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Comment Driven Clickbait Thumbnail Detection using Sentiment and Transformer Based Analysis

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ABSTRACT: The use of eye-catching thumbnails to draw viewers has expanded due to the quick expansion of online video platforms. However, in order to artificially boost video interaction, many artists use deceptive thumbnails, sometimes known as clickbait. Users become dissatisfied and lose faith in online media platforms as a result of these behaviors, which frequently cause a discrepancy between viewer expectations and the actual content. This project suggests a Comment-Driven Clickbait Thumbnail Detection system that uses audience input to identify deceptive thumbnails utilizing sentiment analysis and transformer-based natural language processing techniques. The suggested approach examines user comments to record viewer responses and identify trends that point to discontent or dishonesty rather than depending only on thumbnail images or movie titles. While transformer models extract contextual meaning from textual input to increase detection accuracy, sentiment analysis is used to categorize comments into positive, negative, and neutral categories. Large amounts of comments are processed and assessed by the system in order to efficiently find possible clickbait content. The suggested method increases the accuracy of clickbait identification and helps to improve transparency, credibility, and user experience on video-sharing platforms by taking user perception into account.

KEYWORDS: Clickbait Thumbnail Identification; Sentiment Analysis; Transformer-Based Models; Natural Language Processing; User Comment Analysis; Misleading Content Identification; Social Media Analytics; Deep Learning; Video Content Categorization; Audience Sentiment Mining; YouTube Data Analysis; and Content Credibility.

I. INTRODUCTION

In the digital age, online video-sharing platforms have grown to be among the most widely used sources of entertainment and information. YouTube is one of these sites where millions of videos from content creators in different categories are hosted. Creators frequently create visually appealing thumbnails that entice visitors to click on their films in order to draw viewers and boost engagement. Nevertheless, these thumbnails frequently distort or overstate the video's true content. These deceptive thumbnails, sometimes referred to as "clickbait," have the potential to raise false expectations and detract from the viewing experience. Concerns about the legitimacy and openness of internet content have been highlighted by the growing use of clickbait thumbnails. It is common for viewers to come across instances where the video's title or thumbnail makes promises that are not fulfilled. This lowers trust in digital media platforms and causes user unhappiness. Conventional clickbait detection techniques mostly concentrate on examining video titles or thumbnail graphics, which could not accurately reflect viewers' actual responses and impressions.

1.1 PROBLEM STATEMENT

Many content producers are using eye-catching thumbnails to boost viewer engagement as a result of the quick expansion of online video platforms. However, some thumbnails—a tactic known as clickbait—exaggerate or distort the real video content. When the content does not live up to expectations, viewers may become less trusting of online sites. Because so many videos are posted every day, it is difficult to identify such deceptive thumbnails. Current

detection techniques sometimes overlook viewers' real responses in favor of concentrating mostly on titles, metadata, or visual thumbnail elements. Though this information is rarely used effectively, user comments provide insightful feedback that may indicate whether viewers feel satisfied or misled. An automated technique that examines viewer comments to find possible clickbait thumbnails is therefore required. The system can comprehend audience feedback and increase the precision of clickbait identification by utilizing transformer-based natural language processing algorithms and sentiment analysis, which helps boost the legitimacy of online video platforms.

1.2 OBJECTIVE OF THE STUDY

This study's primary goal is to create a Comment-Driven Clickbait Thumbnail Detection system that uses sophisticated natural language processing algorithms to analyze audience input and detect deceptive video thumbnails. The study's particular goals are:

1. To create an automated system that can identify clickbait thumbnails in web videos by examining user comments related to the content.
2. To categorize viewer comments into good, negative, and neutral groups using sentiment analysis techniques in order to comprehend audience responses to video content.
3. To increase the precision of clickbait identification by using transformer-based natural language processing models to extract contextual meaning from comments.
4. To effectively examine vast amounts of user-generated comments in order to spot trends that point to false or misleading thumbnails.
5. To improve online video services' dependability and reputation by assisting users in identifying possibly deceptive content.

II. LITERATURE REVIEW

In the domains of natural language processing, machine learning, and social media analytics, the identification of deceptive or clickbait information on online platforms has grown in importance. In order to help the creation of the suggested system, this section examines earlier research and methods pertaining to sentiment analysis, clickbait detection, and transformer-based text processing.

In paper [1], Anand Kumar, Tanmoy Chakraborty, and Rajiv Ratn Shah proposed a machine learning-based approach for detecting clickbait content in online media. Their study focused on analyzing linguistic patterns and structural features present in headlines to classify them as clickbait or non-clickbait. The research demonstrated that supervised learning models can effectively identify misleading headlines using textual cues, although the approach mainly relied on headline analysis rather than user feedback.

In paper [2], Abhijit Chakraborty, Bhargavi Paranjape, Sourya Kakarla, and Niloy Ganguly introduced a method for detecting clickbait using advanced text classification techniques. Their work analyzed various linguistic and stylistic features in social media posts to distinguish clickbait from genuine content. The study highlighted the effectiveness of automated detection methods but primarily focused on headline analysis and did not incorporate viewer comments as a key source of information.

In paper [3], Bo Pang and Lillian Lee conducted significant research in the area of sentiment analysis, proposing methods for automatically identifying sentiment polarity in textual data. Their work demonstrated how machine learning techniques can classify opinions expressed in user-generated content such as reviews and comments. The study emphasized the importance of analyzing audience sentiment to understand user reactions toward online content.

In paper [4], Jacob Devlin, Ming-Wei Chang, Kenton Lee, and Kristina Toutanova introduced the BERT (Bidirectional Encoder Representations from Transformers) model, which revolutionized natural language processing tasks. The transformer-based architecture uses attention mechanisms to capture contextual relationships between words, allowing for more accurate text classification and sentiment analysis. This model has significantly improved performance in tasks such as comment analysis, language understanding, and content classification.

III. SYSTEM ARCHITECTURE

The Comment-Driven Clickbait Thumbnail Detection system uses transformer-based natural language processing and sentiment analysis to examine viewer comments and spot deceptive thumbnails in internet videos. To guarantee precise and effective clickbait detection, the system architecture specifies the key elements, their interactions, and the data flow between various modules.

3.1 SYSTEM OVERVIEW

The proposed system follows a three-tier architecture that separates the system into different layers for better scalability, efficiency, and maintainability.

1. Presentation Layer (Frontend) – Provides the user interface through which users or administrators interact with the system, view video data, and analyze detection results.
2. Application Layer (Backend) – Processes requests, performs comment preprocessing, and applies sentiment analysis and transformer-based models to detect clickbait patterns.
3. Data Layer (Database) – Stores video information, user comments, and analysis results for efficient data management and retrieval.

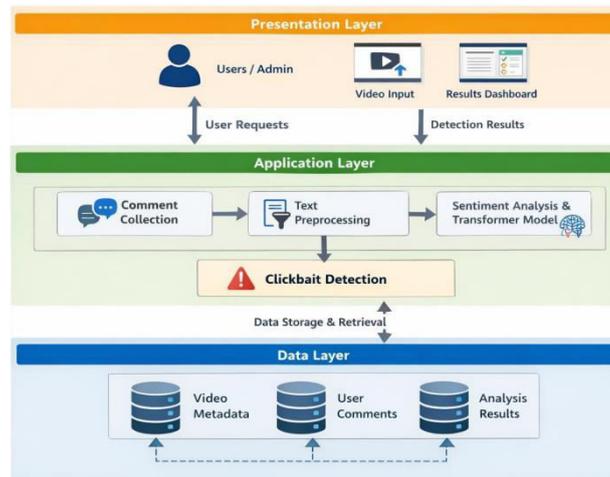


Fig.1 Architecture of the System

3.2 USE CASE ANALYSIS

The Comment-Driven Clickbait Thumbnail Detection System's many user interactions are described in the Use Case Analysis. It lists the key players, how they interact with the system, and the features that help identify deceptive thumbnails. Based on user comments, this study helps guarantee that the system functions effectively and offers precise clickbait detection.

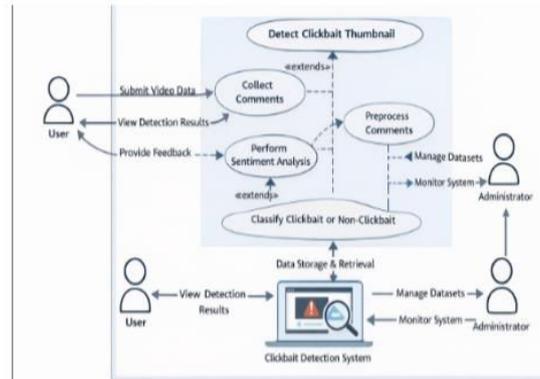


Fig.2 Use Case Diagram

Actors Involved

1. User / Analyst – Inputs video information, initiates the analysis process, and views the clickbait detection results.
2. Administrator – Manages datasets, monitors system performance, and oversees the analysis process to ensure accurate detection.

Use Case Flow Example: The Process of Identifying Clickbait

1. The user logs into the system and uploads video-related data or inputs the video link.
2. The system gathers comments from viewers related to the video.
3. The comments go through text preparation, which eliminates stop words and unnecessary symbols.
4. Transformer-based models and sentiment analysis are used to examine the processed comments.
5. The technology assesses viewer responses to decide if the thumbnail is clickbait or not.

The system's ability to facilitate effective communication between users and the detection model is guaranteed by this use case analysis.

3.3 CLASS DIAGRAM ANALYSIS

The primary elements of the Comment-Driven Clickbait Thumbnail Detection System, together with their characteristics, functions, and connections, are depicted in the class diagram. In order to do comment analysis and identify deceptive thumbnails, it offers a structural perspective of how various entities interact.

1. Key Components and Their Roles

1. User Class

- Represents the individuals who interact with the system to analyze videos.
- Contains attributes such as userID, name, email, and login credentials.
- Includes methods such as login(), submitVideo(), and viewResults() to enable user interaction with the system.

2. Video Class

- Represents the video data that is analyzed for clickbait detection.
- Contains attributes such as videoID, videoTitle, thumbnail, and videoURL.
- Includes methods such as getVideoDetails() and fetchComments() to retrieve video-related information and associated comments.

3. Comment Class

- Represents viewer comments collected from the video platform.
- Contains attributes such as commentID, commentText, userName, and timestamp.
- Includes methods such as collectComments() and preprocessComments() to prepare comment data for analysis.

4. Sentiment Analysis Class

- Responsible for analyzing the emotional tone of the collected comments.
- Contains attributes such as sentimentScore and sentimentCategory.
- Includes methods such as analyzeSentiment() to classify comments into positive, negative, or neutral categories.

5. Transformer Model Class

- Represents the transformer-based natural language processing model used for deeper text analysis.
- Contains attributes such as modelName and modelParameters.
- Includes methods such as extractFeatures() and classifyText() to understand contextual meaning within comments.

6. Clickbait Detection Class

- Performs the final classification to determine whether a video thumbnail is misleading.
- Contains attributes such as detectionResult and confidenceScore.
- Includes methods such as detectClickbait() and generateReport() to produce the final detection outcome.

3.4 DATA FLOW DIAGRAM ANALYSIS

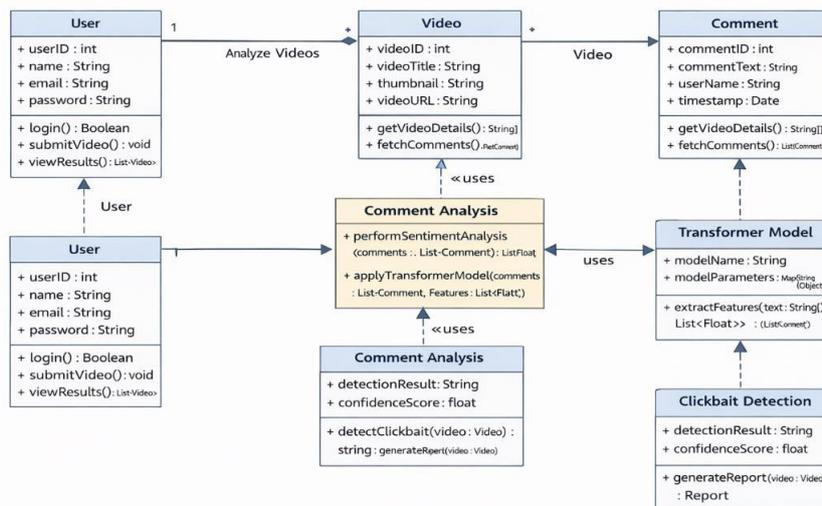


Fig.3 Class Diagram

The Comment-Driven Clickbait Thumbnail Detection System's Data Flow Diagram (DFD) shows how data flows via various system components. In order to identify deceptive thumbnails, it emphasizes how users engage with the system and how comments are handled. The information flow from video input to the final clickbait detection result may be shown with the use of the DFD.

The DFD displays a high-level system overview at Level 0. There are two primary external entities in it: The administrator oversees the dataset and keeps an eye on system functions, while the user uploads video footage for analysis. Comment gathering, sentiment analysis, and classification are carried out via the central Clickbait Detection System. Important data stores like the Video Database, Comment Database, and Analysis Results Database house the processed data. After analyzing the comments gathered, the system produces a final result that indicates whether or not the video thumbnail is clickbait.

The DFD offers a more thorough understanding of the system processes at Level 1. The user first provides the system with a video link or video details. After that, the system gathers and saves viewer comments on the video in the Comment Database. In order to prepare the data for analysis, the gathered comments are subjected to text preprocessing, which eliminates superfluous symbols and stop words.

The emotional tone of viewer input is then ascertained by using sentiment analysis techniques to the preprocessed comments. A transformer-based model receives the processed data and uses it to extract contextual information from the comments and find patterns that point to deceptive images. The video thumbnail is then categorized as clickbait or non-clickbait by the Clickbait Detection module, and the results are saved for user access in the Analysis Results Database. This DFD exhibits an organized and effective data flow, allowing the system to precisely identify deceptive thumbnails on online video platforms and evaluate vast amounts of viewer comments.

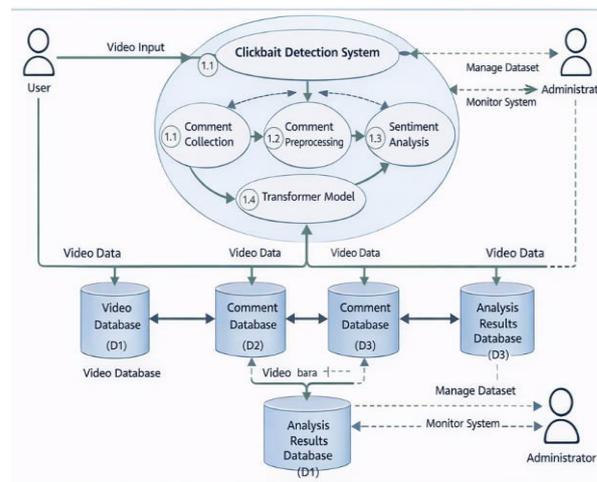


Fig.4 Data Flow Diagram

IV. MACHINE LEARNING MODEL

4.1 TRANSFORMER BASED MODEL

In natural language processing (NLP), transformer-based models are frequently employed to analyze and comprehend textual input. These models capture the contextual links between words in a phrase in order to quickly handle massive amounts of text. Transformer-based models are employed in the suggested Comment-Driven Clickbait Thumbnail Detection System to examine viewer comments and spot trends that might point to deceptive or clickbait thumbnails. A transformer model's self-attention mechanism enables the model to assess each word's significance in relation to other words in the same sentence. Instead of depending solely on specific keywords, this feature allows the algorithm to comprehend the contextual meaning of comments. Because of this, the model is able to effectively analyze complicated user comments and determine if the video material has satisfied or deceived viewers.

Comment collection, which gathers audience remarks about a video, is the first step in the analytic process. In order to prepare the data for analysis, these comments are next subjected to text preprocessing, which involves eliminating superfluous symbols, stop words, and extraneous letters. The cleaned text is transformed into numerical representations for the transformer model to process after preprocessing.

Semantic linkages and contextual dependencies within the text are captured by the transformer model's multi-layer analysis of the processed comments. These layers aid in the extraction of significant characteristics that reflect viewer sentiment and viewpoints. The clickbait classification module receives the extracted features and uses them to determine whether the video's thumbnail is authentic or deceptive.

Because transformer-based models can analyze massive datasets while retaining contextual awareness, they are very effective for text classification tasks. The precision of comment-based clickbait detection systems is greatly increased by their capacity to examine intricate linguistic patterns. The suggested solution offers a dependable method for spotting deceptive thumbnails on online video sites by combining transformer-based analysis with sentiment assessment.

V. RESULTS AND DISCUSSIONS

5.1 COMPARISON WITH EXISTING SYSTEM

By improving accuracy, contextual awareness, and automation, the suggested Comment-Driven Clickbait Thumbnail identification System outperforms conventional clickbait identification techniques in a number of ways. In order to identify clickbait content, conventional methods typically rely on examining video titles, thumbnails, or metadata. Although these techniques can spot some trends, they frequently fall short of capturing viewers' genuine responses and viewpoints, which are crucial in figuring out whether a thumbnail is deceptive.

Current methods for detecting clickbait mostly include simple machine learning models or rule-based approaches that concentrate on particular keywords or visual characteristics. Because these methods may not completely comprehend the contextual meaning of user feedback, they may yield erroneous results. Furthermore, a lot of conventional systems fail to examine viewer comments, which offer important insights on audience happiness and how the video material is perceived.

On the other hand, the suggested approach uses transformer-based natural language processing models and sentiment analysis to better assess audience comments and identify deceptive thumbnails. Deeper interpretation of user feedback is made possible by the transformer model's use of sophisticated attention mechanisms to comprehend the contextual linkages between words.

VI. CONCLUSION

In conclusion, an efficient method for spotting deceptive thumbnails on online video platforms is offered by the suggested Comment-Driven Clickbait Thumbnail Detection System. The system examines user comments using sentiment analysis and transformer-based natural language processing algorithms to comprehend audience responses and identify trends that point to clickbait. Instead of depending only on titles, metadata, or visual thumbnail elements, this method incorporates actual user feedback to increase detection accuracy. By analyzing massive amounts of user comments and using transformer models to extract relevant contextual information, the technology improves the accuracy of clickbait identification. As a result, it makes it easier to spot misleading thumbnails and enhances online media companies' trustworthiness and openness.

VII. FUTURE SCOPE

By adding more features and technologies, the suggested Comment-Driven Clickbait Thumbnail Detection System can be made even more accurate, scalable, and user-friendly. The incorporation of deep learning models for image-based thumbnail analysis is a significant improvement. The method can more successfully identify deceptive visual cues by examining both viewer comments and visual components of thumbnails. Integrating real-time data gathering via platform APIs, which would enable the system to automatically retrieve video comments and metadata from web platforms, is another possible enhancement. This would increase the effectiveness of clickbait identification and allow for ongoing monitoring of recently posted content. The system's accessibility would be improved by adding support for numerous languages, which would enable the analysis of comments made in other languages.

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