IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, November 2025
Impact Factor: 7.67

Intelligent Youtube Analytics Platform

Anshu Raj[1], Jigyasa Thakare[2], Trisha Paul[3],Tapan Potdar[4], Prof. Manisha Shitole[5]
Department of Computer Science Engineering[1,2,3,4,5]
MIT ADT University, Pune, India

Abstract: *YouTube ranks among the largest hubs for sharing videos, yet plenty of people struggle to expand their presence there. Finding down trending subjects takes ages - figuring out which terms work best, spotting shifts in viewer interests, settling on effective tags, crafting eye-catching thumbnails, while keeping tabs on others in the same space takes up hours.This project talks about a smart AI-based system called AI-Driven YouTube Analytics Software as a Service platform that helps with competitor analysis and optimizes content. This system uses artificial intelligence to create thumbnails, predict and identify trending keywords, suggest content, and gather real-time channel data. To make decision-making easier for creators, the platform combines Natural Language Processing (NLP), Computer vision and predictive analysis. The solution helps creators by providing them with data-driven insights in an intuitive interface and is hosted in the cloud and accessible through a web dashboard.*

Keywords*:* YouTube Analytics, Artificial Intelligence, SaaS Platform, Natural Language Processing (NLP), Computer Vision, Predictive Analytics, Trend Prediction, Content Optimization, Outlier Detection, Recommendation System, Data Visualization

I. INTRODUCTION

YouTube is a huge spot for sharing videos, yet standing out there gets difficult every day. Countless people upload content on YouTube nonstop, which makes it difficult for creators to keep their viewers hooked and simultaneously growing their channels. Even though YouTube offers some tools for analysis, they are basic and are not of much help. So, creators usually have to themselves spend a lot of time checking and understanding their own data, finding trends and patterns, understanding competitors, and identifying the top keywords. This takes a lot of effort, manual work, slows down progress and often lets golden chances slip away.

To tackle such problems, this project introduces you to an AI-based YouTube Analytics platform that simplifies how creators boost their content on YouTube in a faster and smoother manner. Instead of manual tracking, the platform automatically collects data from the your channel and from competitor channels using the YouTube Data API which is YouTube's public feed It tracks all important details like views, likes, comments, upload timing, and how viewers interact. Using artificial intelligence, the system learns user's view behavior and forecasts trending topics, suggests useful keywords, and finds patterns. The platform makes use of Natural Language Processing (NLP) to study video titles, descriptions, and tags and offers better search-optimized (SEO-friendly) alternatives so videos get higher ranks in search results. At the same time, computer vision technology reviews the video thumbnail images, evaluates their design, color, and emotion and suggests or creates better ones to attract more viewers. The predictive analytics feature of the system analyses old data to predict upcoming trends, helping creators to have edge against rivals.

II. OBJECTIVES

- YouTube content analysis and track competitors: The system will automatically collect and compare video data, helps to reduce manual work and continuously monitors performance.
- Predicting keywords using AI: Machine learning models understand how people interact with videos and analyse data to predict popular keywords and future trends.
- Finding Good Thumbnails, Tags and Titles using AI: Smart tech tools like NLP and Computer Vision uses image and language analysis to make better titles, content, video descriptions and thumbnails so more people notice them while browsing feeds.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, November 2025 Impact Factor: 7.67

- Provides Insightful Dashboard to Creators: A simple and easy-to-use dashboard that uses charts and visuals to show AI tips and suggestions.
- Reducing Manual Work and Improve Performance: Automation helps to save time and fewer chores by hand yet better results show up when machines take over - less time spent, less strain on people, systems run smoother while choices grow sharper through real information.

III. LITERATURE SURVEY

Sr. No.	Author(s) and Year	Title of the Paper / Study	Methodology / Techniques Used	Key Findings / Contributions	Relevance To Work
1.	Covington, P., Adams, J.,& Sargin,E. (2016)	*Deep Neural Networks for YouTube Recommendion*	Two-stage deep learning model for candidate generation and ranking of videos	Smarter suggestions on YouTube that fit you better, also able to grow smoothly with more users	Builds the base for suggestions inside our new software service
2.	Sajib, M. S. R., Malik, M. A. I., & Islam, M. A. I. (2018)	*Video Recommendation System for YouTube Considering Users Feedback*	Weighted recommendation system using user feedback and ratings	Boosted accuracy through user preference feedback.	Makes it easier for our software tool to add how users engage into reports.
3	Alvarado, O., Heuer, H., Abeele, V., & Breiter, A. (2020)	*Middle-Aged Video Consumers' Beliefs About Algorithmic Recommendations on YouTube*	User perception and qualitative study	Identified gaps in transparency and trust in algorithm suggests things.	Shows how to build clear AI suggestions that make sense.
4.	Xiang, Y., Huo, S., Wu, Y., Gong, Y., & Zhu, M. (2024)	*Integrating AI for Enhanced Exploration of Video Recommendation Algorithm via Improved Collaborative Filtering*	AI-enhanced collaborative filtering	Improved accuracy in video recommendations by combining user behavior and metadata.	Helps build a smart video recommendation feature on our site using AI
5.	Sun, W., Guo, X., & Ding, Y. (2025)	*AI-Assisted Visual Content Creation Process and Optimization Practice for Short Video Platforms*	Computer vision and AI-based optimization for short videos	Auto-tuning the content boosted interaction close to 30%	Balances why we apply artificial smarts to make thumbnails pop plus fine-tune visuals.
6.	Yin, S. (2025)	*Personalized Recommendation Algorithms on*	Comparative study on personalization	Talks about the moral choices tied to how AI suggests things, while also looking	Makes sure our setup stays balanced, free from bias, while focusing on

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, November 2025 Impact Factor: 7.67

		Short Video Platforms: User Experience, Ethical Concerns, and Social Impact	algorithms	at user involvement	what users really need.

IV. SYSTEM DESIGN AND METHODOLOGY

The platform architecture consists of four main layers:

The **Data Collection Layer** works like a smart information collector. It uses the YouTube Data API v3 to automatically collect useful information and details from YouTube, such as video titles, tags, likes, views, comments and also how often a creator uploads new videos on their channel. This data collection helps the system to clearly understand both the creator's and competitors' performance.

The **Processing and AI Layer** acts as the mind of the setup - this is where smart tasks happen. Because it runs various AI models, content gets clearer or better over time. The Natural Language Processing (NLP) model analyses text and gives better video titles, tags and descriptions using advanced transformer-based models. The Computer Vision model handles the images and even creates new thumbnails using deep learning techniques like CNNs (Convolution Neural Networks) or Vision Transformers. These tools help creators choose attractive thumbnails. Then the Trend Predictor uses statistical and time-series models to predict which topics, categories or keywords are going to be more trending in the future.

The **Application Layer** is the layer with which users can actually see and interact with, it is the actual web platform. It is built using modern web technologies such as Next.js for the front end and Node.js for the back end. RESTful APIs act like a bridge between AI models, databases and user dashboards and make sure that the data flows smoothly across the platform.

The **Database and Cloud Layer** is responsible for storing data and making the platform accessible online. Database NeonDB is used to store information about users including their performance and analytics data. ImageKit.io manages and stores all thumbnail images on the cloud. The platform is deployed on cloud services like AWS or Google Cloud to make sure it runs faster and smoothly for multiple users at the same time, also cloud provides scalability and fast performance

V. WORKFLOW

The moment you start using the new YouTube analytics tool, it tracks each action until numbers appear on display. Rather than manual work, it links smart data grabbing with AI-powered analysis, outcome creation along with visual layouts. Everything runs seamless - like linked loops, one piece pushing the next ahead without glitches. The main aim of this workflow is to reduce the manual work and help creators make decisions and act fast based on real-time, data-driven insights.

Step 1: Data Collection

The Data Collection Phase sets things up right from the start, kicking off the whole workflow process. As soon as a user logs into the platform, they are asked to give input like either a specific topic they are interested in or select a rival's YouTube channel for analysis. After that info goes in, the system links up with YouTube Data API v3, this secure bridge lets our system talk smoothly with YouTube. Using that link, it pulls together rich details on relevant videos and channels without any manual work. The details collected cover:

Video titles, descriptions, or tags – these point out what kind of upload it is.

Looking at Views, also likes, along with dislikes plus comments – gives a clear idea of what folks really think about the videos.

Upload Rate – shows how often someone shares fresh videos.

Thumbnail Images and Data Tags these help AI systems work properly while creating images you can see.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, November 2025 Impact Factor: 7.67

First off, any errors, weird bits, or duplicates are sorted out - tidying things up a bit before going further. Then the format's tweaked so it fits better down the line.

Step 2: AI Processing and Analysis

Once the data has been cleaned up, it is then sent to the AI Processing and Analysis Phase. At this stage, the system understands both texts and images from the data which was collected from YouTube.

NLP (Natural Language Processing) Model

The Natural Language Processing (NLP) module checks all the text data, including titles, tags and video descriptions. By providing transformer-based models such as BERT or GPT, it learns language patterns, picks out valid keywords, and evaluates how properly the already existing titles and descriptions can make it easier for people to discover your content in search results. This model can provide more better ideas for titles and descriptions that fits what is popular right now along with what audiences care about lately.

Vision Analysis Model

At the same time, the Vision Analysis Model scans the thumbnail images ties to each video. Instead of just processing raw information, it uses advanced systems such as Convolutional Neural Networks (CNN) and Vision Transformers (ViT), this model judges how eye-catching and emotionally strong each thumbnail looks like. It studies and understands the colour balance, brightness, facial expressions, placement of objects, and clarity to figure out which visual features will grab attention fast. This image-based insight helps the system to recommend new thumbnail ideas that have can capture the viewers' attention more easily and quickly.

Trend Prediction Module

A distinct analysis feature called the Trend Forecast Engine checks how folks interact with posts across weeks to catch themes likely to blow up fast. Using pattern-finding algorithms and past data tracking, it identifies recurring shifts in what grabs attention then sorts post concepts by their success rate. Rather than dumping statistics, it turns details into smart guesses letting creators jump onto growing trends right before they blow up.

User Behavior and Outlier Detection

Traditional recommendation systems usually rely only on user feedback, such as likes, ratings, or direct reviews. But this method has a major limitation known as data sparsity which means that only a small proportion of users actually provide ratings, while the majority of viewer do not interact much. That's why the setup lacks the details it needs to fully grasp what users want or like - making suggestions less precise.

To tackle this problem, the new YouTube Analytics SaaS platform adds a User Behavior and Outlier Detection Mechanism that tracks user actions and spot unusual activity by looking at clear feedback along with hidden signals. Rather than relying just on star ratings, it checks how people actually use YouTube, basically what they click, how long they watch, what they search for, or if they rewatch clips. Mixing these kinds of hints lets the system guess which videos someone enjoys, particularly if they haven't rated anything outright.

The algorithm decides what users care about by ranking their moves with something called preference points. Because of these rankings, the AI can figure out just how into certain stuff a person really is. The process is described below:

Rating Preference: When a user rates a video (for example: by liking or rating it or giving high scores such as 3 out of 5 stars), the system thinks of it as a clear sign of interest that the user enjoyed it. Instead of guessing, this kind of feedback counts as solid proof of what they like. Because it's a direct action, the model treats it as a green light. Such signals clearly show the person connected with the content in some way.

Click Behavior: Many people do not rate or like videos, yet their choices show click patterns. Instead, the system tracks how many times someone taps on similar clips often, replays bits of footage now and then, or visits the same channel repeatedly. If a user clicks or watches a specific category of videos more than a predefined threshold (for example: two or more times), the system automatically increases the weight for that category. So, down the line, the model favors showing alike clips without the need for rating them.

The platform's User Behaviour and Outlier Detection Mechanism improves recommendation accuracy by combining both explicit feedback (such as likes and ratings) and implicit behavior (like clicks, watch time, and repeated views) to get a real picture of what each person actually enjoys. Instead of just counting ratings or likes, it blends visible reactions

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, November 2025
Impact Factor: 7.67

with behind-the-scenes activity so the suggestions keep getting more detailed information about each viewer's interests. Because people don't always rate things, mixing silent signals with direct ones keeps the engine learning without waiting on reviews. Along with this, the Outlier Detection Model identifies unusual or weird performance patterns such as videos getting unexpectedly high or low engagement and marks them down. Spotting these odd patterns lets makers figure out why some clips do way better - or worse - than expected, so they adjust upcoming posts using what their strategy shows. Each piece connects into a single flow, building a loop that improves how closely recommendations fit what users want while upgrading the feedback creators get.

Step 3: Output Generation

After Smart Tech finishes checking the data and pulling key details, focus turns to shaping outcomes. In this stage where different results are combined, every discovery connects - then changes into simple, practical forms. That means:

A list of suggested terms picked by smart tech, i.e., (AI-suggested keywords) - either gaining attention lately or linked directly to the creator's main topic.

Better video titles with descriptions (names plus summaries) along with popular keywords - so people can find them faster - using clear summaries that match what folks are searching for online.

Thumbnail ideas - are provided based on what the image scanner picks up - such as tones, feelings, or layout patterns and the prompt.

Finding strange results - certain videos perform oddly well, hinting about tricks that might work elsewhere - or crash hard, exposing flaws needing a fix.

Every result fits the topic or channel you pick, so advice feels relevant and easy to use.

Step 4: Dashboard Visualization

This is the last step in the process where we build interactive screen full of results that shows all findings which are easy to explore with just a tap or click. This dashboard acts as the main link connecting the system to the person using it. The system is built using tools like Next.js on the client-side or front-end, while servers or back-end runs on Node.js, which is hooked up smoothly with AI modules via RESTful APIs. The dashboard allows users to browse their data easily, no tech skills needed due to straightforward navigation and clear layout. It gives:

Trending Keywords and Topics: A snapshot-type cluster of words showing what folks are looking u lately.

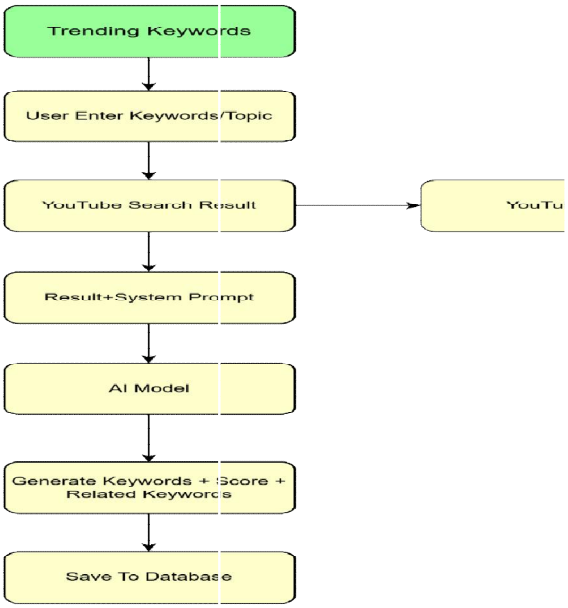

Figure 1: Trending Keywords Finder

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, November 2025
Impact Factor: 7.67

Content Generation: Titles, labels, plus quick descriptions crafted by spotting how words are usually paired together.

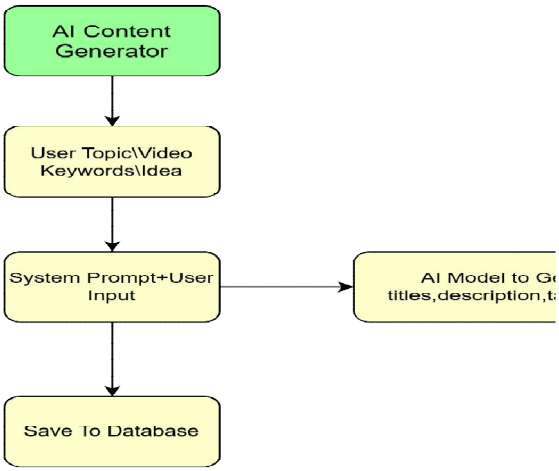

Figure 2: AI Content Generator

Performance Outliers: Visuals highlighting videos that tanked or blew up compared to others - giving you a chance to figure out why things went off track or clicked and then take insights from it.

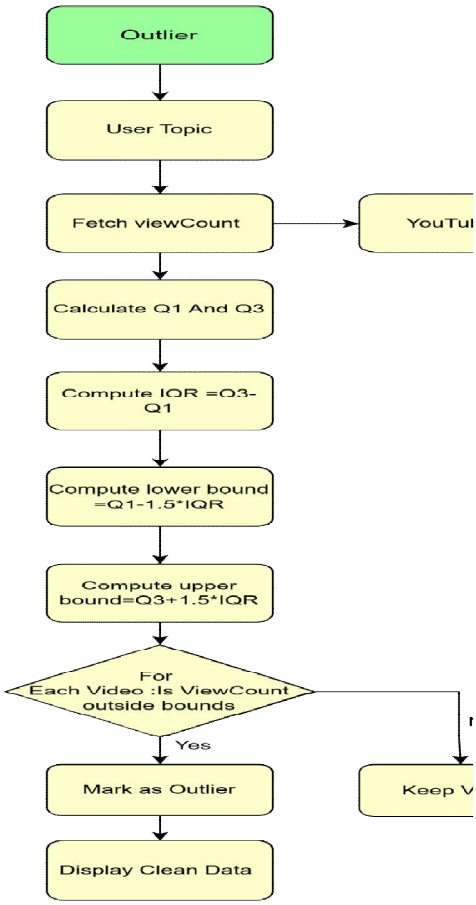

Figure 3: Outlier Detection

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, November 2025
Impact Factor: 7.67

Thumbnail Comparisons: Suggested images of recommended thumbnails alongside the current picks which helps to check for improvements.

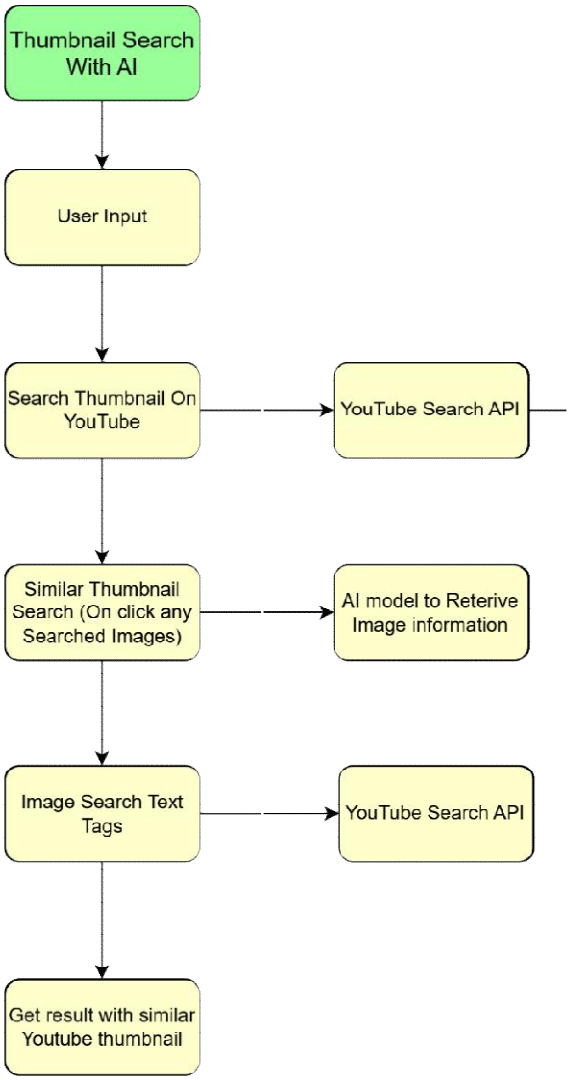

Figure 4: Thumbnail Search

The dashboard runs Next.js up front, meanwhile Node.js powers the backend side. Because it connects to AI tools via RESTFUL APIs, updates show as soon as visuals match analysis. For storage and more room to expand for data, NeonDB takes care of everything which uses PostgreSql.

In short, the workflow of the AI-Driven YouTube Analytics Platform runs nonstop in a smart loop. Firstly, it pulls data straight from YouTube without any manual help, then by using advanced AI-based processing it breaks down both text and visuals. After that, recommendations pop up, displayed clearly so users understand them fast. This end-to-end process tries to transforms raw YouTube data into meaningful and clear insights which can be grown through, which makes easier for the creators to decide which kind of content they can use. They can also change the content based on feedback which helps in increasing the veiws. Growth becomes easier when tasks run themselves thanks to machine smarts behind the scenes.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, November 2025
Impact Factor: 7.67

VI. RESULTS

The AI-powered YouTube analytics tool brought major improvement in performance plus audience attention. Due to auto-processing, hunting for keywords now takes nearly 80% less time. Crafting thumbnails sped up too - around 85% quicker - with clever design support inside. Adjusting titles became way easier, needing just a fraction of the work, around 95% less, once the software took over. Videos using auto-made thumbnails saw clicks go up an average of 25% versus hand-crafted versions. People trying the platform said the live-updating interface felt easy to use, clean on screen, and useful for planning uploads. Tests confirm that adding machine learning to YouTube analysis boosts output quality while lifting audience reach and precision in content choices.

VII. FUTURE SCOPE

The AI-Driven YouTube Analytics Platform might get a boost from sharper AI tools giving creators hints on which videos could do well even before going live. Besides that, it's able to recommend titles, thumbnail styles, or when to post - so more people notice and interact. In times ahead, this tool might deliver live data tracking along with more detailed info on who's watching - like age groups or how they interact. On top of that, it could include ways to study rivals, letting creators see what's working well for similar people in their field. AI-Driven YouTube Analytics SaaS Platform might eventually work across sites such as Instagram, TikTok, or even Facebook - turning it into one hub for handling and checking posts. These updates let it become a strong tool for choices, perfect for any online creator.

VII. CONCLUSION

In summary, the AI-powered YouTube Analytics Platform helps creators improve videos without wasting time on verifying whether they are right or wrong. Instead of guessing, it uses smart tech like language analysis, image scanning, alongside forecasting tools to take over tough jobs - like choosing stronger keywords, designing thumbnails, or catching rising trends. Because of all this, making content becomes faster which also helps in increasing views and audience interaction - no matter how big or small the channel is. With a clean ordered, structured, easy-to-use interface, it tries to turns confusing numbers into clear steps anyone can follow. Over time, upgrades in artificial intelligence will make it even sharper at adapting across platforms, acting more like a personal helper than just software.

REFERENCES

[1]. P. Covington, J. Adams, and E. Sargin, "Deep Neural Networks for YouTube Recommendations," Proceedings of the 10th ACM Conference on Recommender Systems, Google Research, 2016.

[2]. Y. Xiang, S. Huo, Y. Wu, Y. Gong, and M. Zhu, "Integrating AI for Enhanced Exploration of Video Recommendation Algorithm via Improved Collaborative Filtering," Journal of Theory and Practice of Engineering Science, 2024.

[3]. W. Sun, X. Guo, and Y. Ding, "AI-Assisted Visual Content Creation Process and Optimization Practice for Short Video Platforms," International Journal of Multimedia (IJMM), 2025.

[4]. M. S. R. Sajib, M. A. I. Malik, and M. A. I. Islam, "Video Recommendation System for YouTube Considering User Feedback," Global Journal of Computer Science and Technology, vol. 18, no. 4, pp. 45–52, 2018.

[5]. O. Alvarado, H. Heuer, V. Abeele, and A. Breiter, "Middle-Aged Video Consumers' Beliefs About Algorithmic Recommendations on YouTube," Computers in Human Behavior, vol. 110, pp. 106385, 2020.

[6]. S. Yin, "Personalized Recommendation Algorithms on Short Video Platforms: User Experience, Ethical Concerns, and Social Impact," Lecture Notes in Education Psychology and Public Media, 2025