Product Monitoring and Reputation Management

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering degree in Computer Science and Engineering
with Specialization in Artificial Intelligence

By

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF COMPUTING

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INSTITUTE OF SCIENCE AND TECHNOLOGY
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Sethuramalingam G (40731090)** who carried out the project entitled "**Product Monitoring and Reputation Management**" under my supervision from November 2023 to April 2024.

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Submitted for Viva voce Examination held on

Internal Examiner **External Examiner**

DECLARATION

I, **Sethuramalingam G (Reg. No. - 40731090),** hereby declare that the Project Report entitled **"Product Monitoring and Reputation Management"** done by me under the guidance of **Ms. B. Balasaigayathri M.E.,** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering with Specialization in Artificial Inteliigence**.

DATE: 12/04/2024

PLACE: CHENNAI **SIGNATURE OF THE CANDIDATE**

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ABSTRACT

Online reviews are considered as one of the most essential sources of client opinion. In current scenario, consumers can learn about the products and services using online review resources to make decisions. The customer reviews for numerous products plays a very vital role not only for purchasers, But also for the firms. Consumer reviews are used by companies as feedback in their product development strategies and in the management of consumer relations. Due to their disorganized nature, consumer reviews with valuable information still face difficulties in navigating information. Driven by a need for profit, some organizations may generate spam reviews regarding different products or their own product which may mislead customers to buying unworthy product. Because of its promising commercial benefits, sentiment analysis has become one of the most interesting subjects in text analysis. The findings of this study shed light on the challenges and opportunities associated with product monitoring and reputation management in various industries. Moreover, the report presents a series of best practices and recommendations for businesses seeking to enhance their product monitoring capabilities and reputation management strategies. Through a deep exploration of real-world examples and current industry trends, this report not only emphasizes the importance of proactive product monitoring but also highlights the significance of a well-crafted reputation management strategy. It is evident that the effective management of product quality and reputation not only safeguards a company's brand but also fosters trust among stakeholders, enhances customer loyalty, and ultimately contributes to sustained business success. This project report serves as a valuable resource for professionals, executives, and researchers in the fields of marketing, public relations, and business management, providing insights and actionable recommendations to navigate the complex landscape of product monitoring and reputation management in the digital age.

TABLE OF CONTENTS

	LIST OF FIGURES	
FIGURE NO	**FIGURE NAME**	**PAGE NO**

CHAPTER-1
INTRODUCTION

In today's fast-paced and interconnected global marketplace, businesses face an unprecedented challenge: the constant scrutiny of their products and reputation by consumers, competitors, and stakeholders. The success of any organization hinges not only on the quality and performance of its products but also on its ability to effectively manage its reputation in the digital age. This project delves into the multifaceted world of product monitoring and reputation management, two interrelated facets of contemporary business strategy that are pivotal for organizational growth and sustainability.

1.1 Background:

The digital revolution has transformed the way businesses operate, communicate, and compete. The advent of the internet and social media has given consumers unparalleled access to information, enabling them to scrutinize products and services like never before. Simultaneously, organizations are challenged to navigate an intricate web of public perception, where reputation is currency, and a single viral post can shape public opinion in a matter of hours.

In this landscape, a company's products and its reputation are inextricably linked. Product quality directly impacts brand perception, customer loyalty, and market share. Conversely, a company's reputation can significantly influence consumer trust, investor confidence, and stakeholder relationships. Therefore, effective product monitoring and reputation management have emerged as essential components of modern business strategy.

1.2 Objectives of the Project:

The primary objective of this project is to comprehensively explore the concepts, methodologies, and strategies associated with product monitoring and reputation

management. Specifically, the project aims to analyse the theoretical foundations and practical implications of product monitoring and reputation management in contemporary business practices.

Examine the methods and tools employed by organizations to monitor product performance, gather customer feedback, and ensure the continuous improvement of their offerings. Investigate the strategies and tactics used to manage and enhance reputation, both proactively and reactively, in response to public sentiment and crises. Provide a thorough examination of real-world case studies that highlight successful approaches to product monitoring and reputation management across diverse industries.

1.3 Scope of the Project

This project will encompass a wide array of industries, from consumer goods and technology to healthcare and finance, to showcase the universal relevance of product monitoring and reputation management. It will also explore the role of digital technology, social media, and data analytics in shaping these practices.

Through a combination of literature review, case studies, and data analysis, this project will offer insights and recommendations to help businesses navigate the complexities of product monitoring and reputation management. Furthermore, it will underscore the critical importance of these two facets in building and sustaining trust among consumers, stakeholders, and the broader public.

CHAPTER 2
LITERATURE SURVEY

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CHAPTER 3

REQUIREMENT ANALYSIS

A requirement analysis for a product monitoring and reputation management report involves identifying and documenting the specific needs, objectives, and constraints that must be addressed in order to develop an effective monitoring system. Below is an outline of the key components typically included in a requirement analysis.

3.1 STAKEHOLDER IDENTIFICATION

Stakeholder identification for product monitoring and reputation management involves recognizing the various individuals, groups, and entities that have a vested interest or impact on these processes within an organization. Primary stakeholders typically include senior management, marketing and communications teams, customer service departments, and product development teams, who are directly involved in decision-making and strategy formulation. Additionally, secondary stakeholders such as customers, suppliers, regulatory bodies, and investors also play significant roles as they are affected by the organization's reputation and product performance. Understanding the needs, expectations, and perspectives of these stakeholders is essential for designing and implementing an effective monitoring and management system. Clear communication and collaboration with stakeholders throughout the process ensure that the system meets their requirements and aligns with organizational objectives, ultimately contributing to the protection and enhancement of the organization's reputation.

3.2 BUSINESS OBJECTIVES AND GOALS

Business objectives and goals for product monitoring and reputation management encompass a multifaceted approach aimed at safeguarding brand image, fostering customer trust, and driving sustainable growth. One primary objective is to maintain a positive reputation in the eyes of consumers and stakeholders by proactively addressing issues, managing crises effectively, and enhancing brand credibility. This involves monitoring online conversations, customer feedback, and reviews to identify emerging trends, sentiment shifts, and potential reputation risks. Additionally, organizations seek to ensure product quality and customer satisfaction by promptly addressing concerns and continuously improving products and services based on feedback. Another key goal is to

mitigate the impact of negative publicity or crises on brand reputation by implementing robust crisis management strategies and communication protocols. This includes rapid response mechanisms, transparency, and accountability in addressing issues, as well as leveraging positive brand attributes to mitigate reputational damage. Furthermore, organizations aim to capitalize on positive feedback and brand advocates to amplify positive sentiment, foster brand loyalty, and attract new customers. By aligning product monitoring and reputation management efforts with overarching business objectives, organizations can build resilience, credibility, and competitive advantage in the marketplace while nurturing long-term relationships with customers and stakeholders.

3.3 DATA REQUIREMENT

The data requirements for product monitoring and reputation management encompass a diverse array of information sources, formats, and characteristics essential for effectively assessing, analyzing, and managing the reputation of a product or brand. These requirements entail the collection, aggregation, and analysis of various types of data, including but not limited to:

- Customer feedback and reviews from multiple online platforms, including e-commerce websites, social media channels, review sites, and forums.
- Sentiment data indicating the emotional tone and attitude expressed by customers towards the product or brand.
- Trend data illustrating the evolution of consumer sentiment, preferences, and behaviors over time.
- Competitor data providing insights into the competitive landscape, including competitor products, pricing, and customer feedback.
- Media coverage and mentions across traditional and digital media outlets, such as news articles, blogs, and press releases.
- Product performance data, including sales figures, product ratings, and returns or refund statistics.
- User-generated content such as user-generated reviews, comments, and social media posts related to the product or brand.
- Demographic data about the target audience, including demographics, geographic location, and psychographic characteristics.

- Influencer data identifying key influencers and opinion leaders within relevant communities or industries.
- Crisis data documenting any negative events or incidents that may impact the reputation of the product or brand.
- Regulatory data pertaining to compliance requirements, industry regulations, and legal considerations.

These data requirements necessitate the establishment of robust data collection mechanisms, integration with various data sources, and implementation of data processing and analysis techniques such as sentiment analysis, and data visualization. Furthermore, ensuring data quality, integrity, and privacy is paramount, requiring adherence to data governance principles and compliance with regulatory requirements such as the General Data Protection Regulation (GDPR) and other data protection laws. By effectively managing these data requirements, organizations can gain valuable insights into consumer perceptions, trends, and sentiment, enabling them to make informed decisions and proactively manage their product reputation in an increasingly competitive and dynamic market landscape.

3.4 REPORTING AND VISUALIZATION REQUIREMENT

The reporting and visualization requirements for product monitoring and reputation management encompass several key aspects essential for effectively conveying insights and facilitating informed decision-making. Firstly, the system should support customizable reporting formats tailored to various stakeholders' needs, including executives, marketing teams, and customer service representatives. These reports should incorporate key performance indicators (KPIs) such as sentiment analysis scores, brand mentions, and customer satisfaction metrics, presented in clear and concise formats. Visualization techniques such as charts, graphs, and heatmaps should be employed to enhance data interpretation and highlight trends and patterns within the monitoring data. Interactive dashboards with drill-down capabilities enable users to explore data in greater detail and extract actionable insights. Moreover, the reporting system should offer flexibility in scheduling and distribution, allowing for automated generation and delivery of reports via

email or integration with collaboration platforms. Accessibility and usability are paramount, with the user interface designed to be intuitive and user-friendly, catering to users with varying levels of technical expertise. Advanced features such as real-time data updates and customizable alerts enhance the system's responsiveness and enable timely detection and response to emerging issues. Security measures should also be integrated into the reporting system to safeguard sensitive data and ensure compliance with data privacy regulations. Overall, the reporting and visualization requirements should prioritize clarity, flexibility, and usability, empowering stakeholders to make informed decisions and take proactive measures to manage and enhance the organization's reputation effectively.

3.5 USER INTERFACE REQUIREMENT

The user interface for the product monitoring and reputation management system should be intuitive, user-friendly, and visually engaging, catering to the needs of different stakeholders including administrators, analysts, and managers. The interface should provide easy access to relevant features and functionalities, allowing users to efficiently navigate through the system and perform their tasks with minimal effort. Key requirements include a centralized dashboard that provides an overview of key metrics and performance indicators, allowing users to quickly assess the status of product reputation across various channels. The dashboard should feature customizable widgets and panels, enabling users to tailor the display according to their preferences and priorities.

Additionally, the interface should support interactive data visualization techniques such as charts, graphs, and heatmaps, facilitating the analysis of monitoring data and identification of trends and patterns. Users should be able to drill down into specific data points for deeper insights and exploration. The interface should also include robust search and filtering capabilities, allowing users to easily locate relevant information and filter data based on various criteria such as date, source, and sentiment.

Furthermore, the interface should support collaborative features such as annotation and commenting, enabling users to share insights, observations, and recommendations with their team members. Accessibility considerations should be incorporated into the design to ensure that the interface is usable by individuals with disabilities, adhering to relevant accessibility standards and guidelines.

Overall, the user interface should prioritize simplicity, efficiency, and effectiveness, empowering users to effectively monitor product reputation and make informed decisions to protect and enhance the organization's brand image.

3.6 RISK ANALYSIS

Conducting a comprehensive risk analysis for product monitoring and reputation management involves identifying and assessing potential threats and vulnerabilities that could impact the effectiveness and integrity of the monitoring system. One significant risk is the possibility of inaccurate or incomplete data collection, which could lead to skewed analysis and misinformed decision-making. This risk can arise from technical issues such as data integration errors, as well as human error in configuring monitoring tools or interpreting data. Additionally, there is a risk of cybersecurity breaches or data leaks, especially when dealing with sensitive customer information collected during monitoring activities. Such breaches could damage the organization's reputation and erode customer trust. Another risk is the challenge of staying updated with evolving social media platforms and online channels, which may require continuous adaptation of monitoring strategies and tools. Failure to keep pace with emerging trends and technologies could result in missed opportunities or ineffective monitoring practices. Moreover, there is a risk of reputation damage due to negative publicity or viral social media campaigns, which may occur despite proactive monitoring efforts. Organizations must be prepared to respond swiftly and effectively to such incidents to mitigate reputational harm. Furthermore, regulatory compliance risks must be considered, particularly concerning data privacy regulations such as GDPR or CCPA. Non-compliance could lead to legal penalties and reputational damage. Additionally, there are operational risks associated with resource constraints, such as budget limitations or insufficient staffing for monitoring and response activities. Inadequate training and skill development for personnel involved in monitoring and reputation management could also pose a risk to the system's effectiveness. Finally, there is a risk of reputational harm resulting from unethical or inappropriate responses to customer feedback or reviews, highlighting the importance of ethical considerations in reputation management practices. Overall, a thorough risk analysis is essential for identifying and mitigating potential threats to the product monitoring and reputation management system, ensuring its resilience and effectiveness in safeguarding the organization's reputation.

CHAPTER 4
DESCRIPITION OF PROPOSED SYSTEM

Designing a comprehensive model for product monitoring and reputation management involves a multifaceted approach that integrates various methodologies, technologies, and strategies. In this proposed model, we'll delve into the intricacies of product monitoring and reputation management, discussing the importance, challenges, key components, and implementation strategies. This model aims to provide organizations with a robust framework to effectively monitor their products across different channels and manage their online reputation proactively.

4.1 MONITORING TOOLS AND TECHNOLOGIES

4.1.1 Social Media Listening Tools

Social media platforms serve as valuable sources of consumer sentiment and feedback. Social media listening tools enable organizations to monitor conversations, mentions, and trends related to their products or brand. Key features of these tools include:

Real-time monitoring:

Continuous tracking of social media channels for mentions of the brand or specific products.

Sentiment analysis:

Automated analysis of the sentiment associated with mentions (positive, negative, or neutral).

Trend analysis:

Identification of emerging trends and topics relevant to the brand or industry.

Engagement metrics:

Metrics such as likes, shares, and comments to gauge the level of audience engagement.

Popular social media listening tools include:

- Brandwatch
- Sprout Social
- Hootsuite
- Mention
- Talkwalker

4.1.2. Review Monitoring Platforms

Review monitoring platforms focus on aggregating and analyzing customer reviews from various online platforms, including e-commerce websites, review sites, and forums. These platforms offer features such as:

Centralized dashboard:

A unified interface for monitoring reviews across multiple platforms.

Review analysis:

Sentiment analysis and categorization of reviews based on themes or topics.

Review response management:

Tools for responding to customer reviews directly from the platform.

Competitor analysis:

Comparison of product reviews with competitors' offerings.

Prominent review monitoring platforms include:

- Trustpilot
- Yelp for Business
- Google My Business
- TripAdvisor for Business
- Amazon Seller Central

4.1.3. Web Scraping Techniques

Web scraping involves extracting data from websites to gather information relevant to product monitoring and reputation management. While manual web scraping is an option, automated web scraping tools offer efficiency and scalability. Key features of web scraping tools include:

Customizable scraping parameters:

Ability to specify the data fields and sources to be scrapped.

Scheduled scraping:

Automation of regular data extraction tasks at predefined intervals.

Data cleansing:

Filtering and preprocessing of scraped data to remove irrelevant or duplicate information.

Integration capabilities:

Exporting scraped data to other tools or platforms for further analysis.

Popular web scraping tools and frameworks include:

- BeautifulSoup (Python library)
- Scrapy (Python framework)
- Octoparse
- Import.io
- ParseHub

4.1.4. Sentiment Analysis Software

Sentiment analysis software utilizes natural language processing (NLP) and machine learning algorithms to analyze textual data and determine the sentiment expressed within it. These tools can be integrated with monitoring platforms or used independently to analyze customer feedback, reviews, and social media posts. Key features include:

Sentiment classification:

Categorization of text as positive, negative, or neutral.

Aspect-based sentiment analysis:

Identification of specific aspects or attributes mentioned in the text and their associated sentiment.

Multi-language support:

Ability to analyze text in multiple languages for global monitoring.

Customizable sentiment lexicons:

Tailoring sentiment analysis models to specific industries or domains.

Prominent sentiment analysis software solutions include:

- Lexalytics
- MonkeyLearn
- IBM Watson Natural Language Understanding
- Clarabridge
- Aylien

4.2 ARCHITECTURE DIAGRAM

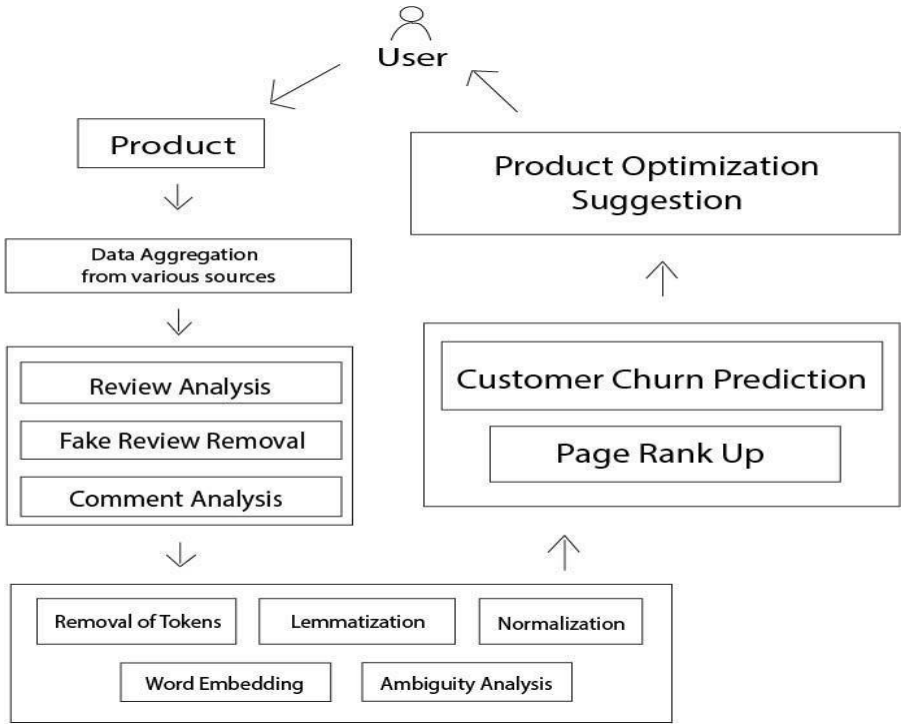


FIG 4.2.1 Architecture Diagram

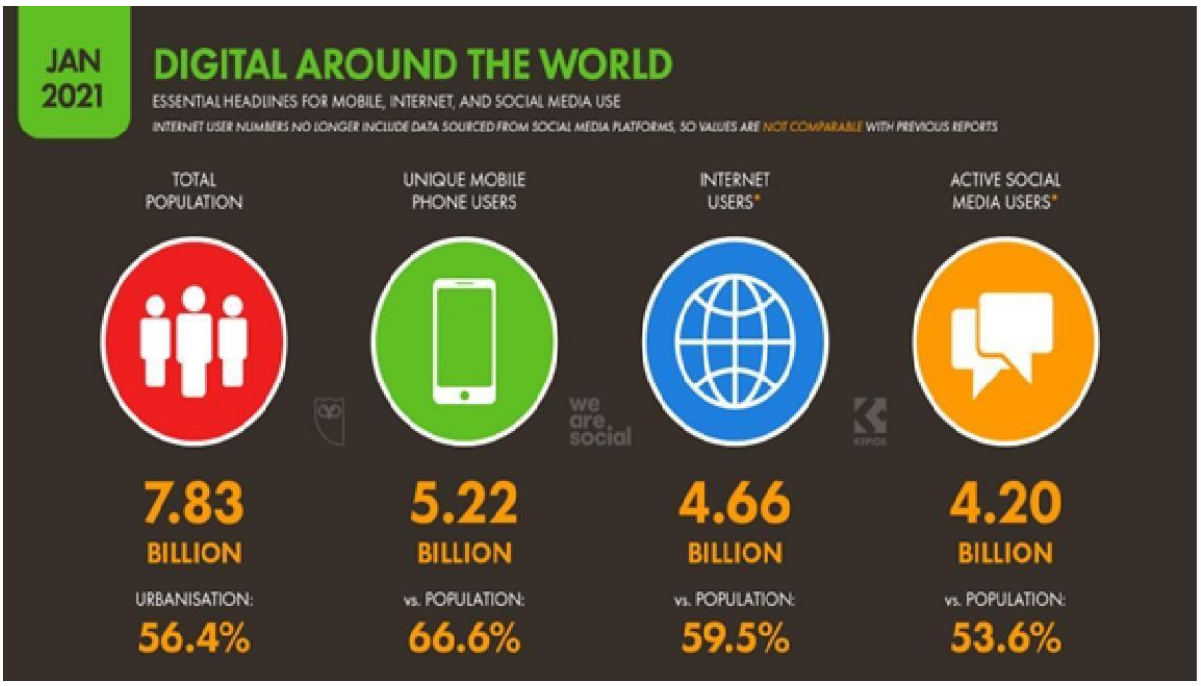


FIG 4.2.2 Digital Around The World

4.3 Data Visualization

The findings were visually presented using charts, graphs, and other visual aids to enhance the presentation of key insights and trends, making the data more accessible to the reader.

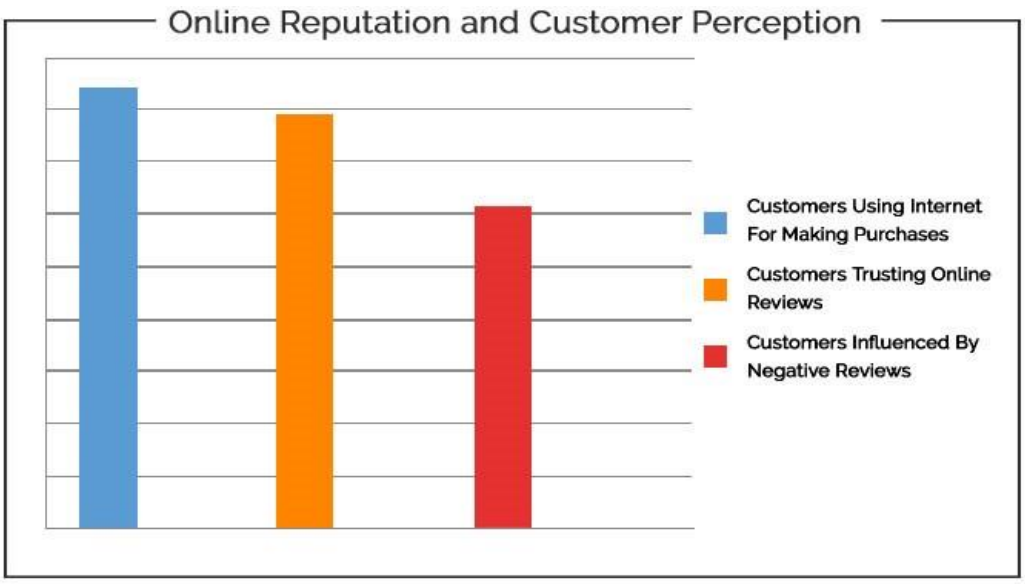


FIG 4.3.1 Bar Graph

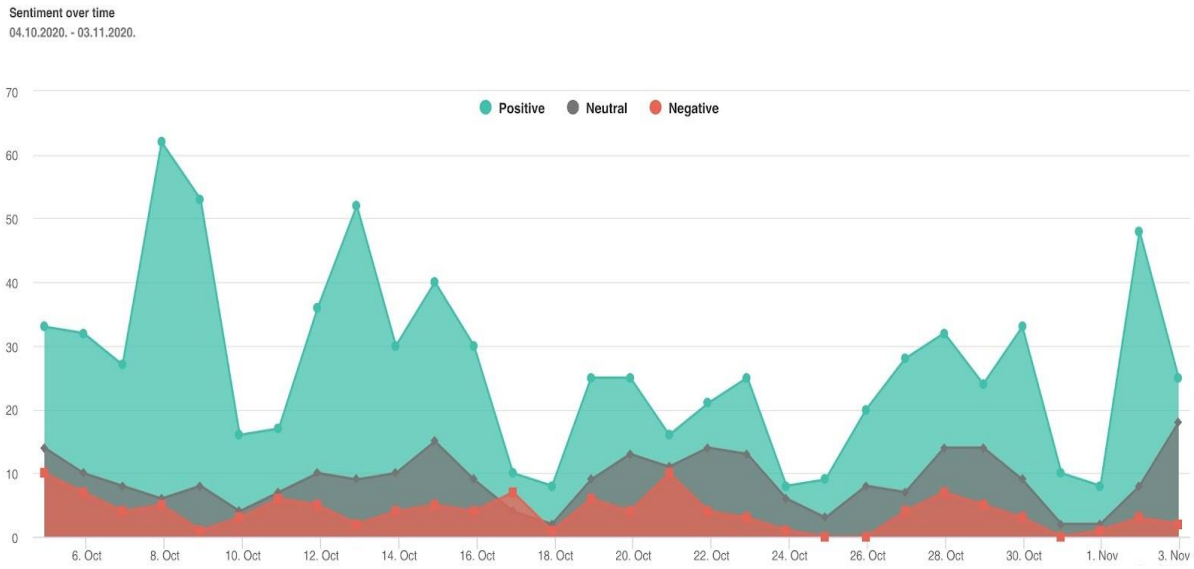


FIG 4.3.2 Time-series Graph

CHAPTER 5

IMPLEMENTATION

This chapter outlines the comprehensive methodology employed to investigate the intricate domains of product monitoring and reputation management. The chosen methodology combines qualitative and quantitative research methods to ensure a thorough examination of these critical aspects of contemporary business strategy.

5.1 Research Design

A mixed-methods research design was selected to provide a holistic understanding of product monitoring and reputation management. This approach integrates both qualitative and quantitative data collection and analysis techniques, allowing for a multidimensional exploration of the research objectives.

5.2 Machine Learning

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy. Machine learning (ML) plays a significant role in product monitoring and reputation management by automating and enhancing various aspects of these processes. Machine learning is an important component of the growing field of data science. Through the use of statistical methods, algorithms are trained to make classifications or predictions, and to uncover key insights in data mining projects. These insights subsequently drive decision making within applications and businesses, ideally impacting key growth metrics. As big data continues to expand and grow, the market demand for data scientists will increase. They will be required to help identify the most relevant business questions and the data to answer them.

5.3 Sentiment Analysis:

Product Monitoring: ML algorithms can be used to analyze customer feedback, reviews, and social media mentions related to a product. Sentiment analysis models classify text as positive, negative, or neutral, allowing companies to gauge customer sentiment and identify areas for product improvement.

Reputation Management: Sentiment analysis helps organizations monitor online conversations about their brand and products. By automatically tracking sentiment, companies can respond quickly to negative comments or trends and take actions to protect their reputation.

Review Summarization:

Product Monitoring: ML models can summarize lengthy product reviews to provide a concise overview of customer opinions and pain points. This helps product teams quickly identify common issues and prioritize improvements.

Recommendation Systems:

Product Monitoring: Recommendation algorithms can suggest related products or upgrades based on customer preferences and purchase history, thereby enhancing the customer experience and increasing sales.

Customer Segmentation:

Reputation Management: ML can segment customers into different groups based on their behavior and preferences. For example, identifying high-value customers allows companies to prioritize addressing their concerns and ensuring a positive experience.

Predictive Analytics:

Product Monitoring: ML models can predict product defects or issues before they become widespread, enabling proactive maintenance and quality control.

Reputation Management: Predictive models can forecast potential reputation risks by analyzing historical data and emerging trends. This allows companies to take preventive measures and respond quickly to potential crises.

5.4 Social Media Monitoring:

Reputation Management: ML-powered social media monitoring tools can track brand mentions, trends, and sentiments across various platforms. These tools can automatically alert companies to any unusual spikes in activity, allowing for timely responses.

Content Moderation:

Reputation Management: ML models can help filter and moderate user-generated content to prevent harmful or inappropriate content from tarnishing a brand's reputation.

Image and Video Analysis:

Product Monitoring: ML can be used to analyze images and videos related to products. For instance, image recognition can identify product defects in manufacturing processes.

Anomaly Detection:

Reputation Management: ML models can detect unusual online behavior or patterns that may indicate a reputation-threatening event, such as a sudden surge in negative reviews or a coordinated social media attack.

5.5 Natural Language Processing (NLP):

Product Monitoring: ML-powered NLP can extract valuable information from unstructured text data, such as customer feedback, warranty claims, or support tickets, to identify product issues and areas for improvement.

Reputation Management: NLP techniques can be used to analyze and categorize text data from various sources, helping organizations gain deeper insights into customer opinions and sentiments.

Continuous Improvement:

Product Monitoring: ML models can continuously learn from new data, enabling product teams to adapt and improve products based on evolving customer feedback and market trends.

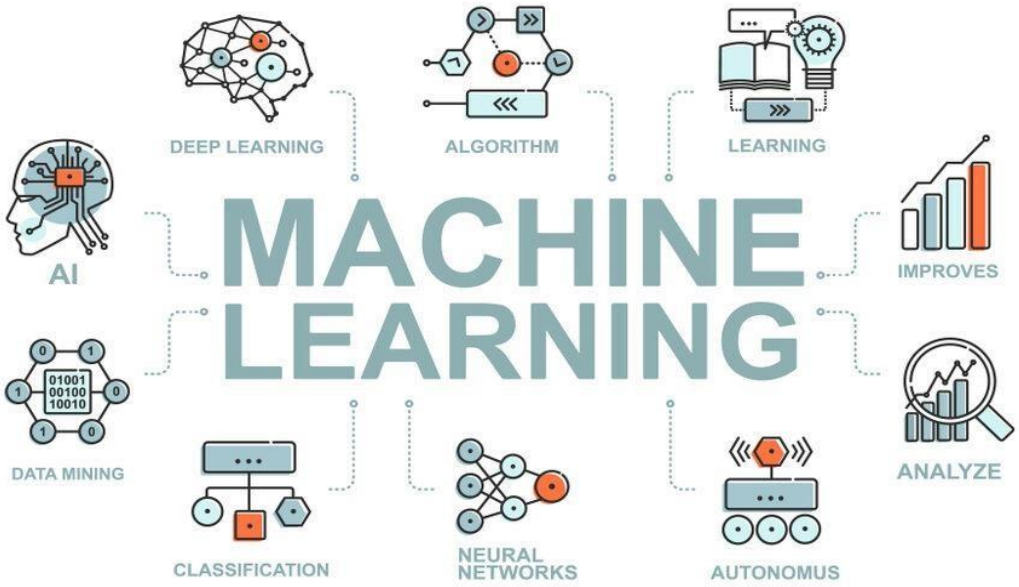


FIG 5.5 Machine Learning Diagram

5.6 Random Forest Algorithm:

Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of ensemble learning, which is a process of combining multiple classifiers to solve a complex problem and to improve the performance of the model.

As the name suggests, "Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset." Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output. The greater number of trees in the forest leads to higher accuracy and prevents the problem of overfitting. Since the random forest combines multiple trees to predict the class of the dataset, it is possible that some decision trees may predict the correct output, while others may not. But together, all the trees predict the correct output. There should be some actual values in the feature variable of the dataset so that the classifier can predict accurate results rather than a guessed result. The predictions from each tree must have very low correlations.

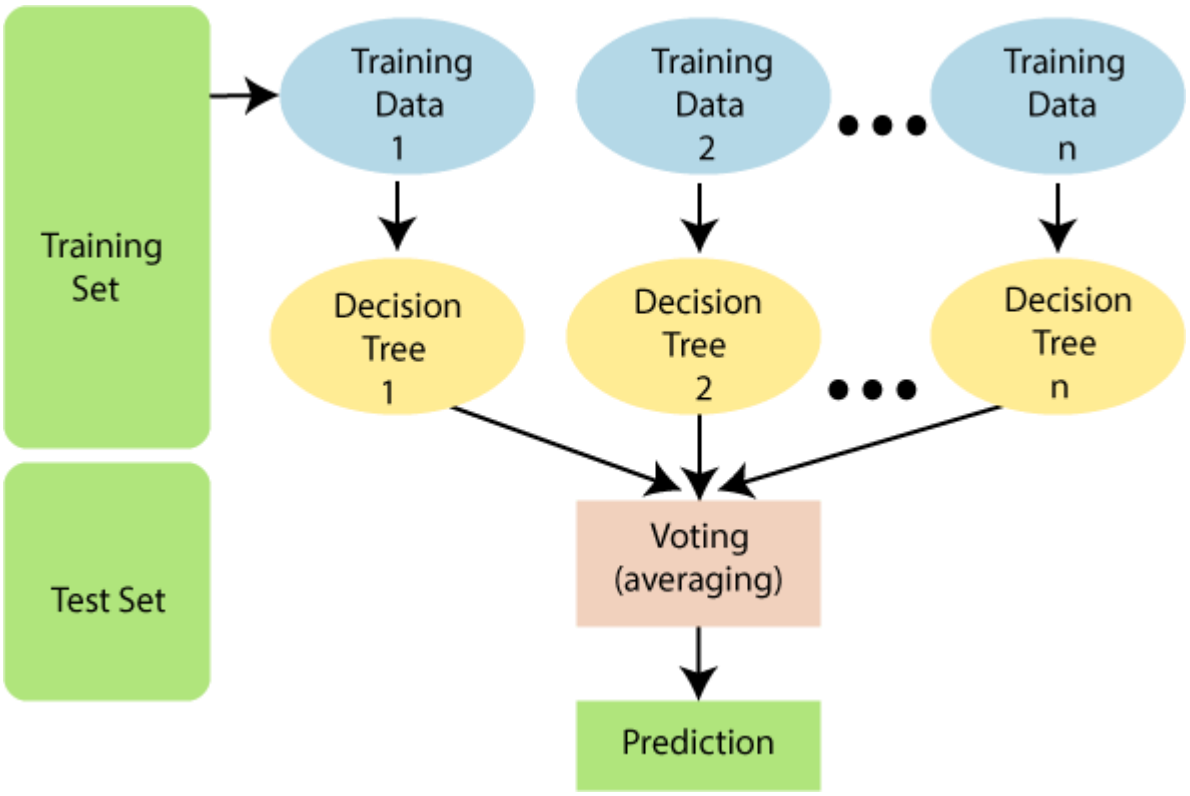


FIG 5.6 Random Forest Algorithm

5.7 Page Rank Algorithm

PageRank (PR) is an algorithm used by Google Search to rank websites in their search engine results. PageRank was named after Larry Page, one of the founders of Google. PageRank is a way of measuring the importance of website pages. According to Google:

"PageRank works by counting the number and quality of links to a page to determine a rough estimate of how important the website is. The underlying assumption is that more important websites are likely to receive more links from other websites."

It is not the only algorithm used by Google to order search engine results, but it is the first algorithm that was used by the company, and it is the best-known.

Algorithm:

The PageRank algorithm outputs a probability distribution used to represent the likelihood that a person randomly clicking on links will arrive at any particular page. PageRank can be calculated for collections of documents of any size. It is assumed in several research papers that the distribution is evenly divided among all documents in the collection at the beginning of the computational process. The PageRank computations require several passes, called “iterations”, through the collection to adjust approximate PageRank values to more closely reflect the theoretical true value.

5.8 Customer Churn Prediction

Customer churn (or customer attrition) is a tendency of customers to abandon a brand and stop being a paying client of a particular business. The percentage of customers that discontinue using a company’s products or services during a particular time period is called a customer churn (attrition) rate. One of the ways to calculate a churn rate is to divide the number of customers lost during a given time interval by the number of acquired customers, and then multiply that number by 100 percent. For example, if you got 150 customers and lost three last month, then your monthly churn rate is 2 percent.

Churn rate is a health indicator for businesses whose customers are subscribers and paying for services on a recurring basis, notes head of data analytics department at ScienceSoft Alex Bekker, “Customers [of subscription-driven businesses] opt for a product or a service for a particular period, which can be rather short – say, a month. Thus, a customer stays open for more interesting or advantageous offers. Plus, each time their current commitment ends, customers have a chance to reconsider and choose not to continue with the company. Of course, some natural churn is inevitable, and the figure differs from industry to industry. But having a higher churn figure than that is a definite sign that a business is doing something wrong.”

There are many things brands may do wrong, from complicated onboarding when customers aren’t given easy-to-understand information about product usage and its capabilities to poor communication, e.g. the lack of feedback or delayed answers to queries. Another situation: Longtime clients may feel unappreciated because they

don’t get as many bonuses as the new ones. In general, it’s the overall customer experience that defines brand perception and influences how customers recognize value for money of products or services they use. The reality is that even loyal customers won’t tolerate a brand if they’ve had one or several issues with it. For instance, 59 percent of US respondents to the survey by PricewaterhouseCoopers (PwC) noted that they will say goodbye to a brand after several bad experiences, and 17 percent of them after just one bad experience.

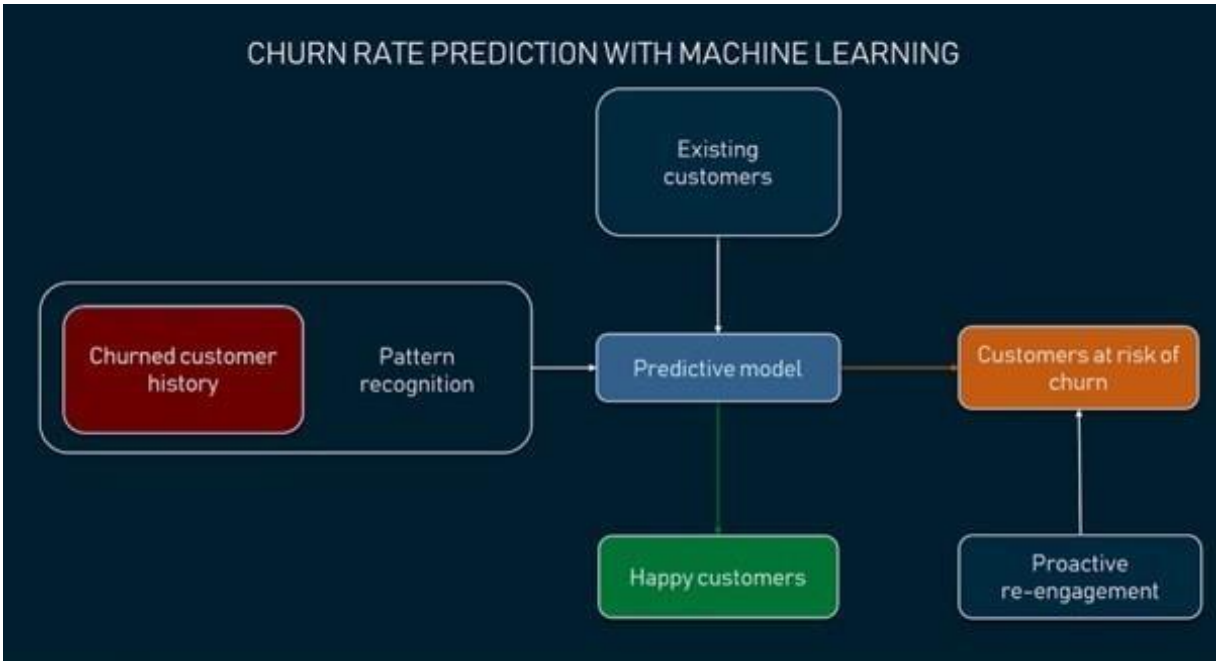


FIG 5.8 Customer Churn Prediction

5.9 Ethical Considerations

Throughout the research process, ethical considerations were upheld. Informed consent was obtained from participants in interviews and surveys, and steps were taken to ensure the confidentiality and anonymity of respondents. Additionally, all data sources, including secondary data from literature and online platforms, were appropriately cited and referenced.

5.10 Tools and Software Used

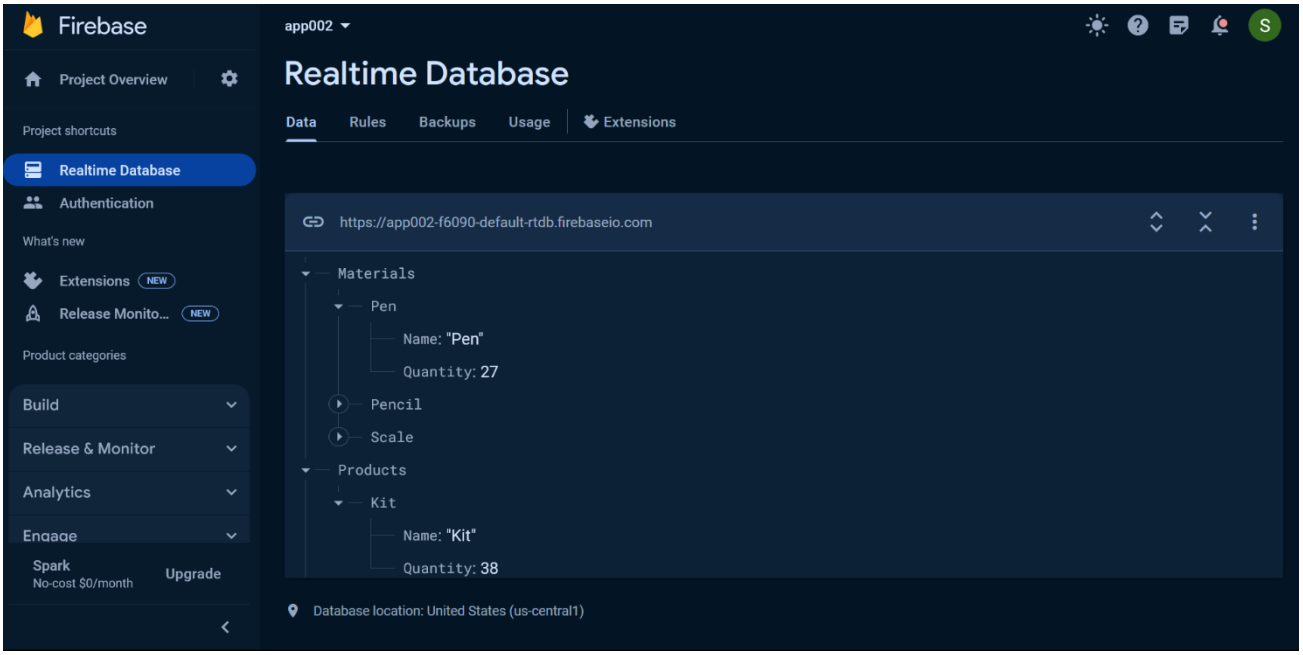
Various tools and software were employed to facilitate data collection and analysis, including statistical analysis software, content analysis tools, data visualization software, and survey software.

Chapter 6
Results and Discussion

In this project, a user-friendly dashboard is created for easy navigation and the design is very simple and easy to understand. It provides various features like Customer Relationship Management (CRM), Natural Language Processing (NLP), Stock Analysis, and other data entry and data-handling options.

The introduction serves as a user manual / user guide to understand the various features present in the website and help the user fully utilize the project for their business.

Google's Firebase provides real-time data storage and access. Different databases are created according to the user's needs. Firebase provides data security and trust; it has proven to be one of the most fastest and very reliable real-time database platform. Its simple and attractive architecture help understand numerous data with clarity. The CRM and Workshop features use Firebase for data storage. These databases can easily be integrated with the users' software and their own platforms if needed.



Pagerank is an old algorithm by Google, used for finding a page's competitive standing among other sites. It has some disadvantages like giving preference to older websites and providing less ambiguous ranking, etc. In this project, we have modified the algorithm to counter its demerit of less ambiguous ranking by giving more context dependent results. By understanding the meaning behind various websites and their contents, the ranking of the pages varies drastically.

The project combines various features available to increase the business value in the market and uses latest software to maintain a proper standing among others. The website is ready to be launched and maintenance is possible for updating the website according to the users' needs and requirements.

CHAPTER 7

CONCLUSION

This project facilitates data-handling for large scale business networks. Users can integrate the features with their own software and real-time databases, and hence incorporating innovative solutions for their business needs. Maintenance is made possible for user-specific requests and queries. Natural Language Processing enables the users to process and analyze the data from the reviews provided by the users.

Users will mostly encounter two different types of people in a business environment namely Customers and Dealers.

Customers are the type of people who buy various products from the users. They review the product and rate them accordingly.

Dealers are the type of people who sell the raw materials to the users required to create a sellable product. These are divided into two different databases resulting in a well-structured and orderly data handling.

In order to run a successful business, we need to be up-to-date with the latest changes in the market and perform competitively. Features like Stock value prediction and Pagerank help the users to compare their business to other businesses and know their standing in the market.

Pagerank algorithm has been modified to tackle its demerits and provide better and ambiguous results. Finally, all the different features have been integrated with a user-friendly interface.

FUTURE WORK

This chapter focuses on providing comprehensive recommendations based on the findings and insights derived from the preceding chapters. It is divided into three main sections: best practices for product monitoring, strategies for effective reputation management, and suggestions for improvement.

Discuss the importance of quality control measures. Offer specific recommendations for setting up quality control protocols. Provide examples of quality control frameworks used in successful organizations. Emphasize the role of technology in data-driven product monitoring. Recommend specific tools and software for monitoring product performance. Provide case studies illustrating the successful implementation of technology in product monitoring. Discuss the significance of KPIs in product monitoring. Recommend a set of KPIs tailored to different industries. Provide guidance on how to track and measure KPIs effectively. Stress the value of customer feedback in product improvement. Suggest strategies for collecting and analyzing customer feedback. Highlight the importance of proactive reputation management. Recommend strategies for building and reinforcing a positive corporate image. Offer guidance on developing corporate social responsibility (CSR) initiatives.

Discuss strategies for crisis prevention and preparedness. Provide a framework for effective crisis management. Share case studies of organizations that successfully navigated reputation crises. Emphasize the significance of online reputation. Recommend approaches to monitor and engage with online audiences. Share examples of companies that have effectively managed their online reputation.

Advocate for a culture of continuous learning and adaptation. Suggest strategies for organizations to stay current with evolving trends. Share examples of companies that have successfully adapted to changing landscapes. Recommend methods for measuring the impact of implemented recommendations. Provide guidance on data collection and analysis to evaluate success. Offer a framework for ongoing improvement

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Appendix

SOURCE CODE

CUSTOMER RELATIONSHIP MANAGEMENT(CRM) CODE:

```
import streamlit as st
from streamlit_option_menu import option_menu
from urllib3 import disable_warnings
from urllib3.exceptions import InsecureRequestWarning
disable_warnings(InsecureRequestWarning)
import pyrebase
from firebase_admin import db
firebaseConfig = {
    'apiKey': " AIzaSyCwdhswGJY5QMANM4bVO8XQmd1TJ08pM7Y ",
    'authDomain': "app001-97f05.firebaseapp.com",
    'projectId': "app001-97f05",
    'storageBucket': "app001-97f05.appspot.com",
    'messagingSenderId': "461483901137",
    'appId': "1:461483901137:web:df034f8dccc390a20c45f0",
    'measurementId': "G-RE5B8WK68Z",
    'databaseURL' : 'https://app002-f6090-default-rtdb.firebaseio.com/'
}
firebase = pyrebase.initialize_app(firebaseConfig)
auth = firebase.auth()
db = firebase.database()
```

```
def signup(email,password):
    try:
        auth.create_user_with_email_and_password(email,password)

        st.toast("Registered New User Successfully")

        return 1

    except:

        login(e,p)

        return 0


def login(e,p):

    try:

        auth.sign_in_with_email_and_password(e,p)

        st.toast("Logged in Successfully")

    except:

        st.error('Invalid Credentials')


if 'clicked' not in st.session_state:

    st.session_state['clicked'] = False

if 'clicked' not in st.session_state:

    st.session_state.clicked = False

def click_button():

    st.session_state.clicked = True


st.header('Real-time Data Dashboard')
```

```
selected = option_menu(
    menu_title = None,
    options = ["Data Entry","Data Overview","Product DB"],
    icons = ["pencil-fill","database-fill-check","database-lock"],
    orientation = 'horizontal',
)
if selected == 'Data Overview':
    st.write("Toggle to switch between Cutomers and Dealers ")
    x = st.toggle("Toggle Button")
    if x:
        users = db.child("users").order_by_child("Type").equal_to("Dealer").get()
        st.write(users.val())
    else:
        users = db.child("users").order_by_child("Type").equal_to("Customer").get()
        st.write(users.val())

if selected == 'Data Entry':
    with st.form("Enter Details here:",clear_on_submit = True):
        d = st.selectbox(label='Are you a Customer or a
Dealer',options=['Customer','Dealer'])
        a = st.text_input(label='Enter Name')
        e = st.text_input(label='Enter Email')
        p = st.text_input(label='Enter Password')
        submit = st.form_submit_button(label = "Submit")
        if submit:
            if a != '':
```

```
            data = { "Name" : a, "Type" : d, "Email" : e, "Password" : p }

            y = signup(e,p)

            if y == 1:

                db.child("users").child(a).set(data)

                st.toast("Submitted Details Successfully!")


if selected == 'Product DB':

    select = st.selectbox(label = '', options = ["Enter Product Details","Product
Overview"])

    if select == 'Enter Product Details':

        with st.form("Product Details",clear_on_submit = True):

            prodName = st.text_input("Enter the name of the Product")

            prodQuantity = st.number_input("Enter Product
quantity",min_value=1,max_value=100,step=1)

            submit = st.form_submit_button(label = "Submit")

            if submit:

                d = {"Name" : prodName, "Quantity" : prodQuantity}

                if prodName != '':

                    products =
db.child("Products").order_by_child("Name").equal_to(prodName).get()

                    if products == '' :

                        db.child("Products").child(prodName).set(d)

                    else:

                        q = db.child("Products").child(prodName).get()

                        q1 = q.val()

                        q2 = q1['Quantity']
```

```
                q2 -= prodQuantity
                d = {"Name" : prodName, "Quantity" : q2}
                db.child("Products").child(prodName).set(d)
            st.toast("Product Details Saved!")
    if select == 'Product Overview':
        products = db.child("Products").order_by_child("Name").get()
        st.write(products.val())
```

PAGE RANK CODE:

```
import numpy as np
import streamlit as st

def pagerank(nodes, edges, damping_factor=0.85, max_iterations=100,
tolerance=1e-6):
    num_nodes = len(nodes)
    adjacency_matrix = np.zeros((num_nodes, num_nodes))
    incoming_count = np.zeros(num_nodes)

    for node, incoming_nodes in edges.items():
        node_index = nodes.index(node)
        for incoming_node in incoming_nodes:
            incoming_index = nodes.index(incoming_node)
            adjacency_matrix[node_index, incoming_index] = 1
            incoming_count[incoming_index] += 1

    for j in range(num_nodes):
        if incoming_count[j] != 0:
```

```
            adjacency_matrix[:, j] /= incoming_count[j]

    pagerank_scores = np.ones(num_nodes) / num_nodes

    for _ in range(max_iterations):

        new_pagerank_scores = (1 - damping_factor) / num_nodes + damping_factor *
np.dot(adjacency_matrix, pagerank_scores)

        if np.linalg.norm(new_pagerank_scores - pagerank_scores, 1) < tolerance:

            break

        pagerank_scores = new_pagerank_scores

    return pagerank_scores


st.title("PageRank Calculator")

select = st.selectbox(label = "Select Type of Pagerank", options = ["Default",
"Modified"])

num_nodes = st.number_input("Enter number of nodes:", min_value=1, step=1)

nodes = st.text_input("Enter Name of nodes (separated by space):")

nodes = nodes.split() if nodes else []

if len(nodes) != num_nodes:

    st.warning("Please provide correct number of node names.")


edges = {}

for node in nodes:

    edges[node] = st.text_input(f"Enter incoming nodes to node {node} (separated by
space):")

    edges[node] = edges[node].split() if edges[node] else []


def pagerankM(nodes, edges, damping_factor=0.85, relevance_factor=0.1,
max_iterations=100, tolerance=1e-6):

    num_nodes = len(nodes)
```

```
    adjacency_matrix = np.zeros((num_nodes, num_nodes))
    incoming_count = np.zeros(num_nodes)
    for node, incoming_nodes in edges.items():
        node_index = nodes.index(node)
        for incoming_node in incoming_nodes:
            incoming_index = nodes.index(incoming_node)
            adjacency_matrix[node_index, incoming_index] = 1
            incoming_count[incoming_index] += 1

    for j in range(num_nodes):
        if incoming_count[j] != 0:
            adjacency_matrix[:, j] /= incoming_count[j]

    pagerank_scores = np.ones(num_nodes) / num_nodes
    for _ in range(max_iterations):
        new_pagerank_scores = (1 - damping_factor) / num_nodes + damping_factor *
np.dot(adjacency_matrix, pagerank_scores)
        new_pagerank_scores += relevance_factor * np.ones(num_nodes) /
num_nodes
        if np.linalg.norm(new_pagerank_scores - pagerank_scores, 1) < tolerance:
            break
        pagerank_scores = new_pagerank_scores
    return pagerank_scores

if st.button("Calculate PageRank"):
    st.write("PageRank Scores")
```

```
    if select == 'Modified':
        scores = pagerankM(nodes, edges)
        sorted_indices = np.argsort(scores)[::-1]
        for i in sorted_indices:
            st.write(f"{nodes[i]}: {(scores[i]*100):.2f}")

    elif select == 'Default':
        scores = pagerank(nodes, edges)
        sorted_indices = np.argsort(scores)[::-1]
        for i in sorted_indices:
            st.write(f"{nodes[i]}: {(scores[i]*100):.2f}")
```

REVIEW ANALYSIS CODE:

```
from textblob import TextBlob
import pandas as pd
import streamlit as st
import cleantext
from PIL import Image

st.title('Product Management')
with st.expander('Analyze Text'):
    text = st.text_input('Enter Text:')
    if text:
        blob = TextBlob(text)
        st.write('Polarity: ',round(blob.sentiment.polarity),2)
```

```
        st.write('Subjectivity: ',round(blob.sentiment.subjectivity),2)

with st.expander('Process Text '):

    pre = st.text_input('Clean Text:')

    if pre:

        st.write(cleantext.clean(pre,clean_all=False,extra_spaces=True,stopwords=Tru
e,lowercase=True,numbers=True,punct=True))

with st.expander('Dataset Analysis'):

    upl = st.file_uploader('Upload File')


    if st.checkbox("Preview:"):

        df = pd.read_csv(upl,encoding='utf-8',encoding_errors='ignore')

        df['Review'] = df['selected_text']

        df['Analysis'] = df['sentiment']

        st.dataframe(df[['Review','Analysis']])

        @st.cache_data
        def convert_df(df):

            return df.to_csv().encode('utf-8')

        csv = convert_df(df)

        st.download_button(
            label="Download Data as CSV",

            data=csv,

            file_name = 'sentiment.csv',

            mime='text/csv',
        )

st.write('\n\n\n\n\n')

st.title('Product Analysis from Image Input')

uploaded_file = st.file_uploader('Choose Image to upload…', type = (["jpg", "jpeg"]))
```

```
if uploaded_file is not None:
    img = Image.open(uploaded_file)
    st.image(img, caption = 'Uploaded image')
```

STOCK CODE:

```
import streamlit as st
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score

st.title('Stock Market Prediction')
uploaded_file = st.file_uploader("Upload CSV file", type=['csv'])

if uploaded_file is not None:
    data = pd.read_csv(uploaded_file)
    st.subheader('Raw data')
    st.write(data)
    st.subheader('Data preprocessing')

    data['Date'] = pd.to_datetime(data['Date'])
    data['Year'] = data['Date'].dt.year
    data['Month'] = data['Date'].dt.month
    data['Day'] = data['Date'].dt.day

    X = data[['Year', 'Month', 'Day']]
```

```
    y = data['Close']

    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
random_state=42)

    st.subheader('Model training')

    model = LinearRegression()

    model.fit(X_train, y_train)

    st.subheader('Model evaluation')

    y_pred = model.predict(X_test)

    mse = mean_squared_error(y_test, y_pred)

    r2 = r2_score(y_test,  y_pred)

    st.write('Mean Squared Error:', mse)

    st.write('R^2 Score:', r2)

    st.subheader('Make a prediction')

    year = st.slider('Year', min_value=2010, max_value=2030, value=2022)

    month = st.slider('Month', min_value=1, max_value=12, value=1)

    day = st.slider('Day', min_value=1, max_value=31, value=1)

    prediction = model.predict([[year, month, day]])

    st.write('Predicted Closing Price:', prediction[0])
```

WORKSHOP CODE:

```
import streamlit as st

from streamlit_option_menu import option_menu

from urllib3 import disable_warnings

from urllib3.exceptions import InsecureRequestWarning
```

```
disable_warnings(InsecureRequestWarning)
import pyrebase
from firebase_admin import db
firebaseConfig = {
    'apiKey': " AIzaSyCwdhswGJY5QMANM4bVO8XQmd1TJ08pM7Y ",
    'authDomain': "app001-97f05.firebaseapp.com",
    'projectId': "app001-97f05",
    'storageBucket': "app001-97f05.appspot.com",
    'messagingSenderId': "461483901137",
    'appId': "1:461483901137:web:df034f8dccc390a20c45f0",
    'measurementId': "G-RE5B8WK68Z",
    'databaseURL' : 'https://app002-f6090-default-rtdb.firebaseio.com/'
}
firebase = pyrebase.initialize_app(firebaseConfig)
auth = firebase.auth()
db = firebase.database()

st.header('Workshop')
selected = option_menu(
    menu_title = None,
    options = ["Materials","Produce"],
    icons = ["list-check","database","hammer"],
    orientation = 'horizontal',
)
```

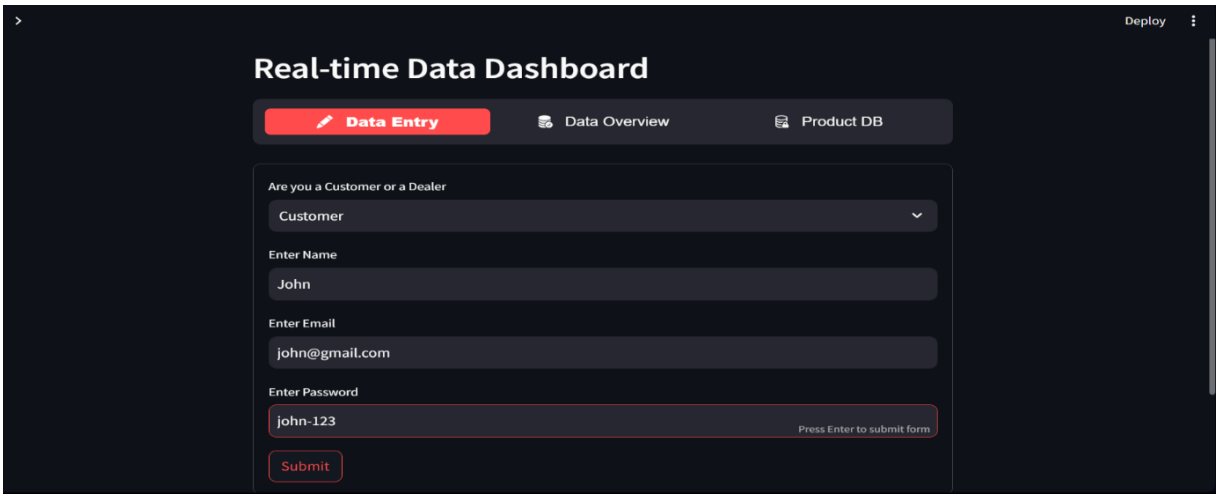
```
if selected == "Materials":
    toggle = st.toggle(label = "View Available Materials")
    if toggle:
        items = db.child("Materials").order_by_child("Name").get()
        st.write(items.val())
    else:
        with st.form("Order Materials ",clear_on_submit = True):
            Name = st.text_input("Enter the name of the material")
            Quantity = st.number_input("Enter
quantity",min_value=1,max_value=100,step=1)
            submit = st.form_submit_button(label = "Submit")
            if submit:
                d = {"Name" : Name, "Quantity" : Quantity}
                if Name != '':
                    products =
db.child("Materials").order_by_child("Name").equal_to(Name).get()
                    if products == '' or products == None:
                        db.child("Materials").child(Name).set(d)
                    else:
                        q = db.child("Materials").child(Name).get()
                        q1 = q.val()
                        if q1 == None:
                            db.child("Materials").child(Name).set(d)
                        else:
                            q2 = q1['Quantity']
```

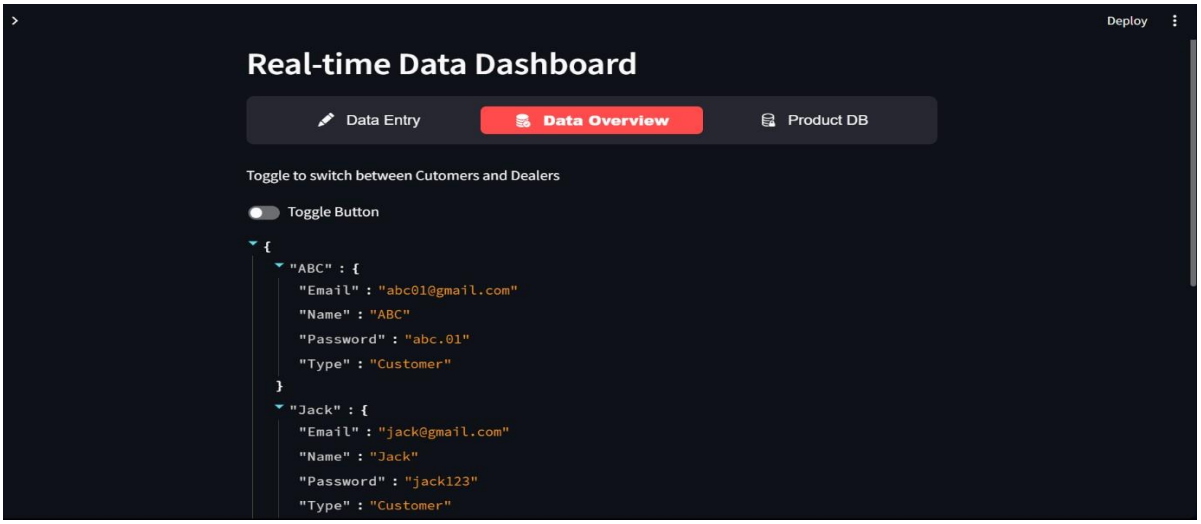
```
                    q2 += Quantity
                    d = {"Name" : Name, "Quantity" : q2}
                    db.child("Materials").child(Name).set(d)
                st.toast("Successfully Ordered!")
            else:
                st.warning("Name cannot be empty")
if 'clicked' not in st.session_state:
    st.session_state['clicked'] = False
if 'clicked' not in st.session_state:
    st.session_state.clicked = False
def click_button():
    st.session_state.clicked = True

if selected == "Produce":
    products = db.child("Products").order_by_child("Name").get()
    option = list(products.val())
    with st.form("Select Item to Produce", clear_on_submit = True):
        item = st.selectbox(label = "Select an item to produce", options = option)
        if item == 'Kit':
            pen1 = db.child("Materials").child("Pen").child("Quantity").get()
            pen = pen1.val()
            pencil1 = db.child("Materials").child("Pencil").child("Quantity").get()
            pencil = pencil1.val()
            scale1 = db.child("Materials").child("Scale").child("Quantity").get()
            scale = scale1.val()
```

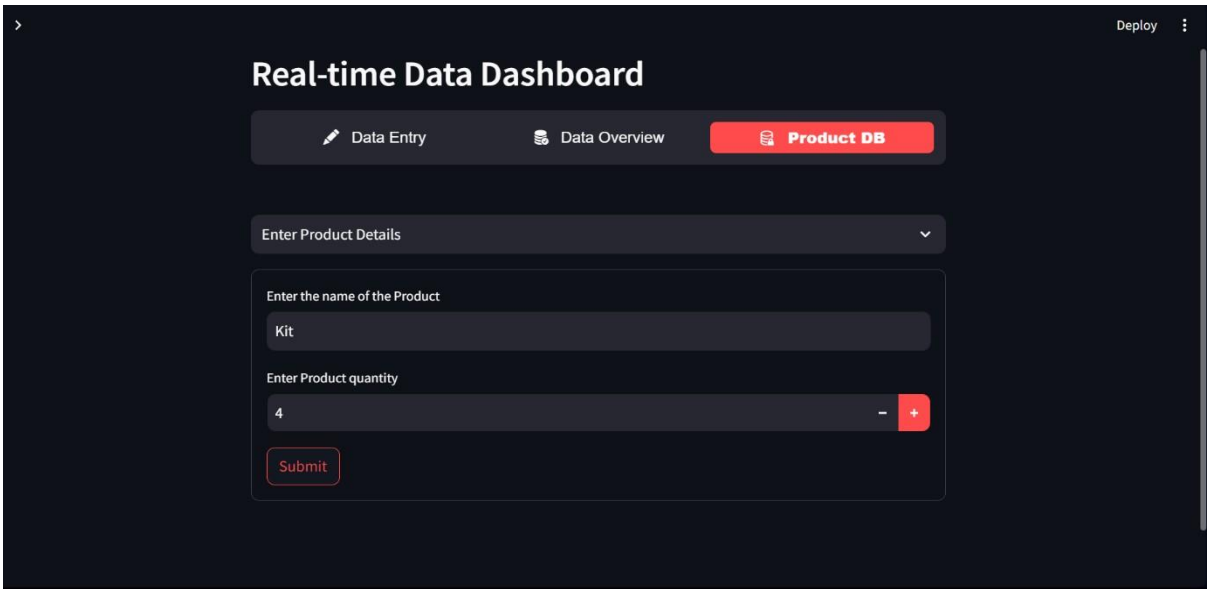
```
        maxi = max(pen,pencil,scale)

        amount = st.number_input("Enter Number of Items to Produce",min_value =
1,max_value = maxi, step = 1)

    submitted = st.form_submit_button("Submit",on_click = click_button())

    if submitted:

        if pen < amount or pencil < amount or scale < amount:

            st.error("Insufficient Materials. Order more to produce.")


        else:

            pen -= amount

            pencil -= amount

            scale -= amount

            data = {"Name" : "Pen", "Quantity" : pen}

            db.child("Materials").child("Pen").set(data)

            data = {"Name" : "Pencil", "Quantity" : pencil}

            db.child("Materials").child("Pencil").set(data)

            data = {"Name" : "Scale", "Quantity" : scale}

            db.child("Materials").child("Scale").set(data)

            st.toast("Order Success")

    itemQuantity = db.child("Products").child(item).child("Quantity").get()

    itemq = itemQuantity.val()

    q = itemq + amount

    g = {"Name" : item, "Quantity" : q}

    db.child("Products").child(item).set(g)
```

OUTPUT:

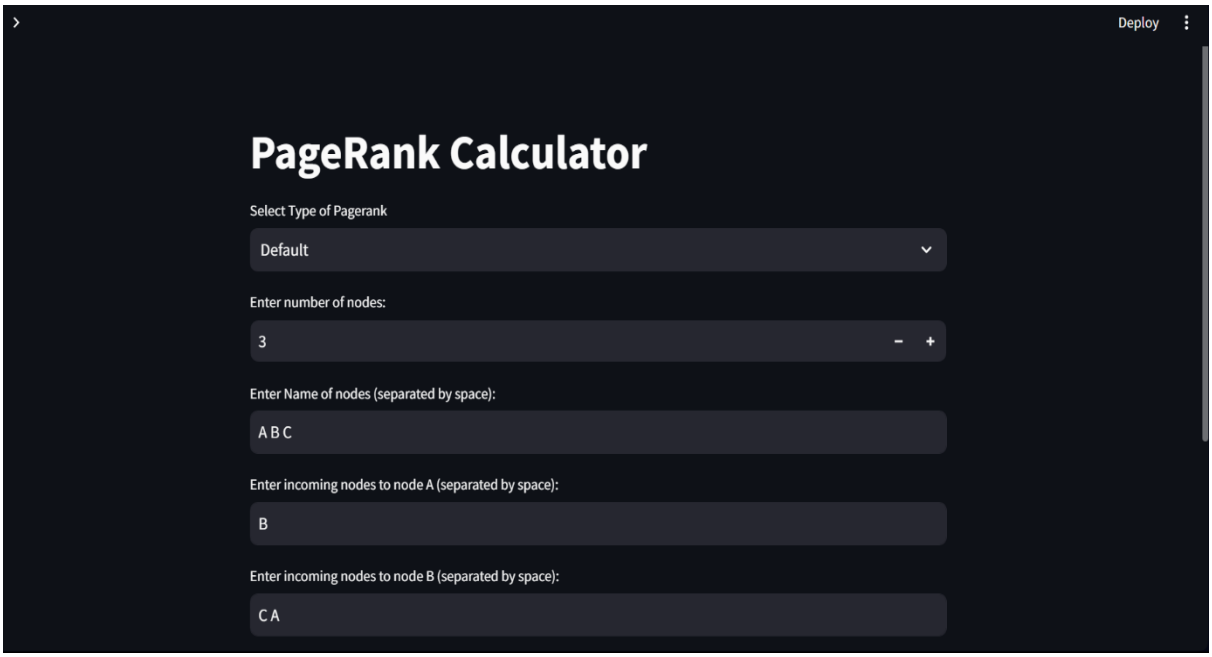
CUSTOMER RELATIONSHIP MANAGEMENT(CRM) OUTPUT:

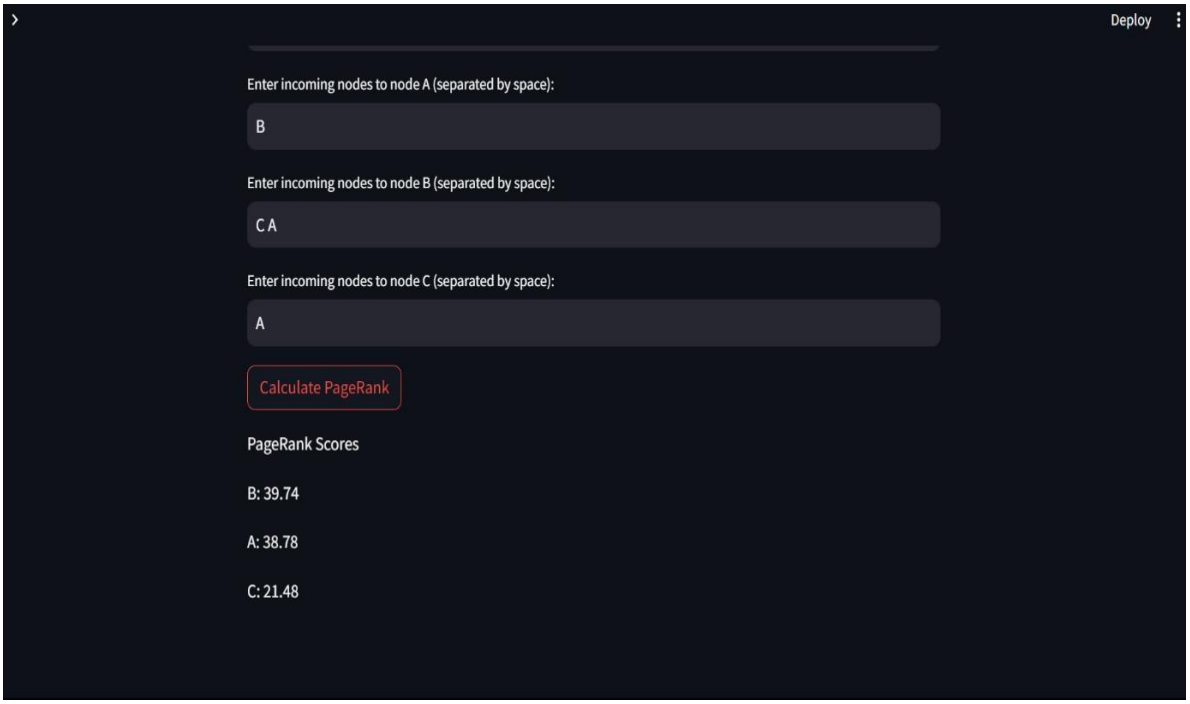




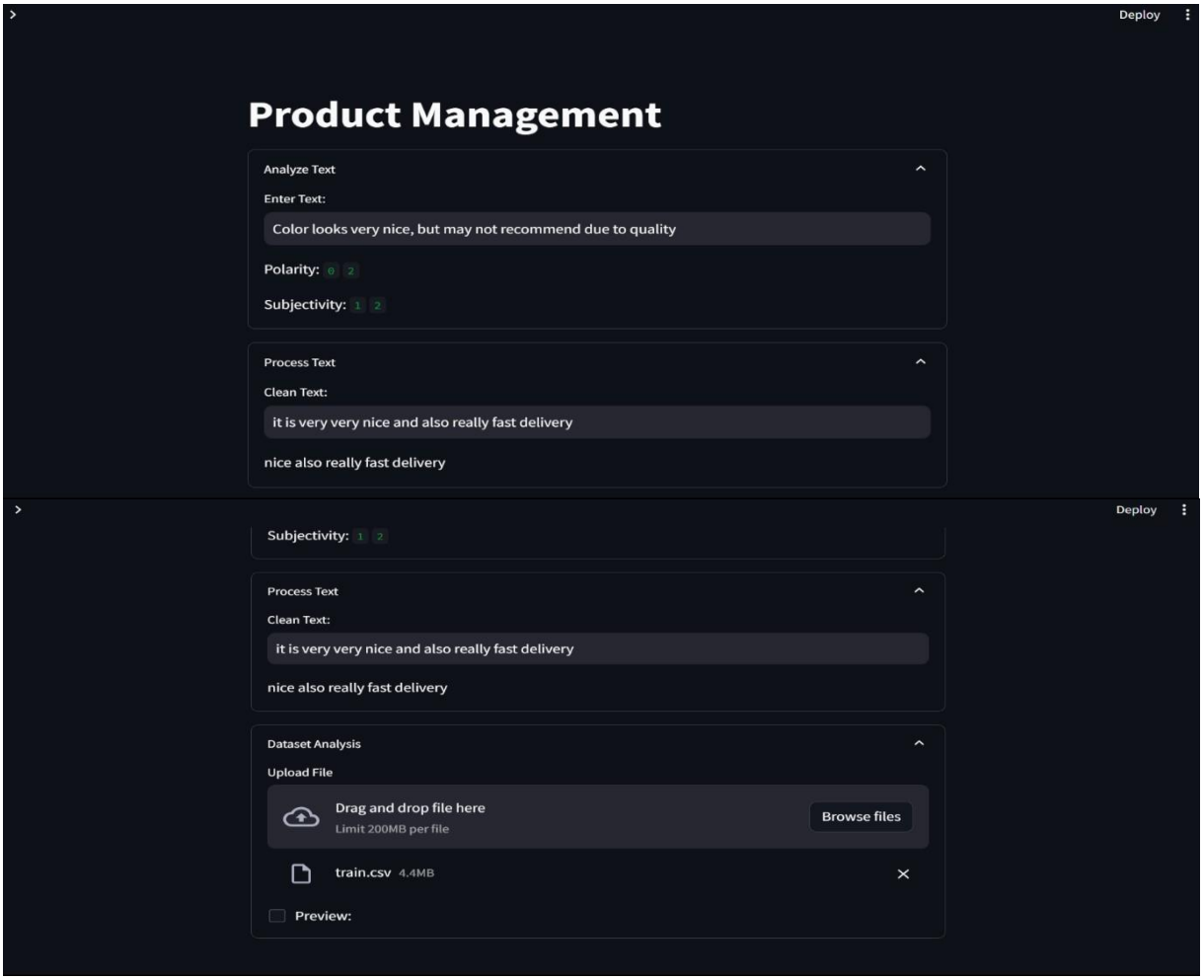


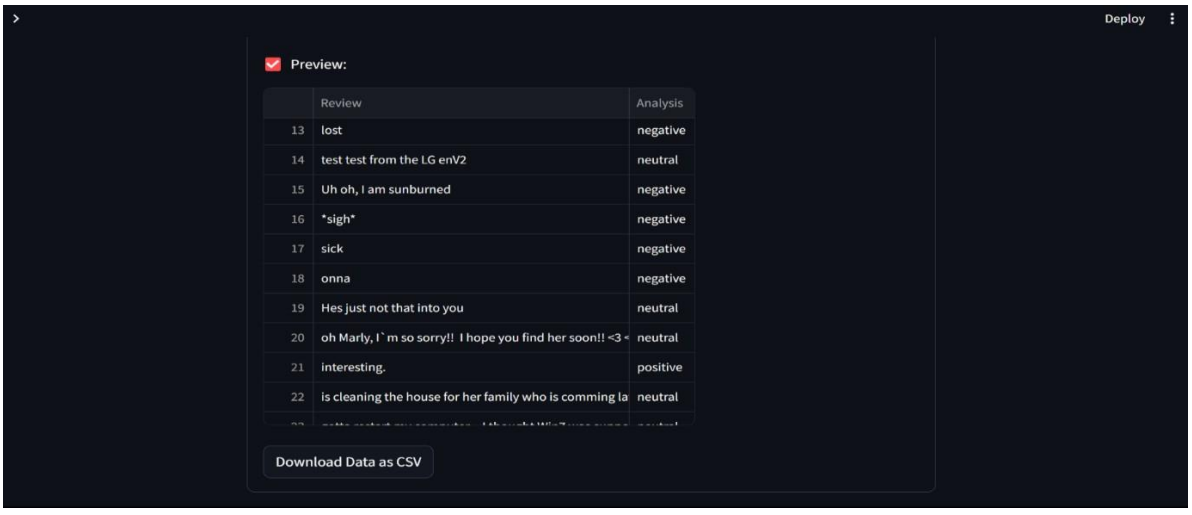
PAGE RANK OUTPUT:

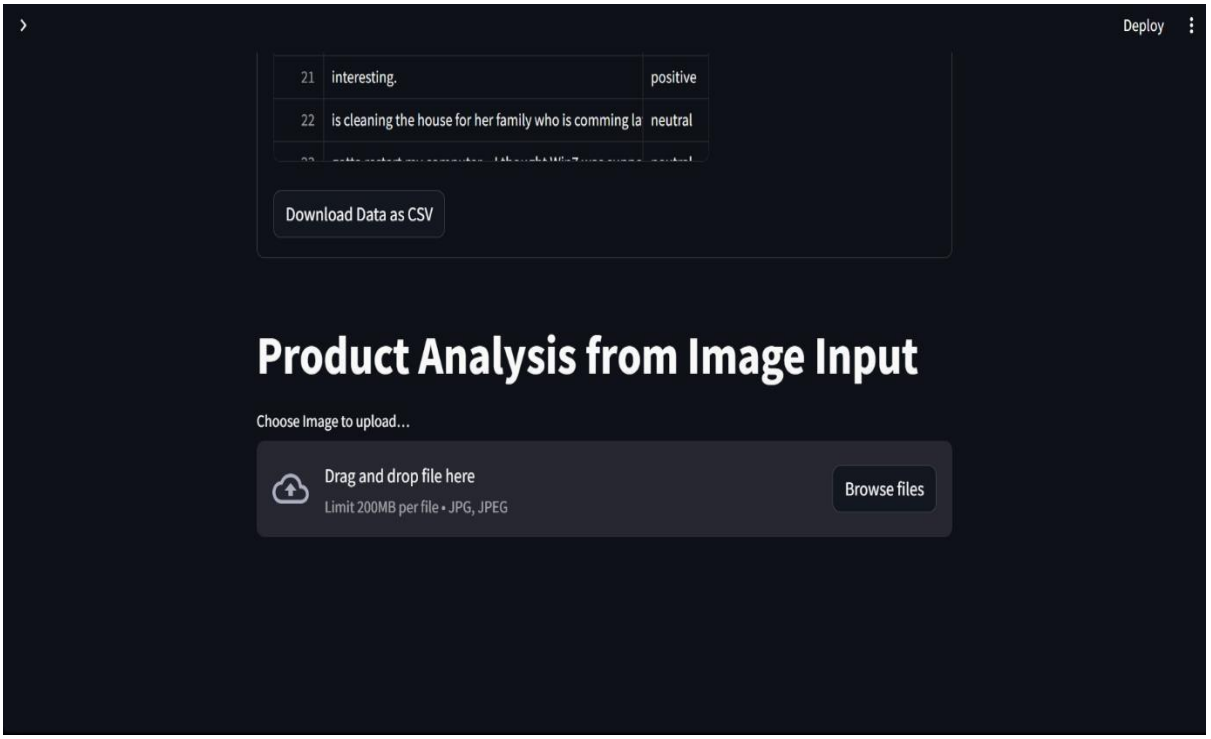


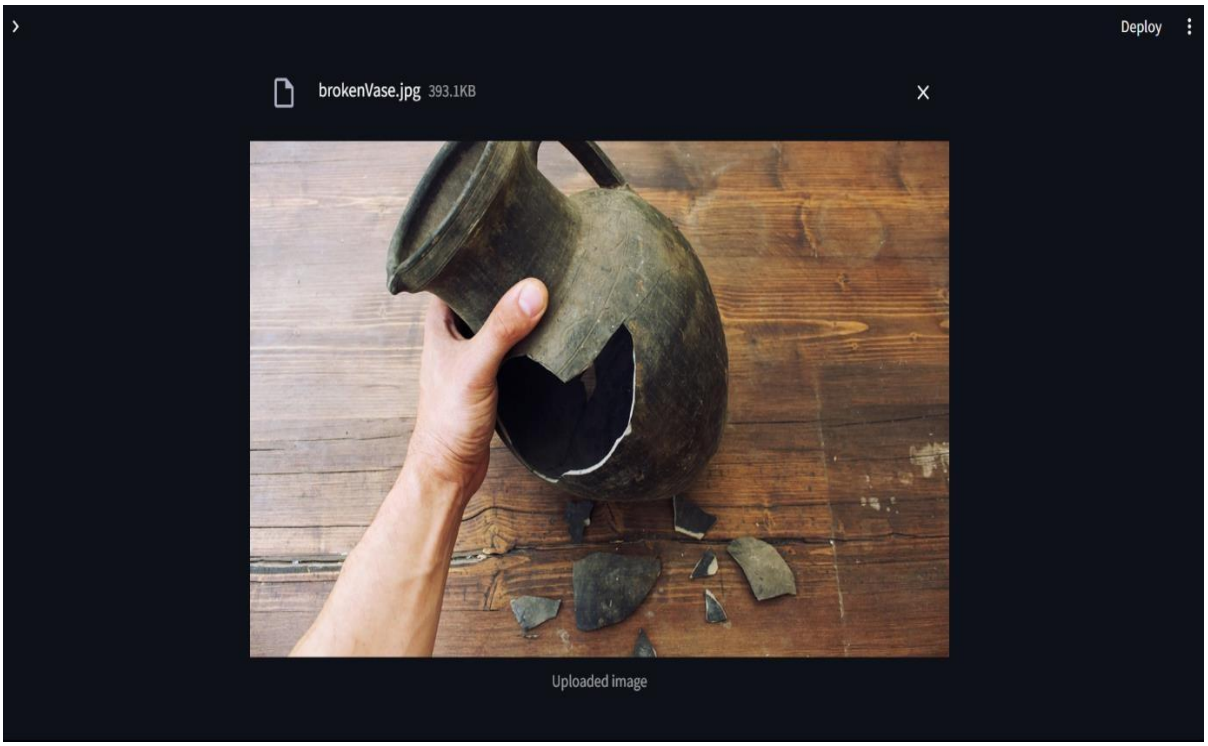


REVIEW ANALYSIS OUTPUT:

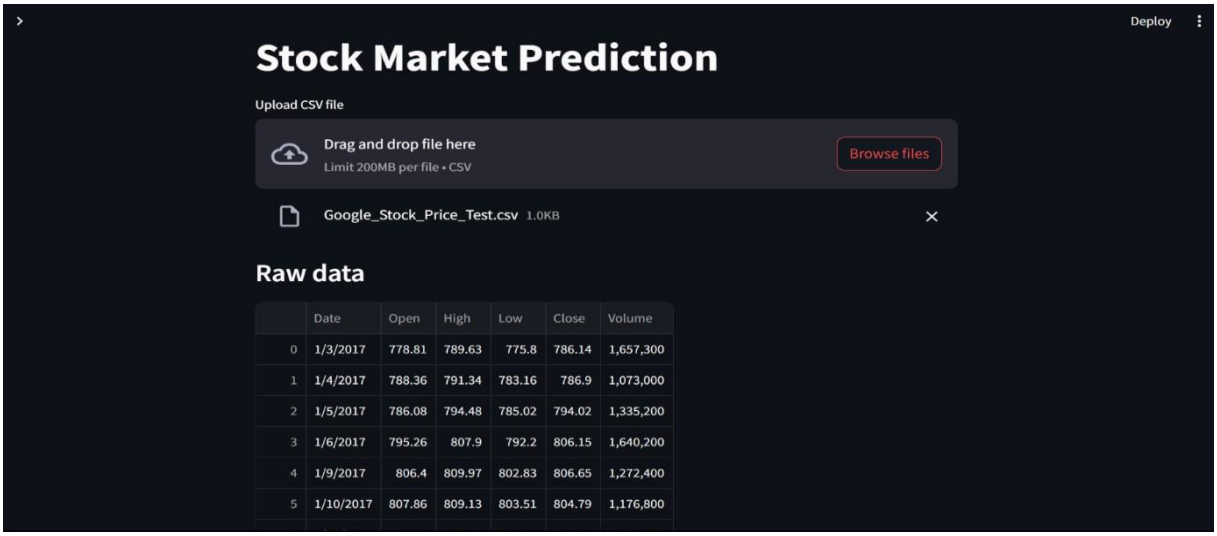


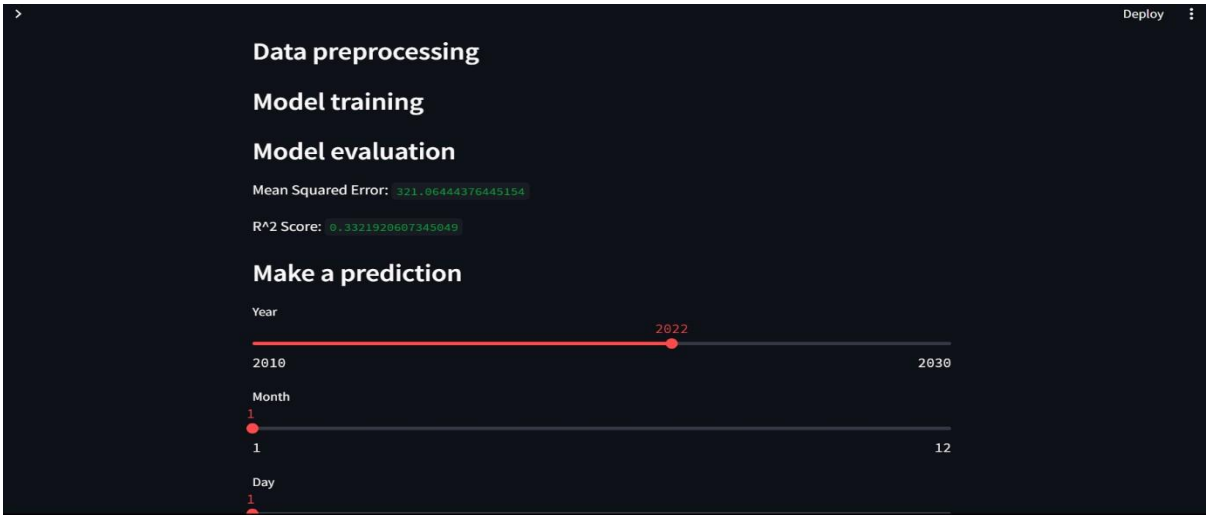



Deploy
21 interesting. positive
22 is cleaning the house for her family who is comming la neutral
Download Data as CSV
Product Analysis from Image Input
Choose Image to upload...
Drag and drop file here
Limit 200MB per file • JPG, JPEG
Browse files


Deploy
brokenVase.jpg 393.1KB
Uploaded image

STOCK OUTPUT:





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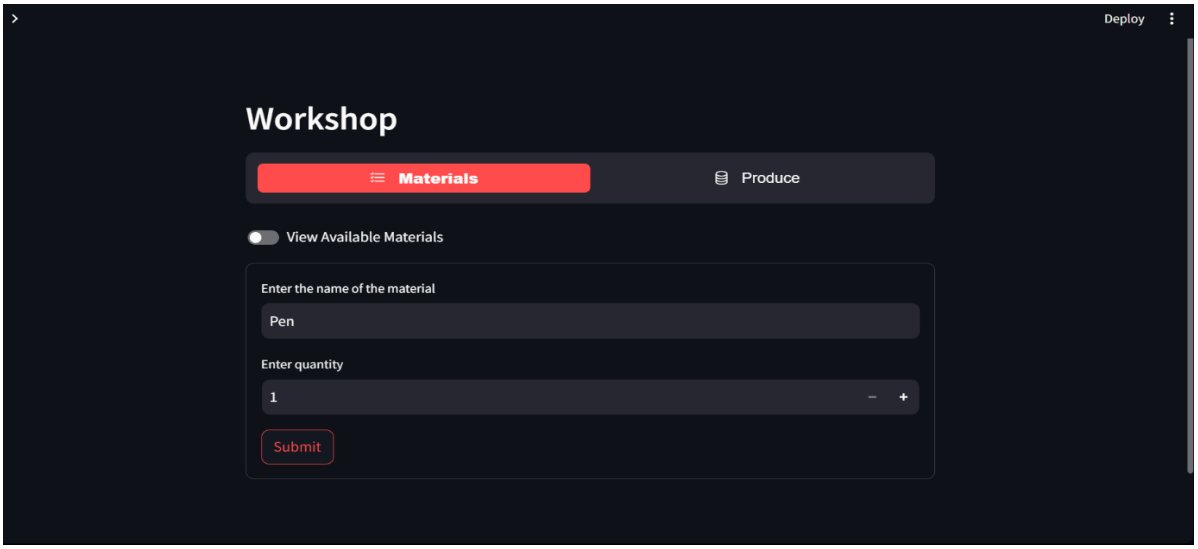

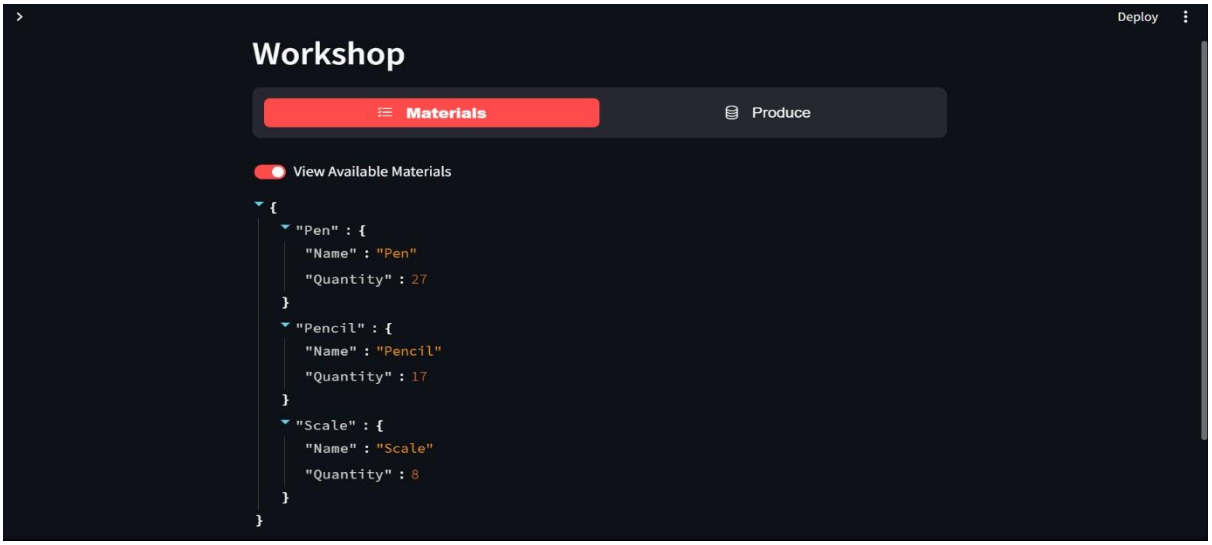

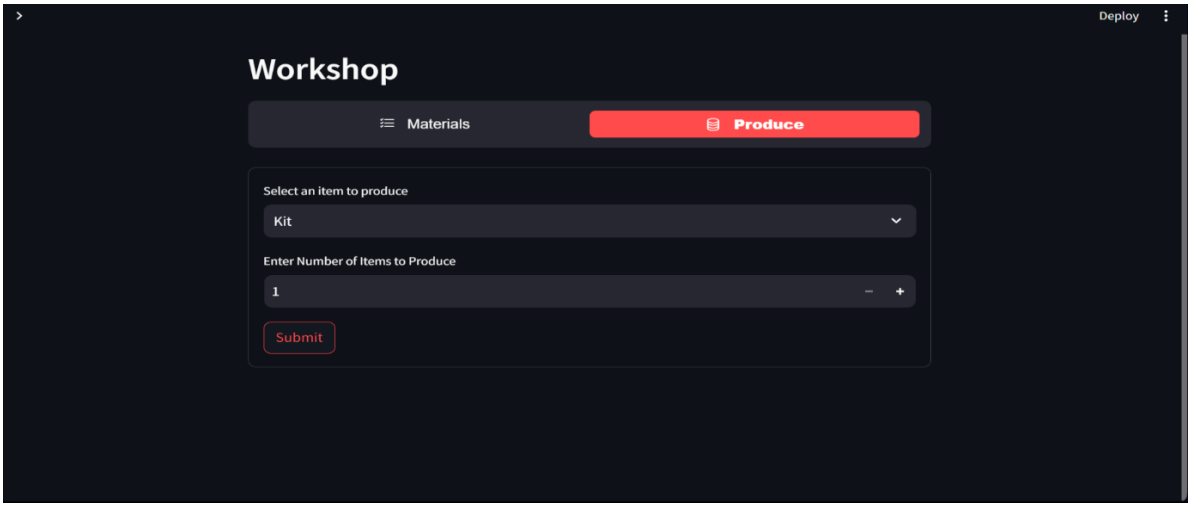

RESEARCH PAPER ON PRODUCT MONITORING AND REPUTATION MANAGEMENT

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ABSTRACT:

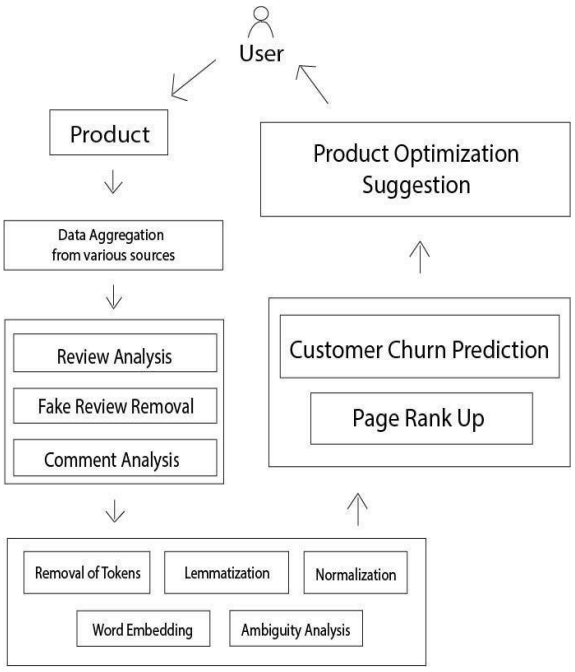
This research paper investigates a mutually beneficial partnership between product monitoring and managing one's reputation in the setting of the contemporary digital marketplace. The study begins by elucidating the changing terrain of consumer interactions and the profound the influence of internet reviews and social media on brand perception. Through a comprehensive literature review, the paper explores the nuanced dimensions of product monitoring, emphasizing the role it plays in ensuring quality assurance and customer satisfaction. Some businesses, motivated by the desire to make money, may create spam reviews about other products or their own, potentially misleading consumers into making purchases unworthy product. Sentiment analysis has emerged as one of text analysis's most fascinating topics due to its possible business advantages. The findings of this study illuminated the challenges and opportunities associated with product monitoring and reputation management in various industries.

INTRODUCTION:

Businesses must navigate a challenging environment where product quality and brand reputation are closely related as consumers use online platforms more and more to investigate, assess, and discuss their experiences. This research paper explores the pivotal domains of product monitoring and reputation management, illuminating their significance in the era of digital and proposing a comprehensive framework for businesses to effectively navigate these crucial aspects. The objective is to retain a favourable reputation while resolving any issues that may emerge. Reputation management encompasses a range of strategies to improve public opinion, manage internet content, and efficiently address unfavourable events or media coverage that may impact an organization's image. Product quality directly impacts brand perception, customer

loyalty, and market share. Conversely, a company's reputation can significantly influence consumer trust, investor confidence, and stakeholder relationships. Therefore, effective product monitoring and reputation management have emerged as essential components of modern business strategy.

ARCHITECTURE DIAGRAM:



PRODUCT MONITORING:

Product monitoring software, which manages the product lifecycle and streamlines the difficult, tedious, and tedious process of monitoring, reviews, and reporting for growth, governance, and compliance, is a game-changer for product leaders. Product governance and compliance: Historically, this has required a great deal of time-consuming, manual monitoring and review that is not scalable.

REPUTATION MANAGEMENT:

It is the art of moulding public opinion of your business or brand. Three fundamental components comprise a brand's reputation: the perceptions of others, the company's performance and operations, and the messaging the brand conveys about itself. Maintaining a robust brand image entails keeping an eye on what people are saying and thinking about the company, reacting to false information, malicious accusations, and unfavourable reviews, and generally keeping an eye out for and seizing opportunities to improve the company's reputation. Management of a company's reputation is rarely owned by one individual or division.

METHODOLOGY:

Methodologies for product monitoring and reputation management involve systematic approaches and frameworks to ensure the quality of products and maintain a positive brand image.

NATURAL LANGUAGE PROCESSING:

One area of artificial intelligence (AI) is called natural language processing (NLP), which focuses on the interaction between computers and human language. It

comprises developing models and methods that enable computers to comprehend, interpret, and produce meaningful, contextually appropriate human language. NLP includes a broad range of activities, such text analysis, sentiment analysis and language translation, and speech recognition. The challenges in NLP lie in dealing with the intricacies of language, including context, ambiguity, and cultural nuances. Ongoing research and innovations in machine learning and deep learning techniques continue to propel the capabilities of NLP, making it an integral component of modern AI systems and shaping the way we interact with technology.

RANDOM FOREST ALGORITHM:

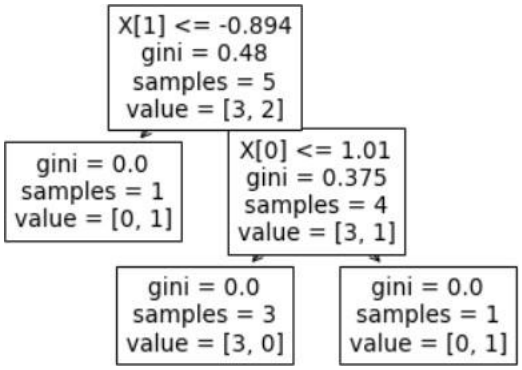
It is a learning algorithm widely used in machine learning for classification and regression tasks. It operates by constructing a multitude of decision trees during training and outputs the mode (classification) or mean prediction (regression) of the individual trees. The "random" in Random Forest stems from two key sources of variability introduced in the tree-building process. The final prediction is an aggregation of the predictions made by individual trees. Random Forest is robust, resistant to overfitting, and effective in handling high-dimensional datasets. Its versatility, scalability, and ability to capture complex relationships make it a popular choice in various domains, from finance and healthcare to image recognition and bioinformatics.

DERIVATION AND EQUATION:

The formula for calculating the feature importance is:

$$fi_i = \frac{\sum_{j:\text{node } j \text{ splits on feature } i} ni_j}{\sum_{k \in \text{all nodes}} ni_k}$$

To understand this formula, first, let's plot the decision tree for the above dataset:



Here we have two columns [0 and 1], to compute the significance of each attribute in [0] we need to find those nodes where the split happened due to this column [0]. In this dataset, we have only 1 node for column [0] and column [1]. Out of all the nodes, we will find the feature importance

of those nodes where the split happened due to column [0] and then divide it by the significance of the trait of all the nodes. To calculate the importance of a node we will use this formula:

Our N_t is 5, N is 5, impurity of that node is 0.48, $N_{t(right)}$ is 4, right impurity is 0.375, $N_{t(Left)}$ is 1, and left impurity is 0, putting all this information in the above formula we get:

$$= \frac{5}{5}[0.48 - (\frac{4}{5} * 0.375) - (\frac{1}{5} * 0)]$$
$$= [0.48 - (0.8 * 0.375)]$$
$$= 0.48 - 0.30$$
$$= 0.18$$

Similarly, we will calculate this for 2nd node:

$$= \frac{4}{5}[0.375 - (\frac{1}{5} * 0) - (\frac{1}{5} * 0)]$$
$$= 0.8 * 0.375$$
$$= 0.30$$

Now let's calculate the importance of features [0] and [1], This can be calculated as:

$$fi_i = \frac{\sum_{j:node\ j\ splits\ on\ feature\ i} ni_j}{\sum_{k \in all\ nodes} ni_k}$$

$$\text{Feature } 0 = \frac{0.3}{0.3 + 0.18} = 0.625$$

$$\text{Feature } 1 = \frac{0.18}{0.18 + 0.3} = 0.375$$

Hence for the feature [0], the significance of the trait is 0.625 and for [1] it is 0.375.

PAGE RANK ALGORITHM:

PageRank is a pivotal algorithm within the domain of search engine optimization and web ranking, initially introduced by Google's co-founders. The algorithm's fundamental principle revolves around assessing the significance of web pages according to the structure of the hyperlink graph. In essence, PageRank interprets a link from page A to page B as a vote of confidence from page A to page B. However, not all votes are equal, as the significance of the page casting the vote contributes to the weight of the vote. Pages with higher PageRank scores pass on more authority to pages they link to. The iterative nature of the algorithm involves calculating PageRank scores for every page according to the scores of pages linking to it, creating a dynamic and recursive process

DERIVATION AND EQUATION:

SIMPLE RECURSIVE FORMULATION:

The vote for each link is based on how important the source page. If page J with importance r_j has n out-links, each link gets rj/n votes. Pages j's own importance is the sum of the votes on its in-links.

$$r_j = \frac{\dot{r}}{3} + \frac{r_k}{4}$$

Page rank -The Flow Model:

A vote from an important page is worth more and defines a "rank" r_j for page j.

$$r_j = \sum_{i=j} \frac{r_i}{d_i}$$

d_i out-degree of note I,

Flow equation:

$$r_y = {}^{r_y}/_{2} + {}^{r_a}/_{2}$$

$$r_a = {}^{r_y}/_{2} + r_m$$

$$r_m = {}^{r_a}/_{2}$$

Additional constraints forces uniqueness:

$$R_y + r_a + r_m = 1$$

Solution:

$$r_y = {}^{2}/_{5}, r_a = {}^{2}/_{5}, r_m = {}^{1}/_{5}$$

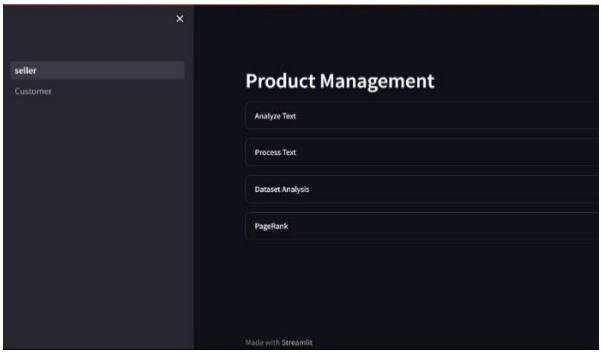
CUSTOMER CHURN PREDICTION:

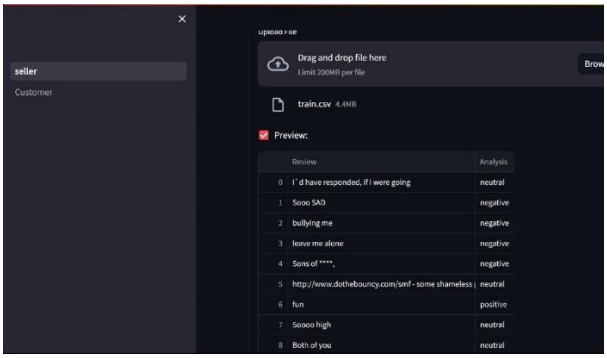
It is a critical aspect of business analytics that involves the application of sophisticated data analysis and key methods for machine learning to forecast the likelihood of customers discontinuing their relationship with a company. In a very competitive business environment, keeping clients is paramount, making churn prediction a strategic imperative for companies across various industries. In-depth exploration of forecasting customer attrition would encompass various methodologies, model evaluation techniques, real-world case studies, and the ethical considerations of using predictive models. The comprehensive analysis would contribute to a nuanced understanding of customer churn dynamics, providing actionable insights for businesses to foster customer retention and sustainable growth.

RESULT AND OUTPUT:

In this paper, we cover the needs of new and uprising entrepreneurs by creating a website with all-in-one features for reviewing datasets and visualizing numerous data. There is also customer churn prediction for identifying trends in purchases and decrypting patterns for customer retention helps in making business prosperous. Page rank helps get a better understanding of the business

standing among various competitors and suggestions improvise business strategies enabling a better position. Entrepreneur are able to get the bigger picture of the workflow and know the dos and don’ts in the business.





CONCLUSION:

In conclusion, the research paper on Product Monitoring and Reputation Management provides a comprehensive exploration of these two interconnected pillars of contemporary business strategy. Through an in-depth analysis of product monitoring methodologies and reputation management practices, the paper underscores their collective impact on organizational success. The Product Monitoring section emphasizes the significance of instantaneous data analysis, quality control measures, and supply chain optimization in ensuring product quality and adherence to industry standards.

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