FREIE UNIVERSITÄT BERLIN

Technical Analysis of the Social Media Platform

Genius

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Abstract

Genius Media Group Incorporated is a collaborative annotation platform and was founded by *Mahbod Moghadam*, *Tom Lehman* and *Ilan Zechory* with the aim to annotate lyrics, which have no license and can be interpreted in form of in-line annotation by members. The first version was launched October 2009 as *Rap Exegesis*, then it changed to *Rap Genius* in December 2009 and finally in July 2014 the title *Genius* was given.

Genius members have six different roles that are closely tied to authorizations sequentially: Whitehat, Editor, Moderator, Verified Artist, Mediator and Staff. We monitored Genius activities on firehose for five weeks, collected 1.3 million activities, 762 thousand of them are annotation activities[1]. We registered 57 thousand unique users and found, that users generate on average 13.33 annotation activities in this period of analysis, which is 0.36 annotation activities per day. The distribution over user groups displays the roles Moderator, Staff, Artist, Mediator and Whitehat. Whitehat embodies the most registered user, but when it comes to drive Genius ahead, then those roles are presented in the following sequence: Artist, Staff, Mediator, Moderator, Editor and at the end is the role Whitehat.

Intelligence Quotient (IQ) can be earned by the most of activities and indicate experience of a member. Although a count of IQs is required to do certain activities, for instance to post into forums, but it does not promote automatically a member's role to become a higher member level.

High-quality[2] annotations and decision maker such as an Editor establish nomination criteria. Earning IQs implies to edit pages; a page is edited on average 295 times, which varies greatly from the median (195) times. This indicates that some pages attract users more than others. For developers Genius provides API, documentation and support forum as well as there are sub-domains in different countries and languages.

We attempt to discover members' collaboration by editing Genius pages and for this purpose we clarify the social, technical and participation architecture of Genius, such as member's permissions as well as options, activity types and distribution of page edits. The following technical report is structured as follows: Section 2 introduces the social structure of Genius, how to interact with the user interface, being a member and the relation between member roles, annotation and earned IQs. Section 3 continues with the technical structure, in which Genius subdomains are presented, what technical options are there for developers to bind Genius services in applications, firehose as notifications process as well as demographic trends of users at Genius. Section 4 describes our member activities study on Genius and which new findings we determined. Finally, section 5 presents our conclusions.

[1]. Those are a part of the collected activities that refer to annotations and we call them annotation activities.

[2]well written, without errors in grammar and contains knowledge that adds meaning depth

1 Introduction

In the 1990s web content was commonly generated by a small amount of publishers and the far bigger rest of users were consumers. Only a decade later another type of content became available on the web: User Generated Content (UGC), in which more and more users participate in content generation. UGC's domain is Social Media (SM) that additionally includes a social networking platform [1] for user collaboration such as Genius. With the trend of social networking websites (e.g., 2003 MySpace, 2004 Facebook, 2004 Flickr, 2006 Twitter, Instagram 2010 etc.) SM has become an additional channel of content sharing variety that enables annotation of UGC.

Genius as a part of SM follows it's modern way strategy that allows user to create and collaboratively modify UGC to support annotating, which makes Genius an online platform for annotations [28][25], that *breaks down text with line-by-line annotations* [9] and provides interpretation of any form of text [32]. Mahbod Moghadam pointed out in 2009 that the business of providing lyrics is an undeveloped market on the Web, while *lyrics is the most popular word searched on the Web after Facebook* [22] according to Moghadam. He came up with the idea for the site and convinced two friends, Tom Lehman and Ilan Zechory, to join up with him in interpreting rap songs [22]. The first version launched October 2009 as Rap Exegesis, but the name was difficult to spell for users [23]. Therefore, it was changed to Rap Genius in December 2009 [7]. Finally in July 2014 the title Genius was given [31]. In 2013 a blog how to manipulate Google search results leads Google to penalize Rap Genius, whose reaction was an apology post and ten days later after removing the blog, Rap Genius was recovered from their penalty [32].

Zechory, as president, and Lehman, as Chief Engineering Officer (CEO), of the company raised more than 50$ million investment [24][5]. The fastest growing start-up in Y-Combinator [3] history became $1.8 million in funding and in 2012 Marc Andreessen and his partner Ben Horowitz invested $15 million [24][5][30]. Dan Gilbert had led a $40 million investment [28][32][27].

Genius Media Group Incorporated, whose house is in Brooklyn NY, with the slogans: *If you don't know, now you know* and *Annotate the world* [32] aims to connect reader's interpretations mainly[4] around lyrics by breaking down text with line-by-line annotations, added and edited by anyone in the world [9].

2 Social Structure

Genius as a collaborative annotation platform with its UGC builds a social media, in which everyone can participate to communicate indirectly with other members to interchange and value interpretations provided in form of annotation to clarify meanings of a piece of text. After registration the member is

[3] `https://de.wikipedia.org/wiki/Y_Combinator`

[4] According to Ben Horowitz *2 percent of all web searches are for lyrics, which still generate most of the site's traffic* [24].

assigned a role, which is Whitehat and can be promoted by earned IQs to extend permissions. How to earn IQ, which other roles and permission are possible at Genius will be clarified in context of social structure in the next subsections. Firstly, we want to clarify the used terms in this technical report:

Genius annotation A frame that includes the interpretation of a piece of text and options. Additionally to a piece of text, an annotation can be referred to by description and suggestion.

Annotation activity A member activity as upvote, downvote, suggest, reply et cetra, which deals with an annotation, such activity We call annotation activity.

Song page Each page on Genius, on which can be generated an annotation.

Main page A Page on Genius with the same header and footer and it's body includes for instance a song page.

Genius sub-domains Projects of Genius as Genius Education, Lit Genius, Law Genius et cetera.

2.1 User Interface

Each main page on Genius offers at it's header five channels categorized by topics as shown in Figure 1.

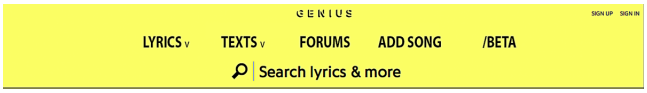


Figure 1: Main Page Header

Screenshot: 10/08/2015
This figure views the header of a main page of Genius

LYRICS of *rap*, *pop*, *rock*, *country*, *r&b* (rhythm and blues) and amount of nations, in which a version of Genius in different languages is present.

TEXTS contains *lit* (literature), *screen* (TV shows and movies) and *sports*. The difference to *LYRICS* is that it does not deal exclusively with lyrics (song texts).

FORUMS is a board for discussions and get information about some internal reports like API Support or Bugs. Only members have read-access and it requires +150 IQs for write-access. Discussions, threads, Genius sub-domains or topics such Genius API and Genius mobile applications can be followed and follower get notifications about every post per e-mail.

ADD SONG is the fundamental building block for Genius, therefore, member should immediately find how to upload new material for annotating. A member chooses a *primary tag* from a collection of topics, inserts his *role*, the content title and finally submits the created content, which could be a lyric or other text to certain topic.

/BETA enables member to create annotations to any extern webpage. *Genius.it/* in front of an URL enables creation of annotations to the linked text content, which turn up immediately on Genius.

The header includes also a search field that enables to enter text like *letter from Birmingham* or *Alan Turing* and find annotation about that. At the bottom of the main page as shown in Figure 2 is a tab bar for navigation to get information about general Genius, instructions how to use some features like Embed a Text into own website and Contributor Guidelines. Additionally entries of community policy and some other useful options are found, too. Everyone can explore Genius and read content, but only registered user can interact with Genius and a few activities as write into forums require at least 150 IQs.

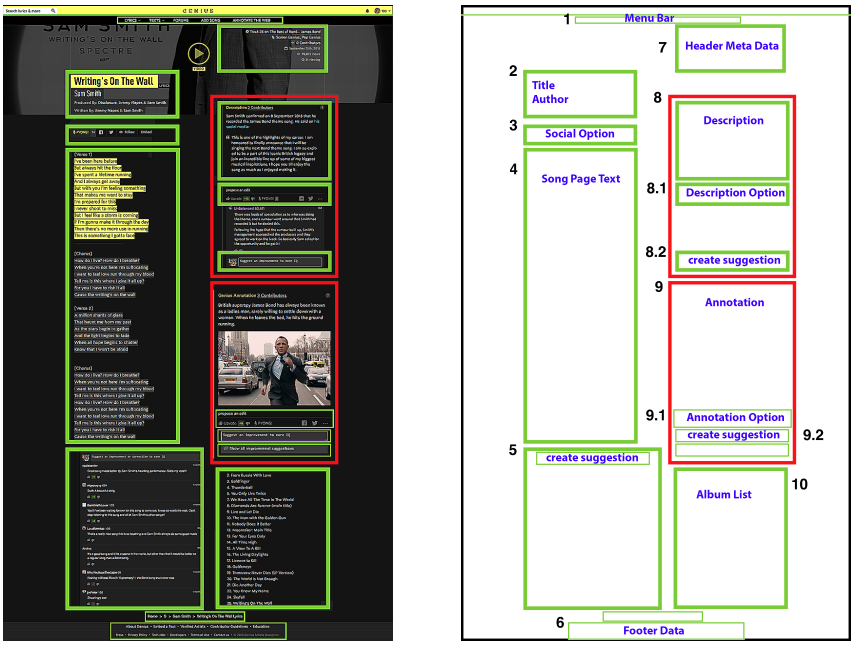
Figure 2: Main Page Footer

Screenshot: 10/08/2015
This figure views the footer of a main page of Genius

2.2 Song Page

A page on Genius is called *Song Page* even it does not refer to a lyric. Song page consists of the following areas presented in Figure 3: A menu bar (1) helps to navigate between Genius topics as shown in Figure 5a, a song page has a title as well as author name (2) and five social options (3). Those options are *PYONG!*, that allows song promotion by sending a notification to all own homepage followers, *Facebook* and *Twitter* to use them with Genius, *Follow* to follow this song and *Embed*, which is for an annotation available, as well, and allows taking song text or annotation to integrate into an own website. The song page text (4) has characteristic options such as *create suggestion* (5). Footer data (6) shows tabs, which contain *Press, Privacy Policy, Jobs, Developers, Terms of Use* and *Contact us* and alphabet list for verified as well as all artists on Genius. In the top right corner is the header meta data (7) that includes information as in which this song page is integrated, count of page's contributors, count of page's views and status if it is locked, in this case a member can create a suggestion, only, or he have at least 600 IQs to annotate, or the page is unlocked. Each page dispose a frame for *description* (8), which has options (8.1) and *create suggestion* (8.2).

Figure 3: Page Layout



(a) Genius Page (b) Page Ground Layout

This figure shows a Genius song page and it's ground layout.

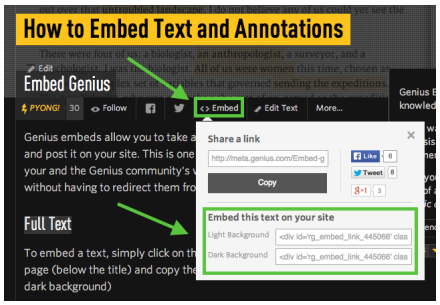


Figure 4: Song Page Text Options

[16]
This Figure shows the options of song text

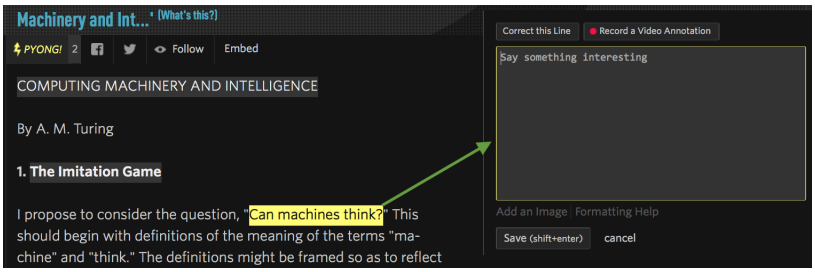
By clicking on a selected piece of text on the song page text an *Annotation* container (9) appears that covers *Annotation Option* (9.1): *Correct this Line*, *Record a Video Annotation* to annotate by means of camera instead of writing text, *Add an Image*, *Formatting Help*, *Save* and *cancel* buttons. If the marked text is already annotated it appears a container as shown in Figure 5b implying the options: *propose an edit*, *vote* up as well as down and *Suggest an improvement* furthermore the opportunity to write an annotation. Usually the song page is listed in a collection together with other song pages of the artist, this collection is called *Album List* (10) that is displayed on every song page of it. A user language has been developed over time. Certain expressions and abbreviations interpret certain behavior or significance. Genius offers a dictionary[5] that explains this vocabulary and thus assists newcomer with these printouts such as *Ded, Diene, Goat, Meme.*

2.3 Annotation

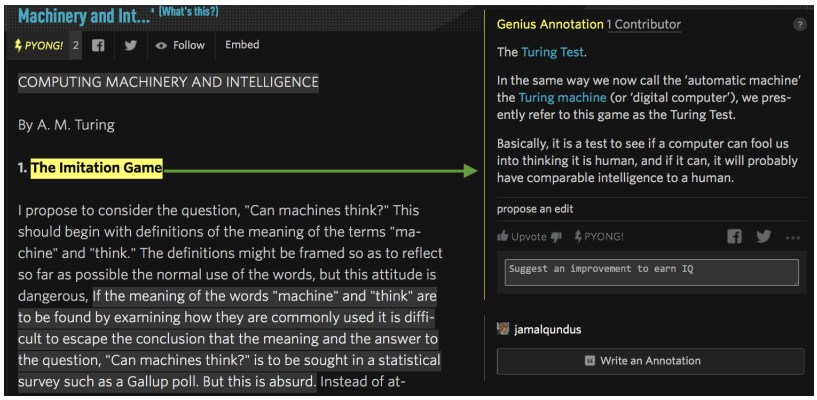
Annotation is the essential module in order to build up a member interactions. Exclusively by means of annotation a text can be interpreted, which is the main aim of Genius. Description and suggestion can be annotated, too. By highlighting any piece of text appears a pop-up field that enables creation of annotation 5a and 5b. An annotation generated by a Whitehat remains unreviewed waiting to be accepted by authorized member to get published. According to Genius description an annotation consists of three elements:

- **decode** reflects the interpretation,
- **research** contains information about author, song or citation and
- **visuals** includes sources like images or videos. Additionally to the classic ***line-by-line*** annotation and the ***Description/SLAs*** that tells about significance of the content, there are three other kinds of annotations:
- **personal annotations** which can only be activated by staff and

[5] `http://genius.com/Genius-editors-genius-dictionary-annotated`



(a)



(b)

Figure 5: [16] This figure shows annotation container appears by highlighting (a) unmarked text (b) already annotated text.

- **producer Genius annotations** which contain all relevant production meta data of that song or that video as in the third kind
- **music video annotations** [13].

2.4 Earn IQ

Users can earn points for committing good content [9]. Although the score of earned IQs does not reflect member's privilege, but it represents an indication of a member's merit and productivity. As illustrated in Table 1, there are different ways to earn IQs, whose count by several activities is up to contributor's role, who interact with the activity negatively or positively [13]. For example, for the first upload of profile picture a user earns +100 IQs, for an accepted annotation +10 IQs and for creating a description +5 IQs.

2.5 Demographic Trends

A survey in 2015 consisting of 21 questions created by Jason D. Morris moderator at Genius and comprised approximately 240 users gives an overview of the

Table 1: Earning IQ

activity	earned IQs
First profile picture added	+100
Annotation upvoted	+2[a]
Suggestion upvoted	+0.5
Suggestion downvoted	-0.5
Annotation downvoted	-1
Forum post upvoted	+0.5
Forum post downvoted	-0.5
Transcribing a song	0
Creating a description	+5
Write an annotation	+5
Annotation accepted	+10
Annotation rejected	-7[b]
Suggestion integrated	+2
Suggestion archived	0

[15]
This table shows earning IQs of several activities
Note: According to the staff *Tyrant*
[a]by a contributor: +2, by contributor with 1000+ IQ: +2, +6 an editor:+6, by a moderator:+10.
[b]This is because the original 5 you got from writing the annotation is taken away, and another 2 is subtracted because of the rejection

demographic of who is on Genius, what instruments (e.g., electronic devices, internet activity and languages) are used and where they are located.

The results indicate that users are male 91.18%, white 57.80%, single and never married 85.29%, born in 1994-1998 66.66%, 17 or younger 48.94% and 18-20 years old 30.21%, not employed and not-/ or looking for work 70.46%, at a high school 47.26%, speak english fluently 97.49% and live in suburban community [14]. Which roles and permissions hold the members is described in next section.

2.6 Member's Roles

Each member has different roles that bear different permissions. Certain activities can be carried out with certain rights. Rights are characterized mostly by the number of IQs scored and the more rights a member has the more central is his role in the community. Members take one of the following roles: *Whitehat*, *Artist*, *Editor*, *Mediator*, *Moderator* or *Staff*. As Genius describes generally *Editor*'s main task is to correct content and to decide about contributions of *Whitehat*, who is a normal user [8] and usually is new member. *Moderator* has

more management activities such as verify *Artist*, who is an owner of a lyric. *Mediator* assists new members. Both *Moderator* and *Mediator* are selected by *Moderator*'s commune or *Staff* [11] [10]. In detail Genius specifies the roles with following particulars:

Whitehat is usually new member and is at the low level of the community and have accordingly few permissions.

Editor is a contributor with high-quality annotations, which are formatted, consistently well written, without errors in grammar, spelling or punctuation and contain knowledge that adds depth to the meaning of the referent. Whitehat is selected by Editors/Moderators to become an Editor.

Moderator is an Editor who has proven , that he/she can coach[6] other contributors to write consistently high-quality annotations. Other tasks are to resolve conflicts and to *de-editor*[7] members, who break community guidelines or participate consistently with contribution of poor quality.

Verified artist has written own lyrics with full permissions on it and has the ability to annotate his own works, as another way to connect with fans.

Mediator role is designed for leaders, who are welcoming and assisting everyone, strive for a positive environment and either uninterested in or unable to do the work of Editors. Mediators are selected by Moderator commune.

Staff are designer, engineer and other employee, those are very few in number, 12 up to now [18]. Responsible for curating the site and the community, they have exclusive powers and abilities.

Nomination process is based on the rule: Not Quantity but Quality. Through high quality of contributions in spelling, sources, images and citations members are promoted to gain more abilities independently of their IQ score range [8]. Figure 6 confirms that there are members, who have more IQs count, but "minor" role level, which means less permissions, for instance the Whitehat *subMACHINE* has more more IQs count than the Staff *Peter Nowogrodzki*.

Intellectual property includes exclusively dealing with lyrics, which have no license worldwide and the user is solely responsible for that [19]. User contents are the exclusive property of Genius and its licensor (including other users who post user content to the service) [19].

Table 9 in the appendix shows that each role is associated with a color that is used for the detection of a role, while the IQ counters do not matter. The rights differ between the roles, but these also differ among users within a role. Some users due to their IQ number own more rights than their equivalents within a role, for example see the role Mediator in the Table 9, which is discussed in section *action* below. In this Table 9, we classify member permissions according to the type of their operations and effect on Genius. Those categories are:

[6] Inspire and train other contributors

[7] Set down a contributor's role from Editor to Whitehat

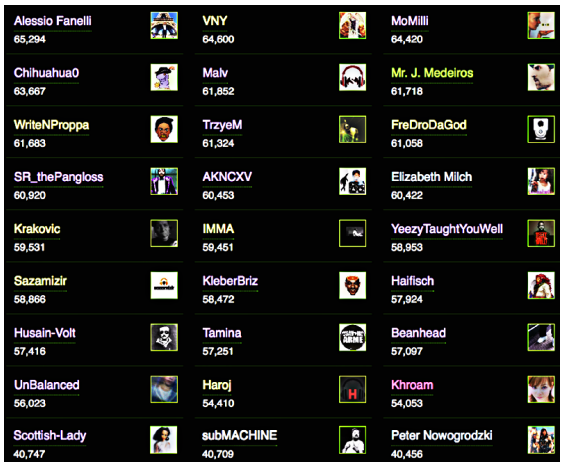


Figure 6: Member's Roles and IQs

Screenshot: `http://genius.com/verified-artists` 13/07/2015
This figure illustrates the independence of member's IQ score range and his role (e.g. in the last row *subMACHINE* with the role Whitehat earned more IQs than the staff *Peter Nowogrodzki*)

- *access* Specific areas are available only for certain users. It means read only access without write permission. Whitehats and Artists have mostly no access, because they have no administrative duties, as we can see in the Table 9 in the appendix. User aliases is a search tab to find other users and shows who changed their name to what and when.
- *action* Extreme roles such as Whitehat and staff are clear, Whitehat has hardly any permissions, while Staff holds fully permissions. In this category the difference between the other roles is in evidence especially Mediator, Editor and Moderator. It can be seen that Moderator and Staff are at the same level, then comes Mediator followed by Editor. Certain Mediators with specific properties (600+) have more rights than Editors or other Mediators, for example *lock / unlock pages* permission has an Editor but no Mediator with less than 600 IQ, while Mediator with 600+ IQ is comparable with Moderator and Staff. The actions are self-explanatory, but we clarify *penalty box* and *pin threads*. Penalty box is like a punishment for a user, where the user can not make any actions for a certain period, because he has failed to comply with certain rules. A threads changes it's order in a forum depends on its voting and user's interaction with it, the more they are, the thread migrates upward. Pin threads (up to 5) holds a claimant for a certain time at the top, regardless of the rating or of interacting with these threads or with others.
- *create* is divided in create into song page (annotation, song page text, vote, album, tracklist and profile picture) and in create into forum (topic, post, postlets). Create into song page is usually open to all, but into forum the access is very limited. Only Moderators and Staffs can create forums, to which users

with 150+ IQ can post. Song page text can be promoted by means of postlets, which go into forums for discussion with references to the original content or/and to the artist.

- *edit* included *delete* rights have mostly Moderators and Staffs, an Artist has almost the same rights but only over his own pages.
- *Promotion* shows again the privilege of the individual roles. The permissions *verifing artist* and *de-editor* contributor can only Staffs, while promoting a Mediator or a Moderator is a Staff's or Moderator commune responsibility. An Editor can only promote a Whitehat to an Editor.

3 Technical Structure

3.1 Genius Subdomains

Genius places at the disposal subdomains for several countries and subjects, including *Feachered*[8] like general discussion, history, ideas, literature, news, technics and *Other*[8] as game, law, religion, wealth and history, as well as subdomains for particular platform as android and iOS and non-public annotation use like education. Members can create subdomains for custom language or channel, as well, *Deutschland*[9], *France*[10] and *Arabia*[11]. Following, we provide some selected example of Genius subdomains.

3.1.1 Education

Education Genius is addressed to teachers at all levels and enables to design and create *classroom projects*[12], which are implemented using the Genius collaborative annotation platform and are distributed from middle school to universities. Each project is a special and exclusive region, in which teacher inhabit different editing skills than students. After activating *Educator* account teachers[13] can add texts and students sign up for accounts, read, annotate and earn IQ's for contributions.

3.1.2 Law Genius

Clarke describes Law Genius[14] as an online collaboration platform for lawyers and law students, which allows everyone sharing law ideas, discussing cases and makes law more accessible for everyone. Collections that work as "free, interactive casebooks[15]"created by Students or educators, who can annotate

[8] `http://genius.com/forums`
[9] `http://genius.com/tags/deutschland`
[10] `http://genius.com/tags/france`
[11] `http://genius.com/genius-arabia`
[12] `http://genius.com/Education-genius-classroom-projects-2013-2015-annotated`
[13] a professor or school as well
[14] `http://genius.com/law-genius`
[15] `http://genius.com/Law-genius-law-school-geniusannotated`

them for analysis or share them with other study groups so that everyone profits from their hard work [4].

3.1.3 Annotate the World

Placing *genius.it/* in front of an URL enables annotating directly on that website. There is a browser extension, bookmarklet[16] and android/iOS application. Annotations made by those ways are called *offsite annotations* [20]. As per the date of writing this paper, this is still a beta version.

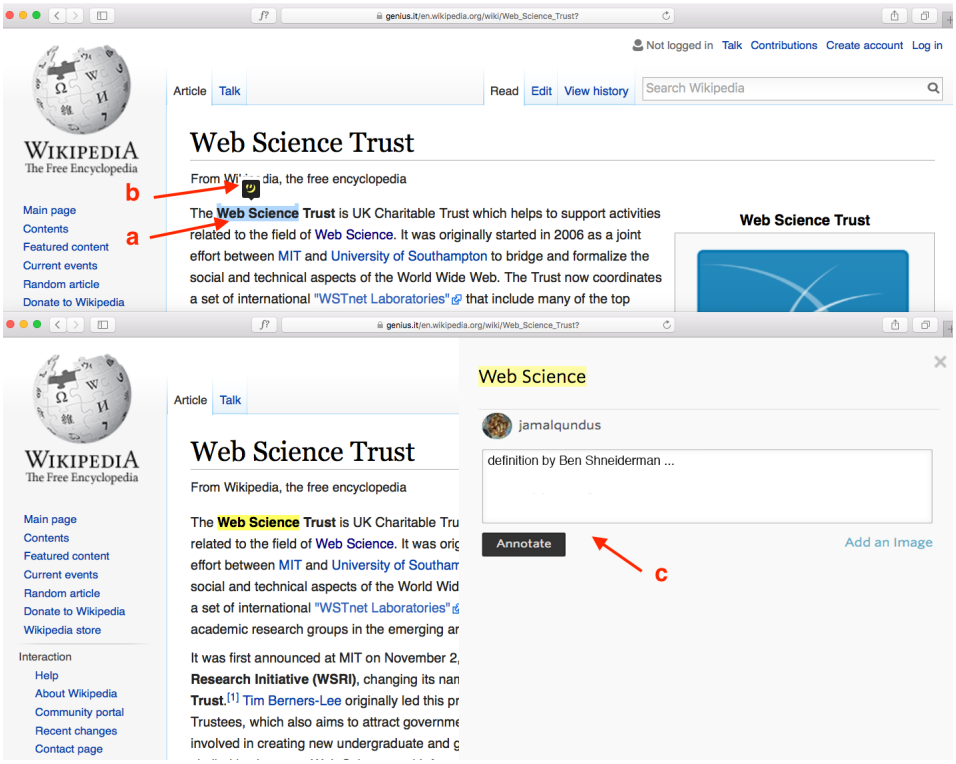


Figure 7: Annotation on Website with Genius Tool

Screenshot: 05/10/2015
This figure illustrates making annotation on website using Genius's tool: Marking[a] piece of text appears Genius's symbol[b], which should be clicked to begin annotation in the field[c] appears to the right.

To make a page annotatable one line of code[17] has to be inserted anywhere within page code source and anyone can highlight content on that page to create annotation, which can be committed to Genius [17].

[16] `http://genius.com/bookmarklet`
[17] Javascript: <script async src "//genius.codes"></script>

3.2 Developers

Genius provides API, documentation and support forum. Developers can sign up, create an API client and get access token to export own annotation into their application or website. A request with the annotation *id*[18] and developer's *key* to Genius server[19] responses a JSON object[20] in Figure 8, that contains all meta data like author, body, vote, time stamp et cetera of the requested annotation. Genius API users are able to *add, manage, and view annotations on any piece of text on the Internet, upvote or downvote annotations and get info on your fave artists and tracks* [12]. The technical services provided by Genius are listed in Table2 below.

Table 2: Technical Services

API URL	https://api.genius.com/
Supporting	http://genius.com/api-support
API client	http://genius.com/developers
Topic	annotation, voting, information
Request protocol	http, https
Response format	JSON, REST
Authentication protocol	OAuth2
Contact	code@genius.com
Documentation	https://docs.genius.com

According to Genius documentation
This table showing an overview of provided technical services

3.3 Firehose

Firehose pushes notifications about members activities. It is the starting point of our study for data collection on Genius. This mechanism documents and records action of members. Firehose includes filters to select specific notification languages and topics. As shown in Figure 9 an activity at Firehose consists of contributor's name, type, subject, symbol of type and time stamp as overview and by clicking on the activity its details are shown.

4 Activity Study

Firehose is used as channel to be notified about user activities on Genius. An approach model is developed for that, it holds a couple operation steps: (a)

[18] can be found at the end of url in browser by clicking the annotation

[19] *http://api.genius.com/annotations/(annotation id)?access_ token=(developer's key)*

[20] a map of its structure is provided in the appendix and more explained in Activity Study section 4 of this work

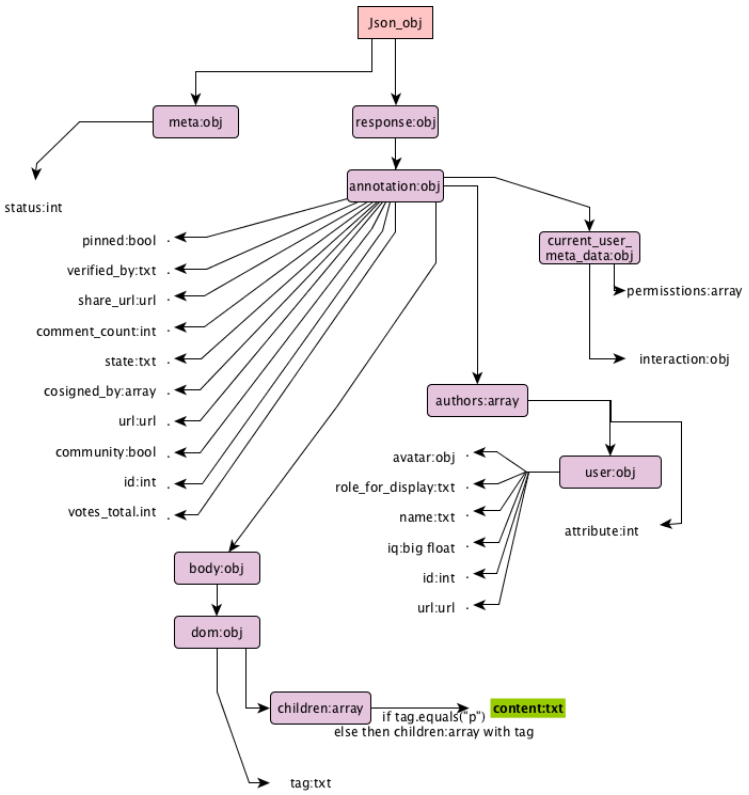


Figure 8: Annotation Activity JSON Object

Created: 25/08/2015
This figure shows a JSON object overview of annotation activity

getting activity notification (b) extracting available links (c) fetching JSON objects (d) identifying and classifying the information (i) forwarding into data base. For realizing this procedure, we implemented a Java programm as shown in Figure 10 that consists of three classes, which are *MainClass*, *HttpConnection* and *FhParser*, additionally to a *DBHandler* class.

The program gets notifications of the activities (1), extracts available contained links[21] (2), which are used in Genius API to get JSON objects (see Figure 8). The included meta data in the JSON object will be extracted and classified according to activity's type (3). This step (3) will be repeated to get data about the author and the song page. Afterwards, the program passes the collected information into PostgreSQL data base (4), it's schema is presented in Figure 11. The entity *fh_ activity* (1) holds the properties activity id (c_id), *title* as well

[21] URL, annotation id, song id and author id

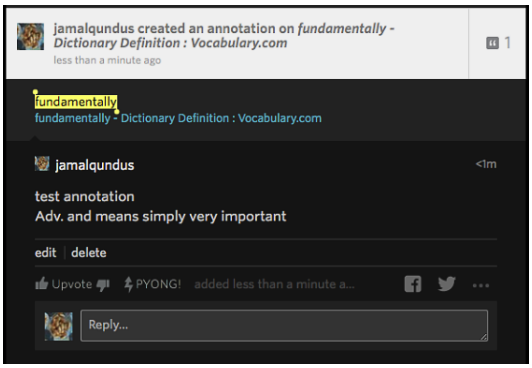


Figure 9: Activity on Firehose

Screenshot:16/09/2015
This figure shows an activity of creating annotation

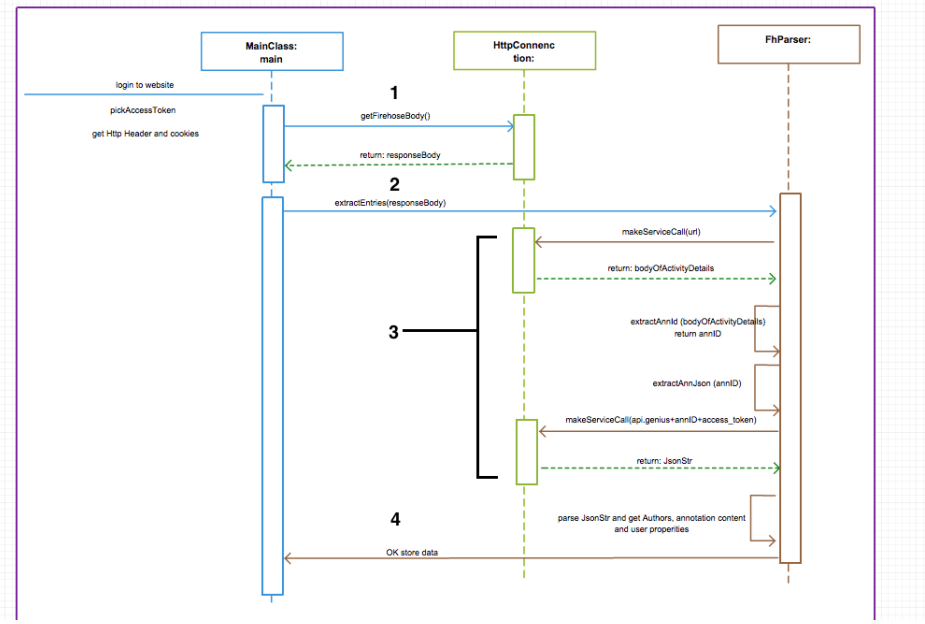


Figure 10: Firehose Activity Parser Workflow

This figure shows our develped parser for extraction data from Firehose activities

as *time_stamp* as primary keys, activity URL (c_url), *type*, *details_url* that links to a page, which contains an overview about the activity and *song_id* of the song page, to which the activity is associated. Afterwards, four entities are aggregated in the data base to *fh_activity*. The entity *song* (2) holds the meta data of the song page. Their association has the multiplicity [1, 1..*], which

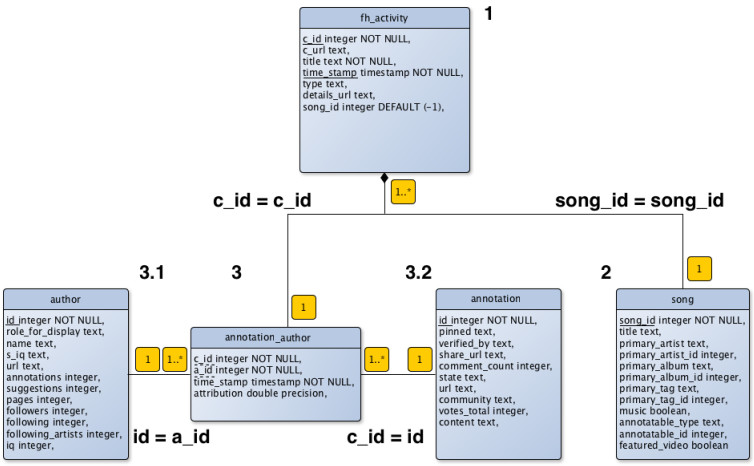


Figure 11: Database Schema

This figure shows database schema of the collected Firehose activities

means a *song* (2) can be referred on the foreign key *song_ id* to at least one or to an amount of *fh_ activity* (1). The association between *fh_ activity* (1) and the entity *annotation_ author* (3) is the same. *annotation_ author* (3) (foreign keys *a_ id* and *c_ id*) refers to the entity *author* (3.1) (primary key *a_ id*) and to the entity *annotation* (3.2) (primary key *c_ id*). For instance, two Firehose activities act1 and act2 should be inserted into the data base. Those activities shall have the following information extracted:

Table 3: Illustration of two activities on Firehose

property	act1	act2	description
c_id	123	456	activity id
song_id	789	789	song page id
a_id	23	45	author id
time_stamp	10/10	11/10	time stamp

Clearly, these activities act1 and act2 are different, they have different c_id's. Different a_id's means they have been created by different authors. act1 and act2 are referred to the same song page, because they have the same song_id. Very frequent in Firehose notifications an author creates an annotation and after shortest time he edits it. Firehose operates according to the real time processing principle without memory and in this case, it reports two independent notifications of the same activity, same author and same song page. The data base gets two entries and differs them by means of the *time_ stamp*.

Each notification has a sequence of characters that embodies a regular ex-

pression: {subject predicate object} as presented in the appendix Table 8, which we describe in detail in section 4.1. The column *Regex* describes the regular expression of every notification. For example the notification *username upvoted annotation* can be subdivided into username as subject, upvoted as predicate and annotation as object.

Genius provides an API to get more meta data about objects, that are related to an annotation, which has an identification to make a request to the Genius API. If the object suggestion in the activity *username upvoted suggestion* is related to an annotation, then we could find an identification to use Genius API for getting a JSON object. Some activities are not existing anymore, because there were marked either as spam, break of Genius rules or have very low quality or wrong content. Other activity types refer to a member page, which we prefer not to analyses currently. Some activity types are not in conformity with the pattern, that provides analytics submitted like *username added a photo - it means a profile photo* - we call such activities dead end activities, that not contain a page URL to use the Genius API for more information. Therefore they will not be considered in this analysis. Table 4 represents an overview for the collected data over the observation time span.

Table 4: Summary Collected Activities

Observation period	2015-09-30 to 2015-11-06
Total notifications	1,306,560
Total annotations[1]	762,853
Unique annotations	240,060
Unique annotators*	57,222

This table showing an overview of collected notifications (activities) over five weeks
*members, who generate annotation.

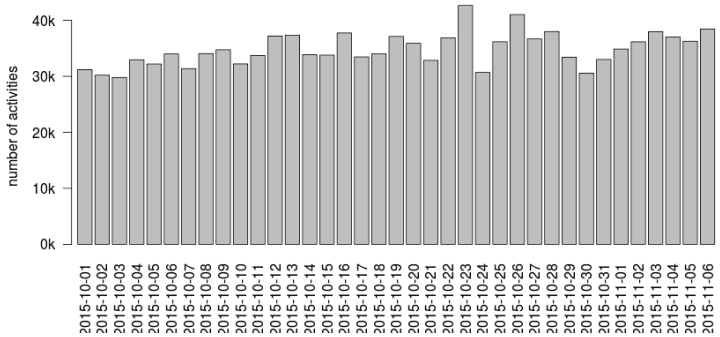


Figure 12: Activity Notifications Overview

This figure shows how much activities are generated daily

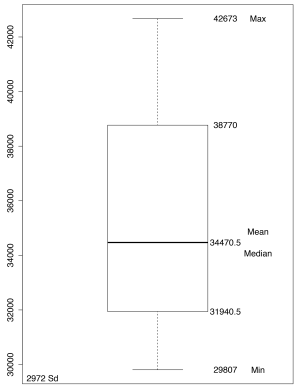


Figure 13: Statistic Elements of the Collected Activities Daily

This figure shows minimum (Min), mean, median, standard deviation (Sd) and maximum (Max) of the collected activities distribution

Figure 12 shows the distribution of the collected activities daily, which we began to collect form 30.09.2015 16:43 to 06.11.2015 23:27. On the first day the begin was at 16:43 PM, therefore it is taken out of the calculation. As shown in Figure 15 mean value (34,867) and the median (34,074) are close together, which indicates a balanced distribution and it does not matter what day it is, it's almost the same amount. The standard deviation is relative low, which confirms that statement.

The plot in Figure 14 for the active users daily has similar properties as those in Figure 12. Mean 5,863 and median 5,309 are close together in Figure 12. Both representations Figure 12 and 14 are build on annotation activities.

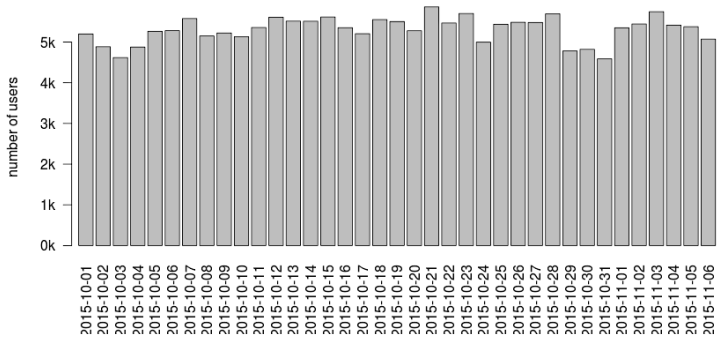


Figure 14: Active Users

This figure shows active users daily

A user generated on mean 13.33 annotation activities in 5 weeks, which is 0.36 annotation activity per day. All annotation activities are based on 240,060 unique annotation activities, that means a user carries out 4.19 different annotation activities on average.

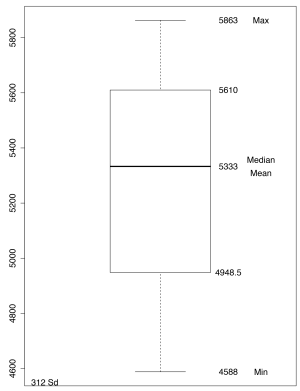


Figure 15: Statistic Elements of Activities and Users

This figure shows minimum (Min), mean, median, standard deviation (Sd) and maximum (Max) of the distribution users to activities

Figure 16 shows the distribution of edits over the pages. Interestingly, the edits are uniform distributed, which means that almost each page has edits, equally, which is unusual observation. On mean a page is edited 295 times, while the median is 195 and the standard deviation is 461 as shown in Figure 17, which means that the distribution contains extreme values as presented in Figure 18.

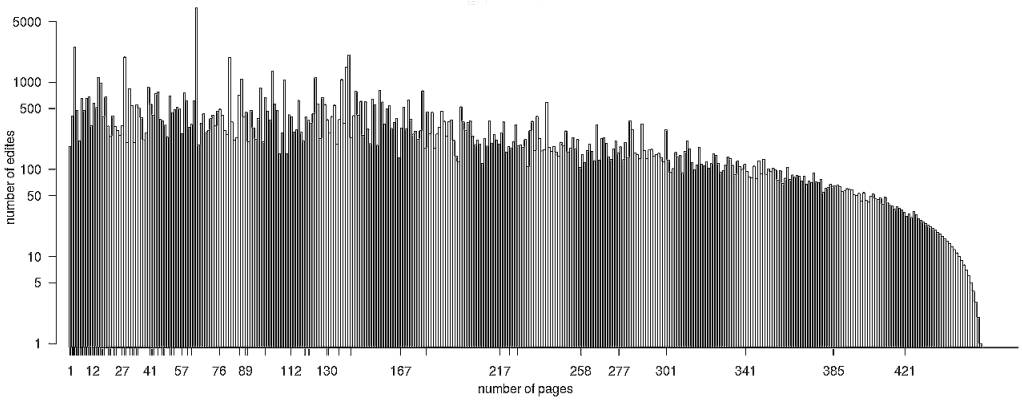


Figure 16: Page Edits

This figure shows edits overview on pages

This is traceable, some pages are more interesting (maximum value :7140 edits) than others (minimum value: 1 edits) and therefore those are more visited and more edited. Nevertheless, it stills not a measure of whether a page is interesting for users or not, as long as the creation date of pages is not taken into consideration, young pages have not the same opportunity to get edits as

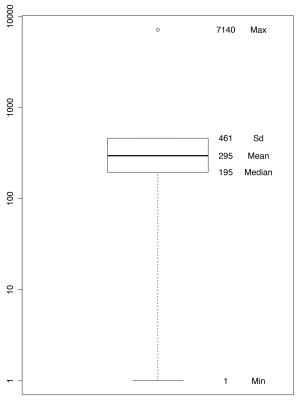


Figure 17: Statistics of Edits on Pages

This figure shows statistic values minimum (Min), mean, median, standard deviation (Sd) and maximum (Max) of edits on pages

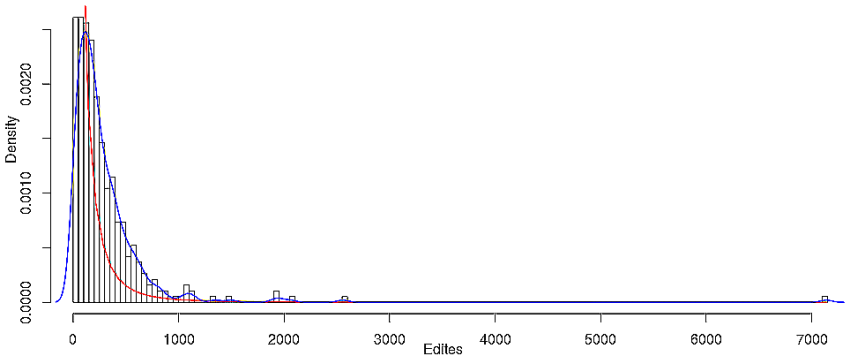


Figure 18: Function Curve of the Edits

This figure shows the distribution function of the edits over pages

older pages.

According to the period of analysis the distribution in Figure 19 shows how many annotation activities are generated by how many users. Additionally, it shows interestingly a remarkable amount (7,396) as inner bolter of users that generate an annotation activities count between 10 and 50.

If we take both extreme values (1 and $>$ 5k) out and look at the next big user group (16.5% of total users 57,222), which generate precisely only two activities, it is clear that the group of this inner bolter, which builds 12.9% of total users, is a large group. To recap here, this observation refers to the observation period and only to annotation activities.

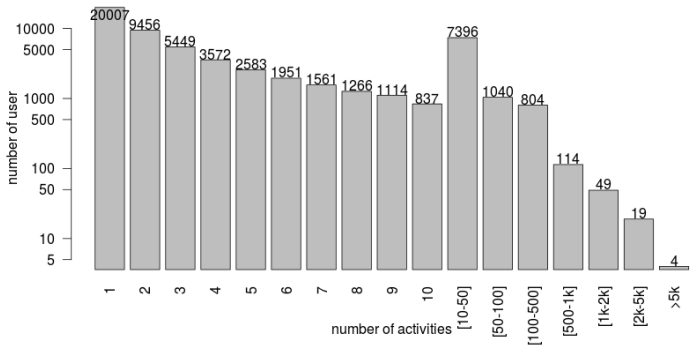


Figure 19: Active Users

This figure shows the distribution of the active users.

4.1 Activity Types

In the observation time span 78 types of activities have been identified as presented in the appendix in the Table 7, from which 52 types are referred to annotation activities. These assume a certain pattern, which can be described with the regular expressions as follows: With:

$$\begin{aligned} \sum_{subject} &= \{members\}, \\ \sum_{predicate} &= \{activity_t ypes\}, \\ \sum_{object} &= \{\epsilon, sub - activities\} \end{aligned} \tag{1}$$

Regex:

$$\left\{ abc|a \in \sum_{subject}, b \in \sum_{predicate}, c \in \sum_{object} \right\} \tag{2}$$

Activities were classified into types according to their predicates, definitively there are many other activity types that did not occur in the observation time span, for example made Moderator / Staff, remixes annotation, text correction, embedding tweets / Facebook, create / edit / manage postlets, clear votes, Penalty Box, et cetera. But we focus on those that occurred and which of them we could find meta data about, and these are annotation activities (see description in the previous chapter 3.2).

Following we present these activity types by their predicates in a different order to consider them more abstract. This abstraction in the Table 5 is based

Table 5: Abstraction of Activity Types

Category	Predicate	Description
augment	upvoted posted created added replied proposed	expand or add Genius with content
detach	rejected deleted archived downvoted	disconnect and disassemble content from Genius
manage	edited accepted marked integrated merged moved incorporated un-/pinned un-/locked verified	manage content. Activities that affect a change on Genius content
movement	followed mentioned registration pyonged cosigned gave access	interact with members and their contents. The influence here is cosmetic and defeat no change

This table showing an abstraction of activities types

on the change that such predicates can trigger in Genius, which is described in four categories:

augment contains such types, that trigger expand or addition into Genius, this embodies the activity *upvoted*, which is controversial here, considering its complement *downvoted* makes it clearly. If an annotation reaches a certain minus IQ's by downvoting, this will be eventually cleared, which is a step towards reducing the content of Genius. While upvoting is a step in the opposite direction that expand content into Genius.

detach is the other side to *augment*.

manage embodies activities that affect content changes.

movement impacts no real change, but it is also no management. For instance,

Following a user effects no changes on Genius, but only the follower gets notifications about the changes generated by the followed user.

4.2 Collaboration on Genius

Benkler and Nissenbaum define *peer production* as a socio-economic system of production, which occurs in the digitally networked environment and involves collaboration among peers, who cooperate effectively to produce knowledge [3] [2] and “Goods" developed and shared according to community-defined rules [21]. Terveen and Frey et al. introduce collaboration as a process involving at least two entities working together to achieve shared goals [29] [6].

We adapt this definitions and extend them in the context of Genius to the amount of participant interactions on a Song Page to achieve the goal to interpret text. Our extension builds on the differentiation *lightweight peer production* (LWPP) and *heavyweight peer production* (HWPP) presented by Haythornthwaite, which are used to refer to participant contributions. LWPP involves interactions, which are targeted to simple and independent contribution without initiation relationships among participants. Its power is its simplicity that allows numerousness of participations, in contrast to HWPP that implies extensive and time consuming contributions and involves also more information about contribution and contributor. That therefore, its power is to allow analysis based on such information. In this collaborative forms the user's participation occurs based on the complexity and dependency of their interaction, which are characterized by “weak-tie attachments" and “strong-tie attachments". Weak-ties are simple enough for participation, while strong-ties require agility and more experience by participants [21]. LWPP is independent on other contributions and straightforward and is described by weak-ties, while strong-ties identify HWPP, which is dependent and more complex.

Complexity refers to contributions -length, consuming-time and -divisibility as well as contributor's agility. This definitions (peer production and collaboration) and differentiation are suitable for the contributions of Genius, that are based on voluntary participation of peers, and for their properties, that can be distinguished into light and heavy consuming effort by a contributor.

The collaboration design of Genius is presented by users' interactions on Song Pages, which we classify in the dimensions LWPP and HWPP based on Haythornthwaite's approach as illustrated in the Table 6. We use predicates as representatives for the interactions. LWPP-predicates are atomistic and independent, therefore there is no need to manage a history of contribution, but a quantitative recognition and measure are of certain interest. HWPP interactions include predicates matched in strong-ties. They are connected and revised, therefore a history of contribution is important as well as qualitative recognition is relevant [21]. For instance, the predicates *down-/upvoted* an annotation or *pyonged* a Song Page of LWPP are atomistic, independent, quantitative instead of qualitative measurement is relevant and done by one click. While the predicates *created* an annotation or *proposed* an edit require more agility by contributor and are time consuming, therefore they are classified into HWPP.

Table 6: Collaboration Interactions

	Predicate	Object	Number of Activities
Lightweight	upvoted	annotation	393,209
	downvoted	suggestion	33,424
	accepted	description	17,591
	marked	comment	11,168
	rejected	Song Page	10,752
	deleted	user	5,711
	archived		5,133
	cosigned		1,886
	incorporated		369
	followed	Song Page	138,783
		user	
	pyonged	description	20,036
		annotation	
		Song Page	
Heavyweight	created	annotation	149,000
	edited	description	45,456 (154,505)
	mentioned	Song Page	66,642
	merged	meta data	2,670
	integrated		4,254
	replied		5,146
	added	suggestion	77,428
	proposed	reply	6,838
		edit	
		comment	

This table is an extension of [26] and illustrates the predicates of collaboration design on Genius, which are classified into LWPP and HWPP. Each predicate can form an activity with each object from its group. Groups are separated by a horizontal line. For example: The predicate *followed* (LWPP from the second group) may combined with the objects *Song Page* or *user*, but not with the object *comment* (LWPP from the first group).

Descriptions of all predicates are in the appendix Table 8.

For another possibility to classify the predicates we consider the Song Page as the object of the collaboration on Genius and its life cycle as shown in Figure 20, where (A) illustrates HWPP-predicats, (B) Song Page states during the collaboration and (C) shows LWPP-predicates. A Song Page is permanently in one of these states (B). The state initialization (start state init) of a Song Page is the first step for the whole. Interaction (inter in (B)) provides collaboration ways for users and it is the core of such collaboration. *inter* includes both designs of collaboration; for instance a user votes (LWPP (B)) an annotation

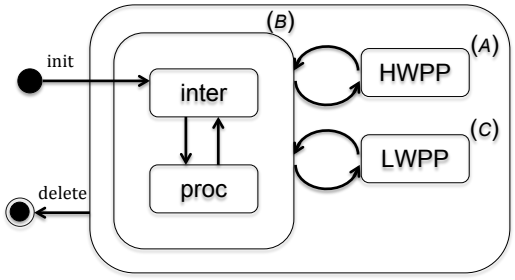


Figure 20: Interaction States

This state chart diagram illustrates interaction states of a Song Page

or a user replies (HWPP (A)) an annotation of another user.

Processing (proc in (B)) is not really a part of the collaboration due to the fact that in this state users contributions are checked by authorized members, either they will be accepted then published or otherwise. In this sense, it is not among collaboration definition, but it is important to mention as a state of a Song Page, because together with *inter* it builds a loop over Song Page's existence. There is a relationship between LWPP and HWPP; generally, LWPP-interactions build on HWPP-interactions, therefore, they must be performed, firstly. Before voting an annotation, this should already have been created, so the direction of the collaboration is from HWPP over a Song Page to LWPP.

With uploading text users can begin the collaboration on the created Song Page and we argue that decidability to which model an interaction is classified, is based on the type and complexity of its predicate.

Our collected data set reflects during the term of analysis 162,747 unique users, which are distributed over 77,806 unique Song Pages. That means on average 2,09 users participated on a Song Page. There are Song Pages with strong collaboration, such as "Hotline Bling [22]" with 508 interactions generated by 28 unique users.

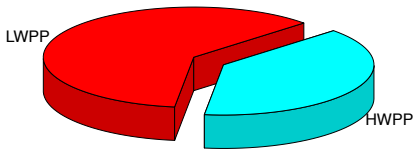


Figure 21: LWPP and HWPP Interactions

This diagram illustrates interactions overview of the interactions of Genius collaboration according to LWPP and HWPP [26]

As illustrated in Figure 21 and confirmed in Table 6 the number of the activities in LWPP is greater than thus in HWPP. Users interact at the level

[22] http://genius.com/Drake-hotline-bling-lyrics

LWPP, mainly. This is reducible to the characteristics of LWPP and it's weakties, which are easy for user to contribute as well as the participation requires low agility by user and based on simple community rules. Therefore the contributions at LWPP do not need examination by authorized members and get published straightforward. For instance, it is simple and will be viewed immediately to upvote an annotation than to create one.

It is to note that we count activities, which build the interactions of the collaboration and are presented in the data set, as well as we pulled out repeated *edited* (45,456 unique of 154,505 edits) from the activity annotate. Usually a user edits his contribution frequently and in a row, which would manipulate our results.

5 Conclusions

We described in this technical report Genius as SM, introduced the opportunities to use it and characterized user's activities. Users can upload text, annotate it and earn IQs by voting by other users and get new roles with more permissions for more interactions.

We analyzed Genius and presented concrete figures on the distribution of activities created over a time span. These figures have shown that Genius is still young, but it is growing very rapidly, which has confirmed the number of the Whitehats as mostly new comers to the number of the other roles. We detected different user roles with different responsibilities and privileges. Artists and Staffs are the roles with the most generated content, while Editors take over the task of correcting the content and Moderators have user coaching and management tasks.

Genius is a stage for providing interpretations of texts, which builds together with the offered options a form for collaborations among users. Such collaboration is embodied by editing pages, knowledge generating as well as sharing and exchange of opinions about texts that will be confirmed or refuted by other users.

6 Appendix

Table 7: Activity Types

Annotation activities (52 from 78)	**Other activities**
accepted annotation accepted their annotation	**accepted a suggestion** **accepted comment**
added suggestion to annotation added suggestion to description added suggestion to their annotation added suggestion to their description	**added a photo** **added comment to text**
archived comment	-
cosigned annotation cosigned description cosigned their annotation cosigned their description	-
created annotation created description	**created text**
deleted annotation deleted their annotation	**deleted text**
downvoted annotation downvoted comment downvoted description downvoted suggestion	**downvoted post**
edited annotation edited description edited their annotation edited their description	**edited metadata** **edited text**
-	**followed**
-	**gave access to forum**
incorporated annotation integrated comment integrated suggestion	
-	**locked**
- - -	**made editor** **made educator** **made mediator**
marked annotation marked description marked their annotation	**marked as spam**
mentioned	-
merged annotation edit merged their annotation edit	**merged discography**

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Table 7 – continued from previous page

Annotation activities (52 from 78)	Author activities
-	**moved post**
-	**pinned**
-	**posted**
proposed edit to annotation proposed edit to description proposed edit to their annotation proposed edit to their description	-
pyonged annotation pyonged description pyonged their annotation pyonged their description	**pyonged**
-	**registration**
rejected annotation rejected annotation edit rejected suggestion rejected comment rejected their annotation rejected their annotation edit	-
replied annotation replied their annotation	-
-	**unlocked**
-	**unpinned**
upvoted annotation upvoted suggestion upvoted description upvoted post upvoted comment	**upvoted post**
-	**verified lyrics**

This table shows the annotation activity types and all activity types, in which dead end activities are in bold.

Table 8: Activity Descriptions

Id	Predicate	Object	Description	Regex
1	accepted	- (their) annotation - (a) suggestion	Member with certain permissions accepted the annotation and (a) suggestion. a suggestion refers to annotation, while suggestion to page text `http://genius.com/3289744`, which we call comment.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
2	added	- photo - (their) annotation - (their) description - text	- member added a profile photo - member added a suggestion to (their) annotation - member added a suggestion to (their) description - member added a comment to page text.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
3	archived	- suggestion	Archive just hides the suggestion (an option between accepted and more likely rejected).	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $d \in \sum_{object}\}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
4	cosigned	- (their) annotation - (their) description	You agree with the person. Similar to ^, but it can also be used when someone posts something that is not directly above you. Person 1: Illmatic's best song is *Halftime*. Person 2: I don't really like that song. Person 3: Cosign Person 1. `http://genius.com/2541962`.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
5	created	- annotation - description - text	-member created annotation on a pice of text - member created description to a page text - member created a page text	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $d \in \sum_{object}\}$
6	deleted	- (their) annotation - text	-member deleted an annotation - member deleted a page text	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
7	downvoted	- annotation - suggestion - comment - description - post	Decrement annotation's / suggestion's / post's IQ score. a suggestion is of a description or an annotation, while comment refers to the page text.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
8	edited	- (their) annotation - (their) description - meta data - text	Change annotation / description/ text or it's meta data.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
9	followed	- member - page	A member can follow a another member or a page.	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $d \in \sum_{object}\}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
10	gave	access to forum	A member with certain permission like an Editor gave another member an access to forum.	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $d \in \sum_{object} \}$
11	incorporated	annotation	Annotation participates in *transcription contest* into Genius annotation. `http://genius.com/Scribe-a-thon-september-2015-annotated/`	$\{abcd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $c \in \sum_{subject}, d \in \sum_{object} \}$
12	integrated	- suggestion - comment	Integrate lets you integrate the suggestion into the annotation (or the comment into the page text. Like archived but integrated is intensify accepted.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object} \}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
13	locked	- page	Page is locked means 600 IQ's is required to edit it. When a Regulator or Moderator locks a page, only Editors and above can edit the text! Check out this annotation `http://genius.com/3288589` for more details on locked pages. Verified Lyrics/Texts: when an artist *verifies* their text, the page is locked to everyone except staff. If an editor comes across text that appear incorrect but have been *verified* by an artist, they should hit up a member of staff to assist them! `http://genius.com/3289756`.	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\},$ $b \in \sum_{predicate}$, $d \in \sum_{object} \}$
14	made	- editor - educator - mediator - moderator - staff	A member has been promoted. Moderator and staff promotion happens rarely.	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\},$ $b \in \sum_{predicate}$, $d \in \sum_{object} \}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
15	marked	- (their) annotation - description - as spam	color coded (if as spam then it will no longer exist!) - marked this as Restates the line: that means your audience feels like you're simply saying what the artist said in different words. `http://genius.com/7507130` - marked this as it's a stretch: means your audience finds your interpretation unlikely or hard to believe. `http://genius.com/7507130` - marked this as Missing something: that means you should check the suggestions and proposed edits to try and improve it. `http://genius.com/7507158`.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
16	mentioned	- member - page	Member or content is referred in another content.	$\{ab\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}\}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
17	merged	- (their) annotation edit - discography	Often people will explain one part of a whole line because they don't understand the other. This can be easily fixed by choosing the best annotation (Annotation 1) then rejecting/deleting the other (Annotation 2) while incorporating the important comment from it (Annotation 2) into the better annotation (Annotation 1). `http://genius.com/1435708` discography: artist ID will be removed and the discography will be added into the list of lyrics of the artists. Example: `http://genius.com/activity_stream/show_details?[]=32188270`.	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $d \in \sum_{object} \}$
18	moved	- threads	Threads/contribution will be moved into *right* or suitable forums/ sections (Lit, sport...).	$\{ab\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate} \}$
19	pinned	- forum threads	Up to five threads can be pinned to the top of any forum at a given Time. Think of the possibilities! Pinned forum expectations! Pinned threads for album clean up! All the pinned threads! `http://genius.com/discussions/172847-New-feature-pinned-forum-threads`	$\{ab\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate} \}$

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
20	posted	- threads	Threads has been posted to a forum.	$\{ab\| a \in \sum_{subject} \setminus \{\epsilon, their\}, b \in \sum_{predicate}\}$
21	proposed edit to	- (their) annotation - (their) description	Making a propose to improve.	$\{abd\| a \in \sum_{subject} \setminus \{\epsilon, their\}, b \in \sum_{predicate}, d \in \sum_{object}\}$
22	pyonged	- member - page	Share a given page with all of their followers. `http://genius.com/2544094`	$\{abd\| a \in \sum_{subject} \setminus \{\epsilon, their\}, b \in \sum_{predicate}, d \in \sum_{object}\}$
23	registration		New member.	*Your * friend X is on Genius!* * Facebook, Google and Twitter

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Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
24	rejected	- (their) annotation (edit) - (a) suggestion	Content will not appear any more because it is rejected.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
25	replied	- (their) annotation	Only replies can be written to annotations created by the page artist (no suggestions).	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
26	unpinned		see 19 pinned.	
27	upvoted	- annotation - suggestion - comment - description - post	Increment annotation's / suggestion's / post's IQ score. Suggestion is of a description or an annotation, while comment refers to the page text.	$\{ab(c)d\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $(c \in \sum_{subject}), d \in \sum_{object}\}$
28	unlocked		See 13 locked.	

Continued on next page

Table 8 – continued from previous page

Id	Predicate	Object	Description	Regex
29	verified	- lyrics	Page is tagged (green marked) as checked.	$\{abd\|$ $a \in \sum_{subject} \setminus \{\epsilon, their\}$, $b \in \sum_{predicate}$, $d \in \sum_{object}\}$

This table shows description of the activities

Table 9: Role Permissions

Permissions	Whitehat	Artist	Mediator	Editor	Moderator	Staff
appearance	White	Green	Magenta	Yellow	Purple	Steel-blue
access						
chat	No	No	Yes	Yes	Yes	Yes
editorial board	No	No	Yes	Yes	Yes	Yes
facebook/twitter	No	No	Yes[a]	No	Yes[a]	Yes
general forum	Yes	Yes	Yes	Yes	Yes	Yes
moderation forum	No	No	Yes	Yes	Yes	Yes
user aliases	No	No	Yes	Yes	Yes	Yes
user report	No	No[a]	Yes	Yes	Yes	Yes
action						
annotate locked song	600+	600+	600+	Yes	Yes	Yes
chart beat	No	No	Yes	Yes	Yes	Yes
clear votes less 0	No	No	Yes	Yes	Yes	Yes
lock/unlock pages	No	own	600+	Yes	Yes	Yes
massage user	300+	300+	300+	Yes	Yes	Yes
mark as spam	No	No	Yes	No	Yes	Yes
move threads	No	No	Yes	No	Yes	Yes
penalty box	No	No	Yes	No	Yes	Yes
pin threads	No	No	Yes	No	Yes	Yes
warn/ban in chat	No	No	No	No	Yes	Yes
create						
content (ann., text, vote)	Yes	Yes	Yes	Yes	Yes	Yes
forum	No	No	No	No	No	Yes
forum-post	150+	150+	Yes	Yes	Yes	Yes
postlets	No	No	No	Yes	Yes	Yes

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Table 9 – continued from previous page

Permissions	Whitehat	Artist	Mediator	Editor	Moderator	Staff
update album-tracklist	1000+	1000+	1000+	Yes	Yes	Yes
upload a profile pic	Yes	Yes	Yes	Yes	Yes	Yes
delete						
forum-thread/post	No	No	No	Yes	Yes	Yes
song page	No	own	No	No	Yes	Yes
text page	No	own	No	Yes	Yes	Yes
edit						
album-tracklist	No	own	No	Yes	Yes	Yes
artist page	No	own	No	Yes	Yes	Yes
forum posts	No	No	Yes	No	Yes	Yes
locked page	No	own	600+	Yes	Yes	Yes
postlets	No	No	No	Yes	Yes	Yes
text page	No	own	No	Yes	Yes	Yes
promotion						
Editor	No	No	No	Yes	Yes	Yes
De-editor	No	No	No	No	Yes	Yes
Mediator	No	No	No	No	Yes	Yes
Moderator / De-mod	No	No	No	No	Mod. commune	Yes
verify Artist	No	No	No	No	Yes	Yes

This table shows the permissions of each user role. They are not complete.
[a]It could not be determined.

R Code :

```
library(ggplot2)
#-------------------------------------
#-- stability calculation based on the number of edits  ---|
#-------------------------------------

#-- read file into a table: This file contains annotation IDs, ordering
sequence
#and the stability
stability_tab =
read.table(" file:/../ stability_ann_id_rownr_orderd_stability.txt",
sep=";",
col.names=c("annid","seq", "stability"), fill=FALSE, strip.white=TRUE)

#-- read values as numeric
z<-as.numeric(unlist(stability_tab[1]))
x<-as.numeric(unlist(stability_tab[2]))
y<-as.numeric(unlist(stability_tab[3]))
```

```
#-- Simulating the values from the normal distribution by the mean
and standard deviation.
stability <- round(rnorm(y, mean=mean(y), sd=sd(y)))

#-- converting values into data frame
stability_dataframe <- data.frame(stability)

#-- ploting data frame using Empirical Cumulative Density Function
ggplot(stability_dataframe, aes(stability)) + stat_ecdf(geom = "point")+
    labs(title="Empirical Cumulative Edits Function", y = "Percent",
x="Edits")+
    theme(panel.grid.minor = element_line(color = "gray", size=0.5))+
    theme_set(theme_gray(base_size = 24))

#---------------------------------------
#-- credibility calculation based on the count of edits IQs ---|
#---------------------------------------
credibility_tab = read.table(" /../ credibility_annotationsIQs.txt",
sep=";",
                  col.names=c("seq", "annoIQ"),
                  fill=FALSE,
                  strip.white=TRUE)
x_c<-as.numeric(unlist(credibility_tab[1]))
y_c<-as.numeric(unlist(credibility_tab[2]))

#-- Simulating the values from the normal distribution by the mean
and standard deviation.
credibility_ann <- round(rnorm(y_c, mean=mean(y_c), sd=sd(y_c)))

#-- converting values into data frame
credibility_dataframe <- data.frame(credibility_ann)

#-- ploting data frame using Empirical Cumulative Density Function
ggplot(credibility_dataframe, aes(credibility_ann)) + stat_ecdf(geom
= "point")+
  labs(title="Empirical Cumulative Edits Function",
       y = "Percent", x="Edits IQs")+
  theme(panel.grid.minor = element_line(color = "gray", size=0.5))+
  theme_set(theme_gray(base_size = 24))


#---------------------------------------
#-- credibility calculation based on the author IQ and author attribution
---|
#---------------------------------------
credibility_tab =
```

```
read.table("file: /../ credibilty_ann_id_authoriqMulAuthorattribution.txt",
sep=";", col.names=c("seq", "userIQ"), fill=FALSE, strip.white=TRUE)
x_u<-as.numeric(unlist(credibility_tab[1]))
y_u<-as.numeric(unlist(credibility_tab[2]))

#-- Simulating the values from the normal distribution by the mean
and standard deviation.
credibility_u <- round(rnorm(log(y_u), mean=mean(y_u), sd=sd(y_u)))

#-- converting values into data frame
credibility_dataframe <- data.frame(credibility_u)

#-- ploting data frame using Empirical Cumulative Density Function
ggplot(df_u, aes(credibility_dataframe)) + stat_ecdf(geom = "point")+
  labs(title="Empirical Cumulative User Function",
       y = "Percent", x="User IQs")+
  theme(panel.grid.minor = element_line(color = "gray", size=0.5))+
  theme_set(theme_gray(base_size = 24))


#-----------------------------------------
#-- quality based edits types n-set of the top most active user. This
can be |
#-- calculated for specific n. These are two examples of whitehat and
artist.|
#-----------------------------------------
quality_u = read.table("file: /quality_most_active_user_role.txt",
sep=";",
                    col.names=c("seq","ann_id","whitehat_co", "artist_co","editor_co","media
"moderator_co","regulator_co"),
                    fill=FALSE, strip.white=TRUE)
x_u<-as.numeric(unlist(quality_u[1]))
ann_id<-as.numeric(unlist(quality_u[2]))
y_w<-as.numeric(unlist(quality_u[3]))
y_a<-as.numeric(unlist(quality_u[4]))
y_e<-as.numeric(unlist(quality_u[5]))
y_me<-as.numeric(unlist(quality_u[6]))
y_mo<-as.numeric(unlist(quality_u[7]))
y_r<-as.numeric(unlist(quality_u[8]))

#-- Simulating the values from the normal distribution by the mean
and standard deviation.
quality_u_w <- round(rnorm(y_w, mean=mean(y_w), sd=sd(y_w)))

#-- converting values into data frame
quality_dataframe_q_u <- data.frame(quality_u_w)
```

```
#-- ploting data frame using Empirical Cumulative Density Function
ggplot(quality_dataframe_q_u, aes(quality_u_w)) + stat_ecdf(geom =
"point")+
  labs(title="Empirical Cumulative User Role Function",
       y = "Percent", x="Whitehat")+
  theme(panel.grid.minor = element_line(color = "gray", size=0.5))

#------ artist
#-- Simulating the values from the normal distribution by the mean
and standard deviation.
quality_u_a <- round(rnorm(y_a, mean=mean(y_a), sd=sd(y_a)))

#-- converting values into data frame
quality_dataframe_q_u <- data.frame(quality_u_a)

#-- ploting data frame using Empirical Cumulative Density Function
ggplot(quality_dataframe_q_u, aes(quality_u_a)) + stat_ecdf(geom =
"point")+
  labs(title="Empirical Cumulative User Role Function",
       y = "Percent", x="Artist")+
  theme(panel.grid.minor = element_line(color = "gray", size=0.5))
```

References

[1] Eugene Agichtein, Carlos Castillo, Debora Donato, Aristides Gionis, and Gilad Mishne. Finding high-quality content in social media. In *Proceedings of the 2008 International Conference on Web Search and Data Mining*, WSDM '08, pages 183–194, New York, NY, USA, 2008. ACM. `http://doi.acm.org/10.1145/1341531.1341557`.

[2] Yochai Benkler. Coase's penguin, or, linux and" the nature of the firm". *Yale Law Journal*, pages 369–446, 2002.

[3] Yochai Benkler and Helen Nissenbaum. Commons-based peer production and virtue*. *Journal of Political Philosophy*, 14(4):394–419, 2006.

[4] Christine Clarke. Christineclarke – what is law genius? `http://genius.com/Christine-clarke-what-is-law-genius-annotated`, 2016. [26/04/2016].

[5] Josh Constine. `http://techcrunch.com/2014/07/11/just-genius/`, 2015. [28/09/2015].

[6] Bruce B Frey, Jill H Lohmeier, Stephen W Lee, and Nona Tollefson. Measuring collaboration among grant partners. *American Journal of Evaluation*, 27(3):383–392, 2006.

[7] Media Group Incorporated Genius. becomes rapgenius. `http://genius.com/posts/13-Rapexegesis-com-becomes-rapgenius-com`, 2009. [28/09/2015].

[8] Media Group Incorporated Genius. about editor. `http://genius.com/Genius-what-is-an-editor-annotated`, 2015. [28/09/2015].

[9] Media Group Incorporated Genius. about genius. `http://genius.com/Genius-about-genius-annotated`, 2015. [28/09/2015].

[10] Media Group Incorporated Genius. about mediator. `http://genius.com/Genius-what-is-a-mediator-annotated`, 2015. [28/09/2015].

[11] Media Group Incorporated Genius. about moderator. `http://genius.com/Genius-what-is-a-moderator-annotated`, 2015. [28/09/2015].

[12] Media Group Incorporated Genius. Api is now public. `http://genius.com/discussions/161769-The-genius-api-is-now-public`, 2015. [28/09/2015].

[13] Media Group Incorporated Genius. Become a genius annotated. `http://genius.com/Genius-become-a-genius-annotated`, 2015. [28/09/2015].

[14] Media Group Incorporated Genius. Demographic survey results. `http://genius.com/Survey-week-2014-demographic-survey-results-annotated/`, 2015. [09/10/2015].

[15] Media Group Incorporated Genius. how do i earn iq. `http://genius.com/7337203`, 2015. [30/09/2015].

[16] Media Group Incorporated Genius. how to embed text. `http://genius.com/Embed-genius-how-to-embed-text-and-annotations-annotated/`, 2015. [06/10/2015].

[17] Media Group Incorporated Genius. Make site annotatable. `http://genius.com/Genius-how-to-use-genius-to-make-your-site-annotatable-annotated`, 2015. [09/10/2015].

[18] Media Group Incorporated Genius. Moderator and staffer contact listing. `http://genius.com/Genius-moderator-and-staffer-contact-listing-annotated`, 2015. [09/10/2015].

[19] Media Group Incorporated Genius. Term of use. http://genius.com/static/terms, 2015. [28/09/2015].

[20] Media Group Incorporated Genius. using genius-com for education annotated. http://genius.com/Onlyeverarabella-using-geniuscom-as-a-platform-for-education-annotated/, 2015. [09/10/2015].

[21] Caroline Haythornthwaite. Crowds and communities: Light and heavy-weight models of peer production. In *System Sciences, 2009. HICSS'09. 42nd Hawaii International Conference on*, pages 1–10. IEEE, 2009.

[22] Kashmir Hill. http://abovethelaw.com/2010/07/a-genius-use-of-deferral-time/, 2010. [28/09/2015].

[23] Benny Luo. Rap genius founder interview | mahbod moghadam: Why rap genius is going to ipo one day. http://nextshark.com/rap-genius-founder-interview-mahbod-moghadam/, 2010. [28/09/2015].

[24] Joe McKendry. Can the brogrammers of rap genius annotate the world? http://nymag.com/daily/intelligencer/2014/12/genius-minus-the-rap.html, 2015. [28/09/2015].

[25] Mahbod Moghadam. http://www.everipedia.com/mahbod.moghadam/, 2015. [28/09/2015].

[26] Jamal Al Qundus. Generating trust in collaborative annotation environments. In *Proceedings of the 12th International Symposium on Open Collaboration Companion*, page 3. ACM, 2016.

[27] Ruth Reader. http://venturebeat.com/2015/06/05/genius-launches-an-api-so-developers-can-help-fuel-its-mission-to-annotate-the-web/, 2015. [28/09/2015].

[28] Technically-Media-Inc. Genius (website). http://technical.ly/organization/genius/, 2015. [28/09/2015].

[29] Loren G Terveen. Overview of human-computer collaboration. *Knowledge-Based Systems*, 8(2):67–81, 1995.

[30] Janet Wagner. New genius api provides annotation functionality to websites and apps. http://www.programmableweb.com/news/new-genius-api-provides-annotation-functionality-to-websites-and-apps/2015/06/05, 2015. [28/09/2015].

[31] Chris Welch. Rap genius rebrands itself 'genius' as part of mission to 'annotate the world'. LINKhttp://www.theverge.com/2014/7/11/5891889/rap-genius-rebrands-as-genius-in-mission-to-annotate-the-world, 2014. [28/09/2015].

[32] Wikipedia. Genius (website) — wikipedia, the free encyclopedia. https://en.wikipedia.org/w/index.php?title=Genius_(website)&oldid=682813176, 2015. [28/09/2015].