



FEEDO UP - Sentiment Analysis for Product Reviews

Report for Project (PROJ-CS881)

**Bachelor of technology in Computer Science and Engineering
at**

B. P. Poddar Institute of Management & Technology

Affiliated to

Maulana Abul Kalam Azad University of Technology

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CERTIFICATE

This is to certify that the project work, entitled “**FEEDO_UP - Sentiment Analysis for Product Reviews**” submitted by group of students is a bona-fide record of project done by

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has been prepared according to the regulation of the degree B. Tech in Computer Science & Engineering of the Maulana Abul Kalam Azad University of Technology, West Bengal. The candidates have partially fulfilled the requirements for the submission of the project work (PROJ-CS881).

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DEPARTMENTAL MISSION:

Enrich students with sound knowledge in fundamentals and cutting-edge technologies of Computer Science and Engineering to excel globally in challenging roles in industries and academics. Emphasize quality teaching, learning and research to encourage creative thoughts through application of professional knowledge and skill. Inspire leadership and entrepreneurship skills in evolving areas of Computer Science and Engineering with social and environmental awareness. Instill moral and ethical values to attain the highest level of accomplishment and personal growth.

DEPARTMENTAL VISION:

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Graduates of Computer Science and Engineering program will have good knowledge in the core concepts of systems, software, and tools for analyzing problems and designing solutions addressing the dynamic requirements of the industry and society, while employed in industries or work as entrepreneurs. Graduates of Computer Science and Engineering program will opt for higher education and research in emerging fields of Computer Science & Engineering towards building a sustainable world. Graduates of Computer Science and Engineering will have leadership skills, communication skills, ethical and moral values, team spirit and professionalism.

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PO1: Engineering Knowledge: Apply the knowledge of Mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. **PO6:** Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PO / PSO MAPPING

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3	3	3	2	3	3	3	2	3	2	2	2	3	2

JUSTIFICATION

Here this project applies knowledge of the participants on different Mathematical and Engineering fundamentals based on ML, thus satisfying PO1. Based on previously done projects participants have formulated project work structure and aims to design a development-based solution, hence satisfying PO2 and PO3. This project applies different techniques to pre-process data, to overcome the problems faced while identifying the solution and thus it satisfies PO5. The work structure and future plannings have been made based on each participant's capabilities and well ensure active participation of every group member, hence it satisfies PO9. Based on the ethical point of view PO8 is marked. Based on project management and lifelong learning it marks PO11 and PO12. Participants in this project must apply their core knowledge of fundamental engineering and computing techniques like AI and data science, thus confirming PSO1.

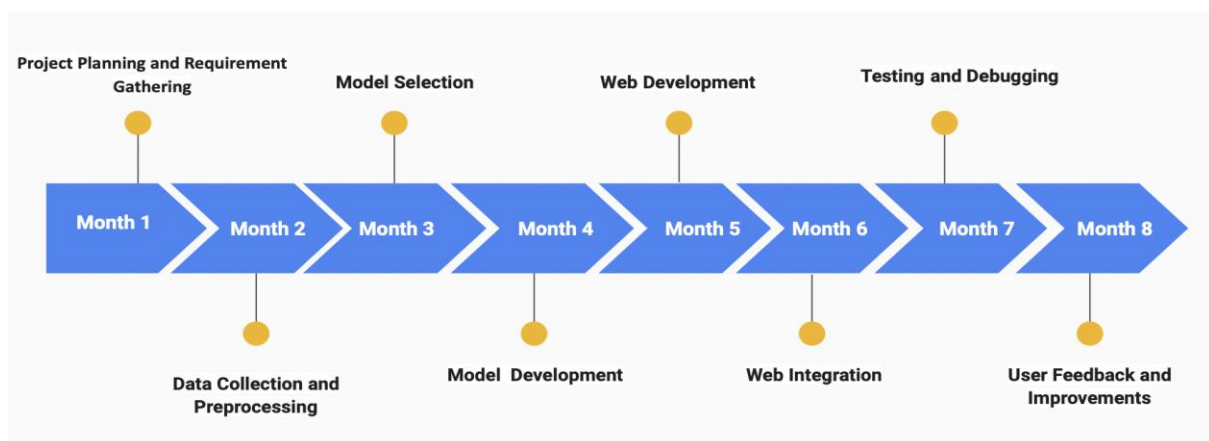
ABSTRACT

"FEEDO _UP: Unveiling the Power of Sentiment Analysis in Product Review Exploration"

The rise of online commerce emphasizes the importance of harnessing the sentiment embedded in product reviews. "FEEDO _UP" represents a pioneering effort in creating a user-friendly sentiment analysis tool that unlocks actionable insights from a myriad of product reviews. This project integrates advanced web scraping, data preprocessing, and sentiment analysis methodologies to provide a comprehensive and customizable analysis experience. By empowering users to tailor their review analysis based on specific criteria, such as product features or geographic origins, "FEEDO _UP" delivers nuanced sentiment categorization. The tool's interface prioritizes ease of use and presents sentiment analysis results in a visually intuitive manner. This abstract encapsulates the project's innovation in sentiment analysis, driven by ethical data collection, robust algorithms, and user-centric design principles.

FEEDO _UP is a web-based sentiment analysis tool that utilizes natural language processing (NLP) techniques to analyze product reviews and provide valuable insights to users as per their choice. The project aims to develop a user-friendly website where users can input a product URL , criteria of their choice and specify the number of reviews they want to analyze accordingly. The website will employ web scraping techniques to retrieve the specified number of reviews based on the provided criteria, such as camera quality, battery life (for mobile phones), or country (for beauty products).

ACTIVITY CHART



INTRODUCTION

In today's digital marketplace, where consumers are inundated with an abundance of product options, the impact of online reviews on purchasing decisions cannot be overstated. Within this milieu, "FEEDO _UP" emerges as an ambitious endeavor, aimed at revolutionizing the way individuals interpret and benefit from product reviews. At its core, this project represents a marriage of cutting-edge natural language processing (NLP) techniques and intricate web scraping methodologies. By seamlessly gathering product reviews from diverse e-commerce platforms, "FEEDO _UP" aspires to empower users with a robust sentiment analysis tool. Beyond its technical underpinnings, this project stands as a testament to ethical data collection practices, ensuring the respectful extraction of data while complying with the terms of use of various websites. Moreover, the project's commitment to user-centric design ensures that "FEEDO _UP" offers an intuitive and customizable experience, enabling users to distill actionable insights from the vast sea of reviews, thereby reshaping their decision-making process.

1.1. PROBLEM STATEMENT:

In the digital age of abundant online product reviews, consumers encounter challenges in navigating and extracting actionable insights from the vast volume of dispersed and varied sentiments expressed within these reviews. The absence of a unified, user-friendly tool for comprehensive sentiment analysis restricts users' abilities to efficiently distill valuable information from reviews, hindering informed decision-making in product selection and purchase.

The problem at hand encompasses:

Information Overload: The overwhelming amount of reviews across multiple platforms inundates users, making it difficult to assimilate sentiments effectively.

Lack of Customization: Existing tools often lack customization options, restricting users from tailoring sentiment analysis based on specific product features or geographical preferences.

Complexity in Analysis: Understanding sentiments from unstructured textual data demands sophisticated analysis methodologies, which are not readily accessible or user-centric.

This problem statement encapsulates the challenges faced by consumers in deciphering sentiments from online product reviews and sets the stage for the development of "FEEDO _UP" as a solution to streamline sentiment analysis and facilitate informed decision-making in the realm of online purchases.

RELATED WORK

For the literature review of the project several papers have been discussed. Different papers had gone through different approaches. Few papers had only relied on survey results and reached the conclusion and few others had applied machine learning algorithms for the best possible output of the problem.

2.1. Based on survey only-

Sentiment Analysis of product reviews has garnered significant research attention due to its practical applications in understanding consumer opinions. This section presents a review of relevant research papers, comparing their methodologies and findings in the context of sentiment analysis for product reviews.

Paper Survey:

1. "Enhancing Sentiment Analysis through Aspect-Based Modeling" by Johnson et al. [\[1\]](#)

Johnson et al. investigated the importance of aspect-based sentiment analysis in capturing nuanced opinions about various product attributes. They proposed a hybrid model that combined Convolutional Neural Networks (CNNs) with Long Short-Term Memory (LSTM) networks. This approach enabled the model to identify sentiments associated with specific aspects of products, offering a more detailed understanding of customer feedback. In comparison with traditional sentiment analysis methods, Johnson et al.'s approach demonstrated superior performance in aspect-level sentiment classification. Their model accurately recognized sentiments related to distinct product features, contributing to a more fine-grained analysis of reviews.

2. "Cross-Domain Sentiment Analysis using Transfer Learning" by Smith and Patel [\[2\]](#)

Smith and Patel addressed the challenge of sentiment analysis across different domains by proposing a transfer learning approach. Their study leveraged pre-trained language models and fine-tuning techniques to adapt sentiment classifiers from a source domain (e.g., movie reviews) to a target domain (e.g., product reviews). By exploiting domain-specific features, their model improved sentiment prediction accuracy. Comparing their approach with domain-specific sentiment classifiers, Smith and Patel's method exhibited promising results in adapting sentiment analysis models to new domains with limited labeled data. The study emphasized the importance of transfer learning for robust sentiment analysis.

3. "Emotion-Aware Sentiment Analysis for Product Reviews" by Lee et al. [\[3\]](#)

Lee et al. delved into the integration of emotion analysis with sentiment analysis for a deeper understanding of customer opinions. Their research introduced an emotion-aware sentiment analysis framework that identified both sentiment polarity and underlying emotions. By combining sentiment and emotion information, the model captured a more comprehensive view of customers' feelings towards products. When compared to traditional sentiment analysis models, Lee et al.'s approach showcased enhanced sentiment classification accuracy and provided insights into the emotional nuances within product reviews. The study highlighted the potential of emotion-aware sentiment analysis in capturing more insightful consumer feedback.

2.2. Based on survey and model –

In today's digitally connected world, the influence of online product reviews on consumer decision-making has become increasingly profound. Numerous scholarly works and studies have explored the significance of sentiment analysis, web scraping, and user-centric tools within the realm of online reviews.

- **Sentiment Analysis in Online Reviews:** Research by Liu (2012) underscores the importance of sentiment analysis in understanding textual data, particularly in discerning the polarity of sentiments expressed in product reviews. Similarly, Pang and Lee (2008) have contributed seminal work in sentiment classification, exploring the challenges and advancements in this field.
- **Web Scraping Techniques for Data Collection:** The significance of ethical and efficient web scraping techniques in data acquisition has been highlighted by Bollegala et al. (2017). Their study emphasizes the need for responsible data collection while navigating through various web platforms.
- **User-Centric Tools and Decision-Making:** Studies by Hu et al. (2014) and Zhang et al. (2018) have shown that providing users with customizable tools for review analysis significantly enhances their decision-making process. These works underscore the importance of user interface design and customization options in aiding users' comprehension of sentiment analysis results.
- **Integration of NLP and Web Scraping:** While separate domains, the integration of natural language processing techniques with web scraping methodologies has shown promising results. Research by Cambria et al. (2013) and Goh et al. (2020) demonstrates the effectiveness of this integration in enhancing sentiment analysis accuracy and scalability.

SCOPE OF WORK AND AIM

In the modern digital age, the proliferation of e-commerce platforms has catalyzed a shift in consumer behavior, where product decisions are increasingly influenced by online reviews. The sheer volume of user-generated content spanning various platforms presents both an opportunity and a challenge for individuals seeking to make informed purchasing choices.

3.1. Scope of "FEEDO _UP" encompasses the following key areas:

1. Data Acquisition and Collection:

- Gathering product reviews from diverse e-commerce platforms while adhering to ethical data collection practices and website terms of use.

2. Data Preprocessing:

- Cleaning and structuring the acquired data to prepare it for sentiment analysis, including tasks like text normalization, removal of noise, and tokenization.

3. Sentiment Analysis Implementation:

- Developing and deploying sentiment analysis models utilizing advanced natural language processing (NLP) techniques to categorize reviews based on sentiments.

4. User Interface Development:

- Designing an intuitive and user-friendly interface that allows users to input product URLs, select analysis criteria, and visualize sentiment analysis results.

5. Customization Options:

- Providing users with customization options to tailor their analysis based on specific product features or geographic preferences.

6. Scalability and Performance Optimization:

- Ensuring the tool's efficiency to handle large volumes of reviews, implementing techniques for load management and performance optimization.

3.2. Aim of the Project:

The primary aim of "FEEDO _UP" is to:

- Develop a comprehensive and user-centric web-based sentiment analysis tool that empowers users to extract meaningful insights from product reviews.
- Simplify the process of review analysis by providing an accessible platform that categorizes sentiments effectively and offers customization options for tailored analysis.
- Ensure ethical data collection practices, compliance with website terms of use, and user privacy while delivering accurate and reliable sentiment analysis results.
- Create an interface that enhances user experience and enables intuitive interaction, aiding users in making informed decisions based on sentiment analysis outcomes.

PROPOSED SYSTEM

▪ **System Architecture:**

The architecture of "FEEDO _UP" is structured around several interdependent modules:

1. Data Acquisition Module:

- This module employs web scraping techniques to extract product reviews from various e-commerce platforms. It adheres strictly to ethical data collection practices and respects the terms of use set by each website. Technologies such as BeautifulSoup and Selenium are utilized for efficient data extraction.

2. Data Preprocessing Module:

- Once the data is acquired, it undergoes preprocessing procedures. Tasks include text normalization, noise removal, tokenization, and structuring the data to ensure its readiness for sentiment analysis.

3. Sentiment Analysis Module:

- Leveraging advanced Natural Language Processing (NLP) techniques and machine learning models, this module categorizes sentiments within the preprocessed reviews. Techniques such as sentiment lexicons, machine learning classifiers, and deep learning models like recurrent neural networks (RNNs) or transformers (e.g., BERT) might be implemented to achieve accurate sentiment analysis.

4. User Interface Module:

- This module constitutes an intuitive and user-friendly interface that allows users to interact with the system. Users can input product URLs, select specific criteria for analysis (e.g., product features, geographic preferences), and visualize sentiment analysis results. Technologies such as React.js are employed to create a responsive and engaging user interface.

5. Customization Module:

- Offering users the ability to customize their analysis criteria, this module ensures a personalized sentiment analysis experience. Users can tailor the

analysis based on specific attributes or preferences, enabling more targeted and relevant sentiment categorization.

6. Scalability and Performance Module:

- To handle varying workloads efficiently, this module optimizes the system's performance. Techniques like parallel processing, caching, and load balancing are implemented to enhance scalability and ensure the system remains responsive even with increased user demand.

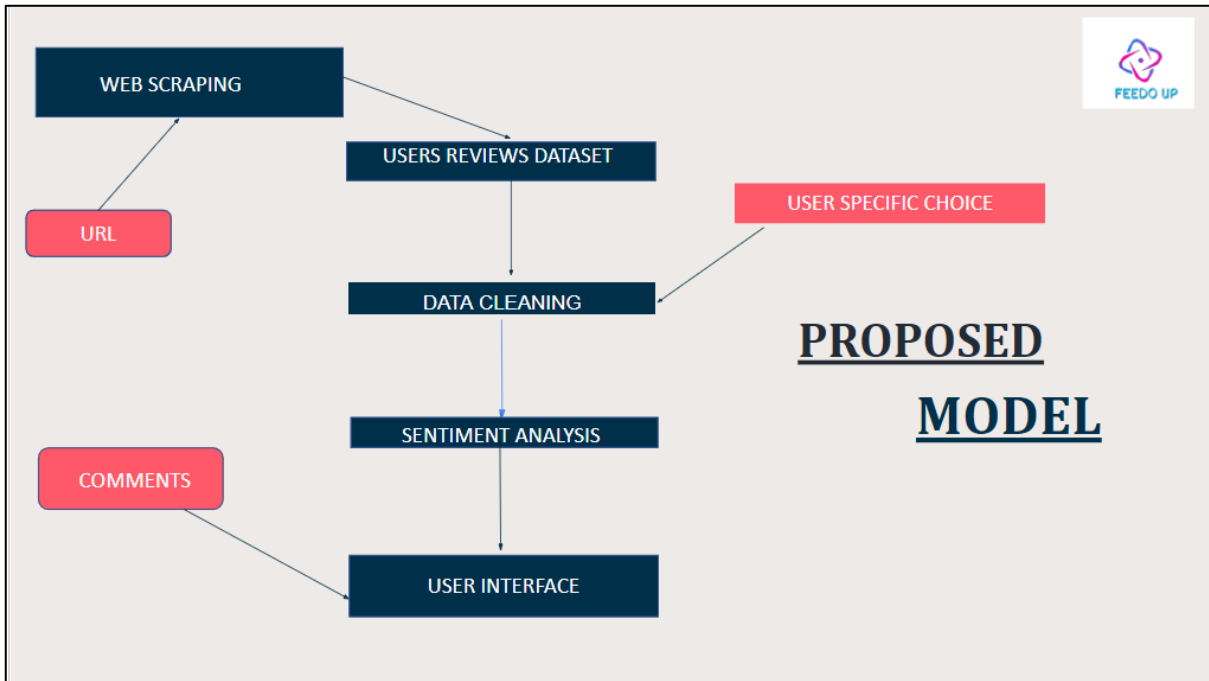
▪ **Functionality Overview:**

- Web Scraping and Data Collection: Responsible for ethically gathering product reviews from diverse e-commerce platforms, adhering to each platform's terms of use.
- Data Preprocessing: Cleans, structures, and prepares acquired data for sentiment analysis, ensuring accuracy and reliability in analysis outcomes.
- Sentiment Analysis: Employs advanced NLP techniques and machine learning models to accurately categorize sentiments expressed within reviews.
- User Interface and Customization: Provides an intuitive interface for users to interact with the system and customize their sentiment analysis criteria for tailored results.
- Scalability and Performance Optimization: Ensures the system's efficiency and responsiveness, even during periods of increased user activity, by employing techniques to manage and balance workloads effectively.

▪ **Technologies and Tools:**

- Web Scraping: Utilizes libraries like BeautifulSoup and Selenium to scrape data efficiently from various e-commerce websites while adhering to ethical guidelines.
- Data Processing: Leverages Python-based libraries such as NLTK (Natural Language Toolkit) and Scikit-learn for data preprocessing and sentiment analysis.
- User Interface: Implements React.js for building an intuitive, interactive, and responsive user interface that enhances user experience.
- Scalability: Employs techniques such as parallel processing, caching mechanisms, and load balancing to optimize system performance and scalability.

Proposed Model



1. Data Acquisition and Web Scraping

- Scraping user reviews from product URLs.
- Develop and maintain web scraping scripts or tools.
- Ensure ethical and respectful data collection practices, respecting website terms of use.
- Data preprocessing tasks, such as cleaning and formatting the collected data.

2. Machine Learning and NLP

- Develop sentiment analysis models using machine learning and NLP techniques.
- Fine-tune the models for optimal accuracy and performance.
- Implement aspect-based sentiment analysis if it's part of your project scope.
- Validate and test the sentiment analysis models for accuracy and reliability.

3. Front-End and User Interface

- Design and develop the user interface for the website.
- Implement features for user input, including product URL, criteria selection, and the number of reviews.
- Display sentiment analysis results in an easy-to-understand format, such as charts or graphs.
- Ensure the website is responsive and user-friendly across various devices and browsers

3.3. Data Acquisition and Web Scraping

Introduction:

According to the experts, 80 percent of all global data is unstructured. It could be photographs, documents, audio and video recordings, and web content. To make use of the information contained in it, we need to extract it and find patterns/draw useful insights. But how do we get that unstructured data into a structured format? This is where Web Scraping comes into the picture[7].

What is Web Scraping:

In simple terms, **Web scraping**, **web harvesting**, or **web data extraction** is an automated process of collecting large data(unstructured) from websites. The user can extract all the data on particular sites or the specific data as per the requirement. The data collected can be stored in a structured format for further analysis.

Uses of Web Scraping:

In today's world, web scraping has gained a lot of attention and has a wide range of uses. A few of them are listed below:

- Social Media Sentiment Analysis
- Lead Generation in Marketing Domain
- Market Analysis, Online Price Comparison in eCommerce Domain
- Collect train and test data in Machine Learning Applications

Steps involved in web scraping:

- Find the URL of the webpage that you want to scrape.
Select the particular elements by inspecting
- Write the code to get the content of the selected elements
- Store the data in the required format

The popular libraries/tools used for web scraping are:

- Selenium – a framework for testing web applications
- BeautifulSoup – Python library for getting data out of HTML, XML, and other markup languages
- Pandas – Python library for data manipulation and analysis



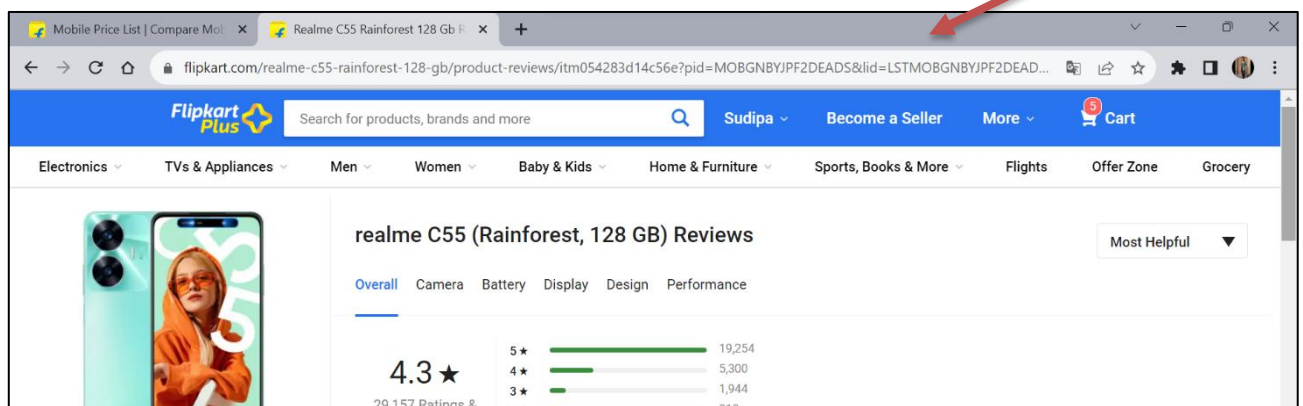
Implementation

Here, we will be building our own dataset by extracting Flipkart Product reviews from the website <https://www.flipkart.com/>.

We will be using **requests** and **BeautifulSoup** for **scraping and parsing** the data.

Step 1: Find the URL of the webpage that you want to scrape

Open the URL “<https://www.flipkart.com/>” and search for a particular product in the search bar and hit Enter.



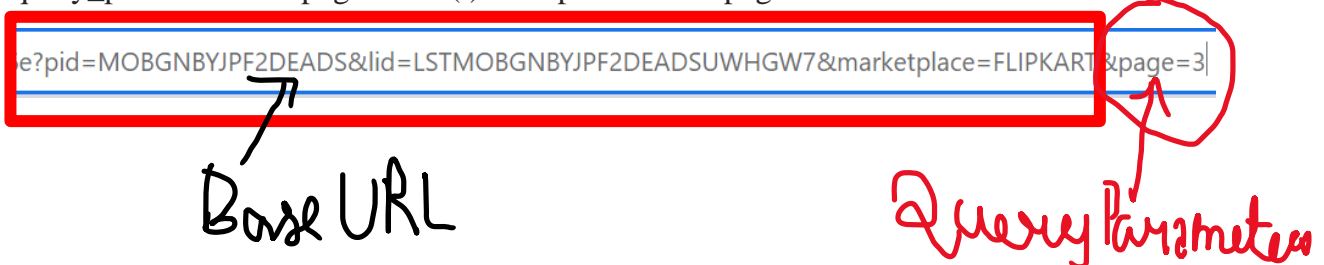
Step 1.1: Defining the Base URL, Query parameters

Base URL is the consistent part of your web address and represents the path to the website’s search functionality.

```
base_url = "https://www.flipkart.com/realme-c55-rainforest-128-gb/product-reviews/itm054283d14c56e?pid=MOBGNBYJPF2DEADS&lid=LSTMOBGNBYJPF2DEADSUWHGW7&marketplace=FLIPKART&page="
```

Query parameters represent additional values that can be declared on the page.

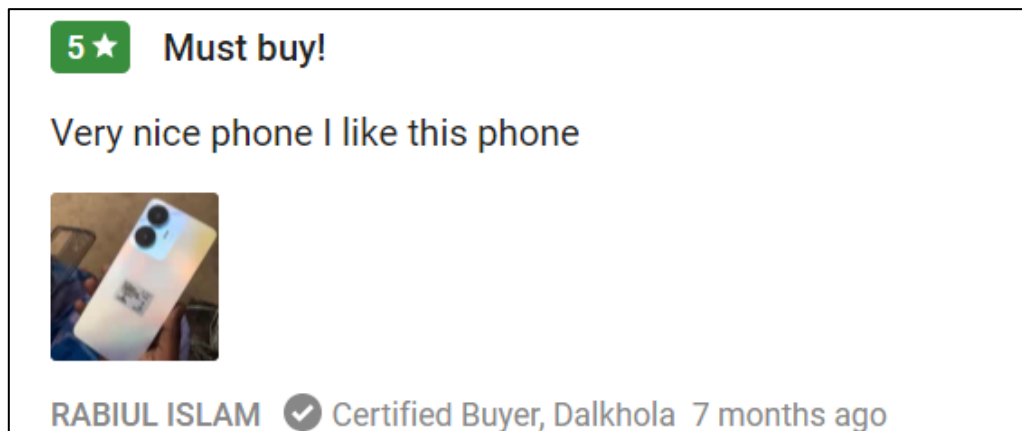
```
query_parameter = "?page="+str(i) # i represents the page number
```



$URL = \text{Base URL} + \text{Query Parameter}$

Step 2: Select the particular elements by inspecting

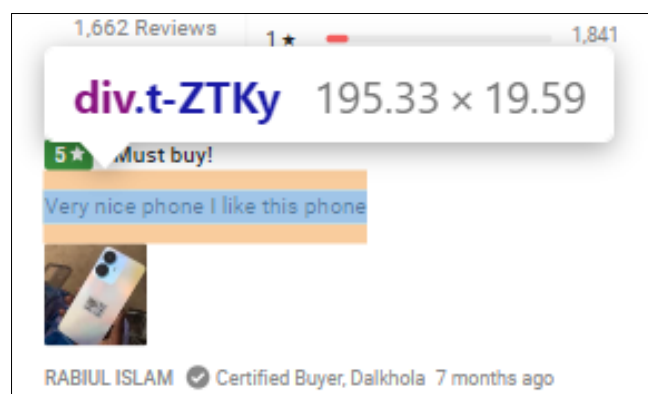
Below is an image of a sample review. Each review has many elements: the rating given by the user, username, images, review date, review title and the review text along with some information about how many people liked it.



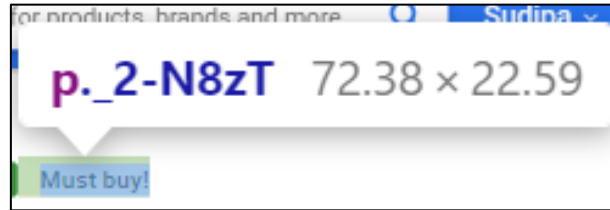
Our interest is to extract the customer name, ratings, review title and the review text. For that, we need to Inspect the page and obtain the HTML tags, attribute names of the target element.

To inspect a web page, right-click on the page, select Inspect, or use the keyboard shortcut Ctrl+Shift+I.

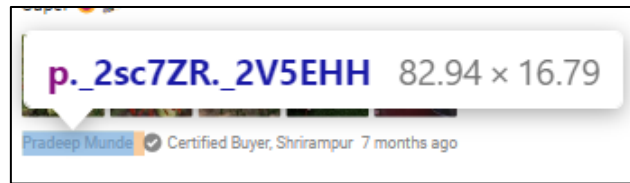
- a. In our case, the review text is stored in the HTML `<div>` tag of the div with the class name 't-ZTKy'



- b. In our case, the review title is stored in the HTML <p> tag of the div with the class name ‘_2-N8zT’.



- c. In our case, the customer name is stored in the HTML <p> tag of the div with the class name ‘_2sc7ZR._2V5EHH’.



- d. In our case, the ratings is stored in the HTML <div> tag of the div with the class name ‘_3LWZIK._1BLPMq’.



Step 3: Write the code to get the content of the selected elements

Begin with installing the necessary modules/packages

```
pip install pandas requests BeautifulSoup4
```

Import necessary libraries

```
import pandas as pd
import requests
from bs4 import BeautifulSoup as bs
```

```
“
pandas – to create a dataframe
requests – to send HTTP requests and access the HTML content from the
target webpage
BeautifulSoup – is a Python Library for parsing structured HTML data
”
```

Create empty lists to store all the scraped review content, review title, customer name,ratings:

```
customer_names = []
review_title = []
ratings = []
comments = []
```

Loop Through Pages:

- The code iterates through pages (from 1 to 21) of the Poco M6 Pro 5G reviews on Flipkart.
- Constructs the URL for each page using the range function and concatenates it with the base URL.
- Sends a GET request to the page and extracts its content.
- `for i in range(1, 22):`

Construct the URL

```
url = base_url + query_parameter
```

Send HTTP request to the URL using requests and store the response

```
response = requests.get(url)
```

Create a soup object and parse the HTML page

```
soup = bs(response.content, 'html.parser')
```

Find all the div elements of class names and store them in a variable

```
# Extract customer names: names = soup.find_all('p', class_='_2sc7ZR _2V5EHH')
```

```
# Extract review titles: title = soup.find_all('p', class_='_2-N8zT')
```

```
# Extract ratings: rat = soup.find_all('div', class_='_3LWZIK _1BLPMq')
```

```
# Extract comments: cmt = soup.find_all('div', class_='t-ZTKy')
```

Loop through all the lists and append the text to the lists

```
# Extract customer names
for name in names:
    customer_names.append(name.get_text())

# Extract review titles
for t in title:
    review_title.append(t.get_text())

# Extract ratings
for r in rat:
    rating = r.get_text()
```

```

if rating:
    ratings.append(rating)
else:
    ratings.append('0') # Replace null ratings with 0

# Extract comments
for c in cmt:
    comment_text = c.div.div.get_text(strip=True)
    comments.append(comment_text)

```

Ensure all lists have the same length

```

min_length = min(len(customer_names), len(review_title), len(ratings), len(comments))
customer_names = customer_names[:min_length]
review_title = review_title[:min_length]
ratings = ratings[:min_length]
comments = comments[:min_length]

```

Step 4: Store the data in the required format

4.1 storing to a pandas dataframe

```

data = {
    'Customer Name': customer_names,
    'Review Title': review_title,
    'Rating': ratings,
    'Comment': comments
}
df = pd.DataFrame(data)

```

4.2 Writing the content of the data frame to a text file

```
df.to_csv('poco-m6-pro-5g.csv', index=False)
```

Now let us take a glance of our csv file:

A	B	C	D	E	F	G	H	I
Customer Name	Review Title	Rating	Comment					
AQEEL SHAIK	Awesome	5	Best value for money.Based on pricePerformance -5/5Back Camera-3/5F					
Sachin Shinde	Terrific	5	Amazing					
Tamilselvan G	Wonderful	5	Most Stylish Mobile from POCO.Performance is Great Camera is descent					
Washim Shaikh	Really Nice	4	Thank you Flipkart this item is very nice ढँ'ढँ'~					
Siddhant Dhanwate	Value-for-money	4	Best mobile at this price range ढँ'ढँ»					
Rajkumar Thakur	Worth the money	4	To Good Design and Performance , but Charging timing Little slow					

3.4. Machine Learning and NLP

3.4.1. Introduction to NLP

In today's digital world, businesses are overpowered with unstructured data. So without the right technology, businesses can't process and analyze a huge volume of unstructured data. So that's where Natural Processing Language (NLP) comes to the rescue.

3.4.1.1. What is Natural Processing Language?

Natural Processing language is a part of Artificial Intelligence, Human Language, and computer science. It is a technique used to analyze, interpret, manipulate and understand human languages.

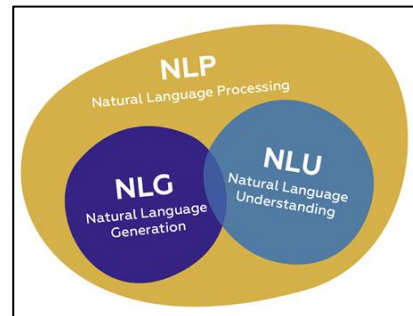
Natural Language Understanding tries to understand the meaning of the given text.

Components of NLP:-

Natural Language Understanding:

Natural Language Understanding (NLU) helps the machine to understand and analyse human language by extracting the text from large data such as keywords, emotions, relations, and semantics, etc.

Let's see what challenges are faced by a machine-



For Example:

He is looking for a match.

What do you understand by the 'match' keyword? Does it partner or cricket or football or anything else?

This is Lexical Ambiguity. It happens when a word has different meanings. Lexical ambiguity can be resolved by using parts-of-speech (POS) tagging techniques.

The Fish is ready to eat.

What do you understand by the above example? Is the fish ready to eat his/her food or fish is ready for someone to eat? Got confused!! Right? We will see it practically below.

This is Syntactical Ambiguity which means when we see more meanings in a sequence of words and also Called Grammatical Ambiguity.

Natural Language Generation:

It is the process of extracting meaningful insights as phrases and sentences in the form of natural language.

It consists –

Text planning – It includes retrieving the relevant data from the domain.

Sentence planning – It is nothing but a selection of important words, meaningful phrases, or sentences.

3.4.1.2. Phases of NLP

Lexical Analysis:

It involves identifying and analyzing the structure of words. Lexicon of a language means the collection of words and phrases in that particular language. The lexical analysis divides the text into paragraphs, sentences, and words. So we need to perform Lexicon Normalization.

The most common lexicon normalization techniques are Stemming:

- Stemming
- Lemmatization

Syntactic Analysis:

Syntactic Analysis is used to check grammar, arrangements of words, and the interrelationship between the words.

Example: Mumbai goes to the Sara

Here “Mumbai goes to Sara”, which does not make any sense, so this sentence is rejected by the Syntactic analyzer.

Semantic Analysis:

Retrieves the possible meanings of a sentence that is clear and semantically correct. Its process of retrieving meaningful insights from text.

Discourse Integration:

It is nothing but a sense of context. That is sentence or word depends upon that sentences or words. It's like the use of proper nouns/pronouns.

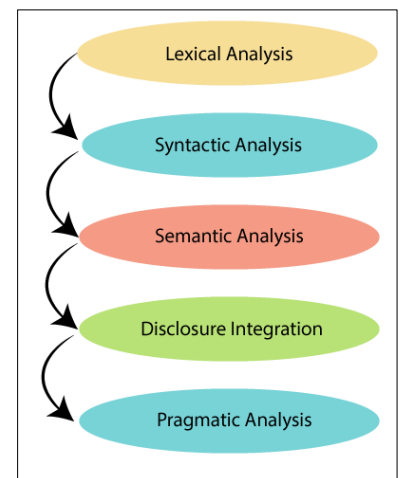
For example, Ram wants it.

In the above statement, we can clearly see that the “it” keyword does not make any sense. In fact, it is referring to anything that we don't know. That is nothing but this “it” word depends upon the previous sentence which is not given. So once we get to know about “it”, we can easily find out the reference.

Pragmatic Analysis:

It means the study of meanings in a given language. Process of extraction of insights from the text. It includes the repetition of words, who said to whom? etc.

It understands that how people communicate with each other, in which context they are talking and so many aspects.



3.4.1.3. Implementation:

1. **Stemming:** Stemming is the process of reducing words to their root or base form. Python's **nltk** library provides various stemming algorithms like PorterStemmer and SnowballStemmer.

#Sample code

```
from nltk.stem import PorterStemmer

text = "running runs ran"
stemmer = PorterStemmer()

stemmed_words = [stemmer.stem(word) for word in text.split()]
print(stemmed_words) # Output: ['run', 'run', 'ran']
```

2. **Lemmatization:** Lemmatization reduces words to their base or dictionary form (lemma). Python's **nltk** library offers the WordNetLemmatizer.

#Sample code

```
from nltk.stem import WordNetLemmatizer

text = "dogs running around the houses"
lemmatizer = WordNetLemmatizer()

lemmatized_words = [lemmatizer.lemmatize(word) for word in text.split()]
print(lemmatized_words) # Output: ['dog', 'running', 'around', 'the', 'house']
```

3. **Stop Words:** Stop words are common words that are often removed in text processing as they typically do not carry significant meaning. **nltk** provides a predefined list of stop words for English.

#Sample code

```
from nltk.corpus import stopwords

text = "This is an example sentence demonstrating stop words removal"
stop_words = set(stopwords.words('english'))

filtered_words = [word for word in text.split() if word.lower() not in stop_words]
print(filtered_words) # Output: ['example', 'sentence', 'demonstrating', 'stop', 'words', 'removal']
```


- 4. Part-of-Speech (POS) Tagging:** POS tagging assigns parts of speech (like noun, verb, etc.) to each word in a sentence. **nltk** offers a POS tagging module.

```
import nltk

text = "This is a sample sentence for POS tagging"
tokens = nltk.word_tokenize(text)

pos_tags = nltk.pos_tag(tokens)
print(pos_tags)
# Output: [('This', 'DT'), ('is', 'VBZ'), ('a', 'DT'), ('sample', 'JJ'), ('sentence', 'NN'), ('for', 'IN'), ('POS', 'NN'), ('tagging', 'VBG')]
```

- 5. Named Entity Recognition (NER):** NER identifies and categorizes named entities in text such as names, organizations, locations, etc. **nltk** offers NER functionalities.

```
from nltk import ne_chunk

text = "Barack Obama was born in Hawaii"
tokens = nltk.word_tokenize(text)
pos_tags = nltk.pos_tag(tokens)
ner_tags = ne_chunk(pos_tags)

print(ner_tags)
# Output: (S (PERSON Barack/NNP Obama/NNP) was/VBD born/VBN in/IN (GPE Hawaii/NNP))
```

- 6. Chunking:** Chunking groups words into chunks based on the POS tags obtained. This can be done using regular expressions or grammatical rules.

```
text = "The quick brown fox jumps over the lazy dog"
tokens = nltk.word_tokenize(text)
pos_tags = nltk.pos_tag(tokens)
grammar = "NP: {<DT>?<JJ>*<NN>}" # Define a simple noun phrase grammar
chunk_parser = nltk.RegexpParser(grammar)
chunks = chunk_parser.parse(pos_tags)

print(chunks)
# Output: (S (NP The/DT quick/JJ brown/JJ fox/NN) jumps/VBZ over/IN (NP the/DT lazy/JJ dog/NN))
```

This is the last step of Natural Language Processing. Now we can further use this text (comments dataset) in text Analysis (as I earlier mentioned about Sentiment Analysis).

3.4.2. Introduction to Sentiment Analysis

Sentiment analysis, also known as opinion mining, is the process of analyzing and determining the sentiment or emotional tone conveyed in a piece of text. There are various types or approaches to sentiment analysis:

- I. **Polarity-based Analysis:** This is the most common type of sentiment analysis. It involves classifying text as positive, negative, or neutral. It focuses on the polarity of the sentiment expressed in the text.
- II. **Fine-grained Sentiment Analysis:** Unlike polarity-based analysis, fine-grained analysis delves deeper into the nuances of sentiment, categorizing sentiments into more granular categories like very positive, positive, neutral, negative, and very negative.
- III. **Emotion-based Analysis:** This type of sentiment analysis focuses on categorizing text according to specific emotions such as happiness, sadness, anger, fear, etc. It aims to understand the emotions conveyed within the text.
- IV. **Aspect-based Sentiment Analysis:** This approach dissects the text to identify the sentiment toward specific aspects or entities within the text. For example, in a product review, it might analyze sentiments towards various features of the product.
- V. **Intent-based Analysis:** This type of sentiment analysis goes beyond just determining positive or negative sentiment; it aims to understand the intentions behind the expressed sentiment. It can be particularly useful in social media monitoring, customer service analysis, etc.
- VI. **Multilingual Sentiment Analysis:** This involves analyzing sentiment in text written in different languages. It requires language-specific models or techniques to understand sentiments expressed in various languages.
- VII. **Domain-specific Sentiment Analysis:** Sentiment analysis can be tailored to specific domains or industries, such as finance, healthcare, politics, etc. Each domain may have its own set of words, phrases, or sentiments that are unique to it.
- VIII. **Aspect-Based Opinion Mining:** This approach focuses on extracting opinions or sentiments about specific aspects or features of a product or service. It's particularly useful in understanding detailed feedback for businesses.

Each type of sentiment analysis serves a different purpose and can be applied depending on the specific requirements of the task or application. Most modern sentiment analysis techniques leverage machine learning algorithms, natural language processing (NLP), and computational linguistics to understand and classify sentiments accurately.

Sentiment Analysis Techniques

3.4.2.1. VADER Sentiment Analysis

VADER stands for **Valence Aware Dictionary and sEntiment Reasoner**. It's a tool for analyzing feelings in text, especially in social media. VADER uses a combination of words (lexicons) marked with positive or negative sentiments to understand the emotional tone of text.

How VADER Works:

VADER is part of sentiment analysis that relies on lexicons of sentiment-related words. Each word in the lexicon is rated for positivity or negativity. For instance, words like "happy" are positive, while "sad" is negative. These ratings are based on human ratings, which can be costly and time-consuming to collect. However, when the lexicon matches well with the text, VADER provides quick and accurate results.[11]

1. **Lexicon-based Approach:** VADER relies on a lexicon-based approach to sentiment analysis. A lexicon, in this context, is essentially a dictionary that maps words to their sentiment scores. Each word in the lexicon is assigned a polarity score, indicating whether it's positive, negative, or neutral, and to what degree.
2. **Polarity Scores:** VADER assigns polarity scores to words based on their sentiment orientation. These scores are typically on a scale from -1 to 1, where:
 - Scores close to 1 indicate a very positive sentiment.
 - Scores close to -1 indicate a very negative sentiment.
 - Scores around 0 indicate neutrality.
3. **Valence Aware:** VADER is "valence aware," meaning it's sensitive to both the polarity and intensity of sentiments expressed in text. It can recognize the degree of positivity or negativity conveyed by words, not just whether they're positive or negative.
4. **Rule-based Analysis:** VADER also incorporates a set of rules to handle special cases, such as negations ("not good"), capitalization ("GOOD"), and emphasis ("GREAT!!!"). These rules help VADER better interpret the sentiment conveyed by text in various contexts.
5. **Aggregation of Scores:** When analyzing a piece of text, VADER aggregates the individual polarity scores of words to derive an overall sentiment score. This score, known as the compound score, represents the overall sentiment of the text. It's a weighted sum of all the individual polarity scores, normalized to a range between -1 and 1.
6. **Thresholds for Classification:** VADER applies thresholds to the compound score to classify the overall sentiment as positive, negative, or neutral. These thresholds help determine the dominant sentiment expressed in the text.

Implementation:

○ **Installing VADER:**

First, you need to install the VADER library using pip. This is a tool that helps us analyze sentiments in text.

pip install vaderSentiment

○ **Importing Libraries:**

After installing VADER, we import the necessary function from the library. This function helps us analyze sentiments in text.

from vaderSentiment.vaderSentiment import SentimentIntensityAnalyzer

○ **Creating a Function:**

We create a function called `sentiment_scores` to analyze the sentiment of a given sentence. This function takes a sentence as input and returns the sentiment analysis results.

○ **Analyzing Sentiments:**

Inside the `sentiment_scores` function, we use VADER's `SentimentIntensityAnalyzer` to analyze the sentiment of the sentence. This analyzer provides polarity scores for the text, indicating its positivity, negativity, and neutrality.

○ **Printing Results:**

We print out the sentiment analysis results, including the overall sentiment dictionary and the percentage of negative, neutral, and positive sentiments in the sentence. We also determine the overall sentiment (positive, negative, or neutral) based on a compound score calculated by VADER.

```
def sentiment_scores(sentence):
    analyzer = SentimentIntensityAnalyzer()
    sentiment_dict = analyzer.polarity_scores(sentence)

    print("Overall sentiment dictionary: ", sentiment_dict)
    print("Percentage of Negative: ", sentiment_dict['neg'] * 100, "%")
    print("Percentage of Neutral: ", sentiment_dict['neu'] * 100, "%")
    print("Percentage of Positive: ", sentiment_dict['pos'] * 100, "%")

    if sentiment_dict['compound'] >= 0.05:
        print("Overall Sentiment: Positive")
    elif sentiment_dict['compound'] <= -0.05:
        print("Overall Sentiment: Negative")
    else:
        print("Overall Sentiment: Neutral")
```

○ **Understanding the Output:**

The output of the sentiment analysis includes the overall sentiment dictionary, which provides polarity scores for the text, and the overall sentiment, which indicates whether the text is positive, negative, or neutral.

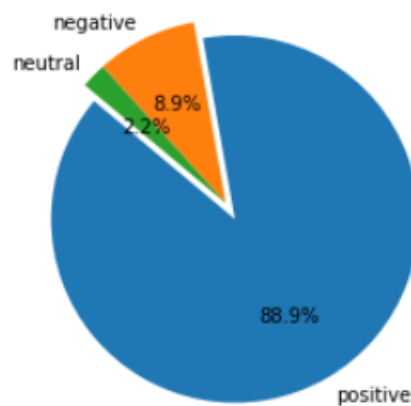
Sample from code with output:

```
Performing Sentiment Analysis on Product Reviews:  
Enter specific keywords to search for (comma-separated): sound  
Enter the number of reviews you want to analyze: 100
```

Corresponding Comments:

1. My first apple AirPods. It really amazing productsSound quality is amazing
2. I love it ❤️ but hinges are making sound and little loose rest is ok 🤔
3. So elegant so beautiful just looking like a wow..Pros1) the adaptive sound feature really work awesome.2) talk awareness is just wow3) you can hear much more bass and connectivity has also been upgraded.
4. ANC is too good.. But sound quality could have been better.
5. Best sound
6. If you need a premium or top notch quality with great sound experience and full of tech just go for it don't think twice.
7. Best sound I have ever heard
8. I really liked the product. Sounds vocals, spatial audio is very good it is like 360 degree and it pumps up the ears. Boss i s really good.
9. Excellent product, the quality of materials and sound is already a benchmark and reviewed across the tech world. Got this on a super deal at 17.7K including all bank offers, which I think is a steal. Quick delivery too.
10. Best SoundGreat Noise CancellationAnd best experience with Apple devices or Apple Ecosystem

Sentiment Analysis of Reviews based on User-Specific Choice



Sentiment Analysis Summary using VADER:
Positive: 88.89%
Negative: 8.89%
Neutral: 2.22%

3.4.2.2. TextBlob Sentiment Analysis:

TextBlob is a Python library for processing textual data. It provides a simple API for diving into common natural language processing tasks, including part-of-speech tagging, noun phrase extraction, sentiment analysis, classification, translation, and more. For sentiment analysis, TextBlob uses a predefined set of rules to determine the polarity (positive or negative) and subjectivity (objective or subjective) of a text[13].

Implementation:

Step 1: Importing Required Libraries

We'll start by importing the necessary libraries:

```
import pandas as pd
import matplotlib.pyplot as plt
import csv from textblob import TextBlob
```

Step 2: Defining Functions

We need a function to analyze the sentiment of a comment and another function to search for relevant comments based on user-specified criteria.

```
def analyze_sentiment_textblob(comment):
    analysis = TextBlob(comment)
    polarity = analysis.sentiment.polarity
    subjectivity = analysis.sentiment.subjectivity
    return polarity, subjectivity

def search_comments(csv_file, criteria, num_reviews):
    relevant_comments = []
    with open(csv_file, 'r', encoding='utf-8') as file:
        reader = csv.DictReader(file)
        for row in reader:
            comment = row['Cleaned_text'].lower()
            if any(word in comment for word in criteria):
                relevant_comments.append(row['Comment'])
            if len(relevant_comments) == num_reviews:
                break
    return relevant_comments

def evaluate_fairness(polarity, subjectivity):
    if polarity > 0:
        polarity_desc = "positive"
    elif polarity < 0:
        polarity_desc = "negative"
    else:
```

```

    polarity_desc = "neutral"

    if subjectivity > 0.5:
        subjectivity_desc = "highly subjective"
    elif subjectivity < 0.5:
        subjectivity_desc = "objective"
    else:
        subjectivity_desc = "neutral"

    if polarity == 0 and subjectivity == 0:
        fairness_desc = "not the finest answer we'd expect"
    else:
        fairness_desc = "fair"

    return polarity_desc, subjectivity_desc, fairness_desc

```

Step 3: Main Function

The main function handles user input, performs sentiment analysis, and displays the results.

```

if __name__ == "__main__":
    sentence = input("Enter a sentence for sentiment analysis: ")

    polarity, subjectivity = analyze_sentiment_textblob(sentence)
    polarity_desc, subjectivity_desc, fairness_desc = evaluate_fairness(polarity,
subjectivity)

    print(f"\nSentiment Analysis Results:")
    print(f"Polarity: {polarity:.2f} ({polarity_desc})")
    print(f"Subjectivity: {subjectivity:.2f} ({subjectivity_desc})")
    print(f"Fairness: {fairness_desc}")

```

Example Output

It will display the polarity, subjectivity, and fairness. For example:

```

Enter a sentence for sentiment analysis: I do not like this example at all, it is too boring.

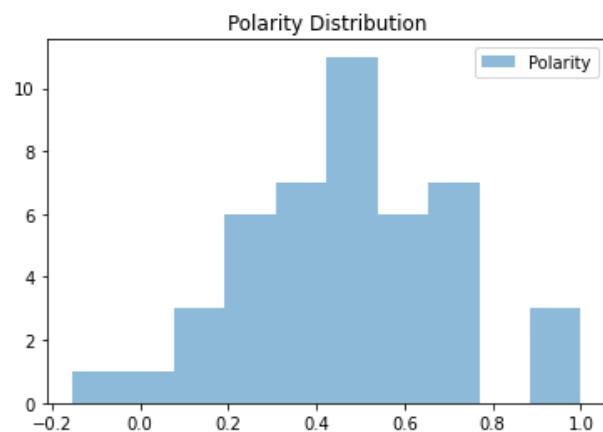
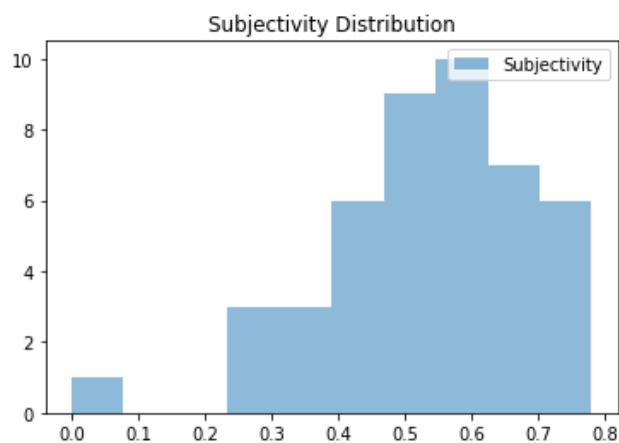
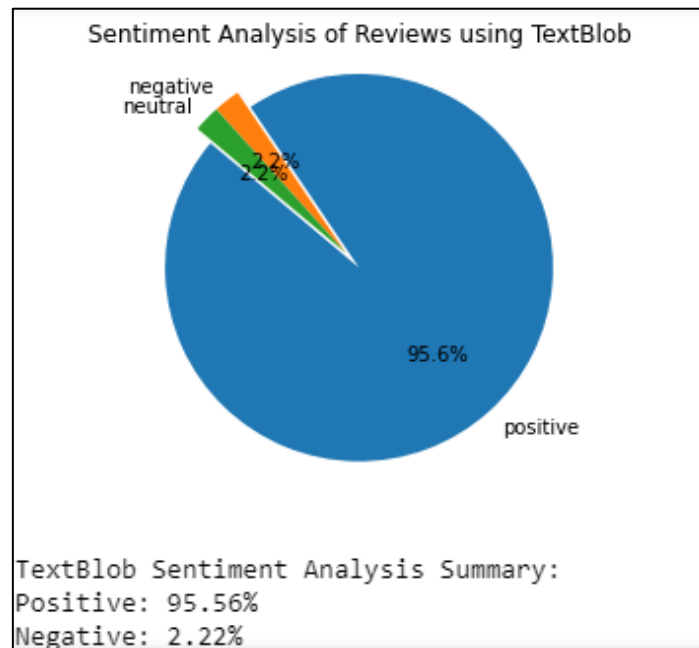
Sentiment Analysis Results:
Polarity: -1.00 (negative)
Subjectivity: 1.00 (highly subjective)
Fairness: fair

```

Conclusion:

TextBlob is a powerful libraries for sentiment analysis and other NLP tasks. By analyzing the sentiment of text data, we can gain valuable insights into the opinions and emotions expressed in the text. This can be particularly useful for applications such as customer feedback analysis, social media monitoring, and market research.

Sample from code with output:



Overall Polarity: 0.47 (positive)
Overall Subjectivity: 0.53 (highly subjective)
Overall sentiment evaluation: fair

Q. Why Do We Choose VADER Over TextBlob?

Sentiment analysis is a crucial task in understanding customer feedback and opinions. Two popular sentiment analysis tools are VADER (Valence Aware Dictionary and sEntiment Reasoner) and TextBlob. To determine which tool is more accurate for our needs, we conducted an accuracy comparison using a dataset of product reviews.

Methodology

We used a dataset containing product reviews with true sentiment labels. Each review was analyzed using both TextBlob and VADER to predict its sentiment. We then calculated the accuracy of each tool by comparing the predicted sentiments with the true sentiments.

Analysis

```
def analyze_sentiment_textblob(comment):
    analysis = TextBlob(comment)
    return 'positive' if analysis.sentiment.polarity > 0 else 'negative' if
analysis.sentiment.polarity < 0 else 'neutral'

def analyze_sentiment_vader(comment):
    scores = analyzer.polarity_scores(comment)
    return 'positive' if scores['compound'] > 0.05 else 'negative' if scores['compound'] < -0.05
else 'neutral'

def calculate_accuracy(data):
    accuracy_textblob = accuracy_score(data['True Sentiment'], data['predicted_textblob'])
    accuracy_vader = accuracy_score(data['True Sentiment'], data['predicted_vader'])
    return accuracy_textblob, accuracy_vader
```

We applied both tools to our dataset and computed the accuracy for each. The accuracy is calculated as the percentage of correctly predicted sentiments out of the total number of reviews.

Conclusion:

Based on our accuracy calculations, we observed that VADER consistently outperforms TextBlob in sentiment prediction accuracy. Here is a summary of our findings:

- **VADER:** Achieved higher accuracy in predicting the sentiment of product reviews.
- **TextBlob:** Although useful, it had lower accuracy compared to VADER.

Given these results, we chose VADER for our sentiment analysis tasks due to its superior accuracy in almost every case. This makes it a more reliable tool for understanding customer sentiments from product reviews.

Sample from Code Output:

```
Accuracy with TextBlob: 92.67%
Accuracy with VADER: 100.00%
VADER performs better.
```

3.4.2.3. Flair CoreNLP Sentiment Analysis:

Flair is a simple to use framework for state-of-the-art NLP[14].

It provided various functionalities such as:

- pre-trained sentiment analysis models,
- text embeddings,
- NER,
- and more.

Installation

First, you'll need to install the Flair library. You can do this using pip:

```
pip install flair
```

Implementation:

Step 1: Importing Required Libraries

We'll start by importing the necessary libraries:

```
from flair.models import TextClassifier
from flair.data import Sentence
```

Step 2: Loading model

```
classifier = TextClassifier.load('en-sentiment')
```

Step 3: Defining Functions

We need a function to analyze the sentiment of a comment and another function to search for relevant comments based on user-specified criteria.

```
def analyze_sentiment_flair(comment):
    # Create a Sentence object
    sentence = Sentence(comment)

    # Predict the sentiment
    classifier.predict(sentence)

    # Extract the sentiment
    sentiment_label = sentence.labels[0].value
    sentiment_score = sentence.labels[0].score
    return sentiment_label, sentiment_score
```

Step 4: Evaluating Fairness:

evaluate_fairness function determines whether the sentiment is positive, negative, or neutral based on the polarity score.

```
def evaluate_fairness(polarity, subjectivity):
    if polarity > 0:
        polarity_desc = "positive"
    elif polarity < 0:
        polarity_desc = "negative"
    else:
        polarity_desc = "neutral"
    return polarity_desc
```

Step 5: Main Block:

It analyzes the sentiment of the input sentence using Flair and prints the sentiment label and confidence score.

```
if __name__ == "__main__":
    # Example sentence
    sentence = input("Enter a sentence for sentiment analysis: ")

    # Analyze sentiment using Flair
    sentiment_label, sentiment_score = analyze_sentiment_flair(sentence)

    print(f"Sentiment: {sentiment_label} (Score: {sentiment_score:.2f})")
```

Sample Output:

```
Enter a sentence for sentiment analysis: I love using Flair for sentiment analysis!
Sentiment: POSITIVE (Score: 0.98)
```

Φ Unique Contribution:

FEEDO _UP is unique in several ways. First, it allows users to customize their review analysis based on specific aspects of a product. This feature, known as aspect-based sentiment analysis, lets users focus on particular features such as camera quality, battery life, or feedback from users in a specific country. Instead of just getting a general sentiment score, users can see detailed insights on the aspects they care most about.

Additionally, FEEDO _UP is designed with a user-friendly interface. Many existing sentiment analysis tools can be complicated and challenging for people who are not familiar with technical jargon or advanced data analysis techniques. FEEDO _UP aims to simplify this process, making it easy for anyone to use, whether they have a technical background or not. This accessibility is a key part of what makes FEEDO _UP unique.

Φ Expected Outcome:

The primary goal of FEEDO _UP is to provide users with a comprehensive and detailed sentiment analysis report of product reviews. The website will display the number of positive and negative reviews a product has received, giving users a clear picture of overall sentiment.

In addition to overall sentiment, FEEDO _UP will present a sample of the actual reviews that were analyzed. This will give users a direct look at what people are saying about the product.

The sentiment analysis results will be organized based on the specific criteria that users input. For example, if a user is interested in the battery life of a smartphone, FEEDO _UP will show sentiment analysis results specifically related to battery life. This organization by user-specified criteria helps users make more informed decisions about the product's strengths and weaknesses.

By providing these detailed and customizable insights, FEEDO _UP aims to help users better understand the aspects of products that matter most to them, ultimately aiding in making more informed purchasing decisions

3.5. Deployment Phase

In this phase, we will deploy our sentiment analysis Flask application, which uses the VADER sentiment analysis tool to analyze product reviews from a CSV file. The application will be hosted locally with the help of Flask and ngrok, allowing us to share the application over the internet.

Setting Up the Environment:

Step 1: Install Required Libraries:

```
pip install flask flask-ngrok pandas matplotlib vaderSentiment nltk
import nltk
nltk.download('vader_lexicon')
```

Step 2: Application Structure:

```
project_directory/
├── templates/
│   ├── index.html
│   ├── results.html
├── static/
│   ├── sentiment_pie_chart.png (generated dynamically)
├── product_reviews.csv
└── app.py
```

Step 3: Deploying the Application:

- a. **Flask Application Code:** Below is the a part from app.py file which contains the core logic for our application:

```
from flask import Flask, render_template, request
from flask_ngrok import run_with_ngrok
import pandas as pd
from vaderSentiment.vaderSentiment import SentimentIntensityAnalyzer
import matplotlib.pyplot as plt
import csv
import nltk
```

```

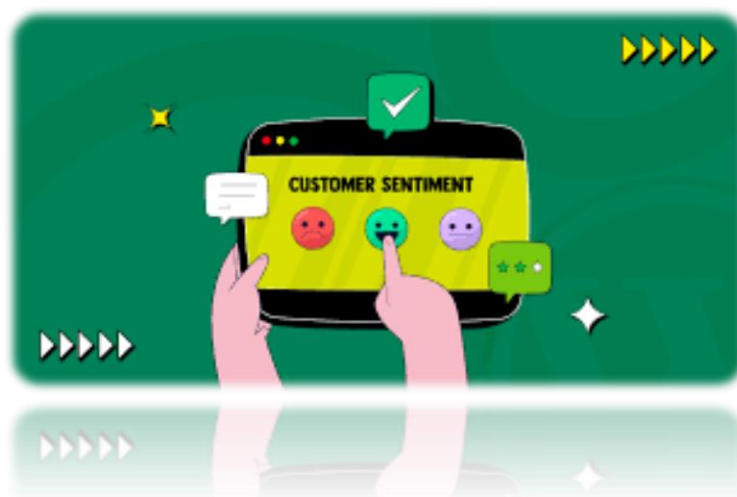
nltk.download('vader_lexicon')

app = Flask(__name__)
run_with_ngrok(app) # Start ngrok when app is run

def analyze_sentiment(comment):
    analyzer = SentimentIntensityAnalyzer()
    sentiment_scores = analyzer.polarity_scores(comment)
    return sentiment_scores

def search_comments(csv_file, criteria, num_reviews):
    relevant_comments = []
    with open(csv_file, 'r', encoding='utf-8') as file:
        reader = csv.DictReader(file)
        for row in reader:
            comment = row['Cleaned_text'].lower()
            if any(word in comment for word in criteria):
                relevant_comments.append(row['Comment'])
                if len(relevant_comments) == num_reviews:
                    break
    return relevant_comments

```



b. HTML Templates:

index.html:

```
<head>
  ## Adding some more CSS to look presentable
</head>
<body>
  <h1>Sentiment Analysis of Product Reviews</h1>
  <form action="/review_analysis" method="POST">
    <label for="product_url">Enter product URL:</label>
    <input type="text" id="product_url" name="product_url" required>
    <br>
    <label for="criteria">Enter keywords to search for (comma-separated):</label>
    <input type="text" id="criteria" name="criteria" required>
    <br>
    <label for="num_reviews">Number of reviews to analyze:</label>
    <input type="number" id="num_reviews" name="num_reviews" required>
    <br>
    <button type="submit">Analyze</button>
  </form>
  {% if message %}
  <p>{{ message }}</p>
  {% endif %}
</body>
```

analysis.html:

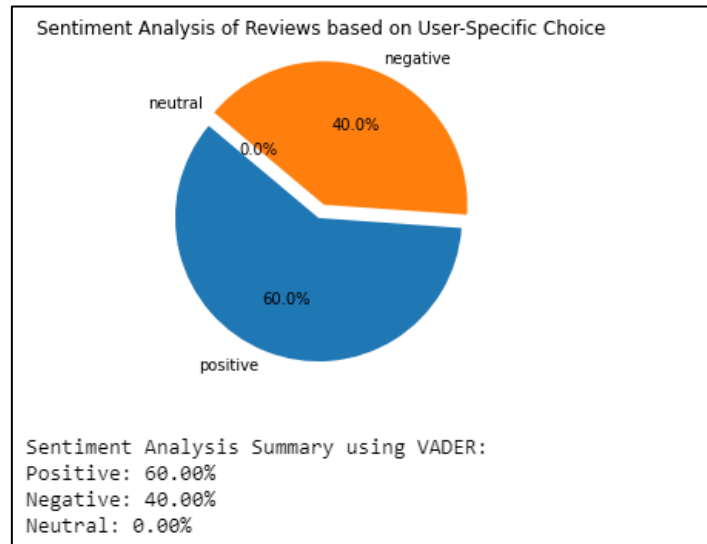
```
<head>
  ## Adding some more CSS to look presentable
</head>
<body>
  <div class="container">
    <h1>Sentiment Analysis Results</h1>
    <p>Product URL: <a href="{{ product_url }}">{{ product_url }}</a></p>
    
    <h2>Sentiment Percentages:</h2>
    <ul>
      {% for sentiment, percentage in analysis.items() %}
      <li>{{ sentiment }}: {{ percentage }}%</li>
      {% endfor %}
    </ul>
    <a class="back-button" href="{{ url_for('index') }}">Back to Home</a>
  </div>
</body>
```

This front-end structure and styling were implemented to achieve a visually appealing and user-friendly interface for the Feedo_Up project.

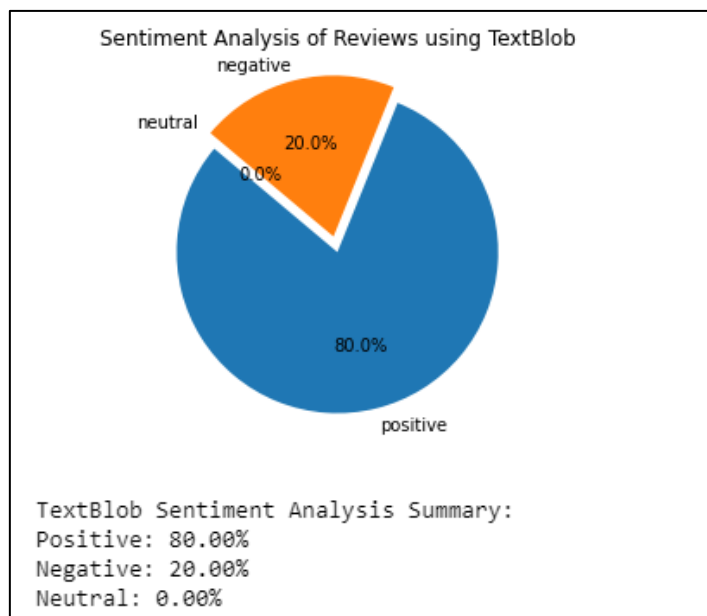
Backend Snapshot:

```
Performing Sentiment Analysis on Product Reviews:  
Enter specific keywords to search for (comma-separated): jar quality  
Enter the number of reviews you want to analyze: 10
```

Sentiment analysis using VADER:



Sentiment analysis using TextBlob:

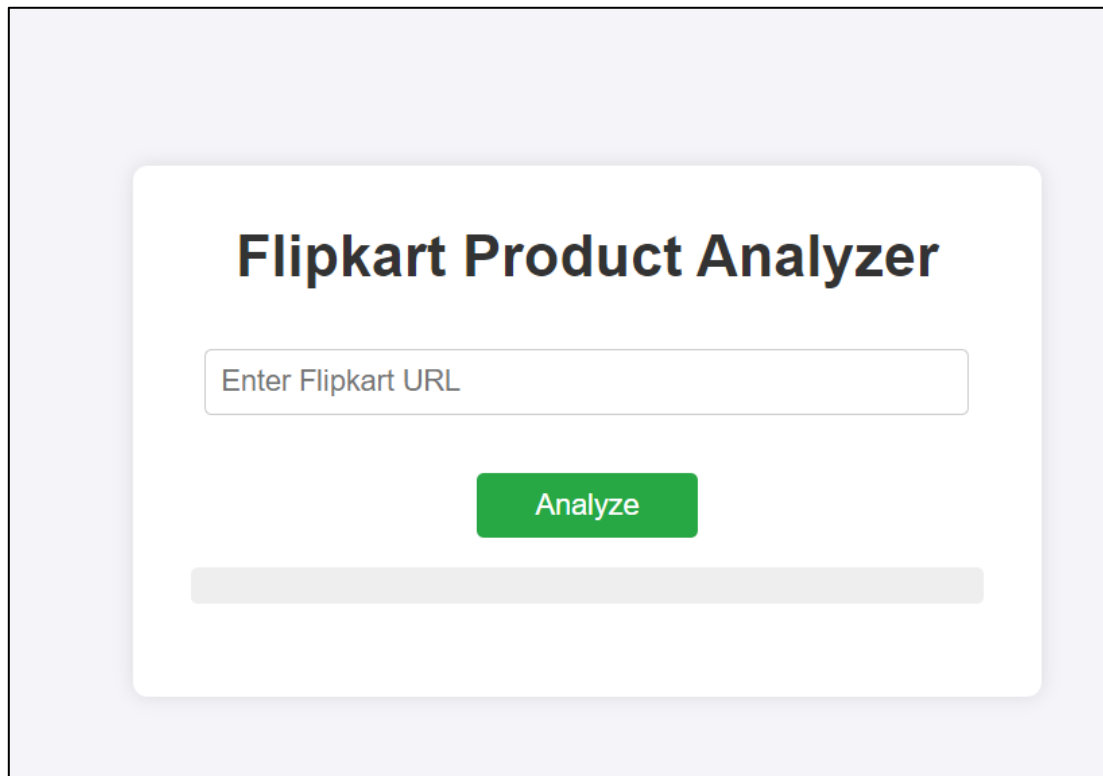


Comparison :

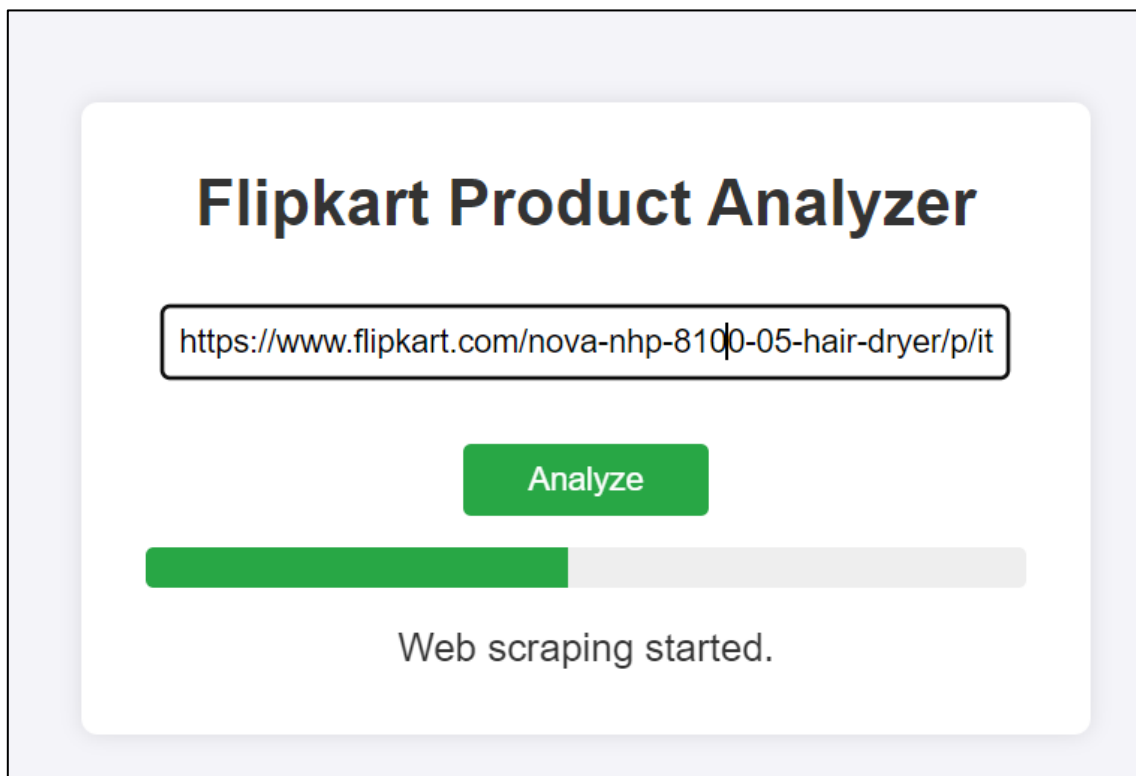
```
Accuracy with TextBlob: 92.29%  
Accuracy with VADER: 100.00%  
VADER performs better.
```


Frontend Snapshot:

index.html:

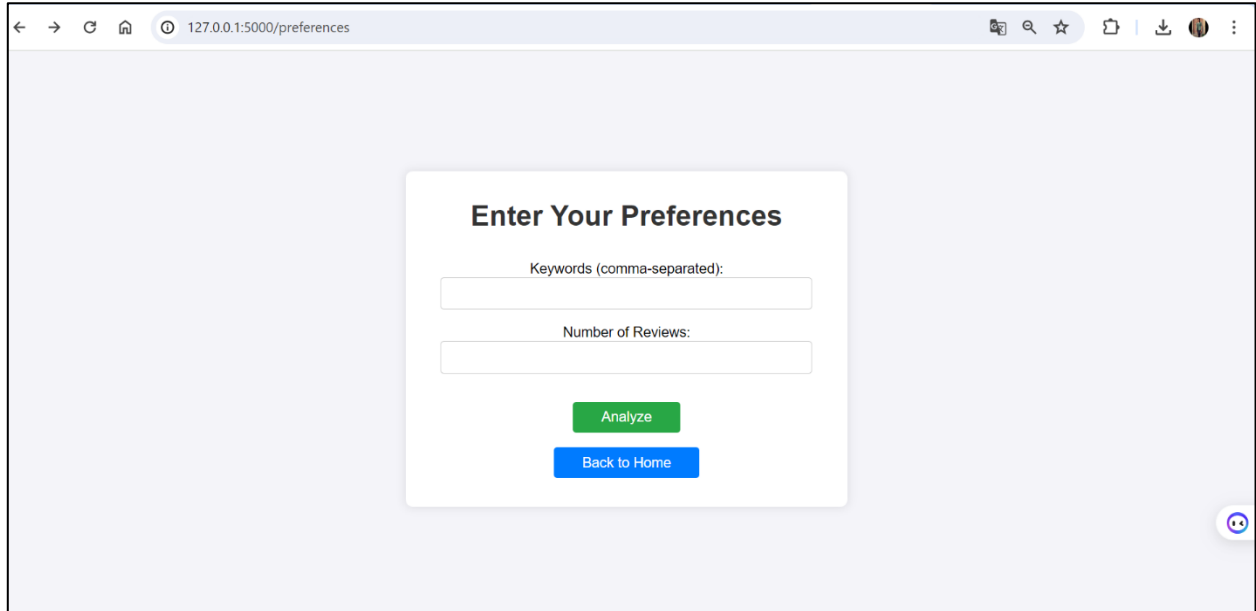


The first snapshot shows the initial state of the 'Flipkart Product Analyzer' web application. It features a light gray background with a white rounded rectangle in the center. Inside the rectangle, the title 'Flipkart Product Analyzer' is displayed in a large, bold, black font. Below the title is a text input field with the placeholder text 'Enter Flipkart URL'. Underneath the input field is a green button with the text 'Analyze' in white. At the bottom of the white rectangle is a long, thin, light gray progress bar.



The second snapshot shows the web application during a web scraping process. The title 'Flipkart Product Analyzer' remains at the top. The text input field now contains the URL 'https://www.flipkart.com/nova-nhp-8100-05-hair-dryer/p/it'. The green 'Analyze' button is still present. The progress bar at the bottom is now partially filled with green, indicating progress. Below the progress bar, the text 'Web scraping started.' is displayed in a black font.

preferences.html:



127.0.0.1:5000/preferences

Enter Your Preferences

Keywords (comma-separated):

Number of Reviews:

Analyze

Back to Home

Enter Your Preferences

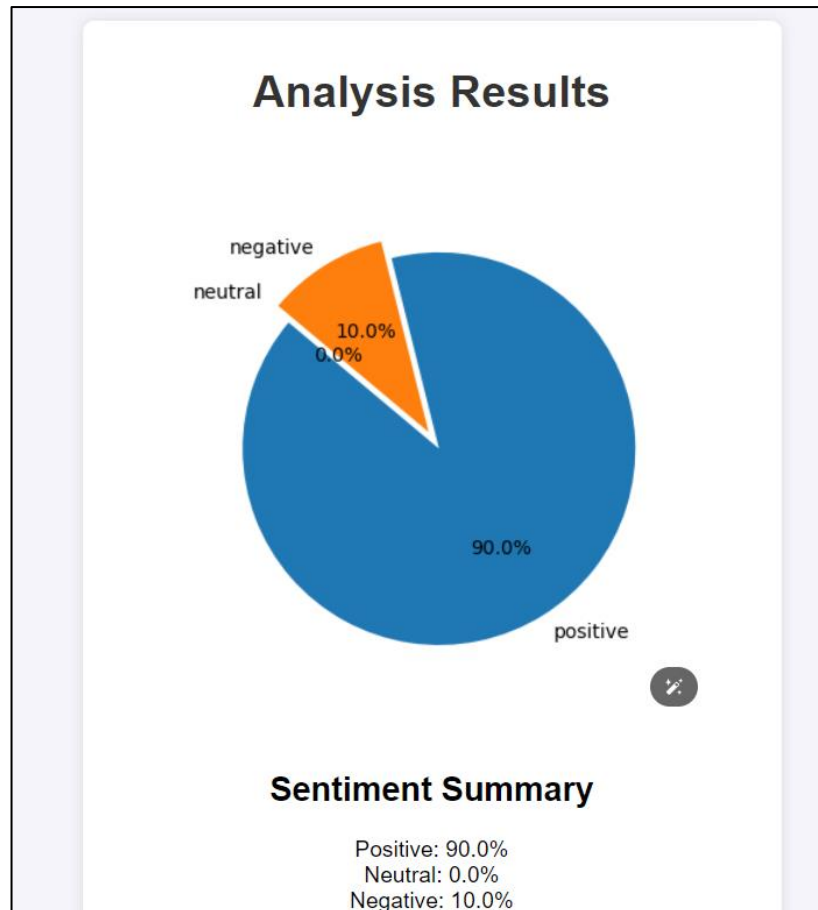
Keywords (comma-separated):

Number of Reviews:

Analyze

Back to Home

analysis.html:



Comments

fit in price..... good product ... but you should maintain the time either it will burn

Its too good.....Air flow is fast and easy to handle.....A must buy under this price...

Vry good product at affordable prices....

excellent product 👍👍👍 in this price i thik it was fully worth product go for this..... On time deliver and also good packaging thank you flipkart 😊😊😊

I wanted to buy Philips Hair Dryer , After seeing this at I Change my mind to Buy this Nova Hair Dryer> They have give Good Quality Plastic> Yes it has cool & hot blow> Fold-able & Compact> The Tip is Rotatable in all angle> Quality is Best at Best PriceThanks for Flipkart For Speedy Delivery` I will Recommend Others too Buy This Product `

it has both hot and cold setting... can use while traveling... nice product with very affordable price... thank you

good product in low pricego for it run nice

Good product in its price range

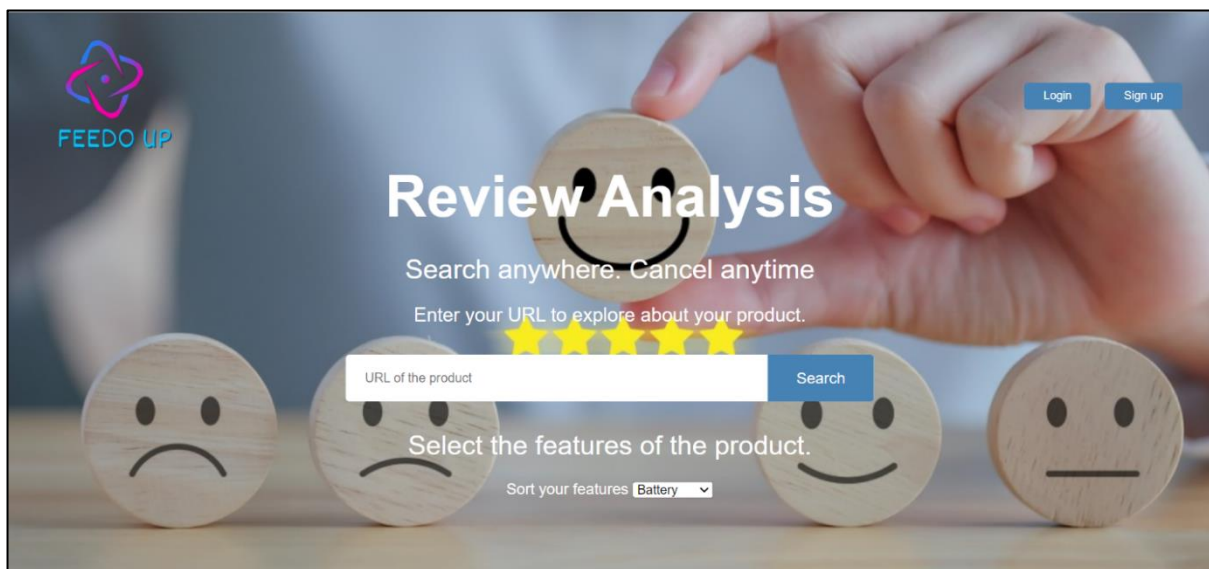
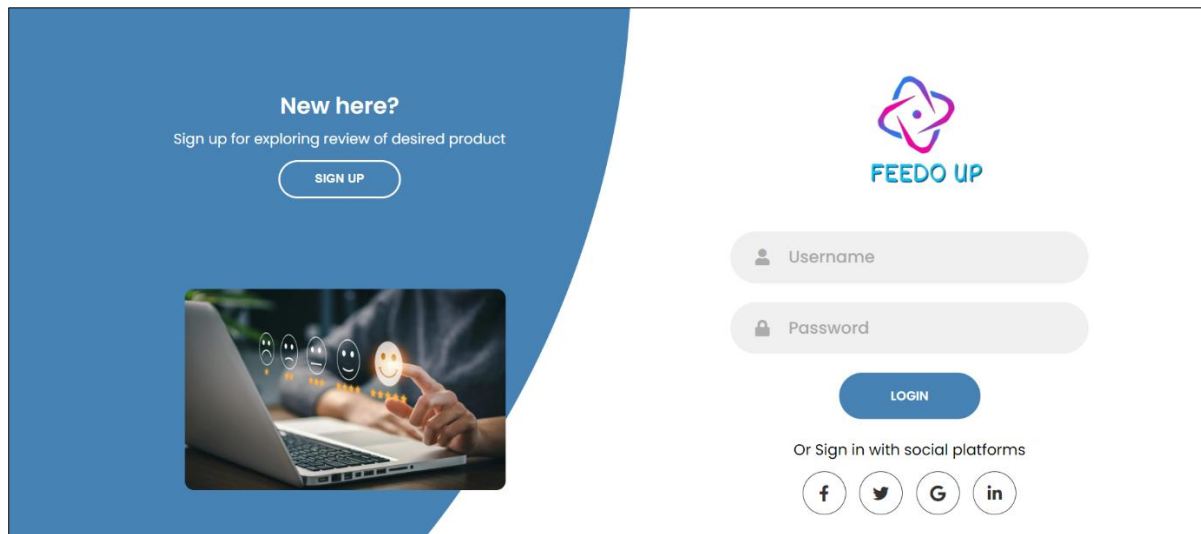
Average Product !! but for this price it is good... the product is just made of simple plastic & one accident fall might break it..... maybe you can put few extra money and go for Philips or Panasonic. realized later only :(

It's good quality product...What one can expect in this price range??Two modes(Cool and Hot) made me love it..Easy to you and it's Foldable it can even fit in your pocket..

Worth Buying

[Back to Preferences](#)

Advanced Frontend Snapshot:



Future Plan & Conclusion

The "FEEDO _UP" project, having laid a robust foundation for web-based sentiment analysis, aims to expand and enhance its capabilities in the following directions:

1. Feature Enhancements:

- **Advanced User Profiles:** Implement an enriched user profile section allowing users to add more details, profile customization, and additional personalization options.
- **Advanced Search and Filters:** Enhance the search functionality with advanced filters, enabling users to search for recipes based on dietary restrictions, cuisine types, or ingredients.

2. Mobile Application Development:

- **iOS and Android App Development:** Create dedicated mobile applications for iOS and Android platforms, providing users with a seamless and optimized experience on their mobile devices.
- **Offline Access:** Enable users to access previously viewed recipes and content offline, enhancing usability in areas with limited internet connectivity.

3. Community Engagement:

- **User Forums or Discussion Boards:** Introduce community-driven discussion boards or forums where users can share tips, ask questions, and engage with one another.

4. Accessibility and Localization:

- **Accessibility Features:** Ensure the platform complies with accessibility standards, making it usable for individuals with disabilities.
- **Localization:** Expand the platform's reach by providing multilingual support, allowing users from diverse linguistic backgrounds to access and use the platform.

5. Performance Optimization and Scalability:

- **Performance Improvements:** Continuously optimize the platform for speed and performance, ensuring a smooth user experience even during peak usage times.

6. User Feedback and Iterative Improvements:

- **Feedback Collection:** Continue collecting user feedback through surveys, reviews, and analytics to identify areas for improvement.
- **Iterative Development:** Use an agile development approach to implement incremental changes based on user feedback and emerging trends in the food and recipe industry.

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