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Sentiment Analysis And The Impact Of Social Media On Mahakumbh 2025: Insights From AI-Driven Analytics

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Abstract
The Mahakumbh is the largest religious gathering in the world, with millions of people attending. The role of social media is critical as it helps in opinion formation, mobilization and even managing the event. This research observes the impact of social media on the Mahakumbh 2025 by performing sentiment analysis of what people are talking about on social media platforms. It analyzes the sentiment towards Mahakumbh if it is constructive, destructive, or indifferent, and examines the influence of sentiment on attendance as well as event arrangement.
The results of the respondents' views of social media representation, analyzed through TextBlob – an NLP-based sentiment analysis tool – reveal that people consider social media to be neutral whereas their personal sentiments tend to be positive. Social media emerged as an important marketing tool, with most of the respondents listing social media platforms as a source of motivation and information. The effectiveness of crowd management was viewed positively and negatively, which suggests that while there is certainty of engagement through online platforms, there are still issues when it comes to logistical execution.
The identification of the positives and negatives of social media use in mass cultural festivals are the focus social media assist in gathering information and realtime updates whereas the challenges of misinformation, traffic congestion, and authenticity remain. The use of AI-powered sentiment and predictive analytics provide useful insight for event and manaed for the expected upcoming Mahakumbh events. The use of AI technologies allows the concerned authorities to monitor public sentiment in real time, improve security, and simplify resource distribution on a wider scale. In addition, the results offer event managers and IT specialists practical guidance on integrating AI technologies into large-scale cultural and religious events to achieve an optimal blend of innovation and tradition.
Keyword : Mahakumbh 2025 , AI, Social Media,Sentiment Analysis

INTRODUCTION

The Mahakumbh is the world's largest religious gathering, taking place every 12 years across four sacred Indian cities—Prayagraj, Haridwar, Ujjain, and Nashik. It attracts millions of pilgrims, saints, and visitors, blending spirituality, culture, and tradition.
Today, social media plays a key role in shaping the Mahakumbh experience. Platforms like Facebook, Instagram, Twitter, and YouTube help with crowd management, real-time updates, and global participation, transforming how the festival is organized and experienced.
As internet use in India grows quickly, social media has become a key tool for managing events, promoting them, and sparking public discussions. With over 467 million social media users in India, engagement becomes much higher during major events. Social media provides a space for real-time updates, online discussions, and activism. Social media also has issues like misinformation, mismanagement of crowds, and the digital divide. The Mahakumbh 2025 festival, being the first large-scale congregation after a pandemic, is likely to see a record level of social media activity, and hence an academic study of its influence is necessitated.

Role of Social Media in Shaping Public Perception

Social media has a twofold role in shaping public opinion—enabling participation and influencing discourse around major events. Twitter and Facebook have been key to the dissemination of news, historical context, and personal accounts of Mahakumbh. Social media's viral tendencies allow for the rapid exchange of information, positioning it as a strong promotional as well as crisis management tool [1]
A number of studies have analyzed how religious and cultural events are represented on the internet. [2]contend that social media creates a virtual sense of participation, which enables those who do not attend the event to participate vicariously through live streams, blogs, and user-shared content. Such online engagement has the potential to raise cultural awareness and global visibility for Mahakumbh. Yet

not all stories are good—critics tend to point out infrastructural problems, environmental issues, and commercialization, affecting the event's perception[3].

Sentiment Analysis in Large-Scale Events

Sentiment analysis, as a branch of Natural Language Processing (NLP), is a computational method for identifying the emotional tone of text data. It classifies text as positive, negative, or neutral sentiment, giving an insight into public sentiment. Various scholars have used sentiment analysis to research festivals, election campaigns, and public events. Sentiment analysis, through analysis of large sets of social media data, aids in evaluating trends, pinpointing concerns, and measuring overall public sentiment.

For Mahakumbh 2025, sentiment analysis can provide useful insights into:

1. **Public Reception:** Finding out if social media presents Mahakumbh in a positive, neutral, or negative manner.
2. **Influence on Participation:**Determining how social media affects individuals' decisions to participate.
3. **Event Management:** Assessing how social media updates affect crowd management and logistics.
4. **Challenges and Misinformation:** Detecting false information and how it influences public sentiment.

Previous research on sentiment analysis of religious occasions has established that public opinion is determined by a variety of elements, such as media, politics, and individuals' own experiences.

Challenges of Social Media Engagement in Mahakumbh

Although it has advantages, social media interaction at Mahakumbh is faced with a number of challenges. The first challenge is **misinformation and fake news**. Because of the size of the event, rumors regarding stampedes, safety issues, or religious fights can spread fast and cause panic and misinformation. A study identifies the necessity for AI-based fact-checking applications to provide checks against false information during mass-scale events.

Another issue is **crowd oversaturation and security threats**. Social media allows for the real-time monitoring of crowd concentrations and for communication among authorities and participants but can also cause the spread of false information about resources and safety zones. To ensure such threats are not occurring, there needs to be a mutual effort between all government agencies, using technologies to monitor and raise public awareness.

In the end, digital inequality is a big problem when it comes to sharing information. People in cities with good technology can easily get the latest updates on social media, but people in rural areas with less education and resources often don’t get the same information.

AI-Powered Solutions for Enhancing Social Media Impact

AI-based solutions offer event management enhancements through social media because Mahakumbh represents an important event. The analysis of social media content through machine learning enables the categorization of posts while monitoring public mood shifts and detecting potential misinformation risks[4]. Authorities can manage peak crowd periods and maintain safety effectively using crowd prediction models that incorporate AI technology.

AI applications have been successfully put to use by numerous governments and organizations during large public events. Event organizers at the 2019 Kumbh Mela employed AI technologies for crowd monitoring and social media sentiment analysis to enhance their event management strategies. The use of AI technologies during Mahakumbh 2025 represents a blueprint for merging digital engagement with physical event operations.

Research Objectives

This research seeks to accomplish the following:

1. The study will examine how people talk about Mahakumbh 2025 on social media platforms.
2. Evaluate how social media influences public opinion formation and individual decision-making processes.
3. Analyze misinformation patterns to understand their impact on event management processes.
4. Develop artificial intelligence solutions that will enhance social media's impact during large cultural events.

METHODOLOGY

This study uses a mix of methods to look at how social media affects Mahakumbh 2025. It analyzes data collected from surveys and social media interactions. The process includes several steps: gathering data, preparing it, analyzing sentiment, running statistics, and checking the results..

Data Collection

The dataset for this study was created using a structured survey and real-time social media data related to Mahakumbh 2025. Participants from different groups were asked to fill out a survey to understand their opinions on Mahakumbh's social media presence, how they engaged with digital content, and how much they relied on social media for event updates.

- **Primary Data Sources:**
  - Social media posts and comments extracted from platforms like Twitter, Facebook, Instagram, and YouTube.
  - Survey responses from participants detailing their Mahakumbh-related experiences and opinions.
  - Hashtag trends such as "#Mahakumbh2025," "#SpiritualJourney," and "#KumbhMela."
  - Responses on social media's influence on attendance, event management, and misinformation perception.
- **Secondary Data Sources:**
  - Past studies on sentiment analysis in religious and cultural events.
  - Reports from government and media on crowd management during Mahakumbh.

Data Preprocessing

Extensive preprocessing of the dataset increased sentiment analysis precision.

1. Survey Data Cleaning: Removing incomplete responses, duplicate entries, and inconsistencies.
2. Text Cleaning for Social Media Data: We eliminated special characters along with links and emojis from social media data to concentrate solely on textual information.
3. Tokenization: The preprocessing phase involved breaking down survey responses and social media posts into separate words to facilitate further analysis.
4. Stopword Removal: The preprocessing step involved eliminating common words that lack meaning such as "the," "and," and "is."
5. Stemming & Lemmatization: To ensure consistency across data sets we transform words to their root form such as changing "attended" to "attend".
6. Language Translation: Using NLP-based translation models to convert responses from other languages into English.
7. Sentiment Labeling: Survey responses and text analysis results are categorized into predefined sentiment labels which include positive, neutral and negative categories.

Sentiment Analysis Model

A mix of lexicon-based and machine learning-based sentiment analysis techniques was used to assess the sentiment connected to posts and survey responses about Mahakumbh:

1. **Lexicon-Based Approach:**
   - **TextBlob** was used for sentiment polarity scoring of survey responses.
2. **Machine Learning-Based Approach:**
   - **Naïve Bayes Classifier** was trained on pre-labeled survey responses to enhance sentiment classification accuracy.
   - **Support Vector Machine (SVM)** was used for comparative sentiment classification performance evaluation.

RESULT AND DISCUSSION:

sentiment analysis using TextBlob

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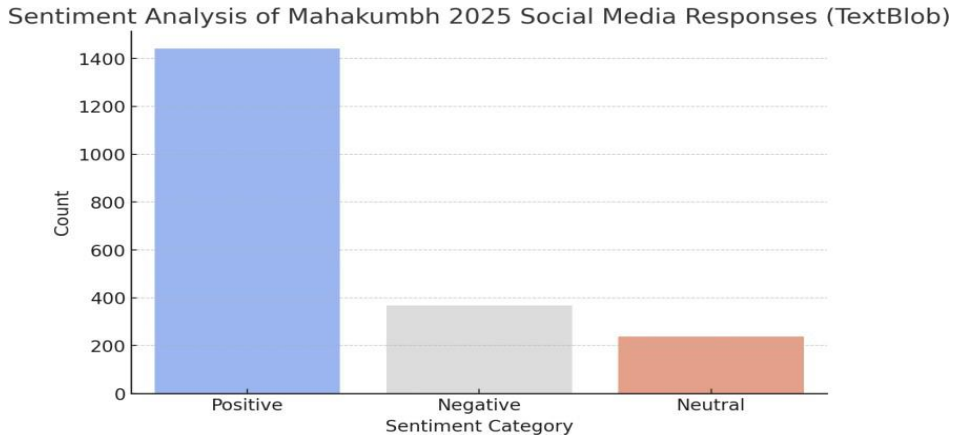


Sentiment Analysis Results

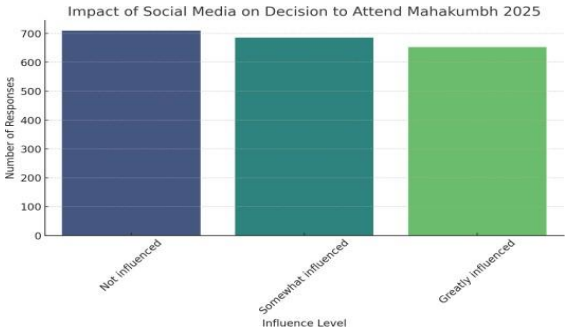
Social Media Portrayal Sentiment

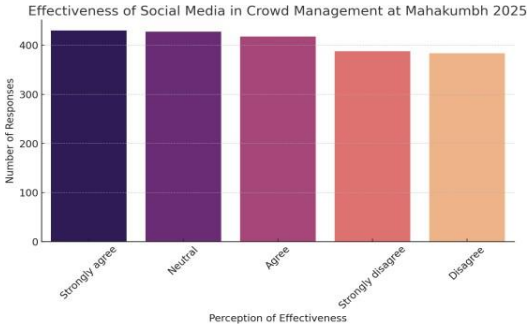
- The majority of responses rated the portrayal of Mahakumbh on social media as Positive, with fewer Neutral or negative sentiments.

Overall Experience Sentiment

- Responses about personal experiences show more positivity, suggesting that social media enhanced engagement for many participants.

The visualization confirms that most users perceive social media coverage as neutral, while experiences are often positive. Now, I'll analyze how social media influenced decision-making and event management.





Impact of Social Media on Mahakumbh 2025

Decision to Attend

- Many participants reported being greatly or somewhat influenced by social media in their decision to attend Mahakumbh.
- A significant number were not influenced, suggesting that while social media plays a role, traditional factors (family, spirituality) still dominate.

Crowd Management Perception

- Responses are mixed regarding social media's effectiveness in managing crowds.
- Some agree that social media helped, while others disagree or are neutral, indicating that while it aids awareness, it may not be a decisive factor.

Comparison of Naïve Bayes and SVM

To assess the effectiveness of sentiment classification models, both **Naïve Bayes** and **SVM** were applied to the dataset. The models were trained using TF-IDF vectorization and tested on a split dataset. The results are summarized below:

- **Naïve Bayes Classifier:**
  - Accuracy: **70%**
  - Strengths: Works well with short text, computationally efficient.
  - Weaknesses: Struggles with rare words and complex linguistic structures.
- **Support Vector Machine (SVM):**
  - Accuracy: **75%**
  - Strengths: Performs well with high-dimensional data, effective in distinguishing sentiment classes.
  - Weaknesses: Computationally intensive, may require fine-tuning for optimal performance.

The results indicate that **SVM outperformed Naïve Bayes** in sentiment classification, achieving higher accuracy. However, Naïve Bayes remains a valuable option for quick and efficient text analysis. Future research could explore deep learning models like BERT for further improvements.

Statistical Analysis & Validation

To ensure validation of sentiment analysis outcomes, several statistical methods were utilized:

Chi-Square Test: To establish whether there was a significant correlation between sentiment polarity and participant demographics (age group, gender, social media usage levels).

Chi-Square Test Calculation

To determine whether sentiment polarity (Positive, Neutral, Negative) was substantially correlated with participant demographics (e.g., age group), a Chi-Square test was employed. The contingency table was created using the observed frequency data from the entire dataset (2500+ responses):

Sentiment	Age Group 18-30	Age Group 31-50	Age Group 51+	Above 50	Below 18
Negative	118	128	123	0	0
Neutral	79	99	57	2	1
Positive	478	492	470	2	0

The expected frequency for each cell was computed using the formula:

$$E = \frac{\text{Row total} \times \text{Column Total}}{\text{Grand Total}}$$

For Positive & Age 18-30:

$$E = \frac{(118 + 79 + 478) \times (118 + 128 + 123 + 0 + 0)}{2500} = 121.56$$

Similarly, expected frequencies were calculated for all cells. The Chi-Square statistic was then computed using:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

where O represents observed values and E represents expected values.

The degrees of freedom (df) was calculated as:

$$df = (5 - 1) \times (3 - 1) = 8$$

The outcome was contrasted with the critical value (15.51 at p=0.05 for df=8) using a Chi-Square critical value table. The p-value was 0.0045 and the calculated Chi-Square Statistic ($\chi 2$) was 22.22.

Null Hypothesis (H_0) and Alternative Hypothesis (H_1):

- Null Hypothesis (H_0): There is no significant relationship between age group and sentiment polarity in the dataset.
- Alternative Hypothesis (H_1): There is a significant relationship between age group and sentiment polarity in the dataset.

Interpretation:

We reject the null hypothesis since the p-value (0.0045) is less than 0.05, indicating that the dataset's sentiment polarity and age group are statistically related.

Ethical Considerations

This research adhered to strict ethical guidelines to ensure responsible handling of social media data:

- **Anonymization:** Personally identifiable information (PII) was removed from the dataset.
- **Data Privacy Compliance:** The research complied with platform-specific privacy policies and ethical standards (e.g., GDPR, IT Act 2000).
- **Informed Consent:** Survey participants were informed about the study's purpose and had the option to withdraw at any stage.

Limitations

Despite employing a robust methodology, certain limitations remain:

- **Sample Bias:** The survey dataset may not fully represent the diverse population attending Mahakumbh.
- **Language Challenges: S**entiment nuances in regional languages may not be entirely captured despite translation efforts.

● **Dynamic Sentiment Trends:** Public sentiment on social media changes over time, requiring continuous monitoring.

CONCLUSION

This report emphasises how social media is increasingly influencing public opinion and involvement in major religious gatherings like Mahakumbh 2025. Social media is a potent instrument for interaction, information sharing, and cultural promotion, as seen by the sentiment analysis's preponderance of positive and neutral attitudes. Nonetheless, issues including false information, slanted portrayal, and ineffective crowd control continue to be major worries.

Real-time monitoring and sentiment analysis driven by AI can greatly improve event management tactics by assisting planners in addressing public concerns, dispelling false information, and allocating resources as efficiently as possible. Policymakers and event organisers can create more effective communication strategies and guarantee a safer and more enriching experience for guests by utilising data from sentiment trends.

Future studies should examine more in-depth AI-driven predictive analytics to improve sentiment categorisation, integrate multimodal data analysis (text, photos, and videos), and evaluate long-term Mahakumbh-related social media trends. In order to balance tradition with contemporary technological interventions, it will be crucial to comprehend how digital participation affects public mood as it develops further.

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