A Project Report on

"News Summarizer and Social Media Trend Analyzer"

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Certificate

This is to certify that the project entitled

“News summarizer and social media trend analyzer”

*being submitted by **Ms. Aditi Durpade, Ms. Afifa Maryam, Ms. Janhavi Gaikwad, Ms. Sabrina Marium** to the Dr. Babasaheb Ambedkar Technological University, Lonere, for the award of the degree of Bachelor of Technology in Computer Science and Engineering, is a record of bonafide work carried out by them under my supervision and guidance. The matter contained in this report has not been submitted to any other university or institute for the award of any degree.*

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With Deep Reverence,
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ABSTRACT

In today's digital age, vast amounts of information are generated every second through news platforms and social media networks. Analysing this data manually is both time-consuming and inefficient, especially when attempting to understand public sentiment, trending topics, and media bias. The News Summarizer and Social Media Trend Analyzer project is designed to tackle this challenge by providing an automated system that collects, processes, and analyses data from both news articles and social media platforms. The News Summarizer module focuses on extracting key information from online news sources. Using APIs to fetch real-time news content, it generates concise summaries that highlight the most important points of each article. This helps users quickly grasp essential news without reading the entire content, improving efficiency and understanding. The social media Trend Analyzer, on the other hand, captures real-time data from platforms like Twitter, Reddit, and others to detect trending hashtags, keywords, and topics. By integrating both modules into a single platform, the system offers a powerful tool for researchers, journalists, and decision-makers to monitor and compare the narrative across media and public domains in real time.

TABLE OF CONTENTS

List of Figures

Chapter 1

INTRODUCTION

In today’s digital world, an enormous amount of news and social media content is generated every second. People often struggle to stay updated due to time limitations and high information overload. News articles are lengthy, and social media trends change rapidly, making it difficult to process information efficiently.

This project aims to develop an API-based system that automatically summarizes news articles and analyzes social media trends to help users quickly understand the most important information. The system uses Machine Learning models to generate meaningful summaries and extract trending topics from platforms like Twitter, Reddit, and YouTube.

1.1 What exactly news summarizer and trend analyzer is?

A News Summarizer and social media Trend Analyzer is an intelligent system that uses Artificial Intelligence and Natural Language Processing (NLP) to automatically process large amounts of online text data, summarize lengthy news articles, and analyse trending topics from social media platforms. In the modern digital era, millions of news articles, posts, tweets, and videos are created every day, making it difficult for people to stay updated with important and relevant information. Reading full-length news articles and manually tracking social media trends is time-consuming and overwhelming.

To solve this challenge, API-based summarization systems automatically extract the most essential information from long news content and generate a short, meaningful summary that users can quickly read and understand. Similarly, a trend analyser examines social media data to identify the most popular hashtags, topics, opinions, and real-time discussions. It helps in understanding public sentiment and current trending events across platforms like Twitter, Instagram, YouTube, and Facebook.

This system combines advanced machine learning models such as BERT, T5, and Text Rank for summarization and NLP keyword extraction, sentiment analysis, and data visualization techniques for trend identification. As a result, users receive concise summaries and clear insights into trending topics without needing to manually browse through large volumes of information.

By integrating news summarization with trend analysis, the system serves students, and journalist, researchers, businesses, and everyday users who want to save time and make informed decisions. It reduces information overload, improves productivity, and supports faster understanding of real-time updates in the world.

Overall, the News Summarizer and social media Trend Analyzer plays a crucial role in helping individuals and organizations stay updated with dynamic global information. It not only minimizes time consumption but also improves productivity, assists in decision making, and reduces cognitive load. The integration of summarization and trend analysis into a single system makes it a modern, innovative, and highly valuable technology in today's information-driven society.

1.2 Project Background

With the rapid growth of digital media, people are continuously exposed to an overwhelming amount of information coming from online news portals, blogs, and various social media platforms. Every minute, thousands of news articles and millions of social media posts are generated, making it extremely challenging for users to consume essential information in a timely manner. Reading each full-length article and manually tracking what is trending on social media requires considerable time, effort, and focus.

To address these challenges, many modern platforms now provide Application Programming Interfaces (APIs) that allow developers to access news articles, headlines, and social media activity in a structured and efficient manner. API-based systems make it possible to retrieve real-time data from trusted news sources as well as social media networks. Using these APIs, applications can fetch article content, important keywords, trending hashtags, and user engagement statistics. This enables developers to build tools that help users quickly view summarized content and trending information without navigating multiple websites.

This project functions as a unified platform that integrates news APIs and social media trend APIs to provide essential information in a simplified and accessible format. Instead of processing full articles through manual reading, the system retrieves concise summaries, short descriptions, or important points directly from news APIs. Similarly, instead of browsing social media pages to look for trending topics, hashtags, or opinions, the system extracts real-time trends using platform-specific APIs. By combining information from these multiple sources, the project offers users a streamlined interface where they can instantly access the latest news summaries and observe ongoing social media trends in one place.

Traditionally, people relied on newspapers, magazines, and television broadcasts to receive important updates. However, with the shift toward digital journalism, news portals now publish articles continuously throughout the day covering every possible category including politics, sports, business, and entertainment. These articles often contain extensive details, background information, and complete event explanations. While this depth is useful, it becomes time-consuming for individuals with limited availability to read through every article in full. Similarly, social media has become a major source of public discussion, and trends can change rapidly within minutes. Manually checking what people are talking about on different platforms can be both confusing and difficult. By utilizing API-based retrieval, the system solves these issues by offering users only the necessary and most relevant information. News APIs deliver headlines, short descriptions, and essential points that help users understand the news quickly. Social media trend APIs provide current topics, hashtags, engagement levels, and other trend indicators, allowing users to stay updated without scrolling endlessly. Through this approach, the project ensures that users receive accurate, real-time, and concise information in a structured and user-friendly manner.

1.3 Objectives of the System

The main objectives of this project are:

- To automatically generate concise and meaningful summaries from long news articles.
- To analyze social media data and identify trending topics, hashtags, and public opinions.
- To use NLP and machine learning techniques for text processing and insight generation.
- To present results through a simple and interactive user interface.
- To help users save time and access relevant information more efficiently.

  Social media platforms such as Twitter, YouTube, Instagram, Facebook, and Reddit have revolutionized the way people express and share information. On platforms like Twitter, trends can emerge within minutes, influencing the global conversation around various topics including elections, crises, social movements, public opinions, and celebrity news. However, the speed at which trends appear and disappear on social media makes manual monitoring extremely difficult. While many systems exist for either news summarization or social media analytics, very few integrate both functionalities. This project bridges this gap by combining two powerful capabilities:

- Summarizing lengthy news articles
- Identifying and analyzing real-time social media trends

This combination provides a more holistic understanding of what is happening globally and how people are reacting to it online.

1.4 Problem Statement

In the digital information era, people depend heavily on online news platforms and social media to stay updated with current events. However, the rapid growth of digital content has created several challenges. News articles are often long and time-consuming to read, requiring users to scan multiple sources for complete information. At the same time, social media platforms such as Twitter, YouTube, and Reddit generate millions of posts every minute, making it extremely difficult to manually track trending topics, hashtags, and public opinions.

Users face information overload, limited time, and difficulty identifying what is important. Also, there is no unified system that provides both summarized news and social media trend analysis in one platform. Existing platforms may provide news articles but not summaries; others may show trends but not detailed insights. The absence of an integrated tool reduces efficiency and makes it harder for users to extract key information quickly.

Hence, there is a need for an API-Based News Summarizer and social media Trend Analyzer that can automatically collect news articles via APIs, summarize them using algorithmic or NLP techniques, and simultaneously fetch real-time social media data through APIs to identify emerging trends. This system solves the problem of information overload, lack of time, and the absence of a centralized platform for news and trend insights.

The system architecture is designed to integrate multiple APIs efficiently. News APIs are used to fetch articles from trusted sources, while social media APIs collect real-time data such as posts, hashtags, likes, comments, and engagement metrics. This collected data is then processed and analyzed to identify trending topics, popular discussions, and emerging public interests. Basic NLP and text-processing techniques such as keyword extraction, frequency analysis, and similarity detection are used to generate concise summaries and trend insights.

Furthermore, the platform provides a centralized dashboard that combines summarized news and social media trends in one interface. This unified approach eliminates the need to switch between multiple applications or websites, thereby saving time and improving user productivity. The system can also be extended in the future to support multiple languages, category-based filtering, and personalized content recommendations.

Overall, this project demonstrates the practical use of APIs, data processing, and text analysis to solve real-world problems related to digital information management. It highlights how technology can simplify content consumption and help users stay informed efficiently in the modern digital era.

1.5 Applications of the System

The system has wide-ranging applications across various fields that rely on timely and concise information. In the field of journalism, the system helps reporters and editors quickly identify major events and understand public reactions without having to manually analyse long articles or monitor social media feeds continuously. This enhances the speed at which news organizations respond to developing stories. For students and academic researchers, the system provides summarized content that can save reading time and offer a strong starting point for research work, especially when dealing with topics that require analysis of public opinion or rapidly evolving trends.

Businesses and corporate professionals can also benefit from this system. Organizations frequently monitor social media to understand customer opinions, emerging trends, competitor activity, and brand-related discussions. The system simplifies this task by automatically identifying trending topics and summarizing relevant news. Similarly, policymakers, analysts, and government agencies can use the platform to track public sentiment on issues of social importance, enabling data-driven decision-making. Even general users who want to stay updated without spending hours reading articles can benefit from having a concise summary of current events and a clear view of what people are discussing online. Thus, the system serves a diverse range of users and provides valuable support in sectors where information plays a critical role.

1.6 Methodology Overview

The methodology behind this project revolves around the integration of APIs with text processing and data-analysis techniques to generate meaningful summaries and identify trending topics. The process begins with the collection of news articles using news provider APIs. These APIs return structured data in formats such as JSON or XML, which the system interprets to extract the title, content, publication date, and source. After the content is collected, it undergoes a preprocessing stage where unwanted characters, excessive punctuation, and irrelevant metadata are removed to refine the input for summarization.

Once the text is cleaned, the summarization module analyzes it using either rule-based techniques, algorithmic models, or external summarization APIs. The module identifies important keywords, key sentences, and contextual relationships within the text. It then produces a condensed version that captures the main information from the original article. This ensures that the user receives a clear and concise summary without reading the entire document.

For social media trend analysis, the system connects to the APIs of platforms such as Twitter, YouTube, or Reddit. These APIs return real-time or near real-time data containing hashtags, user activity, comments, likes, and engagement metrics. The collected data is processed through frequency analysis, keyword extraction, and relevance assessment to identify the most popular and widely discussed topics. The system may also evaluate sentiment by examining patterns in text and user reactions, allowing users to understand not only what is trending but also how the public feels about those topics.

Finally, the processed data—both news summaries and trends—is presented through a user-friendly interface. This interface displays summarized news articles, trending hashtags, top discussions, and relevant insights in a visually clear and easily accessible manner. The entire methodology emphasizes automation, accuracy, and efficiency by utilizing APIs to gather reliable and timely information from diverse sources.

Chapter2

SYSTEM ANALYSIS

A system analysis of News Summarizer and social media Trend Analyzer focuses on understanding the system's components, processes, and stakeholders involved in collecting real-time news and social media data, applying Natural Language Processing (NLP) and Machine Learning techniques for summarization and trend identification, and presenting useful insights to users. This system aims to reduce information overload by providing concise summaries of lengthy news articles and analyzing trending topics across platforms like Twitter, Instagram, and Facebook.

2.1 ER Diagram

An Entity Relationship (ER) Diagram is a high-level conceptual representation of data used to model database structures. In this project, the ER model represents key entities such as User, News Article, Summary, Trend, and Social Media Post, along with their relationships. Each entity consists of attributes such as Article ID, Source, Publish Date, Trend Category, Hashtags, Likes, Comments, etc. Relationships define how entities interact for example, a User reads multiple News Summaries, and multiple Social Media Posts can contribute to one Trend.

Many-to-many relationships exist when multiple articles relate to multiple trends and topics. One-to-many relationships occur when one user saves multiple summaries. Weak entities include keywords extracted from articles, which depend on article identity. Subtype and supertype relationships appear, such as User being a supertype with subtypes Admin and General User. In this project, the ER model captures the essential entities involved in news summarization and trend analysis. Key entities include the User, News Article, Summary, Social Media Post, Trend, and Keyword. Each entity holds important properties. For instance, the News Article entity contains attributes like Article ID, Title, Source, Publish Date, Category, and Raw Text Content. The Summary entity contains Summary ID, Summary Text, Summary Length, and Timestamp. The Trend entity includes Trend ID, Trend Keyword, Popularity Score, Platform Name, Start Time, and Peak Time.

The relationships among entities define how data flows and interacts. For example, a single News Article may produce multiple Summaries depending on user preferences, such as long, medium, or short summaries. This creates a one-to-many relationship. Social Media

Posts collected from different platforms may contribute to forming a Trend, creating a many-to-one or many-to-many relationship. The User entity is linked to the Summary entity because one user can save or access multiple summaries, establishing another one-to-many link.

Weak entities such as Keywords depend on their parent entity, either News Article or Trend, because keywords cannot exist independently without a source. Subtype-supertype relationships include User as the major supertype, with subtypes such as Admin User, who manages the system, and General User, who interacts with the output. Together, the ER diagram provides a structured representation of how large quantities of textual and analytical data remain interconnected.

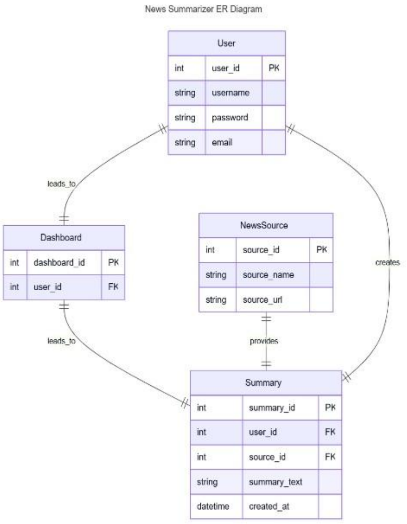


Fig 2.1 Entity Relationship Diagram

2.2 Data Flow Diagram

A Data Flow Diagram (DFD) illustrates how data moves through the system, showing processes, data stores, and external entities. It provides a high-level perspective of how input data is transformed into meaningful output.

In this project, the DFD explains how raw data from news sources and social media APIs is collected, processed by AI algorithms, and delivered to users in summarised and analyzed form. The main data processes include data collection, preprocessing, summarization, trend extraction, and result visualization.

External entities such as News APIs and Social Media Platforms supply data. The system processes these inputs through modules such as text extraction, NLP analysis, sentiment analysis, keyword extraction, and summary generation. Users interact with the system to request summaries, analyze trends, search topics, and store results.

The DFD aids designers in functional decomposition and assists developers in understanding system flow without requiring knowledge of code-level logic or hardware architecture.

n an API-Based News Summarizer and social media Trend Analyzer, external entities such as News API Providers and Social Media Platforms (Twitter/X, Instagram, Reddit, YouTube, etc.) supply raw data. The system receives this raw data through the Data Collection Module. This module sends requests to external systems, retrieves large volumes of JSON responses, validates them, and stores them temporarily in the Raw Data Storage.

The next stage is Preprocessing, where the system removes irrelevant content, duplicates, advertisements, emojis, hyperlinks, and formatting noise. Preprocessing ensures that the text becomes suitable for NLP-based summarization and trend extraction.

The summarization pipeline involves multiple internal processes: tokenization, sentence extraction, semantic analysis, and summary generation. Similarly, trend analysis uses hashtag extraction, engagement metrics, sentiment analysis, frequency distribution, and clustering models to detect trending topics.

Processed data is stored in the Processed Data Store, which is used by the Visualization Module to present results to the user. Users access the system through graphical interfaces or dashboards where they can request summaries, browse trends, filter by category, or save results. The DFD thus explains how data moves seamlessly across different system components to produce output efficiently, ensuring transparency in system design.

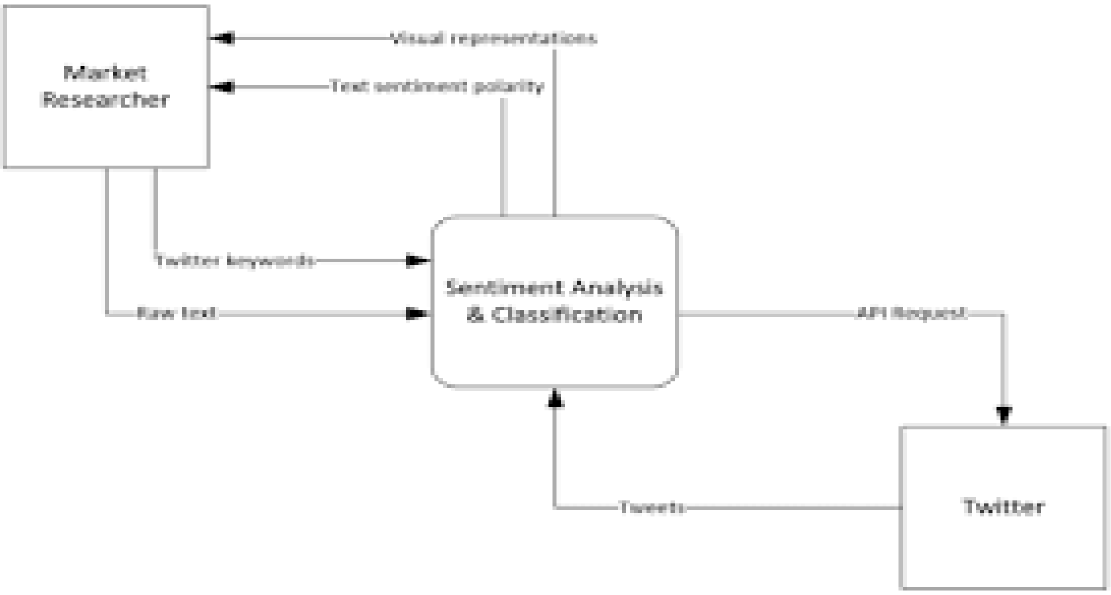


Fig 2.2: Data Flow Diagram

2.3 Use Case Diagram

The Use Case Diagram identifies system interactions from the user's perspective. It helps in understanding what the system must perform to fulfil user expectations and functional requirements.

Actors in the system include General User, Administrator, and External Data API Providers.

The primary use cases include:

- User Authentication
- Viewing AI-generated news summaries
- Analysing trending topics and hashtags
- Searching by category or keywords
- Saving and sharing summarized reports
- Admin management tasks such as updating users or monitoring data sources

The use case diagram enhances communication between system designers and stakeholders by showing how the system behaves under different scenarios. It allows modular development, easier testing, and clearer system boundaries and responsibilities.

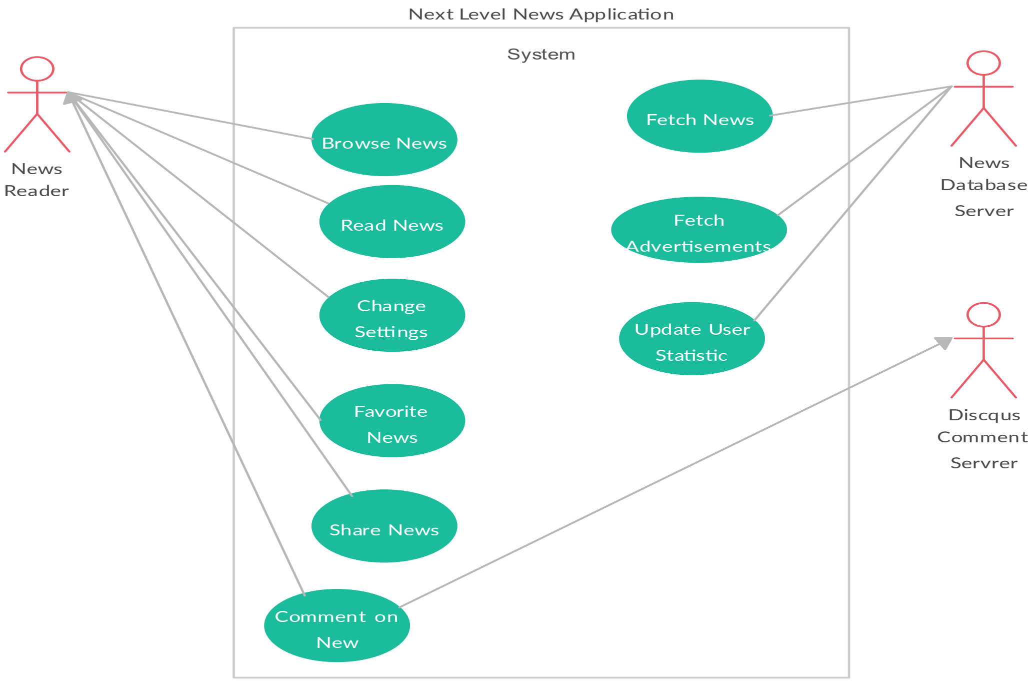


Fig 2.3: Use Case Diagram

2.4 Class Diagram

The Class Diagram represents the object-oriented structure of the proposed system by defining classes, attributes, methods, and their relationships. The project uses class inheritance, associations, and dependency relationships.

The User class is a supertype, and it has subtypes such as Admin and General User. The News Article, Social Media Post, Summary, and Trend classes represent major functional units. These classes store processed and raw data and interact with the AI Model class, which handles summarization operations.

The class diagram supports reusability, modularity, and scalability. The modular structure ensures additional AI features such as sentiment analysis, category prediction, and voice summarization can be integrated without redesigning the entire architecture.

(instances of the student class), course materials (a list of Material objects), and assignments (a list of Assignment objects). The methods in the Course class enable the addition or removal of materials and assignments to the course. These relationships and attributes are structured to facilitate effective management and interaction within the system.

The Class Diagram gives an object-oriented representation of the system architecture. It defines classes, attributes, methods, and relationships such as inheritance, aggregation, and association.

Major classes include:

User Class – containing user details, login credentials, preferences, and saved summaries. It has subtypes Admin User and General User. Admin User may override methods related to system control and management, while General User focuses on consumption of output.

News Article Class – contains raw article text, metadata, and source information. It includes methods like fetch Article (), extract Content (), and get Category ().

Summary Class – stores generated summaries, summary ID, length, timestamp, and reference to the original article. It includes methods like generate Summary (), optimize Summary (), and display Summary ().

Social Media Post Class – stores post ID, user handle, text content, likes, comments, hashtags, and engagement scores.

Trend Class – represents trending topics. It contains attributes such as trend score, emerging speed, platform, and related keywords. Methods include calculate Trend Score (), cluster Keywords (), and predict Trend Growth ().

AI Model Class – the core NLP and ML engine. It handles language modeling, semantic understanding, sentiment analysis, and summary generation using algorithms such as transformers or extractive summarization models.

API Manager Class – responsible for sending requests, handling authentication, rate limiting, and parsing responses from external APIs.

Class relationships show how objects communicate. For example, Summary depends on News Article, while Trend depends on Social Media Post. The modular design ensures scalability, enabling new features such as voice-based summarization, article clustering, or multilingual summarization to be added easily.

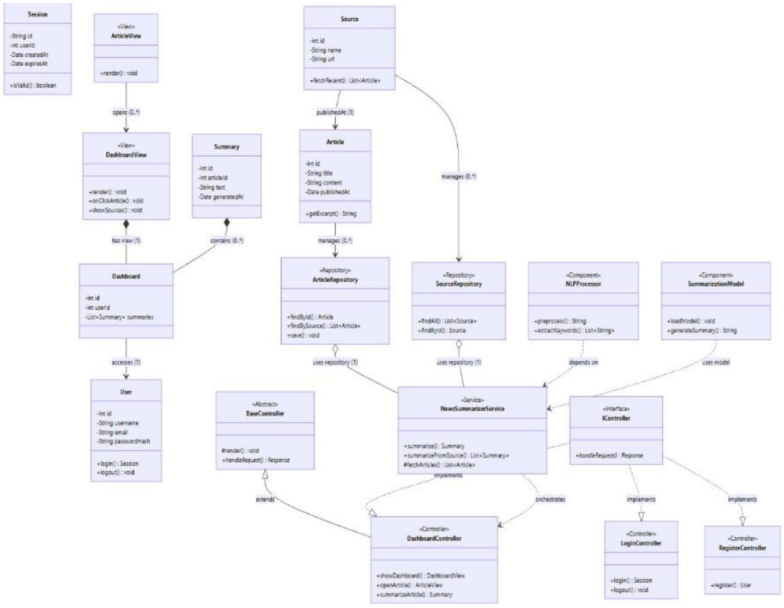


Fig 2.4: Class Diagram

2.5 Sequence Diagram

The Sequence Diagram defines the time-ordered sequence of messages exchanged between system components to achieve a specific task. It illustrates how system operations unfold in real time.

In this project, the sequence begins when a user initiates a request, such as Login or Summarize News. The system responds by authenticating the user, fetching articles or social posts, processing them through AI, and returning output.

The news summarization process begins when the user initiates a request to summarize an article or fetch the latest news summaries. The first component to interact with the user is the User Interface, which captures the user's input and sends it to the system. The interface forwards the request to the Controller, a central coordinating module responsible for managing the overall workflow Sequence diagrams improve understanding of system workflow, performance bottlenecks, timing issues, and inter-component communication.

After generating the summary, the AI Model sends the result back to the Controller, which then instructs the Database Manager to store the summary along with relevant metadata. Storing data ensures that the user can access summaries later without regenerating them, improving system efficiency and reducing redundant calls to external APIs.

Finally, the Controller retrieves the summary from the database and sends it to the User Interface, where it is displayed in a structured and readable format. This completes the sequence of interactions involved in generating a news summary. The sequence diagram visually represents this entire chain of events, showing synchronous calls, return messages, and the order in which messages are exchanged. The sequence diagram also represents the behaviour of the system when performing trend analysis. Similar to the summarization sequence, the operation begins with the user choosing an option such as “View Daily Trends” or “Analyse Hashtags.” The User Interface forwards this request to the Controller.

The Controller then communicates with the API Manager to fetch social media posts or trend data from platforms like Twitter, YouTube, or Reddit. Social media platforms typically return data in JSON format, containing posts, hashtags, user interactions, likes, retweets, comments, and timestamps. This raw data is first validated, filtered, and cleaned by the Data Preprocessing Module.

Once preprocessing is complete, the cleaned data is passed to the Trend Analysis Engine, an intelligent module responsible for identifying trending topics. The module determines which hashtags or topics are gaining traction and assigns popularity or trend scores based on engagement metrics.

The results are then returned to the Controller, which stores them in the database for logging and future retrieval. Finally, the processed trend information is sent to the User Interface, where it is displayed through visual components such as lists, charts, graphs, or interactive dashboards. This sequence demonstrates how multiple internal and external modules collaborate to transform unstructured social media data into meaningful trend insights.

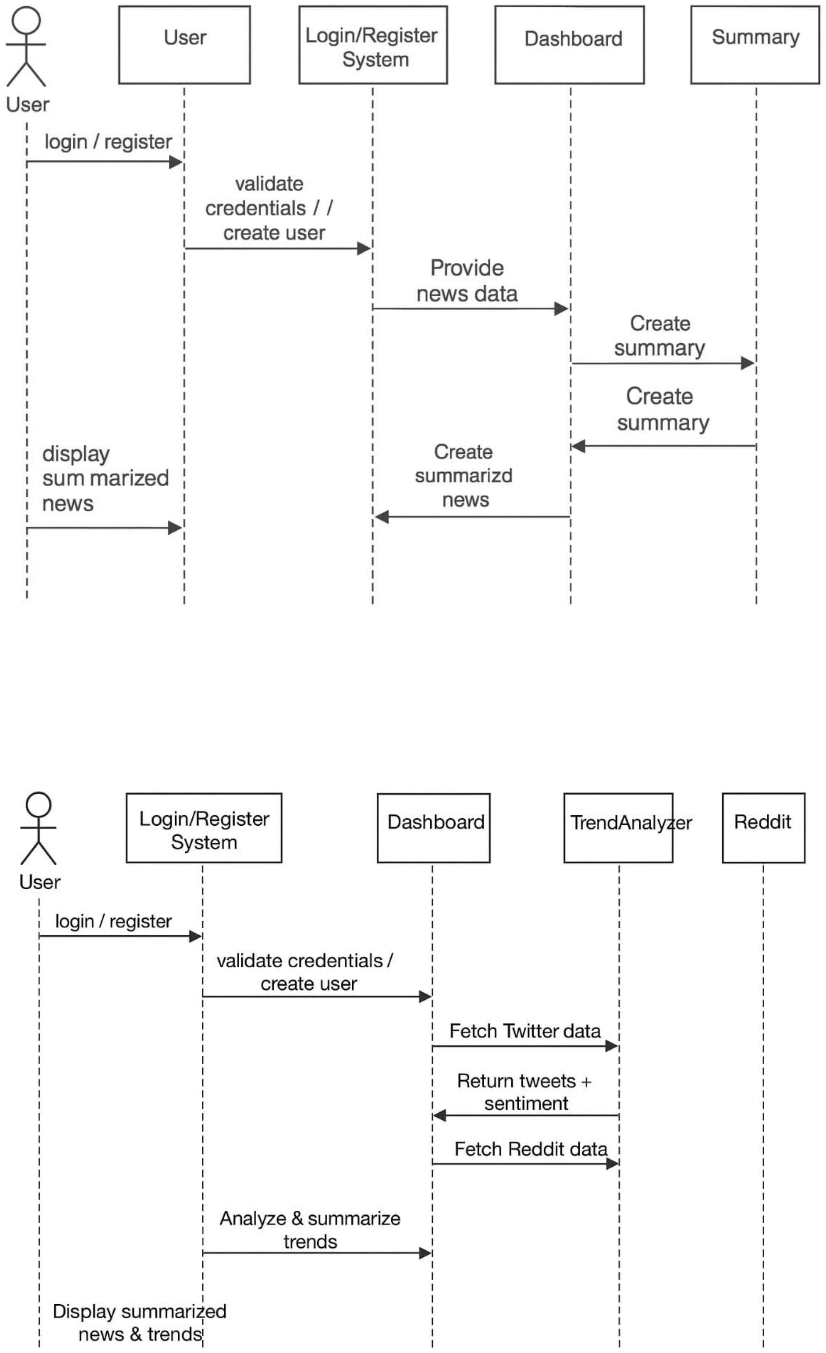


Fig 2.5: Sequence Diagram

Chapter 3

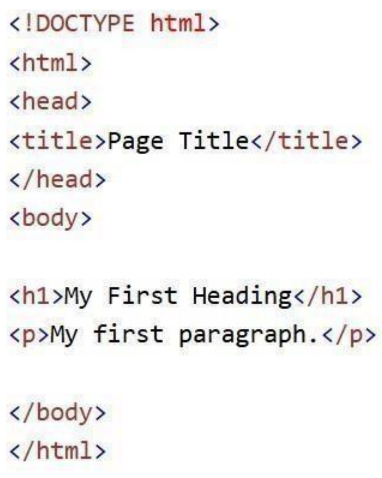
PROGRAMMING LANGUAGES

3.1 HTML

Hypertext Markup Language (HTML) is a code that defines the structure and meaning of web content. It's the most basic building block of the web and is used by web browsers to display text, images, and other multimedia on a webpage.HTML (Hypertext Markup Language) is the code that is used to structure a web page and its content. For example, content could be structured within a set of paragraphs, a list of bulleted points, or using images and data tables.

3.1.1 What is html?

HTML is the standard markup language for creating Web pages.HTML stands for Hyper Text Markup Language.HTML describes the structure of a Web page.HTML consists of a series of elements.HTML elements tell the browser how to display the content.HTML elements label pieces of content such as "this is a heading", "this is a paragraph", "this is a link", etc. A Simple HTML Document is as follows:



```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
</head>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>
```

Fig3.1.1 HTML

The <!DOCTYPE> declaration represents the document type, and helps browsers to display web pages correctly. It must only appear once, at the top of the page (before any HTML tags). The <!DOCTYPE> declaration is not case sensitive.

The <!DOCTYPE> declaration for HTML is:

<!DOCTYPE html>HTML headings are defined with the <h1> to <h6> tags. <h1> defines the most important heading. <h6> defines the least important heading.

<h1>This is heading 1</h1>

3.1.2 Attributes

HTML attributes provide additional information about HTML elements. All HTML elements can have attributes. Attributes provide additional information about elements. Attributes are always specified in the start tag. Attributes usually come in name/value pairs like: name="value"

The href Attribute

The <a> tag defines a hyperlink. The href attribute specifies the URL of the page the link goes to:

<a href="https://www.w3schools.com">Visit W3Schools</a>

The src Attribute

The <img> tag is used to embed an image in an HTML page. The src attribute specifies the path to the image to be displayed:

<img src="img_girl.jpg">

The width and height Attributes

The <img> tag should also contain the width and height attributes, which specify the width and height of the image (in pixels):

<img src="img_girl.jpg" width="500" height="600">

The alt Attribute

The required alt attribute for the <img> tag specifies an alternate text for an image, if the image for some reason cannot be displayed. This can be due to a slow connection, or an error in the src attribute, or if the user uses a screen reader.

<img src="img_girl.jpg" alt="Girl with a jacket">

The style Attribute

The style attribute is used to add styles to an element, such as color, font, size, and more.

<p style="color: red;">This is a red paragraph. </p>

The lang Attribute

You should always include the lang attribute inside the <html> tag, to declare the language of the Web page. This is meant to assist search engines and browsers. Country codes can also be added to the language code in the lang attribute.

The title Attribute

The title attribute defines some extra information about an element. The value of the title attribute will be displayed as a tooltip when you mouse over the element:

<p title="I'm a tooltip">This is a paragraph. </p>

3.1.3 Images

Let's turn our attention to the <img> element again

<imgsre="images/firefox-icon.png" alt="My test image">

As we said before, it embeds an image into our page in the position it appears. It does this via the sre (source) attribute, which contains the path to our image file. We have also included an alt (alternative) attribute. In this attribute, you specify descriptive text for users who cannot see the image, possibly because of the following reasons: They are visually impaired. Users with significant visual impairments often use tools called screen readers to read out the alt text to them.

Something has gone wrong causing the image not to display for example, try deliberately changing the path inside your src attribute to make it incorrect. If you save and reload the page, you should see something like this in place of the image.

3.1.4 Links

Links are found in nearly all web pages. Links allow users to click their way from page to page. HTML links are hyperlinks. You can click on a link and jump to another document. The HTML <a> tag defines a hyperlink. It has the following syntax:

<a herf=”url”>link here</a>

Links are very important use a simple element they are what makes the web a web! To add a link., we need to <a>- "a" being the short form for "anchor". To make text within your paragraph into a link, follow these steps:

1. Choose some text. We chose the text "Mozilla Manifesto".
2. Wrap the text in an <a> element, as shown below:
3. <a>Mozilla Manifesto</a>
4. Give the <a> element an href attribute, as shown below:
5.<a href="">Mozilla Manifesto</a>
6.Fill in the value of this attribute with the web address that you want the link to:
7. <a href="https://www.mozilla.org/en-US/about/manifesto/">MozillaManifesto</a>

You might get unexpected results if you omit the https:// or http:// part, called the protocol, at the beginning of the web address. After making a link, click it to make sure it is sending you where you wanted it to.

3.1.5 Empty Elements

Some elements have no content and are called empty elements. Take the <img> element that we already have in our HTML page.

```
<img src="images/firefox-icon.png" alt="My test image">
```

This contains two attributes, but there is no closing </img> tag and no inner content. This is because an image element doesn't wrap content to affect it. Its purpose is to embed an image in the HTML page in the place it appears.

3.1.6 Anatomy of an HTML document

That wraps up the basics of individual HTML elements, but they aren't handy on their own. Now we'll look at how individual elements are combined to form an entire HTML page. Let's revisit the code we put into our index.html example (which we first met in the Dealing with files article):

```
<!DOCTYPE html>
<html lang="en-US">
<head>
<meta charset="utf-8">
<title>My test page</title>
</head>
<body>
<imgsrc="images/firefox-icon.png" alt="My test image">
</body>
<html>
```

Here, we have the following

<!DOCTYPE html>-doctype. It is a required preamble. In the mists of time, when HTML was young (around 1991/92), doctypes were meant to act as links to a set of rules that the HTML page had to follow to be considered good HTML, which could mean automatic error checking and other useful things. However, these days, they don't do much and are basically just needed to make sure your document behaves correctly.

That's all you need to know for now.

<html></html> the <html> clement. This element wraps all the content on the entire page and is sometimes known as the root element.
<head></head> - the <head> element. This clement acts as a container for all the stuff you want to include on the HTML page that isn't the content you are showing to your page's viewers. This includes things like keywords and a page description that you want to appear in search results, CSS to style our content, character set declarations, and more.
<meta charset="utf-8"> This element sets the character set your document should use to UTF-8 which includes most characters from the vast majority of written languages. Essentially, it can now handle any textual content you might put on it.
There is no reason not to set this and it can help avoid some problems later on. <title></title> - the <title> element. This sets the title of your page, which is the title that appears in the browser tab the page is loaded in. It is also used to describe the page when you bookmark/favourite it.

3.2 CSS

CSS is the language we use to style a Web page. CSS stands for Cascading Style Sheets. CSS describes how HTML elements are to be displayed on screen, paper, or in other media.CSS saves a lot of work. It can control the layout of multiple web pages all at once. External style sheets are stored in CSS files.CSS is used to define styles for your web pages, including the design, layout and variations in display for different devices and screen sizes.

3.2.1CSS Syntax

A CSS rule consists of a selector and a declaration block. The selector points to the HTML element you want to style. The declaration block contains one or more declarations separated by semicolons. Each declaration includes a CSS property name and a value, separated by a colon. Multiple CSS declarations are separated with semicolons, and declaration blocks are surrounded by curly braces.

3.2.2 CSS History

1994: First Proposed by Hakon Wium Lie on 10th October.

1996: CSS was published on 17th November with influencer Bert Bos Later he became co-author of CSS

1996: CSS became official with CSS was published in December

1997: Created CSS level 2 on 4th November

1998: Published on 12th May

3.2.3Why Use CSS?

CSS is used to define styles for your web pages, including the design, layout and variations in display for different devices and screen sizes.

Example: body {backgroundcolor: lightblue;

}h1{ color:white;

textalign:center;} p{font-

family:verdana; font- size:

20px;}

HTML was NEVER intended to contain tags for formatting a web page!

HTML was created to describe the content of a web page, like:

<h1>This is a heading</h1>

<p>This is a paragraph.</p>

When tags like <font>, and color attributes were added to the HTML 3.2 specification, it started a nightmare for web developers. Development of large websites, where fonts and color information were added to every single page, became a long and expensive process. To solve this problem, the World Wide Web Consortium (W3C) created CSS.CSS removed the style formatting from the HTML page! CSS Saves a lot of work. The style Definitions are normally saved in external .css files. With an external stylesheet file, you can change the look of an entire website by changing just one file. Along with HTML, CSS is fundamental to web design. Without it website by changing just one file.

3.2.4 CSS Backgrounds

The CSS background properties are used to add background effects for elements. following are the css background properties:

The background-colorproperty specifies the background color of an element.

Example: body{

background-color: lightblue; }

3.2.5 Links

With CSS, links can be styled in many different ways. Links can be styled with any CSS property (e.g. color, font-family, background, etc.). In addition, links can be styled differently depending on what **state** they are in. The four links states are: **a: link** - a normal, unvisited link. **a: visited** - a link the user has visited. **a: hover** - a link when the user mouses over it. **a: active** - a link the moment it is clicked.

3.3 JAVASCRIPT

JavaScript is a scripting or programming language that allows you to implement complex features on web pages access the application, the only cost involved will be getting access to the Internet. Change both HTML and CSS. JavaScript can Calculate, manipulate and validate data.

JavaScript variables are containers for storing data values. JavaScript is a scripting language that enables you to create dynamically updating content, control multimedia, animate images, and pretty much everything else. One of many JavaScript HTML methods is getElementById().

Example: document.getElementById("demo"). inner HTML = "Hello JavaScript"; In HTML, JavaScript code is inserted between <script> and </script> tags.

3.3.1 JS Datatypes

The object data type can contain both built-in objects, and user defined objects.

Built-in object types can be:

objects, arrays, dates, maps, sets, int arrays, float arrays, promises, and more.

Example:

```
let length = 16; let weight = 7.5; let color = "Yellow"; let
lastName = "Johnson"; let x = true; let y = false; const
person = {firstName:"John", lastName:"Doe"}; const cars
= ["Saab", "Volvo", "BMW"];
const date = new Date ("2022-03-25");
```

JavaScript has dynamic types. This means that the same variable can be used to hold different data types. All JavaScript numbers are stored as decimal numbers (floating point). JavaScript is a weakly typed language (dynamically typed). JavaScript can be used for Client-side developments as well as Server-side developments. JavaScript both an imperative and declarative type of language. JavaScript contains a standard library of objects, like Array, Date, and Math, and a core set of language elements like operators, control structures, and statements. JavaScript is considered lightweight due to the fact that it has low CPU usage, is easy to implement, and has a minimalist syntax. Minimalist syntax as in, has no data types. Everything is treated here as an object. It is very easy to learn because of its syntax similar to C++ and Java.

3.3.2 JS Functions

A JavaScript function is a block of code designed to perform a particular task. A JavaScript function is executed when "something" invokes it (calls it). A JavaScript function is defined with the function keyword, followed by a name, followed by parentheses (). Function names can contain letters, digits, underscores, and dollar signs (same rules as variables) The parentheses may include parameter names separated by commas:

(parameter1, parameter2, ...)

The code to be executed, by the function, is placed inside curly brackets: {} Function parameters are listed inside the parentheses () in the function definition.

Function arguments are the values received by the function when it is invoked.

3.4 MongoDB

MongoDB is a popular, open-source, document-oriented NoSQL database used for highvolume data storage. Instead of storing data in tables and rows like traditional relational databases, MongoDB stores data in flexible, JSON-like documents, making it easier to store and manage unstructured or semi-structured data. MongoDB is designed to handle large-scale, distributed data with high performance and scalability.

3.4.1 What is MongoDB?

MongoDB is a NoSQL, document-based database management system that stores data in BSON (Binary JSON) format. It is used for building high-performance, scalable, and flexible database systems. Unlike SQL databases such as MySQL or Oracle, MongoDB does not require predefined schemas, allowing developers to store different types of data without complex table relationships.

MongoDB is meant to efficiently store large datasets and support real-time processing needs such as analytics, IoT, machine learning, and social media data processing.

3.4.2 History of MongoDB

MongoDB was developed in 2007 by Dwight Merriman and Eliot Horowitz at a company called 10gen, which is now known as MongoDB Inc. It was officially released in feb 2009 as an open-source NoSQL database.

Major releases include:

- **MongoDB 1.0 (2009):** First public release
- **MongoDB 2.0 (2011):** Performance improvements and replica sets
- **MongoDB 4.0 (2018):** Added multi-document ACID transactions
- **MongoDB 5.0 (2021):** Time-series collections and server-side encryption
- **MongoDB 7.0 (2023):** Major scalability and security upgrades

Today, MongoDB is one of the most widely used NoSQL databases in modern web and enterprise applications.

3.4.3 Characteristics of MongoDB

- Stores data in document format instead of tables and rows
- Schema-less database, flexible and easy to modify
- Horizontal scalability through sharding
- Faster read/write performance for large data sets
- Supports cloud deployment via MongoDB Atlas.

3.4.4Syntax

```
 db.students.insertOne({
name: "Rahul",
age: 21,
course: "BCA",
 skills: ["Python", "AI"]
});
```

3.4.5 Why Should we use Mongodb?

MongoDB is used because it provides great flexibility in storing and managing large and varied datasets. It handles Big Data, real-time analytics, fast search operations, and distributed applications easily MongoDB is suitable for:

Rapid application development due to schema-less structure

Real-time data processing and analysis

High traffic web applications and mobile apps

AI, ML, IoT and cloud-based applications

Storing unstructured data such as images, videos, logs, and JSON responses.

3.4.6 Application of Mongodb

MongoDB is widely used across various modern web, mobile, and enterprise applications due to its ability to store and process large amounts of unstructured and semi-structured data. It is extensively applied in real-time big data analytics, where large datasets such as IoT sensor recordings, system logs, and streaming data require fast insertion and processing. MongoDB is also used in content management systems, where flexible and frequently changing content such as articles, images, blogs, and multimedia can be stored without predefined schema restrictions. E-commerce platforms extensively use MongoDB to manage product catalogs, shopping carts, inventory and customer profiles that continuously evolve. In social media applications, MongoDB efficiently handles user-generated posts, comments, likes, and trending hashtags, supporting fast retrieval and large-scale distributed storage. Additionally, MongoDB plays a significant role in artificial intelligence and machine learning environments, where training datasets and model outputs must be handled dynamically. Many mobile applications also use MongoDB as a backend cloud database to support offline browsing and synchronization with online servers when internet connectivity resumes. Due to these capabilities, MongoDB has become an essential database for cloud-native, scalable, and data-intensive applications.

3.4.7 Advantages of MongoDB

MongoDB offers several major advantages, making it a preferred choice for modern application development. One of the most important strengths is its schema-less document structure, which provides great flexibility in storing different types of data without requiring rigid predefined tables. This makes development faster and more adaptable to changing project requirements. MongoDB also provides high performance and speed in read and write operations, making it suitable for applications handling real-time data. Another advantage is its ability to scale horizontally using sharding, allowing the database to be distributed across multiple servers and therefore supporting very large datasets without performance degradation.

The database also offers excellent support for indexing and fast queries, enabling quick retrieval of data even from complex datasets. Furthermore, MongoDB integrates easily with popular programming languages and frameworks such as JavaScript, Python, Node.js, and PHP, simplifying backend development. As a cloud-friendly database, MongoDB supports deployment on leading cloud platforms through MongoDB Atlas, offering backup, monitoring, and automatic scaling. All these advantages make MongoDB ideal for highly dynamic and high-traffic applications.

3.4.8 Disadvantages of Mongodb

Despite its many strengths, MongoDB also has certain limitations that must be considered. Since MongoDB uses a document-based structure, it generally requires more storage space and memory compared to relational databases due to data duplication and the lack of normalization. It may also be less efficient for applications requiring complex joins and transactional operations, where relational databases like MySQL or Oracle may be more effective. Although MongoDB supports transactions in recent versions, earlier versions had limited transaction capabilities, which created challenges for financial or banking systems.

Another disadvantage is the potential security risks if the database is not configured and monitored properly because open access settings can make the database vulnerable to cyber-attacks. Backup and data recovery operations can also be more complex in distributed environments using sharding. In addition, while MongoDB offers flexibility, inexperienced developers may misuse schema-less design, leading to poorly structured and inconsistent data. Due to these reasons, selecting MongoDB requires careful consideration of the type of application and long-term scalability requirements.

3.5 DATABASE

A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database

A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS). Together, the data and the DBMS, along with the applications that are associated with them. are referred to as a database system, often shortened to just database.

Data within the most common types of databases in operation today is typically modelled in rows and columns in a series of tables to make processing and data querying efficient.

The data can then be easily accessed, managed, modified, updated, controlled, and organized. Most databases use structured query language (SQL) for writing and querying data.

3.5.1 What is Structured Query Language (SQL)?

SQL is a programming language used by nearly all relational databases to query manipulate, and define data, and to provide access control. SQL was first developed at IBM in the 1970s with Oracle as a major contributor, which led to implementation of the SQL ANSI standard, SQL has spurred many extensions from companies such as IBM, Oracle, and Microsoft. Although SQL is still widely used today, new programming languages are beginning to appear.

3.5.2 Evolution of the Database

Databases have evolved dramatically since their inception in the early 1960s. Navigational databases such as the hierarchical database (which relied on a tree-like model and allowed only a one-to-many relationship), and the network database (a more flexible model that allowed multiple relationships), were the original systems used to store and manipulate data. Although simple, these early systems were inflexible. In the 1980s, relational databases became popular, followed by object-oriented databases in the 1990s. More recently. NoSQL databases came about as a response to the growth of the internet and the need for faster speed and processing of unstructured data. Today, cloud databases and self-driving databases are breaking new ground when it comes to how data is collected, stored, managed, and utilized.

3.5.3 Types of Databases

There are many different types of databases. The best database for a specific organization depends on how the organization intends to use the data.

1. **Relational databases:**

Relational databases became dominant in the 1980s. Items in a relational database are organized as a set of tables with columns and rows. Relational database technology provides the most efficient and flexible way to access structured information.

2. **Object-oriented databases:**

Information in an object-oriented database is represented in the form of objects, as in object-oriented programming.

3. **Distributed databases:**

A distributed database consists of two or more files located in different sites. The database may be stored on multiple computers, located in the same physical location, or scattered over different networks.

4.Data warehouses:

A central repository for data, a data warehouse is a type of database specifically designed for fast query and analysis.

5.NoSQL databases:

A NoSQL, or nonrelational database, allows unstructured and semi structured data to be stored and manipulated. NoSQL databases grew popular as web applications became a more common and more complex.

6.Graph database:

A graph database stores data in terms of entities and the relationships between entities

7. OLTP databases:

An OLTP database is a speedy, analytic database designed for large numbers of transactions performed by multiple users These are only a few of the several dozen types of databases in use today. Other, less common databases are tailored to very specific scientific, financial, or other functions. In addition to the different database types, changes in technology development approaches and dramatic advances such as the cloud and automation are propelling databases in entirely new directions. Some of the latest databases includes.

8. Open-source databases:

An open-source database system is one whose source code is open source; such databases could be SQL or NoSQL databases.

9. Cloud databases:

A cloud database is a collection of data, either structured or unstructured, that resides on a private, public, or hybrid cloud computing platform. There are two types of cloud database models: traditional and database as a service (DBaaS).

10. Multimodel database:

Multimodel databases combine different types of database models into a single.
integrated back end. This means they can accommodate various data types.

11. Document JSON database:

Designed for storing, retrieving, and managing document-oriented information, document databases are a modern way to store data in JSON format rather than rows and columns.

12. Self-driving databases:

The newest and most ground-breaking type of database, self-driving databases (also known as autonomous databases) are cloud-based and use machine learning to automate database tuning, security, backups, updates.

3.6 API Integration

API integration plays a central role in modern software systems, especially in applications that rely on external data sources such as news platforms, social media networks, and third-party analytics services. In the context of your project, which is an API-based news summarizer and social media trend analyzer, API integration becomes the backbone that enables communication between your application and external providers that supply real-time information. Instead of manually collecting or scraping data, the system uses APIs to automatically request and receive information in a structured format. This not only improves accuracy and reliability but also ensures that the application can handle large volumes of dynamic content such as breaking news updates, trending posts, or viral hashtags.

API integration allows your system to connect multiple independent services into one unified workflow. For example, the news summarization module communicates with news APIs to fetch the latest headlines, full articles, metadata, and publisher information. Similarly, the trend analysis module interacts with social media APIs to retrieve trending topics, engagement metrics, user sentiments, and post statistics. Because APIs follow standardized rules for communication, your system can process this external data without worrying about differences in platform design. This approach significantly reduces development time and enhances flexibility, allowing your project to support additional platforms in the future simply by integrating new APIs.

3.6.1 History and Evolution of API Integration

The concept of APIs originated in the early days of software development when systems needed ways to communicate internally. However, the popularity of web APIs significantly increased in the early 2000s when major technology companies began exposing their services to developers. Platforms such as Salesforce (2000), eBay (2000), and Amazon (2002) launched some of the earliest public APIs. Their success demonstrated the potential of enabling external applications to interact with online services programmatically.

A major milestone came in 2006 when Twitter launched its public API, which revolutionized the way developers interacted with social media data. By allowing free access to tweets, timelines, and trending topics, Twitter inspired a new wave of analytics tools, dashboards, and trend-monitoring applications. Another major breakthrough occurred in 2007 when Google introduced API-based services for YouTube, Maps, and Gmail, making real-time data integration widely accessible.

Over time, APIs evolved from basic data-sharing interfaces to sophisticated systems powered by authentication mechanisms like OAuth, rate limiting, pagination, caching, and encryption. Today, APIs are integral to cloud computing, microservices architecture, mobile app development, and data-driven decision systems. In particular, analytical and AI-based applications rely heavily on APIs to gather fresh datasets continuously. Your project follows this modern approach by using APIs as the primary data source for summarization and trend analysis.

3.6.2 Characteristics of API Integration

API integration in your project is defined by several important characteristics that make it efficient, scalable, and reliable. Unlike traditional data collection methods, APIs provide structured and predictable interactions. API responses are typically returned in machine-readable formats such as JSON or XML, allowing your system to automatically parse and process the incoming information. Additionally, APIs follow standard communication protocols such as HTTP or HTTPS, ensuring secure and consistent data transfer.

Another critical characteristic is the ability to request real-time updates. Instead of storing outdated static data, your application fetches the newest information directly from the source whenever needed. This makes your news summaries and trend analyses highly accurate and relevant. API integration also supports authentication using keys or tokens, which ensures authorized usage and prevents misuse. Most modern APIs allow pagination, filtering, sorting, and keyword-based searching, making it easier to retrieve only the data needed for summaries or trend calculations.

3.6.3 Syntax of API Requests

Although API syntax varies depending on the provider, most APIs follow a similar structure for sending requests and receiving responses. A typical API request includes the endpoint URL, query parameters, and an authentication key. Below is an example of a simple API call used to retrieve news articles:

https://newsapi.org/v2/top-headlines?country=in&apiKey=YOUR_API_KEY

Once the JSON response is received, your application extracts relevant fields such as title, content, published date, and author. This raw information is then passed to your summarization module, which generates a clean and readable summary. Similarly, API calls to social media platforms request trending posts, user interactions, or hashtag statistics for trend analysis.

3.6.4 Why Should We Use API Integration?

API integration is essential for your project because it ensures automation, scalability, and real-time access to vast quantities of information. Without APIs, your system would require manual data collection or unreliable techniques like web scraping, which are harder to maintain and often restricted. APIs offer an official and structured method to interact with data providers, ensuring reliability and compliance with platform policies. API integration enables your news summarizer to retrieve fresh articles instantly, allowing summaries to be generated within seconds. Similarly, your trend analyzer depends on API-driven insights to calculate engagement patterns, detect trending topics, and analyze user behaviors across social media networks. The ability to pull live data ensures that your project remains relevant and accurate, especially when handling time sensitive information like breaking news or emerging online trends.

Another benefit of API integration is extensibility. As your project grows, you can easily incorporate new sources or services by adding additional APIs. This flexibility allows your system to support more platforms, more categories, and more analytics features without major architectural changes. Therefore, API integration is the foundation of scalability in your application.

3.6.5 Applications of API Integration

API integration plays multiple roles within your API-based news summarizer and social media trend analyzer. The primary application is in **news collection**, where the summarizer retrieves article data such as headlines, descriptions, textual content, and reference links from external news APIs. This data is then processed using summarization algorithms, enabling the system to produce concise and meaningful summaries for users. The API also helps categorize articles based on topics like politics, sports, business, entertainment, and technology.

In the trend analysis module, API integration supports the retrieval of real-time social media data. The system gathers trending hashtags, user opinions, comments, engagement rates, and viral posts. Using this data, your application identifies patterns such as which topics are gaining popularity, how user sentiment evolves, and what types of content are becoming viral. APIs also help track public reactions to major news events, enabling cross-platform trend comparison.

Apart from data collection, API integration is used for user authentication, cloud storage, visualization tools, and machine learning services. For instance, the summarization model may rely on a cloud-based NLP API, while the trend analyzer may use an external sentiment analysis API to interpret user opinions. Thus, API integration supports both data acquisition and intelligent processing throughout your project.

3.6.6 Advantages of API Integration

API integration provides numerous advantages that enhance the efficiency and functionality of your project. One major advantage is automation, as APIs eliminate the need for manual data handling. This ensures faster processing and reduces human errors. Another benefit is accuracy because APIs deliver official and structured data directly from trusted providers. This makes your summaries and trends reliable and up to date.

Scalability is another key advantage. By using APIs, your system can easily expand to support more data sources or additional features without redesigning the entire architecture. API integration also ensures compatibility across platforms, as standardized protocols make it simple to connect with almost any service. The ability to retrieve real-time information greatly enhances the effectiveness of a trend analyzer, especially when dealing with fast-changing social media activity.

Furthermore, APIs simplify code maintenance because they provide ready-made services, reducing the need to build complex data-gathering mechanisms. This also shortens development time and accelerates deployment. API integration improves user experience by enabling faster search results, live updates, and dynamic content generation. Overall, APIs make your project more powerful, efficient, and adaptable.

3.6.7 Disadvantages of API Integration

Despite its strengths, API integration also has a few limitations that must be considered during development. One significant drawback is dependency on external services. If an API becomes unavailable, undergoes maintenance, or changes its structure, your application's data flow may be disrupted. Rate limits are another challenge, as most APIs restrict how many requests can be made within a specific time period. This can affect applications that require large volumes of data quickly.

API integration may also involve additional costs. Many providers offer only limited free usage and require payment for extended access. Authentication and security management can be complex, especially when handling API keys, OAuth tokens, or sensitive data. Another disadvantage is inconsistency among different APIs because each provider structures their data differently. This requires additional processing to standardize the data before analysis.

3.7 Tailwind CSS

Tailwind CSS is a modern, utility-first CSS framework used for designing responsive and visually appealing user interfaces without writing traditional CSS code. Unlike conventional frameworks that provide predefined components and styles, Tailwind focuses on offering small, reusable utility classes that can be directly applied within HTML. Each utility class corresponds to a specific CSS property, such as margin, padding, color, flex layout, or font styling. This approach allows developers to design interfaces faster, maintain consistency, and avoid the complexities of writing lengthy files.

In the context of an API-based news summarizer and social media trend analyzer, Tailwind CSS plays an essential role in building an intuitive, clean, and organized user interface. The system requires a layout that displays summaries, trending topics, sentiment graphs, news categories, and social media statistics in an attractive manner. Tailwind allows developers to create such layouts by combining utility classes quickly, ensuring that the application is both visually appealing and responsive across different devices.

3.7.1 Characteristics of Tailwind CSS

Tailwind CSS is distinguished by several unique characteristics that set it apart from other front-end frameworks. Its utility-first approach allows developers to style applications solely through predefined classes, ensuring neat, predictable, and easily maintainable code. Many developers appreciate that Tailwind eliminates the need for writing custom CSS files, thereby reducing complexity and chances of conflict. The framework also provides an extensive collection of utility classes covering typography, spacing, borders, colors, shadows, flexbox, grid, animations, and many other styling features. Another characteristic of Tailwind is its highly configurable nature. The entire framework can be customized through a configuration file, enabling developers to define colors, spacing scales, breakpoints, and themes according to project requirements. Tailwind's Just-In-Time engine generates only the utilities that are used within the project, ensuring superior performance. This makes Tailwind ideal for lightweight, large-scale, or performance-sensitive applications.

Responsiveness is also an integral feature of Tailwind CSS. The framework includes built in responsive breakpoints, allowing developers to effortlessly create layouts that adapt to different screen sizes. This ensures a seamless user experience across desktops, tablets, and mobile devices, which is particularly important for web applications that deliver real time data, such as your news summarizer and trend analyzer.

3.7.2 Applications of Tailwind CSS in the Project

Tailwind CSS plays multiple roles in your project's user interface development. It provides a structured way to design dashboards that display news summaries, trending hashtags, sentiment charts, user inputs, search bars, and category filters. The clean and organized layout helps users easily navigate through summaries and analytics without confusion.

Tailwind enables the creation of responsive cards for displaying article summaries, making them visually appealing and readable across different device sizes. Trend analysis charts, graphs, and data lists benefit from Tailwind's spacing, typography, and color utilities, which improve readability and highlight important information. Tailwind CSS is also used to develop interactive components such as navigation bars, dropdown menus, buttons, and tab sections. These components enhance usability and allow users to switch between summaries, trends, categories, and saved content effortlessly. Because Tailwind supports reusable design patterns, developers can maintain a uniform design throughout the project, giving the entire system a professional and polished appearance.

3.7.3 Advantages of Tailwind CSS

Tailwind CSS offers numerous advantages that improve both development efficiency and user interface quality. Its utility-first approach allows for rapid styling without writing custom CSS, significantly reducing development time. The framework ensures consistent styling across all components, preventing design irregularities. Tailwind’s Just-In-Time compiler optimizes performance by generating only the necessary CSS, resulting in smaller bundle sizes and faster load speeds.

3.7.4 Disadvantages of Tailwind CSS

Despite its many strengths, Tailwind CSS has a few limitations that developers must consider. One common challenge is that HTML files can become crowded with numerous utility classes, making them appear lengthy or cluttered. Another disadvantage is the learning curve associated with memorizing utility classes. New users may need time to understand the naming conventions, spacing scales, and responsive prefixes. Additionally, customization through the configuration file requires familiarity with JSON-like syntax, which might be challenging for inexperienced developers.

3.7.5 Importance of Tailwind CSS

Tailwind CSS is particularly important for modern web applications due to its ability to streamline development, ensure consistency, and reduce code redundancy. In applications like a news summarizer and trend analyzer, where readability and layout clarity are essential, Tailwind enables rapid development of clean, user-friendly interfaces. Instead of spending hours creating custom CSS styles, developers can immediately apply utility classes and focus more on functionality.

Tailwind reduces the risk of style duplication that commonly occurs in traditional CSS development. Because all styling is centralized in utility classes, developers avoid writing repetitive code, thus improving overall maintainability. Tailwind’s responsive design capabilities are essential for applications expected to run on mobile devices, tablets, and desktops. This is crucial for users who access summaries and trend analytics on the go. Moreover, Tailwind’s performance-optimized architecture ensures faster page load times, which significantly enhances user experience. In data-driven applications that continuously update real-time content, efficient styling helps maintain smooth performance, which is important for long-term usability.

Chapter 4

DESIGN

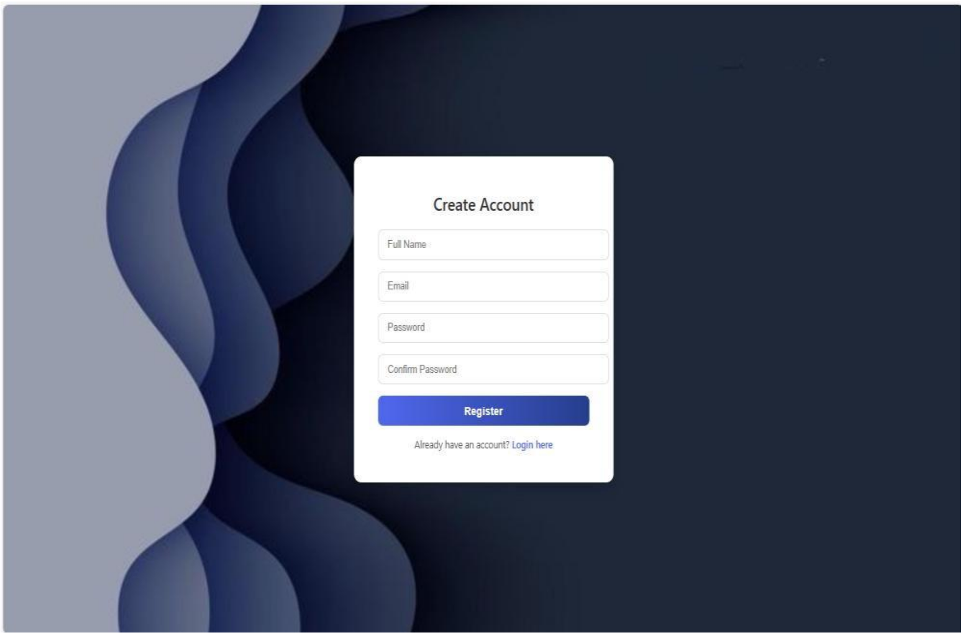
4.1 User Interface Design and Implementation

The User Interface (UI) Design and Implementation plays a central role in the Social Media Summarization and Trend Analyzer system. A well-designed UI ensures that users can easily access summarized content, understand emerging trends, and interact with the system efficiently. Since the purpose of the project is to handle large volumes of social media data and present it in a meaningful, concise manner, the interface must be clear, intuitive, and visually informative.

4.1.1 Register Page

The Register Page is a crucial component of the Social Media Summarization and Trend Analyzer system. It allows new users to create an account, ensuring secure access to personalized dashboards, saved summaries, and trend alerts. A well-designed registration interface contributes to user experience, data security, and overall system credibility. The design incorporates user-friendly elements such as placeholders, labels, and clearly visible input fields so users can easily understand what information is required. Password creation plays a significant role in the registration process, and the interface is designed to guide users toward choosing a strong and secure password. This is done by including real-time validation that checks password strength, ensures the confirmation password matches, and notifies the user of any missing requirements. The system also validates the email format, checks for existing usernames, and provides error messages that appear immediately when a user enters incorrect or incomplete information. These validations prevent mistakes early and reduce the chances of the user facing errors after submitting the form.

To improve usability further, the Register Page includes clear navigation links such as a redirect option for users who already have an account to go to the Login Page. Some implementations of the registration system may also offer additional features such as OTP-based email verification, CAPTCHA to prevent bot signups, or social media-based registration options like Google or Facebook login. While these are not mandatory, they increase security and reliability for a system that handles sensitive data such as user preferences and trend analysis histories.



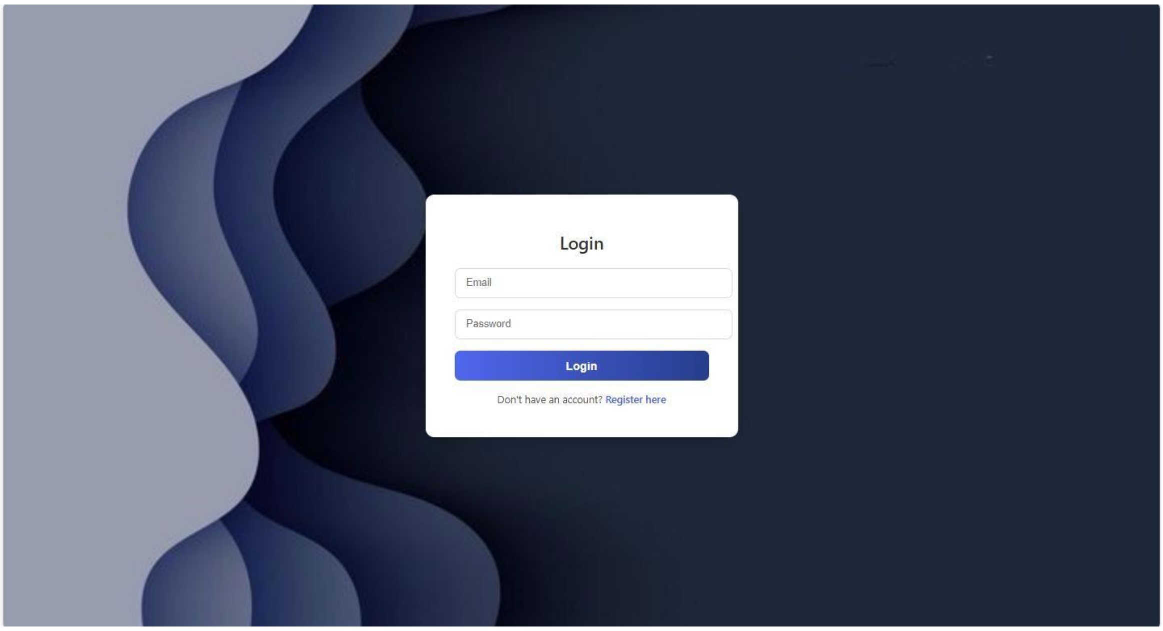
Create Account

Already have an account? Login here

Fig 4.1.1: Register Page

4.1.2 Login Page

The Login Page is a fundamental part of the Social Media Summarization and Trend Analyzer system, as it acts as the secure gateway through which registered users access their personalized dashboards, summaries, and trend analytics. A well-designed login interface ensures that the system remains protected from unauthorized access while maintaining a smooth and user-friendly experience for genuine users. The page typically contains two essential input fields username or email, and password both presented in a clean and organized manner to minimize confusion. The simplicity of the Login Page is intentional, as users should be able to sign in quickly without facing unnecessary complexity. The interface uses clear labels, placeholders, and proper spacing so that users immediately understand what credentials they need to enter. To enhance usability, the Login Page includes real-time validation that alerts users when they enter an invalid email format or leave required fields empty. Error messages appear in a clear and friendly manner, guiding users to correct mistakes such as entering a wrong password or using an unregistered email. In some implementations, the system may also display a “Show Password” option, allowing users to view their typed password to avoid typing errors. The Login Page often includes a “Forgot Password” link, enabling users to recover their account by resetting the password through email verification or an OTP system. This recovery feature ensures users are not locked out of the system and supports long-term user retention as shown in figure 4.1.2



Login

Email

Password

Login

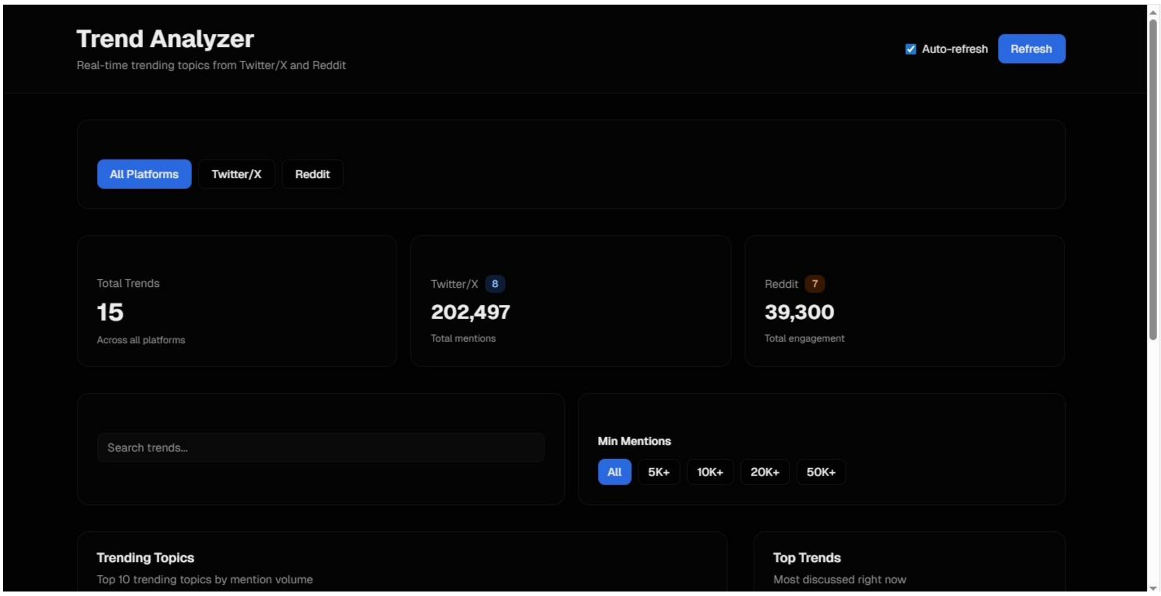
Don't have an account? Register here

Fig 4.1.2: Login Page

4.1.3 Home Page:

The Home Page of the Social Media Summarization and Trend Analyzer system serves as the central hub from which users begin their interaction with the platform. It is designed to provide an immediate overview of the system's purpose, core features, and the latest social media insights in a clear and engaging manner. As soon as a user logs in, they are greeted with a visually appealing and well-organized interface that reflects the overall theme and identity of the platform. The Home Page establishes the first impression, so it emphasizes simplicity, clarity, and accessibility. The layout typically includes a welcoming message, a brief description of the system, and quick access tiles or buttons that direct users to major sections such as Trend Analysis, Summary Generator, User Profile, and Settings. The design ensures that users can quickly understand the platform's capabilities and effortlessly navigate to the feature they need. One of the key elements of the Home Page is the display of real-time or recent social media trends. This section highlights trending hashtags, popular topics, or emerging discussions across different social media platforms. These trends may be shown through graphical widgets, scrolling text, or compact cards that give users a quick sense of what is happening online. The interface may also include a short "Latest Summary Highlights" area, where the most recent summarized content generated through the system’s NLP algorithms is presented in a concise and readable manner. Such highlights allow users to instantly view important discussions without having to search manually, making the system more efficient and user-friendly.

In addition to displaying trends and summaries, the Home Page also includes interactive visual elements such as charts, graphs, or word clouds that depict highlevel analytics. These visual summaries may represent sentiment distribution, popularity growth of keywords, or comparative trends. By presenting complex data in simple visual formats, the Home Page helps users grasp patterns, spikes, or anomalies in social media discussions at a glance. Proper spacing, contrasting colors, and readable fonts enhance the visual appeal and prevent the page from appearing cluttered. After logged in opens Home page as shown in figure 4.1.3. Security and personalization also play an important role in shaping the Home Page. Depending on the user’s profile and preferences, the system may display customized recommendations, saved alerts, or recent activities. This level of personalization enhances the user experience and encourages repeated engagement with the platform. Over all, the Home Page is not just a welcome screen but a powerful control centre that guides users, summarizes system capabilities, provides instant insights, and acts as the starting point for deeper analysis within the Social Media Summarization and Trend Analyzer system.



Trend Analyzer

Real-time trending topics from Twitter/X and Reddit

☑ Auto-refresh

Total Trends 15 Across all platforms

Twitter/X 8 202,497 Total mentions

Reddit 7 39,300 Total engagement

Search trends...

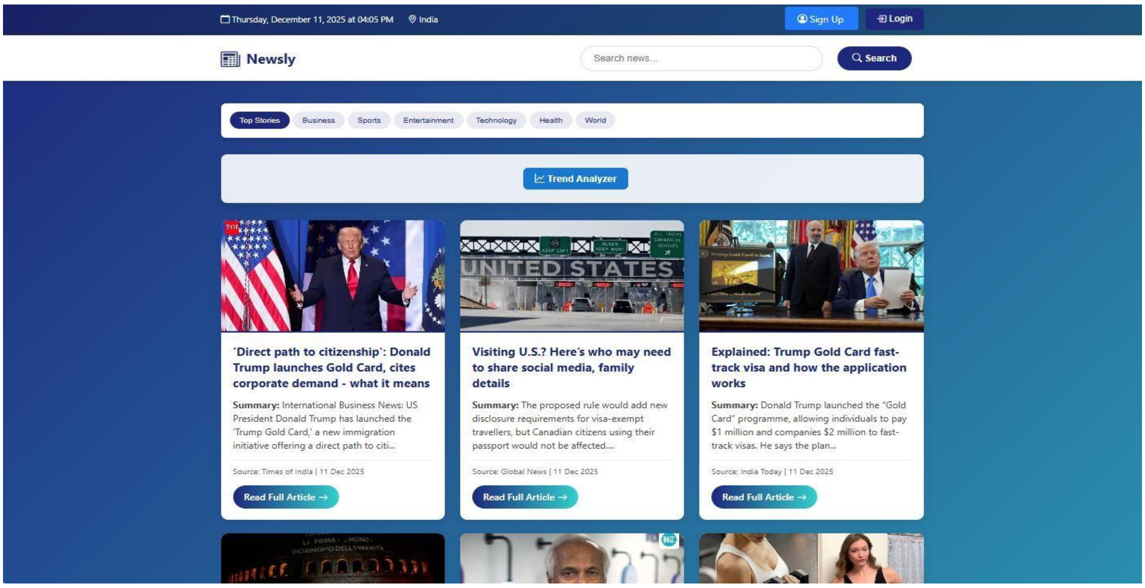
Min Mentions

Trending Topics

Top 10 trending topics by mention volume

Top Trends

Most discussed right now



'Direct path to citizenship': Donald Trump launches Gold Card, cites corporate demand - what it means

Summary: International Business News: US President Donald Trump has launched the 'Trump Gold Card,' a new immigration initiative offering a direct path to citi...

Source: Times of India | 11 Dec 2025

Visiting U.S.? Here's who may need to share social media, family details

Summary: The proposed rule would add new disclosure requirements for visa-exempt travellers, but Canadian citizens using their passport would not be affected....

Source: Global News | 11 Dec 2025

Explained: Trump Gold Card fast-track visa and how the application works

Summary: Donald Trump launched the "Gold Card" programme, allowing individuals to pay $1 million and companies $2 million to fast-track visas. He says the plan...

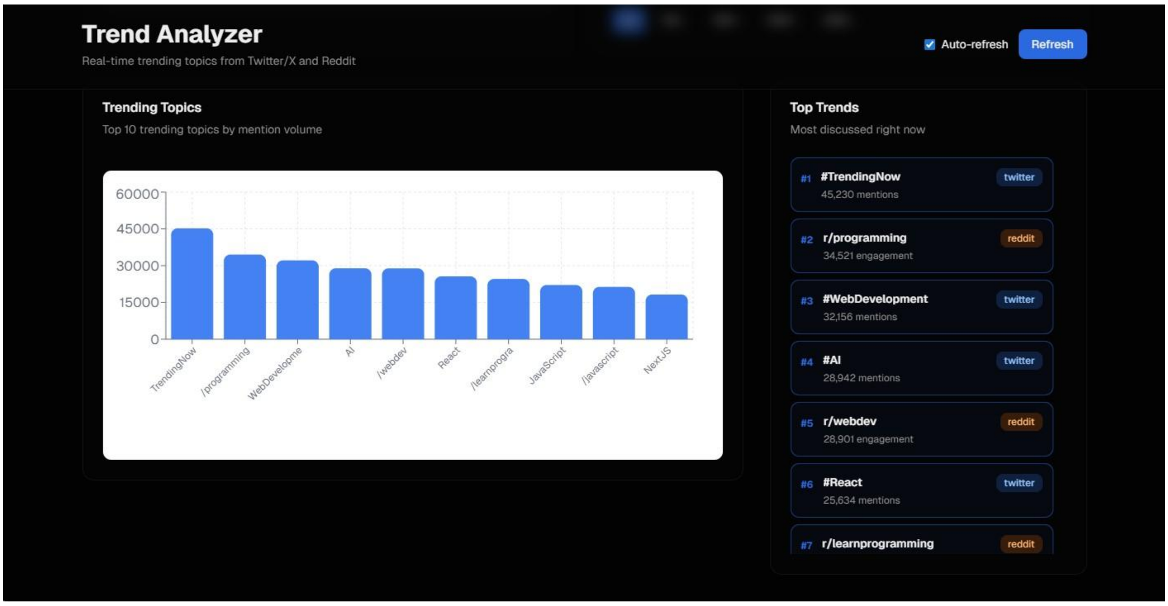
Source: India Today | 11 Dec 2025

Fig 4.1.3: Home Page

4.1.4 Course Page

The Course Page in the Social Media Summarization and Trend Analyzer system is designed to provide users with educational material, tutorials, or guidance related to using the platform effectively. Although the primary purpose of the project is to analyse social media trends and generate summaries, the Course Page plays a supportive role by offering structured learning content that helps users understand different features, data analysis methods, and the overall workflow of the system. This page serves as a knowledge hub for new users, researchers, marketers, and students who may need step-by-step instructions to use trend analysis tools or understand how NLP-based summarization works. The Course Page is created with the aim of making the platform more user-friendly, especially for individuals who are new to social media analytics or data interpretation.

The design of the Course Page emphasizes readability and organization. Instead of overwhelming users with dense information, the content is presented in a clean, structured format with proper headings, subheadings, and short descriptions. The page typically includes sections such as video tutorials, text-based guides, feature explanations, and examples of real-world social media analysis. For instance, the Course Page might have modules explaining how to search for trends, how to apply filters, how sentiment analysis works, or how summaries are generated using natural language processing techniques. These modules provide practical guidance so users can confidently navigate through the system's advanced tools. Some implementations also divide the content into beginner, intermediate, and advanced levels to meet the needs of different types of users.



Trend Analyzer

Real-time trending topics from Twitter/X and Reddit

☑ Auto-refresh

Trending Topics

Top 10 trending topics by mention volume

Top Trends

Most discussed right now

#1 #TrendingNow 45,230 mentions twitter

#2 r/programming 34,521 engagement reddit

#3 #WebDevelopment 32,156 mentions twitter

#4 #AI 28,942 mentions twitter

#5 r/webdev 28,901 engagement reddit

#6 #React 25,634 mentions twitter

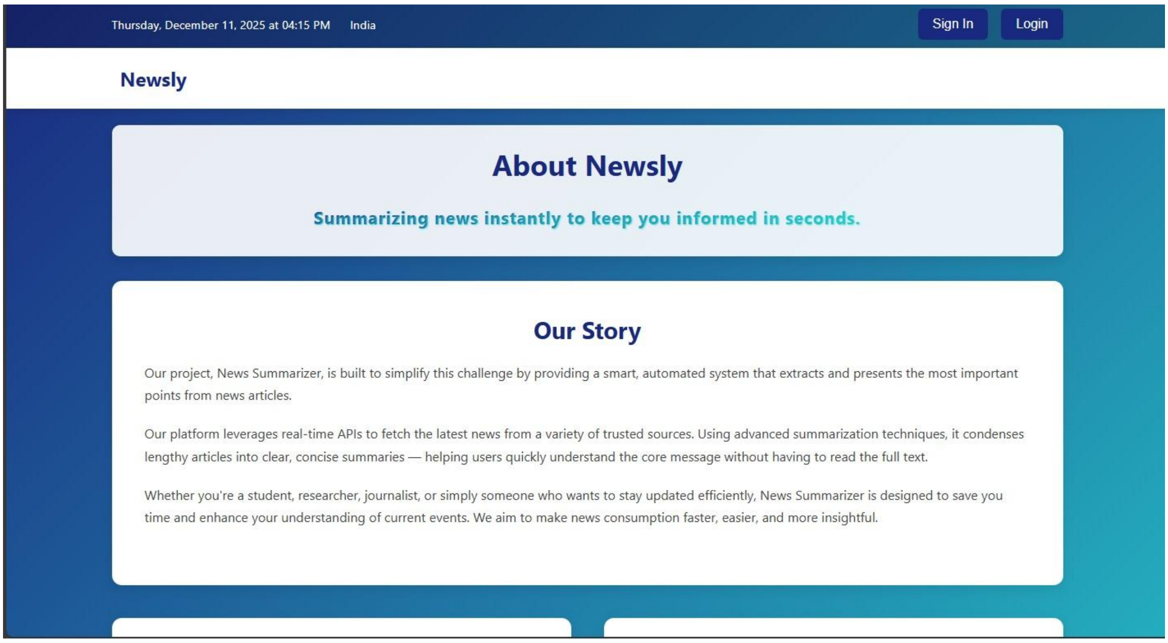
#7 r/learnprogramming reddit

Fig 4.1.4: Course Page

4.1.5 About Us Page

The About Us Page of the Social Media Summarization and Trend Analyzer system serves as an important informational section that introduces users to the purpose, vision, and background of the project. It is designed to give users a clear understanding of what the platform aims to achieve, why it was developed, and the team or organization behind its creation. This page helps build trust and credibility by explaining the motivation behind the system, highlighting its core objectives, and showcasing the values that guide its development. A well-crafted About Us Page reassures users that the platform is reliable, transparent, and created with a genuine intention to simplify social media data interpretation.

The content of the About Us Page typically begins with an overview of the system, explaining that the Social Media Summarization and Trend Analyzer is a technological solution created to help users process large volumes of social media information with ease. It describes how social media generates massive amounts of data every second, making it difficult for users, organizations, and researchers to keep track of trending topics and ongoing discussions. The page explains that the platform was developed to address this challenge by providing tools for summarizing long posts, identifying trends, analysing The About Us Page also highlights the mission and vision behind the platform. The mission is usually described as empowering users by giving them access to simplified, meaningful insights extracted from complex social media data. The vision may focus on creating a smarter, data-driven environment where anyone—from students and professionals to researchers and businesses can easily understand online discussions without manually browsing through thousands of posts. This helps users understand the broader goal of the platform and the long-term impact it aims to create shown in figure 4.1.5



About Newsly

Summarizing news instantly to keep you informed in seconds.

Our Story

Our project, News Summarizer, is built to simplify this challenge by providing a smart, automated system that extracts and presents the most important points from news articles.

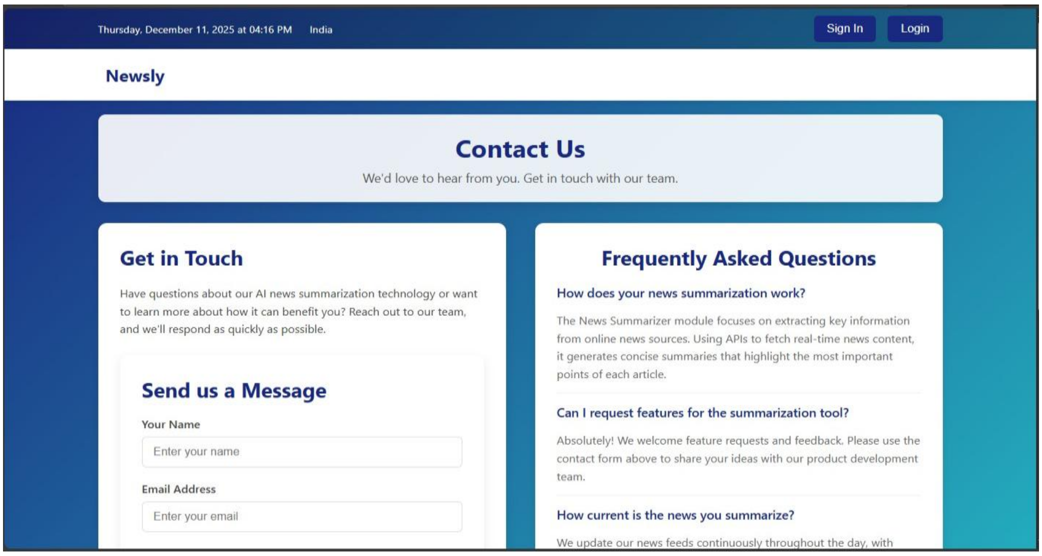
Our platform leverages real-time APIs to fetch the latest news from a variety of trusted sources. Using advanced summarization techniques, it condenses lengthy articles into clear, concise summaries — helping users quickly understand the core message without having to read the full text.

Whether you're a student, researcher, journalist, or simply someone who wants to stay updated efficiently, News Summarizer is designed to save you time and enhance your understanding of current events. We aim to make news consumption faster, easier, and more insightful.

Figure 4.1.5 About Us Page

4.1.6 Contact us Page

The Contact Us Page of the Social Media Summarization and Trend Analyzer system is designed to provide users with a direct and convenient way to communicate with the development team or support staff. This page serves as a bridge between the platform and its users, offering assistance, feedback channels, and opportunities for queries or technical support. Since users may sometimes face issues while navigating the system, encounter technical errors, or require clarification about certain features, the Contact Us Page plays an essential role in maintaining user satisfaction and trust. It reflects the platform's commitment to responsiveness, transparency, and excellent user experience. The content of the Contact Us Page generally begins with a warm and welcoming message encouraging users to reach out whenever they need help. This introduction creates a friendly environment and reassures users that their questions and suggestions are valued. The page includes a structured contact form where users can enter their name, email address, subject, and message. The content of the Contact Us Page generally begins with a warm and welcoming message encouraging users to reach out whenever they need help. This introduction creates a friendly environment and reassures users that their questions and suggestions are valued. The page includes a structured contact form where users can enter their name, email address, subject, and message. This form is designed in a clean and organized layout to ensure easy readability and quick filling. The fields are clearly labeled, and placeholder text guides users on the type of information they should provide. A dedicated submit button allows users to send their messages instantly, and confirmation messages inform them once their inquiry has been successfully submitted. In addition to the contact form, the Contact Us Page may also display other communication channels such as email addresses, phone numbers, or social media links. These details offer users alternative methods to reach the support team, especially if their queries are urgent or require instant attention. Some implementations include office addresses, working hours, or a map section if the platform is associated with an institution or organization. Providing multiple contact options enhances accessibility and gives users confidence that help is available whenever needed.



Contact Us

We'd love to hear from you. Get in touch with our team.

Get in Touch

Have questions about our AI news summarization technology or want to learn more about how it can benefit you? Reach out to our team, and we'll respond as quickly as possible.

Send us a Message

Your Name: Enter your name

Email Address: Enter your email

Frequently Asked Questions

How does your news summarization work?

The News Summarizer module focuses on extracting key information from online news sources. Using APIs to fetch real-time news content, it generates concise summaries that highlight the most important points of each article.

Can I request features for the summarization tool?

Absolutely! We welcome feature requests and feedback. Please use the contact form above to share your ideas with our product development team.

How current is the news you summarize?

We update our news feeds continuously throughout the day, with

Figure 4.1.6 Contact Us Page

Chapter 5

FEATURES AND FUNCTIONALITY

The Social Media Summarization and Trend Analyzer system offers a range of advanced features and functionalities designed to simplify the process of understanding large volumes of online content. The primary objective of the system is to help users efficiently capture the essence of social media discussions, identify realtime trends, and generate meaningful insights from vast streams of data. The core functionality of the platform revolves around its ability to gather posts, comments, and hashtags from multiple social media platforms and transform this raw information into clean, digestible summaries using (API) techniques.

5.1 User Registration and Profiles

Sign-up/Login: The Sign-up and Login module provides secure access control and personalized usage of the Social Media Summarization and Trend Analyzer system. This feature ensures that only registered users can access the dashboard, save their searches, and view customized trend insights. The Sign-up functionality allows new users to create an account by providing essential details such as name, email address, and password.

User Profiles: The User Profiles module plays an essential role in personalizing the experience within the Social Media Summarization and Trend Analyzer system. Once users create an account, a unique profile is generated for them, allowing the system to store and organize their preferences, search history, saved summaries, and frequently followed trends. The profile page acts as a personalized space where users can manage their information, update personal details, and control privacy settings. This module ensures that every interaction a user has with the platform is tailored to their needs, making the overall experience more intuitive and user-centric.

Role-based Access: Different Role-based access is an important security and management feature in the Social Media Summarization and Trend Analyzer system. It ensures that users interact with the platform according to their assigned roles, preventing unauthorized access to sensitive features or administrative controls. By categorizing users into different group such as regular users, premium users, analysts, and administrators the system can regulate what each individual is allowed to view, modify, or manage. This structured approach improves the organization, security, and overall efficiency of the platform.

In this system, regular users typically have access to basic functionalities such as performing searches, generating summaries, and viewing general trends. Premium or advanced users may receive additional privileges, including deeper analytics, customized dashboards, or advanced trend prediction features. Analysts or content experts may have permissions to review trending topics, monitor system performance, or verify the accuracy of summaries. Administrators hold the highest level of access, allowing them to manage user accounts, update system settings, review logs, and maintain platform security.

5.2 Course CatLog and Search

The Course Catalog and Search feature provides users with an organized and easy-tonavigate collection of all available learning resources within the Social Media Summarization and Trend Analyzer platform. This section acts as a digital library where users can browse through courses related to social media analytics, natural language processing, trend prediction, data visualization, and other relevant topics. Each course is presented with essential information such as title, description, duration, difficulty level, and learning outcomes, allowing users to make informed decisions about what they want to study. The catalog is designed to be visually clear and userfriendly, ensuring that even new users can quickly explore courses and identify the content that matches their interests or skill levels.

5.3 Course Creation and Management

The Course Creation and Management module serves as the backbone of the educational component in the Social Media Summarization and Trend Analyzer system. It provides instructors with a dedicated dashboard where they can design, structure, and oversee their courses with ease. Through the instructor dashboard, educators can create new courses, update existing ones, upload learning resources, and define course objectives to guide learners effectively. This centralized interface allows instructors to maintain full control over the content they deliver, ensuring that course material remains relevant, accurate, and aligned with the learning goals of the platform.

A key feature of this module is the ability to organize course content into structured modules. Instructors can divide courses into lessons, units, or weekly segments, each containing videos, reading materials, quizzes, or assignments. This modular structure helps learners progress in a step-by-step manner, improving both clarity and retention of information. It also allows instructors to update or rearrange modules without disrupting the overall course flow, making course maintenance simple and efficient.

The platform supports a wide range of multimedia content to enhance the learning experience. Instructors can upload video lectures, audio recordings, PDFs, slides, infographics, and even host live interactive sessions. This flexibility ensures that learners receive diverse and engaging instructional material, catering to varied learning styles. Additionally, the system offers tools for creating and managing assessments such as quizzes, tests, and assignments. These assessments allow instructors to evaluate student understanding, track progress, and provide personalized feedback.

5.4 Learning Path and Progress Tracking

The Learning Path and Progress Tracking module plays a crucial role in guiding users through a structured and personalized learning experience within the Social Media Summarization and Trend Analyzer platform. This feature ensures that learners follow a clear sequence of topics, moving step-by-step from basic concepts to advanced skills. The learning path can be customized based on the user's goals, such as understanding social media analytics, mastering summarization techniques, or exploring trend prediction models. By offering a guided approach, the system reduces confusion, keeps learners focused, and provides a sense of direction throughout their learning journey.

Progress tracking complements the learning path by continuously monitoring the user's performance and completion status. As learners watch videos, read lessons, attempt quizzes, or submit assignments, the system automatically updates their progress indicators. Visual progress bars, completion percentages, and module-wise status help users understand how much they have learned and what tasks remain. This real-time tracking motivates learners to stay consistent and complete their courses on time. It also helps users identify areas where they may need additional practice or revision.

Instructors and administrators can also view students' progress through this module, allowing them to offer timely support, feedback, or intervention when necessary. For users enrolled in multiple courses, the platform provides a consolidated dashboard summarizing their overall learning activities. This makes it easy to manage different courses simultaneously while maintaining clarity on individual progress. By combining structured learning paths with detailed tracking tools, the system ensures an organized, engaging, and self-paced learning experience that enhances both user satisfaction and long-term knowledge retention.

5.5 Technical Support and FAQs

The Technical Support and FAQs section of the Social Media Summarization and Trend Analyzer system is designed to provide users with immediate assistance and guidance, ensuring smooth and uninterrupted use of the platform. This feature serves as the first line of support, helping users resolve common issues independently without the need to contact the support team. The FAQ section contains a well-organized list of frequently asked questions covering topics such as account creation, login issues, navigation tips, using trend analysis tools, and interpreting summarized content. By presenting answers in a clear and concise manner, the system empowers users to quickly troubleshoot problems, improving their overall experience and reducing frustration.

In addition to static FAQs, the Technical Support component offers interactive support channels, such as email contact forms, live chat options, or ticketing systems, allowing users to report complex problems directly to the support team. Users can submit inquiries, describe their issues in detail, and receive personalized responses from trained support personnel. This ensures that problems beyond the scope of the FAQ section are addressed promptly and effectively. The system may also include self-help resources like video tutorials, step-by-step guides, and troubleshooting tips to assist users in resolving technical challenges independently.

The combination of FAQs and technical support enhances the platform's usability by making help resources easily accessible and comprehensive. It reduces downtime caused by errors, fosters user confidence, and encourages continued engagement with the system. By integrating these support features seamlessly into the interface, the Social Media Summarization and Trend Analyzer ensures that all users, regardless of their technical expertise, can navigate the platform effectively and take full advantage of its analytics, summarization, and trend detection capabilities.

CONCLUSION

The API-Based News Summarizer and social media Trend Analyzer project demonstrates the transformative potential of artificial intelligence in managing and interpreting large volumes of digital information. In today's fast-paced world, individuals often struggle to filter vast amounts of online content and identify meaningful insights. This system addresses that challenge by integrating machine learning models to automatically summarize lengthy news articles and analyze realtime trends emerging across social media platforms. By extracting key points, detecting public sentiment, and presenting concise, relevant information, the solution enhances user understanding and supports quicker decision-making. The system not only improves information accessibility but also contributes to reducing misinformation and digital overload, enabling users to stay updated efficiently and accurately. This project highlights the growing role of AI in media analytics and demonstrates how technology can simplify complex information processing while offering a more intelligent and user-centric information environment.

➢Scope for Future Work

The scope for future advancement of this project is extensive, especially with the rapid evolution of artificial intelligence, machine learning, and big data analytics. The system may be expanded with more sophisticated deep learning models such as transformer-based architectures for even more accurate summarization and sentiment detection. Additional multilingual support could enable users worldwide to access summarized information in their preferred languages. Integration of real-time dashboards, predictive analytics, and visual data representation will further enhance usability and support data-driven decision-making. The implementation of voice-based summaries, personalized content recommendations, and trend forecasting features could provide a more interactive and customized experience. Moreover, incorporating fact-checking modules, fake-news detection techniques, and credibility scoring mechanisms would strengthen reliability and combat misinformation more effectively. With these future enhancements, the system has the potential to evolve into a comprehensive intelligent media analytics platform capable of revolutionizing how people consume and understand digital information.

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