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**Master Thesis**

# How users attend to online comments: an eye-tracking approach

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## Kurzfassung

Die moderne Welt wird höchst durch von Nutzern beigetragene Inhalte wie Nutzerkommentare beeinflusst, die eine der beliebtesten Kommunikationsformen in sozialen Medien sind. Sie tragen dazu bei, eine Verbindung zwischen Content-Erstellern und -konsumenten sowie zwischen den Nutzern einer sozialen Plattform herzustellen, was sie für die Interaktion in der Gemeinschaft äußerst relevant macht.

Die Strategien der Nutzer beim Lesen von Kommentaren wurden von den Forschern jedoch noch nicht besonders detailliert behandelt. Die vorhandenen Berichte beschränken sich auf einen expliziten Ansatz zum Lesen von Kommentaren, der nur in der Lage ist, eine aktive Interaktion zu verfolgen, z. B. die Aufmerksamkeit durch Zählen der Klicks zu analysieren. Diese Technik kann die erregte Aufmerksamkeit nicht vollständig abschätzen, da 73% der Menschen nicht aktiv mit Kommentaren interagieren.

Eye-Tracking spielt eine entscheidende Rolle bei der Lösung der Analyseaufgabe von der impliziten Aufmerksamkeit, da es ermöglicht, solche entscheidende Merkmale zu schätzen wie die Eigenschaften des Kommentars, die die meiste Aufmerksamkeit auf sich zogen, die Höhe der gezeigten Aufmerksamkeit oder die Reihenfolge, in der bestimmte Kommentare gesehen wurden. In der vorliegenden Arbeit wird die auf Eye-Tracking basierende Aufmerksamkeitsanalyse verwendet, um das Leseverhalten der Nutzer auf der echten YouTube-Oberfläche zu untersuchen.

Die vorliegende Masterarbeit konzentriert sich darauf, die Aufmerksamkeitsmechanismen und das Leseverhalten der Nutzer zu analysieren und eine Korrelation zwischen den Kommentarmerkmalen wie Länge, Sprache, Spärlichkeit, Kommentarposition, Anzahl der Likes, Vorhandensein von Antworten, Vorhandensein des Likes des Videoerstellers und der Kennzeichnung als autorisierter Nutzer zu finden, die sich aus rein textlicher Sicht nicht zeigen lassen.

Diese Arbeit stellt dar, dass die Anzahl der Likes und das Vorhandensein von Antworten am meisten zur Aufmerksamkeit beitragen, die Kommentare auf sich ziehen. Die Analyse hat gezeigt, dass die Kategorie eines Videos einen großen Einfluss auf die Emotion und die Länge der beliebten Kommentare hat: Wenn Menschen auf der Suche nach nützlichen Informationen sind, was auf Bildungsvideos zutrifft, neigen sie dazu, neutralen und langen Kommentaren Aufmerksamkeit zu schenken, während Menschen, die auf der Suche nach Unterhaltung sind, höchstwahrscheinlich kurze und positive Kommentare wahrnehmen. Die zwei wichtigen Ergebnisse der geschlechtsspezifischen Analyse sind, dass Frauen dazu neigen, längere Kommentare zu lesen, aber einen höheren Prozentsatz der Kommentare überspringen als Männer.

Es ist zu hoffen, dass diese Forschung zu einem tieferen Verständnis der Merkmale beiträgt, die die meiste Aufmerksamkeit auf sich ziehen, was bei Strategien zur Erstellung von Inhalten und der Entwicklung neuer Ranking-Algorithmen genutzt werden kann.

# Abstract

The modern world is highly influenced by user-contributed content such as user comments, which is one of the most popular forms of communication on social media. They help build a connection between content creators and content consumers, as well as a connection between users of a social platform, which makes them highly relevant for community interaction.

However, researchers have not treated users' comment reading strategies in much detail. The existing accounts are limited to address solely an explicit comment reading approach, which is only able to track an active interaction, e.g. analyze attention by counting a number of clicks. This technique can not fully estimate the drawn attention, as 73% of people do not actively interact with comments.

Eye-tracking plays a vital role in solving the task of analysing implicit attention, as it allows to estimate such crucial characteristics, as comment features, which drew the most attention, the amount of attention given or the order of seeing specific comments. The current research uses eye-tracking based attention analysis for investigating the phenomena of users' reading behaviour on the real YouTube interface.

The present master thesis concentrates on analysing users' attention mechanisms and reading behaviour and finding a correlation between the comment features such as length, language, sparseness, comment position, number of likes, presence of replies, presence of video creator's like and authorised user label, which cannot be exhibited from a pure textual point of view.

This work shows that number of likes and presence of answers contribute the most to the attention drawn by comments. The analysis revealed that the category of a video deeply influences the emotion and length of the popular comments: if people are looking for useful information, which applies to educational videos, they tend to pay attention to neutral and long comments, whereas while looking for entertainment, people most probably will notice short and positive comments. The two important findings from the gender analysis are that women tend to read longer comments, but skip a higher percentage of comments than men.

It is hoped that this research will contribute to a deeper understanding of the features that draw the most attention, which can be exploited in content generation strategies and developing new ranking algorithms.

# Contents

# 1 Introduction

Over the years, the popularity and amount of user-generated content have been increasing. People rely on Google reviews when choosing products and services, post their thoughts on Twitter, share their life on Instagram and scroll through the comments while watching YouTube videos.

The Web offers a plethora of platforms for social media interaction, including an opportunity to express an opinion with a comment and provide ratings of these comments by other users. These tools serve the purpose of filtering relevant opinions more efficiently and skipping offensive or inappropriate comments [SCNJ10].

With the increased number of user comments and online reviews, the problem of making a particular comment stand out has become extremely crucial. For that, one needs to investigate what exactly captures the eye of a random observer and which features are most likely to draw attention. To solve this issue, one needs the means to analyze implicit attention, as people tend to passively consume content instead of actively interacting with it by e.g. clicking or typing some text themselves. The tendency of passive consumption is confirmed by the questionnaire, conducted in the presented research, which showed that approximately 73% of the participants never or only rarely use the active form of interaction with comments.

The eye-tracking approach provides a perfect solution for capturing implicit attention, as with the help of fixations and saccades one can determine the precise features, which drew a user's attention, as well as a concrete order, in which a user inspected elements displayed on the screen. Fixations are built from gaze points, which are the instantaneous spatial locations of the visual axis landing on the stimulus, and durations corresponding to each gaze point. In other words, fixation is a sequence of gaze points, each having a spatial (x, y) location and start and end timestamps, and a time duration, which shows how long a person was looking at a specific screen location. Fixations have characteristics, which can be used to reveal useful information about comment attributes gaining the most attention. For example, an increase in the time taken to make the first fixation on a target suggests a decrease in the salience of that feature, whereas an increase in average fixation duration on an area could signal that what is looked at is more engaging. Saccades are the type of eye movement between two or more phases of fixation. Due to the fast movement during a saccade, the image on the retina is of poor quality and information intake thus happens mostly during the fixation period, where the eye is kept aligned with the target for a certain duration, allowing for the image details to be processed [HNN+18].

Although there was extensive eye-tracking research on how users attend to online reviews [LXTL21; LYZL16; MSPG17; MSVV20], previous studies have failed to elaborate on how users perceive comments, to which features they pay attention and which comment reading strategies they follow. It is critical to make a clear distinction between online product reviews and the comments' field, as they are different in two crucial aspects.

First, the visibility of the social information may differ: when deciding whether to buy a specific product, comments and reviews are directly exposed to a user, whereas when using YouTube, videos constitute the focal point of the online content [MSKP21], i.e. YouTube comments are not directly visible to users, as one typically needs to scroll down to be able to view them.

Second, product reviews and comments under online videos may differ in their relevance [MSKP21], as online product reviews are crucial to estimate the adequacy of investment [CT12] and consumers are motivated to seek out product reviews because they typically provide relevant information [GH06]. In contrast, the importance of YouTube video comments is much lower, as they may not refer to the video or may not constitute valid assessments. These reasons may limit social information's relevance and users' motivation to process social information [MSKP21].

For studying comment reading strategies, the social media platform YouTube was chosen, as it is one of the most famous video-sharing websites, containing billions of opinion-sharing comments. Created in February 2005, it has rapidly grown to be a cultural phenomenon for its mass user-base. According to [Ale21], it is the second most visited site after Google. More than 800 million people use YouTube every month and watch more than three billion hours of video material [SDL13]. Furthermore, ([CDL07], [GALM07]) showed that traffic connected to this social platform accounts for over 20% of the web total and 10% of the whole internet, and comprises 60% of the videos watched online [SCNJ10].

YouTube provides several social tools for community interaction, including the possibility to share thoughts and ideas by commenting on published videos and, in addition, to provide ratings about these comments [SCNJ10] by using thumbs-up and thumbs-down buttons. According to YouTube, more than 100 million people interact every week by rating, sharing and commenting on videos [SDL13]. These meta ratings serve the purpose of helping the community to filter relevant opinions more efficiently. Therefore, the analysis of comments and associated ratings constitutes a potentially riveting data source for obtaining implicit knowledge about users, videos, categories and community interests [SCNJ10].

YouTube is also attractive as a site primarily driven by freely-contributed content, with uploaders being motivated and rewarded by viewers' attention rather than money ([TSV12], [HRW08]). YouTube content is diverse and global, offering the opportunity to broadcast videos to a vast audience. The site thus serves as an attractive platform for both amateur content creators and media companies alike ([Kha17], [XPKP16]). YouTube is one of the largest platforms for user-generated content on the internet, as the platform makes it easy for people with a video recording device and an internet connection to publish their personal videos. [SDL13] provided evidence to support this fact: popular videos accumulate more than 500 comments each day and obtain 100.000 ratings during their lifetime on YouTube. The commenting phenomenon has given social media users a greater degree of control in creating and manipulating content besides creating a sense of community [Kha17]. In addition, user-generated content (UGC) in the form of comments may further encourage user interaction and discussion [KR11]).

The goal of the master thesis is to perform an analysis by obtaining implicit knowledge of attention-drawing features using the gaze data collected from real-world users. In contrast to merely logging the number of clicks, using gaze data can help register a larger quantity of comment attributes, as users do not tend to click on each profile picture, like button or replies that they see. Furthermore, eye movements are considered a reliable indicator of attention ([GLCR06], [PB05]), and previous

studies conclude attention on the basis of users' eye movements. Moreover, the results of the conducted questionnaire showed that most YouTube users like comments only rarely or even never (see section 4.9).

The primary focus of this research is to explore how people read the YouTube comments, in particular, which specific features play a role on drawing the users' attention. There are two categories, which can be investigated in such kind of analysis: video category, as each topic has its individual features, and interest of a specific reader. Before performing an eye-tracking analysis, it is important to determine the features, which could stimulate the attention of a reader, e.g. comment length, sentiment, smileys, user name, profile picture, timestamp, number of likes, number of replies, etc.

This work investigates the following research questions:

1. What strategy (sequential, random or heuristic) do users follow when browsing through comments?

2. What comment attributes (linguistic and metadata) affect the comment reading behaviour?

3. Does comment rating (number of (dis)likes) influence the reading behaviour?

Based on the research questions, the study sets out the following hypotheses:

1. People do not follow a sequential reading order while scrolling through comments.

2. The reading behaviour correlates with linguistic features, e.g. length, language, sparseness, presence of smileys.

3. The reading behaviour correlates with non-linguistic features (metadata), e.g. profile picture, number of (dis)likes, comment position, presence of a video author's answer.

4. The comment reading behaviour correlates with the global property of the video/post like the category of the video/post, e.g., people read short comments on entertainment videos, but spend more time reading long comments on educational/review videos.

5. The comment reading behaviour correlates with personal user characteristics, e.g., age, gender, etc.

6. The popularity of a comment, i.e. number of likes, correlates with the attention drawn by the comment.

The research was conducted as follows. First, the data collection framework was developed by injecting custom code into the real YouTube frontend, which fully preserved the natural conditions in which users typically watch YouTube videos but gave all the needed control to manipulate and save the data. Second, the gaze data from 62 participants and four videos were collected in ten days to increase environmental similarity (see section 3.2). Third, the comment analysis using hierarchical clustering, sentiment models and simple statistical measures was conducted. This master thesis investigated the order in which the participants read comments, the most and least popular comments for each video and the correlation of the comments' popularity with linguistic (length, language, sparseness and presence of smiley) and non-linguistic features (profile picture, number of (dis)likes, comment position, presence of a video author's answer), as well as the correlation of the reading behaviour with video category and participants' gender. The presented research also includes the additional analysis regarding the average percentage of skipped comments and the average amount

of time the participants spent reading comments for each video. Finally, the results of the conducted questionnaire are present, including statistics on participants' YouTube usage and their amount of comment interaction.

The rest of the master thesis is organised in the following way. The following section examines the related work, which consists of attention analysis, computational analysis and general YouTube comment analysis. Section 3 gives more details on the data collection phase, including the YouTube interface, data collection challenges, data collection framework and conduction of the user study. Section 4 describes the first part of the conducted analysis, which is comment reading strategies analysis. It incorporates information on the comment reading order, mode comments, used clustering approaches, the correlation between video category, non-linguistic comment features and comments' popularity, comment reading durability analysis and questionnaire findings. The second part of the conducted research is presented in section 5, which includes an investigation of the specific comments popularity and describes the correlation between popularity and comment features (linguistic and non-linguistic) for the individual comments. Finally, the last section concludes the paper by describing the conclusions made.

# 2 Related work

Eye-tracking is a heavily used technique in marketing, tourism, medicine, teaching and numerous other fields. Online reviews are the most similar domain to the users' comments, which are investigated in the current master thesis. There is a plethora of work on exploiting gaze data in the online reviews field, e.g. [LXTL21; LYZL16; MSPG17; MSVV20].

The approach of [MSVV20] is similar to the one used in this work, however, it focuses on the online reviews field instead of investigating YouTube comments. Maslowka [MSVV20] conducted research on how consumers attend to product pages, namely, she examined which elements of product pages consumers pay attention to, as well as the relative importance of the different product page elements and the difference in attention division between search versus experience products.

No study to the author's knowledge has used an eye-tracking approach for conducting YouTube comments' analysis. Below, a few spheres of related work are described, but no mentioned study encompasses all the directions of research, which is done in the current study. Therefore, the present master thesis fills this knowledge gap by simultaneously applying several methods introduced next to the newly collected dataset.

## 2.1 Attention analysis

The first section of the related work concentrates on describing the attention analysis using gaze data in both web pages and YouTube domains.

### 2.1.1 Web pages and news articles domain

A number of works have been leveraging gaze data in a wide range of different problem settings. One relevant application of eye-tracking is predicting salient regions of web pages done by Buscher et al. [BCM09]. The researchers described general location-based characteristics of visual attention for Web pages dependent on different tasks and demographics, generated a model for predicting the visual attention that individual page elements may receive and introduced a new method for mapping gaze data to visual scenes motivated by findings in vision research. While using gaze data for predicting most salient features (regions), the previously mentioned work concentrates on the web pages domain, whereas the presented paper undertakes an analysis of the most salient YouTube comment features.

Steinfeld et al. [SSL16] studied the popularity of user comments and the effects of pre-existing opinions, readership patterns and the tone of user comments on the evaluation of news articles by testing for a correlation between reading user comments and evaluating a news story article. Although the current study shares some similarities with the paper of Steinfeld et al. in the

investigation of comments' popularity and reading behaviour using eye-tracking, in contrast to the previously mentioned research, this master thesis focuses on the YouTube comments' field, which is different to the one of news articles or product reviews in two crucial aspects.

Another work that performed an eye-tracking analysis in information behaviour is the paper by Helena Lee and Natalie Pang [LP17], which examined how the perception of information scent influences the assessment of information credibility and validated the eye-tracking data and qualitative content analysis to understand users' attentional focus on information patches of varied genre. The researchers used an eye-tracking tool to collect users' eye movements to analyse their fixations and mouse clicks and applied both quantitative and qualitative analysis. The quantitative evaluation examined users' fixations, scan path (gaze interactions) and link clicks (information scent) behaviour on the selected area of interest, while the qualitative method was based on the post-experiment interviews and interpreted through thematic coding.

Although the quantitative evaluation part is partly similar to the one conducted in the presented paper, the work of Lee and Pang concentrated on analysing gaze data of participants looking through web pages containing various kinds of articles. In contrast, the presented paper investigates a far more dynamic domain of YouTube comments.

### 2.1.2 YouTube domain

There are studies which investigated either attention on YouTube videos or attention on YouTube comments. An example from the first category is the work [Tan16], which concentrated on the advertisement banners topic. Tangmanee investigated YouTube visitors fixations on advertisement banners, the correlations between fixation duration on banners and overall fixation counts and the extent to which site visitors are able to recall details of ad banners and of the clip viewed. The mentioned research intersects with the current master thesis solely on the choice of the social media platform, as the latter investigates the correlations between users' attention and comment features and does not conduct any eye-tracking analysis on YouTube videos.

An example from the second category is the work of Möller et al. [MSKP21], which investigated how the valence of social information affects viewers' enjoyment when they are free to determine whether and how much attention they pay to social information (comments and (dis)likes). As forced exposure to information may alter individuals' processing of that information [CLT01; MM03], giving the participants the freedom of choosing the amount of time and social information to which they wanted to give attention, allowed to investigate the attention paid to social information and its effects on users in a naturalistic setting. However, Möller et al. [MSKP21] primarily focused on investigating whether video viewers exposed to solely positive social information enjoy the video more than viewers exposed to solely negative social information. The researchers do not take into account the linguistic comment features, such as comment length, comment sparseness, presence of smileys and non-linguistic features as profile picture, number of (dis)likes, comment position, presence of a video author's answer.

Moreover, Möller et al. [MSKP21] collected gaze data by building a webpage that mimics the online video platform YouTube to control which comments and (dis)likes were presented and to create a stable stimulus. In that approach, some participants were exposed to only positive comments, while the others saw only negative comments, which does not fully correspond to the real-life conditions,

as generally, social media information seldom contains exclusively negative or positive comments. Instead, the social information is often mixed, i.e., it usually consists of both positive and negative comments [MSKP21].

The present research overcomes the limitations mentioned above and explores, for the first time, how users attend to YouTube comments in a dynamic environment. The dynamics are achieved by using the actual YouTube interface, embedded with code for gaze data collection (see section 3.3), which provides a more natural environment both visually and from the content point of view.

## 2.2 Computational analysis

This section encompasses YouTube comment analysis using machine learning techniques.

Siersdorfer et al. [SCNJ10] analysed dependencies between comments, views, comment ratings and topic categories, studied the influence of sentiment expressed in comments on the ratings for these comments using the SentiWordNet thesaurus, a lexical WordNet-based resource containing sentiment annotations, and predicted community acceptance for not yet rated comments. In addition, the research investigated the viability of using comments and community feedback to train classification models for deciding on the likely community acceptance of new comments. The most critical investigated questions are whether one can predict community feedback for comments, whether there is a connection between sentiment and comment ratings, whether comment ratings can be an indicator for polarising content and whether comment ratings and sentiment depend on the topic of discussed content.

In the subsequent paper, which extends the previous study, Siersdorfer et al. [SCP+14] analysed dependencies of comment ratings with textual content, thread structure of comments and associated content. Furthermore, they explored the applicability of machine learning and data mining to detect acceptance of comments by the community. In expands the previous work by considering an additional comment corpus collected from the Yahoo! News website, building a machine learning model to predict comments that will attract replies, comparing language and ratings for troll and non-troll users, and leveraging the textual content of user comments for troll detection.

However, the problem setting in these papers differs from the presented one, as this research provides new insights for the question on which linguistic and non-linguistic comment features people pay the most attention by heavily exploiting eye-tracking data rather than developing a machine learning model for predicting which comments will be accepted by the community and will attract replies.

Further works on YouTube comments in the machine learning sphere related to the current research include performing emotion classification on YouTube comments using word embedding [SP17] and conducting naive multi-label classification of YouTube comments using comparative opinion mining [KKK16]. The only similarity with the presented paper lies in exploiting sentiment analysis, but the goals differ significantly.

Savigny et al. [SP17] compared methods for using word embedding in a classification task, namely average word vector, average word vector with TF-IDF, paragraph vector, and by using Convolutional Neural Network (CNN) algorithm, studied the effect of the parameters used to train the word embedding and compared the performance of the classification with a baseline.

Khan et al. [KKK16], in their turn, used Naïve Bayes machine learning algorithm to perform multi-label classification to find out the sentiments of the commenters for different options. However, in none of these works, neither comment popularity is analysed or taken into account, nor is gaze data used in the first place.

## 2.3 General YouTube comment analysis

The last category of related work performs general YouTube comment analysis and presents some essential benchmarks that can be compared with the current study results.

One example is [TSV12], which identified patterns and provided several criteria, such as typical YouTube comment characteristics, topics with least and most discussions, age, gender and location of the commenters, the average length and sentiment of comments, categories of the videos with the highest/lowest reply densities.

Other examples for YouTube analysis papers are [EVD+13; MRM13; res10; SDL13]. Shultes et al. [SDL13] presented a comment classification approach, which captures salient aspects of YouTube comments and provided YouTube user interaction statistics such as percentage of users that regularly post comments and read comments, defined comment classes and analysed the distribution of the comment classes among video categories.

[res10] presented statistics on how many percentage of active Internet users aged 16-55 years visited YouTube and Facebook in the UK, France and Germany, duration of the typical YouTube/Facebook visit, kinds of activities on YouTube, reasons for using YouTube, users impressions about using both sites, as well as some statistics on brand advertisements.

Edgerly et al. [EVD+13] examined how a video's tone, topic and focus are related to comment features and Madden et al. [MRM13] examined and categorised the types of comments created by YouTube users according to the purpose of leaving a comment.

The results of the papers mentioned above can be compared with the analysis conducted in the current work, such as average length and comment sentiment, percentage of users that regularly read and post comments, relation of topic and comment features and frequency of YouTube usage.

[ASK18; Kha17] gave a thought-provoking background on the ways and reasons that motivate consumers to use and interact with videos on YouTube. Antoniadis et al. [ASK18] identified the following factors of YouTube usage: entertainment seeking, security considerations, information seeking, thrill seeking and social interaction and additionally provided statistics on how often users comment on videos and like/dislike videos. Khan [Kha17] identified similar YouTube consumption motives: seeking information, giving information, self-status seeking, social interaction and relaxing entertainment and did some extra analysis on the correlation between gender and liking/disliking and commenting videos. The results of these works can be incorporated into the presented paper.

While some papers accomplish to classify YouTube comments, explore readership patterns, investigate user comments' popularity, perform sentiment analysis and exploit gaze data when identifying users' attentional focus on information patches, neither achieves to elaborate on what comment features catch the most attention of users.

For the first time, the present research explores the influence of both comments' linguistic and non-linguistic attributes, such as sentiment, length, smileys' presence, video author's comment, answers, comment position, and number of likes on the comments' popularity. Moreover, it creates a rank of popular comments by view count, i.e. number of timestamps on each comment, and percentage of users that saw a particular comment, and simultaneously analyses the comment reading behaviour, differentiating between female and male participants.

# 3 Data collection

This section describes the setup, in which the data collection was carried out, as well as faced challenges, developed data collection framework and the details of the conducted user study.

## 3.1 YouTube interface

YouTube provides the option to set up a user comments section underneath each video, which resembles a message board and allows registered users to post comments. The comments facility was intended to be ä section of text for users to provide information related to a video"[MRM13] and where users could express their opinion on the video. However, this is not always what happens in practice, as comments may contain spam or be utterly irrelevant to the video.

Since YouTube is constantly evolving and attracting a larger and larger audience, its features and interface are a subject of change. For example, [SDL13] published in 2013 reported the following features of the YouTube interface: "YouTube has implemented a sequential comment list sorted by creation date in descending order. Usually, eight to ten posts are displayed per page, and the remaining comments can be viewed via paging. Unfortunately, only the first two or three comments fit in the originally visible space of the video page. The remaining posts disappear in the scroll area (at a typical vertical display resolution of 1080 pixels)."

Another study [MRM13] of the same year documented the following interface features and comment restrictions: "Comments are displayed in reverse chronological order, and if there are large numbers of comments they break over multiple pages. There are certain restrictions placed on the commenting facility: there is a 500-character limit, and as an anti-spam measure, it is forbidden to insert URLs or HTML tags."

The information mentioned above is, however, not valid anymore. In eight years YouTube interface of the comment section has changed drastically, moving from pages of comments to one page, on which further comments are dynamically loaded when users scroll down. In addition, a much looser restriction of comment length was set, going from 500 characters to 10,000 [Mol21] and allowing to post both links and hashtags. There is no confirmed or published YouTube comment order algorithm, which makes it harder for users to write a comment that will be seen by a large number of people, as comments do not seem to be sorted by date, number of likes, number of replies or by prioritising comments by authorised users. Nevertheless, some internal characteristics may exist, such as sorting by the ratio of likes and the amount of time they were given, using the number of subscribers as an internal counter, or adding a certain amount of randomicity in the comments' order.

There are, however, clearly defined guidelines and policies [You21a]. Users are not allowed to share misinformation, hate speeches, any forms of harassment or cyberbullying, post spam comments or comments containing sexual or self-harm content and use vulgar language. In practice, spam,

vulgar language, and misinformation rules are often violated. YouTube tried to encourage following its guidelines and support content creators by launching a feature "that will push commenters to reconsider their hateful and offensive remarks before posting", which would supposedly address longstanding issues with the quality of comments on YouTube's platform [Per20].

Additionally, YouTube implemented a special filter for video creators for blocking comments containing predefined words. It helps avoid useless, unrelated or offensive comments, allowing video uploaders to see the more meaningful audience feedback.

## 3.2 Data collection challenges

Despite being the most popular video platform, YouTube does not provide enough support for developers, limiting ways to integrate its features into other projects. The most used way of interaction with YouTube is YouTube API [You21b], which provides handy features such as adding YouTube functionality to a custom website or searching for content matching specific search terms, topics, locations and publication dates.

However, for the particular use case presented in the current master thesis, the usage of YouTube API was not applicable, since for collecting gaze data, one has to obtain information from the front end part of the website, which is structured in an unclear way, limiting certain possibilities of work. The discovered issues include, for example, the indistinguishability of 'dummy' profile pictures and profile pictures actually containing an image chosen by a user. In both cases, an image is just a link to https://yt3.ggpht.com/ without an image extension in the end, which makes analysing images impossible, as there is no automatic way to save them for future analysis.

Moreover, the YouTube interface contains unexpected and unlogical differences between different languages, e.g. the number of likes in German is depicted precisely, while in English only the number of thousands or millions is shown, such as '3.4K' or '1.5M'. This strange implementation is the reason why the high number of likes is rounded in the section 5 of this master thesis. Another poor architectural decision is that YouTube makes no differentiation between the comments of the video's author and the comments of the authorised users, so it was impossible to differentiate those in the analysis as well.

Since this master thesis investigates a use case of tracking users' attention when reading YouTube comments, a custom data collection framework was developed. The main challenge of data collection was working in the highly dynamic environment, where the comments are constantly added and deleted and even comment order changes a lot from day to day for the popular videos, that is why the comments shown slightly differed for every participant, dependent on the day of participation in the user study. Therefore, a standard approach with taking screenshots and corresponding gaze coordinates with them manually would be infeasible in this case.

Mimicking the YouTube interface to have complete control over the webpage elements was also not an option since it would have affected the proximity to the natural environment in which participants typically use YouTube. Moreover, it would decrease the scientific value and objectivity of the experiment because it would break the dynamicity of the YouTube interface, which is an essential component of social networks.

## 3.3 Data collection framework

Considering the challenges mentioned above, it was necessary to apply an innovative approach, which consisted of altering the actual YouTube frontend.
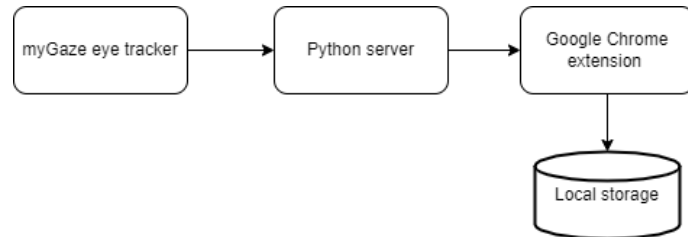


**Figure 3.1:** Data collection framework architecture

The figure 3.1 shows the data collection framework architecture, which includes two programmed components - the simple Python server and the JavaScript client, represented as the Google Chrome extension. The single purpose of the Python server is to receive gaze coordinates from the eye tracker and send them to the JavaScript client, implemented as a browser extension script. Initially, the extension 'Custom JavaScript for Websites 2' [1] was used for this purpose, but it utilises chrome.storage.sync, which has a 100KB script size limit per user [2]. This critical issue forced to change to 'Page Manipulator' [3], which allows altering any web page by injecting custom HTML, CSS or JavaScript code.

| comment_id | author_name | comment_date | comment_text | num_of_likes | num_of_answers | parent_ID | author_comment | author_liked |
|---|---|---|---|---|---|---|---|---|
| 0 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | | TRUE | FALSE |
| 1 | ANGEL LEABRES | 4 months ago | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* I... | 1.3K | View | | FALSE | FALSE |
| 2 | LilEdits | 8 months ago | "Don't think" ~Closes my eyes~ Thinks about how black... | 2.2K | View | | FALSE | FALSE |
| 3 | TheGogeta222 | 7 months ago | How I learned to fall asleep in seconds: Step 1: working... | 1K | View | | FALSE | FALSE |
| 4 | Cate | 9 months ago | I clicked on this video because I have trouble falling asl... | 551 | View | | FALSE | FALSE |
| 5 | Roland B. | 7 months ago | step one: avoid electronics at night mission failed | 271 | 0 | | FALSE | FALSE |

**Figure 3.2:** Example of saved file with all comments for the video ED2

| scroll_time | author_name | comment_date | comment_text | num_of_likes | num_of_answers | author_comment | author_liked |
|---|---|---|---|---|---|---|---|
| 2021-11-7_17:36:38 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2021-11-7_17:36:38 | ANGEL LEABRES | 4 months ago | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* I... | 1.3K | View | FALSE | FALSE |
| 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2021-11-7_17:36:39 | ANGEL LEABRES | 4 months ago | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* I... | 1.3K | View | FALSE | FALSE |
| 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2021-11-7_17:36:40 | ANGEL LEABRES | 4 months ago | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* I... | 1.3K | View | FALSE | FALSE |

**Figure 3.3:** Example of saved file with all visible comments for the video ED2

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[1] https://chrome.google.com/webstore/detail/custom-javascript-for-web/ddbjnfjiigjmcpcpkmhogomapikjbjdk

[2] https://github.com/xcv58/Custom-JavaScript-for-Websites-2/issues/32

[3] https://chrome.google.com/webstore/detail/page-manipulator/mdhellggnoabbnnchkeniomkpghbekko

| coord_x | coord_y | element | time | author_name | comment_date | comment_text | num_of_likes | num_of_answers | author_comment | author_liked |
|---|---|---|---|---|---|---|---|---|---|---|
| 3,23962E+16 | 5,40715E+15 | comment date | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,14091E+16 | 5,89269E+15 | num of answers | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,78662E+16 | 5,52958E+14 | comment date | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,78662E+16 | 5,52958E+14 | num of likes | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,78662E+16 | 5,52958E+14 | creator like | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,78662E+16 | 5,52958E+14 | num of answers | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,21293E+15 | 5,94984E+15 | num of answers | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,79279E+15 | 5,45444E+15 | comment date | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,79279E+15 | 5,45444E+15 | num of likes | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,79279E+15 | 5,45444E+15 | creator like | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,79279E+15 | 5,45444E+15 | num of answers | 2021-11-7_17:36:39 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,2266E+16 | 5,91114E+14 | num of answers | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,29401E+16 | 5,66215E+14 | num of answers | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,30567E+15 | 5,6147E+15 | num of answers | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,85019E+16 | 5,13652E+15 | comment date | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,85019E+16 | 5,13652E+15 | num of likes | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,85019E+16 | 5,13652E+15 | creator like | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |
| 2,85019E+16 | 5,13652E+15 | num of answers | 2021-11-7_17:36:40 | Mike Shake | 10 months ago | Subscribe for new skills every week! Check out more ski... | 1.1K | View | TRUE | FALSE |

**Figure 3.4:** Example of saved file with gaze data for the video ED2

The JavaScript script workflow looks as follows:

1. Since YouTube comments are not loaded automatically after the webpage is loaded, an on-scroll event takes care of comments' preprocessing, which consists of wrapping every word into a span tag and storing the original text to a separate span to be able to access it later for saving into a .csv file. Surrounding each word with a span tag is necessary to register words on which users fixated their eyes for some time, i.e., words that drew more attention than the others.

2. On each scroll event, all the comments visible on the screen at that moment are stored with a timestamp. Saving visible comments was initially thought to track the comments' positions but was eventually redundant. The following information is stored: scroll time, name of the comment's author, comment date, comment text, number of likes, number of answers, presence of authorised comment label and presence of author like. The figure 3.3 shows an example of the stored file with all visible comments.

3. Each time when gaze coordinates are received from the Python server, the JavaScript client determines at which specific element the user looked. The element search is done by comparing the gaze data with the coordinates of each DOM element using the element.getBoundingClientRect() function and afterwards comparing the element tag name, id and belonging to specific CSS classes.

4. For each user's fixation on a comment element, the following element information is stored: timestamp of event, gaze x coordinate, gaze y coordinate, name of element or the actual value of a word if fixation was made on a word, name of the comment's author, comment date, comment text, number of likes, number of answers, presence of authorised comment label and presence of author like. The first fixation on the video was recorded, after which the gaze collecting process was paused until the first fixation on the comment section. The figure 3.4 shows an example of the stored file with gaze data.

5. After a participant finished watching one video, the facilitator presses the 'S' key, which saves three .csv files to the local storage: all comments, all visible comments and gaze data information. The all comments table contains the following information for the comments that were loaded for a specific participant: comment id, name of the comment's author, comment date, comment text, number of likes, number of answers, presence of authorised comment label, presence of author like and the id of the parent comment to preserve the

relations between the comments. The figure 3.2 shows an example of the stored file with all visible comments. The all visible comments and gaze data tables contained the information described in points two and four correspondingly.

The repetition of the stored information was caused by the attempt to minimise risks of possible data correspondence and lack of data issues. Despite that, due to the technical problems, namely, the differences in the YouTube interface in different languages, the number of answers was not recorded. Instead, it was only possible to identify the presence of the answers, which was used later in the analysis.

## 3.4 User study

### 3.4.1 Video choice

Within the user study, the participants watched four videos: "Justin Bieber - Baby (Official Music Video) ft. Ludacris"[4] (further referenced as ENT1), "Ricky Gervais Breaks Down Why He Hates Social Media | Stand Up | Netflix"[5] (further referenced as ENT2), "iPhone 13 Pro Is PERFECT."[6] (further referenced as ED1) and "How I learned to Fall Asleep In 2 Minutes"[7] (further referenced as ED2). The videos were chosen from the most-watched YouTube categories, which according to ([Suk21], [Bro18], [Goo16]) include product reviews, how-to (tutorials), comedy and music videos, while the most commented category of videos is music [Raz22]. The Justin Bieber's song 'Baby' and the stand-up of Ricky Gervais are representatives from the category 'entertainment', as the first one is a music video and the second one is a comedy stand-up. The iPhone review and the sleep tutorial represent the category 'education', as the first video is a product review, and the second is a short how-to video.

There is another subtle and somewhat subjective categorisation of these videos by diving them into 'controversial' - 'non-controversial'. For example, the Justin Bieber's video was chosen for two reasons. First, music videos are the most commented on and one of the most popular video categories ([Suk21], [Goo16], [Raz22]). Second, according to the YouTube top 500 most commented music videos ranking [8] and [tul18], this specific video is one of the most commented ones in the history of YouTube. Third, until 2018 it was the most disliked video on YouTube [Bah18], so there are many people that detest Justin Bieber, but logically there are also some that like his creative work.

Another video in the 'controversial' category is the iPhone review since it does not contain any iPhone critics and generally depicts iPhone in a very positive way. Although this phone has a decent number of fans, many people still use other smartphone models. Another two videos were relatively neutral, but they still can invoke negative feelings in some people who may not like these video genres or these particular content creators.

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[4]https://www.youtube.com/watch?v=kffacxfA7G4ab_channel=JustinBieberVEVO

[5]https://www.youtube.com/watch?v=YulXp2Vy7lMab_channel=StillWatchingNetflix

[6]https://www.youtube.com/watch?v=5sYjibvSORIab_channel=iupdate

[7]https://www.youtube.com/watch?v=7OisipgpQi8ab_channel=MikeShake

[8]https://www.popsonner.com/p/youtube-top-500-most-commented-music.html

### 3.4.2 Participants

The data collection phase involving 62 participants was conducted from the 4th to the 12th of November 2021. The participants were primarily students of the University of Stuttgart aged between 18 and 36 years old, as students are most avid users of social media and therefore constitute a group most relevant to this study. At the end of the experiment, the participants were compensated with a 10 euro honorarium.

Not all participants were interested in reading comments. Out of 62 participants, 58 people read comments for the video ENT1 and ED2, 60 people read comments for the video ENT2 and all participants read comments for the video ED1.

### 3.4.3 Apparatus

In the 3.5, the study setup is depicted. The experiment was conducted in the laboratory of the University of Stuttgart using three Lenovo laptops and three identical myGaze eye trackers. The usage of multiple devices allowed to significantly accelerate the data collection phase while maintaining consistency during the gaze information gathering process. All three laptops had an identical screen resolution of 1920 x 1080 pixels, which permitted to avoid additional data postprocessing to make data comparable. LAN cables instead of WiFi was used to ensure a stable internet connection during the experiment. In addition, the participants utilised headphones to minimise distractions and ensure their comfort and similarity to how they usually use YouTube.



**Figure 3.5:** Study setup

The gaze data was collected using the myGaze eye trackers, non-invasive portable devices placed underneath the screen and therefore required no installation on the participant's body, enabling a more natural experimental environment. The most relevant technical specifications of the myGaze eye tracker include the sampling rate of 30Hz, the gaze position accuracy of 0.4°, the spatial resolution of 0.05°, the operating distance of 40 to 100 cm, the tracking range of 50cmx30cm at 65cm distance and the system end to end latency less than 40ms [Gmb15], which is sufficient for the purpose of the current study. Moreover, the myGaze eye-tracker has good eyewear compatibility, including most glasses and lenses, which allowed to extend the number of potential participants.

### 3.4.4 Procedure

The experiment started with eye tracker calibration using the myGaze application utilising five calibration points - one in each screen corner and one in the middle of the screen. Each participant was seated approximately 60 cm away from the screen. The calibration quality was estimated visually by comparing the points of the registered eye fixations with the reference calibration points. If the quality was unsatisfactory, the calibration process was repeated.

To ensure the optimal conditions for all the participants, the videos in English were selected, whose durability did not exceed eight minutes. The initial aim was to choose videos from the last month whose duration would not exceed 4 minutes to keep the experiment short and provide recent videos that participants had not yet seen. However, that significantly limited the video choice and would make the analysis less objective and complete since such videos typically do not contain many comments and are of poor quality. Furthermore, according to [Dea17], the average length of a first page YouTube video is 14 minutes, 50 seconds. So instead, the videos were chosen from the ones published not earlier than a year ago, except for the Justin Bieber's video, since choosing this video followed other criteria described before.

The overall duration of watching videos did not exceed twenty five minutes. The participants were free to interact with the videos naturally, i.e. scroll through comments while/after watching the videos, read comment replies, pause the videos, or even omit some parts of the videos if they were not interested in the topic, since the detailed familiarity with the video content was not required. For the experiment, however, it was important that participants were roughly familiar with the topic of the video since it could affect the comment reading's behaviour. In other words, the participants watched the YouTube videos in a way that resembles how they would watch online videos in their daily life. In the process, the timestamps of each eye fixation on the comments, as well as eye coordinates and comment information (comment's author name, comment's date, presence of comment replies, number of likes, presence of video author's like and presence of authorised user symbol) were recorded.

After watching all the videos, the participants filled out a questionnaire, in which some demographic questions and questions about their general experience with YouTube were asked. The participants were explicitly made clear that all information collected in the session belongs to the University of Stuttgart and would be used for research purposes only with the complete guarantee of identity confidentiality. No photographs or video recordings were made, and the participants were free to stop participation in the study at any time or ask for their data to be removed. The overall experiment durability did not exceed 45 minutes.

# 4 Comment reading strategies analysis

This section investigates comment reading strategies in general, without analysing any specific comments. It describes if people tend to follow the sequential comment reading order, to which comments they pay attention first, as well as if comment reading behaviour can be dissected using hierarchical clustering and sequential clustering approaches. The findings of the correlation between video category and comments characteristics and between comment popularity and attention comments received are also included. Additionally, the section gives details about non-linguistic comment features, comment reading durability analysis and the results of the conducted questionnaire.

## 4.1 Preliminary analysis

The H2 assumes that the reading behaviour correlates with linguistic features such as length, sentiment, sparseness and presence of smileys. To test this statement, the N most popular comments for each video need to be determined, and afterwards, the linguistic analysis has to be conducted on them. There are two crucial questions to be answered before starting the analysis. First, how many comments should one investigate? Second, how to determine the popularity of the comments, i.e. which metrics to use?

The answer to the first question can be found by calculating the mean and median of the number of comments read by participants. The median is computed additionally since the mean is sensitive to outliers.

The table 4.1 demonstrates the mean and median values calculated for each video.

| Video code | Mean | Median |
|:---:|:---:|:---:|
| ED1 | 17.629 | 16 |
| ED2 | 16.226 | 11 |
| ENT1 | 20.258 | 18 |
| ENT2 | 21.081 | 15.5 |

**Table 4.1:** Mean and median number of comments read by participants for all videos

Based on the calculated mean and median, the N was initially chosen as 20, but after applying it in practice, it turned out that popular and unpopular comments overlap. The reason for this is the highly dynamic environment and a rather low number of comments shown to each participant, as can be seen in the table 4.2. Therefore, the N was decreased to 15.

| Video code | Median |
|:----------:|:------:|
| ED1 | 25 |
| ED2 | 7 |
| ENT1 | 8 |
| ENT2 | 20 |

**Table 4.2:** Median number of comments shown to participants for all videos

The second question regarding measuring the comments popularity is not so trivial to answer, that is why two approaches were applied. At first, the comments were sorted by the amount of attention they got, i.e. the number of fixations on all the features of a particular comment. However, this strategy is prone to outliers, therefore, the analysis results may be distorted if one person stared at the comment for a long period of time. This outliers sensibility is the reason for applying the second approach, where the comment popularity is calculated based on the percentage of people who paid attention to a specific comment. As the experiment was conducted in a dynamic environment, not all comments were shown to all people, hence the percentage was calculated as a number of comments that people saw divided by the number shown to them. Moreover, only the comments shown to at least ten participants were taken into account to increase robustness.

As each video has a different popularity level, the number of comments and the amount of users' interaction differ significantly from one video to another. Number of likes plays a crucial role in the comments' analysis, so it is necessary to determine what is 'high number of likes' and which threshold to use for this metric. For this, the user interaction was analysed manually and the threshold for a high number of likes was determined heuristically for each video separately. For the video ED1, it equals 50, for the video ED2 - 200 and for both videos of the entertainment category it is specified as 500. These numbers can be interpreted as follows: if a comment has more likes than this threshold, it is considered to be a comment with a high number of likes.

## 4.2  Comment reading order

The H1 supposes that people do not follow a sequential reading order while scrolling through comments. In order to reject or approve this statement, a comment order for each participant should be compared with the initial comment order. To achieve this, the comments loaded for each participant were assembled in one separate .csv file, sorted alphabetically and given a unique id for later reference and differentiation. This step was necessary since number, order and comments differed for each participant depending on the amount of time he or she spent scrolling through the comments section and on the day of the participation in the experiment. Then, using the gaze data information, each participant's comment sequences were created using the ids drawn from the .csv file with all the comments assembled previously. Afterwards, an actual comment sequence was created similarly for every participant. Finally, each participant's comment sequence was compared with the real comment sequence, and for every participant, either 'true' or 'false' value for the flag 'order_preserved' was assigned. Only the first fixation on the comment was taken into account, so it did not influence the order preservation flag if a participant returned to a previous comment.

The figure 4.1 represents an example of created comment sequences and 'order_preserved' flags for the video ENT2.

| participant_id | comment_sequence | real_order | order_preserved |
|---|---|---|---|
| 22 | [95, 84, 249, 84, 249, 23, 249, 23, 249, 23, 115, 129, 115, 129, 96, 119, 96, 119, 96, 88, 119, 88, 96, 119, 88, 2, 88, 2, 88, 2, 228, 2, 228, 2, 84, 95, 84, 95, 249, 115, 129, 96, 88, 119, 88, 119, 88, 119, 88, 119, 2, 228, 2, 228, 2, 119, 88, 228, 307, 228, 307, 228, 307, 228, 307, 228, 307, 302, 29, 302, 307, 302, 29, 302, 29, 302, 29, 302, 29, 302, 29, 302, 29, 190] | [95, 84, 249, 23, 115, 129, 96, 119, 88, 2, 228, 307, 302, 29, 190, 104, 192, 32, 98, 235] | True |
| 23 | [95, 84, 23, 249, 84, 249, 84, 249, 84, 249, 84, 249, 84, 249, 84, 249, 84, 249, 23, 249, 95, 23, 249, 23, 115, 23, 115, 23, 115, 129, 96, 119, 88, 2, 88, 2, 228, 307, 228, 307, 228, 307, 228, 307, 302, 307, 302, 307, 302, 307, 302, 307, 302, 307, 302, 190, 29, 235, 98, 235, 98, 235, 96, 147, 279, 225, 279, 272, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 225, 279, 14, ...] | [95, 84, 249, 23, 115, 129, 96, 119, 88, 2, 228, 307, 302, 29, 190, 104, 192, 32, 98, 235, 111, 136, 157, 256, 288, 147, 187, 193, 272, 279, 225, 14, 286, 174, 63, 9, 87, 82, 16, 91, 122, 28, 74, 215, 240, 209, 156, 219, 36, 108, 113, 93, 128, 280, 58, 220, 250, 171, 97, 197] | False |
| 24 | [95, 84, 95, 84, 95, 84, 115, 84, 95, 84, 115, 249, 115, 249] | [95, 84, 115, 249, 129, 96, 23, 88, 119, 2, 228, 307, 302, 192, 29, 104, 190, 235, 98, 32] | True |

**Figure 4.1:** Example of created comment sequences for the video ENT2

The table 4.3 depicts the number of participants that watched each of the videos, as well as the number and ratio of participants that followed the sequential order. As shown in the table, only a minority (less than 28%) of participants followed the actual comment order, which confirms the H1.

| Video code | # of participants that watched this video | # of participants that followed the sequential order | Ratio of participants that followed the sequential order |
|---|---|---|---|
| ED1 | 62 | 7 | 0.113 |
| ED2 | 58 | 16 | 0.276 |
| ENT1 | 58 | 10 | 0.172 |
| ENT2 | 60 | 16 | 0.267 |

**Table 4.3:** General video statistics

## 4.3 Mode comments

The figure 4.2 shows the mode comments - the comments that caught attention first - for the video ENT1, i.e., the first comment in this list was most often read by the participants as the first comment, the second comment in the list was most often read as the second comment and so on. The comments with a high number of likes (> 500) are noticed before the others, while the presence of smileys does not contribute to the order of being seen. All of the first five seen comments contain answers and a comment from the authorized user is included as well. 65% of the mode comments have a high number of likes and 85% of them contain replies. No comments contain a like from the video creator, as there were no such comments present amongst the comments shown to the participants.

| | comment_id | order | author_name | comment_text | num_of_likes | answers_present | author_comment | author_liked |
|---|---|---|---|---|---|---|---|---|
| 0 | 412 | 0 | iiShadowli7 | Someone could confess that they killed someone in here and it would be buried under the 4.6M other comments | 39000 | True | False | False |
| 1 | 264 | 1 | Multicort | It"s crazy how many people come back to this everyday.This song is legendary♪ | 2700 | True | True | False |
| 2 | 192 | 2 | Jackson Bird | Let"s be honest, Justin Bieber owned the world for few days when this song was released | 183000 | True | False | False |
| 3 | 192 | 3 | Jackson Bird | Let"s be honest, Justin Bieber owned the world for few days when this song was released | 183000 | True | False | False |
| 4 | 47 | 4 | AHJSJSJSJJSJS Hello | Damn 10 million dislikes tbh this song gives tons of memories | 30000 | True | False | False |
| 5 | 74 | 5 | Andrei Teleptean | You are now 12 years old and this song has just been released Imagine those days... | 2800 | True | False | False |
| 6 | 180 | 6 | Helena Palit-ang | Dude, he sounds like a 10-year-old.... but he was like 16 when he sang this Edit: Ok I"m not trying to say that he has a bad voice, he has a wonderful voice. He just sounds really young for his age | 40000 | True | False | False |
| 7 | 47 | 7 | AHJSJSJSJJSJS Hello | Damn 10 million dislikes tbh this song gives tons of memories | 30000 | True | False | False |
| 8 | 185 | 8 | Insta Maelfranco | Algum BR presente? | 56000 | True | False | False |
| 9 | 244 | 9 | Mackenzie Leigh | I still remember watching and hearing this for the first time on Disney Chanel… pure nostalgia listening to this now! I must ov been about 10-12 when it came out. I am now 22. Also still remember my whole room being covered in posters of him and other Disney Chanel stars.. ripping them out of all the magazines, so excited to pin them up 😂😂 | 11 | False | False | False |
| 10 | 228 | 10 | Kitty Kate | Baby:took 9 years to get 9.9 million dislikes youtube rewind 2018:took 6 days to get 10 million dislikes | 3800 | True | False | False |
| 11 | 296 | 11 | Pool_Dead | Fun fact: This song is more popular than many artists out there | 1100 | True | False | False |
| 12 | 7 | 12 | 1000 Sbs with 0 video challenge | *******It"s crazy how many people come back to this everyday.This song is legendary♥******* | 11 | False | False | False |
| 13 | 115 | 13 | Cassandra Kameni | Ready for the "Who's watching this in 2021" comments😃 | 4000 | True | False | False |
| 14 | 370 | 14 | Trần V. Nguyễn | y"all know that we"re grow up with this. When this MV realeased, i was 3 years old but i still remember everyone listened to this song, the melody trap in my head forever | 38 | True | False | False |
| 15 | 427 | 15 | phnoob | this is, quite literally, the song of my entire childhood | 38 | True | False | False |
| 16 | 454 | 16 | kindly help me reach 100subscriberbæres with | It"s crazy, thousands of people come to see this masterpiece, this song is legendary ♥ | 90 | True | False | False |
| 17 | 7 | 17 | 1000 Sbs with 0 video challenge | *******It"s crazy how many people come back to this everyday.This song is legendary♥******* | 11 | False | False | False |
| 18 | 297 | 18 | Pop cloudy | Mds, que saudade, ouvia essa musica em 2013, ainda ouço com maior prazer | 119 | True | False | False |
| 19 | 185 | 19 | Insta Maelfranco | Algum BR presente? | 56000 | True | False | False |

**Figure 4.2:** Mode comments for the video ENT1

The figure 4.3 shows the mode comments for the video ED1. The conclusions regarding the mode comments are similar to the ones of the video ENT1. Four first comments also contain a like from the video author. 40% of the mode comments have a high number of likes (> 50) and 90% of them contain replies. There is one comment from an authorised user (5%) and 20% of the mode comments are liked by the video creator.

| | comment_id | order | author_name | comment_text | num_of_likes | answers_present | author_comment | author_liked |
|---|---|---|---|---|---|---|---|---|
| 0 | 115 | 0 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True |
| 1 | 177 | 1 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | 46 | True | True | True |
| 2 | 38 | 2 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120Hz for granted😂 | 214 | True | False | True |
| 3 | 78 | 3 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | 94 | True | False | True |
| 4 | 70 | 4 | G Games | I have the 12 pro max and bought my wife the 13 pro max. The 120hz display feels way different. Trying to convince her to trade. No going so well | 84 | True | False | False |
| 5 | 222 | 5 | chrisak49 | Agree with everything. I did wish Apple didn't do Photographic styles but instead gave us more control over the Smart HDR processing. Let traditional photographers dial down the Smart HDR and let overexposure happen or let people go super aggressive with Smart HDR so nothing is blown out. | 60 | True | False | False |
| 6 | 108 | 6 | Laith Yaseen | Sam if you subtly flipped the bird at your "friends who don"t watch your videos like they"re supposed to" at 2:02 you"re an absolute legend 😂 | 59 | True | False | False |
| 7 | 235 | 7 | sublunarskyler | 😌 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now, and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I"ve spent many of my lunch breaks walking around taking photos and they"re great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it"s just that good. | 13 | True | False | False |
| 8 | 75 | 8 | Gina mua INDIA | Im at 37% and i changed it last 17 hours ago, and I've used it at work, back to back calls, zoom meetings, 3 hours of binge watching mom, and music. this baby has a beautiful battery | 16 | True | False | False |
| 9 | 169 | 9 | Ronnie Zimmerman | I agree that the silver model looks and feels so luxurious. I was amazed and honestly a little mesmerized when I got mine. | 32 | True | False | False |
| 10 | 72 | 10 | Genna Jordan | It seriously is perfect. I got the 13 pro in graphite coming from the 12 pro max and I don't regret it at all. Kinda wish I got the silver one it looks amazing. It feels so premium in hand and I love it! Really is perfect! | 73 | True | False | False |
| 11 | 72 | 11 | Genna Jordan | It seriously is perfect. I got the 13 pro in graphite coming from the 12 pro max and I don't regret it at all. Kinda wish I got the silver one it looks amazing. It feels so premium in hand and I love it! Really is perfect! | 73 | True | False | False |
| 12 | 75 | 12 | Gina mua INDIA | Im at 37% and i changed it last 17 hours ago, and I've used it at work, back to back calls, zoom meetings, 3 hours of binge watching mom, and music. this baby has a beautiful battery | 16 | True | False | False |
| 13 | 172 | 13 | Ryuki | I LOVE WATCHING THINGS I CAN AFFORD 😎 | 28 | True | False | False |
| 14 | 151 | 14 | Nate Jones | I remember going into an AT&amp;T store to try the new display &amp; my 12 pro max felt so weird afterwards. | 20 | True | False | False |
| 15 | 32 | 15 | Cen | I can say the same. I've had the 13 Pro Max for 2 days it feels like a million bucks in my hand 120hz alone. | 22 | True | False | False |
| 16 | 32 | 16 | Cen | I can say the same. I've had the 13 Pro Max for 2 days it feels like a million bucks in my hand 120hz alone. | 22 | True | False | False |
| 17 | 77 | 17 | GreenhubPH Vlogs | yes this is true!!! i just got my 13 promax and it's totally different from the 12 pro max!!! camera - perfection , screen - way better , speakers- amazing, overall it's worth the upgrade! | 0 | False | False | False |
| 18 | 135 | 18 | Marsorry Ickua | Basically, ALMOST perfect. As long as there are critiques, the word perfection should be reserved :). | 15 | True | False | False |
| 19 | 54 | 19 | Dennis Still | Still using my silver 11 Pro. Don't want to upgrade so soon but I've held the 13 Pro in hand and it feels incredibly premium. The 120hz is so good. A similar feeling to playing video games at 120hz. Looking forward to the iPhone 14 Pro. | 0 | False | False | False |

**Figure 4.3:** Mode comments for the video ED1

The figures 4.4 and 4.5 show the mode comments for the video ED2. The conclusions regarding the mode comments are similar to the ones of the video ENT1. 87% of the popular comments have a high number of likes (> 200), all of them have replies, one contains an authorised label and 13% have a like from the video creator.

| | comment_id | order | author_name | comment_text | num_of_likes | answers_present | author_comment | author_liked |
|---|---|---|---|---|---|---|---|---|
| 0 | 139 | 0 | Mike Shake | Subscribe for new skills every week!<br>Check out more skills: http://www.youtube.com/c/MikeShake<br><br>Instagram: https://www.instagram.com/mikeshaketv | 1137 | True | True | False |
| 1 | 11 | 1 | ANGEL LEABRES | Morning: *Tired*<br>Afternoon: *Tired*<br>Evening: *Tired*<br>In bed: *NOT TIRED* | 1300 | True | False | False |
| 2 | 125 | 2 | LilEdits | "Don't think"<br>~Closes my eyes~<br>Thinks about how black became a colour | 2219 | True | False | False |
| 3 | 213 | 3 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day<br>Step 2: going home<br>Step 3: falling into bed<br>Step 4: awaking the next morning<br>Step 5: repeat until death | 1100 | True | False | False |
| 4 | 46 | 4 | Cate | I clicked on this video because I have trouble falling asleep. But I didn't realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False |
| 5 | 46 | 5 | Cate | I clicked on this video because I have trouble falling asleep. But I didn't realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False |
| 6 | 246 | 6 | iixFroggie | Mike Shake in 2050: Learning how to teleport in 24 hours | 7900 | True | False | False |
| 7 | 182 | 7 | Roland B. | step one: avoid electronics at night<br><br>mission failed | 280 | True | False | False |
| 8 | 182 | 8 | Roland B. | step one: avoid electronics at night<br><br>mission failed | 280 | True | False | False |
| 9 | 40 | 9 | CANVAS ARTS | Dont think<br>Dont think<br>Dont think<br><br>My mind: thinks how to not to think | 252 | True | False | False |
| 10 | 115 | 10 | Kryptonite | Mike: "Avoid watching electronics at night"<br><br>Me, watching this at night: 📺👀 | 146 | True | False | False |
| 11 | 228 | 11 | Victor Sørensen | This guy in 70 years be like:<br>This is how I learned how not to die | 2476 | True | False | True |
| 12 | 188 | 12 | SamTheMemerMan | 1:25 "I read a book instead"<br>The light on his face: You lie | 560 | True | False | False |
| 13 | 157 | 13 | Nick C | Everyone knows you shouldn't drink caffeine after like 3pm, you shouldn't use your bed for entertainment, you shouldn't eat for a few hours before bed, you shouldn't stay in bed if you can't sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it's actually brilliant.<br><br>[I wouldn't bother with this tip, however, if you're prone to sleep paralysis and don't enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don't get sleep paralysis or if you're like me and able to stay calm and find it interesting, maybe give it a try.]<br><br>It's simple: ignore itches (and don't toss and turn.)<br><br>That's it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There's good science behind it too.<br>Sleep is FAR from the "passive" sort of "shutdown" we're taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain.<br><br>When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn't want to do this until you're definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it's tired.) So before your brain makes this handoff it tests your body to see if you're ready for sleep or if you're still conscious.<br><br>One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you're awake and it's not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won't scratch, and your brain knows it can get to work.<br><br>So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don't toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It's not easy to ignore them, and they can get very intense sometimes, but just remember that if you don't itch them it'll help you get to sleep. | 18 | True | False | False |

**Figure 4.4:** Mode comments for the video ED2 (1-14)

| 14 | 157 | 14 | Nick C | Everyone knows you shouldn*t drink caffeine after like 3pm, you shouldn*t use your bed for entertainment, you shouldn*t eat for a few hours before bed, you shouldn*t stay in bed if you can*t sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it*s actually brilliant.<br><br>[I wouldn*t bother with this tip, however, if you*re prone to sleep paralysis and don*t enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don*t get sleep paralysis or if you*re like me and able to stay calm and find it interesting, maybe give it a try.]<br><br>It*s simple: ignore itches (and don*t toss and turn.)<br><br>That*s it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There*s good science behind it too.<br>Sleep is FAR from the *passive* sort of *shutdown* we*re taught to think of it as. Sleep is a very active process for the brain. *Sleep* means two different things to you and your brain.<br><br>When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from *awake brain processes* to *sleep brain processes.* It doesn*t want to do this until you*re definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it*s tired.) So before your brain makes this handoff it tests your body to see if you*re ready for sleep or if you*re still conscious.<br><br>One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you*re awake and it*s not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won*t scratch, and your brain knows it can get to work.<br><br>So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don*t toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It*s not easy to ignore them, and they can get very intense sometimes, but just remember that if you don*t itch them it*ll help you get to sleep. | 18 | True | False | False |
| 15 | 217 | 15 | Theory of Everything | My Dad*s a master of this I*m not kidding, his WR is 20 seconds | 52 | True | False | False |
| 16 | 14 | 16 | Ahmad Saad | No one:<br>Mike shake in 2050: how to come back from death | 1895 | True | False | True |
| 17 | 67 | 17 | Ethan Botterill | I*ve been using something very similar to the military method for about 7 years now, but I had no idea it had a name. I coupled it with a meditation type technique, where I lie in bed in a comfortable position, then focus my mind on my feet. Then without moving them, I imagine them falling asleep. Then I move on to the legs, and imagine them falling asleep, and so on up my body until I eventually reach my head, at which point I*m so relaxed I just fall asleep almost instantly. | 6 | True | False | False |
| 18 | 233 | 18 | Yuki Cross | I learnt this thing called 'heart math' that's meant to calm you down. It's quick and I also use it to sleep! It's three steps called heart focus, heart breathe, heart feel.<br><br>Step 1: Heart focus - try focusing on your breath, heartbeat, or pulse. It may help to put your hand over your heart to feel the beat or somewhere you can feel your pulse. Do this for a few seconds or however long you'd like.<br>Step 2: Heart breathe - breathe in and out while counting to how ever long you want. I usually slowly breathe in and out for 6 seconds each. Repeat this step as much as you feel necessary.<br>Step 3: Heart feel - think of or imagine things that make you happy, this can be a good memory of yours, or a favourite food etc. It could also be something you look forward too in the future.<br><br>I'm usually put to sleep after beginning step 3, and this can be used before a test or anything that might make you anxious. Hope this helps anyone! | 1 | True | False | False |
| 19 | 233 | 19 | Yuki Cross | I learnt this thing called 'heart math' that's meant to calm you down. It's quick and I also use it to sleep! It's three steps called heart focus, heart breathe, heart feel.<br><br>Step 1: Heart focus - try focusing on your breath, heartbeat, or pulse. It may help to put your hand over your heart to feel the beat or somewhere you can feel your pulse. Do this for a few seconds or however long you'd like.<br>Step 2: Heart breathe - breathe in and out while counting to how ever long you want. I usually slowly breathe in and out for 6 seconds each. Repeat this step as much as you feel necessary.<br>Step 3: Heart feel - think of or imagine things that make you happy, this can be a good memory of yours, or a favourite food etc. It could also be something you look forward too in the future.<br><br>I'm usually put to sleep after beginning step 3, and this can be used before a test or anything that might make you anxious. Hope this helps anyone! | 1 | True | False | False |

**Figure 4.5:** Mode comments for the video ED2 (15-20)

The figure 4.6 shows the mode comments for the video ENT2. The conclusions regarding the mode comments are similar to the ones of the video ENT1. All comments contain replies, 50% of the comments have a high number of likes (> 500). No comments contain a like from the video creator or a video creator label, as there were no such comments present amongst the comments shown to the participants.

| | comment_id | order | author_name | comment_text | num_of_likes | answers_present | author_comment | author_liked |
|---|---|---|---|---|---|---|---|---|
| 0 | 95 | 0 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it"s not them. hahahah | 5220 | True | False | False |
| 1 | 84 | 1 | Emrah Öz | "You can have your own opinions but you can"t have your own facts." That"s social media in a nutshell. | 1306 | True | False | False |
| 2 | 249 | 2 | Tones Drone Adventures | "Don"t believe everything you read on the internet" - Abraham Lincoln | 2018 | True | False | False |
| 3 | 115 | 3 | Insula Shots | It"s just funny how the joke about bleach aged very well. 😊 | 2800 | True | False | False |
| 4 | 249 | 4 | Tones Drone Adventures | "Don"t believe everything you read on the internet" - Abraham Lincoln | 2018 | True | False | False |
| 5 | 129 | 5 | John Doe | "Think of how stupid the average person is, and realize half of them are stupider than that." George Carlin | 3617 | True | False | False |
| 6 | 96 | 6 | Giggitygoo | The internet was one of the greatest human achievements ever, and we use it in the worst possible way. | 672 | True | False | False |
| 7 | 119 | 7 | J. Galactus | I"ve said it before and I"ll say it again- with social media, stupidity spreads faster than ever before. | 1620 | True | False | False |
| 8 | 88 | 8 | Fattiger | "Do you know how stupid the average person is?" Average audience claps in favour. | 2059 | True | False | False |
| 9 | 2 | 9 | 23v0lv32 | The guitar lesson analogy is perfect | 738 | True | False | False |
| 10 | 228 | 10 | Steve Yao | The 500+ people who clicked "dislike" just helped Ricky make his point. | 190 | True | False | False |
| 11 | 307 | 11 | Рэгр «ﺍﺋﺋﺍﺋ | This. That"s it. Social media and the idea of "influencers" is such a joke. | 378 | True | False | False |
| 12 | 29 | 12 | Black Heart | Ricky doesn"t tell jokes, he spits facts. | 470 | True | False | False |
| 13 | 29 | 13 | Black Heart | Ricky doesn"t tell jokes, he spits facts. | 470 | True | False | False |
| 14 | 190 | 14 | Para Bellum | "Everyone has a right to their opinion" seemed like a good idea before social media. | 295 | True | False | False |
| 15 | 104 | 15 | GumGumOnigiri | YouTube is honestly the closest I get to social media. | 421 | True | False | False |
| 16 | 192 | 16 | Paul Noonan | Respect ricky. Ever sice the Golden Globe awards i see you in a whole new light. It took real guts to hurt the feelings of those idiots in hollywood. | 123 | True | False | False |
| 17 | 235 | 17 | The Brick Patch | Ricky is genuinely the realest, funniest guy. I"d love to meet him. | 169 | True | False | False |
| 18 | 32 | 18 | Brian B | Todays world is Feelings not Facts..We are so screwed. | 375 | True | False | False |
| 19 | 235 | 19 | The Brick Patch | Ricky is genuinely the realest, funniest guy. I"d love to meet him. | 169 | True | False | False |

**Figure 4.6:** Mode comments for the video ENT2

In general, the comments, to which people pay attention the first, tend to have replies (94% on average) and a high number of likes (61%), some of them have an authorised label (3%) and a video author like (17%) as well.

## 4.4 Clustering approaches

### 4.4.1 Hierarchical clustering

Additionally, the hierarchical clustering approach was applied to find similar reading patterns amongst the participants. Hierarchical cluster analysis is an algorithm that groups similar objects into clusters, resulting in a set of clusters, where each cluster is distinct from each other cluster, and the objects within each cluster are broadly similar to each other. Hierarchical clustering was conducted on a distance matrix, which was computed using the Levenshtein distance. Levenshtein distance is a metric for measuring the difference between two sequences, which can also be referred to as edit distance - the number of changes required to be applied to the first sequence in order to obtain the second sequence. The Ward's method was used as linkage criteria since it showed the best results on the given data.

The figure 4.7 shows an example of the hierarchical clustering approach for the video ENT1 after removing empty sequences and outliers. The x axis shows the participants' ids and the y axis represents the Levenshtein distance. The data was divided into three clusters with a cut equal to 350. As the clusters contain an approximately equal number of both females and males, there are no distinct differences in the reading behaviour between females and males regarding the order and number of the comments read. For this reason, the dendrograms for the other videos are not further presented.
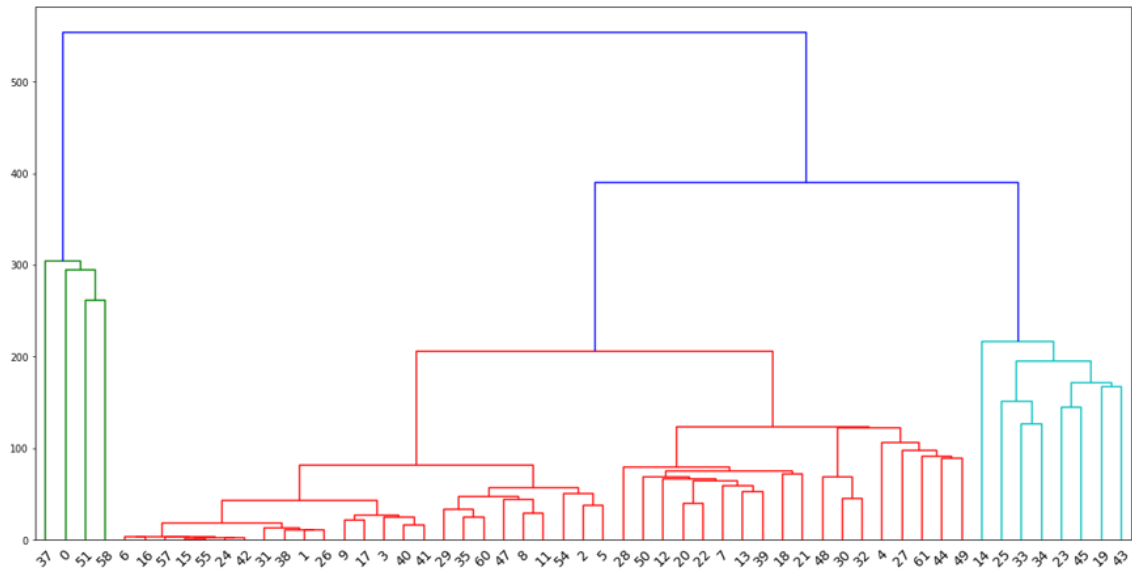
**Figure 4.7:** Dendrogram for the video ENT1

## 4.4.2  Sequence clustering

Since sequence clustering algorithms endeavour to group related biological sequences, an attempt to use them in the given context was made. However, already on the stage of choosing the optimal k for the k-means algorithm, the Elbow method failed, as the figure 4.8 shows. The sequence clustering algorithm itself did not produce meaningful results as well; therefore, it cannot be applied in the YouTube comments' domain.
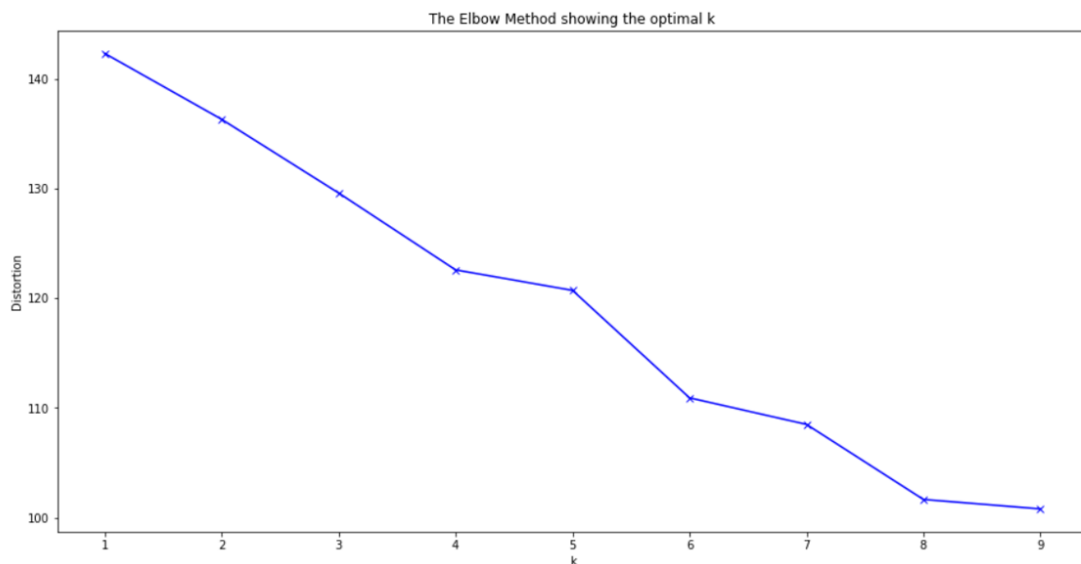


**Figure 4.8:** Elbow rule for the video ENT1

## 4.5 Video category

The H4 supposes that the comment reading behaviour correlates with the global property of the video/post like the category of the video/post, e.g., people read short comments on entertainment videos, but spend more time reading long comments on educational/review videos.

The most popular comments for the video ENT1 were primarily short, except for the comment with the song text and several descriptive nostalgic comments. As this music video represents the category 'entertainment', the H4 is approved in this specific case.

For the video ED1, no long comments were present; that is why it is impossible to approve or reject the H4 in this case.

There were more long comments amongst the popular ones for the video ED2 compared with the other videos. As this video is representative of the category 'education', the H4 is approved in this case.

For the video ENT2, the most popular comments were the shortest compared to other videos. As this video represents the category 'entertainment', the H4 is approved in this case.

## 4.6 Non-linguistic comment features

The H3 suggests that the reading behaviour correlates with non-linguistic features (metadata) such as number of (dis)likes, comment position, presence of a video author's answer.

In order to analyse whether the most popular comments were primarily seen in the most popular screen zone, first, the most popular screen zone should be determined, and second, the number of times the most popular comments were shown in the most popular zone should be counted.

To determine the most popular zone, the screen was divided into three equal horizontal areas, which given the screen size 1920 x 1080, were determined as from 0 to 360 px, from 361 to 720 px and from 721 to 1080 px. Additionally, the limitation of the x-axis of 1280 px was given to make sure only fixations on the comment section are counted. This limitation corresponds to the right edge of the comment section of the YouTube interface for the mentioned screen size. The fixations on the video are neglected in this analysis. Afterwards, the most popular zone was calculated for each comment, i.e. the zone in which it was noticed the most often. In the end, the most popular zone for each of the popular comments was calculated.

The figure 4.9 shows the ranking of the most popular non-linguistic features by view count (number of fixations on each feature) for all videos. Creator like and number of likes have the same number of fixations since they are located very close to each other on the YouTube interface. The ranking is similar for all the videos, except that for the video ED2 presence of answers got slightly more attention than comment author name.

ED1

| | element | count |
|---|---|---|
| 0 | num of likes | 10544 |
| 1 | creator like | 10544 |
| 2 | comment author name | 6397 |
| 3 | num of answers | 4764 |
| 4 | image | 1721 |
| 5 | comment date | 1165 |

ENT1

| | element | count |
|---|---|---|
| 0 | creator like | 9487 |
| 1 | num of likes | 9487 |
| 2 | comment author name | 5434 |
| 3 | num of answers | 4997 |
| 4 | image | 1490 |
| 5 | comment date | 838 |

ED2

| | element | count |
|---|---|---|
| 0 | num of likes | 7625 |
| 1 | creator like | 7625 |
| 2 | num of answers | 4683 |
| 3 | comment author name | 4525 |
| 4 | image | 2355 |
| 5 | comment date | 1128 |

ENT2

| | element | count |
|---|---|---|
| 0 | creator like | 12169 |
| 1 | num of likes | 12169 |
| 2 | comment author name | 7122 |
| 3 | num of answers | 5916 |
| 4 | image | 1556 |
| 5 | comment date | 1290 |

**Figure 4.9:** Most popular non-linguistic features for all videos

The table 4.4 represents the differences between the most and least popular comments for the video ENT1. Amongst the least popular comments, there are only a few comments with a high number of likes, fewer comments from authorised users and comments containing replies. The number of smileys does not correlate with the popularity of this video.

| | # of comments with smileys | # of comments with high number of likes (>500) | # of comments with replies | # of comments from authorised users | # of comments liked by video author | # of non-English comments |
|---|---|---|---|---|---|---|
| Popular comments by view count | 2 | 13 | 15 | 4 | 0 | 1 |
| Popular comments by percentage | 5 | 10 | 12 | 4 | 0 | 6 |
| Unpopular comments | 4 | 3 | 10 | 1 | 0 | 5 |

**Table 4.4:** Most crucial non-linguistic features of the most and least popular comments for the video ENT1

The table 4.5 represents the differences between the most and least popular comments for the video ED1. Amongst the least popular comments, there are zero comments with a high number of likes, comments from authorised users and liked by the video creator and fewer comments containing replies and smileys.

| | # of comments with smileys | # of comments with high number of likes (>50) | # of comments with replies | # of comments from authorised users | # of comments liked by video author | # of non-English comments |
|---|---|---|---|---|---|---|
| Popular comments by view count | 4 | 7 | 15 | 1 | 4 | 0 |
| Popular comments by percentage | 3 | 7 | 13 | 1 | 4 | 0 |
| Unpopular comments | 2 | 0 | 6 | 0 | 0 | 0 |

**Table 4.5:** Most crucial non-linguistic features of the most and least popular comments for the video ED1

The table 4.6 represents the differences between the most and least popular comments for the video ED2. All the comments have replies, but amongst the least popular comments, there are fewer comments with a high number of likes, but more comments from authorised users and liked by the video creator. The number of smileys does not correlate with the popularity of this video.

| | # of comments with smileys | # of comments with high number of likes (>200) | # of comments with replies | # of comments from authorised users | # of comments liked by video author | # of non-English comments |
|---|---|---|---|---|---|---|
| Popular comments by view count | 1 | 10 | 15 | 1 | 1 | 0 |
| Popular comments by percentage | 3 | 8 | 15 | 1 | 0 | 0 |
| Unpopular comments | 2 | 5 | 15 | 2 | 2 | 0 |

**Table 4.6:** Most crucial non-linguistic features of the most and least popular comments for the video ED2

The table 4.7 represents the differences between the most and least popular comments for the video ENT2. Most of the comments have replies, while none of them was posted by an authorised user or liked by the video creator. Both popular and unpopular comments contain only one comment with smileys, but amongst the least popular comments, there are zero comments with a high number of likes.

| | # of comments with smileys | # of comments with high number of likes (>500) | # of comments with replies | # of comments from authorised users | # of comments liked by video author | # of non-English comments |
|---|---|---|---|---|---|---|
| Popular comments by view count | 1 | 11 | 14 | 0 | 0 | 0 |
| Popular comments by percentage | 1 | 10 | 15 | 0 | 0 | 0 |
| Unpopular comments | 1 | 0 | 14 | 0 | 0 | 0 |

**Table 4.7:** Most crucial non-linguistic features of the most and least popular comments for the video ENT2

The table 4.8 represents the total number of loaded comments for each video, as well as the number of comments, for which zone one, two and three was the most popular one. As can be clearly seen in the table 4.8, zone two is the most popular one for every video.

| Video code | Total # of comments | # of comments in zone 1 | # of comments in zone 2 | # of comments in zone 3 |
|:---:|:---:|:---:|:---:|:---:|
| ED1 | 86 | 17 | 67 | 2 |
| ED2 | 117 | 24 | 93 | 0 |
| ENT1 | 333 | 51 | 242 | 40 |
| ENT2 | 143 | 2 | 122 | 19 |

**Table 4.8:** Zone information for all videos

For all most popular comments sorted by view count for the videos ENT1, ED1 and ENT2 the second zone was the most popular one. However, for the video ED2 two comments with the comment ids 67 and 243 were mostly seen in the first zone, as the figure 4.10 shows.



| | comment_id | author_name | comment_text | zone | count |
|---|---|---|---|---|---|
| 0 | 157 | Nick C | Everyone knows you shouldn't drink caffeine after like 3pm, you shouldn't use your bed for entertainment, you shouldn't eat for a few hours before bed, you shouldn't stay in bed if you can't sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it's actually brilliant. \n \n [I wouldn't bother with this tip, however, if you're prone to sleep paralysis and don't enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don't get sleep paralysis or if you're like me and able to stay calm and find it interesting, maybe give it a try.] \n \n It's simple: ignore itches (and don't toss and turn.) \n \n That's it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There's good science behind it too. \n Sleep is FAR from the "passive" sort of "shutdown" we're taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain. \n \n When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn't want to do this until you're definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it's tired.) So before your brain makes this handoff it tests your body to see if you're ready for sleep or if you're still conscious. \n \n One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you're awake and it's not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won't scratch, and your brain knows it can get to work. \n \n So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don't toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It's not easy to ignore them, and they can get very intense sometimes, but just remember that if you don't itch them it'll help you get to sleep. | 2 | 2623 |
| 1 | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day \n Step 2: going home \n Step 3: falling into bed \n Step 4: awaking the next morning \n Step 5: repeat until death | 2 | 2951 |
| 2 | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn't realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 2 | 1742 |
| 3 | 125 | LilEdits | "Don't think" \n ~Closes my eyes~ \n Thinks about how black became a colour | 2 | 1459 |
| 4 | 11 | ANGEL LEABRES | Morning: "Tired" \n \n Afternoon: "Tired" \n \n Evening: "Tired" \n \n In bed: "NOT TIRED" | 2 | 1567 |
| 5 | 50 | CodyTheMemeLord | Title: how i learned to fall asleep in 2 minutes \n \n Me at 2 am: I N T E R E S S T I N G | 2 | 1248 |
| 6 | 67 | Ethan Botterill | I've been using something very similar to the military method for about 7 years now, but I had no idea it had a name. I coupled it with a meditation type technique, where I lie in bed in a comfortable position, then focus my mind on my feet. Then without moving them, I imagine them falling asleep. Then I move on to the legs, and imagine them falling asleep, and so on up my body until I eventually reach my head, at which point I'm so relaxed I just fall asleep almost instantly. | 1 | 784 |
| 7 | 40 | CANVAS ARTS | Dont think \n Dont think \n Dont think \n \n My mind: thinks how to not to think | 2 | 981 |
| 8 | 228 | Victor Sørensen | This guy in 70 years be like: \n This is how I learned how not to die | 2 | 874 |
| 9 | 182 | Roland B. | step one: avoid electronics at night \n \n mission failed | 2 | 700 |
| 10 | 243 | elie T | Mike imagining he's on the beach. \n \n Me imagining I'm inside a class. | 1 | 511 |
| 11 | 188 | SamTheMemerMan | 1:25 "I read a page instead" \n The light on his face: You lie | 2 | 493 |
| 12 | 115 | Kryptonite | Mike: "Avoid watching electronics at night" \n \n Me, watching this at night: 🖥️👀 | 2 | 601 |
| 13 | 139 | Mike Shake | Subscribe for new skills every week!\n \n Check out more skills: http://www.youtube.com/c/MikeShake\n \n \n Instagram: https://www.instagram.com/mikeshaketv | 2 | 447 |
| 14 | 56 | Danny | The book was so interesting that it lit his face up | 2 | 455 |

**Figure 4.10:** Zone information for the video ED2

The most popular comments by percentage of people who saw them for the video ENT1 and ENT2 were primarily noticed in the second zone as well. For the video ED1 and ED2 the first zone was the most popular one for one comment with the comment id 64 and 67 correspondingly. For the space-saving purpose, the comments are not represented once more here, but they can be found in subsection 5.1.

From 60 popular comments sorted by view count and 60 popular comments sorted by percentage of people who saw them, the second zone was the most popular one for the 116 comments (97%), while four comments (3%) were mainly noticed in the first zone and zero comments were primarily seen in the third zone.

## 4.7 Correlation between popularity and attention

The H6 suggests that the popularity of a comment, i.e. number of likes, correlates with the attention drawn by the comment. The Spearman rank-order correlation was used to determine how strong a comment's popularity is correlated with attention paid to it since, in contrast to the Pearson correlation, it assesses monotonic relationships, no matter whether they are linear or not; therefore, it can identify a non-linear correlation. To confirm or reject the H6, the correlation analysis using the Spearman rank-order coefficient was conducted between the comments' popularity and the following non-linguistic comment features: number of likes, presence of answers, authorised attribute and video creator's like.

The table 4.9 depicts the Spearman rank-order correlation between the most popular comments by view count and the non-linguistic comment attributes. The Spearman coefficient is undefined when there is no variation in the feature sequences, so their standard deviation equals zero. The analysis shows that there is a moderate correlation for the videos ED1, ED2 and ENT2 between popularity of the comments and number of likes and presence of answers.

| Video name | # of likes | Presence of answers | Authorised attribute | Video creator's like |
|:---:|:---:|:---:|:---:|:---:|
| ENT1 | 0.452 | 0.321 | 0.194 | undefined |
| ED1 | 0.631 | 0.553 | 0.159 | 0.351 |
| ED2 | 0.556 | 0.628 | 0.161 | 0.085 |
| ENT2 | 0.598 | 0.633 | undefined | undefined |

**Table 4.9:** Correlation analysis of the most popular comments by view count

The table 4.10 depicts the Spearman rank-order correlation between the most popular comments by percentage of people who saw them and the non-linguistic comment attributes. The Spearman coefficient is undefined when there is no variation in the feature sequences, so their standard deviation equals zero. The analysis shows a moderate correlation for all videos between the popularity of the comments and the number of likes they received. In addition, for the videos ED1, ED2 and ENT2, there is an additional moderate correlation between popularity of the comment and presence of answers.

| Video name | # of likes | Presence of answers | Authorised attribute | Video creator's like |
|:---:|:---:|:---:|:---:|:---:|
| ED1 | 0.666 | 0.543 | 0.179 | 0.42 |
| ED2 | 0.644 | 0.586 | 0.136 | 0.11 |
| ENT1 | 0.53 | 0.36 | 0.228 | undefined |
| ENT2 | 0.738 | 0.594 | undefined | undefined |

**Table 4.10:** Correlation analysis of the most popular comments by percentage of people who saw them

## 4.8 Comment reading durability analysis

In addition, a further analysis was conducted, which investigated how much percentage of comments people skip on average for each video and depending on gender, as well as how much time the participants spent on each video in total and reading comments in particular.

The table 4.11 shows the average percentage skipped by the participants for each video. Although the gender-independent percentage is approximately the same for each video, the female participants tended to skip from 21% up to 41% more comments than the male participants.

| Video name | Average % skipped | Average % skipped by females | Average % skipped by males |
|---|---|---|---|
| ED1 | 29.334 | 36.929 | 21.739 |
| ED2 | 29.523 | 32.675 | 25.904 |
| ENT1 | 29.152 | 32.846 | 25.458 |
| ENT2 | 27.281 | 30.53 | 24.033 |

**Table 4.11:** Average percentage of comments skipped

The table 4.12 depicts the average amount of time spent on reading comments and watching videos. The men who participated in the experiment tended to spend more time reading comments, while the women watched the videos longer. However, the average number of the comments read is approximately the same for both genders.

| Video name | Average time spent on video in total | Average time spent on watching video | Average time spent on reading comments | Average number of comments read |
|---|---|---|---|---|
| Women | 436.174 | 325.635 | 112.252 | 20.423 |
| Men | 441.179 | 276.151 | 158.878 | 21.452 |

**Table 4.12:** Average amount of time spent on reading comments and watching videos in seconds for both genders

The table 4.13 shows the amount of time the participants spent for each video on watching the video and reading comments. The video ED1 attracted the most attention since the participants read the comments for this video for the longest time.

| Video name | Average time spent on video in total | Average time spent on reading comments | Average time spent on watching video |
|---|---|---|---|
| ED1 | 32288 | 11806 | 20482 |
| ED2 | 24035 | 5851 | 18184 |
| ENT1 | 19755 | 5969 | 13786 |
| ENT2 | 21309 | 8353 | 12956 |

**Table 4.13:** Average amount of time spent on reading comments and watching videos in seconds for each video

The figures 4.11, 4.12, 4.13 and 4.14 represent the most popular words for each of the four videos, i.e. words in the YouTube comments that received the highest number of fixations (equivalent to the popularity by view count). As can be seen in each figure, the most popular words directly depict the topic of the video.
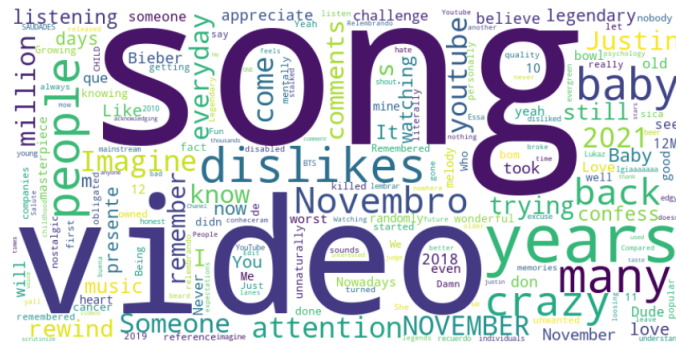


**Figure 4.11:** Most popular words for ENT1
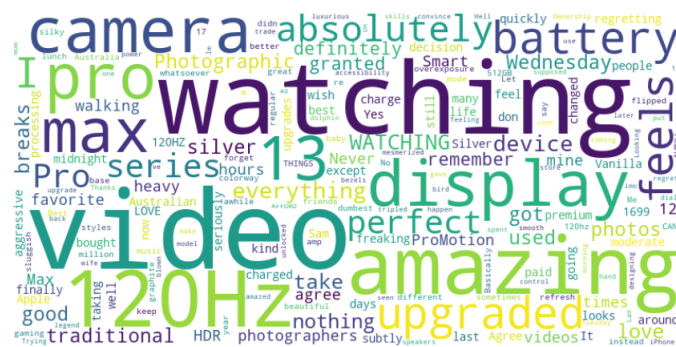


**Figure 4.12:** Most popular words for the video ED1
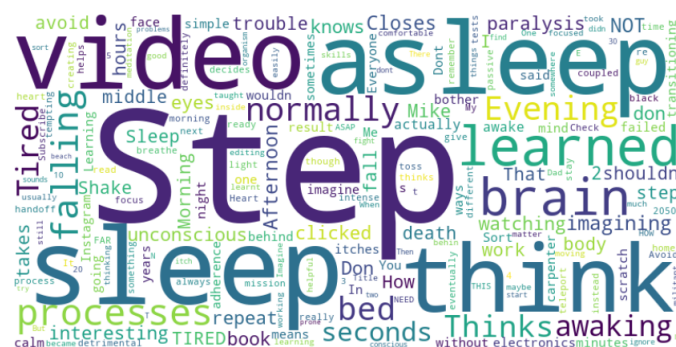


**Figure 4.13:** Most popular words for the video ED2

**Figure 4.14:** Most popular words for the video ENT2

## 4.9 Questionnaire findings

As mentioned in section 3.4, the participants filled out a questionnaire with general questions about their use of YouTube. The figure 4.15 shows the gender of the participants, which was represented by an equal number of women and men. The equivalent number of females and males allowed an analysis of differences in gender reading behaviour.



**Figure 4.15:** Gender of the participants

The figure 4.16 represents the age of the participants, which ranges from 18 to 36 years. The average age is equal to 23.177 years, and the median age is 22.5 years.



**Figure 4.16:** Age of the participants

The figure 4.17 depicts how often the participants usually use YouTube. The majority (88.7%) use YouTube at least several times per week, 6.5% - once per week, 3.2% once per month and only one participant (1.6%) almost never uses this social media platform. These findings demonstrate heavy usage of YouTube amongst young people.
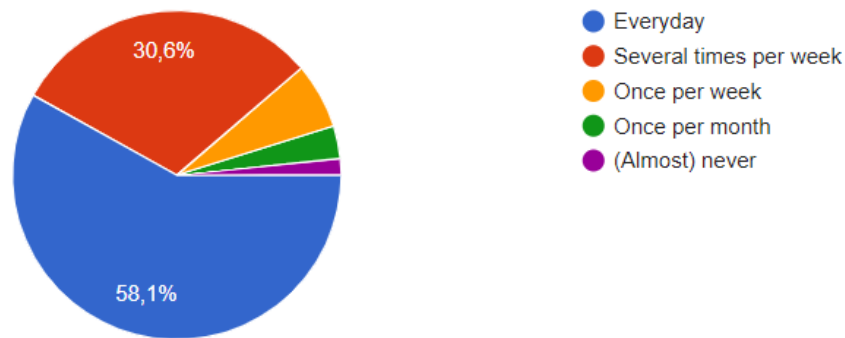


**Figure 4.17:** Frequency of YouTube usage

The figure 4.18 shows how often the participants typically read comments under YouTube videos. The majority (71%) does it rather frequently, 27.4% only rarely and one participant (1.6%) never reads any YouTube comments.
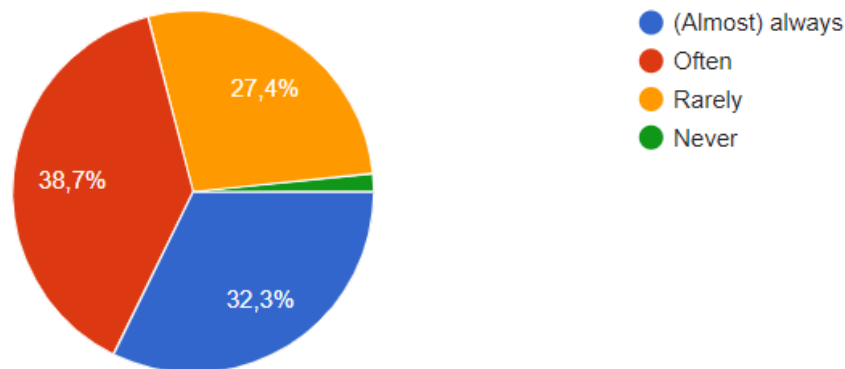


**Figure 4.18:** Frequency of commenting reading

The figure 4.19 represents the frequency of the participants' YouTube interaction, namely, how often they leave and like comments. The majority of the participants (66.667%) never comment on YouTube videos, and 33.333% do it only rarely. Most participants never (38.71%) or rarely (33.871) like comments as well. Only 25.581% often leave likes under comments, and there are even fewer people (4.839%) who do it almost always. Therefore, an active form of interaction with comments is not common.
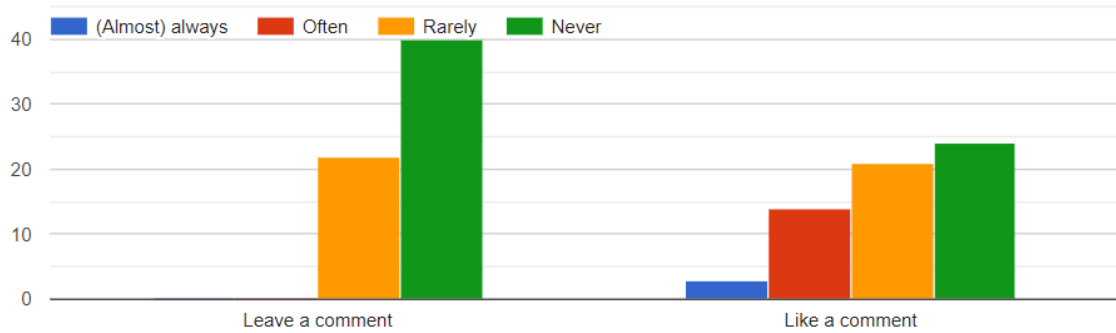
**Figure 4.19:** Frequency of YouTube interaction

The figure 4.20 displays the favourite video categories of the participants, each of which was asked to choose their top three YouTube video categories. The music category turned out to be the most favourite one, which confirms the findings of [Suk21] and [Goo16].
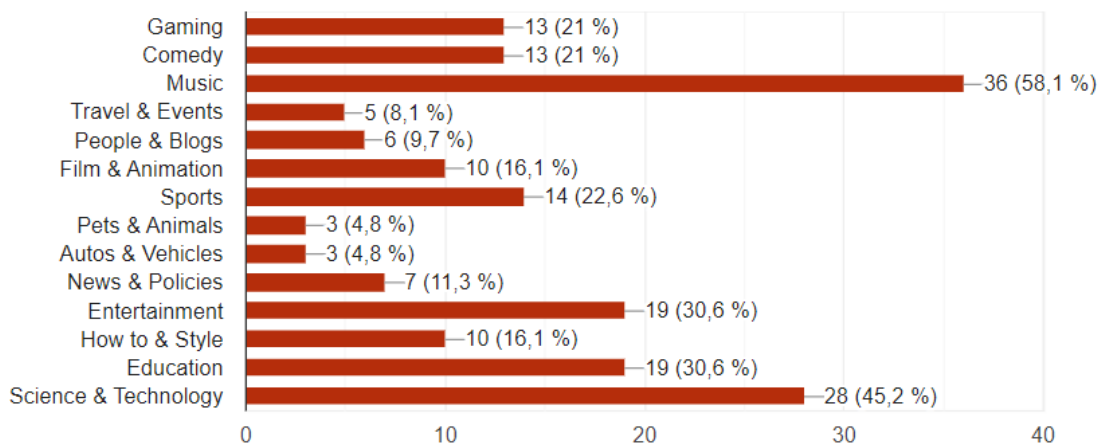


**Figure 4.20:** Top video categories

# 5 Comments' popularity analysis

This chapter investigates the influence of both linguistic and non-linguistic features on the popularity of comments. It includes analysis of the most and least popular comments ranked by two criteria, as well as gender analysis, which describes the differences between female and male reading behaviour.

## 5.1 Popular comments

This section describes the analysis of the linguistic popular comments' features, such as length, sentiment, number of smileys and sparseness and the analysis of the non-linguistic comments' features, such as number of likes, number (presence) of answers and presence of the video's author. To rank the comments, two metrics: view count and percentage of people who saw the comments were used.

### 5.1.1 Ranking by view count

In the beginning, the ranking by the number of fixations (view count) is presented. The figure 5.1 shows the most popular comments for the ENT1 video. Most of the comments (87%) have a high number of likes (> 500), the comments of authorised users are present as well (27%). The presence of answers is a vital feature since all the popular comments have a certain number of replies. The presence of smileys does not seem to influence the amount of received attention since there is only one comment containing them (7%). Most comments can be described as either nostalgic or funny.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count |
|---|---|---|---|---|---|---|---|---|
| 0 | 412 | iiShadowii7 | Someone could confess that they killed someone in here and it would be buried under the 4.6M other comments | 39000 | True | False | False | 2152 |
| 1 | 368 | Tofuh | I am obligated to listen this song 1 hour ... The worst challenge ... | 17000 | True | True | False | 1623 |
| 2 | 74 | Andrei Teleptean | You are now 12 years old and this song has just been released Imagine those days... | 2800 | True | False | False | 1222 |
| 3 | 264 | Multicort | It's crazy how many people come back to this everyday.This song is legendary♪ | 2700 | True | True | False | 1024 |
| 4 | 330 | Selin Naz Sur | Remembered this out of nowhere lmao. I used to STAN Justin Bieber as a preteen. He was a cute kid who was only two years older than me, had a cute voice, dressed very nicely etc. Then a few years later my music taste started to change and he started doing some outrageous things, so my love turned to hate for a while (internet had some influence on that too). Nowadays I don't hate him, but rather, I feel bad for him because I know better as an adult. Looking back, all this fame and attention just didn't do him well mentally. Being a celebrity must take a toll on your psychology with all the (sometimes unwanted) attention and unnaturally high expectations people have for you. The media doesn't leave you alone, music/movie companies don't leave you alone, you're at risk of getting stalked by some real sick individuals, people who don't know you personally judge and scrutinize you over your simplest actions forgetting that you're human too... Now imagine being a CHILD and getting exposed to all of that. I can't excuse when celebs act like fools or break the law, but I get it. I'm not interested in Justin's music anymore but I wish the best for him and his loved ones. | 66 | True | False | False | 1021 |
| 5 | 143 | Dubspez | Compared to the cancer that exists today, this song isn't even half bad. 2010 people had no idea what would come as Internet became more mainstream | 13000 | True | False | False | 1009 |
| 6 | 360 | Thanh Cong - TC | This is a reference for anyone from the future when Youtube no longer show the dislikes :( November 11th and this video has 12M dislikes | 2700 | True | True | False | 965 |
| 7 | 266 | My World | It took me 10 years to realize "DRAKE" was in this video 🎤🙏 | 903 | True | False | False | 897 |
| 8 | 376 | Vel Vel | Imagine trying to bowl but there's guys dancing on the lanes | 5400 | True | False | False | 869 |
| 9 | 180 | Helena Palit-ang | Dude, he sounds like a 10-year-old.... but he was like 16 when he sang this Edit: Ok I'm not trying to say that he has a bad voice, he has a wonderful voice. He just sounds really young for his age | 40000 | True | False | False | 755 |
| 10 | 108 | BujidoCavaco Channel | 05 de Novembro de 2019 relembrando minha infância. Eita SAUDADES MEU DEUS! | 39000 | True | True | False | 739 |
| 11 | 192 | Jackson Bird | Let's be honest, Justin Bieber owned the world for few days when this song was released | 183000 | True | False | False | 688 |
| 12 | 228 | Kitty Kate | Baby:took 9 years to get 9.9 million dislikes youtube rewind 2018:took 6 days to get 10 million dislikes | 3800 | True | False | False | 640 |
| 13 | 273 | Nexo Games | i still can't believe youtube disabled the dislikes. we'll never know what the most hated video will be... | 570 | True | False | False | 574 |
| 14 | 333 | Shreyaa Balaji | This song is evergreen also listening to it brings back all the old memories that was associated with this song. Damn wish I could go back in time. | 63 | True | False | False | 568 |

**Figure 5.1:** Most popular comments for the video ENT1 by view count

The figure 5.2 depicts the most popular comments for the ED1 video. Although not seen directly, the number of likes also correlates with the received attention in this case. This video was far less popular than the ENT1 video (175,785 versus 2,653,129,063 views), which explains the lower number of likes for the most popular comments. One comment from an authorised user is present, 47% of the comments contain a high number of likes (> 50) and some comments (27%) are liked by the video author, four comments (27%) contain smileys. Again, all the comments have replies. The comments can be primarily characterised as descriptive; amongst them, there are a lot of product reviews and experience sharing.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count |
|---|---|---|---|---|---|---|---|---|
| 0 | 235 | sublunarskyler | 😊 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now, and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I've spent many of my lunch breaks walking around taking photos and they're great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it's just that good. | 13 | True | False | False | 3728 |
| 1 | 115 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True | 3621 |
| 2 | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120HZ for granted😊 | 214 | True | False | True | 3408 |
| 3 | 78 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | 94 | True | False | True | 3213 |
| 4 | 70 | G Games | I have the 12 pro max and bought my wife the 13 pro max. The 120hz display feels way different. Trying to convince her to trade. No going so well | 84 | True | False | False | 2604 |
| 5 | 222 | chrisak49 | Agree with everything. I did wish Apple didn't do Photographic styles but instead gave us more control over the Smart HDR processing. Let traditional photographers dial down the Smart HDR and let overexposure happen or let people go super aggressive with Smart HDR so nothing is blown out. | 60 | True | False | False | 2543 |
| 6 | 177 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | 46 | True | True | True | 2468 |
| 7 | 143 | MilkMeSlowly | Can definitely agree on battery life, I last charged my 13 pro max to 100% on Tuesday morning at 7am (in Australia) and now at midnight Wednesday I'm on 17% a full 41 hours later! | 21 | True | False | False | 1953 |
| 8 | 108 | Laith Yaseen | Sam if you subtly flipped the bird at your *friends who don*t watch your videos like they*re supposed to* at 2:02 you*re an absolute legend 😊 | 59 | True | False | False | 1714 |
| 9 | 88 | Jett Angeles | I absolutely love the ProMotion display the most. I"ve been gaming on a 120Hz monitor for my gaming PC and using my iPhone 11 Pro Max just kind of felt sluggish. Now that my phone"s got the same refresh rate? It feels so much better. The camera upgrades are a plus as well. I love what they did with it. | 6 | True | False | False | 1568 |
| 10 | 75 | Gina mua INDIA | Im at 37% and i changed it last 17 hours ago, and I've used it at work, back to back calls, zoom meetings, 3 hours of binge watching mom, and music. this baby has a beautiful battery | 16 | True | False | False | 1565 |
| 11 | 172 | Ryuki | I LOVE WATCHING THINGS I CAN AFFORD 😅 | 28 | True | False | False | 1204 |
| 12 | 72 | Genna Jordan | It seriously is perfect. I got the 13 pro in graphite coming from the 12 pro max and I don't regret it at all. Kinda wish I got the silver one it looks amazing. It feels so premium in hand and I love it! Really is perfect! | 73 | True | False | False | 1179 |
| 13 | 151 | Nate Jones | I remember going into an AT&amp;T store to try the new display &amp; my 12 pro max felt so weird afterwards. | 20 | True | False | False | 1001 |
| 14 | 169 | Ronnie Zimmerman | I agree that the silver model looks and feels so luxurious. I was amazed and honestly a little mesmerized when I got mine. | 32 | True | False | False | 932 |

**Figure 5.2:** Most popular comments for the video ED1 by view count

The figure 5.3 shows the most popular comments for the ED2 video. Here, the most popular comment surprisingly has a low number of likes; for most comments (67%), the high number of likes tendency (> 200), however, remains. As for the previous videos, all most popular comments contain replies. Additionally, there is one comment from an authorised user, one comment with the video author's like and one comment with smileys. A decent number of comments (80%) have line breaks, about half of the comments are funny, and the other half describe experiences, give advice or share other sleep techniques.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count |
|---|---|---|---|---|---|---|---|---|
| 0 | 157 | Nick C | Everyone knows you shouldn't drink caffeine after like 3pm, you shouldn't use your bed for entertainment, you shouldn't eat for a few hours before bed, you shouldn't stay in bed if you can't sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it's actually brilliant.<br><br>[I wouldn't bother with this tip, however, if you're prone to sleep paralysis and don't enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don't get sleep paralysis or if you're like me and able to stay calm and find it interesting, maybe give it a try.]<br><br>It's simple: ignore itches (and don't toss and turn.)<br><br>That's it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There's good science behind it too.<br>Sleep is FAR from the "passive" sort of "shutdown" we're taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain.<br><br>When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn't want to do this until you're definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it's tired.) So before your brain makes this handoff it tests your body to see if you're ready for sleep or if you're still conscious.<br><br>One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you're awake and it's not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won't scratch, and your brain knows it can get to work.<br><br>So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don't toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It's not easy to ignore them, and they can get very intense sometimes, but just remember that if you don't itch them it'll help you get to sleep. | 18 | True | False | False | 4353 |
| 1 | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day<br>Step 2: going home<br>Step 3: falling into bed<br>Step 4: awaking the next morning<br>Step 5: repeat until death | 1100 | True | False | False | 3838 |
| 2 | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn't realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False | 3202 |
| 3 | 125 | LilEdits | "Don't think"<br>~Closes my eyes~<br>Thinks about how black became a colour | 2219 | True | False | False | 2260 |
| 4 | 11 | ANGEL LEABRES | Morning: *Tired*<br><br>Afternoon: *Tired*<br><br>Evening: *Tired*<br><br>In bed: *NOT TIRED* | 1300 | True | False | False | 2171 |
| 5 | 50 | CodyTheMemeLord | Title: how i learned to fall asleep in 2 minutes<br><br>Me at 2 am: I N T E R E S S T I N G | 347 | True | False | False | 1811 |
| 6 | 67 | Ethan Botterill | I've been using something very similar to the military method for about 7 years now, but I had no idea it had a name. I coupled it with a meditation type technique, where I lie in bed in a comfortable position, then focus my mind on my feet. Then without moving them, I imagine them falling asleep. Then I move on to the legs, and imagine them falling asleep, and so on up my body until I eventually reach my head, at which point I'm so relaxed I just fall asleep almost instantly. | 6 | True | False | False | 1499 |
| 7 | 40 | CANVAS ARTS | Dont think<br>Dont think<br>Dont think<br><br>My mind: thinks how to not to think | 252 | True | False | False | 1301 |
| 8 | 228 | Victor Sørensen | This guy in 70 years be like:<br>This is how I learned how not to die | 2476 | True | False | True | 1190 |
| 9 | 182 | Roland B. | step one: avoid electronics at night<br><br>mission failed | 280 | True | False | False | 1045 |
| 10 | 243 | elie T | Mike imagining he's on the beach.<br><br>Me imagining I'm inside a class. | 60 | True | False | False | 978 |
| 11 | 188 | SamTheMemerMan | 1:25 "I read a book instead"<br>The light on his face: You lie | 560 | True | False | False | 839 |
| 12 | 115 | Kryptonite | Mike: "Avoid watching electronics at night"<br><br>Me, watching this at night: 📱👀 | 146 | True | False | False | 761 |
| 13 | 139 | Mike Shake | Subscribe for new skills every week!<br>Check out more skills: http://www.youtube.com/c/MikeShake<br><br>Instagram: https://www.instagram.com/mikeshaketv | 1137 | True | True | False | 685 |
| 14 | 56 | Danny | The book was so interesting that it lit his face up | 65 | True | False | False | 634 |

**Figure 5.3:** Most popular comments for the video ED2 by view count

The figure 5.8 depicts the most popular comments for the ENT2 video. This video is the only one containing one comment with zero replies, so 93% of comments contain answers. 73% of the popular comments have a high number of likes (> 500). The comments from authorised users and with video author's like are absent since there were no such comments amongst the first comments shown to the participants. Only one comment with smileys is present. All popular comments for this video are short; most comments contain jokes, and some complement the stand-up comedian.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count |
|---|---|---|---|---|---|---|---|---|
| 0 | 84 | Emrah Öz | "You can have your own opinions but you can"t have your own facts." That"s social media in a nutshell. | 1306 | True | False | False | 4335 |
| 1 | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it"s not them. hahahah | 5220 | True | False | False | 3751 |
| 2 | 249 | Tones Drone Adventures | "Don"t believe everything you read on the internet" - Abraham Lincoln | 2018 | True | False | False | 2521 |
| 3 | 96 | Giggitygoo | The internet was one of the greatest human achievements ever, and we use it in the worst possible way. | 672 | True | False | False | 2269 |
| 4 | 115 | Insula Shots | It"s just funny how the joke about bleach aged very well. 😊 | 2800 | True | False | False | 2031 |
| 5 | 23 | Ash Fuller | Social media has helped all the stupid people find each other | 1722 | True | False | False | 1725 |
| 6 | 129 | John Doe | "Think of how stupid the average person is, and realize half of them are stupider than that." George Carlin | 3617 | True | False | False | 1512 |
| 7 | 88 | Fattiger | "Do you know how stupid the average person is?" Average audience claps in favour. | 2059 | True | False | False | 1379 |
| 8 | 228 | Steve Yao | The 500+ people who clicked "dislike" just helped Ricky make his point. | 190 | True | False | False | 1332 |
| 9 | 157 | Max Seidelman | Remember when Neil told David Brent that "I think you"d rather be popular than steer the ship in the right direction" ? I think this is a point that Gervais has been making throughout his career in his own brand of clever and creative ways. | 2 | True | False | False | 1323 |
| 10 | 302 | tubez4321 | Most everyone on Twitter believes everyone else is stupid. There"s a great irony in that. | 511 | True | False | False | 1214 |
| 11 | 119 | J. Galactus | I"ve said it before and I"ll say it again- with social media, stupidity spreads faster than ever before. | 1620 | True | False | False | 1180 |
| 12 | 192 | Paul Noonan | Respect ricky. Ever sice the Golden Globe awards i see you in a whole new light. It took real guts to hurt the feelings of those idiots in hollywood. | 123 | True | False | False | 1104 |
| 13 | 136 | K Apple | I love how when he says "Think of how stupid the average person is.." and only about 5% of the audience laugh immediately (being smart enough to keep up with him)... Knowing that the average IQ of ppl at this concert would already be significantly higher than the average person. Gives me hope that smart ppl can be heard in one room laughing. | 2 | False | False | False | 1049 |
| 14 | 2 | 23v0lv32 | The guitar lesson analogy is perfect | 738 | True | False | False | 1031 |

**Figure 5.4:** Most popular comments for the video ENT2 by view count

In total, 67% of the popular comments by view count have a high number of likes, 98% have replies, 14% contain an authorised label, 17% contain a video author's like and 12% contain smileys.

The table 5.1 shows the general comment characteristics, such as average length, average number of line breaks, average number of spaces, average number of words and average word length for the 15 most popular comments of each video.

| Video name | Average length | Average # of line breaks | Average # of spaces | Average # of words | Average word length |
|---|---|---|---|---|---|
| ED1 | 182.333 | 0 | 34.733 | 35.733 | 4.029 |
| ED2 | 274.8 | 3 | 52.867 | 53.867 | 3.745 |
| ENT1 | 177.133 | 0.4 | 32 | 33 | 4.31 |
| ENT2 | 116.667 | 0.2 | 20.467 | 21.467 | 4.484 |

**Table 5.1:** Linguistic comment characteristics for all videos

### 5.1.2 Ranking by percentage of people who noticed comments

Below the most popular comments by percentage of people who saw them are presented. The figure 5.5 shows the most popular comments for the ENT1 video. 67% of the comments have a high number of likes (> 500), so also in this case, the number of likes correlates with the comment's popularity. Four comments (27%) of authorised users are present, and 33% of the comments have smileys. The presence of answers remains an essential feature for popularity since only three popular comments do not have replies (20%). Seven of the most popular comments by view count (47%) are present in this ranking as well. The most popular comment by view comment is the second popular one by percentage of people who noticed this comment, which is not a drastic change. Six comments are not in English, and some of them, e.g. the comments with id 286, 247 and 358, contain neither linguistic nor non-linguistic features, which could draw participants' attention. If

not taking into account the non-English comments, the comments not presented in the sorted by view count ranking are the comments with the ids 305, which contains the song text, and 133, which is positive and nostalgic, contains a smiley, has replies and a high number of likes and is posted by an authorised user.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 108 | BujidoCavaco Channel | 05 de Novembro de 2019 relembrando minha infância. Eita SAUDADES MEU DEUS! | 39000 | True | True | False | 33 | 36 | 0.916667 | 739 |
| 1 | 412 | iiShadowii7 | Someone could confess that they killed someone in here and it would be buried under the 4.6M other comments | 39000 | True | False | False | 52 | 57 | 0.912281 | 2152 |
| 2 | 286 | Pablo | kkkkkkkkkk, saudades dessa época, era muito bom siq, lembro q eu ficava irritado com meu irmão quando chamava de justin BIBA | 38 | True | False | False | 10 | 11 | 0.909091 | 149 |
| 3 | 247 | Marcos Vinícius O. Barreto | Terça feira 02 dos 11 de 2021 e eu aqui relembrando minha infância.... nostalgia BRBR | 43 | True | False | False | 10 | 11 | 0.909091 | 44 |
| 4 | 264 | Multicort | It's crazy how many people come back to this everyday.This song is legendary♪ | 2700 | True | True | False | 29 | 32 | 0.906250 | 1024 |
| 5 | 296 | Pool_Dead | Fun fact: This song is more popular than many artists out there | 1100 | True | False | False | 24 | 28 | 0.857143 | 499 |
| 6 | 206 | João Vitor | Essa música fez parte da minha infância, tinha apenas 6 anos quando conheci essa música...♥♥ | 21 | False | False | False | 12 | 14 | 0.857143 | 135 |
| 7 | 358 | Thainá Frezarini Dias da Silva | Vibe sinistra que faz com que a gente cante sem parar. Nostalgia pura. Saudades dessa época. &lt;3 | 71 | False | False | False | 11 | 13 | 0.846154 | 119 |
| 8 | 133 | Debo Gaming | Who else just randomly remembered this song 😊 | 2400 | True | True | False | 16 | 19 | 0.842105 | 296 |
| 9 | 305 | Rafesa Berlian | Ooh whoa, ooh whoa, ooh whoa<br>You know you love me, I know you care<br>Just shout whenever and I"ll be there<br>You are my love, you are my heart<br>And we will never, ever, ever be apart<br><br>Are we an item? Girl quit playin"<br>We"re just friends, what are you sayin"<br>Said there"s another, look right in my eyes<br>My first love, broke my heart for the first time<br><br>And I was like baby, baby, baby oh<br>Like baby, baby, baby no<br>Like baby, baby, baby oh<br>I thought you"d always be mine (mine)<br>Baby, baby, baby oh<br>Like baby, baby, baby no<br>Like baby, baby, baby ooh<br>I thought you"d always be mine<br><br>Oh for you, I would have done whatever<br>And I just can"t believe we ain"t together<br>And I wanna play it cool<br>But I"m losin" you<br>I"ll buy you anything<br>I"ll buy you any ring<br>And I"m in pieces, baby fix me<br>And just shake me, "til you wake me from this bad dream<br>I"m goin" down, down, down, down<br>And I can"t just believe my first love won"t be around<br><br>And I"m like baby, baby, baby oh<br>Like baby, baby, baby no<br>Like baby, baby, baby oh<br>I thought you"d always be mine (mine)<br>Baby, baby, baby oh<br>Like baby, baby, baby no<br>Like baby, baby, baby ooh<br>I thought you"d always be mine<br><br>Luda, when I was thirteen, I had my first love<br>There was nobody that compared to my baby<br>And nobody came between us no one could ever come above<br>She had me goin" crazy<br>Oh, I was starstruck<br>She woke me up daily<br>Don"t need no Starbucks<br>She made my heart pound<br>And skip a beat when I see her in the street and<br>At school on the playground<br>But I really wanna see her on the weekend<br>She know she got me dazin"<br>"Cause she was so amazin"<br>And now my heart is breakin"<br>But I just keep on sayin"<br><br>Baby, baby, baby oh<br>Like baby, baby, baby no<br>Like baby, baby, baby oh<br>I thought you"d always be mine (mine)<br>Baby, baby, baby oh<br>Like baby, baby, baby no<br>Like baby, baby, baby ooh<br>I thought you"d always be mine<br><br>Now I"m gone<br>Yeah, yeah, yeah<br>Yeah, yeah, yeah (now I"m all gone)<br>Yeah, yeah, yeah<br>Yeah, yeah, yeah (now I"m all gone)<br>Yeah, yeah, yeah<br>Yeah, yeah, yeah (now I"m all gone)<br>Gone, gone, gone, I"m gone | 746 | True | False | False | 10 | 12 | 0.833333 | 292 |
| 10 | 431 | princesses don't cry | Fato: muitos conheceram JB por essa música cmg foi assim 😊 | 19 | False | False | False | 9 | 11 | 0.818182 | 154 |
| 11 | 74 | Andrei Teleptean | You are now 12 years old and this song has just been released<br>Imagine those days... | 2800 | True | False | False | 40 | 50 | 0.800000 | 1222 |
| 12 | 266 | My World | It took me 10 years to realize "DRAKE" was in this video 💀🙏 | 903 | True | False | False | 20 | 25 | 0.800000 | 897 |
| 13 | 368 | Tofuh | I am obligated to listen this song 1 hour ... The worst challenge ... | 17000 | True | True | False | 24 | 30 | 0.800000 | 1623 |
| 14 | 376 | Vel Vel | Imagine trying to bowl but there's guys dancing on the lanes | 5400 | True | False | False | 31 | 39 | 0.794872 | 869 |

**Figure 5.5:** Most popular comments for the video ENT1 by percentage of people who saw them

The figure 5.6 depicts the most popular comments for the ED1 video. The popular comments remain the same except for the comments with the comment id 64 and 131, which are positive reviews and do not have replies, a high number of likes or replies or any other features that could draw the attention of the participants. The ':)' symbol combination at the end is not considered as smiley since it does not stand out with its form and/or colour. Only the four most popular comments (27%) contain a like from the video creator. 47% of the comments have a high number of likes (> 50), 87% have replies, 20% contain smileys and one comment (7%) contains an authorised label.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 177 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | 46 | True | True | True | 61 | 62 | 0.983871 | 2468 |
| 1 | 115 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True | 59 | 62 | 0.951613 | 3621 |
| 2 | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120Hz for granted😊 | 214 | True | False | True | 58 | 62 | 0.935484 | 3408 |
| 3 | 78 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | 94 | True | False | True | 53 | 59 | 0.898305 | 3213 |
| 4 | 235 | sublunarskyler | 😊 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now, and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I've spent many of my lunch breaks walking around taking photos and they're great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it's just that good. | 13 | True | False | False | 49 | 55 | 0.890909 | 3728 |
| 5 | 143 | MilkMeSlowly | Can definitely agree on battery life, I last charged my 13 pro max to 100% on Tuesday morning at 7am (in Australia) and now at midnight Wednesday I'm in 17% a full 41 hours later! | 21 | True | False | False | 54 | 61 | 0.885246 | 1953 |
| 6 | 70 | G Games | I have the 12 pro max and bought my wife the 13 pro max. The 120hz display feels way different. Trying to convince her to trade. No going so well | 84 | True | False | False | 52 | 59 | 0.881356 | 2604 |
| 7 | 222 | chrisak49 | Agree with everything. I did wish Apple didn't do Photographic styles but instead gave us more control over the Smart HDR processing. Let traditional photographers dial down the Smart HDR and let overexposure happen or let people go super aggressive with Smart HDR so nothing is blown out. | 60 | True | False | False | 52 | 60 | 0.866667 | 2543 |
| 8 | 64 | Fran's School Stuff | I have the 13 in blue, loving it so far! :) | 3 | False | False | False | 10 | 12 | 0.833333 | 174 |
| 9 | 108 | Laith Yaseen | Sam if you subtly flipped the bird at your "friends who don't watch your videos like they're supposed to" at 2:02 you're an absolute legend 😊 | 59 | True | False | False | 40 | 50 | 0.800000 | 1714 |
| 10 | 131 | Mark Moore | Hell, I'd even take just a regular 13. They did a fantastic job and now the base has a nice oled screen I like that. | 5 | False | False | False | 28 | 35 | 0.800000 | 698 |
| 11 | 169 | Ronnie Zimmerman | I agree that the silver model looks and feels so luxurious. I was amazed and honestly a little mesmerized when I got mine. | 32 | True | False | False | 41 | 55 | 0.745455 | 932 |
| 12 | 72 | Genna Jordan | It seriously is perfect. I got the 13 pro in graphite coming from the 12 pro max and I don't regret it at all. Kinda wish I got the silver one it looks amazing. It feels so premium in hand and I love it! Really is perfect! | 73 | True | False | False | 36 | 49 | 0.734694 | 1179 |
| 13 | 88 | Jett Angeles | I absolutely love the ProMotion display the most. I've been gaming on a 120Hz monitor for my gaming PC and using my iPhone 11 Pro Max just kind of felt sluggish. Now that my phone's got the same refresh rate? It feels so much better. The camera upgrades are a plus as well. I love what they did with it. | 6 | True | False | False | 41 | 56 | 0.732143 | 1568 |
| 14 | 32 | Cen | I can say the same. I've had the 13 Pro Max for 2 days it feels like a million bucks in my hand 120hz alone. | 22 | True | False | False | 28 | 39 | 0.717949 | 788 |

**Figure 5.6:** Most popular comments for the video ED1 by percentage of people who saw them

The figures 5.7 show the most popular comments for the ED2 video. Four comments (27%) were not present in the ranking by view count, namely, with the ids 233, 217, 218 and 97. 218 and 97 contain smileys, 233 includes a sleeping technique, and 217 is a neutral comment. None of these comments has a high number of likes, but they all have replies. On the contrary, the three most popular comments in this ranking were liked by many users. In total, 20% of the popular comments contain smileys, 53% have a high number of likes, all comments have replies, one comment (7%) contains an authorised label and none of the comments contains a video creator's like.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 11 | ANGEL LEABRES | Morning: "Tired"<br>Afternoon: "Tired"<br>Evening: "Tired"<br>In bed: "NOT TIRED" | 1300 | True | False | False | 57 | 61 | 0.934426 | 2171 |
| 1 | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day Step 2: going home Step 3: falling into bed Step 4: awaking the next morning Step 5: repeat until death | 1100 | True | False | False | 57 | 61 | 0.934426 | 3838 |
| 2 | 125 | LilEdits | "Don't think"<br>~Closes my eyes~<br>Thinks about how black became a colour | 2219 | True | False | False | 55 | 60 | 0.916667 | 2260 |
| 3 | 157 | Nick C | Everyone knows you shouldn"t drink caffeine after like 3pm, you shouldn"t use your bed for entertainment, you shouldn"t eat for a few hours before bed, you shouldn"t stay in bed if you can"t sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it"s actually brilliant.<br><br>[I wouldn"t bother with this tip, however, if you"re prone to sleep paralysis and don"t enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don"t get sleep paralysis or if you"re like me and able to stay calm and find it interesting, maybe give it a try.]<br><br>It"s simple: ignore itches (and don"t toss and turn.)<br><br>That"s it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There"s good science behind it too. Sleep is FAR from the "passive" sort of "shutdown" we"re taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain.<br><br>When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn"t want to do this until you"re definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it"s tired.) So before your brain makes this handoff it tests your body to see if you"re ready for sleep or if you"re still conscious.<br><br>One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you"re awake and it"s not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won"t scratch, and your brain knows it can get to work.<br><br>So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don"t toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It"s not easy to ignore them, and they can get very intense sometimes, but just remember that if you don"t itch them it"ll help you get to sleep. | 18 | True | False | False | 30 | 33 | 0.909091 | 4353 |
| 4 | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn"t realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False | 50 | 59 | 0.847458 | 3202 |
| 5 | 233 | Yuki Cross | I learnt this thing called 'heart math' that's meant to calm you down. It's quick and I also use it to sleep! It's three steps called heart focus, heart breathe, heart feel.<br><br>Step 1: Heart focus - try focusing on your breath, heartbeat, or pulse. It may help to put your hand over your heart to feel the beat or somewhere you can feel your pulse. Do this for a few seconds or however long you'd like.<br>Step 2: Heart breathe - breathe in and out while counting to how ever long you want. I usually slowly breathe in and out for 6 seconds each. Repeat this step as much as you feel necessary.<br>Step 3: Heart feel - think of or imagine things that make you happy, this can be a good memory of yours, or a favourite food etc. It could also be something you look forward too in the future.<br><br>I'm usually put to sleep after beginning step 3, and this can be used before a test or anything that might make you anxious. Hope this helps anyone! | 1 | True | False | False | 21 | 25 | 0.840000 | 593 |
| 6 | 182 | Roland B. | step one: avoid electronics at night<br>mission failed | 280 | True | False | False | 41 | 49 | 0.836735 | 1045 |
| 7 | 115 | Kryptonite | Mike: "Avoid watching electronics at night"<br>Me, watching this at night: 📱👀 | 146 | True | False | False | 34 | 41 | 0.829268 | 761 |
| 8 | 217 | Theory of Everything | My Dad"s a master of this I"m not kidding, his WR is 20 seconds | 52 | True | False | False | 23 | 28 | 0.821429 | 432 |
| 9 | 139 | Mike Shake | Subscribe for new skills every week!<br>Check out more skills: http://www.youtube.com/c/MikeShake<br>Instagram: https://www.instagram.com/mikeshaketv | 1137 | True | True | False | 50 | 61 | 0.819672 | 685 |
| 10 | 40 | CANVAS ARTS | Dont think<br>Dont think<br>Dont think<br>My mind: thinks how to not to think | 252 | True | False | False | 36 | 44 | 0.818182 | 1301 |
| 11 | 218 | This amazing person | I NEED THIS IT IS LITERALLY MIDNIGHT 🕛 I CANT SLEEP WITHOUT THIS!!! | 2 | True | False | False | 13 | 16 | 0.812500 | 238 |
| 12 | 188 | SamTheMemerMan | 1:25 "I read a book instead"<br>The light on his face: You lie | 560 | True | False | False | 30 | 37 | 0.810811 | 839 |
| 13 | 97 | Jiya | "I think of many weird...different things" 😂😂 man that image was awesome | 8 | True | False | False | 17 | 21 | 0.809524 | 377 |
| 14 | 67 | Ethan Botterill | I"ve been using something very similar to the military method for about 7 years now, but I had no idea it had a name. I coupled it with a meditation type technique, where I lie in bed in a comfortable position, then focus my mind on my feet. Then without moving them, I imagine them falling asleep. Then I move on to the legs, and imagine them falling asleep, and so on up my body until I eventually reach my head, at which point I"m so relaxed I just fall asleep almost instantly. | 6 | True | False | False | 23 | 29 | 0.793103 | 1499 |

**Figure 5.7:** Most popular comments for the video ED2 by percentage of people who saw them

The figure 5.8 depicts the most popular comments for the ENT2 video. In contrast to the ranking by view count, all popular comments contain replies. Four comments (27%) with the comment ids 82, 122, 29 and 307 were not present in the previous ranking. The comment with the comment id 307 is negative because it criticises social media but supports Ricky Gervais. All the other new comments are very positive and compliment the stand-up comedian. In total, 73% of the comments have a high number of likes and only one comment (7%) contain smileys. None of the comments contains an authorised label or a video creator's like, as such comments were not present amongst the comments shown to the participants.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 84 | Emrah Öz | "You can have your own opinions but you can"t have your own facts." That"s social media in a nutshell. | 1306 | True | False | False | 60 | 61 | 0.983607 | 4335 |
| 1 | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it"s not them. hahahah | 5220 | True | False | False | 59 | 61 | 0.967213 | 3751 |
| 2 | 249 | Tones Drone Adventures | "Don"t believe everything you read on the internet" - Abraham Lincoln | 2018 | True | False | False | 57 | 61 | 0.934426 | 2521 |
| 3 | 82 | Elizabeth Toner | Goddamn, I adore this man! Protect the critical thinkers at all costs! | 23 | True | False | False | 14 | 15 | 0.933333 | 217 |
| 4 | 122 | Jadeja Brijraj Sinh | this guy never ceases to amaze me with his comedy. the truth he says in disguise of comedy is genius | 26 | True | False | False | 11 | 12 | 0.916667 | 215 |
| 5 | 115 | Insula Shots | It"s just funny how the joke about bleach aged very well. 😊 | 2800 | True | False | False | 54 | 60 | 0.900000 | 2031 |
| 6 | 29 | Black Heart | Ricky doesn"t tell jokes, he spits facts. | 470 | True | False | False | 38 | 43 | 0.883721 | 772 |
| 7 | 88 | Fattiger | "Do you know how stupid the average person is?" Average audience claps in favour. | 2059 | True | False | False | 45 | 51 | 0.882353 | 1379 |
| 8 | 129 | John Doe | "Think of how stupid the average person is, and realize half of them are stupider than that." George Carlin | 3617 | True | False | False | 52 | 59 | 0.881356 | 1512 |
| 9 | 307 | �ᚲᛁᛗ | This. That"s it. Social media and the idea of "influencers" is such a joke. | 378 | True | False | False | 37 | 42 | 0.880952 | 1003 |
| 10 | 2 | 23v0lv32 | The guitar lesson analogy is perfect | 738 | True | False | False | 44 | 50 | 0.880000 | 1031 |
| 11 | 23 | Ash Fuller | Social media has helped all the stupid people find each other | 1722 | True | False | False | 51 | 59 | 0.864407 | 1725 |
| 12 | 228 | Steve Yao | The 500+ people who clicked "dislike" just helped Ricky make his point. | 190 | True | False | False | 41 | 48 | 0.854167 | 1332 |
| 13 | 119 | J. Galactus | I"ve said it before and I"ll say it again- with social media, stupidity spreads faster than ever before. | 1620 | True | False | False | 45 | 53 | 0.849057 | 1180 |
| 14 | 96 | Giggitygoo | The internet was one of the greatest human achievements ever, and we use it in the worst possible way. | 672 | True | False | False | 50 | 59 | 0.847458 | 2269 |

**Figure 5.8:** Most popular comments for the video ENT2 by percentage of people who saw them

In total, 60% of the popular comments by percentage of people who saw them have a high number of likes (7% less than for the popular comments by view count), 92% have replies (6% less than for the popular comments by view count), 14% contain an authorised label (same for the popular comments by view count), 14% contain a video author's like (3% less than for the popular comments by view count) and 20% contain smileys (8% more than for the popular comments by view count).

The table 5.2 shows the general comment characteristics, such as average length, average number of line breaks, average number of spaces, average number of words and average word length for the 15 most popular comments of each video.

| Video name | Average length | Average # of line breaks | Average # of spaces | Average # of words | Average word length |
|---|---|---|---|---|---|
| ED1 | 125.3 | 0.05 | 22.6 | 23.6 | 4.2006 |
| ED2 | 82.95 | 0.7 | 16.35 | 17.35 | 3.895 |
| ENT1 | 135.55 | 0.25 | 23.75 | 24.75 | 4.6434 |
| ENT2 | 131.5 | 0 | 23.3 | 24.3 | 4.3593 |

**Table 5.2:** Linguistic comment characteristics for all videos

Compared to the statistics for the popular videos sorted by view count, the comments sorted by percentage of people who saw them for the videos ENT1, ED1 and ED2 are shorter, but for the video ENT2 they are slightly longer. The average number of spaces and words increased or decreased correspondingly with the comments' length. However, the most popular comments sorted by view count contain fewer line breaks for the video ED1 and more line breaks for the video ENT2. The average word length remained approximately the same.

### 5.1.3 Sentiment analysis

In order to gain some additional insights about the characteristics of the most popular YouTube comments, the sentiment analysis was conducted. For this purpose, three sentiment models were chosen: Flair, XLNet and TextBlob. Flair [Mag18] delivers state-of-the-art performance in solving NLP problems such as named entity recognition (NER), part-of-speech tagging (PoS), sense disambiguation and text classification. Its sentiment classifier is based on a character-level LSTM neural network which takes sequences of letters and words into account when predicting [Ter19]. It is able to take both negations, e.g. 'I do not like dogs', and intensifiers, e.g. 'You are so dumb', into account. One of its most significant advantages is that it can also predict sentiment for out of vocabulary words that it has never seen before, such as typos, which is highly crucial for the YouTube comments domain. Flair is trained on the IMDB dataset and an 'offensive language detection' model, which currently only supports German [Mag18]. The main disadvantage of using this model is the inability of neutral predictions, although it is common for YouTube comments to have a neutral tone. A modification of this model called Flair sentiment fast model represents an RNN based model and is used in the current master thesis mainly for comparison purposes.

XLNet ([YDY+20], [Gha20]) is a Google's model, which achieved state-of-the-art performance on the major NLP tasks such as Text Classification, Sentiment Analysis, Question Answering, and Natural Language Inference along with the essential GLUE benchmark for English. Moreover, it outperformed BERT and is used for not only text classification but also advanced NLP tasks.

XLNet is based on Generalized Autoregressive Pretraining for Language Understanding and the Transformer-XL.XLNet proposes a technique called Permutation Language Modeling during the pre-training phase. This technique uses permutations to generate information and predict the next word using the context words from both the forward and backward directions simultaneously. XLNet uses Transformer XL, which is an enhanced version of the transformer used in BERT by adding two components:

1. A recurrence at specific segments, which gives the context between 2 sequences.

2. A relative positional embedding, which contains information on the similarity between 2 tokens. [YDY+20]

However, the XLNet model has the same limitation as the Flair model, namely, not being able to produce neutral predictions, which is a critical disadvantage for the YouTube comments domain.

The third used sentiment model is TextBlob, which is a Python library for processing textual data. It provides a simple API for diving into common NLP tasks such as part-of-speech tagging, noun phrase extraction, sentiment analysis, classification, translation, and more [1]. The biggest advantage of the TextBlob model is that it includes subjectivity analysis as well, i.e. how factual/opinionated a piece of text is [Ter19]. Sentiment is given as a number from -1 to 1, where -1 is negative, 0 is neutral and 1 is positive, whereas subjectivity is given from 0 to 1, where 0 means 'comment is objective' and 1 means 'comment is subjective'. However, it does not take into account intensifiers or negations.

For the specific domain of YouTube comments, this model is the most appropriate since it is the fastest one, and it is possible to choose thresholds to determine comment sentiment and subjectivity, so it is feasible to distinguish the neutral comments as well.

The figure 5.9 represents the sentiment analysis for the ENT1 video. As one can see, the Flair sentiment model fails to produce correct predictions for the neutral comments; however, the Flair sentiment fast model gives fewer negative scores for the neutral comments. For people, it is obvious that the first most popular comment is a joke, but since it contains the word 'killed', most models yield a very negative prediction for it. Only the TextBlob model gives a minor negative score, which can be transformed to a neutral one given an appropriate threshold. It also gives a perfectly neutral score for the neutral comments of My World, Vel Vel and Kitty Kate. For the objective comment of Kitty Kate it even gave a subjectivity score of 0. XLNet performed the most poorly on this dataset, e.g. it is the only model that gave a positive prediction for a clearly negative comment of the user Tofuh. The manual sentiment analysis shows that amongst these comments, there are two negative ones (13%) with the comment ids 368 and 143, three positive ones (20%) with the comment ids 264, 192 and 333, while all others are neutral (67%). With a threshold (-0.2, 0.2) for the TextBlob model for neutral comment classification, this model correctly classified 57% of comments. The comments written not in English are neglected in the analysis.

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[1] https://textblob.readthedocs.io/en/dev/

| | comment_id | author_name | comment_text | sentiment_flair | sentiment_fast_flair | sentiment_xlnet | sentiment_textblob | subjectivity_textblob |
|---|---|---|---|---|---|---|---|---|
| 0 | 412 | iiShadowii7 | Someone could confess that they killed someone in here and it would be buried under the 4.6M other comments | NEGATIVE (0.9998) | NEGATIVE (0.9733) | negative (0.6828) | -0.1625 | 0.1875 |
| 1 | 368 | Tofuh | I am obligated to listen this song 1 hour ... The worst challenge ... | NEGATIVE (0.9999) | NEGATIVE (0.9888) | positive (0.538) | -1.0000 | 1.0000 |
| 2 | 74 | Andrei Teleptean | You are now 12 years old and this song has just been released Imagine those days... | POSITIVE (0.9684) | POSITIVE (0.9251) | negative (0.5882) | 0.1000 | 0.2000 |
| 3 | 264 | Multicort | It*s crazy how many people come back to this everyday.This song is legendary♪ | POSITIVE (0.9986) | POSITIVE (0.9757) | negative (0.7629) | -0.0333 | 0.4667 |
| 4 | 330 | Selin Naz Sur | Remembered this out of nowhere lmao. I used to STAN Justin Bieber as a preteen. He was a cute kid who was only two years older than me, had a cute voice, dressed very nicely etc. Then a few years later my music taste started to change and he started doing some outrageous things, so my love turned to hate for a while (internet had some influence on that too). Nowadays I don*t hate him, but rather, I feel bad for him because I know better as an adult. Looking back, all this fame and attention just didn*t do him well mentally. Being a celebrity must take a toll on your psychology with all the (sometimes unwanted) attention and unnaturally high expectations people have for you. The media doesn*t leave you alone, music/movie companies don*t leave you alone, you*re at risk of getting stalked by some real sick individuals, people who don*t know you personally judge and scrutinize you over your simplest actions forgetting that you*re human too... Now imagine being a CHILD and getting exposed to all of that. I can*t excuse when celebs act like fools or break the law, but I get it. I*m not interested in Justin*s music anymore but I wish the best for him and his loved ones. | NEGATIVE (1.0) | NEGATIVE (0.5998) | positive (0.5936) | 0.0293 | 0.5636 |
| 5 | 143 | Dubspez | Compared to the cancer that exists today, this song isn*t even half bad. 2010 people had no idea what would come as Internet became more mainstream | POSITIVE (0.9019) | NEGATIVE (0.982) | negative (0.5123) | -0.1222 | 0.4444 |
| 6 | 360 | Thanh Cong - TC | This is a reference for anyone from the future when Youtube no longer show the dislikes :( November 11th and this video has 12M dislikes | NEGATIVE (0.9997) | NEGATIVE (0.9104) | negative (0.5647) | -0.3750 | 0.5625 |
| 7 | 266 | My World | It took me 10 years to realize "DRAKE" was in this video 🎥👤 | POSITIVE (0.7725) | NEGATIVE (0.7883) | negative (0.6177) | 0.0000 | 0.0000 |
| 8 | 376 | Vel Vel | Imagine trying to bowl but there*s guys dancing on the lanes | POSITIVE (0.8659) | NEGATIVE (0.8269) | negative (0.5674) | 0.0000 | 0.0000 |
| 9 | 180 | Helena Palit-ang | Dude, he sounds like a 10-year-old.... but he was like 16 when he sang this Edit: Ok I*m not trying to say that he has a bad voice, he has a wonderful voice. He just sounds really young for his age | NEGATIVE (0.9989) | NEGATIVE (0.6039) | positive (0.5311) | 0.2250 | 0.6417 |
| 10 | 108 | BujidoCavaco Channel | 05 de Novembro de 2019 relembrando minha infância. Eita SAUDADES MEU DEUS! | POSITIVE (0.9658) | POSITIVE (0.9815) | positive (0.5088) | 0.0000 | 0.0000 |
| 11 | 192 | Jackson Bird | Let*s be honest, Justin Bieber owned the world for few days when this song was released | NEGATIVE (0.9777) | POSITIVE (0.616) | negative (0.6353) | 0.2000 | 0.5000 |
| 12 | 228 | Kitty Kate | Baby:took 9 years to get 9.9 million dislikes youtube rewind 2018:took 6 days to get 10 million dislikes | NEGATIVE (0.9994) | NEGATIVE (0.8092) | positive (0.5074) | 0.0000 | 0.0000 |
| 13 | 273 | Nexo Games | i still can*t believe youtube disabled the dislikes. we*ll never know what the most hated video will be... | NEGATIVE (0.9998) | NEGATIVE (0.7061) | negative (0.6873) | -0.2000 | 0.5000 |
| 14 | 333 | Shreyaa Balaji | This song is evergreen also listening to it brings back all the old memories that was associated with this song. Damn wish I could go back in time. | POSITIVE (0.9965) | POSITIVE (0.9962) | positive (0.534) | 0.0333 | 0.0667 |

**Figure 5.9:** Sentiment analysis for the most popular comments for the video ENT1 by view count

The figure 5.10 represents the sentiment analysis for the video ED1. The models performance is similar to the one of the video ENT1: TextBlob successfully determined the sentiments for the vast majority of comments, while predictions of both Flair variants were not so precise and XLNet failed completely. The manual sentiment analysis demonstrates that amongst these comments, there are zero negative ones, six neutral ones (40%) with the comment ids 38, 70, 222, 143, 108 and 151, while all others are positive (60%). With a threshold (-0.2, 0.2) for the TextBlob model for neutral comment classification, this model correctly classified 87% of comments.

| | comment_id | author_name | comment_text | sentiment_flair | sentiment_fast_flair | sentiment_xlnet | sentiment_textblob | subjectivity_textblob |
|---|---|---|---|---|---|---|---|---|
| 0 | 235 | sublunarskyler | 😊 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now, and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I"ve spent many of my lunch breaks walking around taking photos and they"re great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it"s just that good. | POSITIVE (0.9999) | POSITIVE (0.9828) | positive (0.5953) | 0.2833 | 0.5406 |
| 1 | 115 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | POSITIVE (0.9993) | NEGATIVE (0.7637) | negative (0.587) | 0.0000 | 1.0000 |
| 2 | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120Hz for granted 😊 | POSITIVE (0.9994) | POSITIVE (0.6549) | negative (0.5515) | 0.0000 | 0.3000 |
| 3 | 78 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | POSITIVE (0.9998) | POSITIVE (0.9988) | negative (0.5571) | 0.5000 | 0.8000 |
| 4 | 70 | G Games | I have the 12 pro max and bought my wife the 13 pro max. The 120hz display feels way different. Trying to convince her to trade. No going so well | NEGATIVE (1.0) | NEGATIVE (0.9928) | negative (0.599) | 0.0000 | 0.6000 |
| 5 | 222 | chrisak49 | Agree with everything. I did wish Apple didn't do Photographic styles but instead gave us more control over the Smart HDR processing. Let traditional photographers dial down the Smart HDR and let overexposure happen or let people go super aggressive with Smart HDR so nothing is blown out. | POSITIVE (0.5866) | NEGATIVE (0.9983) | negative (0.5313) | 0.1887 | 0.5906 |
| 6 | 177 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | POSITIVE (1.0) | POSITIVE (0.9536) | negative (0.6707) | 1.0000 | 0.3000 |
| 7 | 143 | MilkMeSlowly | Can definitely agree on battery life, I last charged my 13 pro max to 100% on Tuesday morning at 7am (in Australia) and now at midnight Wednesday I'm on 17% a full 41 hours later! | POSITIVE (0.9925) | POSITIVE (0.8831) | positive (0.6142) | 0.0875 | 0.2792 |
| 8 | 108 | Laith Yaseen | Sam if you subtly flipped the bird at your "friends who don"t watch your videos like they"re supposed to" at 2:02 you"re an absolute legend 😊 | POSITIVE (0.9906) | POSITIVE (0.539) | negative (0.6723) | -0.0667 | 0.7000 |
| 9 | 88 | Jett Angeles | I absolutely love the ProMotion display the most. I"ve been gaming on a 120Hz monitor for my gaming PC and using my iPhone 11 Pro Max just kind of felt sluggish. Now that my phone"s got the same refresh rate? It feels so much better. The camera upgrades are a plus as well. I love what they did with it. | POSITIVE (0.9642) | POSITIVE (0.9857) | positive (0.6633) | 0.4333 | 0.5375 |
| 10 | 75 | Gina mua INDIA | Im at 37% and i changed it last 17 hours ago, and I've used it at work, back to back calls, zoom meetings, 3 hours of binge watching mom, and music. this baby has a beautiful battery | POSITIVE (0.9998) | POSITIVE (0.5159) | negative (0.5281) | 0.2125 | 0.2667 |
| 11 | 172 | Ryuki | I LOVE WATCHING THINGS I CAN AFFORD 😎 | POSITIVE (0.9973) | POSITIVE (0.999) | negative (0.6711) | 0.5000 | 0.6000 |
| 12 | 72 | Genna Jordan | It seriously is perfect. I got the 13 pro in graphite coming from the 12 pro max and I don't regret it at all. Kinda wish I got the silver one it looks amazing. It feels so premium in hand and I love it! Really is perfect! | POSITIVE (0.9998) | POSITIVE (0.9993) | negative (0.5608) | 0.8063 | 0.8750 |
| 13 | 151 | Nate Jones | I remember going into an AT&amp;T store to try the new display &amp; my 12 pro max felt so weird afterwards. | NEGATIVE (0.9929) | NEGATIVE (0.8196) | negative (0.5613) | -0.1818 | 0.7273 |
| 14 | 169 | Ronnie Zimmerman | I agree that the silver model looks and feels so luxurious. I was amazed and honestly a little mesmerized when I got mine. | POSITIVE (0.9994) | POSITIVE (0.9826) | negative (0.6918) | -0.1875 | 0.5000 |

**Figure 5.10:** Sentiment analysis for the most popular comments for the video ED1 by view count

The figure 5.11 represents the sentiment analysis for the video ED2. The models performance is similar to the one of the video ENT1. The manual sentiment analysis reveals that all these comments are neutral. With a threshold (-0.2, 0.2) for the TextBlob model for neutral comment classification, this model correctly classified 67% of comments.

| | comment_id | author_name | comment_text | sentiment_flair | sentiment_fast_flair | sentiment_xlnet | sentiment_textblob | subjectivity_textblob |
|---|---|---|---|---|---|---|---|---|
| 0 | 157 | Nick C | Everyone knows you shouldn"t drink caffeine after like 3pm, you shouldn"t use your bed for entertainment, you shouldn"t eat for a few hours before bed, you shouldn"t stay in bed if you can"t sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it"s actually brilliant. [I wouldn"t bother with this tip, however, if you"re prone to sleep paralysis and don"t enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don"t get sleep paralysis or if you"re like me and able to stay calm and find it interesting, maybe give it a try.] It"s simple: ignore itches (and don"t toss and turn.) That"s it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There"s good science behind it too. Sleep is FAR from the "passive" sort of "shutdown" we"re taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain. When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn"t want to do this until you"re definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it"s tired.) So before your brain makes this handoff it tests your body to see if you"re ready for sleep or if you"re still conscious. One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you"re awake and it"s not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes it does during then you won"t scratch, and your brain knows it can get to work. So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don"t toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It"s not easy to ignore them, and they can get very intense sometimes, but just remember that if you don"t itch them it"ll help you get to sleep. | NEGATIVE (0.5863) | NEGATIVE (0.9998) | positive (0.508) | 0.1414 | 0.6032 |
| 1 | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day Step 2: going home Step 3: falling into bed Step 4: awaking the next morning Step 5: repeat until death | POSITIVE (0.6139) | NEGATIVE (0.7875) | positive (0.5537) | 0.0000 | 0.0000 |
| 2 | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn"t realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | NEGATIVE (0.9998) | NEGATIVE (0.9759) | positive (0.5303) | 0.0007 | 0.3444 |
| 3 | 125 | LilEdits | "Don"t think" ~Closes my eyes~ Thinks about how black became a colour | POSITIVE (0.815) | NEGATIVE (0.9556) | negative (0.6418) | -0.1667 | 0.4333 |
| 4 | 11 | ANGEL LEABRES | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* In bed: *NOT TIRED* | NEGATIVE (0.9816) | NEGATIVE (0.9972) | negative (0.5405) | -0.2500 | 0.7000 |
| 5 | 50 | CodyTheMemeLord | Title: how i learned to fall asleep in 2 minutes Me at 2 am: I N T E R E S S T I N G | NEGATIVE (0.9984) | NEGATIVE (0.7643) | negative (0.6125) | 0.0000 | 0.0000 |
| 6 | 67 | Ethan Botterill | I"ve been using something very similar to the military method for about 7 years now, but I had no idea it had a name. I coupled it with a meditation type technique, where I lie in bed in a comfortable position, then focus my mind on my feet. Then without moving them, I imagine them falling asleep. Then I move on to the legs, and imagine them falling asleep, and so on up my body until I eventually reach my head, at which point I"m so relaxed I just fall asleep almost instantly. | POSITIVE (0.6722) | POSITIVE (0.9078) | positive (0.5144) | 0.0750 | 0.5217 |
| 7 | 40 | CANVAS ARTS | Dont think Dont think Dont think My mind: thinks how to not to think | NEGATIVE (0.8409) | NEGATIVE (0.7694) | negative (0.5261) | 0.0000 | 0.0000 |
| 8 | 228 | Victor Sørensen | This guy in 70 years be like: This is how I learned how not to die | POSITIVE (0.9983) | POSITIVE (0.9204) | negative (0.6179) | 0.0000 | 0.0000 |
| 9 | 182 | Roland B. | step one: avoid electronics at night mission failed | NEGATIVE (0.9958) | NEGATIVE (0.9843) | negative (0.6222) | -0.5000 | 0.3000 |
| 10 | 243 | elie T | Mike imagining he"s on the beach. Me imagining I"m inside a class. | POSITIVE (0.8741) | NEGATIVE (0.818) | negative (0.6257) | 0.0000 | 0.0000 |
| 11 | 188 | SamTheMemerMan | 1:25 "I read a book instead" The light on his face: You lie | NEGATIVE (0.9994) | NEGATIVE (0.9351) | negative (0.8198) | 0.4000 | 0.7000 |
| 12 | 115 | Kryptonite | Mike: "Avoid watching electronics at night" Me, watching this at night: 🖥️👀 | NEGATIVE (0.9997) | NEGATIVE (0.9308) | negative (0.5511) | 0.0000 | 0.0000 |
| 13 | 139 | Mike Shake | Subscribe for new skills every week! Check out more skills: http://www.youtube.com/c/MikeShake Instagram: https://www.instagram.com/mikeshaketv | POSITIVE (0.8482) | POSITIVE (0.9636) | positive (0.5663) | 0.3352 | 0.4773 |
| 14 | 56 | Danny | The book was so interesting that it lit his face up | POSITIVE (0.994) | POSITIVE (0.7609) | negative (0.637) | 0.5000 | 0.5000 |

**Figure 5.11:** Sentiment analysis for the most popular comments for the video ED2 by view count

The figure 5.12 represents the sentiment analysis for the video ENT2. The models performance is similar to the one of the video ENT1. The manual sentiment analysis reveals that amongst these comments, there are five negative ones (33%) with the comment ids 96, 23, 129, 88, and 119, four neutral ones (27%) with the comment ids 84, 249, 228, and 302, while all others are positive (40%). With a threshold (-0.2, 0.2) for the TextBlob model for neutral comment classification, this

model correctly classified 60% of comments. This video contains the highest number of negative comments since the stand-up criticises social media, which triggers critics also in the comment section.

| | comment_id | author_name | comment_text | sentiment_flair | sentiment_fast_flair | sentiment_xlnet | sentiment_textblob | subjectivity_textblob |
|---|---|---|---|---|---|---|---|---|
| 0 | 84 | Emrah Öz | "You can have your own opinions but you can"t have your own facts." That"s social media in a nutshell. | NEGATIVE (0.9988) | NEGATIVE (0.7496) | negative (0.627) | 0.4111 | 0.6889 |
| 1 | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it"s not them. hahahah | POSITIVE (0.9955) | POSITIVE (0.5243) | negative (0.5361) | -0.4750 | 0.7000 |
| 2 | 249 | Tones Drone Adventures | "Don"t believe everything you read on the internet" - Abraham Lincoln | NEGATIVE (0.9439) | NEGATIVE (0.762) | negative (0.5753) | 0.0000 | 0.0000 |
| 3 | 96 | Giggitygoo | The internet was one of the greatest human achievements ever, and we use it in the worst possible way. | NEGATIVE (0.999) | POSITIVE (0.688) | negative (0.709) | 0.0000 | 0.7750 |
| 4 | 115 | Insula Shots | It"s just funny how the joke about bleach aged very well. 😊 | POSITIVE (0.9822) | POSITIVE (0.5854) | negative (0.5616) | 0.1167 | 0.5667 |
| 5 | 23 | Ash Fuller | Social media has helped all the stupid people find each other | POSITIVE (0.9757) | POSITIVE (0.9416) | negative (0.6854) | -0.2972 | 0.4806 |
| 6 | 129 | John Doe | "Think of how stupid the average person is, and realize half of them are stupider than that." George Carlin | NEGATIVE (0.9376) | NEGATIVE (0.9916) | negative (0.6017) | -0.3722 | 0.5222 |
| 7 | 88 | Fattiger | "Do you know how stupid the average person is?" Average audience claps in favour. | NEGATIVE (0.9713) | NEGATIVE (0.9714) | negative (0.5128) | -0.3667 | 0.6000 |
| 8 | 228 | Steve Yao | The 500+ people who clicked "dislike" just helped Ricky make his point. | POSITIVE (0.966) | NEGATIVE (0.6044) | negative (0.7708) | 0.0000 | 0.0000 |
| 9 | 157 | Max Seidelman | Remember when Neil told David Brent that "I think you"d rather be popular than steer the ship in the right direction" ? I think this is a point that Gervais has been making throughout his career in his own brand of clever and creative ways. | POSITIVE (0.9999) | NEGATIVE (0.6036) | positive (0.5034) | 0.4305 | 0.8538 |
| 10 | 302 | tubez4321 | Most everyone on Twitter believes everyone else is stupid. There"s a great irony in that. | NEGATIVE (0.6909) | NEGATIVE (0.8674) | negative (0.6202) | 0.1667 | 0.7500 |
| 11 | 119 | J. Galactus | I"ve said it before and I"ll say it again- with social media, stupidity spreads faster than ever before. | NEGATIVE (0.9996) | POSITIVE (0.622) | negative (0.5429) | -0.2833 | 0.5333 |
| 12 | 192 | Paul Noonan | Respect ricky. Ever sice the Golden Globe awards i see you in a whole new light. It took real guts to hurt the feelings of those idiots in hollywood. | POSITIVE (0.9876) | POSITIVE (0.9602) | negative (0.5059) | 0.0727 | 0.5258 |
| 13 | 136 | K Apple | I love how when he says "Think of how stupid the average person is.." and only about 5% of the audience laugh immediately (being smart enough to keep up with him)... Knowing that the average IQ of ppl at this concert would already be significantly higher than the average person. Gives me hope that smart ppl can be heard in one room laughing. | NEGATIVE (0.9297) | POSITIVE (0.6702) | negative (0.5776) | 0.0208 | 0.5623 |
| 14 | 2 | 23v0lv32 | The guitar lesson analogy is perfect | NEGATIVE (0.869) | POSITIVE (0.9838) | negative (0.5391) | 1.0000 | 1.0000 |

**Figure 5.12:** Sentiment analysis for the most popular comments for the video ENT2 by view count

In total, 59% of the most popular comments by view count are neutral on average, 30% are positive and 11% are negative. The sentiments of the most popular comments by percentage of people who saw them are similar: 60% are neutral on average, 29% are positive and 11% are negative.

## 5.2 Unpopular comments

Since unpopular comments are defined in this master thesis as comments that were ignored by the participants, only the second algorithm of using percentage of people who did not pay attention to them is applicable for determining unpopular comments. The view count metric can not be used in this context because all the unpopular comments have zero view count, so it is impossible to do any kind of comparison between them.

The figure 5.13 presents the least popular comments for the video ENT1, amongst which two popular by view count comments are present (comment id 143 and 228). There are two spam comments with the comment ids 7 and 5, and most of the comments are nostalgic. 20% of the least popular comments contain a high number of likes (> 500), 67% have replies, one comment (7%) has an authorised label and 27% contain smileys.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 102 | Bianca Albuquerque | essa msc define a minha vida até os dias de hj KKKKKKKKK | 4 | False | False | False | 5 | 11 | 0.454545 | 84 |
| 1 | 268 | Nadja Bello | Mdss, que nostalgiaaaaaaa ❤️ | 18 | False | False | False | 8 | 16 | 0.500000 | 105 |
| 2 | 297 | Pop cloudy | Mds, que saudade, ouvia essa musica em 2013, ainda ouço com maior prazer | 119 | True | False | False | 8 | 15 | 0.533333 | 116 |
| 3 | 302 | REYDELOU FELIZ DEL CASTILLO | It's been 11 years. How nostalgic | 21 | False | False | False | 15 | 25 | 0.600000 | 276 |
| 4 | 169 | FranJoeldiver | recuerdo cuando era flogger como justin xD | 367 | True | True | False | 7 | 11 | 0.636364 | 116 |
| 5 | 427 | phnoob | this is, quite literally, the song of my entire childhood | 38 | True | False | False | 11 | 17 | 0.647059 | 155 |
| 6 | 139 | Ding Dong | It has been 11 years but I love this song as before. | 33 | False | False | False | 14 | 21 | 0.666667 | 273 |
| 7 | 323 | Samiya 1 | jb in 10 years: grows a beard and is married drake in 10 years : no change | 358 | True | False | False | 8 | 12 | 0.666667 | 185 |
| 8 | 115 | Cassandra Kameni | Ready for the "Who's watching this in 2021" comments 😐 | 4000 | True | False | False | 13 | 19 | 0.684211 | 287 |
| 9 | 208 | Julia Albuquerque | Eu amo essa música sempre vou gostar! Onde estão os brasileiros? ʙʀʙʀʙʀʙʀʙʀ | 22 | True | False | False | 11 | 16 | 0.687500 | 232 |
| 10 | 7 | 1000 Sbs with 0 video challenge | *******It's crazy how many people come back to this everyday.This song is legendary♥******* | 11 | False | False | False | 11 | 16 | 0.687500 | 167 |
| 11 | 5 | 1000 Sbs With No Video Challenge! | *It's crazy how many people come back to this everyday.This song is legendary. It*s So Addictive Also♥* | 58 | True | False | False | 12 | 17 | 0.705882 | 148 |
| 12 | 228 | Kitty Kate | Baby:took 9 years to get 9.9 million dislikes youtube rewind 2018:took 6 days to get 10 million dislikes | 3800 | True | False | False | 17 | 24 | 0.708333 | 640 |
| 13 | 54 | Afifah Auni | Let's just agree that listening to this memorable song is a trip down to our memory lane.... Good old days..... | 41 | True | False | False | 10 | 14 | 0.714286 | 196 |
| 14 | 143 | Dubspez | Compared to the cancer that exists today, this song isn't even half bad. 2010 people had no idea what would come as Internet became more mainstream | 13000 | True | False | False | 23 | 32 | 0.718750 | 1009 |

**Figure 5.13:** Least popular comments for the video ENT1

The table 5.3 shows the results of the sentiment analysis conducted manually for both most and least popular comments for the video ENT1.

| | # of positive comments | # of negative comments | # of neutral comments |
|---|---|---|---|
| **Popular comments by view count** | 3 | 2 | 9 |
| **Popular comments by percentage** | 1 | 1 | 7 |
| **Unpopular comments** | 4 | 1 | 5 |

**Table 5.3:** Sentiment analysis for the most and least popular comments for the video ENT1

The figure 5.14 presents the least popular comments for the video ED1, amongst which two popular by view count comments are present (comment id 172 and 151). Similar to the most popular comments, most comments are product reviews; some compliment the video creator. None of the comments contains a high number of likes (> 50), an authorised label or a video creator's like, 40% contain replies and 13% contain smileys.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 14 | Ash Coronado | It would be perfect if it didn't have a notch, used USB-C for charging instead of Lightning and had matte rails (say Titanium) instead of the glossy stainless steel it uses. | 5 | False | False | False | 10 | 27 | 0.370370 | 267 |
| 1 | 84 | Jason Connolly | You can definitely see the difference of120 hz, when you flip back to 60hz, feels sea sick | 0 | False | False | False | 6 | 15 | 0.400000 | 99 |
| 2 | 43 | Cruz | Gonna keep my 11 Pro Max for one more year. I don't like the rumored iPhone 4-inspired design, but an even bigger battery and a camera with better zoom would make it THE perfect iPhone for me. Here's hoping that both of these will be a thing next year. | 45 | True | False | False | 11 | 21 | 0.523810 | 259 |
| 3 | 224 | enzmondo | Not a lot of people remember that gamers also know what 120Hz/60fps is. 3 things gamers care about in display technology: size (real estate, bezels), quality (pixel density, colour gamut, fidelity), and smoothness (refresh rate, frames per second, animations). | 1 | False | False | False | 6 | 11 | 0.545455 | 224 |
| 4 | 236 | superfragilisticatexpialidoshmur | Technically Apple innovated on the Lightning port back in 2017 when they enabled fast charging via PD, doubled the charging capability, tripled the speed that you"d get with the power adapter that came with the phones. | 7 | False | False | False | 12 | 22 | 0.545455 | 266 |
| 5 | 83 | Itzjosh | Love ya fanboy. I listen to you every day. Stay safe buddy | 0 | False | False | False | 11 | 20 | 0.550000 | 170 |
| 6 | 47 | Dana Kellitt | Thank you from the UK! Ive pre ordered mine and get it next week! :) | 1 | True | False | False | 9 | 16 | 0.562500 | 101 |
| 7 | 145 | Moonglow Melodies | The selling skills are on point. Ownership 🏆 | 1 | False | False | False | 16 | 28 | 0.571429 | 273 |
| 8 | 238 | teammm | The pink is actually nice. I have it and enjoy looking at it. It's 7pm and I still have 68% battery | 7 | True | False | False | 14 | 24 | 0.583333 | 257 |
| 9 | 54 | Dennis Still | Still using my silver 11 Pro. Don't want to upgrade so soon but I've held the 13 Pro in hand and it feels incredibly premium. The 120hz is so good. A similar feeling to playing video games at 120hz. Looking forward to the iPhone 14 Pro. | 0 | False | False | False | 14 | 23 | 0.608696 | 344 |
| 10 | 77 | GreenhubPH Vlogs | yes this is true!!! i just got my 13 promax and it's totally different from the 12 pro max!!! camera - perfection , screen - way better , speakers- amazing, overall it's worth the upgrade! | 0 | False | False | False | 18 | 29 | 0.620690 | 492 |
| 11 | 187 | The Jedi Master | Best B-roll I have seen in a YouTube video in a while! Great work! | 0 | False | False | False | 18 | 27 | 0.666667 | 340 |
| 12 | 135 | Marsorry Ickua | Basically, ALMOST perfect. As long as there are critiques, the word perfection should be reserved :). | 15 | True | False | False | 26 | 39 | 0.666667 | 606 |
| 13 | 172 | Ryuki | I LOVE WATCHING THINGS I CAN AFFORD 😎 | 28 | True | False | False | 27 | 40 | 0.675000 | 1204 |
| 14 | 151 | Nate Jones | I remember going into an AT&amp;T store to try the new display &amp; my 12 pro max felt so weird afterwards. | 20 | True | False | False | 32 | 47 | 0.680851 | 1001 |

**Figure 5.14:** Least popular comments for the video ED1

The table 5.3 shows the results of the sentiment analysis conducted manually for both most and least popular comments for the video ED1.

| | # of positive comments | # of negative comments | # of neutral comments |
|---|---|---|---|
| **Popular comments by view count** | 9 | 0 | 6 |
| **Popular comments by percentage** | 11 | 0 | 4 |
| **Unpopular comments** | 8 | 0 | 7 |

**Table 5.4:** Sentiment analysis for the most and least popular comments for the video ED1

The figure 5.15 presents the least popular comments for the video ED2, amongst which one popular by view count comment is present (comment id 243). Only two comments contain short pieces of advice on how to fall asleep faster; however, none of them includes a detailed description of a

technique one could apply. Five comments enclose jokes, and four compliment the video creator. In general, the least popular comments contain less useful information than the most popular ones. Only 33% have a high number of likes (> 200), all least popular comments contain replies, 13% contain an authorised label, 13% have a video creator's like and 13% have smileys.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 131 | Lucky Ducky | This is going to be great for sleeping to wake up for school!:D | 0 | True | False | False | 5 | 11 | 0.454545 | 13 |
| 1 | 36 | Blue Gaming Media | Master way: Try to read class books | 13 | True | False | False | 6 | 11 | 0.545455 | 104 |
| 2 | 244 | grimmfruit | Spend less time on screens and drink less caffeine<br><br>Me: nevermind then | 21 | True | False | False | 10 | 17 | 0.588235 | 235 |
| 3 | 236 | Yzkiel Estarez | How to fell asleep in 10 seconds<br><br>First step: dont sleep for a day<br>Second step: sleep lol | 2453 | True | False | False | 8 | 13 | 0.615385 | 135 |
| 4 | 178 | Rayah Tevy | Amazing! | 920 | True | True | True | 15 | 24 | 0.625000 | 170 |
| 5 | 77 | GamingWith_Kombo | Love you're videos especially the learning ones you inspire me so much I appreciate you're work and ur vids hope you do a excellent work in the future | 0 | True | False | False | 9 | 14 | 0.642857 | 176 |
| 6 | 143 | Mohammed Elsafi | 1:27<br>I love how there's light coming from the book ☐<br>Nice editing 👍 😊 | 8 | True | False | False | 12 | 18 | 0.666667 | 416 |
| 7 | 73 | Foamy Loro | "That's been my routine for the last 2 weeks"<br>That's been my routine for the last 10 years | 8 | True | False | False | 9 | 13 | 0.692308 | 150 |
| 8 | 206 | Sujai Kirupakaran | This is actually perfect for me, I needed this. Thanks, have a good one! | 1 | True | False | False | 12 | 17 | 0.705882 | 278 |
| 9 | 226 | Valerie Lille | My solution is listening to an audiobook. My mind is focused on the story and doesn*t travel on it's own. Actually works really well for me | 2 | True | False | False | 16 | 22 | 0.727273 | 178 |
| 10 | 37 | Browney | Epic edits 😎 | 6032 | True | True | True | 11 | 15 | 0.733333 | 238 |
| 11 | 243 | elie T | Mike imagining he*s on the beach.<br><br>Me imagining I*m inside a class. | 60 | True | False | False | 25 | 34 | 0.735294 | 978 |
| 12 | 128 | Luca Bistarelli | You could easily be Matt D*Avella*s Italian alter ego. I really like what you are trying to achieve, not only learning to fall asleep ASAP, but everything about learning new skills. | 2 | True | False | False | 20 | 27 | 0.740741 | 344 |
| 13 | 47 | Charlie | *Dont think*<br>Me with autism and adhd: "dont think" thinks about not thinking and staying awake thinking about that | 2013 | True | False | False | 9 | 12 | 0.750000 | 184 |
| 14 | 204 | Strawberry Playz | Mike Shake in 2050: Learning how to teleport in 24 hours | 7911 | True | False | False | 12 | 16 | 0.750000 | 363 |

**Figure 5.15:** Least popular comments for the video ED2

The table 5.5 displays the results of the sentiment analysis conducted manually for both most and least popular comments for the video ED2. All the popular comments are neutral; however, around half of the unpopular comments are positive.

| | # of positive comments | # of negative comments | # of neutral comments |
|---|---|---|---|
| **Popular comments by view count** | 0 | 0 | 15 |
| **Popular comments by percentage** | 0 | 0 | 15 |
| **Unpopular comments** | 7 | 0 | 8 |

**Table 5.5:** Sentiment analysis for the most and least popular comments for the video ED2

The figure 5.16 presents the least popular comments for the video ENT2, amongst which three popular by view count comments are present (comment ids 157, 192 and 147). Similar to the most popular comments, the least popular comments mostly contain social media critics and compliments to the stand-up comedian. None of the least popular comments contains a high number of likes (> 500), 93% contain replies and one comment (7%) contains smileys.

| | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | people_saw | people_was_shown | percent_saw | view_count |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 174 | Negus please | I always say, there's a difference between being cool and being right. | 23 | True | False | False | 8 | 16 | 0.500000 | 109 |
| 1 | 286 | john lee | "Do you realise how stupid the average person is?!" Crowd of average people: WhoHHOHoHoH | 191 | True | False | False | 7 | 13 | 0.538462 | 117 |
| 2 | 14 | Anand Bagaria | "I dont want Guitar lessons!" 😊 | 80 | True | False | False | 11 | 19 | 0.578947 | 151 |
| 3 | 87 | Everything 80's Podcast | It"s amazing the attention given to Twitter by so many, including politicians, when only around 7% of people use it. | 6 | True | False | False | 7 | 12 | 0.583333 | 140 |
| 4 | 220 | Seàn | this feels like it could be a George Carlin routine. If Carlin were still alive | 59 | True | False | False | 7 | 12 | 0.583333 | 285 |
| 5 | 157 | Max Seidelman | Remember when Neil told David Brent that "I think you"d rather be popular than steer the ship in the right direction" ? I think this is a point that Gervais has been making throughout his career in his own brand of clever and creative ways. | 2 | True | False | False | 15 | 25 | 0.600000 | 1323 |
| 6 | 32 | Brian B | Todays world is Feelings not Facts..We are so screwed. | 375 | True | False | False | 23 | 36 | 0.638889 | 583 |
| 7 | 111 | Holdyour Plums | Social Media proves that Einstein was right when he said that, the only difference between genius &amp; stupidity, is that genius has it"s limits. | 198 | True | False | False | 22 | 33 | 0.666667 | 588 |
| 8 | 225 | SmallRaven Ware | One of the many reasons I loved Ricky is his commitment to anti-cruelty. Love that! | 3 | True | False | False | 14 | 20 | 0.700000 | 389 |
| 9 | 193 | Paul Tidey | Its incredibly hard to discount the fact that social media is one of the most powerful tools in social engagement, maybe its time to give it all a break and start actually talking to each other again. | 9 | True | False | False | 18 | 25 | 0.720000 | 675 |
| 10 | 104 | GumGumOnigiri | YouTube is honestly the closest I get to social media. | 421 | True | False | False | 29 | 40 | 0.725000 | 816 |
| 11 | 74 | Donald Roberts | And he forgot the rest of the guitar lessons call. Where the say I don't want guitar lessons, and I tore up your paper because I don't want anyone else to have them either | 37 | False | False | False | 8 | 11 | 0.727273 | 138 |
| 12 | 192 | Paul Noonan | Respect ricky. Ever sice the Golden Globe awards i see you in a whole new light. It took real guts to hurt the feelings of those idiots in hollywood. | 123 | True | False | False | 27 | 37 | 0.729730 | 1104 |
| 13 | 147 | Lynn-Nicole Gatien | "People don't care about the argument, they're looking at who's saying the argument". EXACTLY. People are now conditioned to DISREGARD CONTEXT. This behaviour has increased in the past 6 years... | 32 | True | False | False | 19 | 26 | 0.730769 | 1013 |
| 14 | 190 | Para Bellum | "Everyone has a right to their opinion" seemed like a good idea before social media. | 295 | True | False | False | 32 | 43 | 0.744186 | 952 |

**Figure 5.16:** Least popular comments for the video ENT2

The table 5.6 displays the results of the sentiment analysis conducted manually for both most and least popular comments for the video ENT2. The least popular comments are primarily neutral, whereas the sentiments of the most popular comments are evenly distributed between positive, negative and neutral.

| | # of positive comments | # of negative comments | # of neutral comments |
|---|---|---|---|
| **Popular comments by view count** | 6 | 5 | 4 |
| **Popular comments by percentage** | 5 | 5 | 5 |
| **Unpopular comments** | 3 | 2 | 10 |

**Table 5.6:** Sentiment analysis for the most and least popular comments for the video ENT2

In total, 54% of the least popular comments are neutral, 40% are positive and 6% are negative. The least popular comments' list contains less neutral and negative comments and more positive ones compared to the both lists of the most popular comments. This means that people tend to pay less attention to the positive comments. On average, 13% of the least popular comments have a high number of likes, 75% contain replies, 7% contain an authorised label, 7% contain a video creator's like and 15% contain smileys.

The table 5.7 shows the general comment characteristics, such as average length, average number of line breaks, average number of spaces, average number of words and average word length for the 15 least popular comments of each video.

| Video name | Average length | Average # of line breaks | Average # of spaces | Average # of words | Average word length |
|---|---|---|---|---|---|
| ED1 | 133.267 | 0 | 23.6 | 24.6 | 4.204 |
| ED2 | 82.933 | 0.733 | 15.533 | 16.533 | 4.084 |
| ENT1 | 73.6 | 0.2 | 12.333 | 13.333 | 4.697 |
| ENT2 | 117.467 | 0 | 20.133 | 21.133 | 4.51 |

**Table 5.7:** Linguistic comment characteristics for all videos

Compared to the statistics for the most popular comments sorted by percentage of people who saw them, the least popular comments for the video ED1 are on average longer, for the videos ENT1 and ENT2 - shorter, while for the video ED2 the average comment length stayed approximately the same. The average number of spaces and the average number of words increased or decreased correspondingly with the average length for the videos ENT1, ED1 and ENT2 but slightly decreased for the video ED2, although the average length of the comment remained the same. The average number of line breaks and word length remained almost identical.

## 5.3 Gender analysis

The H5 assumes that the comment reading behaviour correlates with personal user characteristics, e.g., age, gender, etc. As all the participants were ages between 18 and 36 years old, it is not feasible to differentiate the reading behaviour for the different age ranges. That is why only analysis between females and males was conducted.

Similarly to the general analysis of the most and least popular comments, the gender analysis was conducted using view count and percentage of people who saw the comments as measures for popularity.

### 5.3.1 Female reading behaviour analysis

The figure 5.17 shows the most popular comments by view count for females. Approximately half of the comments are from the video ED1. The majority of the comments are descriptive, where only two contain a joke. All comments have replies, 73% of the comments have a high number of likes, one comment (7%) has an authorised label, 27% contain a video author's like and 13% contain smileys. 33% of the most popular comments are positive, 0% are negative and 67% are neutral.

| | video_name | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count |
|---|---|---|---|---|---|---|---|---|---|
| 0 | sleep | 157 | Nick C | Everyone knows you shouldn't drink caffeine after like 3pm, you shouldn't use your bed for entertainment, you shouldn't eat for a few hours before bed, you shouldn't stay in bed if you can't sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it's actually brilliant.<br><br>[I wouldn't bother with this tip, however, if you're prone to sleep paralysis and don't enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don't get sleep paralysis or if you're like me and able to stay calm and find it interesting, maybe give it a try.]<br><br>It's simple: ignore itches (and don't toss and turn.)<br><br>That's it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There's good science behind it too.<br>Sleep is FAR from the "passive" sort of "shutdown" we're taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain.<br>When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn't want to do this until you're definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it's tired.) So before your brain makes this handoff it tests your body to see if you're ready for sleep or if you're still conscious.<br><br>One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you're awake and it's not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won't scratch, and your brain knows it can get to work.<br><br>So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don't toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It's not easy to ignore them, and they can get very intense sometimes, but just remember that if you don't itch them it'll help you get to sleep. | 18 | True | False | False | 2794 |
| 1 | sleep | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day<br>Step 2: going home<br>Step 3: falling into bed<br>Step 4: awaking the next morning<br>Step 5: repeat until death | 1100 | True | False | False | 2184 |
| 2 | social | 84 | Emrah Öz | "You can have your own opinions but you can't have your own facts."<br><br>That's social media in a nutshell. | 1306 | True | False | False | 2113 |
| 3 | social | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it's not them. hahahah | 5220 | True | False | False | 1862 |
| 4 | sleep | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn't realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False | 1797 |
| 5 | iphone | 115 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True | 1457 |
| 6 | social | 249 | Tones Drone Adventures | "Don't believe everything you read on the internet"<br>- Abraham Lincoln | 2018 | True | False | False | 1342 |
| 7 | iphone | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120Hz for granted😎 | 214 | True | False | True | 1335 |
| 8 | iphone | 78 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | 94 | True | False | True | 1333 |
| 9 | iphone | 177 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | 46 | True | True | True | 1108 |
| 10 | iphone | 222 | chrisak49 | Agree with everything. I did wish Apple didn't do Photographic styles but instead gave us more control over the Smart HDR processing. Let traditional photographers dial down the Smart HDR and let overexposure happen or let people go super aggressive with Smart HDR so nothing is blown out. | 60 | True | False | False | 1037 |
| 11 | iphone | 235 | sublunarskyler | 😅 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now, and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I've spent many of my lunch breaks walking around taking photos and they're great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it's just that good. | 13 | True | False | False | 957 |
| 12 | social | 115 | Insula Shots | It's just funny how the joke about bleach aged very well. 😄 | 2800 | True | False | False | 951 |
| 13 | iphone | 70 | G Games | I have the 12 pro max and bought my wife the 13 pro max. The 120hz display feels way different. Trying to convince her to trade. No going so well | 84 | True | False | False | 946 |
| 14 | iphone | 143 | MilkMeSlowly | Can definitely agree on battery life, I last charged my 13 pro max to 100% on Tuesday morning at 7am (in Australia) and now at midnight Wednesday I'm on 17% a full 41 hours later! | 21 | True | False | False | 941 |

**Figure 5.17:** Most popular comments by view count for females

The figure 5.18 shows the most popular comments by percentage of people who saw them for females. Around half of the comments intersect with the most popular comments by view count. There are more comments from the video ED2; two contain a joke and one a piece of advice. The comment with the comment id 233 has only one like, but it contains helpful information for one interested in acquiring techniques to fall asleep faster and has some number of replies. There are two comments from the video ENT1. The comment with the comment id 108 is not in English, but it has a high number of likes, which can explain the significant amount of attention. 80% of the comments contain a high number of likes, all contain replies, 13% contain an authorised label, 20% have a video creator's like and only one comment (7%) has smileys. 20% of the most popular comments are positive, one comment (7%) is negative and 73% are neutral.

| | video_name | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count | people_saw | people_was_shown | percent_saw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | social | 84 | Emrah Öz | "You can have your own opinions but you can''t have your own facts." That''s social media in a nutshell. | 1306 | True | False | False | 2113 | 30 | 31 | 0.967742 |
| 1 | social | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is." and everyone applauds, thinking it''s not them. hahahah | 5220 | True | False | False | 1862 | 30 | 31 | 0.967742 |
| 2 | iphone | 177 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | 46 | True | True | True | 1108 | 30 | 31 | 0.967742 |
| 3 | baby | 108 | BujidoCavaco Channel | 05 de Novembro de 2019 relembrando minha infância. Eita SAUDADES MEU DEUS! | 39000 | True | True | False | 467 | 19 | 20 | 0.950000 |
| 4 | iphone | 115 | Mahomes86 | I finally upgraded from an 8+ (don''t judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True | 1457 | 29 | 31 | 0.935484 |
| 5 | sleep | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day Step 2: going home Step 3: falling into bed Step 4: awaking the next morning Step 5: repeat until death | 1100 | True | False | False | 2184 | 29 | 31 | 0.935484 |
| 6 | social | 249 | Tones Drone Adventures | "Don''t believe everything you read on the internet" - Abraham Lincoln | 2018 | True | False | False | 1342 | 29 | 31 | 0.935484 |
| 7 | sleep | 157 | Nick C | Everyone knows you shouldn''t drink caffeine after like 3pm, you shouldn''t use your bed for entertainment, you shouldn''t eat for a few hours before bed, you shouldn''t stay in bed if you can''t sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it''s actually brilliant. [I wouldn''t bother with this tip, however, if you''re prone to sleep paralysis and don''t enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don''t get sleep paralysis or if you''re like me and able to stay calm and find it interesting, maybe give it a try.] It''s simple: ignore itches (and don''t toss and turn.) That''s it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There''s good science behind it too. Sleep is FAR from the "passive" sort of "shutdown" we''re taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain. When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn''t want to do this until you''re definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it''s tired.) So before your brain makes this handoff it tests your body to see if you''re ready for sleep or if you''re still conscious. One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you''re awake and it''s not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won''t scratch, and your brain knows it can get to work. So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don''t toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It''s not easy to ignore them, and they can get very intense sometimes, but just remember that if you don''t itch them it''ll help you get to sleep. | 18 | True | False | False | 2794 | 14 | 15 | 0.933333 |
| 8 | sleep | 233 | Yuki Cross | I learnt this thing called ''heart math'' that''s meant to calm you down. It''s quick and I also use it to sleep! It''s three steps called heart focus, heart breathe, heart feel. Step 1: Heart focus - try focusing on your breath, heartbeat, or pulse. It may help to put your hand over your heart to feel the beat or somewhere you can feel your pulse. Do this for a few seconds or however long you''d like. Step 2: Heart breathe - breathe in and out while counting to how ever long you want. I usually slowly breathe in and out for 6 seconds each. Repeat this step as much as you feel necessary. Step 3: Heart feel - think of or imagine things that make you happy, this can be a good memory of yours, or a favourite food etc. It could also be something you look forward too in the future. I''m usually put to sleep after beginning step 3, and this can be used before a test or anything that might make you anxious. Hope this helps anyone! | 1 | True | False | False | 399 | 10 | 11 | 0.909091 |
| 9 | sleep | 125 | LilEdits | "Don''t think" ~Closes my eyes~ Thinks about how black became a colour | 2219 | True | False | False | 927 | 28 | 31 | 0.903226 |
| 10 | sleep | 11 | ANGEL LEABRES | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* In bed: *NOT TIRED* | 1300 | True | False | False | 866 | 28 | 31 | 0.903226 |
| 11 | social | 129 | John Doe | "Think of how stupid the average person is, and realize half of them are stupider than that." George Carlin | 3617 | True | False | False | 918 | 28 | 31 | 0.903226 |
| 12 | iphone | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don''t take my 120Hz for granted😭 | 214 | True | False | True | 1335 | 28 | 31 | 0.903226 |
| 13 | baby | 412 | iiShadowii7 | Someone could confess that they killed someone in here and it would be buried under the 4.6M other comments | 39000 | True | False | False | 897 | 25 | 28 | 0.892857 |
| 14 | social | 2 | 23v0lv32 | The guitar lesson analogy is perfect | 738 | True | False | False | 427 | 25 | 28 | 0.892857 |

**Figure 5.18:** Most popular comments by percentage of people who saw them for females

The figure 5.19 shows the least popular comments for females. Similar to the most popular comment by percentage of people who saw them, the majority of comments are from the video ED1, which are mainly product reviews. None of the comments contain a high number of likes, an authorised label or a video creator's like, 53% have replies and 20% contain smileys. 67% of the least popular comments are positive, one comment (7%) is negative and 26% are neutral.

| | video_name | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count | people_saw | people_was_shown | percent_saw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | iphone | 14 | Ash Coronado | It would be perfect if it didn't have a notch, used USB-C for charging instead of Lightning and had matte rails (say Titanium) instead of the glossy stainless steel it uses. | 5 | False | False | False | 150 | 4 | 14 | 0.285714 |
| 1 | iphone | 54 | Dennis Still | Still using my silver 11 Pro. Don't want to upgrade so soon but I've held the 13 Pro in hand and it feels incredibly premium. The 120hz is so good. A similar feeling to playing video games at 120hz. Looking forward to the iPhone 14 Pro. | 0 | False | False | False | 154 | 5 | 12 | 0.416667 |
| 2 | iphone | 83 | Itzjosh | Love ya fanboy. I listen to you every day. Stay safe buddy | 0 | False | False | False | 61 | 5 | 11 | 0.454545 |
| 3 | baby | 302 | REYDELOU FELIZ DEL CASTILLO | It*s been 11 years. How nostalgic | 21 | False | False | False | 121 | 5 | 11 | 0.454545 |
| 4 | iphone | 172 | Ryuki | I LOVE WATCHING THINGS I CAN AFFORD 😅 | 28 | True | False | False | 207 | 9 | 19 | 0.473684 |
| 5 | iphone | 43 | Cruz | Gonna keep my 11 Pro Max for one more year. I don't like the rumored iPhone 4-inspired design, but an even bigger battery and a camera with better zoom would make it THE perfect iPhone for me. Here's hoping that both of these will be a thing next year. | 45 | True | False | False | 209 | 7 | 14 | 0.500000 |
| 6 | iphone | 145 | Moonglow Melodies | The selling skills are on point. Ownership 🎯 | 1 | False | False | False | 89 | 7 | 14 | 0.500000 |
| 7 | iphone | 151 | Nate Jones | I remember going into an AT&amp;T store to try the new display &amp; my 12 pro max felt so weird afterwards. | 20 | True | False | False | 233 | 12 | 24 | 0.500000 |
| 8 | iphone | 135 | Marsorry Ickua | Basically, ALMOST perfect. As long as there are critiques, the word perfection should be reserved :). | 15 | True | False | False | 172 | 9 | 18 | 0.500000 |
| 9 | sleep | 244 | grimmfruit | Spend less time on screens and drink less caffeine  Me: nevermind then | 21 | True | False | False | 119 | 6 | 11 | 0.545455 |
| 10 | iphone | 146 | Morgan White | "This is the dumbest dolphin noise I've ever seen!" 😂 Had to pause and take a break cause I was laughing so hard | 29 | True | False | False | 204 | 12 | 22 | 0.545455 |
| 11 | social | 157 | Max Seidelman | Remember when Neil told David Brent that "I think you*d rather be popular than steer the ship in the right direction" ? I think this is a point that Gervais has been making throughout his career in his own brand of clever and creative ways. | 2 | True | False | False | 523 | 9 | 16 | 0.562500 |
| 12 | iphone | 229 | josh j | watching these types of videos t make me feel good about my purchase. can*t wait for it to arrive | 1 | False | False | False | 94 | 8 | 14 | 0.571429 |
| 13 | iphone | 77 | GreenhubPH Vlogs | yes this is true!!! i just got my 13 promax and it's totally different from the 12 pro max!!! camera - perfection , screen - way better , speakers- amazing, overall it*s worth the upgrade! | 0 | False | False | False | 239 | 8 | 14 | 0.571429 |
| 14 | social | 32 | Brian B | Todays world is Feelings not Facts..We are so screwed. | 375 | True | False | False | 174 | 12 | 21 | 0.571429 |

**Figure 5.19:** Least popular comments for females

## 5.3.2 Male reading behaviour analysis

The figure 5.20 shows the most popular comments by view count for males. Similar to the most popular comments by view count for females, approximately half of the comments are from the video ED1. In general, the most popular comments for females and males mainly intersect, there are only four comments not present in the analysis for females, namely, the comments with the comment ids 115 for the video ED1, 96 for the video ENT2 and 125 and 11 for the video ED2. The majority of the comments are descriptive, where only two contain a joke. 80% have a high number of likes, all have replies, one comment (7%) has an authorised label, 27% contain a video creator's like and 13% contain smileys. 26% of the most popular comments are positive, one comment (7%) is negative and 67% are neutral.

| | video_name | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count |
|---|---|---|---|---|---|---|---|---|---|
| 0 | iphone | 235 | sublunarskyler | 😊 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now, and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I've spent many of my lunch breaks walking around taking photos and they're great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it's just that good. | 13 | True | False | False | 2771 |
| 1 | social | 84 | Emrah Öz | "You can have your own opinions but you can't have your own facts." That's social media in a nutshell. | 1306 | True | False | False | 2222 |
| 2 | iphone | 115 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True | 2164 |
| 3 | iphone | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120Hz for granted😊 | 214 | True | False | True | 2073 |
| 4 | social | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it's not them. hahahah | 5220 | True | False | False | 1889 |
| 5 | iphone | 78 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | 94 | True | False | True | 1880 |
| 6 | iphone | 70 | G Games | I have the 12 pro max and bought my wife the 13 pro max. The 120hz display feels way different. Trying to convince her to trade. No going so well | 84 | True | False | False | 1658 |
| 7 | sleep | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day Step 2: going home Step 3: falling into bed Step 4: awaking the next morning Step 5: repeat until death | 1100 | True | False | False | 1654 |
| 8 | sleep | 157 | Nick C | Everyone knows you shouldn't drink caffeine after like 3pm, you shouldn't use your bed for entertainment, you shouldn't eat for a few hours before bed, you shouldn't stay in bed if you can't sleep, etc., but one of the best tips I ever received about how to fall asleep sounds crazy, but it's actually brilliant. [I wouldn't bother with this tip, however, if you're prone to sleep paralysis and don't enjoy it because this tip, while helpful for transitioning to sleep, can result in sleep paralysis. If you don't get sleep paralysis or if you're like me and able to stay calm and find it interesting, maybe give it a try.] It's simple: ignore itches (and don't toss and turn.) That's it. Sort of. You have to be militant about your adherence to that rule though, for it to work. There's good science behind it too. Sleep is FAR from the "passive" sort of "shutdown" we're taught to think of it as. Sleep is a very active process for the brain. "Sleep" means two different things to you and your brain. When you fall asleep and become unconscious your brain goes through a transition, like a handoff of responsibilities from "awake brain processes" to "sleep brain processes." It doesn't want to do this until you're definitely unconscious though, because that would be detrimental to any organism focused on survival. (Imagine becoming physucally paralyzed while in the middle of a fight because your brain decides it's tired.) So before your brain makes this handoff it tests your body to see if you're ready for sleep or if you're still conscious. One of the ways your brain tests your body is by creating itches. If you scratch the itch then your brain knows you're awake and it's not time to start all the processes it does during sleep. If you are unconscious and ready for the sleep processes to behin then you won't scratch, and your brain knows it can get to work. So when you lay down to go to sleep, get comfortable, close your eyes, and be still. Truly still. Don't toss and turn no matter how tempting, and ignore the urge to scratch all the little itches you get. It's not easy to ignore them, and they can get very intense sometimes, but just remember that if you don't itch them it'll help you get to sleep. | 18 | True | False | False | 1559 |
| 9 | iphone | 222 | chrisak49 | Agree with everything. I did wish Apple didn't do Photographic styles but instead gave us more control over the Smart HDR processing. Let traditional photographers dial down the Smart HDR and let overexposure happen or let people go super aggressive with Smart HDR so nothing is blown out. | 60 | True | False | False | 1506 |
| 10 | social | 96 | Giggitygoo | The internet was one of the greatest human achievements ever, and we use it in the worst possible way. | 672 | True | False | False | 1406 |
| 11 | sleep | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn't realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False | 1405 |
| 12 | iphone | 177 | Shevon Salmon | The best 13 series device imo except the Vanilla colorway | 46 | True | True | True | 1360 |
| 13 | sleep | 125 | LilEdits | "Don't think" ~Closes my eyes~ Thinks about how black became a colour | 2219 | True | False | False | 1333 |
| 14 | sleep | 11 | ANGEL LEABRES | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* In bed: *NOT TIRED* | 1300 | True | False | False | 1305 |

**Figure 5.20:** Most popular comments by view count for males

The figure 5.21 shows the most popular comments by percentage of people who saw them for males. The comments mainly intersect with the ones popular by view count. Approximately half of the comments differ from the popular comment by percentage of people who saw them for females. 80% have a high number of likes, 93% contain replies, one comment (7%) contain an authorised label, 20% have a video creator's like and 20% contain smileys. 34% of the most popular comments are positive, 13% are negative and 53% are neutral.

| | video_name | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count | people_saw | people_was_shown | percent_saw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | iphone | 115 | Mahomes86 | I finally upgraded from an 8+ (don't judge me). I literally feel like I have a Ferrari in my hand. | 643 | True | False | True | 2164 | 30 | 31 | 0.967742 |
| 1 | sleep | 11 | ANGEL LEABRES | Morning: *Tired* Afternoon: *Tired* Evening: *Tired* In bed: *NOT TIRED* | 1300 | True | False | False | 1305 | 30 | 31 | 0.967742 |
| 2 | iphone | 38 | Chief__YT | Me watching this on a Silver 13 Pro, not regretting my decision whatsoever, and sometimes I just turn in low power mode so I don't take my 120Hz for granted😄 | 214 | True | False | True | 2073 | 30 | 31 | 0.967742 |
| 3 | social | 95 | Gaurang R | I just like it when he says "Think of how stupid the average person is.." and everyone applauds, thinking it"s not them. hahahah | 5220 | True | False | False | 1889 | 29 | 30 | 0.966667 |
| 4 | social | 115 | Insula Shots | It"s just funny how the joke about bleach aged very well. 😄 | 2800 | True | False | False | 1080 | 28 | 29 | 0.965517 |
| 5 | iphone | 235 | sublunarskyler | 😄 when I paid $1699 Australian for the base 13 Pro. It does feel freaking good though, it feels all the kind of premium that it should feel. Never used 120Hz before now; and the display feels silky smooth. On more moderate use days I can go to bed and put it on charge at 40%, heavy days it still has 25% left. I"ve spent many of my lunch breaks walking around taking photos and they"re great. I love having this amazing camera with me at all times to quickly take photos or videos and forget about the battery life, because it"s just that good. | 13 | True | False | False | 2771 | 26 | 27 | 0.962963 |
| 6 | social | 307 | ₱⋆₦₣ ⋄₦₴₦₦ | This. That"s it. Social media and the idea of "influencers" is such a joke. | 378 | True | False | False | 729 | 18 | 19 | 0.947368 |
| 7 | baby | 368 | Tofuh | I am obligated to listen this song 1 hour ... The worst challenge ... | 17000 | True | True | False | 963 | 16 | 17 | 0.941176 |
| 8 | sleep | 213 | TheGogeta222 | How I learned to fall asleep in seconds: Step 1: working as carpenter for 10-12 hours per day Step 2: going home Step 3: falling into bed Step 4: awaking the next morning Step 5: repeat until death | 1100 | True | False | False | 1654 | 29 | 31 | 0.935484 |
| 9 | social | 249 | Tones Drone Adventures | "Don"t believe everything you read on the internet" - Abraham Lincoln | 2018 | True | False | False | 1179 | 28 | 30 | 0.933333 |
| 10 | sleep | 125 | LilEdits | "Don't think" ~Closes my eyes~ Thinks about how black became a colour | 2219 | True | False | False | 1333 | 28 | 30 | 0.933333 |
| 11 | iphone | 78 | GunsandGlamour | Yes it is, and I'm in love with mine. I got the silver in 512GB this year. I plan to keep it for awhile. The camera, and the 120HZ is my favorite. | 94 | True | False | True | 1880 | 28 | 30 | 0.933333 |
| 12 | iphone | 131 | Mark Moore | Hell, I'd even take just a regular 13. They did a fantastic job and now the base has a nice oled screen I like that. | 5 | False | False | False | 404 | 14 | 15 | 0.933333 |
| 13 | sleep | 46 | Cate | I clicked on this video because I have trouble falling asleep. But I didn"t realize HOW much trouble I had falling asleep until he said normally it took him 20-30 minutes to fall asleep. Then I was like: Holy cow I must really have problems, because it normally takes me 2-4 hours to fall asleep! | 562 | True | False | False | 1405 | 28 | 30 | 0.933333 |
| 14 | baby | 412 | iiShadowii7 | Someone could confess that they killed someone in here and it would be buried under the 4.6M other comments | 39000 | True | False | False | 1255 | 27 | 29 | 0.931034 |

**Figure 5.21:** Most popular comments by percentage of people who saw them for males

The figure 5.22 shows the least popular comments for males. Similar to the most popular comment by percentage of people who saw them, the comments are approximately evenly distributed between all four videos. 20% have a high number of likes, 67% contain replies, one comment (7%) has an authorised label, one comment has a video creator's like and 13% contain smileys. 47% of the least popular comments are positive, 13% are negative and 40% are neutral.

| | video_name | comment_id | author_name | comment_text | num_of_likes | answers_present | authorized_comment | author_liked | view_count | people_saw | people_was_shown | percent_saw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | iphone | 14 | Ash Coronado | It would be perfect if it didn't have a notch, used USB-C for charging instead of Lightning and had matte rails (say Titanium) instead of the glossy stainless steel it uses. | 5 | False | False | False | 117 | 6 | 13 | 0.461538 |
| 1 | iphone | 238 | teammm | The pink is actually nice. I have it and enjoy looking at it. It's 7pm and I still have 68% battery | 7 | True | False | False | 163 | 8 | 14 | 0.571429 |
| 2 | sleep | 178 | Rayah Tevy | Amazing! | 920 | True | True | True | 101 | 8 | 14 | 0.571429 |
| 3 | iphone | 145 | Moonglow Melodies | The selling skills are on point. Ownership 🔫 | 1 | False | False | False | 184 | 9 | 14 | 0.642857 |
| 4 | social | 104 | GumGumOnigiri | YouTube is honestly the closest I get to social media. | 421 | True | False | False | 411 | 12 | 18 | 0.666667 |
| 5 | iphone | 77 | GreenhubPH Vlogs | yes this is true!!! i just got my 13 promax and it's totally different from the 12 pro max!!! camera - perfection , screen - way better , speakers- amazing, overall it's worth the upgrade! | 0 | False | False | False | 253 | 10 | 15 | 0.666667 |
| 6 | sleep | 226 | Valerie Lille | My solution is listening to an audiobook. My mind is focused on the story and doesn't travel on it's own. Actually works really well for me | 2 | True | False | False | 106 | 9 | 13 | 0.692308 |
| 7 | iphone | 187 | The Jedi Master | Best B-roll I have seen in a YouTube video in a while! Great work! | 0 | False | False | False | 180 | 9 | 13 | 0.692308 |
| 8 | sleep | 128 | Luca Bistarelli | You could easily be Matt D*Avella*s Italian alter ego. I really like what you are trying to achieve, not only learning to fall asleep ASAP, but everything about learning new skills. | 2 | True | False | False | 215 | 12 | 17 | 0.705882 |
| 9 | social | 111 | Holdyour Plums | Social Media proves that Einstein was right when he said that, the only difference between genius &amp; stupidity, is that genius has it*s limits. | 198 | True | False | False | 270 | 10 | 14 | 0.714286 |
| 10 | baby | 302 | REYDELOU FELIZ DEL CASTILLO | It*s been 11 years. How nostalgic | 21 | False | False | False | 155 | 10 | 14 | 0.714286 |
| 11 | social | 147 | Lynn-Nicole Gatien | "People don't care about the argument, they're looking at who's saying the argument". EXACTLY. People are now conditioned to DISREGARD CONTEXT. This behaviour has increased in the past 6 years… | 32 | True | False | False | 763 | 8 | 11 | 0.727273 |
| 12 | social | 32 | Brian B | Todays world is Feelings not Facts..We are so screwed. | 375 | True | False | False | 409 | 11 | 15 | 0.733333 |
| 13 | baby | 266 | My World | It took me 10 years to realize "DRAKE" was in this video 🐸🙈 | 903 | True | False | False | 129 | 9 | 12 | 0.750000 |
| 14 | baby | 228 | Kitty Kate | Baby:took 9 years to get 9.9 million dislikes youtube rewind 2018:took 6 days to get 10 million dislikes | 3800 | True | False | False | 405 | 11 | 14 | 0.785714 |

**Figure 5.22:** Least popular comments for males

### 5.3.3 Miscellaneous gender analysis

The table 5.8 shows the number of comments for each video for the most and least popular comments for females and males. The most popular comments by view count for both females and males include zero comments from the video ENT1, while the comments distribution for the other videos is similar. The distribution of the most popular comments by percentage of people who saw them for females and males are approximately the same; in contrast to the most popular comments by view count, both include two comments for the video ENT1. The majority of the least popular comments for females belong to the video 'iPhone 13 Pro Is PERFECT', whilst the least popular comments for males are evenly distributed across all four videos.

| Video name / Category | ED1 | ED2 | ENT1 | ENT2 |
|---|---|---|---|---|
| **Popular comments by view count for females** | 8 | 3 | 0 | 4 |
| **Popular comments by view count for males** | 7 | 5 | 0 | 3 |
| **Popular comments by percentage of people who saw them for females** | 3 | 5 | 2 | 5 |
| **Popular comments by percentage of people who saw them for males** | 5 | 4 | 2 | 4 |
| **Unpopular comments for females** | 11 | 1 | 1 | 2 |
| **Unpopular comments for males** | 5 | 3 | 3 | 4 |

**Table 5.8:** Number of comments for each video for the most and least popular comments for females and males

The table 5.9 represents the linguistic comment characteristics for the most and least popular comments for both females and males. While the average comment length of the most popular comments by view count is almost equal for females and males, the average length for the popular comments by percentage of people who saw them for males is twice smaller than for females. This characteristic slightly decreases also for females. The average length of the least popular comments is significantly (67% for females and 39% for males) lower than for the most popular comments by percentage of people who saw them. The least popular comments tend to contain zero line breaks, whilst the popular comments by percentage of people who saw them for females contain more than twice line breaks on average than the popular comments for males. For the most popular comments by view count, the results are opposite: the most popular comments for males contain 26% more line breaks than those for females. The average number of spaces and words decrease or increase correspondingly with the average comment length. The average word length is similar for all the categories.

| Category | Average length | Average # of line breaks | Average # of spaces | Average # of words | Average word length |
|---|---|---|---|---|---|
| Popular comments by view count for females | 316.667 | 1.333 | 59.4 | 60.4 | 4.128 |
| Popular comments by view count for males | 313.467 | 1.8 | 58.867 | 59.867 | 4.08 |
| Popular comments by percentage of people who saw them for females | 301.267 | 2.267 | 56.8 | 57.8 | 4.284 |
| Popular comments by percentage of people who saw them for males | 149.2 | 0.933 | 28.4 | 29.4 | 3.973 |
| Unpopular comments for females | 98.667 | 0.067 | 17 | 18 | 4.443 |
| Unpopular comments for males | 90.4 | 0 | 15.2 | 16.2 | 4.672 |

**Table 5.9:** Linguistic comment characteristics

For the videos ENT1 and ENT2, more than 500 likes is considered to be a high number, whereas for the video ED2 comments with more than 200 likes and for the video ED1 comments with more than 50 likes are regarded as comments with a high number of likes. These measures were chosen heuristically depending on the number of views of each video and the degree of user interaction.

While the presence of smileys and the authorised label do not influence the comments' popularity, the number of likes, presence of replies and video creator's like make an immense contribution to the attention drawn by a comment, as the least popular comments for both females and males contain significantly fewer comments with these features.

| Category | # of comments with smileys | # of comments with high number of likes | # of comments with replies | # of comments from authorised users | # of comments liked by video author | # of non-English comments |
|---|---|---|---|---|---|---|
| Popular comments by view count for females | 3 | 11 | 15 | 1 | 4 | 0 |
| Popular comments by view count for males | 2 | 12 | 15 | 1 | 4 | 0 |
| Popular comments by percentage of people who saw them for females | 1 | 12 | 15 | 2 | 3 | 1 |
| Popular comments by percentage of people who saw them for males | 3 | 12 | 14 | 1 | 3 | 0 |
| Unpopular comments for females | 3 | 0 | 8 | 0 | 0 | 0 |
| Unpopular comments for males | 2 | 3 | 10 | 1 | 1 | 0 |

**Table 5.10:** Most crucial non-linguistic features

The table 5.11 shows the conducted sentiment analysis for both females and males. The majority of the most popular comments for both rankings are neutral, whereas the majority of the least popular comments are positive.

| Category | # of positive comments | # of negative comments | # of neutral comments |
|---|---|---|---|
| **Popular comments by view count for females** | 5 | 0 | 10 |
| **Popular comments by view count for males** | 4 | 1 | 10 |
| **Popular comments by percentage of people who saw them for females** | 3 | 1 | 11 |
| **Popular comments by percentage of people who saw them for males** | 5 | 2 | 8 |
| **Unpopular comments for females** | 10 | 1 | 4 |
| **Unpopular comments for males** | 7 | 2 | 6 |

**Table 5.11:** Gender sentiment analysis

# 6 Conclusion

The research was conducted using gaze data of 62 participants collected in conditions similar to the typical environment in which users watch YouTube videos. The analysis revealed that only about 28% of people follow the sequential approach when browsing through the comments and that there are no distinct differences in the reading behaviour between females and males regarding the order and number of the comments they read. The non-linguistic features as high number of likes and presence of replies help draw attention to comment, so the comments that had these features were usually seen by the participants before the others (94% of the comments that caught attention first contained replies and 61% had a high number of likes).

A high number of likes and presence of replies play a significant role in comments' popularity as well, as most of the popular comments (both by view count and by percentage of people who saw them) tended to have these features: on average, 64% of the popular comments had a high number of likes and 94% of the popular comments had replies, while only 13% of the least popular comments had a high number of likes and 75% of them had replies. The presence of smileys did not influence the amount of received attention much since only 24% of the most popular comments contained smileys (15% for the least popular comments). The most popular comments by view count for the videos from the entertainment category were funny and short. On the contrary, for the videos from the education category, the most popular comments were longer and contained helpful information such as sleeping techniques for ED2 video or product reviews for ED1 video. Since the ED2 video was made in an easy and entertaining manner, half of the comments supported this mood and made jokes related to the topic of the video or the video creator.

For the most popular comments by percentage of people that saw them, the popularity of the comments did not always correlate with the number of likes, but the presence of answers preserved its significance in contributing to the comments' popularity. Some of the most popular comments were not in English but had many likes, which probably attracted the participants' attention. Not all comments had a high number of likes, but replies were always present in this case.

Although the least popular comments have similar content to the most popular ones, they tend to contain spam and other useless information. For the videos ENT1 and ED1 the sentiment distribution for the most and least popular comments does not change. However, the most popular comments for ED2 are neutral, whereas half of the least popular ones are positive. For the ENT2 video, another tendency is to observe: the least popular comments are primarily neutral, and the emotions of the most popular comments are evenly distributed between neutral, positive and negative. The reason for this could be the video category: when people are interested in obtaining helpful information, they tend to look for neutral comments, whereas for entertaining purposes, neutral comments are less suitable. The three most popular non-linguistic features are number of likes, comment author name and presence of answers.

The comparison analysis between the least and the most popular comments made clear that amongst the least popular comments, there are only a few or no comments with a high number of likes (51% less than for the popular comments), 7% less comments from authorised users, 9% less comments with a video creator's like and 19% less comments containing replies, which confirms the importance of these features. The middle zone of the screen is the most popular one and 97% of the most popular comments were primarily seen in it.

The gender analysis showed that the length of the most popular comment by percentage of people that saw them for men was twice smaller than for women. The average length of the least popular comments turned out to be significantly (67% for females and 39% for males) lower than for the most popular comments by percentage of people who saw them.

For the gender analysis, not only the number of likes and presence of replies make an immense contribution to the attention drawn by a comment, but also a video creator's like has a significant influence on it, as the least popular comments' lists for both females and males contain significantly fewer comments with this feature: 24% of the most popular and 0% of the least popular comments for females contained a video creator's like and the least popular comments for males contained 20% less comments with this feature.

The most popular comments' rankings for females contained 100% of comments with replies, which is 47% more than the least popular comments' ranking, the least popular comments' list included 0% of comments with a high number of likes, an authorised label or a video creator's like, which is respectively 77%, 10% and 24% less than the most popular comments. The most popular comments' lists for males contained 30% less comments with replies, 60% less comments with a high number of likes, the same percent of comments with an authorised label and 17% less comments with a video creator's like.

The majority of the most popular comments for both rankings (70% for females and 60% for males) are neutral, whereas most of the least popular comments (67% for females and 47% for males) are positive. Additionally, the gender analysis revealed that the female participants tended to skip from 21% up to 41% more comments than the male participants. Moreover, the women on average spent 50 seconds more watching the videos and 47 seconds less reading the comments than men.

The calculated Spearman rank-order correlation coefficient demonstrated a moderate correlation (> 0.5) for the most popular comments between popularity of the comments and number of likes and presence of answers: 0.595 and 0.605 respectively for the most popular comments by view count on average for the videos with the moderate correlation and 0.645 and 0.574 for the most popular comments by percentage of people who saw them on average for the videos with the moderate correlation.

88.7% of the participants use YouTube at least several times per week, which is an indicator of the heavy YouTube usage amongst students. The majority, which is 71% of the participants, frequently read YouTube comments, which confirms that the experiment simulated the usual conditions for the YouTube users. Most of the participants (around 67%) never comment on YouTube videos, and around 73% never or only rarely like YouTube comments, which highlights the importance of the conducted gaze-data research.

## 6.1 Use-cases

The results of this master thesis can be beneficial for the following use-cases:

- Content generation strategies:

  - Manual strategies: content creators and anyone, who engages in promoting a company or a specific product, may be interested in learning how to construct meaningful comments from the investigation on how people interact with the comments. Knowing what stimulates the reader's attention can help copywriters construct comments, tweets, posts, etc., that are more likely to be noticed by a large number of users. Exploring users' reading approach can have an impact on marketing strategies embraced by companies. In particular, knowing, which text structure is most likely to draw attention, can help in creating advertisements that are potentially more successful in attracting new customers to a product or a service. The conducted analysis showed that for manual comment creation it is crucial to consider the video category, since people tend to read shorter comments when watching entertainment videos and longer comments when looking for a piece of advise or a product review.

  - Automatic strategies: the findings of this master thesis can be exploited to improve content quality or increase user engagement when developing artificial intelligence robots, i.e. robots, which are often used nowadays to gain more followers and likes by posting auto comments [1]. For example, some replies can be automatically generated to draw more attention to a comment, since people are more likely to notice comments containing replies.

- Ranking algorithms: another possible way of using the results of the proposed approach is to develop a strategy of recommending how the comments on the social media platforms (YouTube, Instagram, Facebook, Twitter, etc.) should be ranked, e.g. the comments, which are predicted to be read by a large number of users, can be ranked higher. The features that can be taken into account when developing ranking strategies, are number of likes and presence of answers, since they turned out to be the most crucial one according to the conducted analysis, i.e., the comments with the big number of likes and replies should be ranked higher.

## 6.2 Limitations and further research

There was no qualitative analysis conducted, i.e. the participants were not explicitly asked to which comment features they pay the most attention or how do they usually read comments. The reason for this is the high subjectivity of the possible answers. However, it could be interesting to compare the results of the qualitative research with the finding of the conducted quantitative analysis. Another limitation of the work is that the number of replies was not saved because of the technical issues connected with the YouTube implementation logic. Due to the software design specificities, it is technically impossible to track the correlation of the reading behaviour with the profile picture and presence of a video creator's answer (see section 3.2), therefore, these features can be analysed solely

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[1]https://instazood.com/

in case of the YouTube frontend design changes. Finally, given that participants in this study were primarily students, mainly majoring in computer science, physics and mechanical engineering, their age range is not wide, and their reading behaviour can differ from those of the general population, limiting the generalizability of the findings to some degree.

A possible direction for further research could be predicting a general comment probability to be noticed (some research is already done in this direction, see, e.g. [SCNJ10]) and additionally predicting a probability that a comment is seen by a specific user given their location, gender and age. One possible way to implement this could be to use the hybrid text saliency model [STMB20], which is able to predict attention represented as fixations on certain words. This information can be used to predict the words which draw the most attention and also to prognosticate the comments which are most likely to be noticed, as they contain a higher number of attention-drawing words.

# Bibliography

[Ale21]    I. Alexa Internet. *The top 500 sites on the web*. 2021. URL: https://www.alexa.com/topsites (visited on 12/30/2021) (cit. on p. 8).

[ASK18]    I. Antoniadis, V. Saprikis, E. Karteraki. "Patterns of usage of Social Network Sites: The case of YouTube". In: *MIBES Transactions* 12.1 (2018), pp. 1–12 (cit. on p. 14).

[Bah18]    S. Bahr. *Justin Bieber's 'Baby' dethroned as the most disliked video on YouTube*. 2018. URL: https://eu.indystar.com/story/news/2018/12/14/justin-biebers-baby-dethroned-most-disliked-video-youtube-rewind-2018/2309505002/ (visited on 01/06/2022) (cit. on p. 21).

[BCM09]    G. Buscher, E. Cutrell, M. Morris. "What do you see when you're surfing?: using eye tracking to predict salient regions of web pages". In: *CHI '09: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (2009), pp. 21–30 (cit. on p. 11).

[Bro18]    C. Brown. *Here Are the Top 10 Most Popular Types of Videos on YouTube*. 2018. URL: https://mag.octoly.com/here-are-the-top-10-most-popular-types-of-videos-on-youtube-4ea1e1a192ac (visited on 01/06/2022) (cit. on p. 21).

[CDL07]    X. Cheng, C. Dale, J. Liu. "Understanding the Characteristics of Internet Short Video Sharing: YouTube as a Case Study". In: (Aug. 2007) (cit. on p. 8).

[CLT01]    C.-H. Cho, J.-G. Lee, M. Tharp. "Different forced-exposure levels to banner advertisements". In: *Journal of advertising research* 41.4 (2001), pp. 45–56 (cit. on p. 12).

[CT12]     C. M. Cheung, D. R. Thadani. "The impact of electronic word-of-mouth communication: A literature analysis and integrative model". In: *Decision support systems* 54.1 (2012), pp. 461–470 (cit. on p. 8).

[Dea17]    B. Dean. *Here's What We Learned About YouTube SEO*. 2017. URL: https://backlinko.com/youtube-ranking-factors (visited on 01/06/2022) (cit. on p. 23).

[EVD+13]   S. Edgerly, E. Vraga, K. Dalrymple, T. Macafee, F. T.K.F. "Directing the Dialogue: The Relationship Between YouTube Videos and the Comments They Spur". In: *Journal of Information Technology & Politics* 10.3 (2013), pp. 276–292 (cit. on p. 14).

[GALM07]   P. Gill, M. Arlitt, Z. Li, A. Mahanti. "Youtube Traffic Characterization: A View from the Edge". In: (2007), pp. 15–28 (cit. on p. 8).

[GH06]     R. E. Goldsmith, D. Horowitz. "Measuring motivations for online opinion seeking". In: *Journal of interactive advertising* 6.2 (2006), pp. 2–14 (cit. on p. 8).

[Gha20]    S. Ghag. *Using XLNet for Sentiment Classification*. 2020. URL: https://medium.com/swlh/using-xlnet-for-sentiment-classification-cfa948e65e85 (visited on 01/08/2022) (cit. on p. 52).

[GLCR06]   Z. Guan, S. Lee, E. Cuddihy, J. Ramey. "The validity of the stimulated retrospective think-aloud method as measured by eye tracking". In: *Conference on Human Factors in Computing Systems - Proceedings* 2 (Apr. 2006), pp. 1253–1262. DOI: `10.1145/1124772.1124961` (cit. on p. 8).

[Gmb15]    V. I. GmbH. "myGaze Eye Tracking System Manual". In: (2015) (cit. on p. 23).

[Goo16]    Google. *YouTube Cross Screen Survey*. 2016. URL: `https://www.thinkwithgoogle.com/consumer-insights/consumer-trends/top-content-categories-youtube/` (visited on 01/06/2022) (cit. on pp. 21, 42).

[HNN+18]   R. Hessels, D. Niehorster, M. Nyström, R. Andersson, I. Hooge. "Is the eye-movement field confused about fixations and saccades? A survey among 124 researchers". In: *Royal Society open science* 5.8 (2018) (cit. on p. 7).

[HRW08]    B. Huberman, D. Romero, F. Wu. "Crowdsourcing, Attention and Productivity". In: *Journal of Information Science* 35 (Oct. 2008). DOI: `10.2139/ssrn.1266996` (cit. on p. 8).

[Kha17]    M. Khan. "Social media engagement: What motivates user participation and consumption on YouTube?" In: *Computers in Human Behavior* 66 (2017), pp. 236–247 (cit. on pp. 8, 14).

[KKK16]    A. Khan, M. Khan, M. Khan. "Naïve Multi-label Classification of YouTube Comments Using Comparative Opinion Mining". In: *Procedia Computer Science* 82 (2016), pp. 57–64 (cit. on pp. 13, 14).

[KR11]     R. E. Kraut, P. Resnick. "Encouraging Contributions to Online Communities". In: (2011), pp. 21–76 (cit. on p. 8).

[LP17]     H. Lee, N. Pang. "Information scent – credibility and gaze interactions: an eye-tracking analysis in information behaviour". In: *In Proceedings of ISIC, the Information Behaviour Conference, Zadar, Croatia, 20-23 September, 2016: Part 2. Information Research* 22.1 (2017) (cit. on p. 12).

[LXTL21]   J. Luan, J. Xiao, P. Tang, M. Li. "Positive effects of negative reviews: an eye-tracking perspective". In: *Internet Research* ahead-of-print (May 2021) (cit. on pp. 7, 11).

[LYZL16]   J. Luan, Z. Yao, F. Zhao, H. Liu. "Search product and experience product online reviews: An eye-tracking study on consumers' review search behavior". In: *Computers in Human Behavior* 65 (2016), pp. 420–430 (cit. on pp. 7, 11).

[Mag18]    T. Magajna. *Text Classification with State of the Art NLP Library — Flair*. 2018. URL: `https://towardsdatascience.com/text-classification-with-state-of-the-art-nlp-library-flair-b541d7add21f` (visited on 01/08/2022) (cit. on p. 52).

[MM03]     E. F. McQuarrie, D. G. Mick. "Visual and verbal rhetorical figures under directed processing versus incidental exposure to advertising". In: *Journal of consumer research* 29.4 (2003), pp. 579–587 (cit. on p. 12).

[Mol21]    K. Molenaar. *The Full Guide to YouTube Character Limits*. 2021. URL: `https://influencermarketinghub.com/youtube-character-limits/` (visited on 12/30/2021) (cit. on p. 17).

[MRM13]    A. Madden, I. Ruthven, D. McMenemy. "A classification scheme for content analyses of YouTube video comments". In: *Journal of Documentation* 69.5 (2013), pp. 693–714 (cit. on pp. 14, 17).

[MSKP21]   A. Möller, B. S.E., R. Kühne, J. Peter. "The effects of social information on the enjoyment of online videos: An eye tracking study on the role of attention". In: *Media Psychology* 24.2 (2021), pp. 214–235 (cit. on pp. 8, 12, 13).

[MSPG17]   P. Mikalef, K. Sharma, I. O. Pappas, M. N. Giannakos. "Online Reviews or Marketer Information? An Eye-Tracking Study on Social Commerce Consumers". In: *Digital Nations – Smart Cities, Innovation, and Sustainability*. Ed. by A. K. Kar, P. V. Ilavarasan, M. Gupta, Y. K. Dwivedi, M. Mäntymäki, M. Janssen, A. Simintiras, S. Al-Sharhan. Cham: Springer International Publishing, 2017, pp. 388–399 (cit. on pp. 7, 11).

[MSVV20]   E. Maslowska, C. M. Segijn, K. A. Vakeel, V. Viswanathan. "How consumers attend to online reviews: an eye-tracking and network analysis approach". In: *International Journal of Advertising* 39.2 (2020), pp. 282–306 (cit. on pp. 7, 11).

[PB05]   A. Poole, L. Ball. "Eye tracking in HCI and usability research". In: *Encyclopedia of Human Computer Interaction, C. Ghaoui, Ed. Idea Group Reference* 1 (Jan. 2005), pp. 211–219. DOI: 10.4018/978-1-59140-562-7.ch034 (cit. on p. 8).

[Per20]   S. Perez. *YouTube introduces new feature to address toxic comments*. 2020. URL: hhttps://techcrunch.com/2020/12/03/youtube-introduces-new-features-to-address-toxic-comments/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29v Z2xlLmNvbS88&guce_referrer_sig=AQAAAERF1G8EMtY0DTc7ME_n8UtezjJqlXKbPZV4Gf Tg7ZekKlY92yQK7IemKvOnXVgK7nGBpkvDC0cy3-bUX08LC1H1No1OujQRoS6CHI8kGBgVX5Dl 5q7bm-Q1SvaPwrrPT027fmbCiH5WV8n3ko-WHyoM6zy_r1N5TV8bB0MLKeL0/ (visited on 12/30/2021) (cit. on p. 18).

[Raz22]   S. Razdan. *10 Most Commented Video on YouTube In 2022 | BTS Rocks The List*. 2022. URL: https://pathofex.com/most-commented-video-on-youtube/ (visited on 01/06/2022) (cit. on p. 21).

[res10]   iab research. *Social: A closer look at behaviour on YouTube Facebook, Executive summary*. 2010. URL: http://www.iabuk.net/research/library/social-a-closer-look-at-behaviour-onyoutube-and-facebook (visited on 07/20/2021) (cit. on p. 14).

[SCNJ10]   S. Siersdorfer, S. Chelaru, W. Nejdl, P. J.S. "How useful are your comments?: analyzing and predicting youtube comments and comment ratings". In: *WWW '10: Proceedings of the 19th international conference on World wide web* (2010), pp. 891–900 (cit. on pp. 7, 8, 13, 76).

[SCP+14]   S. Siersdorfer, S. Chelaru, J. S. Pedro, I. S. Altingovde, W. Nejdl. "Analyzing and mining comments and comment ratings on the social web". In: *ACM Transactions on the Web (TWEB)* 8.3 (2014), pp. 1–39 (cit. on p. 13).

[SDL13]   P. Schultes, V. Dorner, F. Lehner. "Leave a Comment! An In-Depth Analysis of User Comments on YouTube". In: *Wirtschaftsinformatik Proceedings 2013* (2013) (cit. on pp. 8, 14, 17).

[SP17]   J. Savigny, A. Purwarianti. "Emotion classification on youtube comments using word embedding". In: *International Conference of Advanced Informatics: Concept, Theory and Application (ICAICTA)* (2017) (cit. on p. 13).

[SSL16]   N. Steinfeld, T. Samuel-Azran, A. Lev-On. "User comments and public opinion: Findings from an eye-tracking experiment". In: *Computers in Human Behavior* 61 (2016), pp. 63–72 (cit. on p. 11).

[STMB20]  E. Sood, S. Tannert, P. Mueller, A. Bulling. "Improving Natural Language Processing Tasks with Human Gaze-Guided Neural Attention". In: (Oct. 2020) (cit. on p. 76).

[Suk21]  R. Sukhraj. *What Are the Most Popular Types of YouTube Videos in 2021? [Infographic]*. 2021. URL: https://www.impactplus.com/blog/most-popular-types-of-videos-on-youtube-infographic (visited on 01/06/2022) (cit. on pp. 21, 42).

[Tan16]  C. Tangmanee. "Fixation and recall of YouTube ad banners: An eye-tracking study". In: *International Journal of Electronic Commerce Studies* 7 (June 2016), pp. 49–76. DOI: 10.7903/ijecs.1404 (cit. on p. 12).

[Ter19]  M. Terry-Jack. *NLP: Pre-trained Sentiment Analysis*. 2019. URL: https://medium.com/@b.terryjack/nlp-pre-trained-sentiment-analysis-1eb52a9d742c (visited on 01/08/2022) (cit. on pp. 52, 53).

[TSV12]  M. Thelwall, P. Sud, F. Vis. "Commenting on YouTube videos: From guatemalan rock to El Big Bang". In: *Journal of the American Society for Information Science and Technology* 63.3 (2012), pp. 616–629 (cit. on pp. 8, 14).

[tul18]  tuleconghoa1. *Top 10 music videos attracts the most comments on Youtube*. 2018. URL: https://kbizoom.com/top-10-music-videos-attracts-the-most-comments-on-youtube/ (visited on 01/06/2022) (cit. on p. 21).

[XPKP16]  W. W. Xu, J. Y. Park, J. Y. Kim, H. W. Park. "Networked Cultural Diffusion and Creation on YouTube: An Analysis of YouTube Memes". In: *Journal of Broadcasting & Electronic Media* 60.1 (2016), pp. 104–122 (cit. on p. 8).

[YDY+20]  Z. Yang, Z. Dai, Y. Yang, J. Carbonell, R. Salakhutdinov, Q. V. Le. "XLNet: Generalized Autoregressive Pretraining for Language Understanding". In: (2020) (cit. on p. 52).

[You21a]  YouTube. *Community Guidelines*. 2021. URL: https://www.youtube.com/intl/en_us/howyoutubeworks/policies/community-guidelines/ (visited on 12/30/2021) (cit. on p. 17).

[You21b]  YouTube. *YouTube data API*. 2021. URL: https://developers.google.com/youtube/v3/ (visited on 12/30/2021) (cit. on p. 18).

All links were last followed on January 6, 2022.

**Declaration**


I hereby declare that the work presented in this thesis is entirely my own and that I did not use any other sources and references than the listed ones. I have marked all direct or indirect statements from other sources contained therein as quotations. Neither this work nor significant parts of it were part of another examination procedure. I have not published this work in whole or in part before. The electronic copy is consistent with all submitted copies.




Stuttgart, 01.02.2022

place, date, signature