

## **RECOMMENDATION OF EFFECTIVENESS OF YOUTUBE VIDEO CONTENTS BY QUALITATIVE SENTIMENT ANALYSIS OF ITS COMMENTS AND REPLIES**

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**ABSTRACT:** As YouTube offers a lot of videos about general life recipes such as cure of diseases, best exercises, tutorials and tips etc. But there is no automatic way to calculate the effectiveness of the content of the video. So, in this paper we proposed a novel approach to find out the recommendation of effectiveness of a YouTube video content by using quantitative sentiment analysis of its comments and replies. By using ("GoogleAPI," n.d.)Google API, we extracted the YouTube video comments in .csv format and then calculate the state-of-the-art qualitative sentiment of comments and its replies after necessary pre-processing the data. Further we follow two approaches to get the recommendation label of the video. First calculating the number of positive and negative replies against each comment and calculate percentage of positive replies against each comment, then count the percentage of comments having replies sentiment percentage greater than 50%. In the second approach we calculate the average sentiment of replies against each comment and then calculate the percentage of comments who have positive average replies sentiment. Finally, we make arithmetic mean of score of both approaches to get the single normalized score. Based on this score, our approach finally concludes the video as one of the four labels 1) not recommended 2) may be recommended 3) recommended and 4) highly recommended. We test our proposed approach on several YouTube videos comments and it gives significantly accurate result as per human judgement. This is certainly improving the video selection criteria belongs to any search term on YouTube.

**Keywords:** YouTube, sentiment analysis, Google APIs, Video recommendations.

### **INTRODUCTION**

YouTube is the website of videos sharing and uploading. When it was started the YouTube is only considering the site for uploading a video to share with people this is done in 2005 and the first video is uploaded by Mr. Jawed Karim related to visit the Zoo this video watched by 2.7 million people. With the time passing the YouTube user increased and the number of videos uploaded are too increased now 2 billion are the registered user on YouTube and each year number of YouTube channels are earning six figure income and YouTube 40% increased year by year. 70% of the YouTube watcher is on the mobile devices. Number of channels are 1 million subscribers are increased 75% year by year. YouTube provide the features like, share, upload and comments on the video and add in the playlist too to make you easy to watch your videos later. The YouTube help the users in learning and many people upload their work and experiences they upload many ideas, tutorials related to many fields, there are a lot of categories in the YouTube. YouTube have more products like YouTube TV, YouTube Music, YouTube kids, you can create your channel and get the subscribers if you got according to the Google policy for subscriber in a month the YouTube will offer you Google AdSense Account to earn money

from Google. YouTube is a big platform for video sharing people use YouTube for learning and getting the information from the experienced people that they upload the informative videos people watch and share if they get the productive information. Now the ratio of uploading videos and the same topic (key word) videos are mostly upload from all over the world. One Single topic (key word) and multiple information you will searched on the YouTube. Some time it's too difficult to get your targeted video and some time you will get the video but some time not.

The people try to get the information about the content of the video from the comments of the video and judge the video whether it is good or not or related to your need or not some time people watch the video and do the practice and then they get the confirmation the video is authentic or not based on the searched keyword than people comments on the video and give them the feedback in term of like and dislike and negative and positive comments.

This method is promising when the likes and comments are limited and the user will get the desired information from reading the 20 to 30 comments but if the user found the comments are not positive and the replies on the comments some are positive and negative than you will not confirmed that the content of the video is authentic / productive than you will try your own to

get confirmation the video content is productive or not by watching the whole video ,when the user put negative comments than we get the negative information(about video content) if the user put positive comments than we get positive information.

In this regard if the video comments are too much and this should impossible for the human body to read and get the authenticity of the video content is good or not than we get help form machine and try to calculate the sentiments and the score of the sentiments and form the sentiment score we get the information from people comments and peoples replies on each comment. The more positive comments will describe the video is more authentic contents and the data is more trustworthy.

We here talk about productive comments the comments which are help to get the information that the video content is productive or not, our extraction from the YouTube comments and the people need to get productive comments and they want to know what people talk about and what they more talk about and when talking about means our focus on the productive comments like in Sales, Cardiac Work, Tutorials, and medical sciences, Medicine, cure, and any topic for which the video is uploaded.

This process will make the user target-oriented comments score is concern and not to waste the time on the garbage comments. This will also improve the user productive feedback and enable the watcher to make efficient decision. The processes will reduce the time of the user to waste in searching and viewing the videos related to their topic. In (Meldrum *et al.*, 2017), authors are commenting on the video in different nature some are for question base, some are "I will try", some are criticized, it means different types of the comment's users will put on the YouTube comments section, some are knowledge-based comments. When peoples search on YouTube will offer the data based on Geo-Location so the results are different, it's totally depends on the user search keyword on the YouTube. Different keywords will receive different results videos so the author collect 1000 comments (based on different keywords searched) and get results that the 20% on the nature of the comments are shows the complementary for video.

They (Chauhan and Meena, 2019) use the aspects of the YouTube Video on that bases the Google ranked the video if we change the aspects of the video that will affect the ranking , the results gives us the F-Score is 0.74 as compared to Precision 0.74 , recall 0.68 means they said that the aspects are make an effects on the YouTube video ranking.

(Cunha *et al.*, 2019)Another technique is Deep Neural Network which helps us to classify the user response in comments. The case study in using the deep neural network to make their results more accurate. The deep neural network helps us more productive than statistical classifier. In the case study they check the fake

and original content of the YouTube. Author use 2 videos with 1000 comments as dataset. They (Chaithra, 2019) manually generate FVC, and VAVD two data sets and Run and Test his own UCNNet Deep Neural Network used and try to get the video is fake or original content the results shows the F-Score of base line is 0.36, Features base is 0.73 and 0.76 is achieved by UCNNet.

Another (Hegarty *et al.*, 2017) tool STATA version 8.2 help us to get the sentiment analysis of the YouTube comments and the collection of videos 55 which the patients they describe their personal experiences that is 34.54% and the major people are positively biased 85.45% and 27.27% of the videos are good and excellent general information and the 61.81% had moderated information and only 10% videos gives us very poor information content (Schultes *et al.*, 2013)

There is another approach used for the E-Commerce if you want to get the batter results then first you should must defined some attributes or attributes dictionary on the basis of the defined attributes / Attributes Dictionary we processes sentiments using the LinLog energy model (Fu *et al.*, 2019) and attribute sentiment pair correlation model to get accurate results about the products review. They achieve the results up-to Accuracy is 74.72% and the Recall is 84.29% and the F value is 79.21%.

In China the Author (Ye and Tan, 2019) build a system application with visual information for Sentiment Analysis with direct interaction with Sina Weibo(*social media website in China*) the system is used to monitor the user's sentiments and trend. They use Facebook diabetics community group. They use Weka for experiments and try to find the behavior intensity expressed in their reaction on the Facebook post how they behave and make more accurate classification. The system achieves the results up to 94.6%.in Jan 2019 Priyank Palod<sup>1</sup>, Ayush Patwari<sup>2</sup>, Sudhanshu Bahety<sup>3</sup>, Saurabh Bagchi<sup>2</sup>, and Pawan Goyal developed a model (Chu *et al.*, 2016)UCNNet they use this model to detect the fake or fake content videos on YouTube they find that the content on the YouTube videos are misleading content they introduced a model UCNNet to take the problem effectively and make the supervised classifications. By using UCNNet they achieve the results of the macro averaged F-Score 0.82 and the baseline model score 0.36.

There is another study (Djerf-Pierre *et al.*, 2019) about science videos and political/ Journalism videos the author use the some parameters use the number of views , sentiment analysis of parent comments and their replies and compare the result of the YouTube Video comments on the topic of "Superbug" with two categories 1.Science Videos 2.Journalism.people are mostly response on the video as per their content is that general science content or political content. People commenting and taking call for action this purpose the journalist use the YouTube plate-form for their communication and get the user

response as per studies results the people talk about the science related videos and political related videos are same response with ratio 1.

**Data collection:** We first to decide the category of videos and use the keyword to search on YouTube and on the basis of keyword YouTube will shows the results as per his current policy and from the ranked videos we filter or exclude the non-English videos and also monitor manually the videos which are ranked by YouTube but the video have comments less than 10 and the minimum 4 reply to each comment in the video comments section.

Now we select the 5 videos for each category and then scrap the comments using (“GoogleAPI,” n.d.)Google API’s for comments scraping. We have selected 25 videos with more than 50,000 comments, 5 categories with 5 ranked videos in each category. Each video containing the different frequency of the comments.

We downloaded Dataset and performing preprocessing / cleaning and then this cleaned data we use baseline methodology to get the below attributes as results. From the different category’s videos with different topics. Our major focus in the data are, Video link, No Of Comments, No Of Replies, likes / dislikes , Major Comments Pos, Major Comments Negative , Major Comments Neutral Score, Replies Comments Positive , Reply Comments Negative, Replies Comments Neutral. (Siersdorfer *et al.*, 2010) Filtration and cleaning dataset, finding major comments with minimum 04 replies for each comment than find the sentiment of each major comment and assign a score than find the sentiment of the each reply and make the all a one score according to conditions. Here is a video selection process model shows fig. 1 and the sample comments data for a video is also shown below.

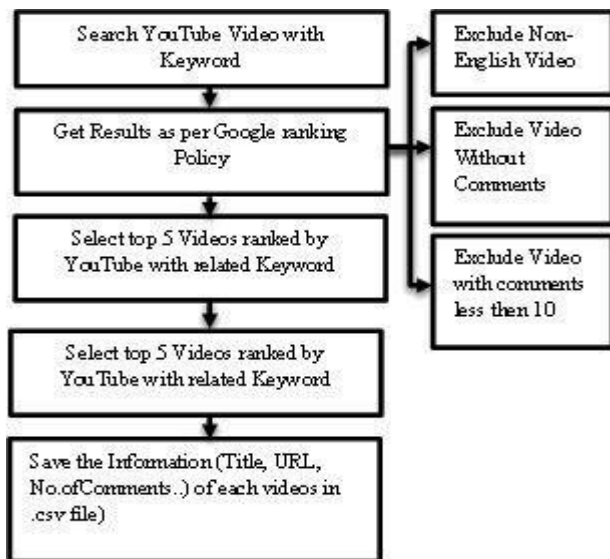


Figure-1: Video selection process model

## MATERIALS AND METHODS

Using the Google APIs and pass the URL of the video and the Google APIs is the Google free API’s used for collecting the comments the Google APIs are available in the C# , Python and R languages. We use the Python in our work. After passing the URL the Google APIs will collect the data from the Youtube.com.

After the collection of comments, the API’s will save the file in CSV (depends on the code) the file can be saved in simple text, CSV or Json format we save our comments dataset in the CSV format.

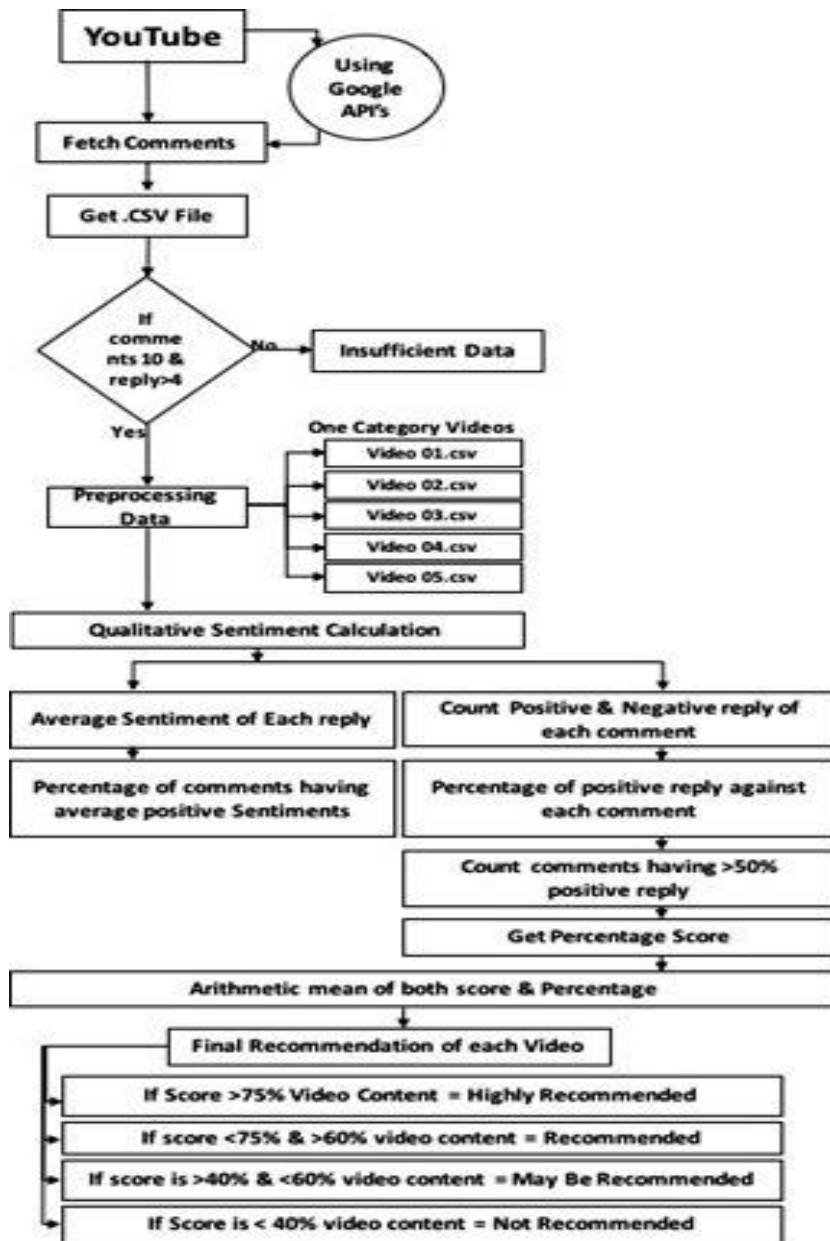
We first need to clean the data or pre-processing the data. In this step we remove unnecessary data which is not required and will not affect during our analysis. After cleaning the data, we require processing the sentiment of all comments and its replies. As we need to calculate the quantitative sentiment of the comments and its replies for the video, we use state of the art python library for quantitative sentiment calculation that is Vader Sentiment (Chaithra, 2019). Table 1 gives the sample comments and replies of the video related to belly fat loss recipe with corresponding quantitative sentiment.

Process the sentiment of all the replies of each major comment. Moreover, data will be declared as sufficient if it has at least 10 comments having at least 4 replies otherwise it is declared as insufficient does not give any recommendations. Process the sentiments of the average of the replies having more than 4 replies. Processes the percentage of all replies the video dataset and calculate the results of the sentiments. If the percentage of positives replies are more than 75% of the comments replies, then the video will tag as *Highly Recommended* video and his content is more reliable and accurate. If the percentage of the sentiment of the replies are below 75% but above 60% is labeled as *Recommended* video content. If the percentage of sentiments of the replies is in between 60% to 40% label will be *May Be Recommend* if below than 40% the video content is not recommended for you.

**Recommendation score algorithm:** We adopt the methodology based on the algorithm that if the average percentage of each reply comment having positive and the average sentiment of the reply positive comments is greater than 50% and the Arithmetic mean of the both scores is the final results for the video qualitative content. If the score is greater than 75% the video achieves the score of labeled is *Highly Recommended* video, if in between the 75% to 60% its label is *Recommended*, if the Percentage in between 60% to 40% the video will be labeled *May be Recommended*, if the percentage is below than 40% the video data will not be Qualitative and labeled as *Not Recommended*. The flow of system model is shown in the fig. 2.

Our methodology gives us the system and methodology is work like a human mind and observation. Our work makes people search more effective and

progressive and gives the ease in the time spent on the YouTube searching their actual content video.



**Figure-2: proposed methodology.**

**Table 1: Quantitative Sentiment Score of Sample Comments regarding Belly Fat Loss Video.**

Comment Text	Replies.	Comment Text	Sentiment C	Sentiment R
Hey guys! Have you already tried these nan recipes? Which one works best for you?			0.5903	0.0000
Btw, if you wanna have a flat stomach, avoid these foods				
<a href="https://www.youtube.com/watch?v=BE18zhORU4">https://www.youtube.com/watch?v=BE18zhORU4</a>				

nan	BRIGHT SIDE lemon water	0.0000	0.5622
nan	When I feel a cold coming on I take 1 whole lemon squeezed and include pulp, 3 tablespoons of honey, water and a knife tips worth of Cayenne pepper. Add water and sip. It actually tastes good. 100% Maple syrup will work if you don't have Honey. But Honey is the best.	0.0000	0.8481
nan	BRIGHT SIDE epic vid	0.0000	0.5622
nan	Can you use a lime	0.0000	0.0000
nan	BRIGHT SIDE i did try before but now not so much.	0.0000	0.3218
nan	Maude Beth Mathilde Haworth You know what else is great, lemon ginger hot tea. Boil thinly sliced ginger root for 15 mins, drain the water into a container to rid of excess ginger, then just add fresh lemon juice to taste. AMAZING, especially if your sick.	0.0000	0.8110
nan	<a href="https://youtu.be/fBu5cQYOB5g">https://youtu.be/fBu5cQYOB5g</a>	0.0000	0.0000
nan	BRIGHT SIDE i love your videos	0.0000	0.8331
nan	Body Hub today was ma 1st term result.and I failed on 3 subjects out of 5	0.0000	-0.5106
nan	BRIGHT SIDE i use the cinnamon one. But in a weird way, i put it in mac n cheese. It sounds weird but it's amazing! Try it!	0.0000	0.7935

## RESULTS AND DISCUSSION

by our algorithm. The last column shows the recommendation label.

Below is the table which describes the result of recommendation of different YouTube videos generated

**Table-2: Results.**

Sr. No	Category	Keyword	Video Title	Comments	Results
Health-01	Health	cardiac workout	5-Minute Workout That Replaces High-Intensity Cardio	8029	Recommended
Health-02	Health	cardiac workout	10 Min Abs Workout -- At Home Abdominal and Oblique Exercises	9940	Recommended
Health-03	Health	cardiac workout	HOW TO GET THE ULTIMATE PHYSIQUE (CARDIO WORKOUT) 2016   THENX	2,007	may be recommended
Health-04	Health	cardiac workout	Fat Burning Cardio Workout - 37 Minute Fitness Blender Cardio Workout at Home	23,521	Recommended
Health-05	Health	cardiac workout	Cardiac Rehab: Smart for Healing Hearts - Mayo Clinic	9	Insufficient data
Health-06	Health	cardiac workout	Simple & Easy Cardio Exercises to Lose Weight FAST	430	Recommended
Health-07	Health	cardiac workout	30 Min Fat Burning Cardio Workout - Bipasha Basu Unleash 'Full Routine' - Full Body Workout	8,378	Recommended
Health-tip-01	Health	Health tips in UK	My 5 Top Tips for a Healthy Lifestyle   UK Dietitian Nichola Whitehead	9	insufficient Data
Health-tip-	Health	Health tips in	12 Weight Loss Tips Approved By Doctors &	30	insufficient Data

02		UK	National Health Service UK		
Health-tip-03	Health	UK	MY HEALTHY MORNING ROUTINE + WORK OUT ROUTINE   Lydia Elise Millen   Ad	2,318	Recommended
Health-tip-04	Health	UK	Health tips in Claiming Benefits - My Tips   invisible i	101	Not Recommended
Health-tip-05	Health	UK	Health tips in Healthcare in The United Kingdom	1,500	Recommended

Here we have selected 5 videos of one category ranked by google and get the comments using Google API 's. We have a Minimum range of the comments are 9(Health-05, Not meet minimum comments criteria) and the maximum comments on the video is 23521(Health-04, Score Recommended). We notice that there must be one video meet the score of recommended video in the same keyword search category.

Our methodology does not depend upon the comments possess the video (DataScience-05) with comments 91 get the score of Highly Recommended and the Video (Health-04) with 23521 comments have achieve a score of *Recommended*. The healthCare-01 having comments 130 the score is *Recommended* and the HealthCare-02 having comments 1243 and score is *Recommended*. Some of the video (Health-fi-05) having more than 100 comments but still not meet the minimum criteria of 10 comments having minimum 4 replies number of views are 113337 means that the number of views is not the authenticity that the video content is highly qualitative.

Here we are processing all videos and get the score of all videos in the Table 2. The videos may have a same qualitative data and the score may be the same like in our experiments the Video HealthCare-02 and the HealthCare-03 having different comments frequency but the score is same "*May be Recommended*" these are in between range of 40% to 60% positive response against the major comments.

**Conclusion:** In this article we propose an approach to get the recommendation label of the YouTube video based on his textual comments and replies. We devise two approaches first by calculating percentage of positive replies against each comment and second by calculating average sentiment of replies against each comment. By combining both score using arithmetic mean the final score is calculated and further translate into recommendation label amongst Highly Recommended, Recommended, may be recommended and Not recommended as explained in the model fig. 2. As per human judgment this give significantly accurate results. This algorithm really helps to get the best video among so many videos belonging to some keyword and thus save precious time of the people.

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