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A Video Classification System using Software Defined Network

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Abstract: *In this paper, we propose an innovative video classification system for efficient content management and user experience enhancement on platforms like YouTube. The system leverages Software-Defined Networking (SDN) techniques to optimize network performance, focusing on resource allocation rather than comment analysis. Using traditional Natural Language Processing (NLP) techniques, user comments associated with videos are preprocessed and analyzed, extracting relevant information such as sentiment analysis, keyword extraction, and topic modeling. These extracted features serve as inputs for the subsequent SDN-based network optimization stage. By dynamically allocating network resources, the system optimizes bandwidth, processing power, and storage, improving classification speed and reducing latency. Experimental results on a large dataset demonstrate the system's effectiveness in enhancing network performance and classification efficiency compared to traditional methods. Overall, our video classification system, combining NLP techniques for comment analysis and SDN principles for network optimization, offers a scalable and efficient solution for video classification on platforms like YouTube, enhancing the overall video sharing experience.*

Keywords: Wireshark, Supervised learning, Bag-of-Words(BOW), Random-Forrest-classifier, Video-Classification, Software Defined Networks, Natural Language Processing

I. INTRODUCTION

Software-defined networking (SDN) is an emerging network architecture that promises to simplify network management, improve network resource utilization, and boost evolution and innovation in traditional networks. The SDN allows the abstraction and centralized management of the lower-level network functionalities by decoupling the network logic from the data forwarding devices into the logically centralized distributed controllers. However, this separation introduces new scalability and performance challenges in large-scale networks of dynamic traffic and topology conditions[1].

Video classification is the process by which the videos are categorized into some predefined class like educational or entertainment. Video are classified based on the type of content present in them such as a sports video will be classified as entertainment class and a science related video will be classified as educational. The inability of the systems available to classify this video has lead to a major missing by users at different levels.

Typically, most of the data for classification is of heterogeneous nature collected from the web, through newsgroups, bulletin boards, and broadcast or printed news scientific articles, news reports, movie reviews, and advertisements. They are multi-source, and consequently have different formats, different preferred vocabularies and often significantly different writing styles even for documents within one genre. Therefore, automatic text classification is highly essential.

Now-a-days the amount of information available on the web is tremendous and increasing at an exponential rate. Automatic text classification has always been an important application and research topic since the inception of digital documents to manage the enormous amount of data available on the web. It is based on machine learning techniques that automatically build a classifier by learning the characteristics of the categories from a set of pre-classified documents. It plays an important role in information extraction and summarization, text retrieval, and question-answering.[3]

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II. LITERATURESURVEY

The paper focuses on addressing the challenges of adaptive and scalable flow control in OpenFlow-based software-defined networking (SDN) environments. The authors propose several techniques and approaches to achieve efficient flow control in large-scale networks.[1]

The paper proposes a method for classifying videos into two categories, namely academic and entertainment, by analyzing their subtitles. The authors present an approach that leverages natural language processing techniques to extract textual information from subtitles and then apply machine learning algorithms for video classification.[2]

This paper presents a Video Streaming Adaptive Quality of Service (QoS) Routing with Resource Reservation (VQoSRR) model for Software-Defined Networking (SDN) networks. The authors propose a routing mechanism that dynamically adjusts the Quality of Service parameters to optimize video streaming performance in SDN environments[3]

This paper provides a comprehensive survey of the literature on automatic video classification. The authors review various approaches, techniques, and algorithms proposed in previous research for the automated classification of videos based on their content.[4]

This paper presents a comparative study between the Naive Bayes algorithm and the Support Vector Machine (SVM) with Particle Swarm Optimization (PSO) feature selection for sentiment analysis on e-wallet reviews. The authors aim to determine the effectiveness of these two algorithms in classifying sentiment polarity in e-wallet reviews by selecting the most relevant features using PSO.[5]

This paper presents a method for large-scale video classification using Convolutional Neural Networks (CNNs). The authors propose a deep learning approach to automatically learn hierarchical features from video frames and employ them for accurate and efficient video classification.[6]

III. PROPOSEDSYSTEM

The proposed video classification system using SDN for YouTube videos based on comments, integrated with a Chrome extension, involves the following key points:

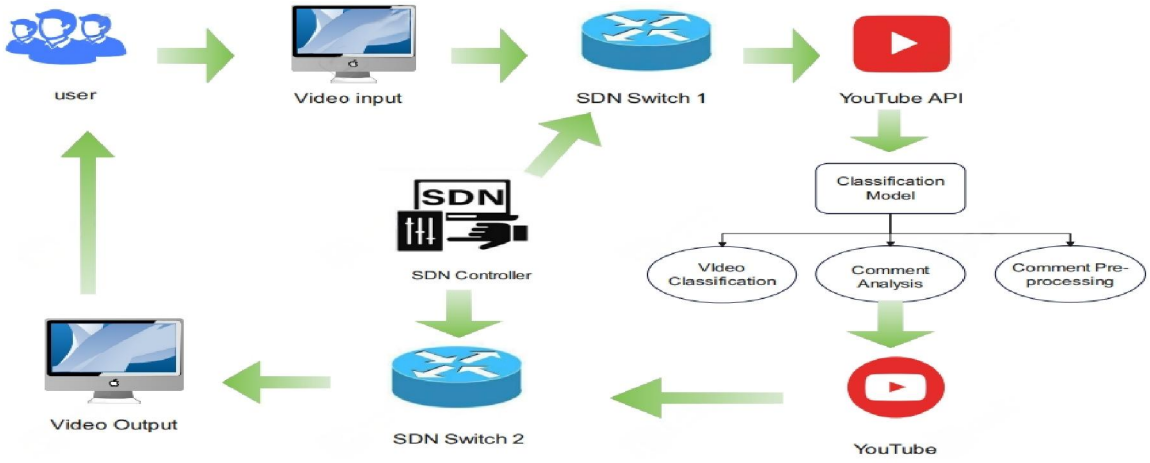

Figure 1: System Architecture

Data Collection and Preprocessing:

The system collects YouTube videos and their associated comments as the primary dataset. The comments are preprocessed to remove noise and irrelevant content, ensuring data quality and standardization.

Feature Extraction and Video Classification:

Natural Language Processing (NLP) techniques are applied to extract meaningful features from the comments, such as sentiment analysis, keyword extraction, and topic modeling. These features are then used to train video classification models. Machine learning or deep learning algorithms are employed to categorize videos into relevant classes or topics based on the extracted features.

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SDN-based Network Optimization:

Software-Defined Networking (SDN) principles are utilized to optimize the network infrastructure supporting the system. SDN allows for centralized control and efficient resource allocation, dynamically scaling the system to handle the increasing volume of videos and comments.

Real-time Classification and User Interaction:

The Chrome extension interacts with the video classification system in real-time. As new videos and associated comments are uploaded, the extension preprocesses the comments, extracts features, and applies the video classification models to categorize the videos. The extension provides users with real-time feedback, recommendations, and additional insights within the YouTube interface, enhancing their browsing experience.

Enhanced Safety and Personalization:

The integration of the Chrome extension enhances user safety by alerting users about potentially harmful or inappropriate videos based on the video categorization and sentiment analysis of comments. The extension also allows users to personalize their browsing experience by setting preferences for specific categories, sentiment types, or keywords, enabling the system to recommend videos aligned with their interests.

IV. RESULT

Entertainment Category :

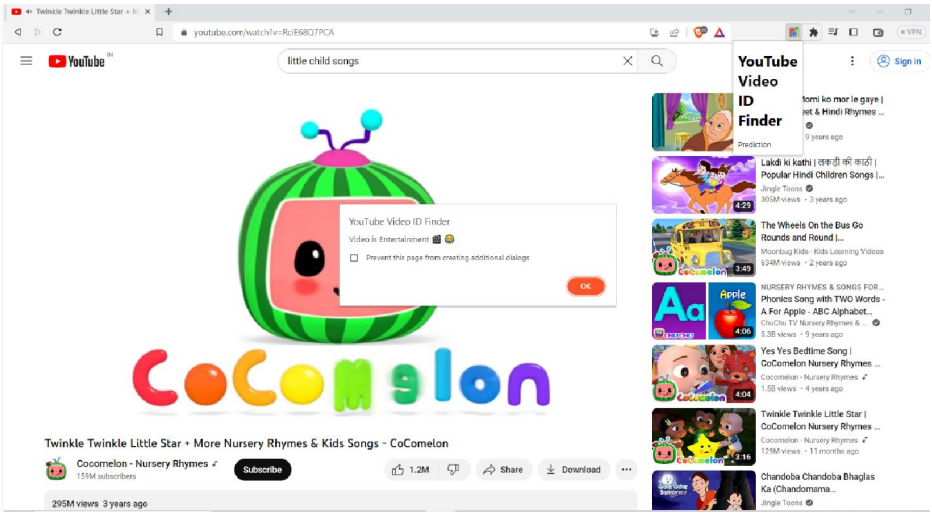

Figure 2: Entertainment Category

Educational Category :

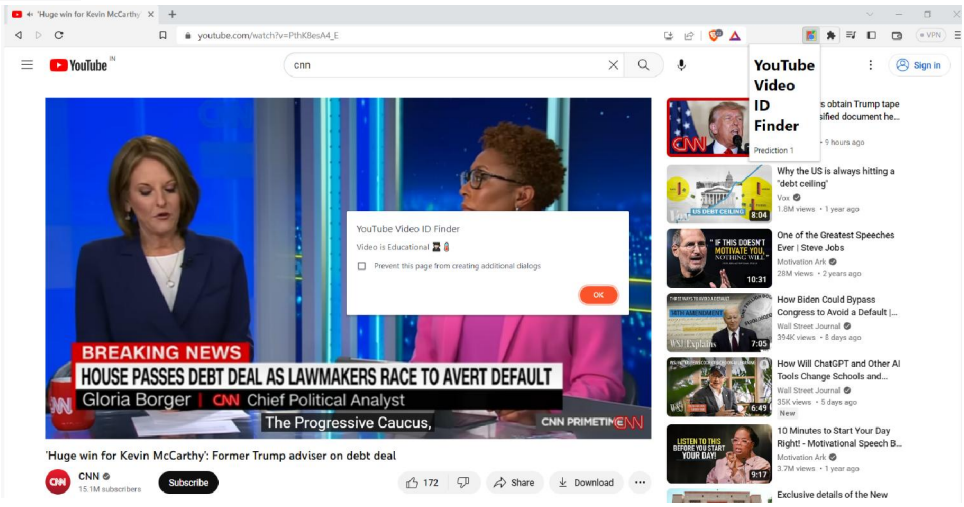

Figure 3: Educational Category

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V. CONCLUSION

In conclusion, our proposed video classification system showcases the potential of integrating Natural Language Processing (NLP) techniques and Software-Defined Networking (SDN) principles to enhance content management and user experience on platforms like YouTube. By leveraging NLP, we can extract valuable insights from user comments, enabling content creators and platform administrators to optimize their strategies and improve engagement. Moreover, the integration of SDN allows for dynamic resource allocation, optimizing network performance and classification efficiency. The experimental results validate the effectiveness of our system, demonstrating its ability to enhance network performance, reduce latency, and improve the overall video sharing experience. This research opens up new avenues for developing scalable and efficient video classification systems, showcasing the potential of combining NLP and SDN for enhanced content analysis and network optimization in online video platforms.This model can be described as having a high level of accuracy, achieving approximately 80 percent precision in its responses.

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