

After getting data from Kaggle, we divided it 7:3 to train and test the program respectably. After training the program we uploaded it on GitHub and deployed it. The program is trained by the dataset available on the internet. It is showing 78% accuracy.

Deployed Program: <https://sentiment-analysis-cpro.netlify.app/>

The Uploaded Codes: <https://github.com/rishikesh-ranjan/Sentiment-analysis>



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sentiment-analysis-cpro.netlify.app

Sentiment Analysis Tool

Bang in your text and see what it sounds like...

This is a sentiment analysis tool. Whatever you wanna say, add it to this textbox and find out what kind of sentiment it conveys.

Give your text here
I am a student of international institute of information technology

It sounds **Neutral**

Thank you for your feedback.

ANALYZE AGAIN

Rishikesh Ranjan
B418037@iiit-bh.ac.in

Vikalp Prasad
B218052@iiit-bh.ac.in

29°C Clear

11:12 PM 07-05-2022

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sentiment-analysis-cpro.netlify.app

Sentiment Analysis Tool

Bang in your text and see what it sounds like...

This is a sentiment analysis tool. Whatever you wanna say, add it to this textbox and find out what kind of sentiment it conveys.

Give your text here
I hate milk

It sounds **Negative**

Thank you for your feedback.

ANALYZE AGAIN

Rishikesh Ranjan
B418037@iiit-bh.ac.in

Vikalp Prasad
B218052@iiit-bh.ac.in

29°C Clear

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6. Conclusion & Future Work

6.1 Conclusion

We conclude that the project is going to be a successful help for many marketers and other businessmen who wish to use it. The more the model will be trained the smarter it will get. As is the nature of a machine learning program. The program will most definitely help us understand how the human species react to a certain kind of visual (text in this case) stimulus. Which will then in return help us to design better marketing campaigns which are less expensive.

6.2 Future Work

After this project has been completed, we wish to deploy it on the web as a free chrome extension which will help marketers for free, keep collecting data and training itself. After a time when it will have enough training and it can give us a more exact reason for a post virality, we will convert this into a B2B (business-to-business) to be used by many marketing agencies, individual marketer and Big Companies for marketing purposes.

Another use of this project is to create a business plan. We will add more dimensions to the equation than just neutral, positive and negative. After an analysis of the character of an investor on the basis of his/her social media and what kind of companies they invest in, we can check that exactly what kind of business plan will the investor like. We can check dimensions like confidence, formality, influence, etc. to determine that the investor is going to like it or not and helping the entrepreneurs to pitch their business ideas and get funding.

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