

AI-Powered Multi-Platform Management & Insights



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Abstract

In the fast-moving digital age, social media is now a vital instrument for communication and branding, as well as user engagement. Entities and thought leaders with multiple accounts across the likes of Facebook, Instagram, YouTube, and X (Twitter) are the norm rather than the exception. However, managing accounts individually causes inefficiency and wasted efforts and also increases the risk of human errors. In addition, pulling out actionable insights and evaluating audience behavior without the benefit of integrated analytics is a big pain point. There seems to be little in the way of solutions that integrate sentiment analysis in real time, trend analysis, cross-platform content scheduling, and data-driven recommendations on one unified system.

A new social media analytics tool called SocialSight will offer AI technology in order to improve the way that small business owners manage their social media presence as well as gain insights from social media. Users will be able to use SocialSight to post and schedule messages on multiple social media sites (such as Facebook, Twitter, etc.) using a single platform. Users will also have the ability to view engagement statistics for each of their social media sites and analyze sentiment and trends in real time using Hugging Face APIs. In addition, the content calendar in SocialSight will include features such as a calendar view to allow users to plan out their content and a dashboard to allow users to view all of the metrics related to their social media presence at once. Finally, SocialSight will include the functionality to provide users with intelligent recommendations based on the user's audience demographics and preferences in order to optimize engagement and overall effectiveness of their content. As a result of SocialSight's object-oriented programming design, SocialSight is easily scalable and capable of integrating with future social media platforms. SocialSight provides a secure experience for its users through the use of OAuth 2.0 Authentication, JWT API Protection, middleware to prevent various web attacks and other technologies to ensure that SocialSight remains a safe and reliable experience for users.

SocialSight optimizes social media workflows and provides decision makers with superior insight to increase their productivity and the quality of their community engagement through a unique combination of intelligent automation, predictive analytics and interactive visualizations. The early results are very promising and indicate that the platform leveraged automation and analytics insights to drive improvements in content performance while saving time. Multi-user collaboration, advanced AI-based data analytics, gamification (gaming-like experience), and multi-language support are a few of the functionalities that SocialSight is looking to include as part of its future roadmap. Briefly, it is an end-to-end, fully scalable, social media management solution that encompasses strategy, analytics and content development within one very user-friendly interface.

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“Everybody should learn to program a computer, because it teaches you how to think.”

Steve Jobs, Former CEO and Creator of Apple Inc.

Contents

Abstract	i
1 Introduction	1
1.1 Project Background	1
1.2 Problem Description	2
1.3 Objectives	3
1.4 Scope	4
1.4.1 Inclusions	4
1.4.2 Target Users	4
1.4.3 Exclusions	4
1.4.4 Boundaries	5
1.5 Potential Impact	5
1.6 Project Features	5
2 Literature Review	7
2.1 Traditional Methods	7
2.1.1 Features of Traditional Methods:	7
2.1.2 Limitations:	8
2.2 Trends in Social Media Platform Usage (2020–2025)	8
2.2.1 Evolution and Growth Patterns	8
2.2.2 AI-Driven Engagement and Marketing Shifts	8
2.3 Comparative Study	9
2.4 Analysis of Existing Tools	12
2.4.1 Hootsuite	12
2.4.2 Buffer	13
2.4.3 SocialPilot	13
3 Requirement Specification	15
3.1 Existing System	15
3.1.1 Limitations of Existing Systems	15
3.2 Proposed System	16
3.2.1 Features of the Proposed System	16
3.3 Requirement Specifications	17
3.3.1 Functional Requirements	17
3.3.2 Non-Functional Requirements	19
3.4 Use Cases	20
3.5 Descriptive Use Cases	21

3.5.1	User Manages Social Accounts	21
3.5.2	Post Scheduling and Publishing	22
3.5.3	Analytics and Insights	22
3.5.4	Sentiment Analysis of Comments	23
3.5.5	Post Comparison	23
4	Design	24
4.1	System Architecture	24
4.2	Design Constraints	25
4.3	Development Methodology	26
4.4	Design Methodology	27
4.5	Activity Diagram	28
4.6	High-Level Design	29
4.6.1	Component Diagram	29
4.6.2	Deployment Diagram	30
4.7	Sequence Diagram	32
4.7.1	User Authentication Process (Login/Signup)	32
4.7.2	Post Management Process	33
4.7.3	Analytics Retrieval Process	35
4.7.4	Sentiment Analysis Process	35
4.7.5	Post-Comparison Process	36
4.8	Platform-Specific Posting Flows	37
4.8.1	Facebook Page Posting Flow	37
4.8.2	Instagram Posting Flow	39
4.8.3	YouTube Video Posting Flow	41
4.8.4	Twitter Posting Flow	43
4.9	Low-Level Design	45
4.9.1	Entity Relationship Diagram	45
4.10	GUI Design	46
4.10.1	Landing Page	46
4.10.2	Sign Up / Sign In Page	47
4.10.3	Dashboard Page	48
4.10.4	Post Management Page	48
4.10.5	Content Calendar Page	49
4.10.6	Draft Page	50
4.10.7	Analytics Page	51
4.10.8	Sentiment Analysis Page	52
4.10.9	Comparison Page	52
4.10.10	Connection Page	53
4.10.11	Settings Page	54
5	System Implementation	56
5.0.1	System Internal Components	57
5.0.2	Functionality of Components	57
5.0.3	Component Communication	63
5.1	Tools and Technology Used	65
5.1.1	Technologies Used	65

5.1.2	Tools Used	65
5.2	Application Access Security	66
6	System Testing and Evaluation	67
6.1	Introduction	67
6.2	Performance Testing	67
6.2.1	Overall System Performance Testing	68
6.3	Usability Testing	69
6.3.1	Registration	69
6.3.2	Login	70
6.3.3	Publishing	70
6.3.4	Draft Management	71
6.3.5	Social Account Connection	71
6.3.6	Theme Toggle	72
6.3.7	Notifications	72
6.3.8	User Information Updates	73
6.4	Security Testing	73
6.4.1	2FA Enforcement	74
6.4.2	JWT Token Validation	74
6.4.3	HTTPS Enforcement	75
6.5	Frontend Testing with Google PageSpeed Insights	75
6.5.1	PageSpeed Insights Audit	75
6.5.2	PageSpeed Insights Test for Desktop	76
6.5.3	PageSpeed Insights Test for Mobile Devices	76
6.6	Evaluation Summary	76
7	Conclusion	77
7.1	Final Reflections and Key Insights	77
7.2	Future Enhancements	78
7.2.1	Multi-platform Expansion	78
7.2.2	Advanced AI Features	78
7.2.3	Collaboration & Team Management	79
7.2.4	Enhanced Analytics & Reporting	79
7.2.5	Payment Gateway Integration	79
	Appendix A: User Manual	80
	References	83

List of Figures

2.1	Hootsuite	12
2.2	Buffer	13
2.3	SocialPilot	14
3.1	Use Case of AI-Powered Multi-Platform Management & Insights	20
4.1	Lifecycle of AI-Powered Multi-Platform Management & Insights	26
4.2	Activity Diagram of AI-Powered Multi-Platform Management & Insights	28
4.3	component Diagram of AI-Powered Multi-Platform Management & Insights	30
4.4	Deployment Diagram of AI-Powered Multi-Platform Management & Insights	31
4.5	User Authentication Process of AI-Powered Multi-Platform Management & Insights	32
4.6	Post Management Process of AI-Powered Multi-Platform Management & Insights	34
4.7	Analytics Retrieval Process of AI-Powered Multi-Platform Management & Insights	35
4.8	Sentiment Analysis Process of AI-Powered Multi-Platform Management & Insights	36
4.9	Post Comparison Process of AI-Powered Multi-Platform Management & Insights	37
4.10	Facebook Posting Flow of AI-Powered Multi-Platform Management & Insights	38
4.11	Instagram Posting Flow of AI-Powered Multi-Platform Management & Insights	40
4.12	YouTube Video Posting Flow of AI-Powered Multi-Platform Management & Insights	41
4.13	Twitter Posting Flow of AI-Powered Multi-Platform Management & Insights	43
4.14	Class Diagram of AI-Powered Multi-Platform Management & Insights . .	45
4.15	Landing Page of SocialSight	47
4.16	Signup Page of SocialSight	47
4.17	Login Page of SocialSight	47
4.18	Dashboard Page of SocialSight	48
4.19	Post Management Page of SocialSight	49
4.20	Content Calendar Page of SocialSight	50
4.21	Draft Page of SocialSight	50
4.22	Analytics Page of SocialSight	51
4.23	Sentiment Analysis Page of SocialSight	52

4.24	Post Comparison Page of SocialSight	53
4.25	Facebook Connection Page of SocialSight	54
4.26	User Setting Page of SocialSight	55
4.27	App Setting Page of SocialSight	55
5.1	Architecture Flow of AI-Powered Multi-Platform Management & Insights	56
5.2	Training Loss Curve of Sentiment Analysis Module	60
5.3	Training and Validation Accuracy Curve of Sentiment Analysis Module .	61
5.4	Confusion Matrix for Test Predictions of Sentiment Analysis Module . .	61
5.5	Per-Class Accuracy Distribution of Sentiment Analysis Module	62
5.6	Evaluation Metrics of the BERT Sentiment Analysis Model	63
6.1	SocialSight PageSpeed Insights Test for Desktop Devices	76
6.2	SocialSight PageSpeed Insights Test for Mobile Devices	76

List of Tables

2.1	Key Trends and Performance of Major Social Media Platforms (2020–2025)	9
2.2	Comparative Study	9
3.1	User Manages Social Accounts Use Case	21
3.2	Post Scheduling and Publishing Use Case	22
3.3	Analytics and Insights Use Case	22
3.4	Sentiment Analysis Use Case	23
3.5	Post Comparison Use Case	23
6.1	Performance Test Case	68
6.2	Test Case for User Registration	69
6.3	Test Case for User Login	70
6.4	Test Case for Publish Post	70
6.5	Test Case for Drafts	71
6.6	Test Case for Social Account Connection	71
6.7	Test Case for Theme Toggle	72
6.8	Test Case for Notifications	72
6.9	Test Case for User Information Updates	73
6.10	Test Case for 2FA Enforcement	74
6.11	Test Case for JWT Token Validation	74
6.12	Test Case for HTTPS Enforcement	75

Acronyms and Abbreviations

JWT	JSON Web Token
OAuth2	Open Authorization 2.0
2FA	Two-Factor Authentication
API	Application Programming Interface
OOP	Object-Oriented Programming
DoS	Denial of Service
AI	Artificial Intelligence
TOTP	Time-based One-Time Password
ODM	Object Data Modeling (used with Mongoose)
HTML	HyperText Markup Language
CSS	Cascading Style Sheets
NoSQL	Not Only SQL
HTTPS	HyperText Transfer Protocol Secure
CRUD	Create, Read, Update, Delete

Chapter 1

Introduction

1.1 Project Background

In the digital world, social media is the essential platform that companies, influencers, and people have to build brand awareness and connect with their audience. Managing multiple accounts on these platforms (including Facebook, Instagram, YouTube, and Twitter) can be a challenge, particularly for small businesses and independent creators with limited resources. The challenge of regularly producing engaging content, coupled with the need to track the interacting target audiences, makes social media management tricky. Without the right tools, users are generally fighting for consistency and optimization.

Following the rapid expansion in amounts of digital content, intelligence and usability driven solutions were identified as becoming necessary to facilitate posting, consolidate analytics, and provide meaningful insights on audience engagement. With the pace of social trends changing so rapidly, users are increasingly demanding platforms that provide more than automation of routine tasks and data-driven decision-making to personalized content strategies. While some of these needs are addressed by tools like Buffer, Sprout Social, SocialPilot, and Hootsuite, they're usually costly, can be complex, and don't offer the same level of customization needed for a small team or individual user. This highlights the critical requirement for a far more cost-effective and user-friendly solution that has the capability to scale, allowing users to take control of their online presence without having to give up functionality or insight.

Our platform is built to solve these problems by providing a seamless, integrated experience that includes all the essential features. It provides a unified dashboard to view KPIs and recent activity and post management to schedule, write, and publish on several platforms. Sophisticated analytics pages provide information on reach, impressions, engagement, demographics, and top posts. With an AI-powered sentiment analysis tool that evaluates audience feedback as positive, negative, or neutral, and a post comparison tool that allows you to compare the performance of individual posts to mitigate your approach.

1.2 Problem Description

In the modern-day digitalized world, social media has turned into a very important resource that businesses, influencers, and creators as individuals use to create brand recognition, reach their audience, and spark their growth. Nevertheless, there are multiple challenges facilitated by operating more than one account on such platforms as facebook, Instagram, YouTube and Twitter. The lack of central, cheap and smart tools will lead to inefficiencies and a lack of successful online interaction. The key problems include:

- **Fragmented Tools and Disconnected Workflows:**

Scheduling, analytics, audience interaction, and monitoring are also performed using a variety of third-party tools that are also used by many users, which often fragment the workflow. The habit of changing platforms continuously wastes time, is more expensive and may lead to inconsistency in strategies. Without integration, the businesses and creators cannot easily have a whole picture of their performance.

- **Manual Posting and Redundancy:**

It is tedious and consumes time to upload the content on the individual platforms. This will make the probability of mistakes and errors, including posting images twice, formatting mistakes, or even posting at the incorrect time. In small teams or individuals who are just creating, this manual approach creates inefficiency, burnout, and inconsistent brand presence.

- **Inconsistent Posting Schedules:**

The consistency in postings is vital in retaining the audience and visibility of the algorithms. There will be no single scheduler, which makes posts less predictable, and thus less interesting. The un-automation of the posting system renders regular posting almost impossible during the high-demand times such as product launches.

- **Limited Insights and Analytics:**

The native analytics in the social media platforms tend to display only the most basic metrics such as likes, comments, and reach. They fail to provide more information about the audience behavior or trends in more than one platform. Users find it hard to find effective content strategies without post comparison tools or centralized dashboards.

- **Lack of Accessible Sentiment Analysis:**

It is essential to comprehend the emotions of the audience in order to create a powerful content. Sentiment analysis is not offered on the majority of platforms and users are unable to assess the tone of the feedback and trends. This may lead to lack of engagement opportunities and poor content approach strategies.

- **High Subscription Costs of Existing Tools:**

Management platforms such as Hootsuite and Buffer are also quite costly and might not be affordable to small business owners or other creators. A lot of advanced features are only unlocked with high tiers where users who require extensive tools do not have access to it.

1.3 Objectives

The main aim of our intended Social Media Management Platform is to make it easy, centralized, and optimized for businesses, creators, and marketing professionals to manage their multiple social media sites. The system, for its part, addresses the following goals:

- **Unified Account Management:**

Allow users to connect, observe, and administrate several social media sites like Facebook, Instagram, YouTube, and X all at once from a single platform. It diminishes reliance on several tools, simplifies work processes, and generates a centralized view of entire performance.

- **Efficient Content Scheduling and Automation:**

Let users write, compose, and schedule posts ahead of time so there is steady publishing across platforms. It enhances audience engagement, keeps brands alive, and saves creators and marketing teams a lot of hours.

- **Data-Driven Insights and Analytics:**

Offer end-to-end analytics, from reach and impressions to engagement and audience demographics. Comparing post performance across multiple platforms equips users to find out which of their various content approaches work best and helps them make data-driven decisions.

- **AI-Powered Sentiment Analysis:**

Sentiment analysis of audience reactions and feedback can be performed with Hugging Face Transformer models. Pre-trained models categorize interactions into positive, negative, and neutral, helping users adjust their content strategy based on audience feedback.

- **User-Friendly Interface and Security:**

An intuitive, responsive dashboard for ease of navigation and seamless functionality access. Secure user accounts and protect data through authentication techniques like OAuth 2.0, JWT, and two-factor authentication.

- **Customization and Personalization:**

Enable the users to personalize the settings of notifications, profiles, and the look and feel of the site according to their needs. It is built for a wide range of users, from small businesses to marketers to individual creators, for a tailored experience across all types of users.

1.4 Scope

The scope of this project determines the edges and magnitude of the predicted Social Media Management Platform. It explains functionalities that are to be incorporated into the system, probable users, and envisaged limitations so that the project stays realistic, feasible, and concise.

1.4.1 Inclusions

- Integration with leading social sites (Facebook, Instagram, YouTube, and Twitter) by their own APIs.
- Key modules like authentication, scheduling, analytics, sentiment analysis, and post comparison.
- A centralized dashboard for aggregated knowledge and account management.
- Security protocols such as 2FA, OAuth 2.0, JWT, and middleware securities [1].

1.4.2 Target Users

- Small and medium-sized enterprises, self-created creators, and marketing specialists.
- Users having few resources who require affordable ways of servicing many accounts.
- Small businesses and individuals trying to enhance posting tactics and know audience interacting better.

1.4.3 Exclusions

- Integration of non-priority platforms (e.g., TikTok, LinkedIn, Threads) falls beyond the current scope but is being considered for future improvement.
- Comment replies, post boosting, and messenger messaging are not being considered for the first release.
- Features of advanced AI like predictive analysis, integration of chatbots, and suggestion of contents are going to omit its first version.

- Multi-user role management, workflow approval, and team mode at enterprise-level are not covered under current scope but are possible to be added anytime based on the product vision.

1.4.4 Boundaries

- It is meant for management and analysis of social media, not for building new platforms.
- Technical feasibility, usability, and security will be emphasized in the project, more so than large-scale commercial exploitation.
- Performance shall be proved on testing datasets and sparse real-world stories instead of large-scale industry implementation.

1.5 Potential Impact

- **Enhanced Efficiency:**

By bringing together account management, scheduling, and analytics under one roof, users minimize time spent and effort for maintaining a variety of social media sites.

- **Supporting Growth:**

The website offers data-backed information, including reach, impressions, and audience demographics, to allow for strategy optimization as well as audience growth efficiently.

- **Improved Engagement:**

By sentiment analysis, user feedback is categorized as positive, negative, or neutral, enabling creators to know how their audience perceives things and engage more profoundly.

- **Cost-Effectiveness:**

The service provides a budget-friendly alternative for businesses to spend money on commercial software, scaling its advanced social media management capabilities to reach small businesses and solitary creators.

1.6 Project Features

The platform offers a full suite of built-in tools to streamline and simplify management for multiple social media accounts to help bring efficiency, consistency, and more intelligent decisions on all connected platforms:

- **Dashboard:**

A centralized hub displays key performance metrics such as total reach, engagement rate, number of posts, active platforms, and follower growth trends. Recent activity logs and graphical insights help the user track performance at a glance.

- **Post Management:**

Tools to create, draft, schedule, and publish posts across multiple platforms are included. Easily manage posting schedules through a calendar view and save or publish draft posts at a later point in time.

- **Analytics:**

Provides detailed performance insights, such as followers, impressions, reach, and demographics by age, gender, and location, and it also shows top-performing posts. The user can adjust the time filter by week, month, and year in order to analyze trends over time.

- **Sentiment Analysis:**

This module uses AI to classify audience feedback into positive, negative, or neutral categories to give actionable insight into audience perception.

- **Post Comparison:**

Compare two posts side by side, with metrics including likes, comments, shares, and reach, to help you assess your content's effectiveness.

- **Channel Management:**

Securely connect and manage multiple social media accounts, such as Facebook, Instagram, X, and YouTube; the option to disconnect channels when needed is also provided.

- **User & App Settings:**

It provides the choices of personalization, such as updating the profile, selecting the theme (light/dark mode), notification preferences, and account deletion, all at the user's discretion.

Chapter 2

Literature Review

This chapter is providing an overview of the state of the art of research, technologies and tools that define Intelligent Social Media Management, mainly concerning aspects related to sentiment analysis, monitoring user's engagement and smart analytics. As a result of the content generated by users that has increased exponentially, enterprises are employing AI and deep learning to enable efficient content curation, to optimize engagement, and to predict trends and analyze data in real time. Such technologies give brands and individuals an immediate understanding of what their audiences are doing, so they can make data-informed decisions to help grow and monetize their online presence. This work reviews both academic and industrial efforts to discover the state of the art, the limitations, and the challenges and directions for future research on a new breed of social media management system that is fundamentally more integrated, flexible and intelligent and that promotes automation, insight and strategy flexibility in an environment consistent with multi-platform deployment.

2.1 Traditional Methods

Prior to the advent of AI-driven applications, social media management was largely a manual labor process, with the help of basic analytics tools. These crude procedures were the basis for managing accounts online but had several real-world limitations.

2.1.1 Features of Traditional Methods:

- **Manual Posting and Scheduling:** Content creators and marketers had to craft each post manually and publish it on each site one by one with no automation or centralized control. The procedure was time-consuming and monotonous, and when users became bored with it, they would start posting irregularly or stop entirely. Instead, multitasking across platforms became a losing battle for both time and attention.

- **Basic Metrics Tracking:** Other engagement metrics such as likes, shares and comments were also manually tracked or via a basic analytics dashboard that lacked any predictive capacity.
- **Platform-Specific Management:** Each social media platform was treated as an individual, and there was no uniform method for scheduling across multiple platforms at once.

2.1.2 Limitations:

- **Time-Consuming:** It was a lot of work and required some coordination and time to keep up with all of the social media accounts individually. It also compromised regular posting, which was subsequently inconsistent across platforms.
- **No Sentiment Analysis:** The earlier tools were not equipped to perform auto analyses of user sentiments, views or feedback. Hence, as far as the audience perception and adjusting on the content strategies, there was much manual review.
- **Limited Automation:** The vast majority of tasks and activities, from post scheduling to engagement analysis to content optimization, were executed by hand. This added to the user's workload and left them little time to be creative or strategic elsewhere.
- **Lack of Integration:** Traditional methods did not include any sophisticated features such as sentiment analysis, multi-platform comparison and integrated dashboard for comprehensive monitoring. Hence, users suffered when trying to get an integrated view of performance data and audience insights.

2.2 Trends in Social Media Platform Usage (2020–2025)

2.2.1 Evolution and Growth Patterns

Social media experienced extraordinary growth between 2020 and 2025, as over 4.9 billion people accessed social networking sites worldwide [2]. This transient digital transformation was largely influenced by opportunities brought about by the pandemic and the increase in digital marketing and AI-driven analytics adoption. Although challengers such as TikTok have obtained some space, the classic ones like Facebook, Instagram, YouTube, and Twitter (X) still flourish worldwide when it comes to communication and popularizing brands [3].

2.2.2 AI-Driven Engagement and Marketing Shifts

It was also an era of growing cross-platform promotional messages and sophisticated AI-enabled user analyses. It has been shown to increase customer retention and provide a more data-driven approach to content [4]. The emergence of machine learning-based

approaches for influencer analysis has also enabled marketers to assess the quality of engagement in terms of, for example, audience sentiment and time of interactions for the first time [2]. Video content also consistently attracted the highest level of engagement at 63% of all impressions on platforms [5]. Such trends would shift to AI-driven, influencer-centric networks and a focus on predictive analytics, personalized recommendations, and across-platform optimization.

Table 2.1: Key Trends and Performance of Major Social Media Platforms (2020–2025)

Platform	Primary User Demographic	Content Dominance	Engagement Trend	Marketing Effectiveness
Instagram	18–34 years	Short videos, influencer content	↑ +32%	High (AI-driven targeting)
YouTube	18–44 years	Long-form, tutorials, reviews	↑ +28%	Very High (SEO visibility)
Facebook	25–50 years	Ads, community engagement	↓ -15%	Moderate (SME advertising)
Twitter (X)	20–45 years	Real-time updates	↓ -8%	Niche (PR, journalism)

2.3 Comparative Study

To the best of our knowledge, this is the most comprehensive performance comparison and analysis of the state-of-the-art academic tools and commercial products related to our work. It pinpoints major innovations of social media management, sentiment analysis, and post optimization. It determines the advantages and limitations of current solutions and points out their voids and potential, which are being aimed at by our proposed SocialSight system, including cross-platform scheduling of posts, real-time sentiment feedback, and centralized analytics panels.

Table 2.2: Comparative Study

Ref	Title	Key Insight	Project-Relevant Gap
[6]	Enhancing sentiment analysis accuracy on social media comments using a tuned BERT model	BERT model fine-tuned for social media comment sentiment classification; outperforms SVM, Naive Bayes, LSTM, CNN; dataset: MCSAD; accuracy up to 99.98%	Focuses on comment-level sentiment only; does not address cross-platform sentiment aggregation, real-time analytics, or integration with post management

Ref	Title	Key Insight	Project-Relevant Gap
[7]	Sem-AI: A Unique Framework for Sentiment Analysis and Opinion Mining Using Social Network Data	Introduces Sem-AI framework: DCNM (feature selection), HbO (dimensionality reduction), SA-DAN (classification); achieves high accuracy (99%) and F1-score	Only covers sentiment and opinion mining; lacks post creation, scheduling, and multi-platform integration relevant to SocialSight
[8]	RoBERTa and VADER Sentiment Analysis: A Comparative Approach	Compares RoBERTa (transformer) vs VADER (lexicon-based) for social media sentiment; shows model strengths and limitations	Limited to single-platform sentiment analysis; does not cover AI-driven cross-platform content analytics
[9]	XLM-RoBERTa Based Sentiment Analysis of Tweets on Metaverse and 6G	XLM-RoBERTa transformer for sentiment classification on multilingual social media data; results show predominance of neutral/positive sentiments	Focused on sentiment detection only; does not cover post scheduling, multi-platform integration, or AI-driven content generation
[10]	GPT-4V(ision) as A Social Media Analysis Engine	GPT-4V evaluated on multimodal social media content (text, images, video); tasks: sentiment, hate speech, fake news, demographic inference	Lacks discussion on AI-generated content creation, post scheduling, or cross-platform analytics dashboards

Ref	Title	Key Insight	Project-Relevant Gap
[11]	Using ChatGPT in Content Marketing: Enhancing Users' Social Media Engagement in Cross-Platform Content Creation through Generative AI	GPT-4 generates AI content for Facebook, Instagram, Twitter; improves engagement on some platforms	Focuses on content creation, does not integrate real-time sentiment analytics or post scheduling
[12]	Interactive simulation and visual analysis of social media event dynamics with LLM-based multi-agent modeling	Multi-agent LLM-based simulation of social media events; includes interactive visualization dashboards	Focused on simulation, not practical post management, AI-driven content scheduling, or analytics integration
[13]	Cross-Platform Social Media Management: A Case Study on Cyber Public Relations Implementation	Case study: PR engagement across multiple social media platforms; scheduling and platform-specific content strategies	Case-study based; does not cover AI-driven content generation, analytics dashboards, or real-time sentiment feedback
[14]	Social Media Management Tools for Customer Service: A Review	Reviews feature of social media management tools for customer service; adoption challenges and capabilities	Focused on customer service use, not cross-platform post creation, scheduling, or AI-based analytics
[15]	On the Development of an Information System for Monitoring User Behavior in social media	Proposes system architecture for collecting and analyzing user behavior; insights into monitoring, data pipelines, and analytics	Covers user behavior monitoring, not post creation, scheduling, or integrated analytics for SocialSight

2.4 Analysis of Existing Tools

The rising demand for social media management has spawned many commercial software programs that ease content scheduling, engagement tracking, and analytics. This section compares the functionality, along with the advantages and disadvantages, of three of the most popular programs, Hootsuite, Buffer, and SocialPilot, in relation to a centralized AI-based platform like SocialSight. Such a comparison reveals existing gaps in automation, integration, and intelligence in current offerings that SocialSight tries to bridge through its unified and data-driven approach.

2.4.1 Hootsuite

Hootsuite provides a range of functionality for social management, including multi-platform scheduling of posts across Facebook, Twitter, Instagram, and LinkedIn, social monitoring, and engagement auditing. It allows team management by role and pre-defined report templates for performance analysis. However, some of the limitations to Hootsuite include a lack of AI-based sentiment or predictive analysis, a limited capability to view user behavior and trends of engagement, and few options to build out custom analytics that may hinder further deeper optimization of a piece of content and tactical decision-making [16].



Figure 2.1: Hootsuite

2.4.2 Buffer

Buffer comes with a clean, easy-to-use interface for content scheduling and multi-platform support. It also provides visual reports on performance, including likes, shares, and comments, and manages teams around content approval and review. Buffer is recommended for small teams because of its intuitive design and direct workflow. It has its limitations, which are that it doesn't give in-depth sentiment analysis or predictive capabilities, analytics are mostly backward-looking and not in real-time, and there's limited integration with multi-platform automation, which may limit comprehensive management of social media strategies. Another feature that Buffer does not provide is advanced AI-driven insights, nor post comparisons that make strategy optimization slower. Even with these gaps, Buffer has been the default for simple scheduling and team collaboration [17].

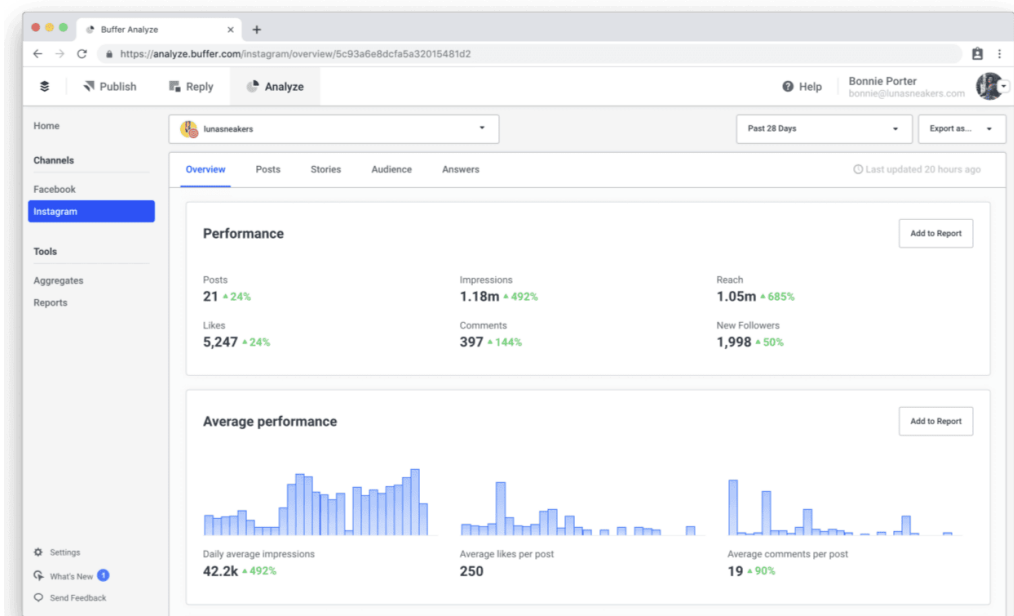


Figure 2.2: Buffer

2.4.3 SocialPilot

SocialPilot is a powerful social media management tool that makes it easy to manage multiple accounts in one place. SocialPilot allows you to post in bulk to different social channels, attach a collaborating team (username and password) for managing clients, and also provides you insights about posts and engagement of audiences. It also assists with content curation: users can plot and organize posts ahead of time. With features like this, it's simple for people, businesses, and agencies to keep their social media on track, but you do have to be online on a computer to make use of them. SocialPilot has quite a few significant drawbacks. It doesn't have live sentiment analysis or predictive engagement

monitoring for having a real-time understanding of what people are thinking and then enhancing future posts. The platform doesn't include AI-driven content optimization and content generation, and analytics for text, images, and videos are not entirely multimodal. The majority of reports are static and not immediately usable, which might limit a user's ability to take strategic action on insights delivered.

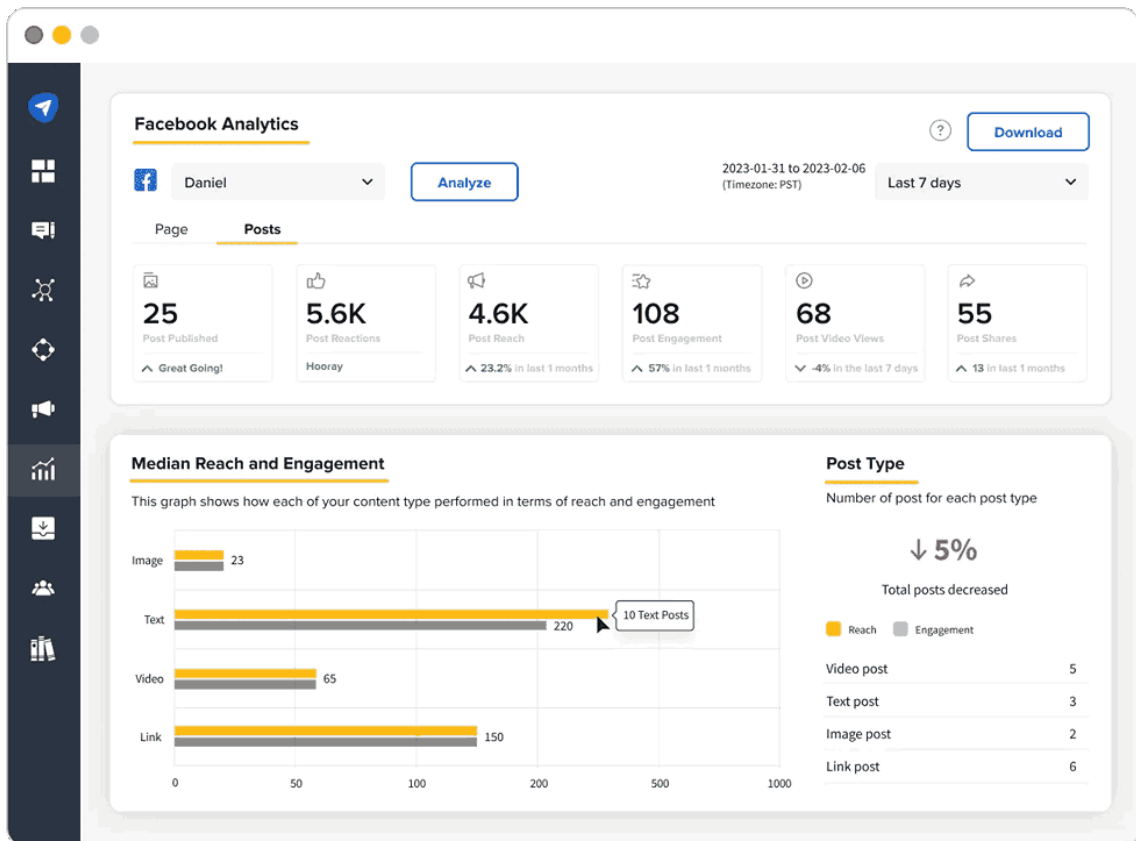


Figure 2.3: SocialPilot

Chapter 3

Requirement Specification

3.1 Existing System

Popular tools in today's social media management market include Hootsuite, Buffer and SocialPilot, which are widely adopted by individuals, businesses and marketing teams. These are some of the useful features available:

- **Post Scheduling:** The ability to schedule posts across multiple social networks.
- **Content Calendars:** A single timeline to organize and plan upcoming campaigns.
- **Analytics Dashboards:** Tracking followers, likes, comments, impressions, and engagement.
- **Collaboration Tools:** Let your team work together to create and publish campaigns.

Although these solutions are useful for managing basic social tasks, the digital marketing landscape is ever-changing and evolving and demands more intelligent, real-time, and cost-efficient solutions. Traditional tools are inadequate to address these new needs, and they have various limitations, which could be leveraged to provide better solutions.

3.1.1 Limitations of Existing Systems

There are some shortcomings of the existing systems that restrict their accessibility, usability, and performance, particularly for the freelancers, small teams, and business applicants, although they are widely accepted.

- **High Subscription Costs:**
Advanced functionality (deep analytics, scheduling in bulk, and multiple account linking) is locked behind paid tiers. This turns away tiny businesses, individual creators, and academy customers who don't have massive recurring costs to cover.

- **Complex Interfaces:**

Business-centered sites usually have overly complex dashboards and technical flows. Although fine for bigger marketing departments, sites have too much information and confuse technical-phobes who like things simple and straightforward.

- **Fragmented Tools:**

Users often rely on multiple platforms or third-party add-ons to fill functionality gaps. For example, a post scheduler might be separate from a sentiment analysis tool, creating fragmented workflows and increasing time spent on account management.

- **Lack of Real-Time Sentiment Analysis:**

Most current systems rely on basic keyword or engagement tracking and lack AI-powered sentiment analysis. As a result, marketers miss real-time insights into audience emotions and perceptions.

- **No Cross-Platform Performance Comparison:**

Metrics are also provided on a per-platform basis, without a single view of comparing results across channels. It is then challenging to know which platform achieves better engagement.

3.2 Proposed System

In order to address the limitations of current tools, our system is designed as an all-in-one, smart, and user-friendly platform. Unlike fragmented software requiring multiple services, it integrates post scheduling, analytics, sentiment analysis, and cross-platform comparison in a centralized, secure space. It is affordable, scalable, and suitable for small businesses, marketers, and content creators.

3.2.1 Features of the Proposed System

- **Secure Authentication:**

For data protection and safeguard of account, login and registration are securely supported by the platform. It also adapts Two-Factor Authentication (2FA), which provides increased security by getting a further verification process apart from simply a password.

- **Dashboard:**

The dashboard provides a consolidated view of key performance indicators (KPI) including reach, engagement rate, post activity, and follower base growth. It also displays live activity and visual patterns, giving people ability to see how things are going at a high level.

- **Post Management:** SocialSight allows users to compose, draft, schedule, and publish posts across multiple platforms. Its integrated calendar view helps with effective planning, enabling users to manage upcoming content and deadlines visually. This minimizes reliance on separate scheduling tools.
- **Analytics:** The analytics module offers detailed data on followers, impressions, engagement, demographics, and top posts data. It also has time-based filters that allow users to view short-term and long-term trends, helping them make better decisions based on data.
- **Sentiment Analysis:** Using AI-driven Hugging Face Transformer models that have been fine-tuned on social media datasets, SocialSight processes user comments in real-time and labels them as positive, negative, or neutral.
- **Post Comparison:** Unlike several other tools, SocialSight allows users to compare two posts side by side and see likes, comments, shares, and reach on each together. This allows for the best-performing content types to be recognized and for future strategies to be refined.
- **Channel Management:** The platform enables secure connection of multiple social media accounts such as Facebook, Instagram, Twitter (X), and YouTube. Users retain control of their linked platforms and have the ability to connect or disconnect accounts whenever they want.

3.3 Requirement Specifications

3.3.1 Functional Requirements

The functional requirements are the core-balancing operation processes that the entire system must perform, and describe the way in which each function helps lead the platform towards its overall goals and experience.

1. User Authentication

- Provide secure sign-up and sign-in process with OAuth 2.0 for social media accounts.
- Add Two-Factor Authentication (2FA) for added account security.

2. Multi-Platform Posting

- Let users write, draft, schedule and publish posts on Facebook, Instagram, Twitter/X, and YouTube from one place.

- Provide a calendar view that makes scheduling easier and helps to deliver a steady stream of well-timed content to all integrated platforms.

3. Dashboard Display

- Provide a single pane of glass to view live KPIs.
- With metrics such as reach, engagement rate, follower growth and total post count.
- Show recent activities and best platforms.
- The engagement rate represents the percentage of users that interact with the content from all the audience reach. A larger value means better audience engagement [18]. Engagement Rate (%) is given by:

$$\text{Engagement Rate (\%)} = \frac{\text{Engagements}}{\text{Reach}} \times 100 \quad (3.1)$$

Equation 3.1: Engagement Rate Equation

4. Analytics Visualization

- Produce graphical reports with interactive charts and visual insights.
- Show the demographics of the audience, impressions, and engagement over time.
- Provide analysis with daily, weekly and monthly time filters.

5. Sentiment Analysis

- Get user comments from linked platforms.
- Sentiment Class (Positive, Negative or Neutral) with AI models.

6. Post Comparison

- Enable to display two posts side-by-side, along with metrics such as reach, likes, shares, and engagement rate.
- Allow users to determine what content strategies work best for them by seeing which posts connect most with their audience, and generate the most engagement.

7. Channel Management

- Safely handle multiple social media accounts and add or remove connected platforms and switch between them with ease.

- Automatically verify and renew access tokens to maintain seamless and safe connectivity on all connected accounts.

8. User Settings

- Allow the user to edit their profile and preferences.
- Allow for theme setting, notification setting and account removal/reinstatement.

3.3.2 Non-Functional Requirements

The system should also satisfy the following conditions for reliability, subjective performance, and user satisfaction:

1. Security

- Secure user accounts with OAuth 2.0, JWT sessions, and 2FA.
- Encrypt sensitive information, sanitize inputs and use HTTPS.

2. Performance

- Serve a large number of users concurrently and consistently.
- Post publishing and dashboard loading must have low latency.

3. Scalability

- Accommodate a growing number of users and accounts without degradation in service quality.
- Enable the eventual addition of more social platforms.

4. Usability

- Have a simple, intuitive and responsive interface for all type of users.
- Provide a uniform experience across devices.

5. Reliability

- High uptime and Retrieve accurate data from APIs.
- Have log and recovery features for error handling.

6. Cost-Effectiveness

- Provide a competitively priced alternative to enterprise tools for individual creators and small businesses, offering comparable functionality at a significantly lower price while ensuring the product is easy to use and scale as needs grow.

3.4 Use Cases

This section describes the core use case scenarios for the main User actor. Users have a secure login to add or remove their social media accounts via OAuth and can manage their posts by writing them, scheduling or saving as drafts. They can also log into analytics dashboards to analyze performance, compare posts and conduct sentiment analysis to gain deeper insights into how their audiences respond.

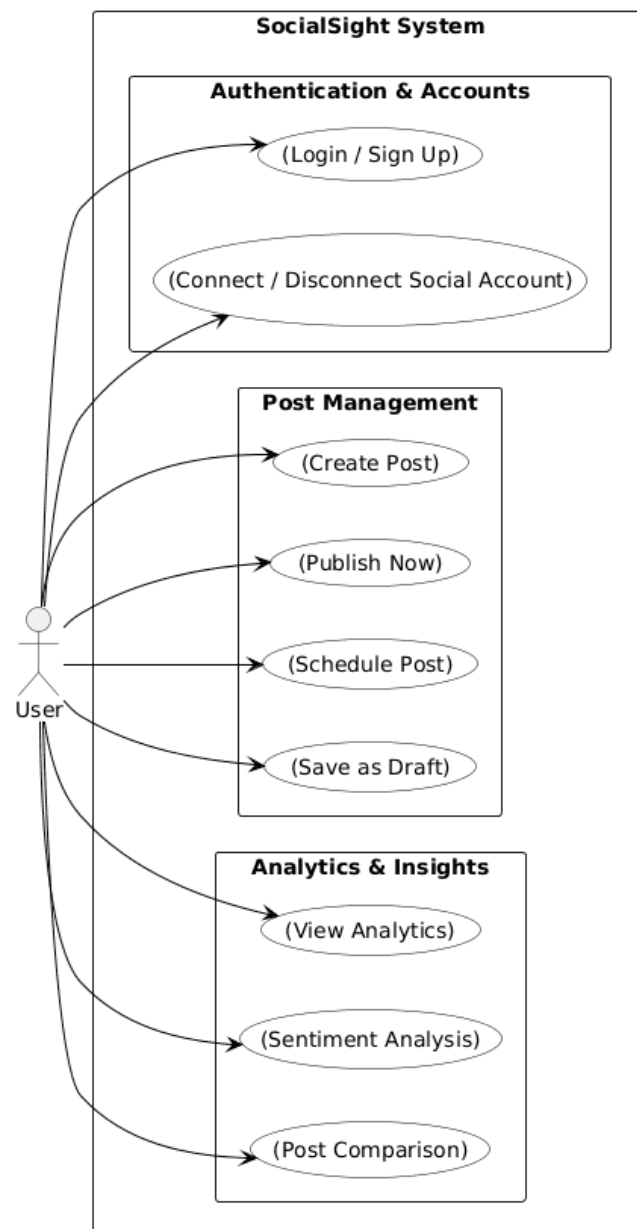


Figure 3.1: Use Case of AI-Powered Multi-Platform Management & Insights

3.5 Descriptive Use Cases

Descriptive use cases describe the interaction between a user and a system for performing a task. Each tenor of events is a step-by-step interaction between the user and the system, defining the normal flow of events and the alternate flows of events. These descriptions define what is expected to happen during authentication, account management, post creation, scheduling, viewing of analytics, performing sentiment analysis and comparing posts.

These are intended to act as guidance for developers, testers, and end users to understand system's flow, usability issues, as well as to provide a consistent, secure and friendly experience. In addition, descriptive use cases deliver a good reference implementation for future extensions and scaling.

3.5.1 User Manages Social Accounts

Table 3.1: User Manages Social Accounts Use Case

Use Case ID	UC-1.1
Use Case Name	Manage Social Accounts (Connect/Disconnect)
Actor(s)	User
Pre-Conditions	User must be registered, logged in, and have an active internet connection.
Priority	High
Actor Actions	1. Navigate to the Channel Management section. 2. Select "Add Account" and choose a social platform (Facebook, Instagram, X, YouTube). 3. Authorize SocialSight to access the selected account. 4. Return to dashboard to view updated connected accounts. 5. Optionally, select "Remove Account" to disconnect a platform. 6. Confirm changes to finalize account management actions.
System Response	1. Display available options for adding or removing accounts. 2. Initiate OAuth 2.0 authentication and request necessary permissions. 3. Securely receive and store OAuth tokens for authorized accounts. 4. Update the dashboard to show connected account status. 5. Disconnect account upon user request and refresh dashboard. 6. Log all account management actions for security and auditing purposes.
Post Conditions	Accounts are securely connected or disconnected, dashboard reflects the current status, and accounts are ready for immediate use.

3.5.2 Post Scheduling and Publishing

Table 3.2: Post Scheduling and Publishing Use Case

Use Case ID	UC-1.2
Use Case Name	Post Scheduling and Publishing
Actor(s)	User
Pre-Conditions	At least one social account connected.
Priority	High
Actor Actions	1. Navigate to Post Management. 2. Create a post (text, image, or video). 3. Select platforms. 4. Choose “Publish Now”, “Schedule Post”, or “Save as Draft”. 5. Confirm action. 6. At scheduled time, post is published. 7. If draft, can publish it later.
System Response	1. Display post creation interface. 2. Validate content format. 3. Prepare multi-platform posting. 4. Show scheduling/calendar options or confirm draft save. 5. Perform action: a) Save as draft, b) Save schedule, c) Publish immediately. 6. Auto-publish to selected platforms and log results. 7. Revalidate draft if changed before publishing.
Post Conditions	1. Post published immediately or at scheduled time. 2. Draft remains until user publishes or deletes.

3.5.3 Analytics and Insights

Table 3.3: Analytics and Insights Use Case

Use Case ID	UC-1.3
Use Case Name	View Analytics and Insights
Actor(s)	User
Pre-Conditions	Social accounts connected.
Priority	Medium
Actor Actions	1. User navigates to Analytics Dashboard. 2. User selects a time filter (daily, weekly, monthly and platform). 3. User views results.
System Response	1. System fetches KPIs from social media APIs. 2. System filters and recalculates metrics. 3. System displays charts, graphs, and top posts.
Post Conditions	User obtains insights into post performance and audience engagement.

3.5.4 Sentiment Analysis of Comments

Table 3.4: Sentiment Analysis Use Case

Use Case ID	UC-1.4
Use Case Name	Sentiment Analysis
Actor(s)	User
Pre-Conditions	Posts with comments exist.
Priority	Medium
Actor Actions	1. User navigates to Sentiment Analysis. 2. User selects a post. 3. User views sentiment breakdown. 4. User explores categorized lists.
System Response	1. System fetches recent comments. 2. System retrieves associated comments. 3. AI model classifies comments into Positive, Negative or Neutral. 4. Visual summary (charts) is shown by system.
Post Conditions	User gains understanding of audience sentiment.

3.5.5 Post Comparison

Table 3.5: Post Comparison Use Case

Use Case ID	UC-1.5
Use Case Name	Post Comparison
Actor(s)	User
Pre-Conditions	At least two posts exist.
Priority	Medium
Actor Actions	1. User navigates to Post Comparison. 2. User selects two posts. 3. User views results.
System Response	1. System displays list of posts. 2. System retrieves performance metrics. 3. System displays side-by-side comparison (reach, impressions, engagement, comments).
Post Conditions	User identifies the best-performing content through comparison.

Chapter 4

Design

4.1 System Architecture

The SocialSight platform is made up of an object-oriented service architecture, which allows for multi-platform social media management integration. It is modular, scalable, and secure, and it easily integrates with various social media platforms such as Facebook, Twitter, YouTube, and X. This allows for the management of all your accounts with an easy-to-use unified interface, which greatly simplifies the task of switching between platforms and help you save time and effort. It also has tools to track performance, post on a schedule, and analyse participation, so users have a full view of their presence on social networks, and they get assistance when making decisions about content.

- **Frontend Interface:** It's built using React.js and Tailwind CSS, a frontend that is responsive and interactive for the end users. It handles the user activities such as posting, scheduling, and viewing analytics. The frontend communicates securely with the backend via HTTPS API calls all user interactions and information requests are sent securely.
- **Backend Services:** It is developed with Node.js and Express.js as the backbone and works as the processor for all queries in the system. It handles user authentication, manages platform-agnostic service modules, and runs post creation, scheduling, fetching analytics, and sentiment analysis. With all of those centralized, your backend will run the system smoothly and consistently across all plugged-in platforms.
- **Platform Services:** Each social media platform is represented by a new service class that inherits from PlatformService. The system uses the PlatformFactory pattern to choose the appropriate service at runtime according to the platform type. The structure of the module is such that new platforms are easily extendable in the future and uniform in their interactions with each of the social media APIs.

- **Database Layer:** User accounts, OAuth tokens, drafts in progress, and analytics data are stored in a MongoDB database. In doing so, it establishes data integrity, supports scalability, and efficiently handles multiple users and social media sites in a single instance. Posts, analytics, and user data are all securely stored and fetched on demand.
- **Security Layer:** This layer of security also encompasses the use of middleware such as Helmet, express-mongo-sanitizer, xss-clean, and express-rate-limit to guard the platform from common web attacks. They protect it from cross-site scripting (XSS), NoSQL injection attacks, brute force, and many other exploits, resulting in a very safe protection environment for everyone.

4.2 Design Constraints

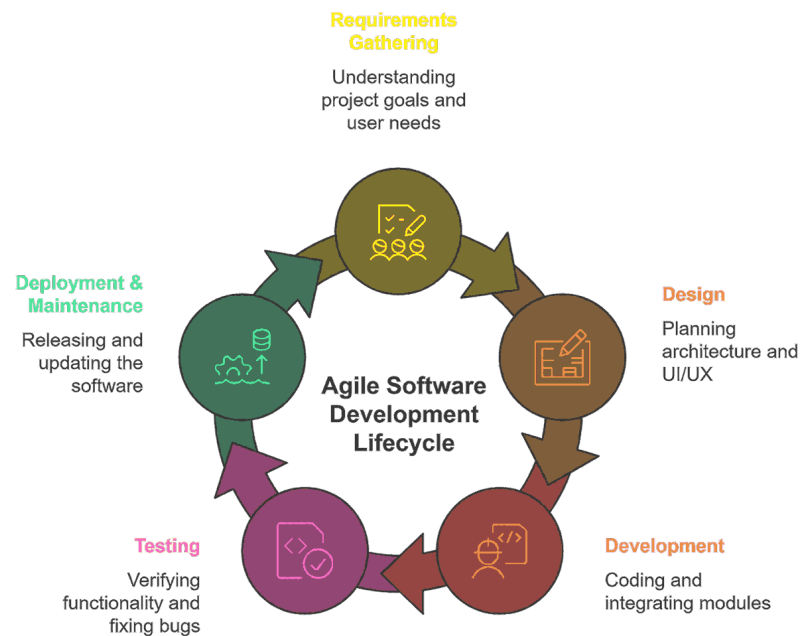
Throughout the design and development of SocialSight, we have catered to many real-world and technical implications to make the platform stable, secure, and flexible for future add-ons. The focus was on performance and scalability versus user experience, and on compliance with third-party API requirements. Two crucial factors were the necessity to handle many users, and to support multiple social media APIs, as well as bring security measures which ensure the user data and system integrity.

- **API Rate Limits:** Applications are subject to rate limits from data platforms like Facebook, Instagram, YouTube, and X (Twitter); these platforms impose strict limits on the number of times an application can query for data. SocialSight implements scheduling, caching, and queuing to deal with the above restrictions and ensure smooth operation of on one hand and to prevent slowdown or blocking of access on the other hand.
- **Resource Management:** Features like real-time AI sentiment and cross-platform scheduling post management require the server to run at high performance, especially in high user loads. SocialSight solves this problem through asynchronous processing, memory-efficient operation, and scalable cloud architecture, delivering speedy responses with the cost of operation in control.
- **Security Requirements:** A robust security is working for the necessity because users connect their personal and business social media. it implements industry standard best practices, such as OAuth 2.0 authentication, data encryption, and password hashing like SocialSight, along with session verification on the server side and input sanitization to avoid the execution of client side scripts and protect against unauthorized access to sensitive data.

- **Compatibility Across Platforms:** It is built to run on all desktop and mobile platforms, on any device, on all major browsers. Its responsive, browser-agnostic design guarantees a seamless and friendly user experience at any place, at any time, on any device.
- **Extensibility and Future Integration:** The system’s architecture supports growth and scalability, making it easy to plug in new platforms in the future, such as TikTok or Threads. It also supports sophisticated functionality such as team collaboration, role-based access control, and advanced analytics without substantial rework of the system.

4.3 Development Methodology

The proposed system follows iterative and incremental approach and this approach enables us to have more frequent user involvements and developer interactions, and these are supported by testing and evolving during the life cycle of the project. Each sprint produced a functional component (e.g., the authentication system or the posting system, or the analytics or sentiment analysis) that was tested and improved based on feedback.



Made with Hapkin

Figure 4.1: Lifecycle of AI-Powered Multi-Platform Management & Insights

4.4 Design Methodology

In this section, we present the design methodologies and the architectural choices taken in SocialSight. Besides, the system design parts illustrate that the platform fulfill its technical, security and user requisites. It provides an integrated system architecture that can be easily integrated into many social sites with high scalability, performance and maintainability. The design also guarantees modularity so that the system can be extended with future features without affecting the existing modules of the system.

- **Layered Architecture:** The architecture follows a layered style, isolating the presentation layer (user interface) from the business logic layer (application services) and the data layer (database and external interfaces). The segregation of concerns results in improved security, scalability, and simplified debugging and maintenance.
- **API-Driven Integration:** Multiple social media platforms are integrated through their proprietary APIs. Each site's API is encapsulated in its own service class, which makes it easy to securely and efficiently manage authentication tokens, rate limits, and site-specific features.
- **AI Integration:** There is a dedicated AI module for sentiment analysis and other transformer-based features. Such a module is separate from the main application, with its own design and architecture, meaning that it can be updated, enhanced and optimized for performance without affecting core application behaviour.
- **Security by Design:** Security factors were built in from the foundation. User access to the application is secured by JWT authentication, and OAuth 2.0 manages safe connection as well as authorization for connected social sites. All information exchanges are completed through HTTPS, and highly sensitive information, for instance, access tokens and user credentials, are secured by encryption and kept tightly, conforming to industry best procedures.
- **Scalability and Performance:** For ensuring high concurrency for users and real-time analytics, asynchronous processing for activities like scheduling of posts and retrieval of analytics is used by the system. Scaly and adaptable storage is available through a NoSQL database (MongoDB) for storing user data growing exponentially and multi-platform activities efficiently.
- **User-Centric UI/UX:** The UI is designed with simplicity, readability and speed in mind. Interactive dashboards, simple forms, and real-time feedback loops create a smooth, user-friendly experience for both medium-to-small businesses and individual content creators. Device-level responsiveness also contributes to ease of use.

4.5 Activity Diagram

The following activity diagram for SocialSight showing the post planning, creation, scheduling, and analytics in a web interface for multiple social media accounts at a glance, supporting post management on the web. It describes the user's path from a secure login to monitoring performance, with a focus on the interaction of system components that delivers a seamlessly integrated workflow. Also highlighted are potential automation opportunities, optimization and extension to other platforms.

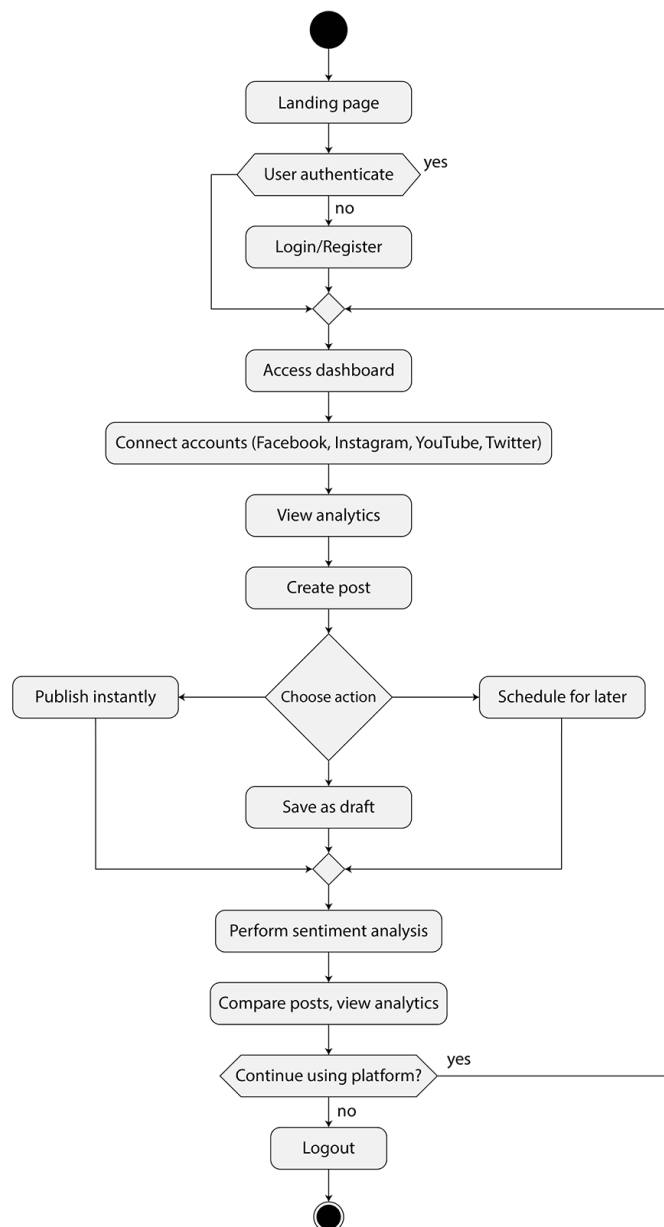


Figure 4.2: Activity Diagram of AI-Powered Multi-Platform Management & Insights

- **User Actions:** The user initiates the process by opening the dashboard. There the user chooses their connected social media pages and makes a post (text, image, etc.). After having written their post, the user specifies how the job is to be executed using one of the following options: Post Now, Schedule, Save as Draft.
- **Decision Point:** A three-branch diamond in the figure indicates the user's option. Choosing "Post Now" will immediately post to the respective platforms APIs and change its status Updating. Selecting "Schedule" saves the post with a time and operate a persistent scheduler to publish automatically. Choosing "Save As Draft" the post will be saved for editing and when you want to publish it.
- **Activities after Post-Publishing:** When a post is published for live broadcasting or for scheduling, the system starts to track data of related interactions (i.e., likes, comments, shares, and impressions). At the same time, the sentiment analysis is conducted on the comments to offer a small tip of audience reactions, indicating how the post itself did.
- **Analytics:** After that, users can also view posts comparisons and analysis right from the dashboard. Users have the potential to best utilize the insights from both types of intelligence (metrics and sentiment intelligence) to further drive engagement, inform evolving content strategy, and guide future posts.

4.6 High-Level Design

The high-level system design is system design at an architectural level. It is designed in a modular fashion with core subsystems, such as the presentation layer, business logic, data access layers being made available for scalability and maintainability. The design also defines the data flow between components, as well as with external APIs to define the communication protocol and integration method.

4.6.1 Component Diagram

The component diagram depicts the system's logical architecture and the interaction among the major modules to achieve social media scheduling, analytics, and AI-based insights. It outlines the interactions between users, backend services, databases, and external APIs to create a seamless end user experience.

- **User & Frontend:** Users connect with SocialSight via a React.js single-page application (SPA) running on a custom domain. The frontend makes API calls to the backend for performing tasks like creating posts, scheduling, and fetching analytics.

- **Backend Components:** The API Controller is responsible for all the requests and interacts with core components such as Scheduler (post automation), OAuth and Social Media Services (publishing), Sentiment Client (AI based Sentiment analysis).
- **Database:** MongoDB is used as the primary data store for retrieving user data, post data, scheduled jobs and sentiment results. It is used by the API controller and the scheduler to retrieve and update the data efficiently.
- **External Services:** Social media APIs handle post publishing and authentication with OAuth 2.0, and the RoBERTa-based AI service conducts sentiment analysis on user opinions.
- **CI/CD:** GitHub Actions takes care of build, deploy and update the backend and the AI services, allowing for a hassle free and continuous integration experience.

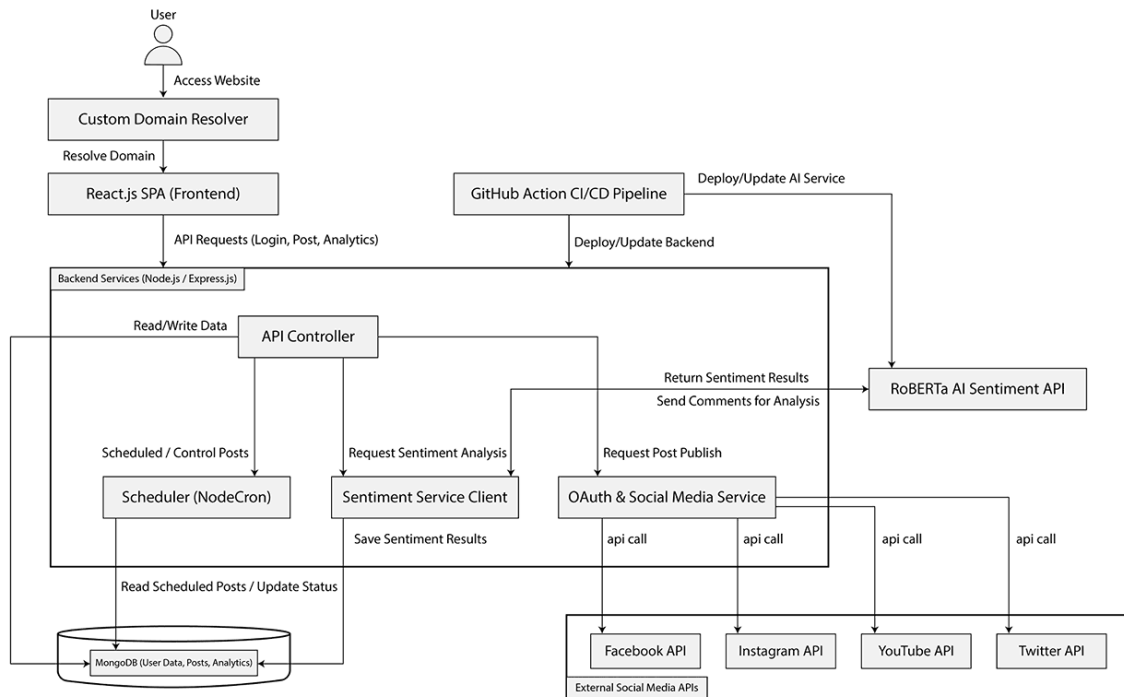


Figure 4.3: component Diagram of AI-Powered Multi-Platform Management & Insights

4.6.2 Deployment Diagram

The deployment diagram illustrates how the components that make up the system in SocialSight are distributed over several layers and how they send and receive messages.

- **User Layer:** The users of the application are the users with browsers that are routed through a custom domain (Namecheap). The React.js frontend is deployed on Vercel which provides a high performance and availability.

- **Backend Layer:** The Nginx server is responsible for processing all the API requests in the AWS VPS, serving as an SSL manager and reverse proxy. The API based on Node.js/Express.js handles the request logic, links to the database, to the AI service, and to the social media APIs. NodeCron Scheduler: It ran and constantly checks and posts the scheduled posts.
- **Database Layer:** User information, scheduled posts, analytics and sentiment evaluation are stored in MongoDB Atlas.
- **External APIs:** Using OAuth 2.0 to securely authorize and publish, the system integrates with Facebook, Instagram, YouTube, and Twitter APIs.
- **AI Service:** The RoBERTa API for Sentiment Analysis is running on a DigitalOcean VPS which analyzes comments and provides sentiment scores that are stored in MongoDB for additional insights.
- **CI/CD Pipeline:** We add GitHub Actions to automate the deployment process, to keep both DigitalOcean AI and AWS backend continuously updated.

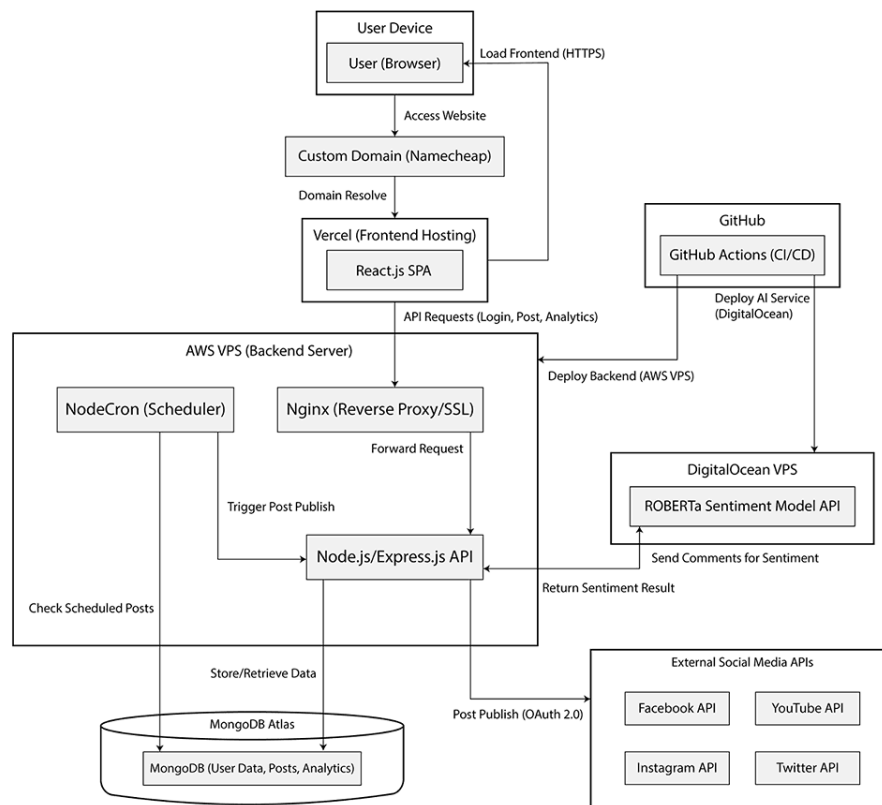


Figure 4.4: Deployment Diagram of AI-Powered Multi-Platform Management & Insights

4.7 Sequence Diagram

The sequence diagrams illustrate the flow of interaction between user and system components, showing the processing of requests at both ends from the moment a request is initiated until it is completed. These diagrams help illustrate the sequence of actions between the frontend, the backend, the database and third party services.

4.7.1 User Authentication Process (Login/Signup)

The above sequence diagram is a representation of user authentication process, where a user can log in or sign up. The procedure consists of four primary components:

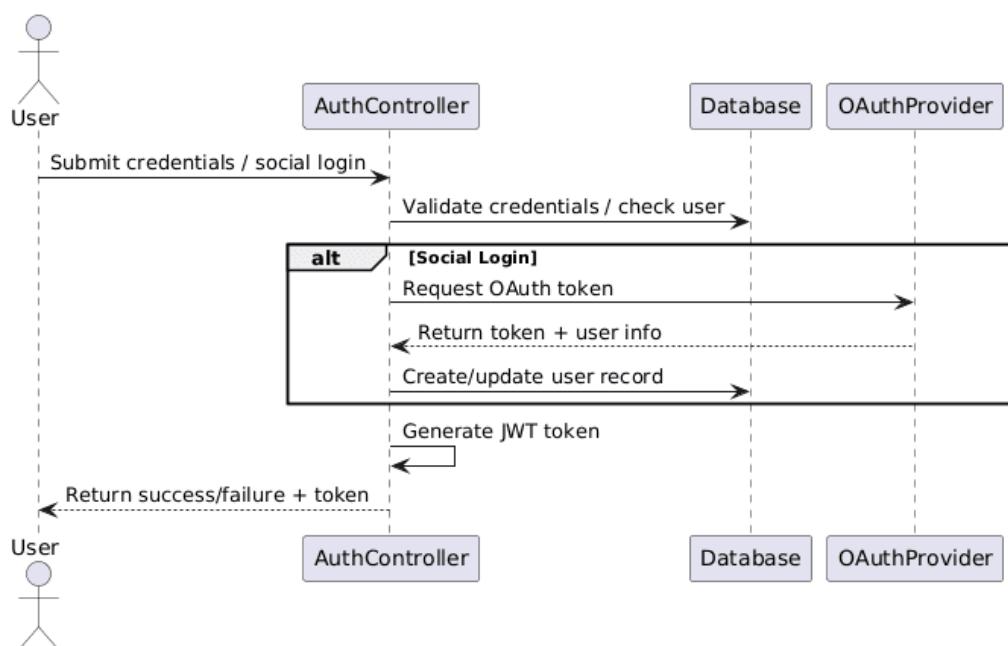


Figure 4.5: User Authentication Process of AI-Powered Multi-Platform Management & Insights

- **User:** This Specify your login or signup credentials or use one of the social login options like Google or Facebook. The user can communicate with a secure frontend that assures that the data is sent over a secure channel (HTTPS).
- **AuthController:** The logic that validates input, queries the database for users, and initiates OAuth flows, etc. If authentication is successful, it creates a secure JSON Web Token (JWT) that is used to manage the session, and it also gracefully manages invalid credentials or expired tokens.
- **Database:** Securely store hashed passwords, user records, and authentication tokens with algorithms such as bcrypt. It confirms the identity of the user on login, enforces data integrity, and secures sensitive credentials from unauthorised access.

- **OAuth Provider:** Takes care of the third-party authentication (Google, Facebook, LinkedIn) and provides an access token and verified user information under OAuth 2.0 so that users can securely login without exposing their passwords directly to SocialSight.

This authentication flow handles both traditional and social login flows securely with token-based validation. It employs convenience and security in OAuth 2.0 and JWT to allow easy access in multiple environments but keep user data and performance in which can be trusted. It streamlines the user experience but also lessens the friction of repeated logins so you can more quickly access all your connected accounts in one place. In all, it shows how to do a secure, modern, scalable authentication architecture.

4.7.2 Post Management Process

The sequence diagram of user post schedule shows an interaction between user, system, and third-party platform. The high-level building blocks of the system and their flow are: This is how the scheduling times, token check, and post delivery to each connected platform are managed while the service editor content is published automatically.

- **User Actions:** The user writes a post and selects one of the three actions: Post Now, Schedule, or Save as Draft.
- **Draft Path:** In case a post is saved as a draft, it is saved in database in the same format with status ="Draft." From the draft page, the user can:
 - Publish Now: Post is sent at once by PlatformService to the social media API, status is changed.
 - Schedule: User selects time of a future posting, Scheduler posts on user's behalf at time synchronized to time zone.
 - Delete: Delete the draft.
- **Schedule Post:** Future time - scheduled posts are saved as "Scheduled" along with the date and time. Scheduled Posts If a scheduled post needs to be deleted:
- **Post Now:** The post is sent at once to PlatformService which then talks to the appropriate social media API. After a successful publishing, the post status is changed in the database.
- **System Components:** The database contains the content, status and schedule of the post. Scheduler automates the publishing of scheduled posts. PlatformService and SocialMediaAPI are responsible for communicating and posting on external social media platforms.

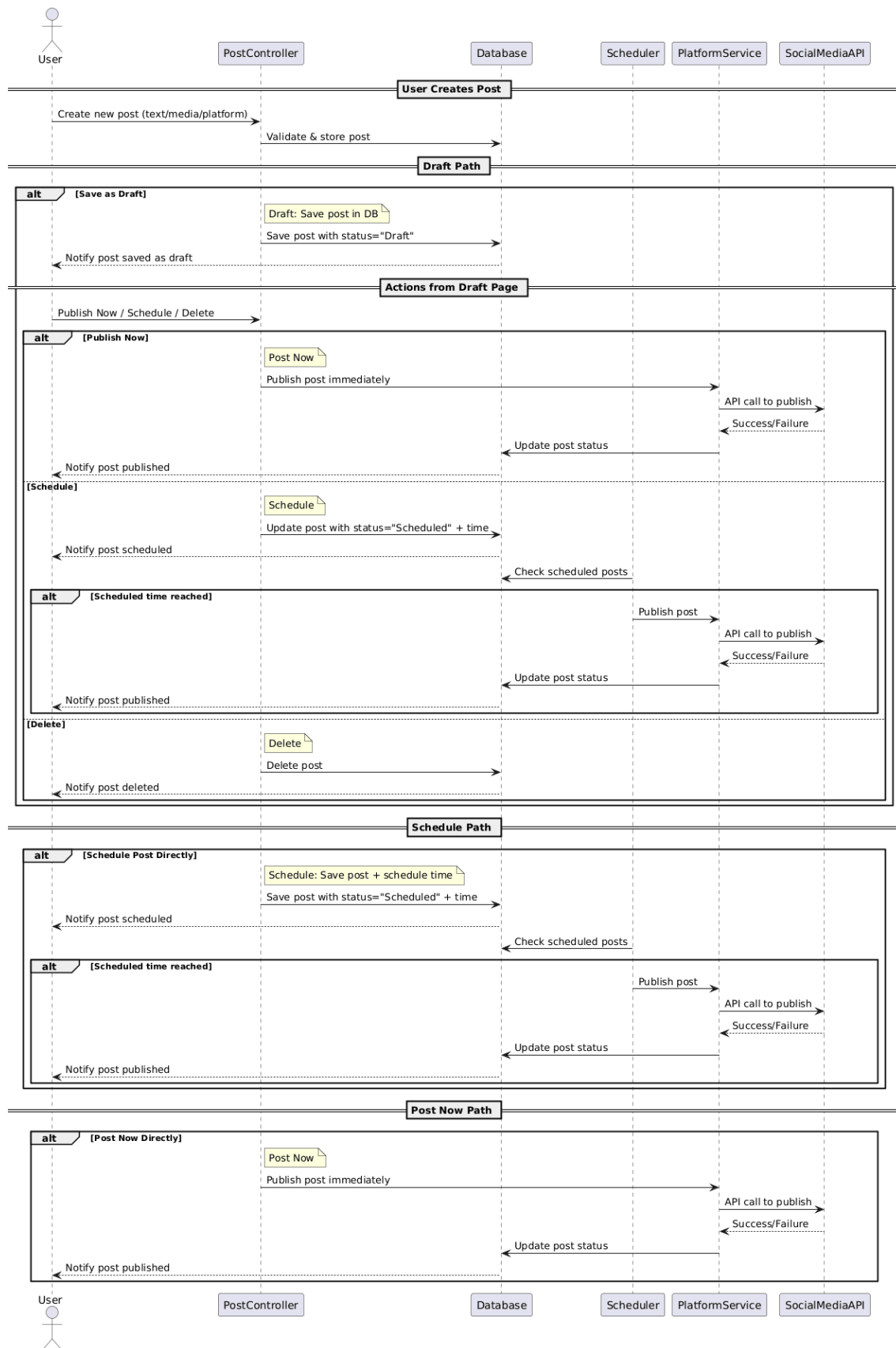


Figure 4.6: Post Management Process of AI-Powered Multi-Platform Management & Insights

4.7.3 Analytics Retrieval Process

The analytics retrieval sequence demonstrates how SocialSight fetches and displays performance metrics for user posts. The main components and flow are as follows:

- **User:** Requests analytics for posts or connected accounts.
- **AnalyticsController:** Receives the request, validates input, and forwards it to the service layer.
- **AnalyticsService:** Fetches the metrics from the Database and/or live SocialMediaAPI. It compiles and processes data for reporting and insights.
- **Database:** Historical analytics data for posts and accounts.
- **SocialMediaAPI:** When needed (such as for live view counts, likes, comments), it offers live metrics.

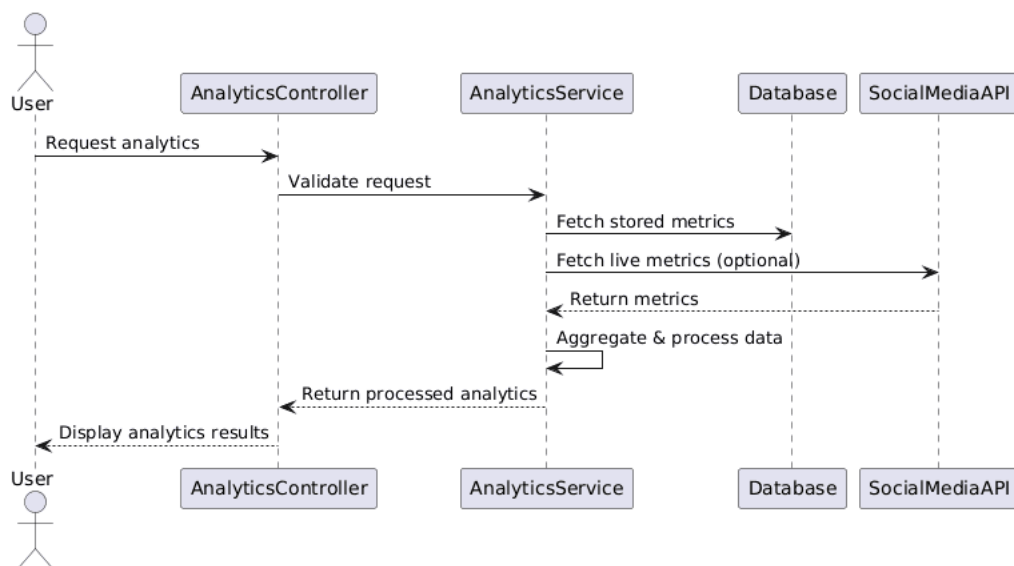


Figure 4.7: Analytics Retrieval Process of AI-Powered Multi-Platform Management & Insights

4.7.4 Sentiment Analysis Process

This diagram illustrates the way SocialSight performs sentiment analysis to gauge audience response on posts.

The main components and flow are as follows:

- **User:** Get a sentiment analysis of posts.
- **SentimentController:** The request is received, input validated and then the request forwarded to the service layer.

- **SentimentService:** Get comments and reactions either from Database or from live SocialMediaAPI. It uses fine-tuned Hugging Face Transformer models to predict sentiment.
- **Database / SocialMediaAPI:** Deliver stored historical data or live post data upon request.
- **Displayed Metrics:** Positive / Negative / Neutral percentages, graphical chart (Pie Chart), top positive/negative comments.

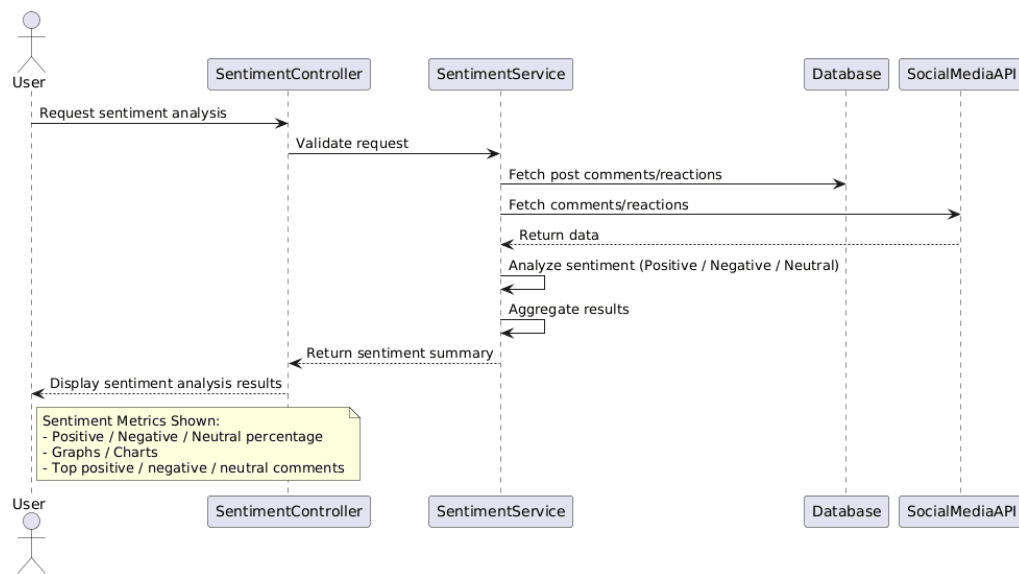


Figure 4.8: Sentiment Analysis Process of AI-Powered Multi-Platform Management & Insights

4.7.5 Post-Comparison Process

The post comparison in SocialSight is represented by the sequence diagram below, demonstrating how two posts are compared and visualized. The basic structure and flow are listed as follows:

- **User Selection:** The user chooses two posts to compare (with an option to filter by platform and date). The two selected posts are shown in the left and right panes of the dashboard.
- **Controller & Service:** ComparisonController ensures the user's choice is valid. ComparisonService retrieves analytics metrics for the two posts from the database or the SocialMediaAPI, if required.
- **Data Processing:** In order for the comparison to be fair, metrics are normalized and aggregated. Differences and highlights (best-performing post).

- **Metrics Displayed:** Likes/Reactions, Comments, Shares, Views, Engagement Rate, dual bargraphs, tables, and highlights.
- **Goal:** To provide a fast visual comparison of post performance for a user and to allow them to examine their best content to help them make decisions.

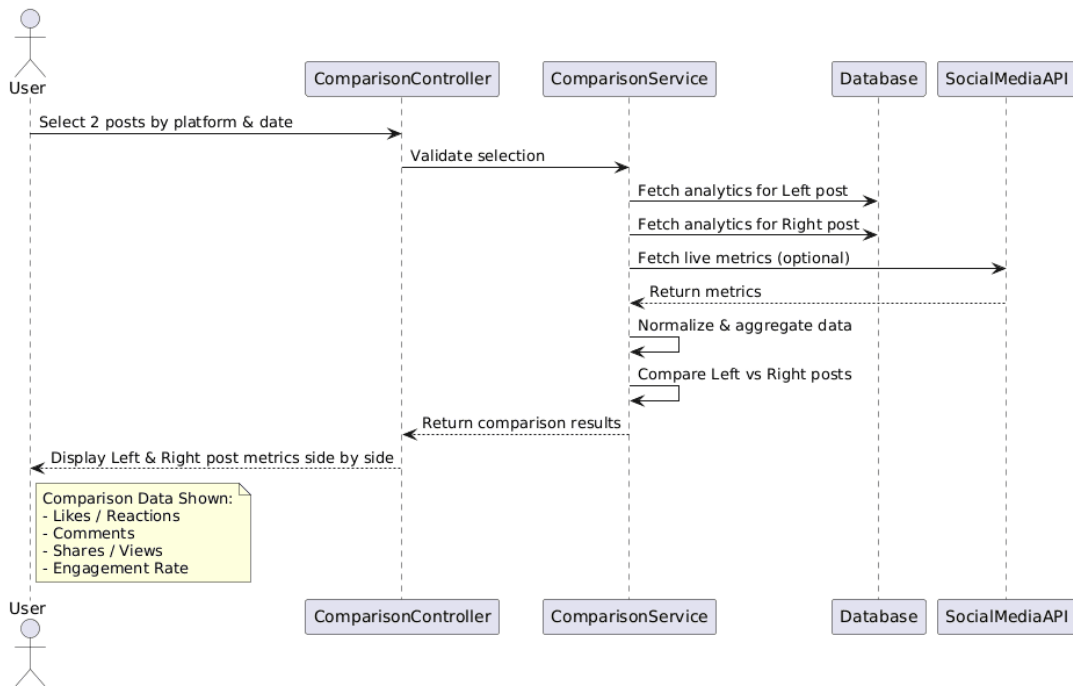


Figure 4.9: Post Comparison Process of AI-Powered Multi-Platform Management & Insights

4.8 Platform-Specific Posting Flows

This section below shows the sequence diagrams for posting flows tailored to each supported social media platform, including Facebook, Instagram, YouTube, and Twitter. Each diagram focuses the platform-specific steps, API interactions, and logic for handling draft, scheduled, and instant posts.

4.8.1 Facebook Page Posting Flow

This diagram shows how a user accesses the Facebook post page on SocialSight, with information on login, post creation, post scheduling and post analytics. It covers the entire process, from log in to post management to real-time insights, giving users a clear understanding of the flow of data throughout the application, which helps to enable faster onboarding and task completion.

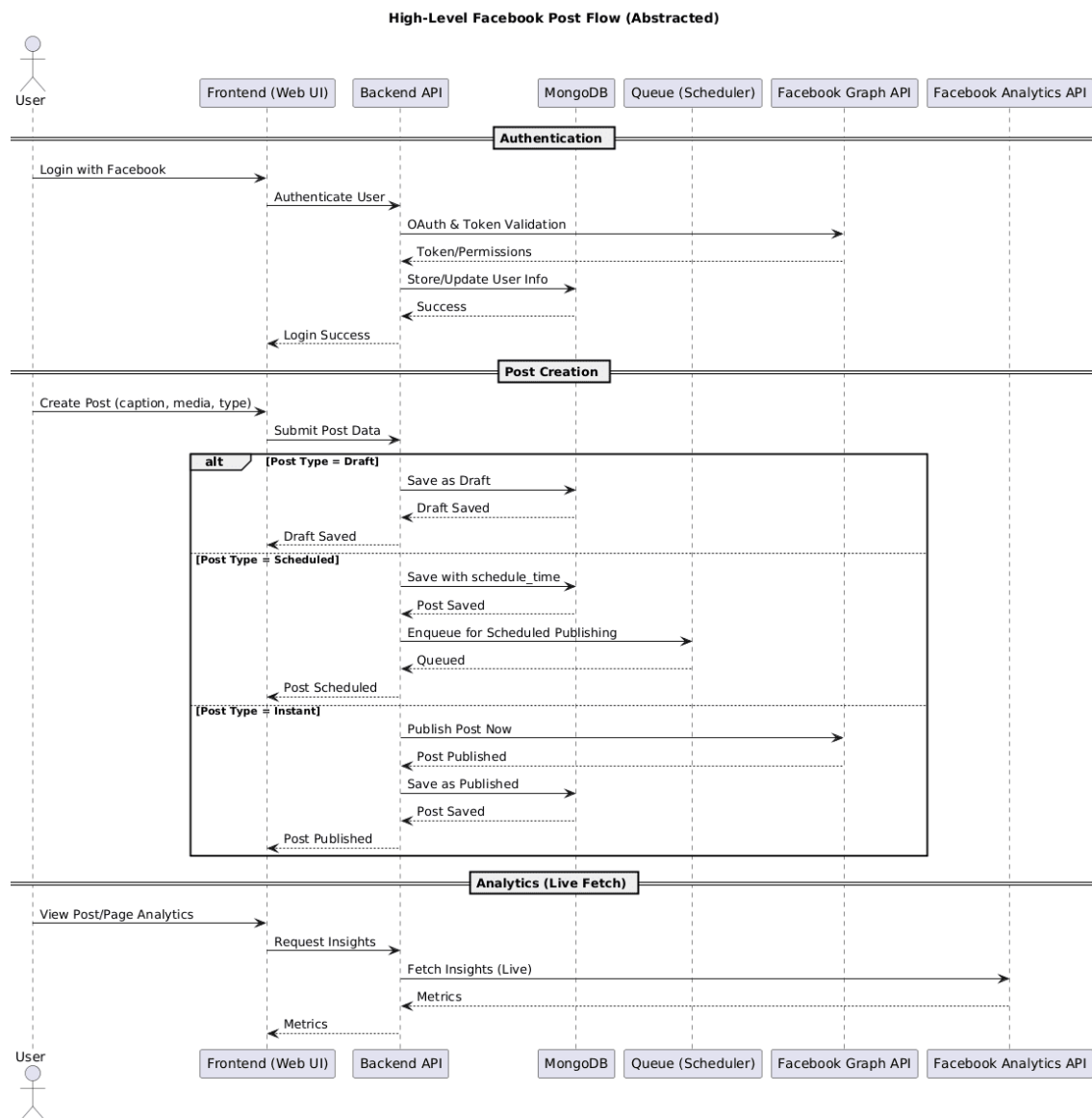


Figure 4.10: Facebook Posting Flow of AI-Powered Multi-Platform Management & Insights

1. Actors and Components

- **User:** The user has a responsive web interface via which she/he accesses the system to post to Facebook.
- **Frontend (Web UI):** Isolates the user inputs and safely transmit them to the backend.
- **Backend API:** Implements business logic and API, communicates with database, and interfaces with Facebook APIs for posting and analytics.
- **MongoDB:** Holds user data, OAuth tokens, drafts, scheduled and published posts.
- **Queue (Scheduler):** Or...scheduled posts that you want to post at a later date.

- **Facebook Graph API:** Checks tokens and posts instantly or schedules.
- **Performance Data:** Using Facebook Analytics API, get real-time dirty data for post performance.

2. Authentication Flow

The user logs in through Facebook in the frontend. The backend uses the Graph API to verify the OAuth token, then saves or updates the user data in MongoDB and responds to the frontend with a successful login.

3. Post Creation Flow

Posts can be created as Draft, Scheduled, or Instant:

- **Draft:** Saved in MongoDB for editing at a later time; confirmation is sent to frontend. This option enables users to edit and proofread content prior to publishing.
- **Scheduled:** Stored with a time and queued in the scheduler for automatic publishing. The post will be live on the dot of the given period of time.
- **Instant:** Published immediately through Graph API, stored in MongoDB, and confirmed to the frontend. Users can also get instant feedback when the post is live.

4. Analytics Flow

Users have access to live post statistics through the backend that requests information from Facebook Analytics API and delivers processed insights to the frontend via specific channels for evaluation and take action.

4.8.2 Instagram Posting Flow

This is a sequence diagram showing a user interaction with Instagram post the whole post functionality with authentication, creating a post, and getting analytics.

1. Actors and Components

- **User:** Active user of the platform via Web UI.
- **Frontend (Web UI):** Sends user input to backend and displays response.
- **Server API:** Contains the business logic, communicates with the Instagram APIs, taking care of the DB and scheduling posts.
- **MongoDB:** User data along with post drafts, scheduled posts and posted ones.
- **Queue (Scheduler):** Manages timed execution of posts to be submitted.
- **Instagram Graph API:** Creates instant posts and verifies OAuth tokens.
- **Instagram Analytics API:** Delivers real-time analytics and metrics of posts.

2. Authentication Flow

The user signs in with Instagram on our web app through the frontend. The backend verifies the token through Instagram Graph API and then upserts information in MongoDB.

3. Post Creation Flow

Posts may be created as Draft, Scheduled or Instant:

- **Draft:** Saved to MongoDB; the frontend is notified.
- **Scheduled:** Added with a scheduled time and enqueued in the scheduler, with notifications sent to the user.
- **Instant:** Posted straight away through Instagram Graph API, stored in MongoDB, and notified to the frontend.

4. Analytics Flow

Users can fetch live metrics for any post or page. The backend calls Instagram Analytics API and forwards the response to the frontend.

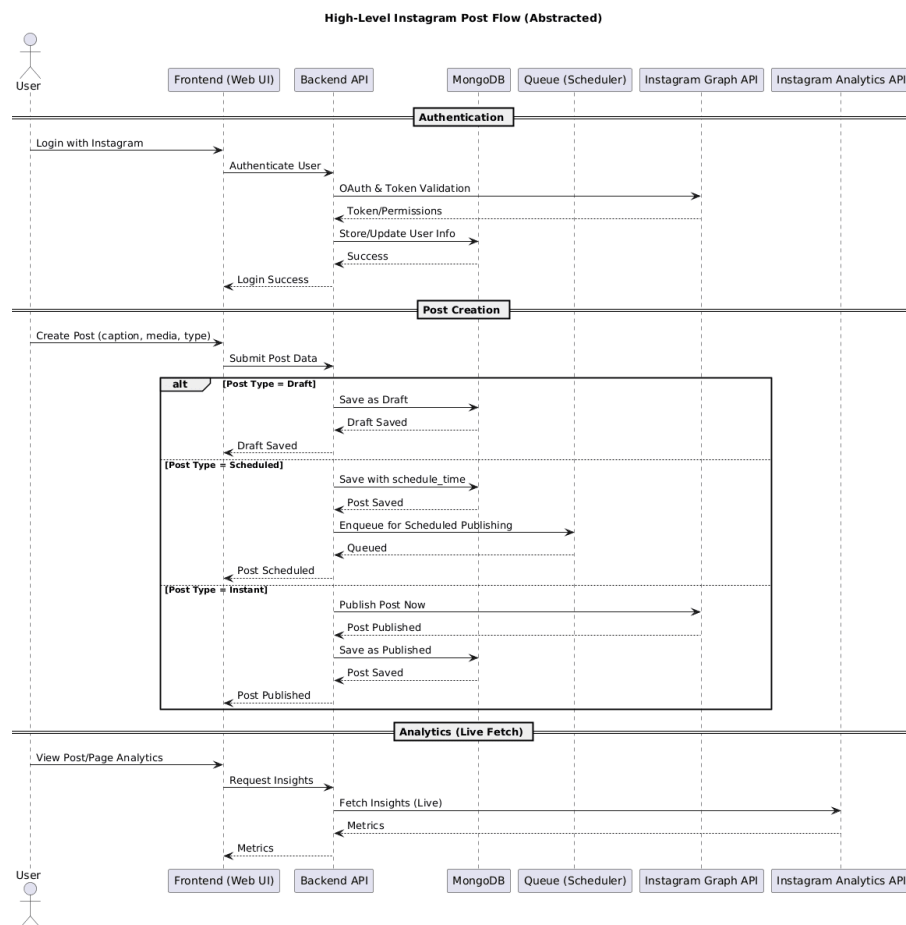


Figure 4.11: Instagram Posting Flow of AI-Powered Multi-Platform Management & Insights

4.8.3 YouTube Video Posting Flow

This diagram shows the complete flow where a user can manage his/her videos in YouTube via SocialSight. It allows all the important authentication, video uplouploading, analytic retrieving procedures to be bridged seamlessly between the front end, the backend servserves, the YouTube APIs. The flow also shows how post modes, user credentials are securely handled by the system and how the system is optimized continuously based on engagement data.

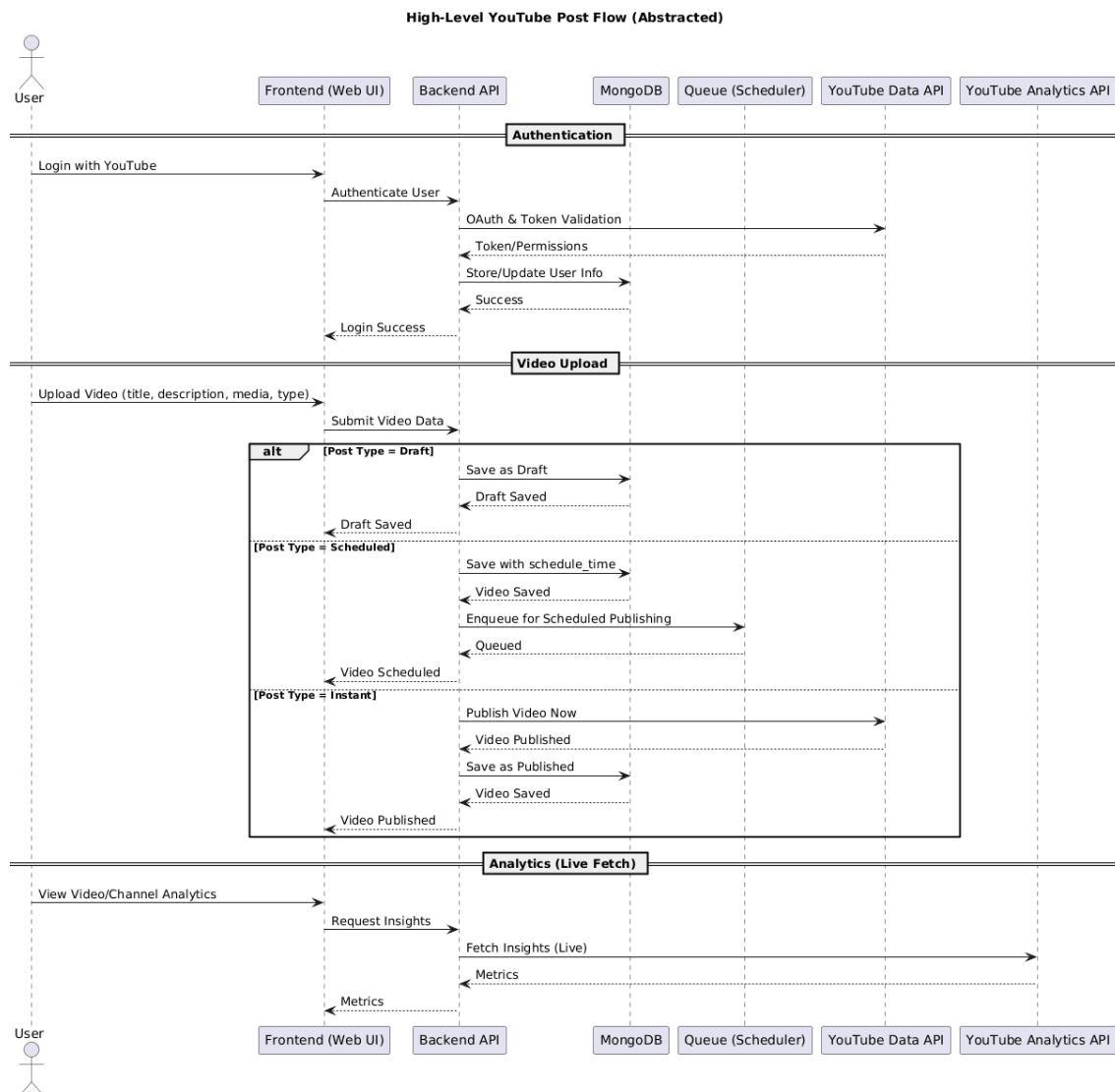


Figure 4.12: YouTube Video Posting Flow of AI-Powered Multi-Platform Management & Insights

1. Actors and Components

- **User:** The user who interacts with the platform via an easy-to-use web interface to upload, organize and analyse videos.

- **Frontend (Web UI):** Receives the user's inputs (video files, description, title, time for scheduled publishing) and sends them to the backend via secured API calls.
- **Backend API:** Implements the business logic, checks the validity of OAuth tokens, handles video uploads and interfaces with YouTube APIs. It also busies with scheduling jobs and ensuring data integrity.
- **MongoDB:** Functions as the source of truth: holding user information, video drafts, scheduled upload information, published video logs, and metadata.
- **Queue (Scheduler):** Conducts the batch uploads for you at the interval you decide to run it, and posting at the precise time defined by you guarantees that you will post consistently and automatically.
- **YouTube Data API:** Facilitates interaction with YouTube to publish videos, verify tokens, and process upload requests instantaneously.
- **YouTube Analytics API:** Obtains real-time statistics including views, engagement rates, audience information, and watch time for individual videos, as well as an aggregated report of all your videos.

2. Authentication Flow

Then on the frontend user sign in using YouTube OAuth. When the user authorizes, the backend receives an authorization token which can be verified using the YouTube Data API. Upon confirmation, the app will insert or update the user's account information in MongoDB securely. A confirmation message is then sent to the frontend.

3. Video Upload Flow

Users have following flexible upload options to meet different posting needs:

- **Draft:** The video and its metadata are saved temporarily in MongoDB. This means users can go back and edit or complete a post prior to publishing it.
- **Scheduled:** The video is saved with a specified publication date. The backend adds the upload job to the scheduler queue which will perform the upload at the given time and send confirmation.
- **Instant:** The video is uploaded directly to YouTube through the YouTube Data API. On a successful upload, a post is logged in MongoDB, and the frontend informs the user with the published status.

4. Analytics Flow

Once live, users may request detailed stats of their videos or channel usage. The backend retrieves the necessary data from the YouTube Analytics API, formats the data to be easily

readable, then sends it to the frontend. Impressions, engagement rate, audience retention, and view distribution are among the available metrics in a visually interactive dashboard that allows users to analyse content performance, identify actionable insights.

4.8.4 Twitter Posting Flow

This figure illustrates the user's entire interaction with the Twitter posting system in SocialSight that is login, tweet generation, tweet scheduling, and analytics fetching. It enables the frontend and backend to talk to each other with Twitter APIs.

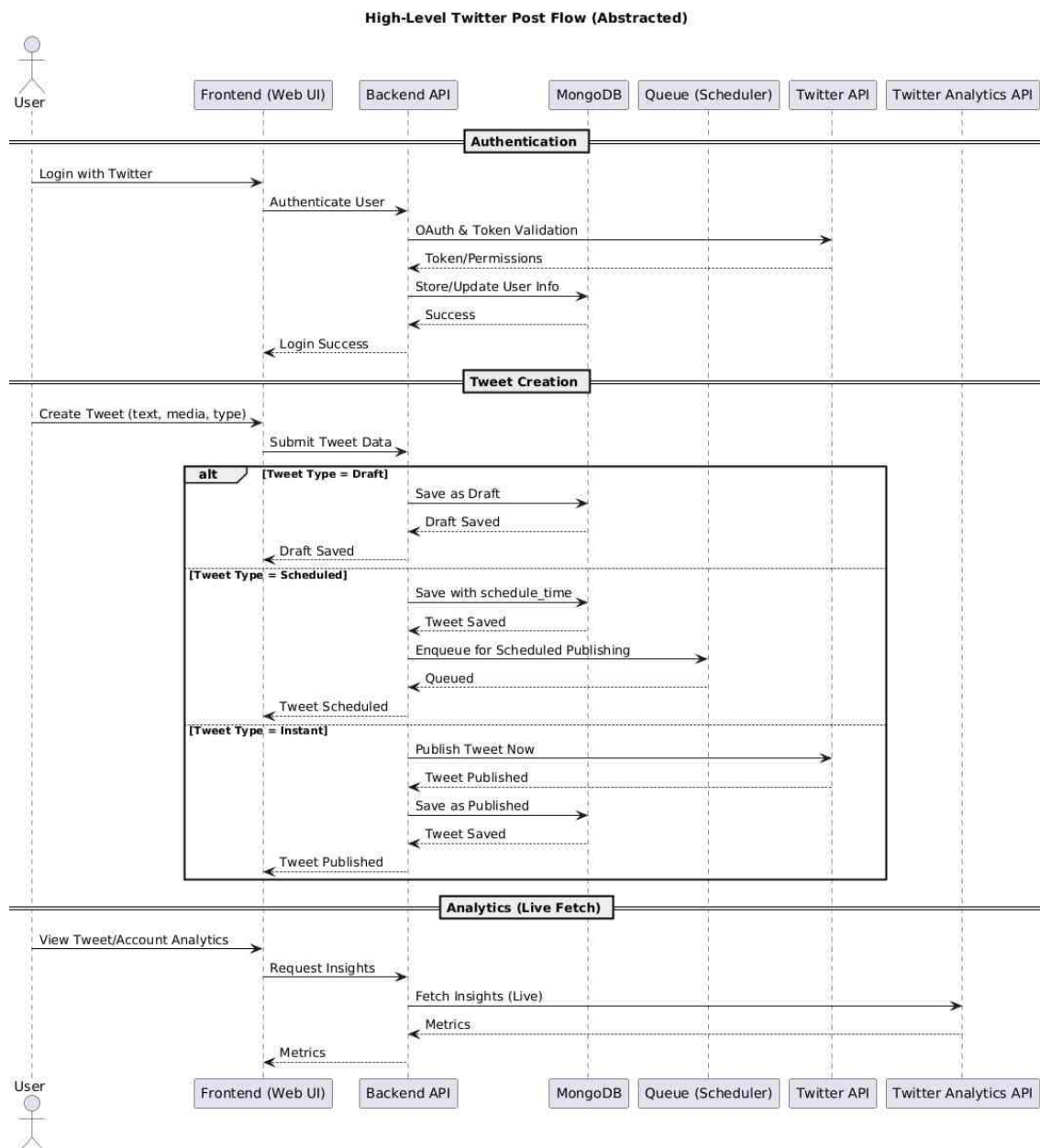


Figure 4.13: Twitter Posting Flow of AI-Powered Multi-Platform Management & Insights

1. Actors and Components

- **User:** A user is anyone who tweets or reads tweets on the service.
- **Frontend (Web UI):** The frontend consists of the login, tweet creation, and analytics pages and communicates with backend via secured channels.
- **Backend API:** The business logic layer and the data base interaction layer, that also communicates with Twitter APIs for posting and analytics.
- **MongoDB:** user credentials, drafts, schedules, published tweets, and analytics.
- **Queue (Scheduler):** It takes care of the auto-publishing of the scheduled tweets.
- **Twitter API:** To authenticate and tweet.
- **Twitter Analytics API:** To see engagements and audience data.

2. Authentication Flow

The flow starts when a user signs in with their Twitter account:

- The frontend makes a login request to the backend.
- The OAuth token is authenticated by the backend via Twitter's API.
- The user's information and access tokens are encrypted and saved in MongoDB.
- The frontend receives a login success confirmation.

3. Tweet Creation and Scheduling Flow

You can write a tweet and then post it immediately, schedule it, or save it as a draft:

- **Draft:** Kept in MongoDB for future use.
- **Scheduled:** Put on hold for timed posting.
- **Instant:** Post right away using Twitter API and store again to the database.

4. Analytics Flow

After publishing, users can view tweet or account performance:

- The user makes a request for analytics from frontend.
- The backend retrieves data from Twitter Analytics API.
- Metrics such as impressions, likes and engagement rates are presented on the dashboard.

This process allows Twitter posting, scheduling and analytics to remain fully automated, secure, and easy-to-use within SocialSight, giving your users a way to effectively manage their online presence all from within one consolidated solution.

4.9 Low-Level Design

The SocialSight LLD is the elaborated system design with descriptions of all the modules at the level of each and every module's internals. It focuses on classes, attributes, methods, and relationships and gives a clear view of implementation as well as future possibilities. This part includes a technical design that enables developers to carry out the code and module integration. It makes sure that every element meets the scalability, maintainability, and performance requirements of the project.

4.9.1 Entity Relationship Diagram

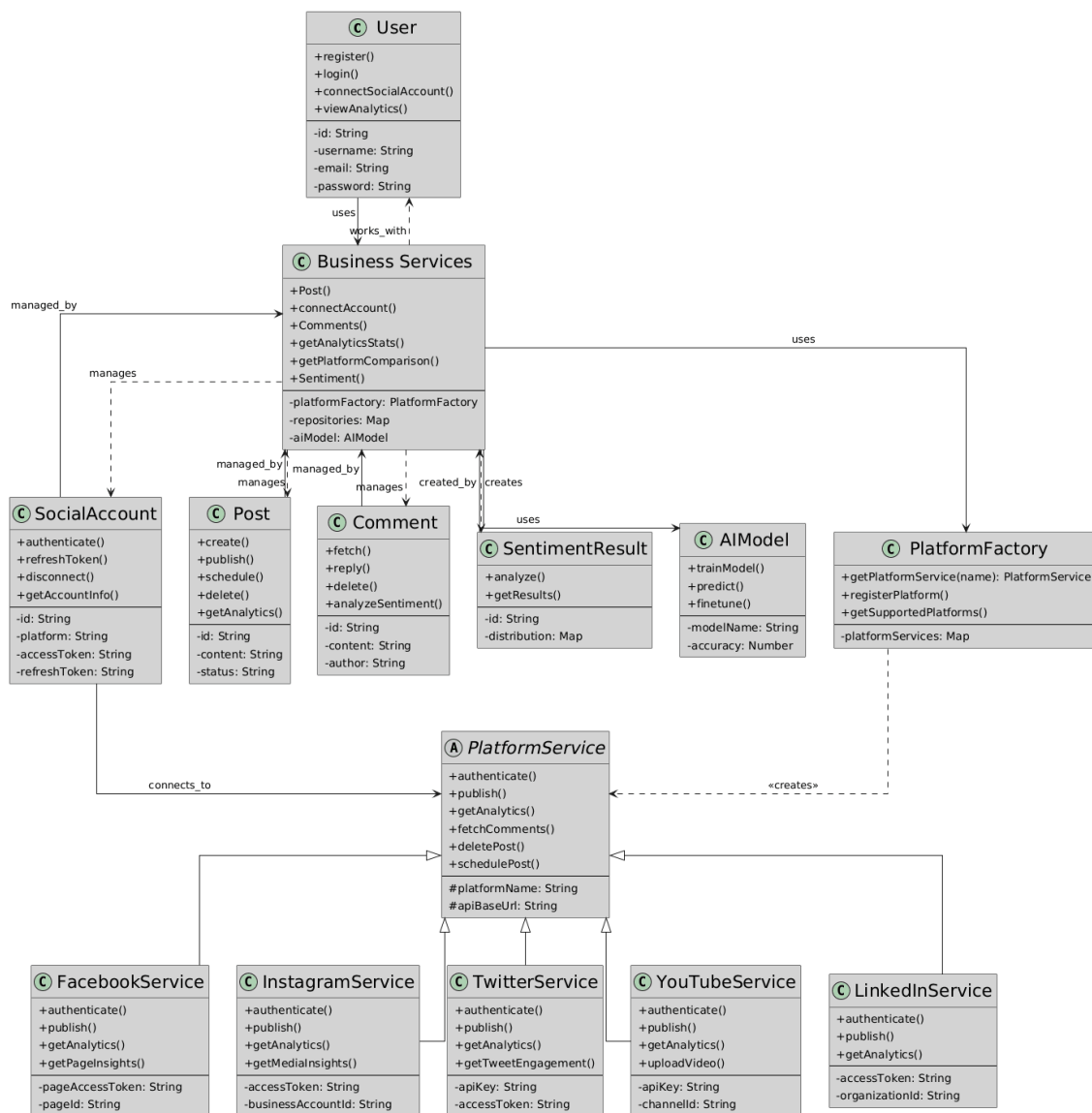


Figure 4.14: Class Diagram of AI-Powered Multi-Platform Management & Insights

The entities are User, SocialAccount, Post, Comment, SentimentResult, and AIModel in ER diagram. System users are business services, which represent posts, comments, and account information. Social accounts are linked to platform-specific services such as Facebook, Instagram, Twitter, and YouTube using the PlatformFactory, which takes the lead to provide a modular and scalable solution for dealing with multi-platform. Below is the explanation of the ERD diagram:

- User communicates with SocialSight via services to post, track analytics and manage accounts.
- The Post and Comment entities are governed by business services that implement the rest of the logic such as publishing, scheduling, replying, deleting, etc. . .
- SocialAccount is tied to platform services for authentication, token management and platform specific functions.
- The AIModel runs sentiment analysis on posts and comments, and the output is saved to SentimentResult.
- PlatformFactory is also the core manager of all platform services, and so developers can easily implement a new platform without impacting the old ones.

Overall, this architecture maintains the good separation of concerns, reusability and future scalability (i.e., plugging in advanced analytics and/or AI features).

4.10 GUI Design

The GUI of the SocialSight application is simple, intuitive, and clean with clear navigation. The interface design is clean and simple, making it easy for the users to keep multiple social media account under one roof. All elements of the templates have been formatted for simplicity with the visually the same font and colours used throughout all pages.

In the following, the main pages of the application are explained:

4.10.1 Landing Page

The Landing Page provides a brief overview of the platform with a focus on the main features and benefits. This is the first place where new visitors interact with it, is with a plain and simple interface along with two options for Navigation that take them to the Login Page and the Sign-Up Page. The look and feel are simple and user-friendly, suitable for new users to have a look around and get some idea of what SocialSight is capable of.

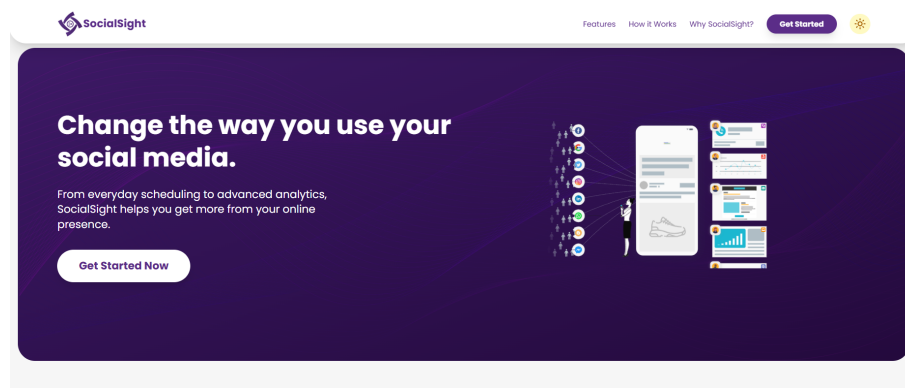


Figure 4.15: Landing Page of SocialSight

4.10.2 Sign Up / Sign In Page

The Sign Up and Sign In page is used to enter the platform securely. The new users can register by providing the information and those who are registered can sign in. Both pages adhere to a strict authentication policy, assuring a flawless login experience. After a successful sign-in, the users are taken to their Dashboard where they can add and manage their social media sites.

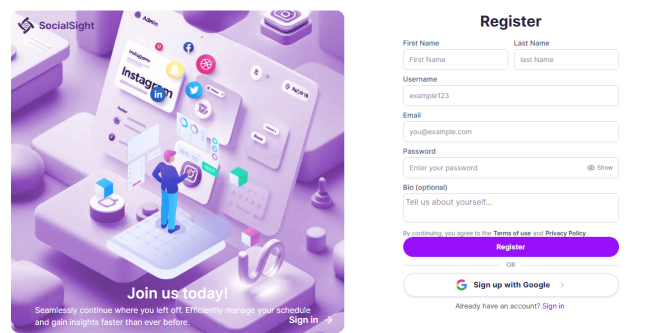


Figure 4.16: Signup Page of SocialSight

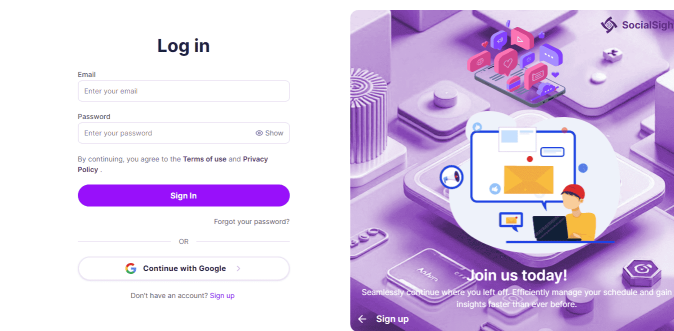


Figure 4.17: Login Page of SocialSight

4.10.3 Dashboard Page

The dashboard is the main module of socialsight system, and this is where users most of their time, as this module provide a fast overview of their social media status. It features a few top-level KPIs to indicate content potency and audience activeness, including Reach, Engagement Rate, Total Posts and Active Platforms. Two graphical insights under these indicators assist in analysis: The Followers Growth Chart shows the adquisition of followers and level of engagement along the time, and the Platform Comparison Graph compares the performance of all the connected social networks. Recent Activity The Dashboard also includes a Recent Activity section to allow users to follow their most recent posts and find out if any pending or failed actions.

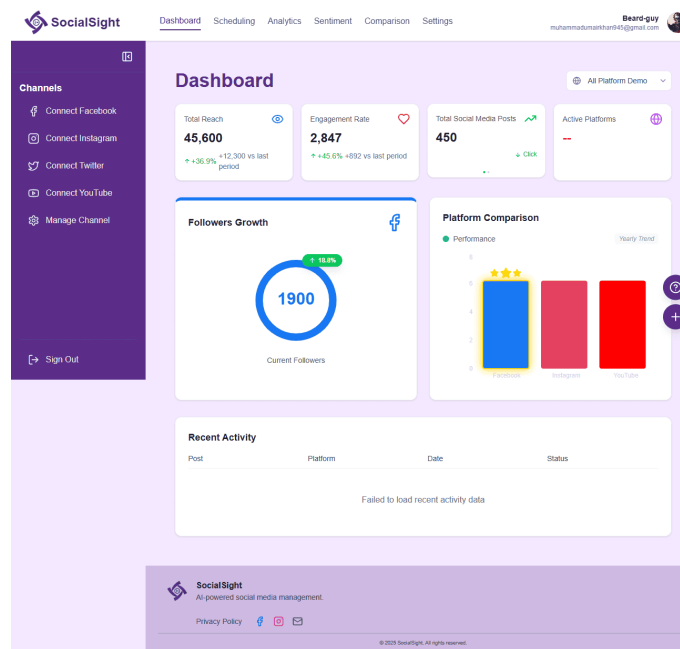


Figure 4.18: Dashboard Page of SocialSight

4.10.4 Post Management Page

The Post Management Page makes it possible to create and manage posts without leaving the page, so you can write and polish your posts with a fraction of the clicks. Users can attach media files, such as images or videos, and specify the publishing mode Post Now, Schedule, or Save as Draft. When scheduling a post, users have the option to specify the publication date and time, ensuring the post will be automatically published at that time. Also, a live preview of the selected post is available at the bottom of the page, so users can check the content before going live. This page simplifies creating and scheduling posts and gives you full control over your content.

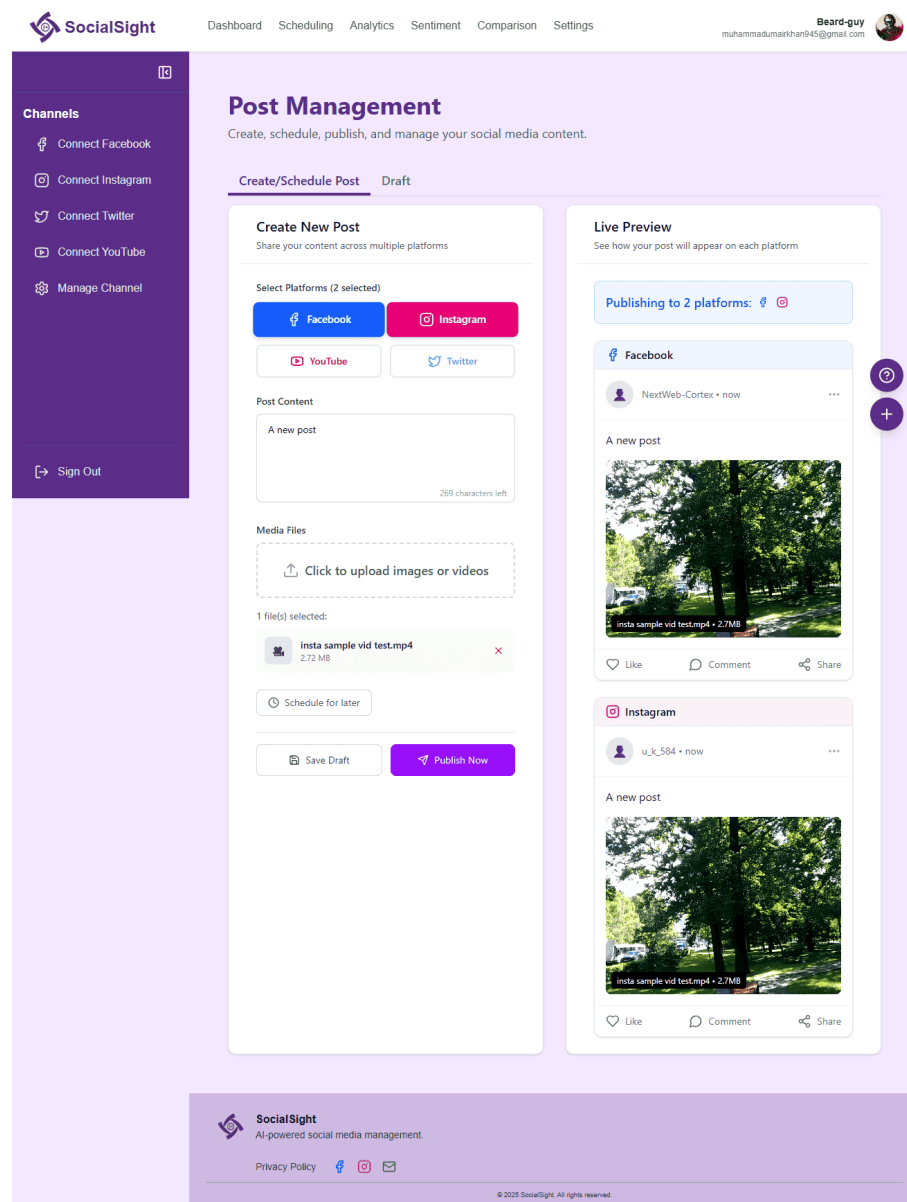


Figure 4.19: Post Management Page of SocialSight

4.10.5 Content Calendar Page

The content calendar gives you a neat overview of your past and future posts. A date is displayed in a top calendar with posts that are scheduled (or have been published) on this date marked. Below the calendar, all scheduled posts are listed with a bit of information on each post (which platform, what type of content, and the date). This dual approach calendar and list view allows users to see at a glance “what’s next,” to confirm their lineup, and to tweak posting plans on the fly across multiple platforms. It also highlights content gaps and keeps them posting regularly. Users can also swiftly modify schedules in response to a breaking story or a campaign turn.

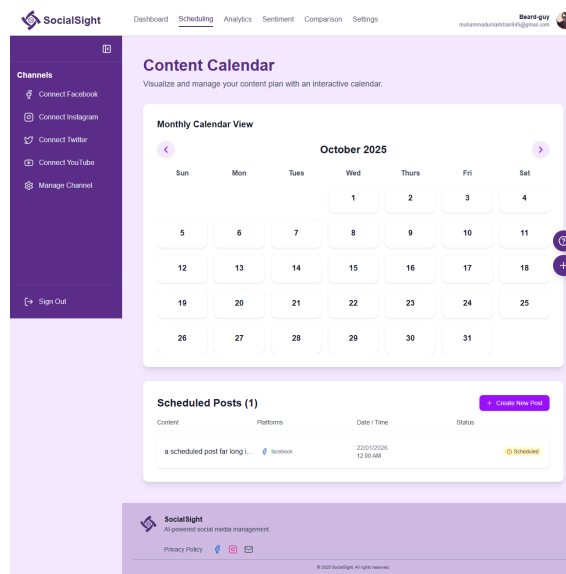


Figure 4.20: Content Calendar Page of SocialSight

4.10.6 Draft Page

The Draft Page contains all posts that have been saved as draft. At any point in time, users can preview, schedule, or remove a draft post. Draft posts can be finished and scheduled to be posted later, which helps with the content creation workflow. The page makes certain that all uncompleted or pending posts on rest are properly organized so that the users can keep them consistent and get help in managing their content over multiple social media platforms without risking the loss of anything in the process.

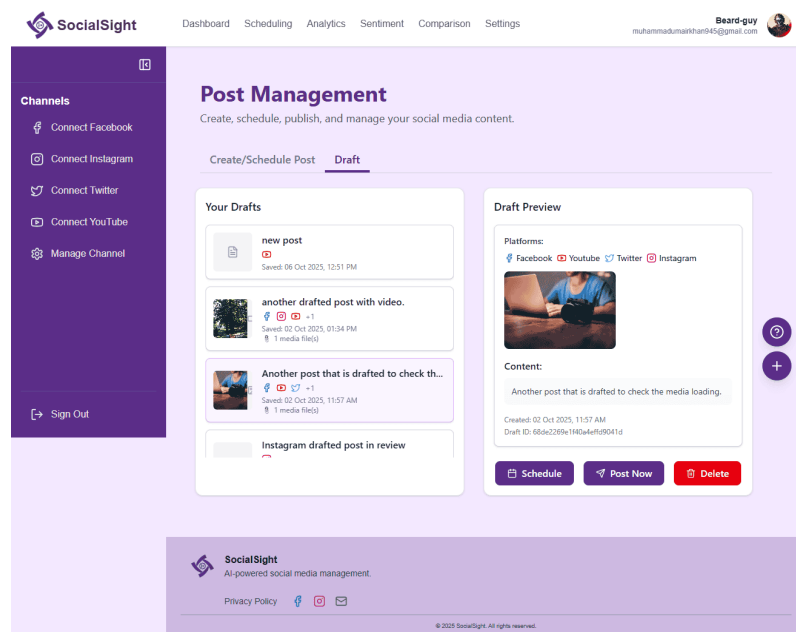


Figure 4.21: Draft Page of SocialSight

4.10.7 Analytics Page

The Analytics Tab presents a variety of social media stats. Users can view information for day, week, and month and specific platforms, such as Facebook, Twitter (X), or YouTube. Followers, Reach, Impressions, and Engagement are the main metrics tracked. Performance strength graph engagement activity trends are displayed on the performance strength graph, audience demographics such as gender, location and engagement activity are analyzed. Other metrics such as views or clicks help to understand the level of engagement of the audience. Finally, a Top Performing Posts table shows the most engaging content so that users can learn from what they do best. This all gives the user the overview and results of there posts.

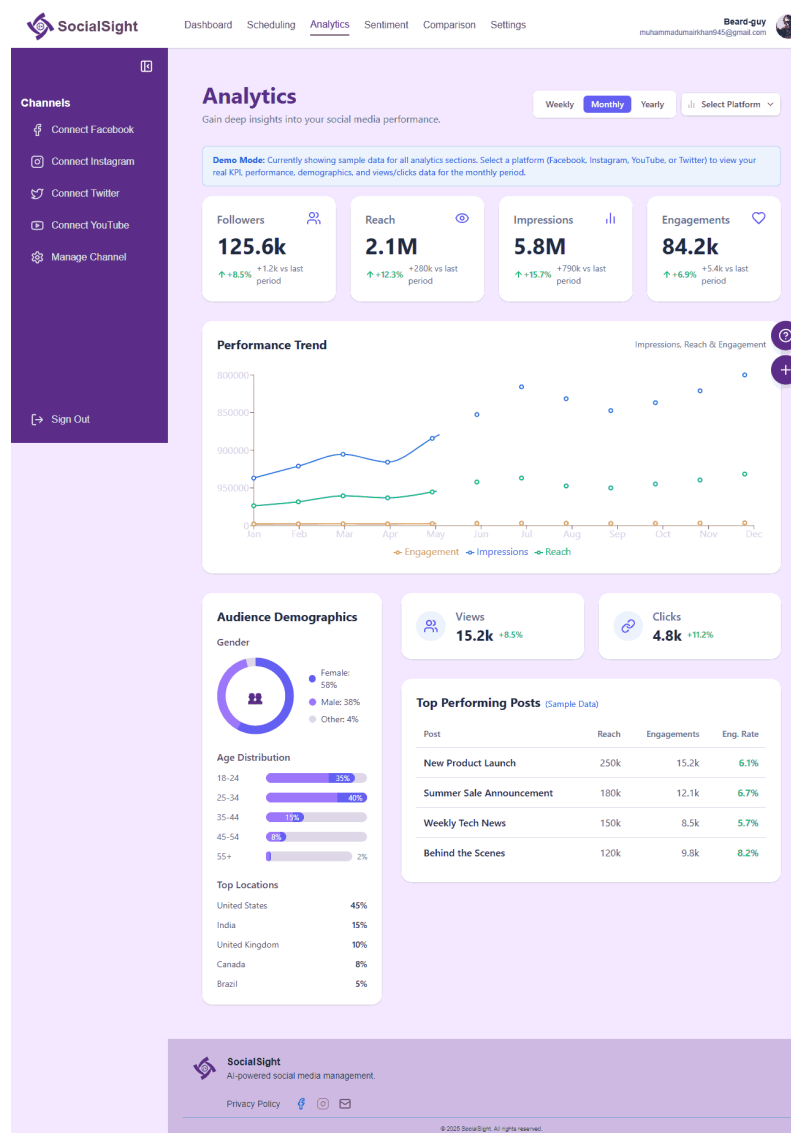


Figure 4.22: Analytics Page of SocialSight

4.10.8 Sentiment Analysis Page

The Sentiment Analysis Page allows users to gauge the emotions and responses of their audience. Key sentiment indicators including total comments, positive, negative and neutral comments are rendered as a pie chart and can be a percent value. User can choose Platform, date, to analyze the post. After a brief wait, you're then presented with a Pie Chart showing the percentage of sentiment types, a comment list below where the individual comments are also tagged with its detected sentiment. There are filters enabled to view only positive comments, negative comments or neutral comments. Here, you would be able to assess the perceptions of the audience, and in turn, tweak your content strategy.

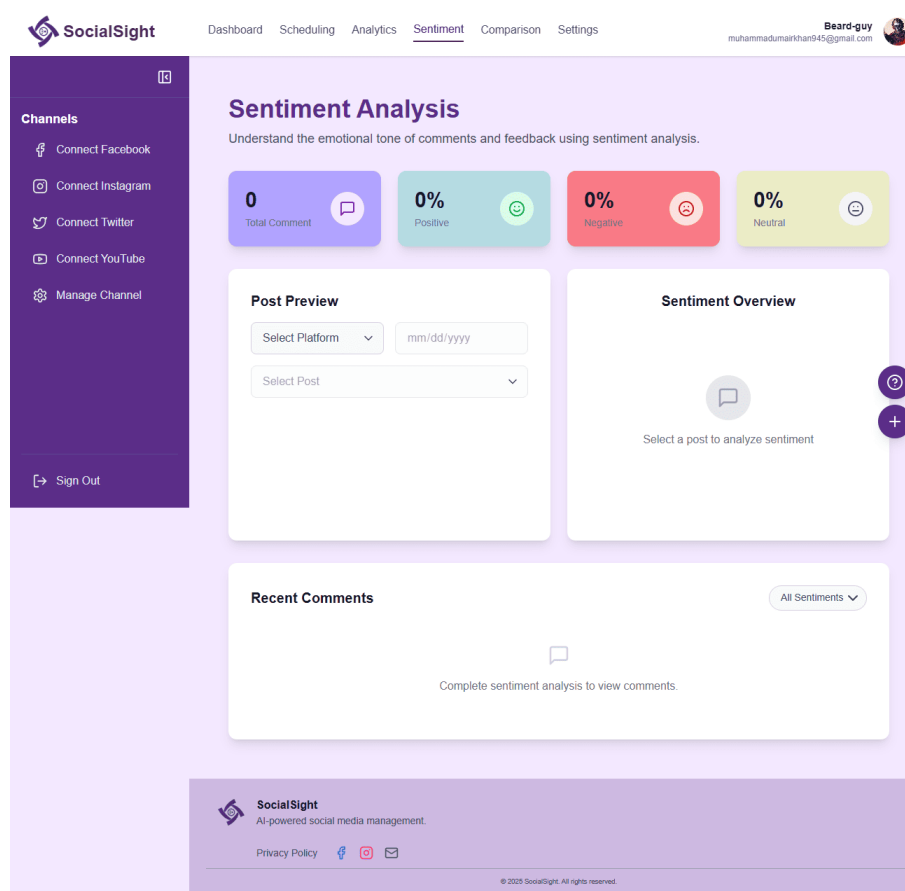


Figure 4.23: Sentiment Analysis Page of SocialSight

4.10.9 Comparison Page

The Comparison Page enables you to compare multiple posts or campaigns across columns and rows, so you can easily see how they are performing. On each side you can choose a

platform, a date range and posts to compare likes, comments, shares, reach, and engagement. The side-by-side layout simplifies comparing the performance of different posts and campaigns at a single glance.

Also users who visit a post later will have possibility to see sentiment analytics of that post (they analyzed that post on Sentiment Analysis Page). This enables users to understand which content strategies the best are performing ongoing, and where the trends are going as well as to gain deeper knowledge about the audience's behavior and engagement modes making even more informed predictions for content planning.

In general, the Comparison Page gives users the ability to fine-tune their social media strategy based on insights that tell them what to do and a snapshot that tells them how well they are doing.

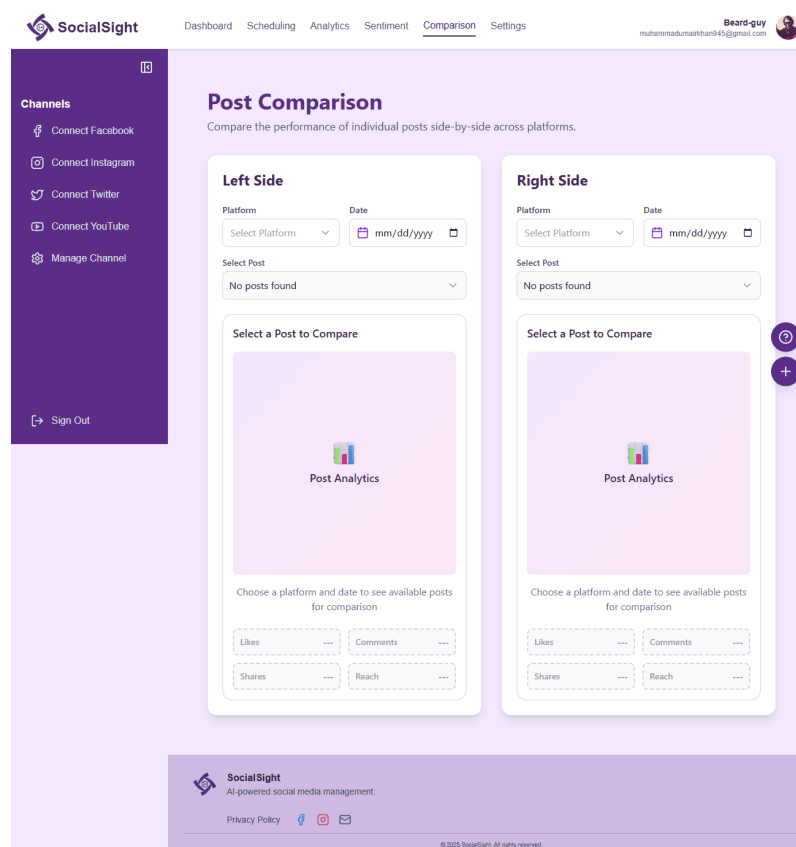


Figure 4.24: Post Comparison Page of SocialSight

4.10.10 Connection Page

On the Connection Page, the users are permitted to connect their social media accounts (Facebook, Instagram, Twitter (X), YouTube) to the service. The process is the same across all platforms and use OAuth authentication which is the one that guarantees the protection of users' information and privacy. After choosing a service to connect to, users

are pushed to the service’s authorization page where they can grant the application access. Once permissions have been verified, a secure connection is created with the ability to post, analyze, and gauge sentiment.

Linking your accounts is easy and fast and it spares you the trouble of signing in to each platform individually. This combined authentication method delivers a smooth and seamless experience, giving users the confidence that their accounts are protected, and allowing them to manage all of their social media from one place.

Once their accounts are linked, users can start using the platform immediately, making it simple to schedule posts, track performance, and gain insights with out any technical difficulties.

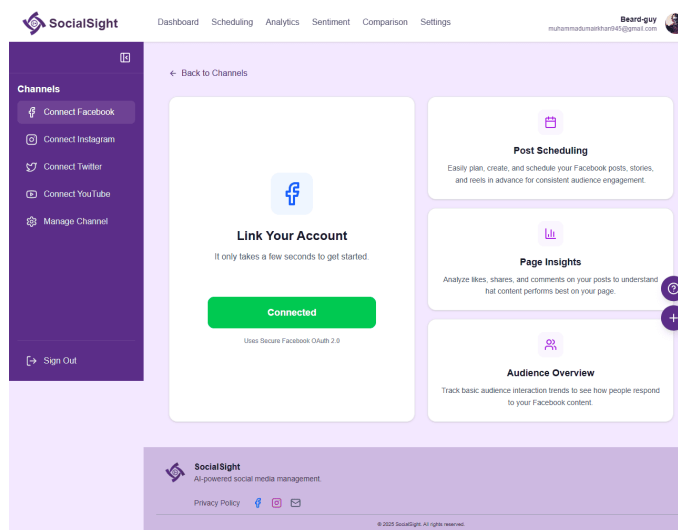


Figure 4.25: Facebook Connection Page of SocialSight

4.10.11 Settings Page

The Settings page enables users to personalize their profile and select app options to their liking. After logging in, users that want to update their profile, change account settings, or customize their platform experience can do so via this page. It’s the one-stop-shop for users to make an account truly their own while still determining how the app communicates with them. And that, in turn, helps users feel comfortable and confident in crusing through the platform.

Personal Information in User Settings where users can change their name, username, email, and bio. They can also set other personal preferences, such as profile images or links to external accounts, and can even delete their account if they want. That means you can rest assured that you can protect your profile, customize how you look to others, and pretty much know everything that anyone can know about their personal data and how visible it should be.

App settings are some basic-level settings like turning two-factor authentication on and off, notifications, and switching between light or dark themes. Now, with these features turned on, the user experience is more secure, users get useful notifications, and have a more comfortable, tailored experience. At the end of the day, users should be able to do their own safety and feel safe on the site. It adds up to users feeling like they're a little more connected to, and in control of, the place every day they log on.

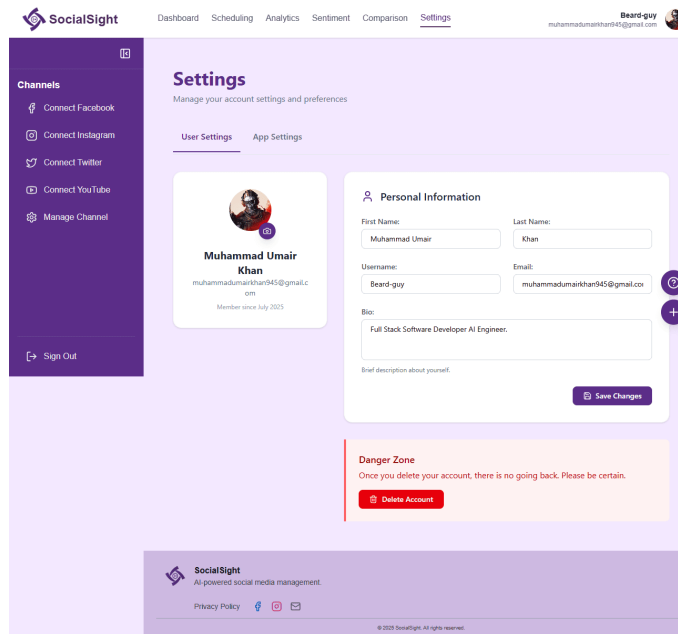


Figure 4.26: User Setting Page of SocialSight

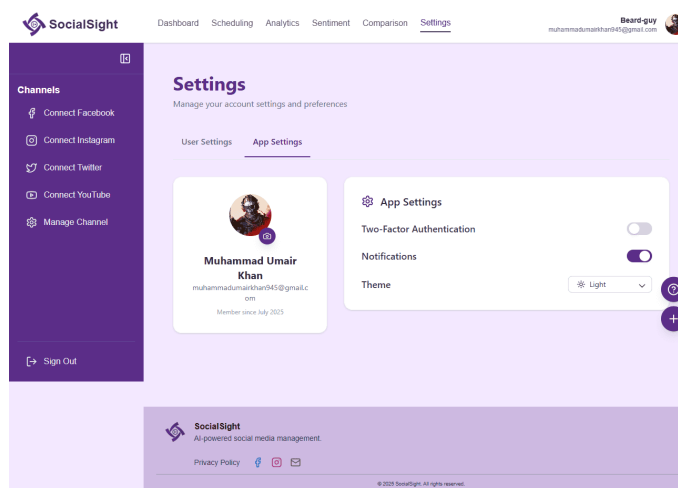


Figure 4.27: App Setting Page of SocialSight

Chapter 5

System Implementation

The introduced system, SocialSight, is a cross-platform social media management software that allows users to create, schedule, and manage their posts on various social networks from a single interface. The design is based on OOP (object-oriented programming) and SOA (service-oriented architecture) which allows to be highly modular, scalable and maintainable in terms of reusable components. Specific-platform modules, derived from a common base class, provide a straightforward method to add more features or platforms later on without significantly affecting the design, and without sacrificing the systems flexibility, maintainability, and overall ability to adapt to emerging social media technology.

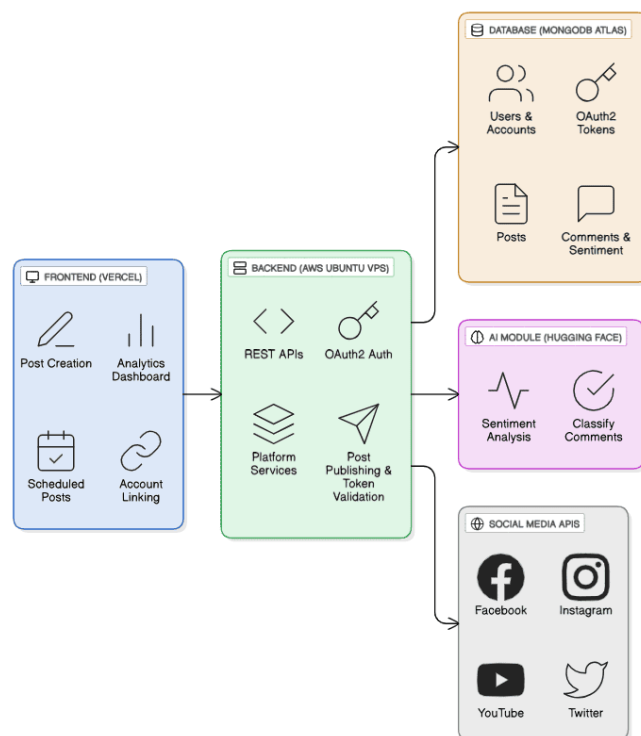


Figure 5.1: Architecture Flow of AI-Powered Multi-Platform Management & Insights

5.0.1 System Internal Components

- **Frontend Interface (Web Dashboard)** The frontend was built using React.js, Tailwind CSS and functions as an interactive web dashboard that enables users to compose, modify, and schedule posts on multiple platforms. It offers a live window into analytics, scheduled posts, notifications, and account activities. The dashboard also provides secure account linking and real-time post previews for a seamless and friendly user experience.

- **Backend Services**

The critical operations of authentication, post scheduling, and communication with social media APIs via the Platform Service Modules are managed in the Node.js/Express.js based backend service. These modules translate user interactions into platform-specific API calls, handle OAuth2 tokens, and normalize API responses, providing a unified experience on all platforms.

- **Database (MongoDB Atlas)**

Critical data such as user profiles, authentication tokens, scheduled posts, analytics data and sentiment analysis outputs is stored in a cloud-hosted MongoDB Atlas database. This allows domain logic to run on the frontend/backend with data consistency, realtime synchronization and strong availability between backend/frontend.

- **Security Middleware**

The security layer protects the system from exploits using Helmet, express-mongo-sanitize, xss-clean, and express-rate-limit. It checks and is input all input active sanitized, that keeps from data manipulation or injection attacks, and works with the authentication procedures to get user accounts and data shielded.

- **AI & Sentiment Analysis Module**

This part employs Hugging Face Transformer models (trained on social media datasets) to process audience comments and categorize them into positive, negative or neutral. The sentiment information is shown on the analytics dashboard, providing users with a great deal of information on how the audience perceives them and allowing them to modify their content strategy accordingly.

5.0.2 Functionality of Components

1. Frontend Interface (Web Dashboard)

- There is one dashboard to rule them all, from which you can write, schedule or draft post on Facebook Twitter, Instagram, and Youtube without having to fiddle with platform peculiarities.

- Uses Zod to validate login and register information before it is sent to the backend to be processed securely.
- Provides an interactive chart, table, and sentiment summary to present the performance of tweets.
- Provides account management for comfortably link and unlink multiple social media accounts.
- Show your scheduled posts, Latest activities and system notifications in real time. Tailored to help you manage workflow efficiently.

2. Backend Services

- Serves as the processing center of the system, receiving the request from the frontend, then sending the request to the database, APIs, and AI module, respectively.
- Adds authentication and authorization with JWT access token for securing APIs, OAuth2 for connecting with external accounts, and 2FA as extra protection for logging in.
- Manages the post scheduling and publishes it automatically on the specified time.
- Joins Platform Service Modules: each platforms Facebook, Instagram, YouTube and Twitter (X) has a dedicated class that inherits from the base service class.
- These are modules that convert broad user commands (e.g. “publish post”) into API-specific commands, automatically refresh OAUTH tokens, and create uniform responses to ensure a uniform look and feel across platforms.
- It’s modular so you can easily add additional features or services without recompiling the entire backend should you wish to expand.

3. Database (MongoDB Atlas)

- Securely stores user profiles, authentication tokens, post metadata.
- Keeps a current record of the posts on schedule and the posts that have been published.
- A full log of sentiment results is also kept for analytics and trend tracking.

4. Security Middleware

- Acts like a multi-layered security buffer that protects your app from the most common types of cyber ttacks, maintaining confidentiality, integrity of your data and protection against threats like XSS, SQL Injection or even Brute Force.

- Employs Helmet for HTTP header security, express-mongo-sanitize to sanitize inputs against query selector injection, xss-clean to sanitize user inputs from any potential XSS attacks, and express-rate-limit to rate limit the requests.
- In order to keep the data integrity, the input from the user will be sanitized and validated before going any further.
- Is integrated into the authentication mechanisms (JWT OAuth2, 2FA) to provide secure access and prevent unauthorized use.

5. AI & Sentiment Analysis Module

This part details the development of the RoBERTa-based sentiment analysis module and its integration in SocialSight. The module classifies a text into three sentiment classes: positive, negative and neutral, and was fine-tuned on a custom dataset prior to being deployed on the backend for real-time inference.

- **Dataset and Class Balancing:**

There are three sentiment classes in the dataset, with a significant skew. To this end, the data was initially divided into training, validation, and test sets, and then each subset was balanced via undersampling solely. Equalizing the classes in all three folds also contributes to minimizing bias towards the majority class and leads to more consistent performance of the model.

- **Preprocessing:**

Preprocessing was handled in a stepwise manner in the training script to prepare inputs for the RoBERTa model:

- Removal of URLs, mentions, and hashtags
- Removal of emojis and non-ASCII characters
- Lowercasing all text
- Tokenization compatible with RoBERTa
- Stopword removal
- Lemmatization of tokens
- Joining tokens back into strings

These procedure standardizes the input text, and reduces noise, so the transformer can learn meaningful contextual representations.

- **Model Architecture:**

The module uses `cardiffnlp/twitter-roberta-base-sentiment`, a transformer-based model with:

- **Embedding Layer:** Converts tokens to dense vector representations (23.5M parameters)

- **Transformer Layers:** 12 layers capturing contextual relationships (95.1M parameters)
- **Classification Head:** Maps transformer output to sentiment classes (6.0M parameters)

- **Hyperparameters:**

The hyperparameters for fine-tuning were chosen through iterations of experimentation to obtain stable learning and good generalization, while trading off training efficiency with evaluation performance. Following are the hyperparameters used in the model:

- Batch size: 16
- Epochs: 5
- Learning rate: $2e-5$
- Warmup steps: 500
- Weight decay: 0.01
- Optimizer: AdamW
- Loss function: CrossEntropyLoss (handles softmax internally)

The training was performed on the GPU, which allowed for a fast convergence while monitoring the loss and the accuracy.

- **Training and Evaluation Results:**

The results for the model were evaluated by a few plots such as the loss and accuracy curves, confusion matrix and per class accuracy is also given for the model accuracy. All of these plots together allowed us to monitor the model's learning process, detect overfitting phenomena and assess the quality of the predictions on a class-wise basis.

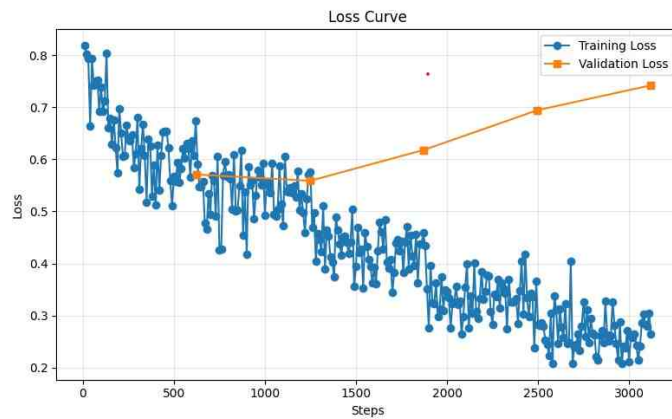


Figure 5.2: Training Loss Curve of Sentiment Analysis Module

As shown in Figure 5.2, the training Loss (blue line) was monotonically decreasing with steps, showing the model was learning. The validation loss (orange line) decreased initially, but began to increase after approximately step 1800, indicating potential overfitting beyond this stage.

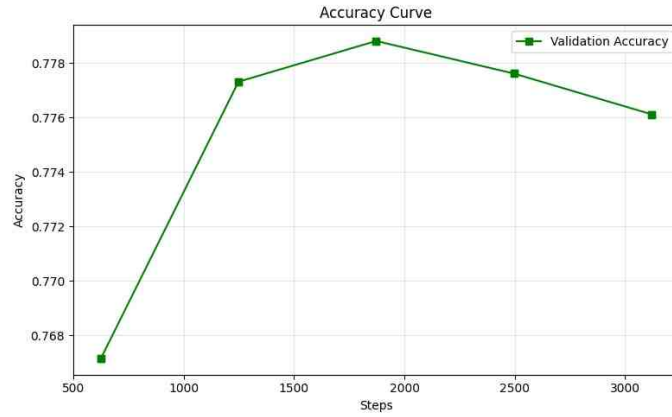


Figure 5.3: Training and Validation Accuracy Curve of Sentiment Analysis Module

As shown in Figure 5.3, the plot depicts the Validation Accuracy (denoted by the green line) increasing rapidly up to about step 1850 where it reached a maximum of 0.7785 (77.85%). Following this peak, the accuracy started to decrease slightly, confirming the previous statement derived from the loss curve that the best training point was approximately at step 1850.

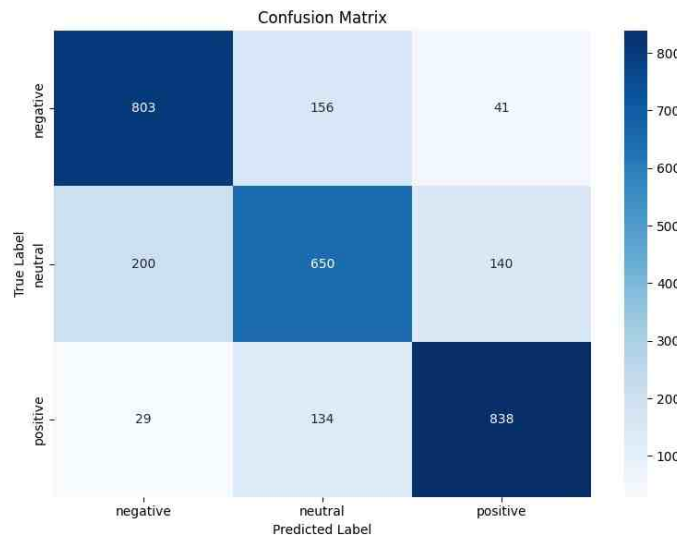


Figure 5.4: Confusion Matrix for Test Predictions of Sentiment Analysis Module

As shown in Figure 5.4, the matrix displays the performance of the model on the test data. The diagonal corresponds to (803, 650, 838) that are the correct predicted numbers of negative, neutral and positive classes respectively. The

model is best for positive class, then negative class, and worst for the neutral class (which is confused with more classes).

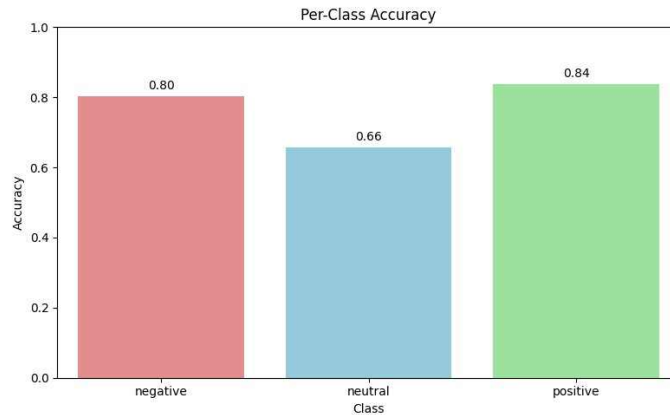


Figure 5.5: Per-Class Accuracy Distribution of Sentiment Analysis Module

As shown in Figure 5.5, this is a descriptive bar chart of the Recall (Per-Class Accuracy) for each sentiment class that is very easy to read. The model achieves the highest accuracy on the positive class 0.84 (84%), and the second highest on the negative class 0.80 (80%). The accuracy for the neutral class is the lowest with 0.66 (66%), which also verifies the inferior performance on this class as shown in the Confusion Matrix.

All these results demonstrate that learning was stable for the fine-tuned RoBERTa model, that showed strong class-wise performance, making it a good candidate to be integrated into SocialSight's backend.

• BERT Baseline Model Comparison

To evaluate the effectiveness of the BERT-based sentiment analysis model, its performance was analyzed using standard classification metrics, including accuracy, precision, recall, and F1-score. These metrics provide a comprehensive view of the model's predictive capability and class-wise generalization.

As shown in Figure 5.6, the bar chart illustrates the performance of the BERT-based sentiment analysis model in terms of accuracy, precision, recall, and F1-score. The model achieved an overall accuracy of approximately 75%, while the remaining metrics were comparatively lower, indicating weaker class-wise generalization. Although the BERT model was trained using the same architecture, preprocessing pipeline, and hyperparameter configuration as the RoBERTa model to ensure a fair comparison, it was consistently outperformed across all evaluation metrics. Consequently, RoBERTa was selected as the final model due to its superior accuracy and more balanced performance across sentiment classes.

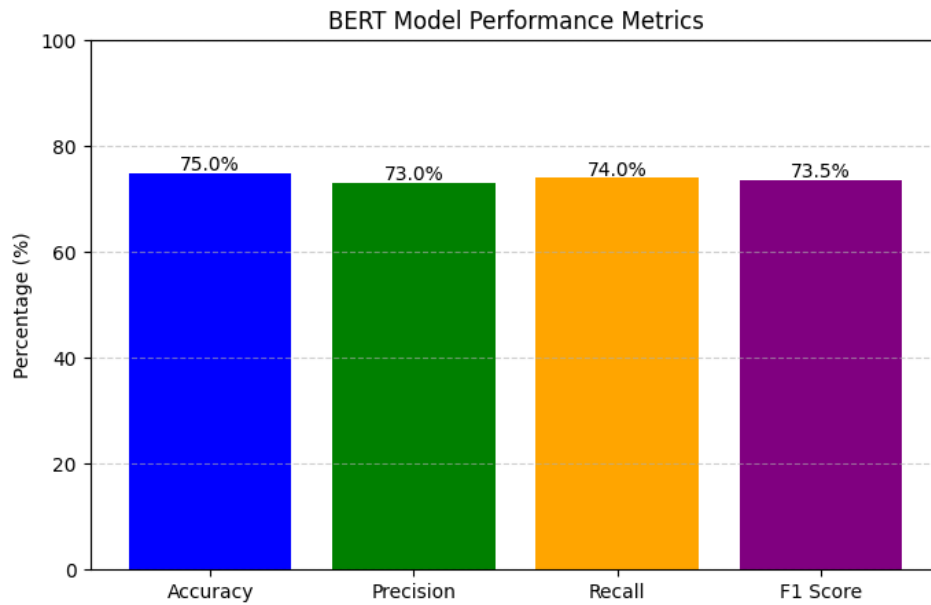


Figure 5.6: Evaluation Metrics of the BERT Sentiment Analysis Model

5.0.3 Component Communication

1. Frontend–Backend Communication

- The frontend communicates with the backend via authenticated HTTPS calls.
- Upon creation, or scheduling a post by a user, the request is redirected to the backend for handling.
- Also, when analytics or account information is needed, the frontend securely fetches these via authenticated API calls.
- All requests are subject to session security through JWT verification, account linking via OAuth2, and login protection with 2FA.

2. Backend Services as the Core Processing Unit

- The backend intercepts the frontend requests, then the backend decides what to do and sends the requests to the appropriate platform service module.
- For example, when posting on Facebook, the backend calls the FacebookService class to execute API related tasks.
- It handles errors in a graceful way, returning user-friendly and informative responses that make the user aware of the problem and how they can work around or fix it.
- It also interfaces with the ai module to run, e.g., analytics or sentiment on demand.

3. Platform Service Modules Communication

- These modules communicate directly with their respective social media APIs to perform such tasks as posting, deleting, scheduling, and pulling analytics.
- They manage OAuth2 token expiration and refresh workflow to keep connections secured.
- Normalize the API responses so that all the results returned to the back end are consistently formatted.

4. Database Operations

- The backend handles database transactions for storing, updating, and retrieving, user information, post details, and analytics.
- It guarantees that the scheduled post and published post are sync in real time, so as to achieve the same result of keeping the same content on different platforms with no resulting duplication or losing.
- Sentiment information and engagement data are stored for trend analysis and visualization.
- Changes of the data will be applied to the frontend in a real time manner either through API responses or WebSocket synchronization.

5. AI & Sentiment Analysis Communication

- The backend sends the audience response to the AI sentiment analyser.
- The module employs fine-tuned Transformer models to predict the sentiment of each comment and provides aggregated sentiment information.
- The processed information is saved in the database and can be viewed on the admin panel with ease.

6. Security Middleware Communication

- The middleware intercepts all requests, sanitizing and validating the inputs prior to the execution of the backend code.
- It removes harmful or incorrectly formatted content, preventing potential XSS, NoSQL injection, or brute-force attacks.
- Works with authentication systems (JWT, OAuth2, and 2FA) to ensure that access is authorized.
- It monitors outgoing responses and alerts if any sensitive information such as access tokens or personal information is sent to the client, avoiding leakage of data and enforcing security and privacy compliance.

5.1 Tools and Technology Used

5.1.1 Technologies Used

1. Frontend

- React.js: To construct user interface elements.
- Tailwind CSS: Tailwind CSS is a utility-first CSS framework for rapid UI development that can be made responsive.
- JavaScript (ES6+): Frontend business logic, interactivity, and API calls.
- HTML5 & CSS3: For layout, styling and animating.

2. Backend

- Node.js: Server for backend services.
- Express.js: Framework for generating RESTful APIs.

3. Database

- MongoDB: A NoSQL database which is used to store the application data.
- Mongoose: ODM library to make MongoDB collections more structured and manageable.

4. Authentication & Security

- Passport.js with OAuth 2.0 based authentication (JWT + social logins).
- Password hashing using Bcrypt.
- Helm, input sanitization, and rate-limiting to protect APIs.

5.1.2 Tools Used

- Nodemon: Used to run the server in the environment of the development. Everything is manual and no automation / restarts are provided.
- ESLint and Prettier Make your code clean and consistent.
- Ngrok: Used to make the local server accessible from internet to test webhooks. This was applied only on dev.
- Morgan Log the HTTP Requests.
- QR Code Generators (Library: qrcode): We utilized the qrcode library in order to generate QR-codes, that then have been used for link sharing as well as for 2FA.
- Speakeasy: Implementation of Two-Factor Authentication (TOTP).

5.2 Application Access Security

1. Authentication

- JWT Tokens protect API routes after the user logs in.
- Safe access to social users accounts is ensured with OAuth2.
- Credentials for social accounts are never stored in plaintext.

2. Authorization

- Users may only access their own posts and social accounts.

3. Social Account Security

- OAuth2 tokens are stored securely and separately for each user and every social media platform they connect to, so there's no possibility of cross-account access or token abuse.
- The system handles token refresh and revocation in a secure way, seamlessly refreshing tokens prior to expiration and revoking tokens immediately if suspicious activity is detected or the user disconnects an account.

4. Backend Security

In order to preserve system integrity and protect it from common web attacks, several security middlewares were utilized in the backend. These protections shield the app from:

- **NoSQL Injection Attacks**
Prevention of malicious queries through input sanitization and validation.
- **Cross-Site Scripting (XSS)**
Validation and sanitization of user input to prevent injection of malicious scripts.
- **HTTP Header Vulnerabilities**
Employing middleware like Helmet to enhance HTTP headers security and API security in general.
- **Brute-Force Attacks**
Add rate-limiting on failed login attempts to reduce DoS attempts and repeated password guessing.

Chapter 6

System Testing and Evaluation

6.1 Introduction

In this section, testing is used to check if the end system is tested as a whole product for cohesive interaction among all the components such that from the user interface at the frontend to the APIs at the backend, they work together seamlessly. Although these scenarios were based on user actions and run in a constrained environment, they risked to show the efficiency, usefulness, and safety of the system by applying simple tasks of the users in posting making a post, conducting a sentiment analysis, tracking analytics, and running a social account. With this method, it is possible to find out about potential problems of implementation and thus all users will have a smooth ride.

Each of these tests was designed to evaluate both the functional (does it give the right answer) and non-functional (execution time, reliability, scalability, security) aspects. We know those stress and edge case tests. They make sure that the app can handle all the things you throw at it, including multiple runs for consistency in execution under different environments. This stage, in a nutshell, shows you what is normal operation and what is seamless user experience and that SocialSight meets its bar for a fast, reliable, easy to understand platform.

6.2 Performance Testing

A performance evaluation was conducted to measure the performance of SocialSight under normal and extreme workload. Response time, throughput, resource utilization, and system stability were of interest. They confirmed the platform was responsive and began to diverge under traffic (or parallel runs). Performance testing also resulted in identification of potential bottlenecks on the front-end, back-end, and network layers which were subsequently tuned to increase scalability and performance. This process guaranteed that platform efficiency remained unchanged in the presence of high user load.

6.2.1 Overall System Performance Testing

Table 6.1: Performance Test Case

Field	Details
Module Name	Web Application Performance
Test Case ID	SocialSight PT1
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Monitor the performance of post publishing, dashboard loading, and sentiment analysis during normal and high usage. Evaluate system performance with high volume posts, and stability, response time, and output accuracy with multiple concurrent posts. .
Priority	High
Pre-Requisites	Backend running locally or on AWS, user logged in, social accounts connected, browser cache cleared, and performance monitoring tools ready for timing measurements.
Post-Requisites	Post should appear in “Published Posts”, dashboard and sentiment pages load successfully, results displayed, and no errors or timeouts occur.
Environment	Chrome latest, stable Internet, Windows
Test Scenario	Check performance for all major modules, the timing of responses, the UI responsiveness, the server processing and the stability with several simultaneous postings.
Test Inputs	1. Post text: “performance test” (on Facebook and Instagram only), no media. 2. Dashboard: repeatedly apply filters and refresh. 3. Sentiment page: analyze sentiment on filtered post. 4. Run multiple simultaneous posts to simulate server load.
Test Steps	1. Log in to SocialSight. 2. Create post and publish. 3. Time post to appear in Published Posts. 4. Load the Monitor page, apply filters and record time. 5. Go to Sentiment Analysis, choose a post, run an analysis, record result generation time. 6. Repeat steps 2 through 5 with multiple posts at the same time to test for stability under load.
Expected Result	Post publishing <5s, Dashboard <3s, Sentiment analysis <4s. No UI lag, errors, or server crashes under normal and peak load.
Actual Result	All modules performed within expected limits. System stable, response times <4s, no crashes or major delays.
Status	Pass
Severity Level	Low (minor delays under peak load acceptable, no functionality failures observed)
Comments	The system operated smoothly under both normal and simulated peak load conditions. Logging verified stability (no crashes and no major backlogs). Handling of multiple simultaneous posts may benefit from some minor tuning.

6.3 Usability Testing

The goal of this testing was to measure the effectiveness and efficiency of users' interaction with the SocialSight system through usability testing. The goal was to uncover confusion or potential roadblocks within the workflow for such tasks as making posts, understanding audience sentiment, or accessing analytics data. This review verifies that the processes and procedures are logical for the end users and provide a delightful and productive user experience whether they are novice or expert users.

During the process, evaluators watched users as they moved around the interface, searched for critical features, and made sense of system responses. We recorded metrics including task completion time, error rate, and user satisfaction. Content readability, consistency of design, and responsiveness of the user interface on different devices were among the concerns addressed further.

The gathered findings expose moments of users hesitation and uncertainty, thus providing opportunities for navigation and design enhancement. Incorporating these results, the platform is optimized for all users to have a seamless, accessible experience, allowing SocialSight to be not only functionally robust but intuitively engaging and effective.

6.3.1 Registration

Table 6.2: Test Case for User Registration

Field	Details
Test Scenario ID	Register
Test Case ID	SocialSight UT1
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user can register successfully and credentials are safely saved.
Priority	High
Pre-Requisite	User should not already have an account with the same email.
Post-Requisite	New account created and confirmation mail sent.
Environment Information	Browser: Chrome
Test Scenario	User registers using required credentials.
Test Steps	1. Navigate from login page → Click on signup 2. Enter details → First name, last name, username, email, password, bio (optional)
Test Inputs	User details (name, email, password, etc.)
Expected Results	Account should be created successfully
Actual Results	User created successfully
Status	Pass
Comments	Registration workflow is simple and clear.

6.3.2 Login

Table 6.3: Test Case for User Login

Field	Details
Test Scenario ID	Login
Test Case ID	SocialSight UT2
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user can log in with valid credentials and access the dashboard.
Priority	High
Pre-Requisite	User must have a registered account.
Post-Requisite	User redirected to dashboard.
Environment Information	Browser: Chrome
Test Scenario	Login workflow for registered users.
Test Steps	1. Open login page 2. Enter username and password 3. Click login
Test Inputs	Username and password
Expected Results	Credentials validated and dashboard accessed
Actual Results	Login successful, dashboard opened
Status	Pass
Comments	Login workflow is clear and user-friendly.

6.3.3 Publishing

Table 6.4: Test Case for Publish Post

Field	Details
Test Scenario ID	Post Creation Workflow
Test Case ID	SocialSight UT3
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user can create and publish posts easily.
Priority	High
Pre-Requisite	User logged in, app running locally or on AWS.
Post-Requisite	Post published and visible in “Published Posts”.
Environment Information	Browser: Chrome
Test Scenario	Publish new post workflow.
Test Steps	1. Log in 2. Click “Create Post” 3. Enter content 4. Select platforms 5. Click “Publish”
Test Inputs	Post content: “Usability Test”, Platforms: Facebook
Expected Results	Post should be published and visible
Actual Results	Post published successfully
Status	Pass
Comments	Workflow is intuitive and works as expected.

6.3.4 Draft Management

Table 6.5: Test Case for Drafts

Field	Details
Test Scenario ID	Draft Retrieval and Editing
Test Case ID	SocialSight UT4
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user can save, retrieve, and publish drafts.
Priority	Medium
Pre-Requisite	User logged in
Post-Requisite	Draft saved, retrieved, and published successfully
Environment Information	Browser: Chrome
Test Scenario	Draft workflow for posts
Test Steps	1. Create post 2. Save as draft 3. Navigate to Drafts 4. Delete, schedule, or publish draft
Test Inputs	Post content: “Draft Test”
Expected Results	Draft should be saved, retrieved, and published successfully
Actual Results	Draft saved, retrieved, and published successfully
Status	Pass
Comments	Draft management is clear and functional.

6.3.5 Social Account Connection

Table 6.6: Test Case for Social Account Connection

Field	Details
Test Scenario ID	Social Account Connection Flow
Test Case ID	SocialSight UT5
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user can connect and disconnect social accounts easily.
Priority	Medium
Pre-Requisite	App running, user logged in
Post-Requisite	Account connected or disconnected successfully
Environment Information	Browser: Chrome
Test Scenario	Connect/disconnect social platform workflow
Test Steps	1. Go to Settings 2. Connect platform via OAuth 3. Disconnect platform from Manage Channels
Test Inputs	Facebook account
Expected Results	Account connected/disconnected successfully
Actual Results	Workflow successful, no issues
Status	Pass
Comments	Account connection workflow is reliable and intuitive.

6.3.6 Theme Toggle

Table 6.7: Test Case for Theme Toggle

Field	Details
Test Scenario ID	Theme Toggle Accessibility
Test Case ID	SocialSight UT6
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify theme toggle works and persists after logout/login.
Priority	Low
Pre-Requisite	User logged in
Post-Requisite	Theme preference persists for future sessions
Environment Information	Browser: Chrome
Test Scenario	Switch between dark/light mode
Test Steps	1. Go to settings 2. Toggle theme 3. Log out/in 4. Check theme
Test Inputs	Toggle switch
Expected Results	Theme should persist and UI updated
Actual Results	Theme persisted correctly
Status	Pass
Comments	Toggle is accessible and works as expected.

6.3.7 Notifications

Table 6.8: Test Case for Notifications

Field	Details
Test Scenario ID	Notifications
Test Case ID	SocialSight UT7
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user receives notifications for platform connection/disconnection.
Priority	Medium
Pre-Requisite	User must have published/scheduled posts
Post-Requisite	Notifications appear in panel and via email
Environment Information	Browser: Chrome
Test Scenario	Notification workflow for platform events
Test Steps	1. Go to Settings 2. Enable notifications 3. Connect platform 4. Disconnect platform
Test Inputs	Toggle and OAuth flow
Expected Results	Email + toast notifications displayed correctly
Actual Results	Notifications received as expected
Status	Pass
Comments	Notification system works reliably.

6.3.8 User Information Updates

Table 6.9: Test Case for User Information Updates

Field	Details
Test Scenario ID	User Information Update
Test Case ID	SocialSight UT8
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify user can update profile information successfully and changes reflect immediately across the platform, including analytics and posts associated with the profile.
Priority	Medium
Pre-Requisite	User must be logged in and have an existing profile. Ensure browser cache is cleared to avoid outdated data display.
Post-Requisite	Updated information saved in the database, reflected in profile, and used in platform features like analytics, notifications, and post attribution.
Environment Information	Browser: Chrome (latest), OS: Windows/macOS, stable internet connection.
Test Scenario	Update workflow for personal info, including name, email, bio, and profile picture.
Test Steps	1. Go to Settings 2. Edit data fields (name, bio, email, image) 3. Submit 4. Check changes on profile page and all other associated pages 5. Refresh and relogin to verify persistence.
Test Inputs	User updated information: name, bio, email, profile picture.
Expected Results	Profile information should update successfully, changes visible across the platform, no errors occur, and data persists after logout/login.
Actual Results	Information updated correctly, immediately reflected across profile and related sections. No issues encountered.
Status	Pass
Severity Level	Low (minor UI delays acceptable, functionality works as expected)
Comments	Update workflow is smooth, intuitive, and reliable. Feedback messages confirm successful updates, improving user confidence.

6.4 Security Testing

Security testing certified that SocialSight was secure and stable for all users. The audit included password encryption, session management, token handling and role based access control. Additional investigations were conducted for vulnerabilities such as SQL/NoSQL injections, and cross-site scripting (XSS). Two-Factor Authentication (2FA) was verified to ensure secure login procedures. The results show that all data transfers are encrypted and the system follows industry best practices. In all, SocialSight does an excellent job of protecting your user credentials, connected social media accounts and communication channels against potential threats.

6.4.1 2FA Enforcement

Table 6.10: Test Case for 2FA Enforcement

Field	Details
Test Scenario ID	2FA Enforcement
Test Case ID	SocialSight ST1
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify 2FA is enforced on login.
Priority	High
Pre-Requisite	2FA enabled for account.
Post-Requisite	Login only succeeds with correct OTP.
Environment Information	Browser: Chrome, Authenticator App
Test Scenario	User logs in with 2FA enabled.
Test Steps	1. Log in 2. Enter username/password 3. Enter OTP from authenticator app
Test Inputs	Username, password, OTP
Expected Results	Login only succeeds with correct OTP.
Actual Results	Login succeeded only with correct OTP; incorrect OTP denied access.
Status	Pass
Comments	2FA is enforced and secure.

6.4.2 JWT Token Validation

Table 6.11: Test Case for JWT Token Validation

Field	Details
Test Scenario ID	JWT Token Validation
Test Case ID	SocialSight ST2
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify API access requires valid JWT.
Priority	High
Pre-Requisite	User logged in, JWT obtained.
Post-Requisite	API access only with valid JWT.
Environment Information	Postman
Test Scenario	Perform API calls with valid, invalid, and expired JWT tokens to validate security enforcement.
Test Steps	1. Make API call with JWT 2. Make API call without JWT
Test Inputs	JWT token
Expected Results	Access granted only with valid JWT; access denied for invalid or expired tokens
Actual Results	API correctly allowed access with valid JWT and blocked all unauthorized attempts.
Status	Pass
Comments	JWT validation works as intended; API endpoints enforce proper token checks.

6.4.3 HTTPS Enforcement

Table 6.12: Test Case for HTTPS Enforcement

Field	Details
Test Scenario ID	HTTPS Enforcement
Test Case ID	SocialSight ST3
Tester Name	Muhammad Umair / Esha Zafar
Test Case Description	Verify all endpoints enforce HTTPS.
Priority	High
Pre-Requisite	App deployed with HTTPS.
Post-Requisite	HTTP traffic redirected to HTTPS.
Environment Information	Browser: Chrome
Test Scenario	Access app via HTTP and HTTPS.
Test Steps	1. Try accessing via HTTP 2. Confirm redirect to HTTPS
Test Inputs	N/A
Expected Results	HTTP redirects to HTTPS.
Actual Results	HTTP redirected to HTTPS; all traffic secured.
Status	Pass
Comments	HTTPS is enforced for all endpoints.

6.5 Frontend Testing with Google PageSpeed Insights

The speed, accessibility, and responsivity on various screen sizes of the frontend of the SocialSight platform were evaluated with Google PageSpeed Insights and browser developer tools. The objective was to guarantee an efficient and consistent user interface.

6.5.1 PageSpeed Insights Audit

The Google PageSpeed Insights audit was conducted to assess four main aspects of the platform:

- **Performance:** We tested how fast pages load and respond to user input. Desktop performance was consistent with some minor room for improvement, however mobile speed was slightly sluggish.
- **Accessibility:** The platform passed with flying colours when it came to ease of use and accessibility with a straightforward navigation system and clean, readable designs. Some advanced accessibility features such as ARIA labels need to be fully supported.
- **Best Practices:** The code follows best practices for web development so it's a clean, secure, and well-maintained solution.
- **SEO:** The platform attained positive SEO scores, which indicates that content is in the index and visible to the web crawlers.

6.5.2 PageSpeed Insights Test for Desktop

The following figure displays the PageSpeed Insights test results for desktop devices of our system..

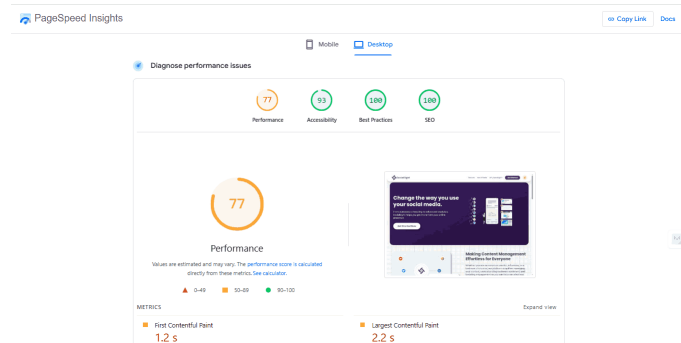


Figure 6.1: SocialSight PageSpeed Insights Test for Desktop Devices

6.5.3 PageSpeed Insights Test for Mobile Devices

The figure below presents the PageSpeed Insights test results for mobile devices of our system.

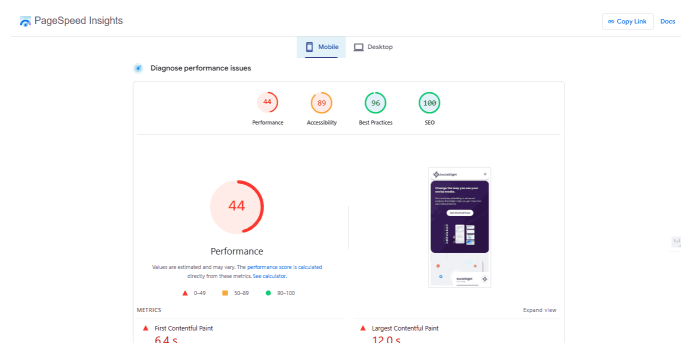


Figure 6.2: SocialSight PageSpeed Insights Test for Mobile Devices

6.6 Evaluation Summary

The SocialSight system was fully tested through functional, usability, and performance tests. User login, post writing, analytics visualization, and sentiment analysis all worked as showed. PageSpeed Insights showed good performance for desktop with minor room for improvement for mobile. In conclusion, the test results confirm that SocialSight is fulfilling its purpose by providing a stable, reactive, and user-tailored experience in all its functionalities and platforms.

Chapter 7

Conclusion

The development of SocialSight offers a good insight on how to develop multi-platform social media management systems in terms of system design, development, and security. The project illustrated that an object-oriented service architecture with Node.js, Express.js, and MongoDB as a backend can provide a modular and scalable platform for managing multiple social media accounts via a single interface.

Major innovations are the successful application of the PlatformService abstraction and the Factory Design Pattern. These design decisions create a clear separation of concerns and facilitate code reuse, meaning that with minimal effort we can add support for new platforms or add new features.

In terms of usability, SocialSight made it possible to create a single post for all networks and schedule it, users could draft, publish and schedule posts on a variety of networks. This simplified UI/UX can be enhanced such as with engagement monitoring and more advanced analytics, showing that the platform has its primary goals of being secure, modular, and extendable and at the same time it manages to give a professional experience that users will find easy and friendly to use.

7.1 Final Reflections and Key Insights

- **Modular and scalable architecture:** To obtain reusability and extensibility, an object-oriented service architecture and the factory design pattern were utilized, so that other social media platforms could be introduced without the need to recompile the whole application.
- **Consistent, user-focused experience:** Having one interface from which you could create, schedule, and publish posts across multiple platforms made the user's workflow more efficient and highlighted the importance of simplicity, having a clear navigation hierarchy, and consistency across platforms.

- **Security matters:** OAuth 2.0, 2FA, token management, and security middlewares (Helmet, xss-clean, express-mongo-sanitize, and rate-limiting) once again highlight that the key aspect is the security of sensitive user data.
- **Robustness to API rate limits and failures:** The rate limits, token policy, and content policy depends on the social platform. Each social platform has various rate limits, token policies, content restrictions and so on. The project concentrated on exception details, retry logic, and alternate path.
- **Scalable and performant monitoring:** As the number of users and platforms to connect to grows, the system needs to scale transparently, and monitoring the server load, database efficiency, and performance will be a never-ending chore.
- **AI integration is useful but must be integrated appropriately:** Sentiment analysis enriched the workflows with knowledge on the audience perception. AI modules have to be compact, reliable, and thoroughly tested so they don't detract from the UI/UX.

7.2 Future Enhancements

Based on what has already been outlined, the SocialSight can be expanded upon in the following ways:

7.2.1 Multi-platform Expansion

Support for other platforms such as TikTok, Threads is being added and enhanced LinkedIn support making the platform more usable for more types of users. With this extension, users will be able to access all their social media accounts on a single platform, making it easier to manage contents across platforms and increasing efficiency.

7.2.2 Advanced AI Features

The system can be enhanced with Artificial Intelligence through:

- Predictive analytics to predict post performance (likes, reach, shares).
- A chatbot assistant for questions, proofreading and suggesting improvements on your stories prior to publishing.
- AI-backed scheduling, which calculates the best times to post based on when your audience is most active.
- Several sentiment analysis models to increase accuracy.
- Multilingual sentiment analysis for international audiences.

7.2.3 Collaboration & Team Management

Enhance organizational use with:

- Support for multi-user roles (admin, editor, reviewer) with customizable permissions and approval workflow to have the content reviewed prior to publishing.
- Offer shared calendars and content planning to better collaborate on work and/or coordinate publishing efficiently as a team.

7.2.4 Enhanced Analytics & Reporting

Deeper analytics can provide:

- Customizable dashboards based on user needs and real-time notifications on vital metrics to keep users informed of their performance.
- Reports can be exported to Excel and PDF formats, and can be compared with historical data and analyzed for trends for making smarter decisions.
- Edit posts in draft mode, enabling a smoother workflow as you review and manage your content performance.

7.2.5 Payment Gateway Integration

Integrate a secure payment gateway (e.g., Stripe) to enable subscription management, premium feature access, and user payment processing.

Appendix A

User Manual

This appendix describes how the SocialSight platform can be accessed and used as a public web application. It gives end users an outline of the key features, navigation, and getting help.

A.1 Accessing SocialSight

SocialSight is a cloud-based social media analytics and management platform. You do not need to install any software. Simply use your web browser.

To access SocialSight:

- Open your preferred web browser (Chrome, Firefox, Edge, Safari, etc.).
- In the address bar, type: <https://socialsight.me>
- Press Enter or search for “SocialSight” using your favorite search engine and follow the official link.

A.2 Supported Devices and Browsers

- **Desktop:** Windows, macOS, Linux (latest Chrome, Firefox, Edge, Safari)
- **Mobile:** Android and iOS browsers (Chrome, Safari)
- **Tablet:** All major browsers

For the best experience, use the latest version of your browser.

A.3 Account Registration and Login

- On the homepage, click Sign Up to create a new account.
- Enter your email, password, and any required profile information.

- If prompted, verify your email address.
- To log in, click Login and enter your credentials.

A.4 Connecting Social Media Accounts

- After logging in, go to the Accounts or Settings section.
- Click Connect next to Facebook, Instagram, or YouTube.
- Authorize SocialSight to access your social media account.
- Your connected accounts will appear in your dashboard.

A.5 Using the Dashboard

Navigate to the Dashboard from the main menu. Use the platform selector to view analytics for all platforms or a specific one. User can view recent activity and trends over time. The dashboard displays the following important metrics:

- Total Reach
- Engagement Rate
- Followers Growth
- Platform Comparison (best platform highlighted)

A.6 Creating and Scheduling Posts

- Go to Create Post.
- Write your content and upload images or videos.
- Choose which platforms you would like to post on.
- Choose to publish immediately or schedule for later.
- Click Post or Save as Draft.

A.7 Managing Drafts

- Open the menu and tap Drafts.
- View your drafts before publishing or deleting them.

A.8 Media Guidelines

- Supported image formats: JPG, PNG, GIF, WEBP
- Supported video formats: MP4, MOV, MKV, WEBM

Uploaded media is securely stored and displayed in your posts and analytics.

A.9 Troubleshooting

- **Cannot log in:** Use the “Forgot Password” link or contact support.
- **Social account not connecting:** Ensure you are logged into the correct social media account and have granted permissions.
- **Media not displaying:** Check your internet connection and refresh the page.
- **Analytics not updating:** Wait a few minutes and refresh; some data may update periodically.

A.10 Support

For help, visit the Help or Support section on the website. You can also contact support via the contact form or email listed on the site.

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