Department Of Computer Science

Gujarat University

Certificate

Roll No: 06 *Seat No:* 50005

This is to certify that Ms. **Shivangi chotaliya** *student of MCA Semester – V, has duly completed her Dissertation titled* **Identification Of Annotators Agreement Using Microblogs Related To Grievances** *towards partial fulfillment of her Degree of Masters in Computer Science & Application.*

Date of Submission *Guide(s)*

Head of Department

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Roll No: 06 *Seat No:* 50005

This is to certify that Mr. **Ajinkya Rathod** *student of MCA Semester – V, has duly completed his Dissertation titled* **Identification Of Annotators Agreement Using Microblogs Related To Grievances** *towards partial fulfillment of his Degree of Masters in Computer Science & Application.*

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Identification Of Annotators Agreement Using Microblogs Related To Grievances

Abstract

We are working on tweets that has been done by users who travel in trains and have tweeted about the complaint of Indian Railways.

Determine whether the tweet is grievance or non-grievance with the help of Cohen's kappa score pinpoint precision.

Our job is to identify whether they were relevant or not.

For evaluation, data has been retrieved from @RailMinIndia which is and official Account of Railway Government of India.

The overall point of all these is Evaluating a classification model when overall accuracy is biased

A confusion matrix is created based on annotators reviews. Cohen's Kappa is apply to the matrix and acquire the correct accuracy and evaluate if the tweet is grievance or non-grievance.

The implementation of the methodology is done using Django framework which is Python based programming language.

Keyword

Cohen's kappa, Microblogging, Public Grievance, Grievance, Non-grievance, Tweet, Tagger, Pandas, Confusion matrix, Railway Complaint Tweets

List of Abbreviations

Abbreviation	**Full Form**
DARPG	Department of Administrative Reforms and Public Grievance
CPGRAMS	Centralized Public Grievance Redress and Monitoring System
PSUs	public sector undertaking
PG	Public Grievance

Acknowledgement

A research project like this is never the work of any one alone. The contributions of many different people, in their different ways, have made this possible. We would like to extend our appreciation especially to the following.

It is our pleasure to take this opportunity to thank all those who helped us directly or indirectly in our research work. Not everything that we have received can be acknowledged with few words.

We are thankful to our guide **Dr. Hardik Joshi, Dr. Hiren Joshi, Ms. Khushboo Shah** for their valuable help during the work of this thesis. Their suggestions were always there whenever we needed and their guidance helped us in all the time of research and writing of this thesis.

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Shivangi Chotaliya

Ajinkya Rathod

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1.

Introduction

What is Grievance?

Something that you think is unfair and that you want to complain or protest about it.

A grievance is kind of a formal complaint that is raised by an user towards Railway Ministry of India (here).

For instance, I officially mailed the Railway Ministry of India is considered as Complaint. A grievance, for example, is that some issue raised on twitter towards Railway Ministry of India.

Grievances are statements about expectations that have not been met. They are also the opportunities for the organization to reconnect with customers by fixing a service or product breakdown. In this way, complaints are gifts that customers give to the businesses.

For instance, the employee expects proper implementation of the Central and State Government's laws, collective agreements, company policies, and management responsibilities. Any violation of these laws, agreements, and policies causes dissatisfaction on his part. Thus, the grievance is caused due to the difference between the employee expectation and management practice.

Importance of Grievance

A grievance process is designed to give employees and employers a fair and objective system to raise and review serious issues and complaints without bias.

A formal grievance procedure should support employees to raise concerns relating to a safe working environment without the fear of any negative repercussions.

What is the difference between a complaint and a grievance?

While the terms grievance and complaint are used interchangeably, they are marginally different from each other. While a complaint is usually informal and is generally `accusational` in nature, a grievance is a formal complaint raised by an employee to the concerned authorities, often in a written format. While complaints tend to be colored with emotions and not always based on facts, grievances are more objective and are based on facts that made the employee feel uncomfortable about something at work.

Types of Grievance

1. Visible Grievances or Hidden Grievances:
    - When the grievances are clearly visible to the others is called visible grievances. But it is not necessary that all times these are visible then these are called hidden one. It is called hidden grievances.
2. Real or Imaginary:
    - The management or concerned party responsible for redressing of grievance is called a real, genuine, or factual grievance. Second, the imaginary grievance is that when it is there not for any valid reason. The management is not at fault. It is called imaginary only.
3. Expressed or Implied:
    - When an employee felt the grievance and expressed or reports to the management in written or oral forms, is called express because it has been made clear. When it is not made clear but from the situation, it can be inferred or judged that there is a grievance. That type of grievance is called an implied grievance.
4. Oral or Written:
    - According to the way of expression, the grievances can be oral or written. When orally it is reported or expressed then it is called an oral grievance. An employee makes a written complaint then it becomes a written grievance.
5. Disguised Grievances:
    - Sometimes the grievances take place but the employees do not know the reasons of grievances. The causes of grievances are unknown. These are called disguised grievances.
6. Individual or Group Grievances:
    - When an individual is affected then it is called an individual grievance. When a group is affected due to the grievances and reported then it becomes a group grievance.
7. Union Grievances or Public Grievances:
    - The union presents the grievances to the management on behalf of member employees then it becomes a union grievance.
8. Policy Grievances:
    - When a grievance is related to the policy of the company relating to terms of employment is called policy grievance.

Public Grievances

The public Grievance (PG) Cell of the Ministry is entrusted with the responsibility of redressal of public grievances. PG Cell receives the grievances/representations from two sources i.e electronically on pgportal.gov.in and through the post. PSUs/Autonomous Bodies/ Divisions of the Ministry have been provided with a CPGRAMS link. The grievances are transferred to the concerned officials electronically, requesting them to take necessary action and inform the aggrieved person/organization of the action taken with a copy to this Ministry.

Ministry has been monitoring the redressal of grievances with the concerned Divisions/ Subordinates through periodic meetings and personal contacts. Many grievances pertain to issue related to State Governments, Electrification of Villages, Compensation to oustees, etc. which are forwarded to respective State Governments for taking necessary action.

Grievance Redressal Mechanism in India

Public grievance redress in a time bound manner and improving public service delivery in banking, insurance and pension sectors are key priorities of the Department of Financial Services.

Grievances received in the Department of Financial Services online or by post / manually in the Department of are processed and forwarded through CPGRAMS (Centralized Public Grievance Redress and Monitoring System) to the concerned organizations for resolution/disposal and are monitored and periodically reviewed. As per guidelines/instructions of DARPG the maximum time limit of resolution of a grievance is 45 days. The maximum time limit for disposal of COVID-related grievances is 3 days. The Portal is accessible at www.pgportal.gov.in.

For Instance, Centralised Public Grievance Redress and Monitoring System (CPGRAMS) is an online platform available to the citizens 24x7 to lodge their grievances to the public authorities on any subject related to service delivery. It is a single portal connected to all the Ministries/Departments of Government

of India and States. Every Ministry and States have role-based access to this system. CPGRAMS is also accessible to the citizens through a standalone mobile application downloadable through the Google Play store and a mobile application integrated with UMANG.

The status of the grievance filed in CPGRAMS can be tracked with the unique registration ID provided at the time of registration of the complainant. CPGRAMS also provides an appealing facility to the citizens if they are not satisfied with the resolution by the Grievance Officer. After the closure of grievance, if the complainant is not satisfied with the resolution, he/she can provide feedback. If the rating is 'Poor' the option to file an appeal is enabled. The status of the Appeal can also be tracked by the petitioner with the grievance registration number.

What is Microblogging?

Microblogging is an online broadcast medium that exists as a specific form of blogging. A microblog differs from a traditional blog in that its content is typically smaller in both actual and aggregated file size. Micro-blogs "allow users to exchange small elements of content such as short sentences, individual images, or video links", which may be the major reason for their popularity. hence small messages are sometimes called micro-posts.

Twitter is a "microblogging" Web site. Recall that blogs emerged in the late 1990s and resembled online diaries. People could write anything they wanted and post it for people to read or comment on. While blogs could take any form, the posts were often essay length. Microblogging allows users to make posts, but they tend to be very short. Twitter limits posts to 140 characters. This creates an environment that is fundamentally different from blogging since it is easy for someone to read hundreds of posts in a short amount of time. This chapter presents an overview of the different types of information people share on the site and how to find those people.

Cohen's Kappa

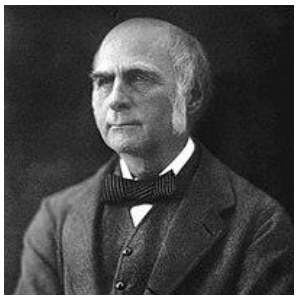
Cohen's kappa coefficient (κ) is a statistic that is used to measure inter-rater reliability (and also inter-rater reliability) for qualitative (categorical) items.

It is generally thought to be a more robust measure than simple percent agreement calculation, as κ takes into account the possibility of the agreement occurring by chance.

The kappa statistic is frequently used to test interrater reliability. The importance of inter-rater reliability lies in the fact that it represents the extent to which the data collected in the study are correct representations of the variables measured.

Inter-rater agreement

In statistics, inter-rater reliability (also called by various similar names, such as inter-rater agreement, inter-rater concordance, inter-observer reliability, and so on) is the degree of agreement among independent observers who rate, code, or assess the same phenomenon. It gives a score of how much homogeneity, or consensus, there is in the ratings given by judges.



History

The first mention of a kappa-like statistic is attributed to Galton (1892) and Smeeton (1985).

The seminal paper introducing kappa as a new technique was published by Jacob Cohen in the journal Educational and Psychological Measurement in 1960.

He introduced the Cohen's kappa, developed to account for the possibility that raters actually guess on at least some variables due to uncertainty.

Definition

Cohen's kappa measures the agreement between two raters who each classify N items into C mutually exclusive categories.

$$\kappa \equiv \frac{p_o - p_e}{1 - p_e} = 1 - \frac{1 - p_o}{1 - p_e},$$

P0 is the relative observed agreement(Actual) among raters.

Pe is a chance agreement(Expected) among raters.

If the raters are in complete agreement then k=1.

If there is no agreement among the raters then k=0.

It is possible for the statistic to be negative, which implies that there is no effective agreement between the two raters or the agreement is worse than random

Steps

- Collecting all the tweets from Railway official Accounts
- Ex. we collect 9 Tweets.
- @RailMinIndia PNR 8535486976 dirty and used blanket and used bedroll given no one is responding very bad
- @sureshpprabhu @RailMinIndia Dear Sir I am travelling in 19046 train & there is no water in toilets. The condition of the train is worst.

- There are two parts to this:
    - Calculate observed agreement (Actual)
    - Calculate agreement by chance (Expected)

$$\kappa = \frac{p_A - p_E}{1 - p_E}$$

- Let's say we're dealing with "yes" and "no" answers and 2 raters. Here are the ratings:

    Tagger1 = ['yes', 'no', 'yes', 'yes', 'yes', 'yes', 'no', 'yes', 'yes']

    Tagger2 = ['yes', 'no', 'no', 'yes', 'yes', 'yes', 'yes', 'yes', 'yes']

- Turning these ratings into a confusion matrix:

	Tagger 2 YES	Tagger 2 NO
Tagger 1 YES	6	1
Tagger 2 NO	1	1

Observed agreement = (6 + 1) / 10 = 0.7

Chance agreement = probability of randomly saying yes (P_yes) + probability of randomly saying no (P_no)

P_yes = (6 + 1) / 10 * (6 + 1) / 10 = 0.49

P_no = (1 + 1) / 10 * (1 + 1) / 10 = 0.04

Chance agreement = 0.49 + 0.04 = 0.53

- Since the observed agreement is larger than chance agreement we'll get a positive Kappa.

  Kappa = 1 - (1 - 0.7) / (1 - 0.53) = **0.36**

- Using sklearn's implementation

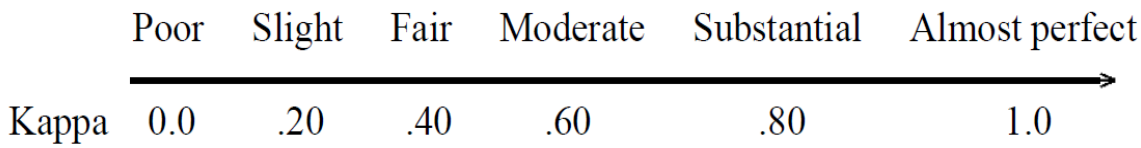
  from sklearn.metrics import cohen_kappa_score

  cohen_kappa_score(Tagger1, Tagger2)

  which returns **0.35714.**

Interpretation of Kappa

Interpretation of Kappa



Kappa	Agreement
< 0	Less than chance agreement
0.01–0.20	Slight agreement
0.21– 0.40	Fair agreement
0.41–0.60	Moderate agreement
0.61–0.80	Substantial agreement
0.81–0.99	Almost perfect agreement

Special Case

- Less than chance agreement

  Tagger1 = ['no', 'no', 'no', 'no', 'no', 'yes', 'no', 'no', 'no', 'no']

  Tagger2 = ['yes', 'no', 'no', 'yes', 'yes', 'no', 'yes', 'yes', 'yes', 'yes']

  cohen_kappa_score(rater1, rater2)

  = -0.2121

- **If all the ratings are the same and opposite**
- **This case reliably produces a kappa of 0**

  Tagger1 = ['yes'] * 10

  Tagger2 = ['no'] * 10

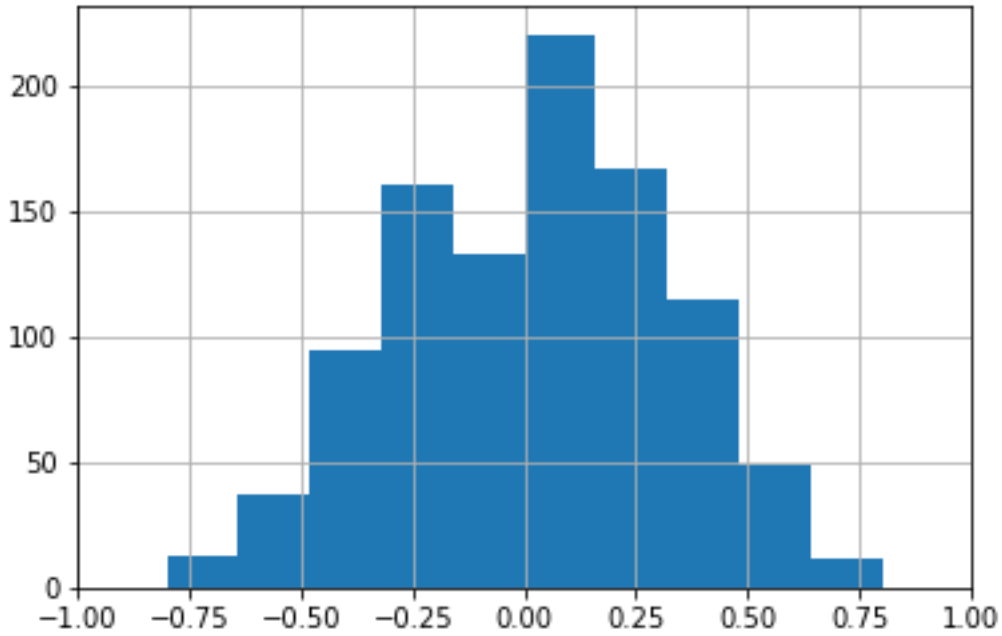
  cohen_kappa_score(rater1, rater2)

  0.0

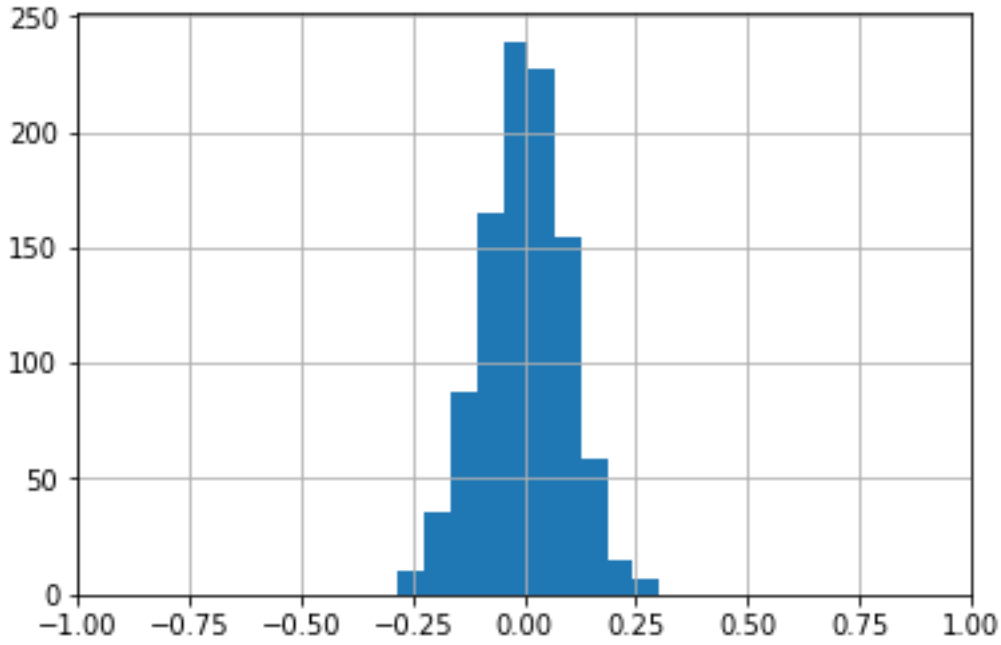
Random Rating

- For random ratings Kappa follows a normal distribution with a mean of about zero.
- As the number of ratings increases there's less variability in the value of Kappa in the distribution.

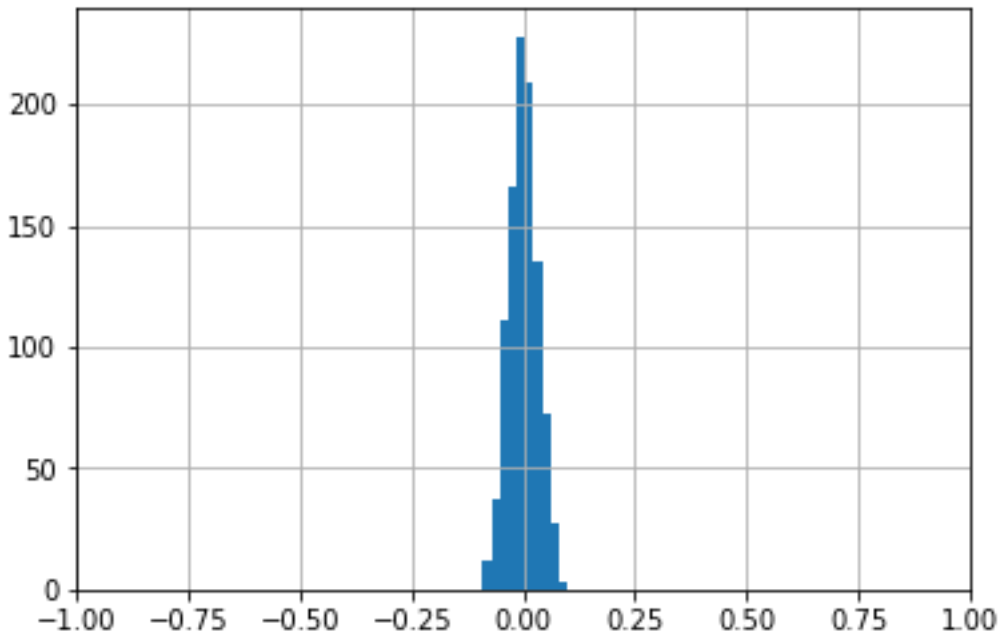
- 10 random ratings for each rater (random sample of 1,000 inter-rater Kappa calculations)



- 100 random ratings for each rater (random sample of 1,000 inter-rater Kappa calculations)



- 1000 random ratings for each rater (random sample of 1,000 inter-rater Kappa calculations)



Limitation of Cohen's Kappa

- Cohen's Kappa only applied to 2 raters rating the exact same items.
- $\kappa = 0$ when the observed allocation is apparently random
- Kappa is an index that considers observed agreement with respect to a baseline agreement.
- Kappa's baseline agreement is the agreement that would be expected due to random allocation.

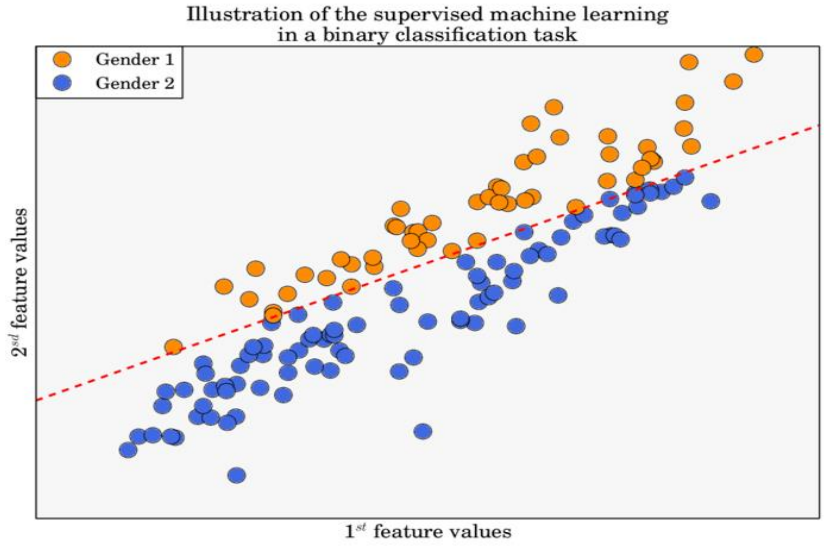
Literature Review

4. Literature Review

Title	Authors	Published in	Year
A Simplified Cohen'S Kappa for Use in Binary Classification Data Annotation Tasks	Juan Wang, Yongyi Yang, Bin Xia	IEEE Access	2019

Introduction to Binary Classification

- Binary classification refers to those classification tasks that have two class labels.
- Examples: Email spam detection (spam or not).
- Typically, binary classification tasks involve one class that is the normal state and another class that is the abnormal state.
- For example "not spam" is the normal state and "spam" is the abnormal state. Another example is "cancer not detected" which is the normal state of a task that involves a medical test and "cancer detected" is the abnormal state.
- The class for the normal state is assigned the class label 0 and the class with the abnormal state is assigned the class label 1.



Data Annotation

- Data annotation is simply the process of labeling information so that machines can use it.
- It is especially useful for supervised machine learning (ML), where the system relies on labeled datasets to process, understand, and learn from input patterns to arrive at desired outputs.

- it has been demonstrated that the quality of the data labels can have a number of effects on the resulting classifier, ranging from the classification performance, the complexity of the classifier model, to the number of required training samples
- Therefore, it is important to assess the quality of annotations prior to their use in supervised learning

Cohen's Kappa

- One such metric is Cohen's kappa coefficient (or kappa in short), which has been accepted as the de facto standard for the measurement of inter-annotator agreement.

- Cohen's kappa coefficient (κ) is a statistic that is used to measure inter-rater reliability for qualitative (categorical) items.

- **In** binary classification tasks, Cohen's kappa is often used as a quality measure for data

- annotations, which is **inconsistent** with its original purpose as an inter-annotator consistency / inter-rater reliability (two or more people agree on the same point) measure.

- Therefore, it is important to assess (judge or form the opinion about something) the quality of annotations prior to their use in supervised learning

- One such metric is **Cohen's kappa** coefficient which has been accepted as the de facto standard for measurement of inter-annotator agreement

- Mathematically, Cohen's kappa is defined as:

$$\kappa = \frac{p_A - p_E}{1 - p_E}$$

- where pA is the observed(actual) relative agreement between two annotators, and pE is the hypothetical (expected) probability

- Cohen's kappa is also cited for its problems associated with bias and prevalence in the interpretation of kappa values. The bias problem is caused by the difference in the distribution of annotation categories of the two annotators, while the prevalence problem arises when the underlying distribution of class categories is skewed.
- For example, based on the 2×2 confusion matrix, Feuerman and Miller obtained the following relationship:

$$\kappa = \frac{2\alpha\beta(Se + Sp - 1)}{(\alpha^2 + \beta^2) + (\beta - \alpha)(\alpha Se - \beta Sp)}$$

- for Se not equal Sp, where Se is sensitivity, Sp is specificity, α is the proportion of examples in the positive class, and β = 1 − α

- The analytic relationship between kappa and commonly used classification metrics (e.g., sensitivity and specificity) is non-linear, and thus is difficult to be applied for interpretation of the classification performance of the annotations

- In the previous study, based on an annotation generation model, we derived a linear relationship.

- κ = Se + Sp − 1 derivation to the more general case of biased annotations.

- In this study we extend this derivation to the more general case of biased annotations. We derive a simplified, linear relationship of kappa, sensitivity, and specificity by employing the 1st-order Taylor approximation. This relationship is further simplified by relating to Youden's J statistic, a metric used for classification performance

- The results demonstrate the effectiveness of the developed relationship when no severe bias and prevalence issues exist. In addition, the relationship between kappa and Youden's J is also validated on a real-life dataset collected from diabetic retinopathythy (DR) screening study, wherein the discrepancy between kappa and Youden's J is applied for annotator assessment

- We provide an analysis on the linear coefficients in the simplified relationship and the approximation error, and conduct a linear regression analysis to assess the relationship by using a synthetic dataset where the ground truth is known

- The results demonstrate the effectiveness of the developed relationship when no severe bias and prevalence issues exist.

In addition, the relationship between kappa and Youden's J is also validated on a real-life dataset collected from a diabetic retinopathy (DR) screening study.

- The discrepancy between kappa and Youden's J is demonstrated to be an effective measure for annotator assessment when no ground truth is available.

- Ground truth is a term used in various fields to refer to information that is known to be real or true, provided by direct observation and measurement as opposed to information provided by inference.

Methods

1. Annotation Generation Model
2. Cohen's Kappa coefficient
3. Sensitivity and Specificity
4. Kappa Approximation

1). Annotation Generation Model

- Let LXi be the annotation of an instance provided by the ith annotator (i ∈ {1, 2}) and c ∈ {0, 1} be the category of the labels, in which c = 1 denotes positive class and c = 0 is negative class. The annotation process above suggests an annotation generation model with latent variable l for the easy and hard types, i.e., l = E (easy) and l = H (hard).

- (Hint : Xi is annotator , c=1 denotes positive class , c=2 denotes negative class, E= easy , H=hard

- latent variable – a variable that cannot be observed because it is hidden and no measurement error associated with it.)

- It is described by conditions as follows:

$$P(X1 = c|l = E) = P(X2 = c|l = E) \quad (2)$$

$$P(X1 = X2|l = E) = 1 \quad (3)$$

$$P(X1, X2|l = H) = P(X1|l = H)P(X2|l = H) \quad (4)$$

- Equations (2) and (3) represents that the two annotators perfectly agree on the easy instances. Equation (4) denotes that the two annotators independently provide labels for the hard Instances.

- The annotation generation model yields $\kappa = 1$ for easy instances and $\kappa = 0$ for hard instances [26]. When the population consists of both easy and hard instances, $0 < \kappa < 1$. These results together indicate that $0 \leq \kappa \leq 1$ when the annotation generation model is considered

2). Cohen's Kappa coefficient

- To investigate the relationship between kappa and classification metrics, one annotator has to be ground-truth annotator.

- Cohen's kappa can be expressed as:

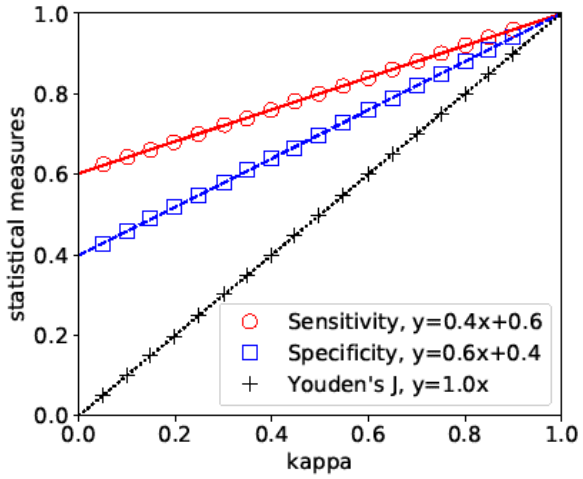
$$\kappa = \frac{e}{e + \frac{1-p_h}{2q_0q_1}h}$$

3). Sensitivity and Specificity

- Se + Sp = 1 + e
- This relationship indicates that the summation of sensitivity and specificity is determined by the proportion of easy instances in the dataset.
- Youden's J statistic is a performance summary for binary classification task. It is defined as J , Se+Sp−1. Equation suggests the following relationship between eand Youden's J:

  J = e

- It indicates that Youden's J measures the proportion of the easy instances.



4). Kappa Approximation

- To deal with this issue, we consider kappa approximation in this section. To ensure low approximation error, we derive kappa approximation with respect to e and h, respectively.

    I. KAPPA APPROXIMATION WITH RESPECT TO E,For e > 0, equation

    II. KAPPA APPROXIMATION WITH RESPECT TO H, H is used to eliminate the issue of potential great error when e is large

    III. FINAL KAPPA APPROXIMATION, kappa approximation with respect to e and h yield errors:

Conclusion

In binary classification tasks, Cohen's kappa is often used as a quality measure for data annotations, which is inconsistent with its original purpose as an inter-annotator consistency measure. In this study, based on an annotation generation model, we derive a simplified, linear relationship for Cohen's kappa, sensitivity, and specificity by using the 1st-order Taylor approximation. This relationship is further simplified by relating to Youden's J statistic, performance metric for binary classification tasks. The relationship between kappa and Youden's J is validated on an annotation dataset from seven graders in a diabetic retinopathy screening study. The discrepancy between kappa and Youden's J is demonstrated to be an effective measure for annotator assessment when no ground truth is available.

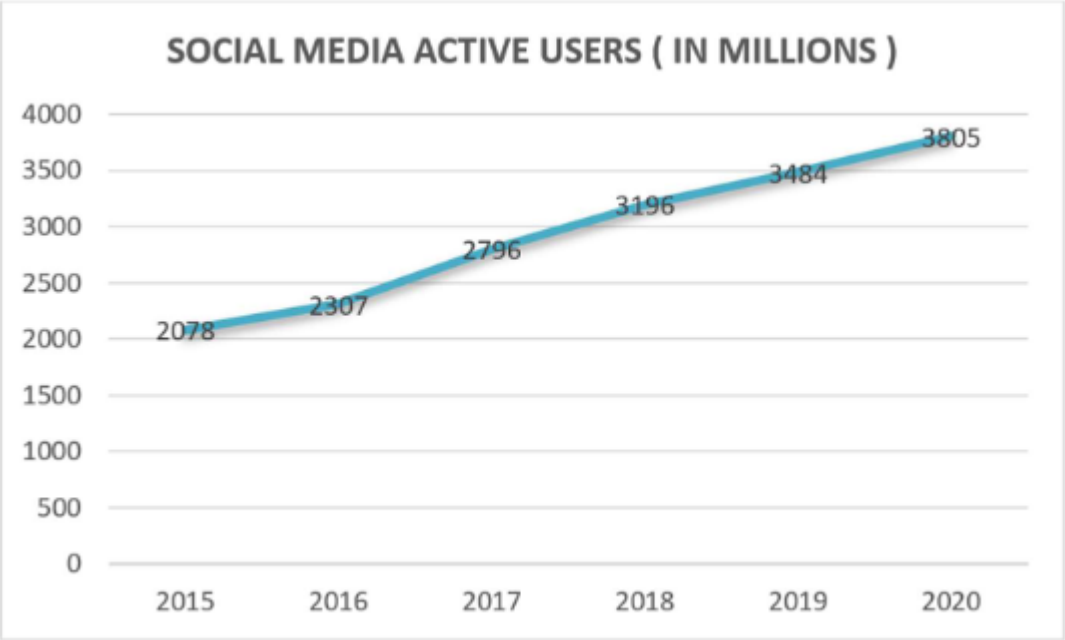
Title	Authors	Published in	Year
SMART APPROACH TO RECOGNIZE PUBLIC GRIEVANCE FROM MICROBLOGS	Ms. Khushboo Shah Dr. Hardik Joshi Dr. Hiren Joshi	Gujarat University	2021

The foremost priority for the government of any country is to resolve the citizen's problems. Indian government provides various ICT (Information Communication Technology) based platforms such as website and mobile application for the Indian citizens to lodge their grievance against ministries and departments.

Due to the easy access and transparency of social media, people prefer to raise their voices there. The dissatisfaction and anger that they express through microblogging is also a kind of complaint. This paper discusses the various categories of public grievance, their importance and its redressal mechanism in India.

The main aim of this research is to take these social media complaints into consideration and solve them rapidly with the help of Artificial Intelligence where, it's one branch Natural Language Processing, processes the text to retrieve the information from the piece of text and another branch Machine Learning helps to know the priority and severity of the grievance.

The influence of social media has changed the way people express their views publicly. Here they have chance to exhibit their views and opinions to the world. Statistics shows how much does global social media growth rates increased year on year. In the year 2020, there are 3805 million active users on social media around the world that is an increase of 9.2% from 3484 million active users from the year 2019. Earlier in the year 2015, this number was 2078 million which was increased 11%, 21% and 9.0% in the year 2016,2017 and 2018 respectively



A Public Survey on the Popularity of CPGRAMS Vs. Social Media

To know the popularity of CPGRAMS and Social Media to lodge the grievance, a survey form was designed with 10 questions, with the help of google forms and shared with the people through email and WhatsApp. Questions were designed in such a way to get the information about the popularity of CPGRAMS and Social Media among population which can help to understand the importance of microblogging grievances.

Total 468 responses received from different age groups from both male and female genders.

First four questions are about the name, surname, age and gender. Out of 468, 60.3% of male and 39.7% of female responded, which shows the active participation of male gender is high.

The next question was about the awareness of CPGRAMS where only 23.9% people are aware about the CPGRAMS in India while

76.1% people said that they don't know about the CPGRAMS which seems to be a major concern for the Government of India. Out of 23.9% CPGRAMS aware people, only 5.8% have registered with it.

Microblogging on Social Media – A New Way to Express Dissatisfaction

The influence of social media has changed the way people express their views publicly. Here they have chance to exhibit their views and opinions to the world.

Statistics shows how much does global social media growth rates increased year on year. In the year 2020, there are 3805 million active users on social media around the world that is an increase of 9.2% from 3484 million active users from the year 2019. Earlier in the year 2015, this number was 2078 million which was increased 11%, 21% and 9.0% in the year 2016,2017 and 2018 respectively.

Microblogging is a small piece of content on social media which could be text, links, pictures and short videos. Microblogging tools provide a light-weight and easy way of communication with the world where user can broadcast and share information, knowledge, viewpoint, status and activities.

Microblogging is an example of individual's freedom which changes with the evolution of state of art technologies. This microblogging service has a large and rapidly growing micro-bloggers base where they post status messages for updating what is on their mind.

Not only this, also they express their opinion towards services, events, products, people and a government as well, irrespective of the nature of the opinion.

Proposed

Approach

5. Our approach/proposed methodology/proposed approach

5.1 Language Used

Python:

Python is a programming language that lets you work more quickly and integrate your systems more effectively.

Advantages/Benefits of Python:

The diverse application of the Python language is a result of the combination of features that give this language an edge over others. Some of the benefits of programming in Python include:

- Presence of Third Party Modules

The Python Package Index (PyPI) contains numerous third-party modules that make Python capable of interacting with most of the other languages and platforms.

- Extensive Support Libraries

Python provides a large standard library which includes areas like internet protocols, string operations, web services tools and operating system interfaces. Many high use programming tasks have already been scripted into the standard library which reduces length of code to be written significantly.

- Open Source and Community Development

Python language is developed under an OSI-approved open source license, which makes it free to use and distribute, including for commercial purposes. Further, its development is driven by the community which collaborates for its code through hosting conferences and mailing lists, and provides for its numerous modules.

- Learning Ease and Support Available

Python offers excellent readability and uncluttered simple-to-learn syntax which helps beginners to utilize this programming language. The code style guidelines, PEP 8, provide a set of rules to facilitate the formatting of code. Additionally, the wide base of users and active developers has resulted in a rich internet resource bank to encourage development and the continued adoption of the language.

- User-friendly Data Structures

Python has built-in list and dictionary data structures which can be used to construct fast runtime data structures. Further, Python also provides the option of dynamic high-level data typing which reduces the length of support code that is needed.

- Productivity and Speed

Python has clean object-oriented design, provides enhanced process control capabilities, and possesses strong integration and text processing capabilities and its own unit testing framework, all of which contribute to the increase in its speed and productivity. Python is considered a viable option for building complex multi-protocol network applications. As can be seen from the above-mentioned points, Python offers a number of advantages for software development. As upgrading of the language continues, its loyalist base could grow as well.

Applications for Python

Python is used in many application domains.

Web and Internet Development:

- Python offers many choices for web development:

- Frameworks such as Django and Pyramid.
- Micro-frameworks such as Flask and Bottle.
- Advanced content management systems such as Plone and django CMS.

Python's standard library supports many Internet protocols:

- HTML and XML
- JSON • E-mail processing.
- Support for FTP, IMAP, and other Internet protocols.
- Easy-to-use socket interface.

And the Package Index has yet more libraries:

- Requests, a powerful HTTP client library.
- Beautiful Soup, an HTML parser that can handle all sorts of oddball HTML.
- Feedparser for parsing RSS/Atom feeds.
- Paramiko, implementing the SSH2 protocol.
- Twisted Python, a framework for asynchronous network programming

Scientific and Numeric:

- Python is widely used in scientific and numeric computing:
- SciPy is a collection of packages for mathematics, science, and engineering.
- Pandas is a data analysis and modeling library.
- IPython is a powerful interactive shell that features easy editing and recording of a work session, and supports visualizations and parallel computing.
- The Software Carpentry Course teaches basic skills for scientific computing, running bootcamps and providing open-access teaching materials.

Education:

- Python is a superb language for teaching programming, both at the introductory level and in more advanced courses.
- Books such as How to Think Like a Computer Scientist, Python Programming: An Introduction to Computer Science, and Practical Programming.
- The Education Special Interest Group is a good place to discuss teaching issues.

Desktop GUIs:

- The Tk GUI library is included with most binary distributions of Python.
- Some toolkits that are usable on several platforms are available separately:
- wxWidgets
- Kivy, for writing multitouch applications.
- Qt via pyqt or pyside
- Platform-specific toolkits are also available:
- GTK+
- Microsoft Foundation Classes through the win32 extensions

Software Development:

- Python is often used as a support language for software developers, for build control and management, testing, and in many other ways.
- SCons for build control
- Buildbot and Apache Gump for automated continuous compilation and testing.
- Roundup or Trac for bug tracking and project management.

Business Applications:

- Python is also used to build ERP and e-commerce systems:
- Odoo is an all-in-one management software that offers a range of business applications that form a complete suite of enterprise management applications.
- Tryton is a three-tier high-level general purpose application platform.

1.2 API Used(Libraries)

❖ Pandas:

- pandas is a fast, powerful, flexible, and easy-to-use open-source data analysis and manipulation tool, built on top of the Python programming language.
- pandas is a software library written for the Python programming language for data manipulation and analysis.
- In particular, it offers data structures and operations for manipulating numerical tables and time series.

Features

Handling of data

- The Pandas library provides a really fast and efficient way to manage and explore data. It does that by providing us with Series and DataFrames, which help us not only to represent data efficiently but also manipulate it in various ways. These features of Pandas is exactly what makes it such an attractive library for data scientists.

Alignment and indexing

- Having data is useless if you don't know where it belongs and what it tells us about. Therefore, labeling of data is of utmost importance. Another important factor is an organization, without which data would be impossible to read. These two needs: Organization and labeling of data are perfectly taken care of by the intelligent methods of alignment and indexing, which can be found within Pandas.

Handling missing data

- As discussed above, data can be quite confusing to read. But that is not even one of the major problems. Data is very crude in nature and one of the many problems associated with data is the occurrence of missing data or value. Therefore, it is pertinent to handle the missing values properly so that they do not adulterate our study results. Some Pandas features have you covered on this end because handling missing values is integrated within the library.

Cleaning up data

- Like we just said, Data can be very crude. Therefore it is really messy, so much so that performing any analysis over such data would lead to severely wrong results. Thus it is of extreme importance that we

clean our data up, and this Pandas feature is easily provided. They help a lot to not only make the code clean but also tidies up the data so that even the normal eye can decipher parts of the data. The cleaner the data, the better the result.

Input and output tools

- Pandas provide a wide array of built-in tools for the purpose of reading and writing data. While analyzing you will obviously need to read and write data into data structures, web service, databases, etc. This has been made extremely simple with the help of Pandas' inbuilt tools. In other languages, it would probably take a lot of code to generate the same results, which would only slow down the process of analyzing.

Multiple file formats supported

- Data these days can be found in so many different file formats, that it becomes crucial that libraries used for data analysis can read various file formats. Pandas aces this sector with a huge scope of file formats supported. Whether it is a JSON or CSV, Pandas can support it all, including Excel and HDF5. This can be considered as one of the most appealing Python Pandas features.

Merging and joining of datasets

- While analyzing data we constantly need to merge and join multiple datasets to create a final dataset to be able to properly analyze it. This is important because if the datasets aren't merged or joined properly, then it is going to affect the results adversely and we do not want that. Pandas can help to merge various datasets, with extreme efficiency so that we don't face any problems while analyzing the data.

A lot of time series

- These Pandas features won't make sense to beginners right away, but they will be of great use in the future. These features include the likes of moving window statistics and frequency conversion. So, as we go deeper into learning Pandas we will see how essential and useful these features are, for a data scientist.

Optimized performance

- Pandas is said to have a really optimized performance, which makes it really fast and suitable for data science. The critical code for Pandas is written in C or Cython, which makes it extremely responsive and fast.

❖ **metrics**

- The original idea of metrics was a platform that can be extended with many different metrics. At the time I will focus only on SLOC and McCabe complexity metrics. *metrics* is built in a way to support many, many languages. Currently, we test support for Python, C, C++, Go, and JavaScript.
- Sklearn metrics are import metrics in SciKit Learn API to evaluate your machine learning algorithms. Choices of metrics influences a lot of things in machine learning :
    - Machine learning algorithm selection
    - Sklearn metrics reporting

❖ **Pylab**

- Pylab is basically just Numpy and Matplotlib under a unified namespace. Learn about either of those and you will understand Pylab.
- If you want to plot things in scripts it is generally preferred that you use import matplotlib.pyplot instead of import pylab, but really the choice is up to you.
- If you want to have interactive plotting (for instance, by calling ipython --pylab) then pylab is the way to go. However pyplot can also be put in an interactive mode using pyplot.ion().

- Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK. There is also a procedural "pylab" interface based on a state machine (like OpenGL), designed to closely resemble that of MATLAB, though its use is discouraged

❖ **Mataplotlib**

- Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK.

- Matplotlib is a cross-platform, data visualization and graphical plotting library for Python and its numerical extension NumPy. As such, it offers a viable open source alternative to MATLAB. Developers can also use matplotlib's APIs (Application Programming Interfaces) to embed plots in GUI applications.

Features

- Setting the aspect ratio of the axes box
- Colored labels in legends
- Ticks and labels
- rcParams can be passed as Decorators
- 3D plots now support minor ticks
- Specifying backend while saving the figure
- Infinite lines through two points

❖ **Seaborn**

- Seaborn is a Python data visualization library based on matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics.

- For a brief introduction to the ideas behind the library, you can read the introductory notes or the paper. Visit the installation page to see

how you can download the package and get started with it. You can browse the example gallery to see some of the things that you can do with seaborn, and then check out the tutorial or API reference to find out how.

- To see the code or report a bug, please visit the GitHub repository. General support questions are most at home on StackOverflow or discourse, which have dedicated channels for seaborn.

- Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK. There is also a procedural "pylab" interface based on a state machine (like OpenGL), designed to closely resemble that of MATLAB, though its use is discouraged. SciPy makes use of Matplotlib.

❖ **pycm**

- PyCM is a multi-class confusion matrix library written in Python that supports both input data vectors and direct matrix, and a proper tool for post-classification model evaluation that supports most classes and overall statistics parameters. PyCM is the swiss-army knife of confusion matrices, targeted mainly at data scientists that need a broad array of metrics for predictive models and accurate evaluation of a large variety of classifiers.
- PyMC (formerly known as PyMC3) is a Python package for Bayesian statistical modeling and probabilistic machine learning which focuses on advanced Markov chain Monte Carlo and variational fitting algorithms.
- It is a rewrite from scratch of the previous version of the PyMC software.Unlike PyMC2, which had used Fortran extensions for performing computations, PyMC relies on Aesara, a Python library that allows to define, optimize, and efficiently evaluate mathematical expressions involving multi-dimensional arrays. From version 3.8 PyMC relies on ArviZ to handle plotting, diagnostics, and statistical checks. PyMC and Stan are the two most popular probabilistic

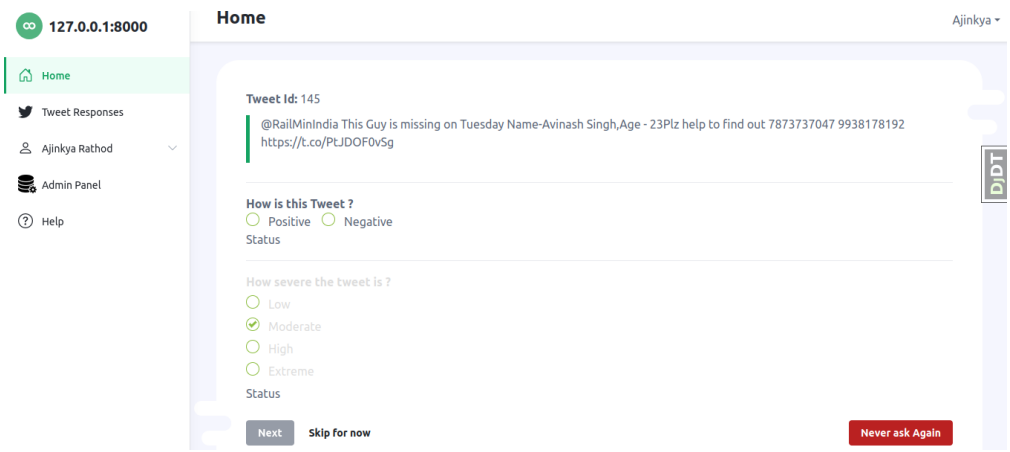
programming tools. PyMC is an open source project, developed by the community and fiscally sponsored by NumFOCUS.

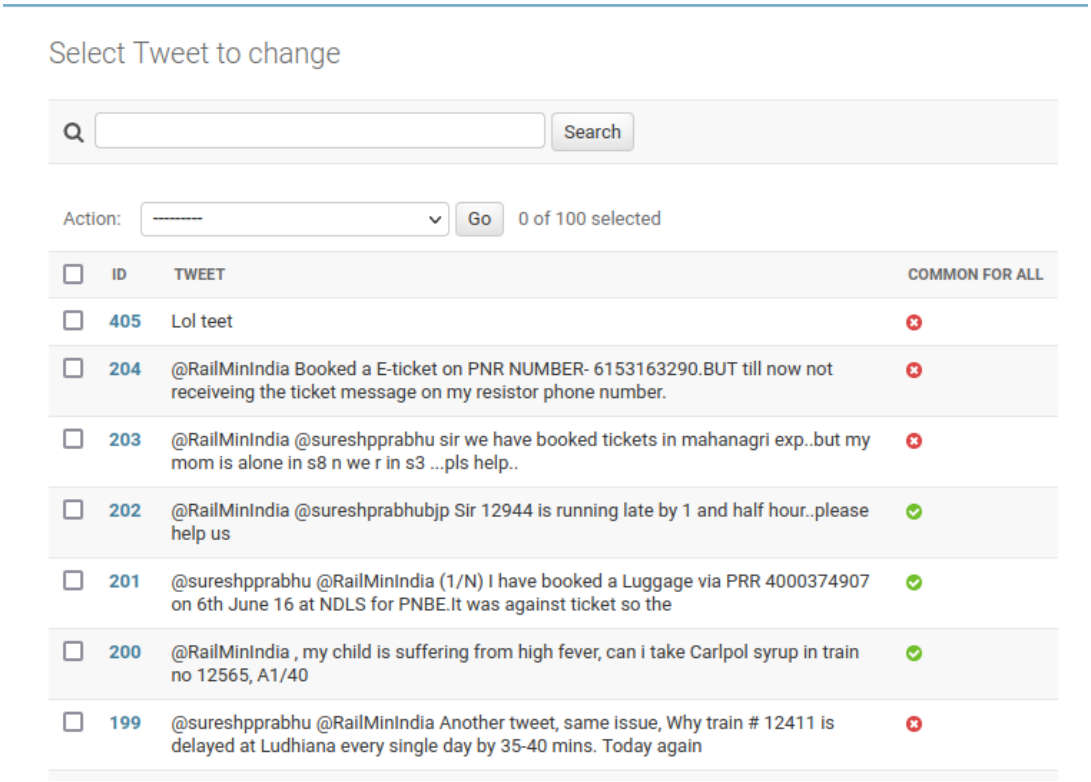
1.3 Dataset Used

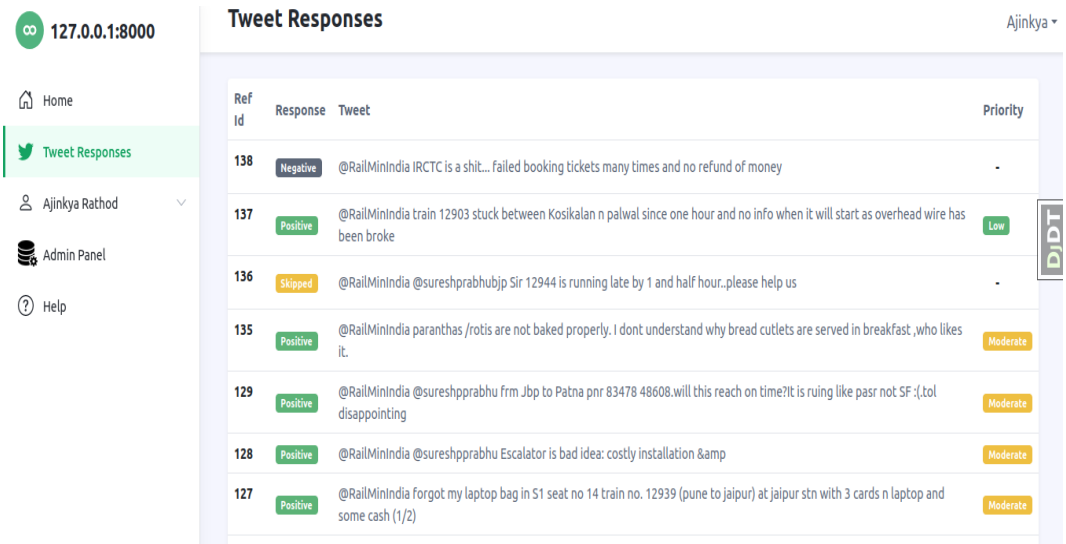
CLASS	TWEET
1	@RailMinIndia @sureshpprabhu dhauli worst train.12822 coach C1 ac not wrkng. refund money .why is this coach even there when ac nt working?
1	@RailMinIndia confusion or misprint #whatever# but Chd to allp was worst noAC,ntClean,leaking in rain,noWater https://t.co/MLRJygEHmt
1	@RailMinIndia sir I am since morning and two time I had connected the at no 011-39340000 . But they give me very bad response . 1/2
1	@RailMinIndia @sureshpprabhu pathetic railway 5 to 6 train has been overtaken at cheoki n dis suvidha is stuck mre than 1hrs now 05514
1	@sureshpprabhu @RailMinIndia Dear Sir I am travelling in 19046 train & there is no water in toilets. The condition of the train is worst.
1	@RailMinIndia my PNR is 2118887897 train number 12983. Very bad experience with badding. Just wrapped in paper not even washed.
1	@RailMinIndia unable to trace my Parcel from delhi. I m from cbe. Parcel off staff have no idea whether material loaded or not. Wat do i do
1	@RailMinIndia Pnr8647770808 very bad situation..all unreserved passengers sitting in resrvation coach causing inconvinience to passengers
1	@sureshpprabhu @RailMinIndia .. bed rolls in AC, bad overpriced food, unmaintained toilets etc etc. Sorry to say, the situation has ..(5)
1	@RailMinIndia traveling by 12005 NDL -CHD Shatabdi ,pathetic condition, no water in toilets, train runing late apparently without any reason
1	@RailMinIndia PNR 8535486976 dirty and used blanket and used bedroll given no one is responding very bad
1	@sureshpprabhu @RailMinIndia PNR 8535486976 dirty and used blanket and used bedroll given no one is responding very bad
1	@RailMinIndia Loss Rupees 2500 on Monday due to 2.5 hrs latency in Jbp-Ind express. Very bad. Late without any reason. Got late in ofc
1	@RailMinIndia below stated train waste almost one and half hour on platform please try to fix up less time!!! Help https://t.co/eFBcgrduwr
1	@RailMinIndia PNR 2861119352. Pantry supplied pathetic food. Also, no water in toilet. And, this is the Rajdhani :(Unable to reach 138.
1	@RailMinIndia why train status not shown on NTES when train is running delay b/w Mughalsarai and Allahabad. Much frustrated.
1	@sureshpprabhu @RailMinIndia travelling in 12481 AC Chair car. The condition of the coach is too poor. All the seats require replacement
1	@RailMinIndia having very bad experience by railway TTE in G3 OF 12984 SEAT 10 , TTE NOT EVEN RPLYD PRPRLY WEN ASKED ABT SEAT 4 LADIES
1	@sureshpprabhu @RailMinIndia sir,wt shall consumer do if IRCTC doesn;t take care of issue? thr telephone customer support is worst ever exp>
1	@sureshpprabhu @RailMinIndia Ind rail enquiry sys is down from last 1/2 an hour.unable to track train's location https://t.co/eGUdIQ51XT
1	@RailMinIndia it's really bad service for RAC under 3rd AC category.... Really a bad experience.. No pillow,no bed sheet n really rude staff
1	@RailMinIndia PNR 6253134881 train no 22940. Dirty toilets and bedroll. Pathetic. Please help.
1	@RailMinIndia Jbp pltfrm no.6 .This mess looks bad on an otherwise clean platform. https://t.co/peTDdynqVB
1	@sureshpprabhu @RailMinIndia The local train service is very bad on harbor line no place for commuters. Please help https://t.co/FhYqNTO89W
1	@RailMinIndia @sureshpprabhu Can't even log in at tatkal time...why don't you increase bogie in Howrah Jamalpur express,disappointed
0	@RailMinIndia Railway was never been so irresponsible. so called fake development is happening. railway was never been so irresponsible. ????

1.4 Flow of Data.

1.5 Output Screens




Select Tweet to change
Search
Action:
Go
0 of 100 selected
ID
TWEET
COMMON FOR ALL
405
Lol teet
204
@RailMinIndia Booked a E-ticket on PNR NUMBER- 6153163290.BUT till now not receiveing the ticket message on my resistor phone number.
203
@RailMinIndia @sureshpprabhu sir we have booked tickets in mahanagri exp..but my mom is alone in s8 n we r in s3 ...pls help..
202
@RailMinIndia @sureshprabhubjp Sir 12944 is running late by 1 and half hour..please help us
201
@sureshpprabhu @RailMinIndia (1/N) I have booked a Luggage via PRR 4000374907 on 6th June 16 at NDLS for PNBE.It was against ticket so the
200
@RailMinIndia , my child is suffering from high fever, can i take Carlpol syrup in train no 12565, A1/40
199
@sureshpprabhu @RailMinIndia Another tweet, same issue, Why train # 12411 is delayed at Ludhiana every single day by 35-40 mins. Today again


127.0.0.1:8000
Home
Tweet Responses
Ajinkya Rathod
Admin Panel
Help
Tweet Responses
Ajinkya
Ref Id
Response
Tweet
Priority
138
Negative
@RailMinIndia IRCTC is a shit... failed booking tickets many times and no refund of money
-
137
Positive
@RailMinIndia train 12903 stuck between Kosikalan n palwal since one hour and no info when it will start as overhead wire has been broke
Low
136
Skipped
@RailMinIndia @sureshprabhubjp Sir 12944 is running late by 1 and half hour..please help us
-
135
Positive
@RailMinIndia paranthas /rotis are not baked properly. I dont understand why bread cutlets are served in breakfast ,who likes it.
Moderate
129
Positive
@RailMinIndia @sureshpprabhu frm Jbp to Patna pnr 83478 48608.will this reach on time?It is ruing like pasr not SF :(.tol disappointing
Moderate
128
Positive
@RailMinIndia @sureshpprabhu Escalator is bad idea: costly installation &amp
Moderate
127
Positive
@RailMinIndia forgot my laptop bag in S1 seat no 14 train no. 12939 (pune to jaipur) at jaipur stn with 3 cards n laptop and some cash (1/2)
Moderate

7. Conclusion and Future Work

- **Conclusion**

- **What you have done?**
  - **The purpose of this research was to identify effective strategies for dealing with inter-rater reliability identified in individuals with various aspects.**
  - **Based on the analysis conveyed, it can be concluded that there are multiple agreements modification is important for the improvement of this these things.**

What can be done to improve?

- **Future exploration into these modification techniques could be useful to finding further such techniques. The amount this could improve the algorithm of others with repetitive checking behaviours is worth exploring.**

8. References

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- https://www.sciencedirect.com/science/article/pii/S016740481730250X
- https://smallbusiness.chron.com/crowdsource-twitter-34435.html
- https://github.com/amirziai/learning/blob/master/statistics/Inter-rater%20agreement%20kappas.ipynb
- https://hrdc.gujaratuniversity.ac.in/Uploads/EJournalDetail/30/1046/6.pdf