IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AGE - TAILORED AI VIDEO RECOMMENDATION FOR CHILDREN.

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Abstract

The project aims to improve the safety and appropriateness of video content for young children by using an automated content analysis system specifically designed for YouTube. It works by comparing a variety of video elements - such as text content, visual sceneries, frame sequences, audio qualities, and color usage - to predetermined standards. Rapid frame changes, unsettling noises, excessive use of vivid colors, improper language or conversation, and disagreeable graphic components are just a few examples of the potentially hazardous or inappropriate information that the system effectively recognises and filters out. The last Filtering Module evaluates all of the analyzer outputs together, allowing for a thorough decision - making process to establish video appropriateness. This technology plays a vital part in ensuring a secure online environment for young viewers by utilizing a comprehensive approach and advanced content analysis tools, giving parents and guardians greater trust in their children's online video experiences.

Keywords: Video content analysis, YouTube safety, Automated filtering, Child-appropriate content, Parental trust.

1. INTRODUCTION

In an era where digital content has become an integral part of our daily lives, ensuring that individuals, particularly children, have access to age-appropriate and engaging video content is of paramount importance. The explosion of online video platforms has ushered in a wealth of educational and entertainment resources, but it has also underscored the need for personalized, safe, and responsible content recommendations. This report delves into the development and implementation of an "Age-Tailored AI Video Recommendation System," a transformative endeavor designed to cater to the diverse and dynamic needs of users in a digital age.

1.1 PROJECT IDEA

The project, 'AGE – TAILORED AI VIDEO RECOMMENDATION FOR CHILDREN,' is a pioneering initiative aimed at addressing a pressing concern in today's digital age. With the exponential growth of online content, particularly 9 videos, ensuring a safe and age-appropriate environment for children has become a paramount responsibility. Our project seeks to bridge this gap by leveraging cutting-edge artificial intelligence and data science technologies. At its core, the project aims to develop an advanced video recommendation system specifically designed for young audiences. Using sophisticated content analysis techniques, adaptive machine learning algorithms, and stringent privacy considerations, our system will ensure that children receive highly personalized content recommendations while maintaining a strong focus on safety and appropriateness. Key components of this system include video frame analysis to detect rapid scene changes, sound analysis for loud or disturbing audio, color analysis to identify the overuse of intense colors, and text analysis to filter out harmful language. Furthermore, the project will employ computer vision for object detection to screen for any objectionable or disturbing content within the videos. This innovative recommendation system will not only take into account children's ages and interests but also prioritize ethical content analysis, scalability, and multiplatform compatibility. By the project's conclusion, we aim to contribute to the creation of a safer and more engaging online environment for children, ensuring that the content they encounter is both educational and age-appropriate.

1.2 MOTIVATION OF THE PROJECT

The project 'AGE - TAILORED AI VIDEO RECOMMENDATION FOR CHILDREN' was inspired by the growing concern about the influence of internet content, particularly children's videos. While platforms like YouTube offer a diverse range of information, many parents have expressed concern about the addictive quality of particular videos, such as 'Cocomelon', which have caught the undivided attention of young brains. The attractiveness of such movies frequently leads to excessive screen usage, which can be detrimental to a child's overall development. This addictive pattern also promotes the formation of a 'Cocomelon vocabulary', in which children begin copying sounds and words from these movies, frequently at the expense of broader linguistic and cognitive development. The project is motivated by the pressing need to address these challenges. We hope to create an alternative that prioritizes the healthy development of children while catering to their interests, providing peace of mind to parents and carers alike, by developing an AI-driven recommendation system that achieves the perfect balance between engagement and appropriateness. In addition to addressing the addictive nature of some online content, our project also recognizes the importance of safeguarding young viewers from potentially harmful or inappropriate material. The internet's vastness and accessibility make it challenging for parents to manually curate content for their children. Our AIdriven recommendation system will not only help in reducing addiction but also enhance content safety by filtering out videos that do not meet predefined parameters. This comprehensive approach guarantees that children can explore the digital world without encountering disturbing or unsuitable content, promoting their overall well-being and fostering a more responsible online environment.

LITERATURE SURVEY

1.Paper: Digital wellbeing: Are educational institutions paying enough attention? [1]

Author: Priyanka Nageswaran: Writing - original draft; Writing - review & editing. Kay Leedham-Green: Writing - original draft; Writing - review & editing. Harris Nageswaran: Writing - original draft; Writing - review & editing. Ana V. Madeira Teixeira Baptista: Writing - original draft; Writing - review & editing.

Description: The 2017 Digital Wellbeing Survey conducted by the National Library of Medicine is a significant contribution to the understanding of the impact of digital technology on the 3D visual imaginations of individuals, particularly children and adolescents. This comprehensive research paper delves into the intricate dynamics between screen time and the development of age-appropriate visual imagination, shedding light on the potential consequences of prolonged exposure to digital screens. The survey highlights how contemporary society's immersion in digital devices affects the cognitive faculties related to 3D visual thinking, with a focus on age-specific considerations. One of the key takeaways from the study is the identification of the critical need for age-appropriate digital programs. It underscores the importance of

tailoring digital content to the developmental stages of children and teenagers, emphasizing the potential benefits of educational, stimulating, and imaginative content. However, the research also reveals a gap in understanding concerning the influence of visual color and video context. While it acknowledges the influence of digital media, it points to a lack of consideration regarding the role of color schemes and the context in which visual content is consumed. This research paper is a vital contribution to the ongoing discourse about the intersection of digital technology, cognitive development, and the need for more nuanced approaches to fostering 3D visual imagination while emphasizing the importance of addressing these existing gaps.

2.Paper: Deep Neural Networks for YouTube Recommendations[2]

Author: Paul Covington,Jay Adams,Emre Sargin

Description: YouTube serves as a prime example of a colossal and intricately designed recommendation system within the industrial landscape. In this document, we offer an overview of this system, placing particular emphasis on the remarkable enhancements introduced by deep learning techniques. The paper adheres to the conventional two-stage framework of information retrieval. Firstly, we delve into the intricacies of a deep candidate generation model, followed by an exploration of a distinct deep ranking model. Additionally, we share valuable practical experiences and insights garnered from the intricate process of conceptualizing, refining, and sustaining an extensive recommendation system that wields substantial influence on end-users.

3.Paper: DramaQA: Character-Centered Video Story Understanding with Hierarchical QA[3]

Author: Seongho Choi, Kyoung-Woon On, Yu-Jung Heo, Ahjeong Seo, Youwon Jang,

Minsu Lee, Byoung-Tak Zhang

Description: Despite the notable progress in computer vision and natural language processing, the challenge of creating a machine capable of comprehending video narratives remains challenging due to the inherent complexity of video storytelling. Furthermore, there has been limited progress in devising methods to assess the extent of video understanding, aligning with the intricacies of human cognitive processes. This paper introduces a groundbreaking Video Question Answering (Video QA) challenge known as DramaQA, aimed at achieving a comprehensive grasp of video narratives. DramaQA is designed with two primary objectives in mind: 1) Hierarchical QAs: These serve as an evaluation metric, mirroring the cognitive developmental stages of human intelligence. 2) Character-Centered Video Annotations: These annotations capture the local coherence of the story by focusing on the characters' perspectives and roles. The dataset is constructed from the TV drama “Another Miss Oh” and encompasses 17,983 QA pairs derived from 23,928 video clips of varying lengths. Each QA pair is categorized into one of four difficulty levels. The dataset is enriched with 217,308 annotated images featuring character-centered information, including visual bounding boxes, character behaviors, emotional expressions, and resolved co references within the scripts. Furthermore, the paper introduces the Multi-level Context Matching model, which hierarchically interprets character-centered video representations to respond to questions. The dataset and model are made openly available for research purposes, with the anticipation that this work will introduce a fresh perspective on the field of video story understanding research.

2 METHODOLOGY

METHODOLOGY

The methodology adopted for this project follows a data-centric approach, consisting of several key steps: data collection, preprocessing, and AI model development. To commence, we compile a diverse dataset of children's videos, meticulously annotating them to gauge age-appropriateness and then preprocess the data for subsequent analysis. Our AI models, which include Natural Language Processing (NLP) and Computer Vision techniques, are subsequently trained on this refined dataset to facilitate in-depth content analysis. Personalization algorithms are developed to tailor content recommendations according to individual user profiles and preferences. The user interface is meticulously designed to ensure child friendliness while incorporating robust parental control features. Throughout the development process, our methodology places a strong emphasis on rigorous testing, content review, and ethical considerations to guide the system's evolution. Continuous monitoring and feedback mechanisms are integrated to facilitate ongoing enhancements and refinements. This comprehensive approach is geared towards creating a secure, personalized, and captivating video recommendation system that meets the unique needs of children, parents, and guardians.

2.2 Type of Project

The project "AGE - TAILORED AI VIDEO RECOMMENDATION FOR CHILDREN" represents a technological project designed to enhance the video-watching experience for students by providing a safe and age-appropriate environment for children to enjoy YouTube videos. This initiative focuses on harnessing cutting edge technology, including artificial intelligence, to revolutionize the way children interact with online video content, ensuring that they can explore and learn in a secure and tailored environment

3 Functional Requirement

Functional Requirements:

YouTube Data API: The YouTube Data API is a fundamental component that allows your system to access and retrieve information from YouTube, such as video metadata, comments, and user data. This is crucial for collecting the initial dataset of videos, their characteristics, and user preferences. .

PIP (Python Package Manager) and Google API: PIPY (Python Package Index) and Google API are essential for managing and accessing various Python packages and libraries, which are required for different functionalities in your project. This includes the installation of external libraries and handling communication with Google services.

Imagehash and OpenCV: Imagehash and OpenCV are key for image and video analysis. Imagehash is useful for perceptual hashing of images, which can help in identifying similar frames in videos. OpenCV offers capabilities for video processing, object detection, and the examination of frame sequences, thereby enhancing the content analysis aspect of your project.

YOLOv8 (You Only Look Once version 8): YOLOv8 is a state-of-the-art object detection model that enhances the video analysis. It's utilized for the purpose of recognizing and recognizing objects within videos, particularly for identifying prohibited or inappropriate content.

Hugging Face and SpeechRecognition: Hugging Face offers pre-trained NLP models that can be applied for comprehending natural language and processing of user feedback and comments on YouTube videos. SpeechRecognition is essential for converting audio content from videos into text, facilitating audio analysis.

Speedtest-cli for Network Speed Analysis: Speedtest-cli is employed to gauge network performance, ensuring that the system has the capability to deliver content seamlessly by assessing the user's internet

speed and optimizing video quality accordingly.

Flask or Django Frameworks for User Feedback: Flask or Django frameworks are essential for creating a user-friendly interface, enabling users to provide feedback and report issues. These frameworks support the advancement of the frontend and back-end components of your feedback mechanism, enhancing user interaction and engagement.

4. Experimental Setup

Experimental Setup

The experimental setup is a crucial chapter in our project's story. It serves as a bridge, connecting the vision of system development to its practical, real-world application. At this stage, we meticulously gather empirical evidence to validate the system's capabilities and to ensure that it aligns with its intended objectives.

DATA SET:

The dataset contains 13 attributes having discrete values:

• **Hypothesis:** This feature aims to mitigate the impact of Nomophobia in toddlers and early teens, where Nomophobia refers to the fear of being without a mobile device. By analyzing video and audio streams, we anticipate that our system can identify content that may contribute to this issue and reduce its exposure.

• **Input:** The experimental setup takes into account image streams and audio data extracted from videos. These components play a vital role in the analysis and assessment of video content for their potential effects on young audiences.

• **Dataset:** To evaluate and validate our hypothesis, we rely on a rich and diverse dataset sourced from the YouTube Data API. The dataset consists of per-video analytics scores, encompassing a wide range of parameters such as view count, likes, dislikes, comments, and more. These metrics provide insights into the popularity and user engagement levels of the videos.

• **Parameter Settings and Design of Experiment:** The experiment incorporates various parameters and settings to gauge the impact of video content on children. Parameters include guardian feedback and academic performance. Guardian feedback involves obtaining insights from parents or guardians who can express their concerns or preferences about the videos their children consume. Academic performance data is employed to assess the potential influence of video content on a child's educational progress. By analyzing these parameters and experimenting with the dataset, we aim to gain a comprehensive understanding of how certain video content can affect young viewers and whether our system can effectively reduce the exposure to such content. This experimental setup is crucial in shaping the development of our AI-driven video recommendation system, which prioritizes children's well-being and safety while engaging them with suitable and age-appropriate content.

ARCHITECTURAL DESIGN

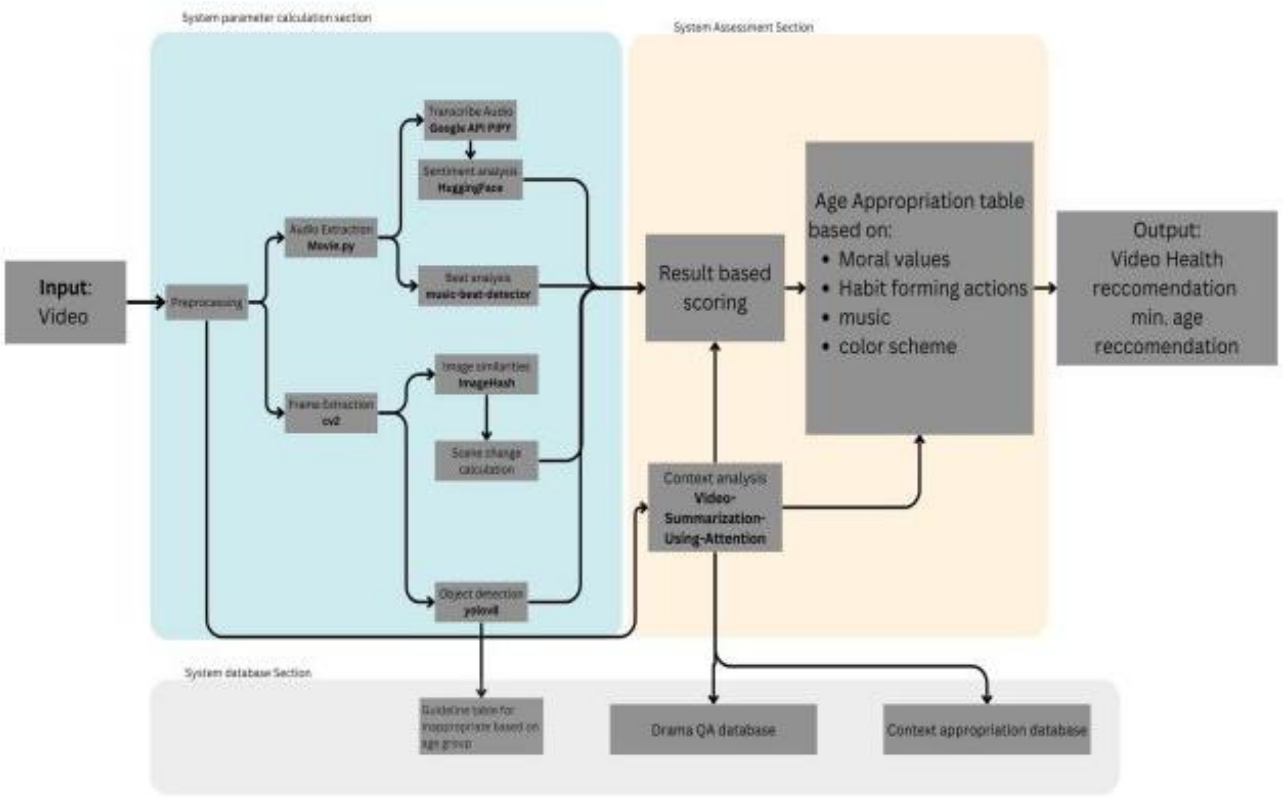


Figure: Architecture

The system's core function is to thoroughly analyze YouTube videos uploaded by users, with a specific focus on filtering out content that could be harmful for young children, all based on predefined criteria. Users submit a diverse range of videos, encompassing educational, entertaining, and potentially unsuitable materials. To ensure a secure and age-appropriate viewing experience for children, the system extensively evaluates the content. It scrutinizes not only the video material itself but also extracts essential metadata such as the title, description, and tags associated with each uploaded video. By meticulously assessing these elements, the system makes well-informed determinations regarding the suitability of the video content for young audiences, effectively excluding potentially harmful or age-inappropriate material and thereby promoting a safer environment for children to enjoy YouTube videos.

Frame Analyzer: Analyzes frame sequences to calculate average time between frame changes. Flags videos with frequent rapid changes.

Sound Analyzer: Extracts soundtracks from videos Analyzes volume, pitch, frequency of sounds Flags loud or disturbing sounds based on predefined thresholds.

Color Analyzer: Extracts and analyzes individual frame colors Calculates frequency of colors and color transitions Flags videos with overuse of bright/intense colors.

Filtering Module: Analyzes outputs from all analyzers . Assigns weightages to different parameters Filters out videos exceeding overall threshold Passes through approved videos
for viewing

Text/Dialogue Analyzer: Performs optical character recognition on text/subtitles. Analyzes detected words against blacklist of harmful words Flags videos containing abusive/inappropriate words

Content Analyzer: Applies computer vision techniques like object detection. Analyzes video scenes for prohibited objects like weapons Flags objectionable or disturbing content These modules work in harmony, driven by a robust feedback loop that incorporates user input and engagement metrics to fine-tune the learning style analysis and content recommendation in real-time. This user-centric approach ensures a dynamic and personalized learning experience, allowing users to grasp, understand, and apply knowledge effectively. The architecture is shown in the figure.

TECHNOLOGY USED

1. **Python:** A highly versatile and user-friendly programming language, to serve dual roles in my project. First, we will utilize Python for Machine Learning (ML) tasks, leveraging its extensive libraries like TensorFlow and scikit-learn for developing ML algorithms and models. Second, Python forms the backbone of this application using the Django web framework. Django simplifies web application development, offering features for routing, database interaction, and templating, making it the ideal choice for the project's backend.

2. **Flask and Django:** Flask and Django are both popular Python web frameworks, each with its own strengths. Flask is a micro-framework, offering simplicity and flexibility, making it ideal for small to medium-scale projects. Django, on the other hand, is a high-level framework that provides an extensive set of features for building complex web applications quickly. Developers often choose Flask for its minimalism and Django for its built-in tools and conventions, depending on the project’s size and requirements.

3. **MySQl:** MySQL is a widely used open-source relational database management system known for its reliability, scalability, and ease of use. It plays a fundamental role in web applications, supporting data storage and retrieval. MySQL’s versatility, speed, and robust features make it a top choice for developers and businesses looking to manage their data efficiently and securely.

4. **Anaconda env:** Anaconda environments are isolated workspaces created within 38 the Anaconda distribution, a popular Python data science platform. These environments allow users to manage and isolate project-specific packages and dependencies. By doing so, Anaconda simplifies package management, reduces compatibility issues, and ensures reproducibility in data science and machine learning projects. Anaconda environments are valuable for organizing, developing, and sharing code, making them an essential tool for Python developers and data scientists.

5. **YOLO(version 8):** YOLOv8, or You Only Look Once version 8, is an advanced real-time object detection framework that offers state-of-the-art performance in identifying and locating objects within images and videos. Known for its speed and accuracy, YOLOv8 has gained popularity in various applications, including autonomous vehicles, surveillance systems, and image analysis. This version further refines object detection by utilizing a deep neural network architecture, making it a top choice for projects that demand efficient and precise object recognition.

6. RESULT

Outcome

It is envisaged that the project will produce a highly secure and personalized video content recommendation system. The main result will be a user-focused platform that customizes content recommendations based on each child’s age, interests, and safety needs. To allay worries about exposure to improper information, the project tries to discover a balance between interesting and appropriate content. To guarantee content suitability, it will make use of sophisticated AI models that integrate Computer Vision (CV) and Natural Language Processing (NLP) methods. A secure viewing environment will be ensured by a kid-friendly interface that includes parental controls. The integration of continuous improvement processes and ethical content analysis will yield a dependable and constantly improving resource for children’s online content consumption.

6.3 Performance Parameters

1. Accuracy: Following tasks have been completed with the specified accuracy levels: Video frame extraction: 100% Audio extraction: 100% Audio to text conversion: 90-95% (using Google Cloud API via PYPI) Text sentiment analysis: 88% (using Hugging Face) Color detection: 90-95% (using cv2) Frame change detection: ~80% (using Imagehash and OpenCV) Additionally, it appears that video context/summary has been achieved with an accuracy level of around 60% via the "Video-Summarization-UsingAttention" method.

2. Time: Video frame extraction: Execution Time: 0.31 seconds Audio to text conversion process: Execution Time: 0.20 seconds Text Sentiment Analysis: 2.02 seconds Color Detection: 5.2 seconds Frame change detection: 6 seconds Video summarization: 11.03 seconds All the parameter checking: 2 seconds total execution time: 25.3 seconds (for a 60 seconds video).

3. Error Rate: The error rates in our processes are as follows: audio to text conversion (5- 10%), text sentiment analysis (12%), color detection (5-10%), frame change detection (20%), and video context/summary generation (40%). These figures reveal the potential for inaccuracies and limitations in each respective process.

6.4 Efficiency Issues

• **Content Retrieval Delays:** Timely content availability could be affected by factors such as slow internet connections, server issues, or content moderation procedures. The system should be designed to manage and minimize these delays to ensure a seamless user experience.

• **Text Sentiment Analysis Processing Delays:** The sentiment analysis process may introduce slight delays due to the need to process and analyze 40 textual content. Optimizing the sentiment analysis algorithms and their integration into the system is crucial to minimize these delays.

• **Real-Time User Feedback Processing:** Handling real-time feedback efficiently is important for making prompt improvements. The system should have mechanisms to process user feedback quickly and effectively, allowing for adjustments based on user suggestions or concerns.

• **Video Summarization Performance:** The time it takes to generate video summaries can impact overall processing times. Ensuring that the video summarization process is optimized is essential to avoid delays in content delivery

• **External API Dependencies:** If the system relies on external APIs for certain functions, there may be latency and downtime issues associated with those APIs. The system should be robust enough to handle these external dependencies and gracefully manage any interruptions in service.

• **Resource-Intensive Tasks:** Resource-intensive tasks, such as video analysis or content filtering, should be efficiently managed to avoid overloading the system.

6 DIAGRAMS

Class Diagram

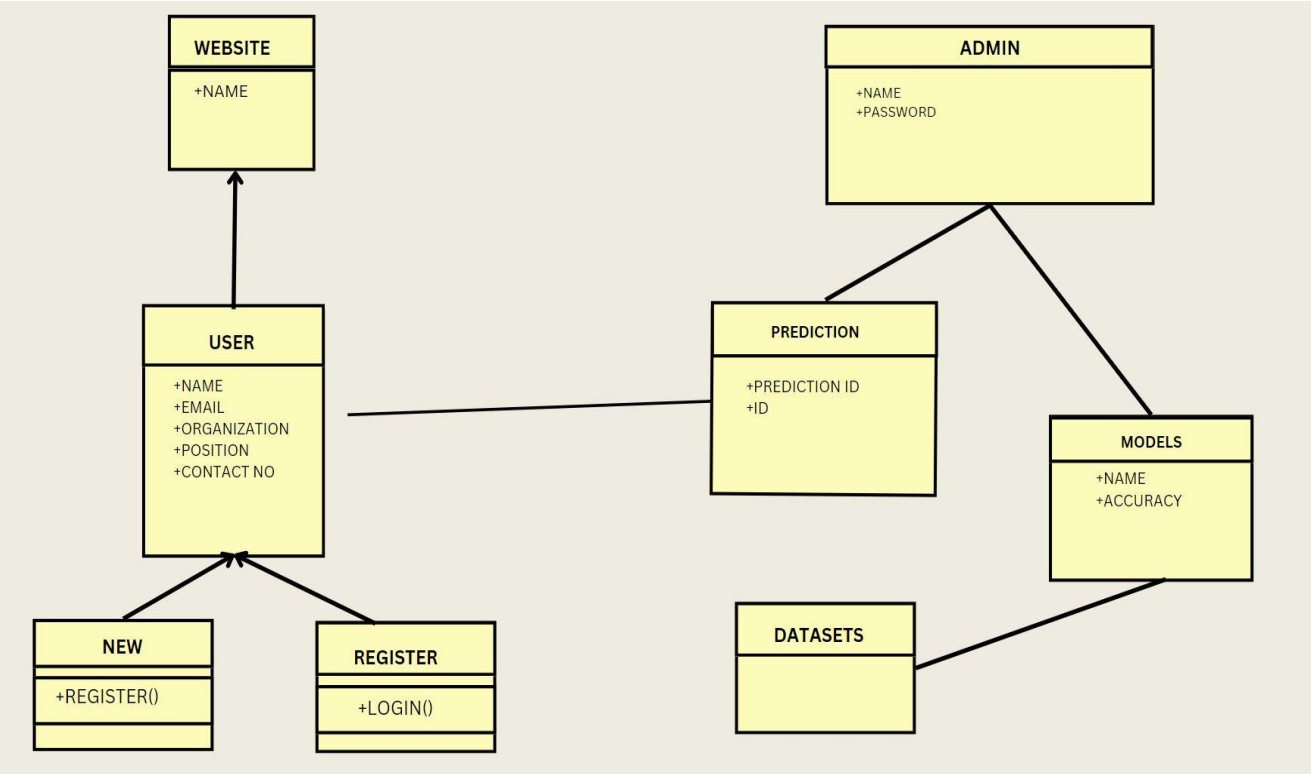


Figure: Class Diagram

The Class Diagram presented in figure offers a detailed depiction of the organization of software components and their interconnections within the system. Specifically tailored to this project's objectives, the Class Diagram delineates the assortment of classes and their corresponding attributes associated with crop prediction, disease detection, and fertilizer recommendation functionalities. By visually representing these components and their relationships, the Class Diagram serves as a valuable tool for comprehending the intricate structure and interactions within the software architecture. It provides insights into how various classes collaborate and communicate to fulfill the system's objectives effectively. This visual representation aids developers and stakeholders alike in grasping the overall organization and functionality of the software elements, facilitating smoother development processes and informed decision-making. technical responses by processing them. Lastly, using weighted values for each component, the ”FinalScore” class combines the multiple scores—audio, video, and response—to calculate the final assessment score.

Component Diagram

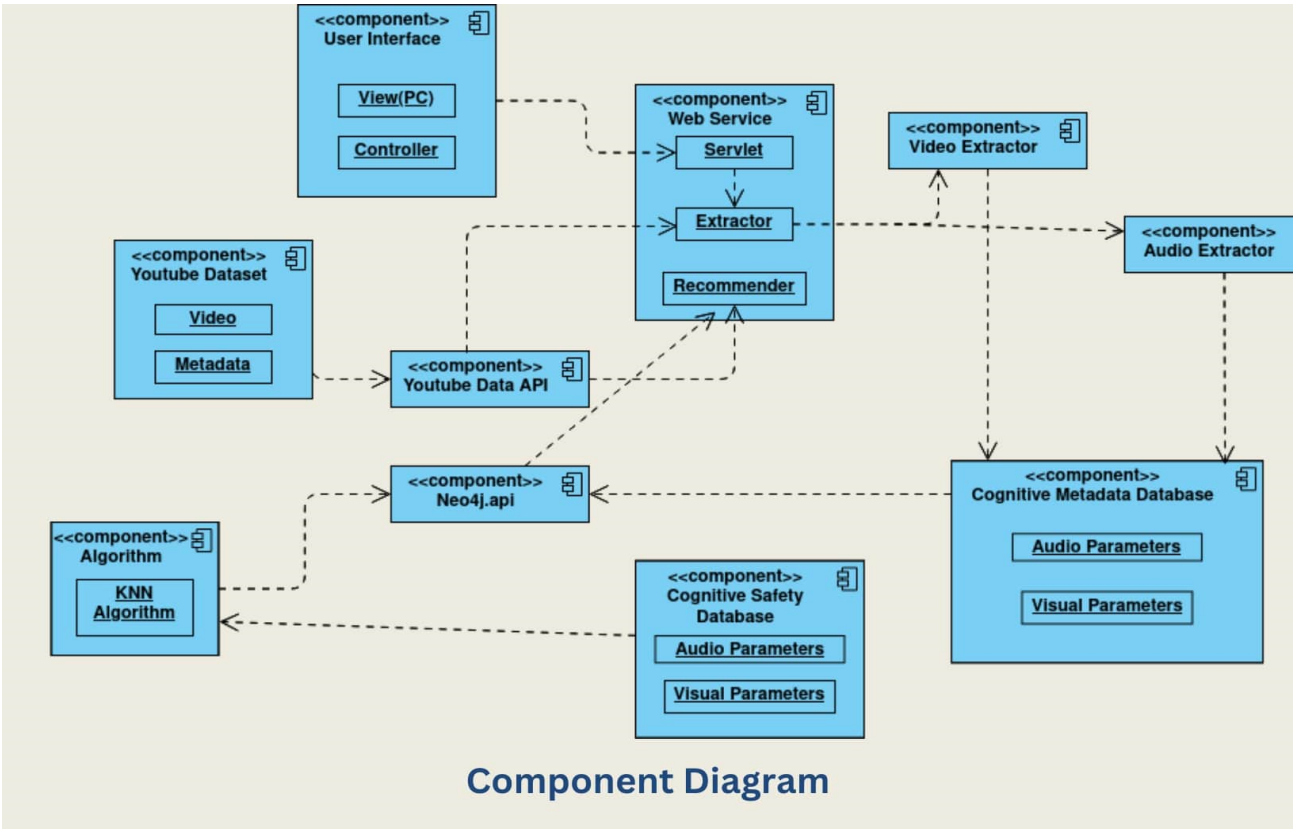
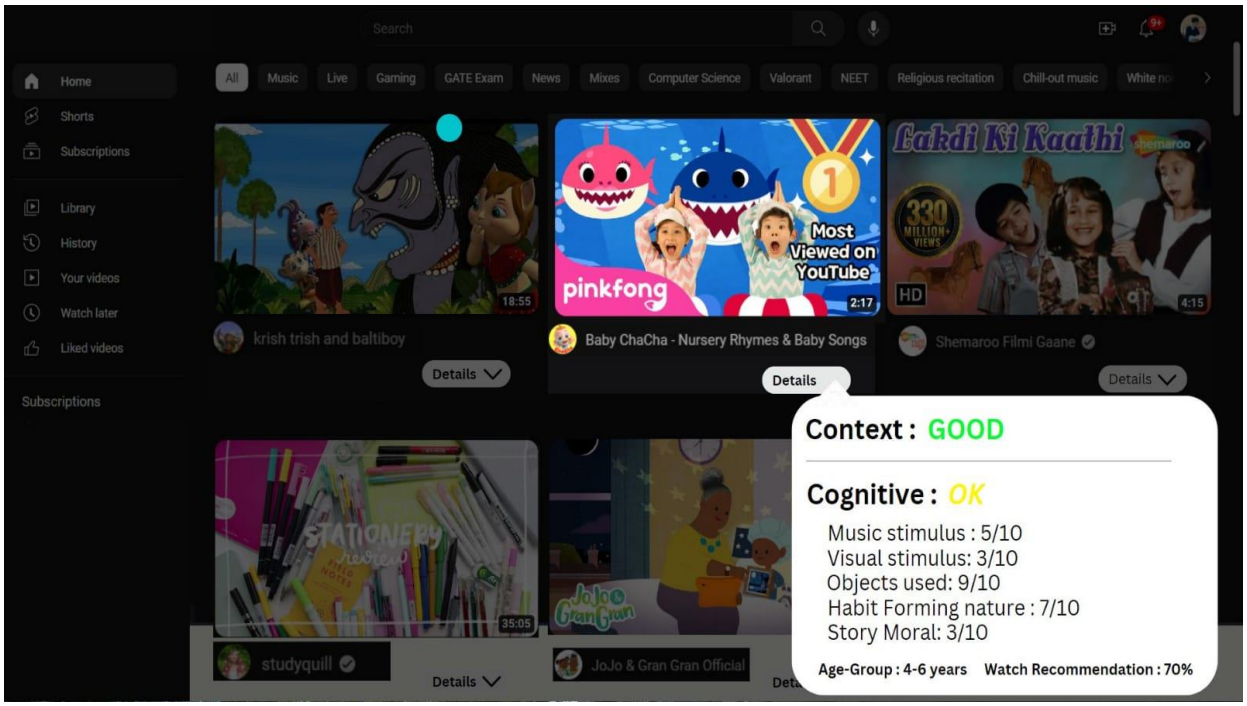


Figure : Component Diagram

The Component Diagram depicted above illustrates the architecture of the system, delineating the various components and their interactions. It serves as a visual representation of the software modules responsible for data processing, prediction, and user interaction within the project. The User Interface (UI) component, situated at the top left corner, acts as the primary interface for user engagement, facilitating seamless interaction with the system. Interconnected with the UI, the View (PC) and Controller components aid in managing data flow and control. The Web Service component assumes a critical role in request and response management, communicating with the UI via the Servlet to ensure smooth interactions. Leveraging the YouTube Data API, the YouTube Dataset, encompassing Video and Metadata, enables real-time data retrieval and processing, supporting functionalities like content recommendation. Nestled within the Algorithm component, the KNN Algorithm interfaces directly with the Neo4j API, contributing to data analysis and prediction, which are fundamental aspects of the system. The Extractor and Recommender components serve as pivotal entities in data extraction and recommendation processes, interacting with various modules, including the Web Service Servlet, to facilitate comprehensive data handling. Specialized Extractors, including the Video Extractor and Audio Extractor modules, efficiently process audio and video content. Centralizing essential parameters related to audio and visual analysis, the Cognitive Metadata Database enhances the system's capabilities in conducting thorough media assessments.

User Interface Screens:

The UI as shown in the figure is a snapshot of the feature giving insights about the video and also recommending whether the video should be watched and if yes then by which age group.



7 SUMMARY AND CONCLUSION

The summary outlines the primary findings of the research and elucidates the components and objectives of the age-tailored AI video recommendation system for children. It emphasizes the significance of selecting appropriate content and employing recommendation algorithms to provide personalized suggestions, along with ensuring user-friendly interfaces and robust privacy measures.

SUMMARY:

Developing an age-tailored AI video recommendation system for children involves various critical considerations. It begins with selecting suitable, educational, and engaging content. Recommendation algorithms, powered by machine learning, deliver personalized suggestions based on each child's age and preferences. The user interface prioritizes child-friendliness while offering parental controls. Data privacy measures are essential, as are ethical content curation, rating systems, and user feedback mechanisms. Diverse content libraries, ongoing learning, and performance metrics enhance the system's reliability, creating a secure and enriching digital environment for children.

CONCLUSION:

The "AGE – TAILORED AI VIDEO RECOMMENDATION FOR CHILDREN" project is a significant advancement in addressing challenges related to children's online content consumption. By leveraging cutting-edge technologies, we've developed a system capable of analyzing and recommending age-appropriate content. While improvements are needed, particularly in video context summarization accuracy, the project sets a strong foundation for further development. Motivated by combating content addiction and improving age-appropriate recommendations, our solution promises to enhance children's online experiences and provide valuable tools for parents and guardians. This project reflects our commitment to safeguarding children's digital experiences and fostering their growth.

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