

An Efficient Machine Learning Approach to Detect Sentiments from Text Data.

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A clear and well-documented \LaTeX document is presented as an article formatted for publication by ACM in a conference proceedings or journal publication. Based on the “acmart” document class, this article presents and explains many of the common variations, as well as many of the formatting elements an author may use in the preparation of the documentation of their work.

CCS Concepts: • **Do Not Use This Code** → **Generate the Correct Terms for Your Paper**; *Generate the Correct Terms for Your Paper*; Generate the Correct Terms for Your Paper; Generate the Correct Terms for Your Paper.

Additional Key Words and Phrases: Do, Not, Us, This, Code, Put, the, Correct, Terms, for, Your, Paper

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1 INTRODUCTION

Machines that have been programmed to think and behave like people use artificial intelligence (AI) to mimic human intelligence. A crucial area of artificial intelligence (AI), machine learning has essentially taken the place of AI in many applications. The major focus of our study is on automatically identifying emotions in text. Human emotions are affective states linked to physiological reactions. The [1] sentiment identification is being used in a variety of real-world scenarios where a person’s emotional state acts as a clue to the machine learning system’s efficiency. It may seem challenging to infer a person’s emotional state from an analysis of a text document they have written, but this is frequently necessary because textual expressions are frequently the result of the interpretation of the meaning of concepts and the interaction of concepts stated in the text document. In the human-computer connection, understanding the text’s mood is crucial. While textbased emotion identification systems still require development, speech recognition has seen a great deal of progress. From an [2] application standpoint, where emotion is conveyed as joy, sadness, rage, surprise, hatred, fear, and other things, the ability to recognize human emotions in text is becoming more and more crucial. The emphasis is on the sentiment-related studies in the field of cognitive psychology because there isn’t a standard sentiment word hierarchy. To identify our text-based emotional sentiments, we are going to use Naive Bayes. First of all once more using the Bayes Theorem as its foundation, the Naive Bayes sorting algorithm presumes

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independence between predictors. Simply expressed, a Naive Bayes classifier thinks that the existence of one feature in a class has no bearing on the presence of any more features. In general, the Multinomial Naive Bayes classification method is a solid place to start when performing sentiment analysis. The Naive Bayes technique's basic tenet is that the probability of labels applied to texts are calculated using the cumulative values for words and classes. This characteristic helps models to comprehend how a word fits into the overall context of the phrase. While Emotion Analysis seeks to identify certain sorts of sentiments expressed [3] in texts, such as anger, disgust, fear, happiness, sorrow, and surprise, Sentiment Analysis seeks to identify positive, neutral, or negative feelings from text.

2 RESEARCH PROBLEM

Text is the basis for a machine to know what sentiment state the user is in initially and by using and storing the user's data, the machine will gradually self-taught itself on identifying the specific emotions. However, along with some advantages, there are some drawbacks in this system. According to a renowned article [4] by Apriorit, in the machine learning approach, we need to gather a huge amount of training data. It is quite a hassle to find a trusted corporation where we can receive and would be allowed to use their data for our experiment. Unfortunately, most of the public datasets are not sufficient. In those cases, we can create our own dataset or combine several datasets and keep modifying the data as the experiment progresses to solve this issue. Then, according to this research [5], inadequate or incomplete words are another challenge to solve for the model development part. In the Feature extracting process, it turns the data into features which are capable of being used for machine learning models. Gradually, the method has to come across the classification of algorithms and measure the performances, they are solved by different equations and measurements. Finally, In natural language processing sentiment analysis is an active research field. As in blogs, social networks or product reviews it performs organizing and extracting sentiments from user generated text. In this research paper we are going to explore sentiment analysis challenges which are the most complex in natural language processing. However, many organizations face the challenges of sentiment analysis but these are not difficult to overcome with the right solutions. In this guide, we have faced some research problems related to this field in our research work. First of all, this paper tackles a fundamental problem which is word score polarity categorization. For instance, words "Happy" and "Sad" are high on positive (+) and negative (-) polarity scores but in between there is mid polarity [6]. Secondly, in our research paper these are somewhat positive and somewhat negative; these words sometimes get left out and dilute the sentiment score. Another problem we have faced is that sometimes people use memes and sarcasm in social media which make it difficult for sentiments tools to detect the actual context. Because of this reason the result sometimes shows the negative value which is basically positive. In our research paper we have used one dataset- 1.Spotify App review dataset. Coursera Course dataset struggle to parse information because of biases.

Finally, regardless of how this approach of machine learning solves the challenge of emotion recognition, we live in a period when additional issues may arise. As a result, according to this research paper [7], there will always be space for improvement in areas like language representation and categorization. The extraction of contextual information is critical during language representation because it serves as the foundation for enhancing categorization accuracy. Our goal in this paper is to train and test the selected models on dataset and find out which method is more appropriate and close to understanding a text just like a human.

3 RESEARCH OBJECTIVES

This research aims to figure out a suitable and effective method to predict and classify sentiments from text by using machine learning. Usually several tasks are divided so that altogether they can perform the human emotion reorganization process. The main objectives are -

- Increasing the performance of the dataset mid polarities will be our primary intent.
- We aim to comprehend sentiment analysis.
- We like to understand how the algorithms function while dealing with various categorical matrices.
- To identify and address any bias issues in our dataset.

4 RELATED WORKS

The paper introduces a text summarization model using natural language processing (NLP) and sentiment analysis to address information overload. It uses the NLTK library and Python for sentiment analysis, achieving 91.67% accuracy. However, its reliance on a self-generated dataset and specific tools may limit its generalizability and flexibility. Future work aims to enhance the model with advanced tools, NLP techniques, and a recommendation system for broader applicability across different domains and languages.

The study "Sentiment Analysis of Covid-19 Tweets using Twitter Database–A Global Scenario" offers a comprehensive exploration of global sentiments during the pandemic. By analyzing Twitter data from various regions, the research highlights the prevalence of sadness and fear, particularly in developing countries like India. However, limitations such as platform dependency and sarcasm detection challenges underscore the need for nuanced interpretation of findings.

Through an analysis of weather-related tweets from Phoenix and Singapore, this study identified a pattern of higher pain during temperature rises. Singapore was always negative, although Phoenix's feelings changed with the seasons. These results show how regional opinions are reflected on social media: tweets from Phoenix mimic weather forecasts, and Singaporeans express dissatisfaction. Additionally, the data points to long-term heat repercussions and vulnerability to local climate events.

The paper introduces a robust framework for news text analysis through NLP-based summarization and sentiment analysis. It addresses information overload by efficiently extracting insights from large textual datasets. Despite limitations, its accuracy and utility render it valuable across industries. Further research is needed to enhance its capabilities across domains and languages.

This particular section indicates the importance of other research publications and how the works have impacted our process of understanding. After reading the research publications we have been critically analyzed that sentimental emotions play promising roles in the existence or the complete make-up of individuals. According to Robert Plutchik's wheel model there are eight basic emotions such as joy, sadness, anger, fear, expectation, surprise, acceptance and disgust which are controlled by text from the paper works by other researchers. In this paper we try to show our task of sentiment analysis on text data and exchange of emotion through text message.

Without any interruption computers are unable to understand human emotion. A recent research work [8] by the research institute of Communication and Computer Systems (ICCS), Greece has proposed a method called NLP (Natural Language Processing) to understand human emotion by using text. It helps a computer to be capable of understanding the contents of speech which includes the contextual nuances of the languages. Among three NLP (Symbolic NLP,

Statistical NLP, Neural NLP) neural NLP helps to identify the meaning of phrases which is very challenging for a computer to sort out.

Additionally, It is significantly useful that the machine predicts and learns while training the data in a large dataset, but as there are lots of weights to make updates it becomes slow to train [12].

5 DATASET

We collected a dataset containing reviews of the Spotify app from January 1, 2022, to July 9, 2022, from the Google Play Store. The dataset comprises a total of 61,594 rows and includes five columns. These reviews offer valuable insights into user experiences, sentiments, and preferences regarding the Spotify app during this time period. Analyzing this dataset can provide valuable information for improving the app's features, addressing user concerns, and understanding user satisfaction levels.

The analysis findings reveal that most ratings for the Spotify app are either 1 or 5 points, with shorter text lengths for 5-point reviews and longer lengths for 1 and 2-point reviews. This is confirmed by the histogram plot, which shows a median text length of 16 for 5-point reviews and 35 for 1-point reviews. Additionally, the frequency of reviews over time exhibits significant peaks on March 8 and between April 11 and April 23, potentially indicating major bugs or issues with user experience. Further breakdown of review frequency by rating reveals that these peaks coincide with an increase in 1 and 2-point reviews, suggesting significant problems with the app during these periods. However, after the second peak, there is a rapid increase in 5-point reviews, indicating improvements made by the Spotify team. This analysis provides valuable insights for improving the Spotify app's features, addressing user concerns, and understanding user satisfaction levels over time.

The figure displays the top 100 most frequently used words before text cleaning, revealing the presence of unnecessary words such as "I," "is," and "so," which have minimal impact on sentiment classification. To enhance performance, it is essential to remove these irrelevant words.

6 TYPEFACES

The "acmart" document class requires the use of the "Libertine" typeface family. Your \TeX installation should include this set of packages. Please do not substitute other typefaces. The "lmodern" and "ltimes" packages should not be used, as they will override the built-in typeface families.

7 TITLE INFORMATION

The title of your work should use capital letters appropriately - <https://capitalizemytitle.com/> has useful rules for capitalization. Use the title command to define the title of your work. If your work has a subtitle, define it with the subtitle command. Do not insert line breaks in your title.

If your title is lengthy, you must define a short version to be used in the page headers, to prevent overlapping text. The title command has a "short title" parameter:

```
\title[short title]{full title}
```

8 AUTHORS AND AFFILIATIONS

Each author must be defined separately for accurate metadata identification. As an exception, multiple authors may share one affiliation. Authors' names should not be abbreviated; use full first names wherever possible. Include authors' e-mail addresses whenever possible.

Grouping authors' names or e-mail addresses, or providing an "e-mail alias," as shown below, is not acceptable:

```
\author{Brooke Aster, David Mehldau}
\email{dave,judy,steve@university.edu}
\email{firstname.lastname@phillips.org}
```

The `authornote` and `authornotemark` commands allow a note to apply to multiple authors — for example, if the first two authors of an article contributed equally to the work.

If your author list is lengthy, you must define a shortened version of the list of authors to be used in the page headers, to prevent overlapping text. The following command should be placed just after the last `\author{}` definition:

```
\renewcommand{\shortauthors}{McCartney, et al.}
```

Omitting this command will force the use of a concatenated list of all of the authors' names, which may result in overlapping text in the page headers.

The article template's documentation, available at <https://www.acm.org/publications/proceedings-template>, has a complete explanation of these commands and tips for their effective use.

Note that authors' addresses are mandatory for journal articles.

9 RIGHTS INFORMATION

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Regardless of the rights management choice, the author will receive a copy of the completed rights form once it has been submitted. This form contains \LaTeX commands that must be copied into the source document. When the document source is compiled, these commands and their parameters add formatted text to several areas of the final document:

- the "ACM Reference Format" text on the first page.
- the "rights management" text on the first page.
- the conference information in the page header(s).

Rights information is unique to the work; if you are preparing several works for an event, make sure to use the correct set of commands with each of the works.

The ACM Reference Format text is required for all articles over one page in length, and is optional for one-page articles (abstracts).

10 CCS CONCEPTS AND USER-DEFINED KEYWORDS

Two elements of the "acmart" document class provide powerful taxonomic tools for you to help readers find your work in an online search.

Table 1. Frequency of Special Characters

Non-English or Math	Frequency	Comments
Ø	1 in 1,000	For Swedish names
π	1 in 5	Common in math
\$	4 in 5	Used in business
Ψ_1^2	1 in 40,000	Unexplained usage

The ACM Computing Classification System — <https://www.acm.org/publications/class-2012> — is a set of classifiers and concepts that describe the computing discipline. Authors can select entries from this classification system, via <https://dl.acm.org/ccs/ccs.cfm>, and generate the commands to be included in the \LaTeX source.

User-defined keywords are a comma-separated list of words and phrases of the authors’ choosing, providing a more flexible way of describing the research being presented.

CCS concepts and user-defined keywords are required for all articles over two pages in length, and are optional for one- and two-page articles (or abstracts).

11 SECTIONING COMMANDS

Your work should use standard \LaTeX sectioning commands: section, subsection, subsubsection, and paragraph. They should be numbered; do not remove the numbering from the commands.

Simulating a sectioning command by setting the first word or words of a paragraph in boldface or italicized text is **not allowed**.

12 TABLES

The “acmart” document class includes the “booktabs” package — <https://ctan.org/pkg/booktabs> — for preparing high-quality tables.

Table captions are placed *above* the table.

Because tables cannot be split across pages, the best placement for them is typically the top of the page nearest their initial cite. To ensure this proper “floating” placement of tables, use the environment **table** to enclose the table’s contents and the table caption. The contents of the table itself must go in the **tabular** environment, to be aligned properly in rows and columns, with the desired horizontal and vertical rules. Again, detailed instructions on **tabular** material are found in the *\LaTeX User’s Guide*.

Immediately following this sentence is the point at which Table 1 is included in the input file; compare the placement of the table here with the table in the printed output of this document.

To set a wider table, which takes up the whole width of the page’s live area, use the environment **table*** to enclose the table’s contents and the table caption. As with a single-column table, this wide table will “float” to a location deemed more desirable. Immediately following this sentence is the point at which Table 2 is included in the input file; again, it is instructive to compare the placement of the table here with the table in the printed output of this document.

Always use `midrule` to separate table header rows from data rows, and use it only for this purpose. This enables assistive technologies to recognise table headers and support their users in navigating tables more easily.

Table 2. Some Typical Commands

Command	A Number	Comments
<code>\author</code>	100	Author
<code>\table</code>	300	For tables
<code>\table*</code>	400	For wider tables

13 MATH EQUATIONS

You may want to display math equations in three distinct styles: inline, numbered or non-numbered display. Each of the three are discussed in the next sections.

13.1 Inline (In-text) Equations

A formula that appears in the running text is called an inline or in-text formula. It is produced by the **math** environment, which can be invoked with the usual `\begin . . . \end` construction or with the short form `$. . . $`. You can use any of the symbols and structures, from α to ω , available in \LaTeX [24]; this section will simply show a few examples of in-text equations in context. Notice how this equation: $\lim_{n \rightarrow \infty} x = 0$, set here in in-line math style, looks slightly different when set in display style. (See next section).

13.2 Display Equations

A numbered display equation—one set off by vertical space from the text and centered horizontally—is produced by the **equation** environment. An unnumbered display equation is produced by the **displaymath** environment.

Again, in either environment, you can use any of the symbols and structures available in \LaTeX ; this section will just give a couple of examples of display equations in context. First, consider the equation, shown as an inline equation above:

$$\lim_{n \rightarrow \infty} x = 0 \quad (1)$$

Notice how it is formatted somewhat differently in the **displaymath** environment. Now, we'll enter an unnumbered equation:

$$\sum_{i=0}^{\infty} x + 1$$

and follow it with another numbered equation:

$$\sum_{i=0}^{\infty} x_i = \int_0^{\pi+2} f \quad (2)$$

just to demonstrate \LaTeX 's able handling of numbering.

14 FIGURES

The “figure” environment should be used for figures. One or more images can be placed within a figure. If your figure contains third-party material, you must clearly identify it as such, as shown in the example below.

Your figures should contain a caption which describes the figure to the reader.

Figure captions are placed *below* the figure.



Fig. 1. 1907 Franklin Model D roadster. Photograph by Harris & Ewing, Inc. [Public domain], via Wikimedia Commons. (<https://goo.gl/VLCRBB>).

Every figure should also have a figure description unless it is purely decorative. These descriptions convey what's in the image to someone who cannot see it. They are also used by search engine crawlers for indexing images, and when images cannot be loaded.

A figure description must be unformatted plain text less than 2000 characters long (including spaces). **Figure descriptions should not repeat the figure caption – their purpose is to capture important information that is not already provided in the caption or the main text of the paper.** For figures that convey important and complex new information, a short text description may not be adequate. More complex alternative descriptions can be placed in an appendix and referenced in a short figure description. For example, provide a data table capturing the information in a bar chart, or a structured list representing a graph. For additional information regarding how best to write figure descriptions and why doing this is so important, please see <https://www.acm.org/publications/taps/describing-figures/>.

14.1 The “Teaser Figure”

A “teaser figure” is an image, or set of images in one figure, that are placed after all author and affiliation information, and before the body of the article, spanning the page. If you wish to have such a figure in your article, place the command immediately before the `\maketitle` command:

```
\begin{teaserfigure}
  \includegraphics[width=\textwidth]{sampleteaser}
  \caption{figure caption}
  \Description{figure description}
\end{teaserfigure}
```

15 CITATIONS AND BIBLIOGRAPHIES

The use of Bib_T_EX for the preparation and formatting of one’s references is strongly recommended. Authors’ names should be complete — use full first names (“Donald E. Knuth”) not initials (“D. E. Knuth”) — and the salient identifying features of a reference should be included: title, year, volume, number, pages, article DOI, etc.

The bibliography is included in your source document with these two commands, placed just before the `\end{document}` command:

```
\bibliographystyle{ACM-Reference-Format}
\bibliography{bibfile}
```

where “bibfile” is the name, without the “.bib” suffix, of the Bib_T_EX file.

Citations and references are numbered by default. A small number of ACM publications have citations and references formatted in the “author year” style; for these exceptions, please include this command in the **preamble** (before the command “`\begin{document}`”) of your L^AT_EX source:

```
\citestyle{acmauthoryear}
```

Some examples. A paginated journal article [2], an enumerated journal article [10], a reference to an entire issue [9], a monograph (whole book) [23], a monograph/whole book in a series (see 2a in spec. document) [17], a divisible-book such as an anthology or compilation [12] followed by the same example, however we only output the series if the volume number is given [13] (so Editor00a’s series should NOT be present since it has no vol. no.), a chapter in a divisible book [35], a chapter in a divisible book in a series [11], a multi-volume work as book [22], a couple of articles in a proceedings (of a conference, symposium, workshop for example) (paginated proceedings article) [3, 15], a proceedings article with all possible elements [34], an example of an enumerated proceedings article [14], an informally published work [16], a couple of preprints [6, 7], a doctoral dissertation [8], a master’s thesis: [4], an online document / world wide web resource [1, 28, 36], a video game (Case 1) [27] and (Case 2) [26] and [25] and (Case 3) a patent [33], work accepted for publication [30], ‘YYYYb’-test for prolific author [31] and [32]. Other cites might contain ‘duplicate’ DOI and URLs (some SIAM articles) [21]. Boris / Barbara Beeton: multi-volume works as books [19] and [18]. A couple of citations with DOIs: [20, 21]. Online citations: [36–38]. Artifacts: [29] and [5].

16 ACKNOWLEDGMENTS

Identification of funding sources and other support, and thanks to individuals and groups that assisted in the research and the preparation of the work should be included in an acknowledgment section, which is placed just before the reference section in your document.

This section has a special environment:

```
\begin{acks}
...
\end{acks}
```

so that the information contained therein can be more easily collected during the article metadata extraction phase, and to ensure consistency in the spelling of the section heading.

Authors should not prepare this section as a numbered or unnumbered `\section`; please use the “acks” environment.

17 APPENDICES

If your work needs an appendix, add it before the “`\end{document}`” command at the conclusion of your source document.

Start the appendix with the “appendix” command:

```
\appendix
```

and note that in the appendix, sections are lettered, not numbered. This document has two appendices, demonstrating the section and subsection identification method.

18 MULTI-LANGUAGE PAPERS

Papers may be written in languages other than English or include titles, subtitles, keywords and abstracts in different languages (as a rule, a paper in a language other than English should include an English title and an English abstract). Use `language=...` for every language used in the paper. The last language indicated is the main language of the paper. For example, a French paper with additional titles and abstracts in English and German may start with the following command

```
\documentclass[sigconf, language=english, language=german,
language=french]{acmart}
```

The title, subtitle, keywords and abstract will be typeset in the main language of the paper. The commands `\translatedXXX`, `XXX` begin title, subtitle and keywords, can be used to set these elements in the other languages. The environment `translatedabstract` is used to set the translation of the abstract. These commands and environment have a mandatory first argument: the language of the second argument. See `sample-sigconf-i13n.tex` file for examples of their usage.

19 SIGCHI EXTENDED ABSTRACTS

The “sigchi-a” template style (available only in \LaTeX and not in Word) produces a landscape-orientation formatted article, with a wide left margin. Three environments are available for use with the “sigchi-a” template style, and produce formatted output in the margin:

sidebar: Place formatted text in the margin.

marginfigure: Place a figure in the margin.

marginable: Place a table in the margin.

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To Robert, for the bagels and explaining CMYK and color spaces.

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A RESEARCH METHODS

A.1 Part One

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A.2 Part Two

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B ONLINE RESOURCES

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