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SOCIAL MEDIA POST ENGAGEMENT TRACKER AND PREDICTION

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ABSTRACT

Social media platforms generate large amounts of data through posts, likes, comments, shares, views, hashtags, followers, and user interactions. Analyzing this data can help understand how audiences respond to different types of content. The **Social Media Post Engagement Tracker and Prediction** system is designed to analyze these interactions and provide meaningful insights into post performance.

The proposed system processes social media post information such as post type, caption, hashtags, posting date, posting time, likes, comments, shares, views, reach, followers, and engagement rate. Data preprocessing techniques are applied to clean the collected dataset by handling missing values, duplicate records, inconsistent formats, and invalid entries. The processed data is then prepared for analytical and predictive tasks.

The system calculates important performance metrics such as total likes, comments, shares, views, reach, engagement rate, average engagement, and post-performance trends. An interactive dashboard can present these metrics through KPI cards, charts, graphs, tables, and filters. Users can analyze engagement based on post type, date, time, hashtag, campaign, or other available attributes.

The prediction module uses historical social media data and Machine Learning techniques to estimate the expected engagement of future posts. Factors such as posting time, content type, historical engagement, follower count, hashtags, and reach can be used as predictive features. The system can also classify posts into different engagement levels such as low, medium, or high.

Overall, the proposed system combines social media analytics, performance tracking, visualization, and predictive modeling in a unified platform. It can help content creators, marketers, businesses, and analysts understand audience engagement patterns. Future enhancements can include real-time social media integration, sentiment analysis, hashtag recommendations, optimal posting-time prediction, and automated content-performance alerts.

I. INTRODUCTION

Social media has become an important communication and marketing channel for individuals, organizations, and businesses. Platforms generate large amounts of engagement data through likes, comments, shares, views, followers, and other interactions. This data provides valuable information about audience interests and content performance.

The performance of a social media post can depend on several factors, including content type, posting time, hashtags, caption, audience size, topic, and historical engagement. Understanding these factors can help users identify content patterns that receive higher levels of audience interaction.

Traditional social media analytics tools generally provide basic statistics such as likes, comments, shares, impressions, reach, and views. Although these metrics are useful,

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users may need to manually compare different posts to identify patterns. This can become difficult when the number of posts and engagement records increases.

Data analytics and visualization techniques can transform social media data into understandable information. Dashboards can display engagement trends, post comparisons, content-type performance, hashtag performance, and time-based patterns. Users can apply filters to analyze specific campaigns, periods, or types of posts.

Machine Learning can further enhance social media analytics by predicting the potential engagement of future posts. Historical engagement data can be used to train models that estimate expected likes, comments, shares, or overall engagement. The proposed system combines tracking, analysis, visualization, and prediction to provide a comprehensive social media engagement analytics platform.

II. LITERATURE SURVEY

Social media analytics has become an important research area because digital platforms generate large amounts of user-interaction data. Common social media datasets contain attributes such as post type, publication date, likes, comments, shares, views, reach, followers, and engagement rates. Researchers use these attributes to understand audience behavior and content performance.

Engagement analysis is commonly used to evaluate the performance of social media content. Metrics such as likes, comments, shares, views, impressions, and engagement rate can be combined to measure audience interaction. Comparing these metrics across different posts can help identify content categories that receive greater engagement.

Time-based analysis is another important area of social media research. Engagement can vary depending on the day of the week, time of day, season, or campaign period. Historical analysis can identify posting periods associated with different levels of audience interaction, although such patterns can vary by platform and audience.

Content-type analysis examines how different formats perform on social media. Posts may include images, videos, text, reels, stories, links, or other formats depending on the platform. Comparing engagement across these categories can provide insights into content performance.

Machine Learning techniques have been applied to social media engagement prediction. Regression algorithms can estimate numerical engagement metrics, while classification models can categorize posts into low, medium, or high engagement groups. Features such as posting time, content type, follower count, historical engagement, and hashtags can be used as model inputs.

Modern social media analytics systems combine descriptive analytics, predictive modeling, visualization, and Natural Language Processing. Sentiment analysis can be applied to comments and captions to understand audience opinions. The proposed framework follows this approach by integrating engagement tracking, trend analysis, interactive visualization, and predictive analytics.

III. SYSTEM ANALYSIS

The Social Media Post Engagement Tracker and Prediction system is designed to analyze social media posts and measure audience engagement. The system accepts information such as post type, caption, hashtags, posting date, posting time, likes, comments, shares, views, reach, and follower count. The input data is validated to ensure that required fields and supported formats are available. A preprocessing module handles missing values, duplicate records, invalid entries, and inconsistent

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formats. Date and time attributes are transformed into useful features such as hour, weekday, month, and posting period. The system calculates engagement metrics such as engagement rate, total interactions, average likes, comments, and shares. Content-type analysis compares engagement across different post formats. Hashtag and time-based analysis identifies patterns associated with audience interaction. The analytics engine generates performance summaries and historical engagement trends. A Machine Learning module can be trained using historical post data to predict future engagement. The prediction module estimates expected engagement or classifies a post into a suitable engagement category. Visualization components display results through charts, graphs, tables, and KPI cards. The final dashboard provides users with an integrated view of social media performance and prediction results.

Existing System

Existing social media platforms and analytics tools provide information about post performance and audience interactions. Users can generally view metrics such as likes, comments, shares, views, impressions, reach, and follower growth. These tools are useful for monitoring individual posts and campaigns. However, detailed historical comparisons may require manual analysis. Users may need to examine multiple reports to identify patterns across content types and posting periods. Basic dashboards may not provide comprehensive prediction of future post engagement. Identifying the relationship between hashtags, posting time, content type, and engagement can also be difficult. Audience comments may be available but may not be systematically analyzed. Static reports can limit interactive exploration of large datasets. Comparing multiple campaigns or accounts may require additional tools. Historical data may be stored without applying predictive models. These limitations create a need for an integrated platform that combines engagement tracking, analytics, visualization, and prediction.

Disadvantages of Existing System

- Limited detailed engagement analysis.
- Manual comparison of post performance.
- Limited historical trend analysis.
- Difficult to identify optimal posting patterns.
- Limited engagement prediction.
- Hashtag performance may require manual analysis.
- Limited content-type comparison.
- Audience feedback may remain unstructured.
- Limited sentiment analysis.
- Static reports may reduce analytical flexibility.
- Separate tools may be required for advanced prediction.
- Difficult to combine multiple engagement metrics.

Proposed System

The proposed Social Media Post Engagement Tracker and Prediction system provides a centralized platform for monitoring and analyzing social media engagement. Users can upload historical post datasets or connect the system to an authorized data source. The validation module checks required fields, data types, formats, and basic data quality. The preprocessing module removes duplicate records and handles missing, invalid, and inconsistent information. Feature engineering generates attributes such as posting hour, weekday, month, content type, hashtag count, and historical engagement indicators. The analytics module calculates likes, comments, shares, views, reach,

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total interactions, and engagement rate. Content-type analysis compares the performance of images, videos, text posts, reels, or other available formats. Time-based analysis identifies engagement patterns across different days and posting periods. Hashtag analysis examines the relationship between hashtags and post performance. A Machine Learning model uses historical post characteristics and engagement data to predict future performance. The prediction module can estimate numerical engagement or classify posts into low, medium, and high engagement categories. Interactive dashboards display KPIs, trends, comparisons, and prediction results. The proposed system therefore provides a unified solution for social media performance monitoring and predictive analysis.

Advantages of Proposed System

- Provides centralized social media analytics.
- Automates engagement calculations.
- Tracks likes, comments, shares, views, and reach.
- Calculates engagement rates.
- Supports content-type comparison.
- Provides time-based engagement analysis.
- Supports hashtag performance analysis.
- Identifies historical engagement patterns.
- Predicts potential post engagement.
- Provides interactive dashboards.
- Reduces manual reporting effort.
- Supports data-driven content planning.

IV. METHODOLOGY

The methodology begins with collecting historical social media post and engagement data from authorized datasets or platform sources. The collected data is validated to check its structure, required attributes, data types, and completeness. Data preprocessing is performed to remove duplicate records and handle missing, invalid, and inconsistent values. Date and time information is standardized to support accurate time-based analysis. Features such as post type, posting hour, weekday, month, hashtag count, follower count, and historical engagement are prepared for analysis. Engagement metrics such as total interactions, engagement rate, average likes, comments, shares, views, and reach are calculated. Exploratory Data Analysis is performed to understand engagement distributions and identify performance patterns. Content-type analysis compares engagement across different formats. Time-based and hashtag analysis identifies patterns associated with audience interaction. Machine Learning models can be trained using historical post features to predict future engagement. Regression models can estimate numerical engagement, while classification models can categorize posts into engagement levels. Appropriate evaluation metrics are used to assess predictive model performance. Finally, analytical insights and prediction results are presented through an interactive social media engagement dashboard.

SYSTEM ARCHITECTURE

The system architecture consists of several interconnected layers that process social media data and generate engagement insights and predictions. The Data Source Layer provides post details, likes, comments, shares, views, reach, followers, hashtags, and publication information from authorized sources.

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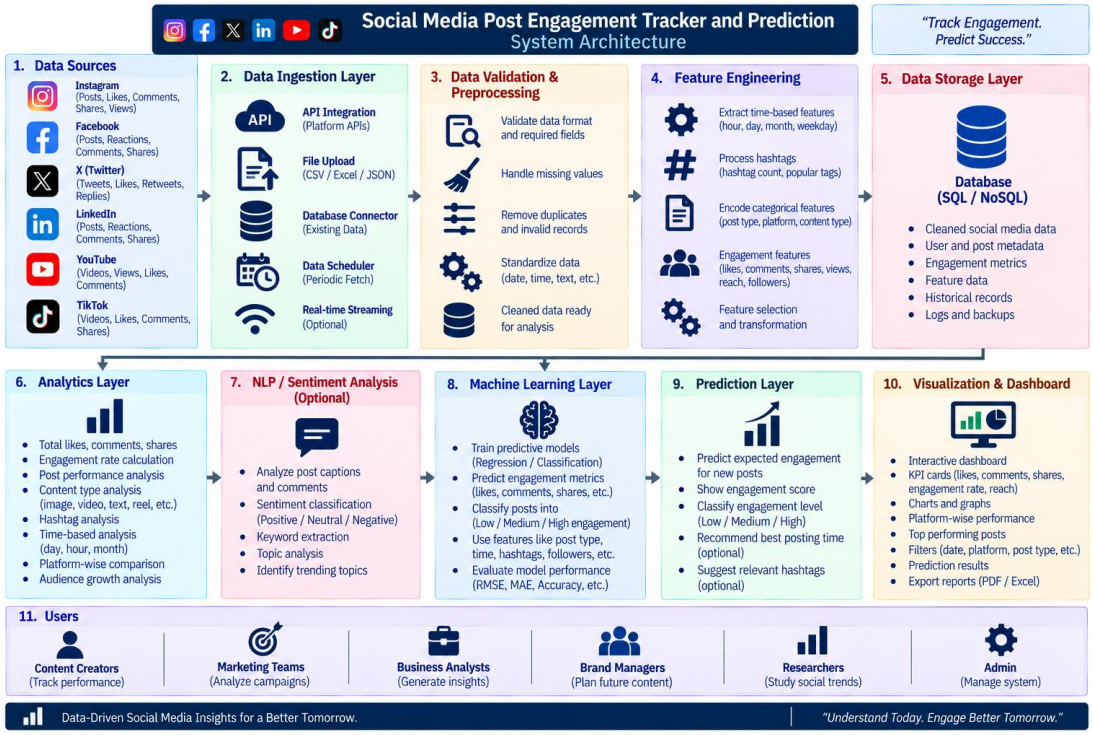

The Data Input Layer accepts data through CSV files, Excel files, databases, or APIs. The Data Validation Layer checks file formats, required fields, data types, and basic data quality. The Data Preprocessing Layer handles missing values, duplicate records, invalid entries, and inconsistent formats. The Feature Engineering Layer creates attributes such as posting hour, weekday, month, content type, hashtag count, and engagement indicators. The Data Storage Layer securely stores cleaned historical social media records. The Engagement Analytics Layer calculates total interactions, engagement rate, likes, comments, shares, views, and reach. The Content Analysis Layer compares performance across different post types, topics, campaigns, and hashtags. The Time Analysis Layer identifies engagement patterns across different dates and posting periods. The optional NLP Layer can analyze captions and comments using sentiment and keyword analysis. The Machine Learning Layer trains and evaluates models for engagement prediction. The Prediction Layer estimates expected engagement or assigns an engagement category to new posts. The Visualization Layer presents results through interactive dashboards, charts, graphs, tables, and KPI cards. The Reporting Layer generates performance summaries and analytical reports for authorized users.

V. RESULT AND OUTPUT

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VI. CONCLUSION

The Social Media Post Engagement Tracker and Prediction system provides a data-driven platform for monitoring, analyzing, and predicting social media post performance. The system converts raw engagement data into meaningful insights through data preprocessing, analytics, visualization, and Machine Learning techniques. The system analyzes important metrics such as likes, comments, shares, views, reach, followers, engagement rate, post type, hashtags, and posting time. This helps identify engagement patterns and understand how different content characteristics influence audience interaction.

The interactive dashboard presents information through KPI cards, engagement trends, platform-wise comparisons, content-type analysis, hashtag performance, sentiment analysis, and top-performing post tables. These visualizations make large social media datasets easier to understand and support efficient performance monitoring.

The prediction module can estimate the potential engagement of future posts based on historical data. It can also classify posts into different engagement levels such as low, medium, and high, helping users understand the expected performance of their content.

In the future, the system can be enhanced with real-time social media API integration, advanced sentiment analysis, optimal posting-time prediction, automated hashtag recommendations, content recommendation, campaign performance forecasting, and real-time engagement alerts. These improvements can make the system more intelligent and useful for effective social media performance management.

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