CS 613: Natural Language Processing
Group:- T7
Assignment 1

Tasks:

1. Dataset Description:

- The dataset contains the top 100 posts from the Pakistan subreddit with the below attributes:

➢ **Attribute Information:**

  - Post Title (string)
  - Post Id (alphanumerical)
  - Post URL (string)
  - Total number of Comments (numerical)
  - Creation time (numerical - in seconds)
  - Score (numerical)

- The second dataset contains all the comments of the above 100 posts with the below attributes:

➢ **Attribute Information:**

  - Comment Id (alphanumerical)
  - Comment parent Id (alphanumerical)
  - Comment body (string)
  - Comment depth (numerical)
  - Comment score (numerical)
  - Creation time (numerical - in seconds)

2. & 3. COLAB Link:

https://colab.research.google.com/drive/1hn7vdveNXLbKlMrS7qzL2wACWjTDUckE#scrollTo=Y7Jkm0A6JHPS

To know what any particular code is doing, please read the comment on the top of every Cell.

4. We have done Exploratory Data Analysis (EDA) on 125 CSV files in the file “EDA.ipynb”.

5. Here is the link for the Colab Notebook, which contains code for sampling 100 sentences randomly (annotated comments with majority label) for the entire corpus. Also, we have made sure that there is an equal proportion of sentiments (positive, nagetive and neutral): https://colab.research.google.com/drive/1e8seneIG043BefMLFGhAbBVzzb4-MG0z5nm?usp=sharing

6. During the annotation process, contextual information regarding comments is unavailable. A random selection of 100 comments is drawn from the entire corpus, ensuring an equitable representation of negative, positive, and neutral sentiments as labeled by the model. Annotators individually assess each comment based solely on its content and their immediate impressions.

7. Krippnedorff’s alpha = 0.53

8. Here is the link for the Colab Notebook, which contains the code to get the majority vote of the three annotators' labels to get the majority label: https://colab.research.google.com/drive/1e8eIG043BefMLFGhAbBVzzb4-MG0z5nm?usp=sharing

9. The first five comments from the sample of 100 sentences, where the majority label of models and majority label of human annotations are different, are shown below -

comment_body	**Human_Majority**	**Models_Majority**
That's a big fat lye there are plenty of children that live on the streets of Pakistan Ã°Å¸â€¡ÂµÃ°Å¸â€¡Â° without any care an attention, so you keep living in your bubble and not paying attention to what's out their ,	0	-1

boys and girls who are being abused by many adults, boys and girls being raped and murdered on a daily basis Ã°Å¸â€¡ÂµÃ°Å¸â€¡Â° and that's a fact		
When we are the ones contributing the largest amount of foreign investment to the national exchequer (investment not loans) we have a right to speak our minds. We do it bc we love Pakistan.	0	1
Marry me you sexy bustard...	-1	1
This is not something that can really be proved via stats and numbers as its based on perceived performance. What is true is, previous governments did not have a pandemic to deal with alongside a hostile western (aka controllers of the world) block."	0	-1
"First of all, regardless of his sins, I don't believe it gave anyone the right to end his life. Secondly, if you think this is all about glorifying him as a person, then we clearly see things differently. I see this more about what his death represented. It represented a system that oppresses and abuses people based on their race. A system where the punishment for a crime is a warning if you're white but a death	0	-1

sentence if you're black. Painting his face on mural is bringing attention to that in a way that is not as easily avoidable because it's in people's faces."		

Results:

1. While performing human evaluation with respect to sentiment analysis, it is observed that the sentiment predictions generated by the model and those made by human annotators diverge significantly.

   EDA-based analysis:-

   - There were a lot of comments which were either [removed], [deleted] or under moderation. These were removed while preprocessing so as to do EDA.
   - There were quite a number of comments with only usernames, subreddit, reddit mentions which had to be removed while preprocessing.
   - There were some comments which had urls, emails which do not form part of our analysis, so we removed the urls and emails from the comments.
   - There were words which had to be considered as spam due to their very long length and had to be removed while comparing them to the vocabulary present in wordnet corpus.
   - The most frequent words were of a neutral to positive stance, while also consisting of nationalistic or religious words like 'india', 'indian', 'pakistan', 'pakistani', 'muslim', 'allah', and so on.
   - From the pairplot, though we could not find any significant correlation between most frequent five words and upvote scores, we found some positive correlation between the frequency (per comment) of some most frequent words.

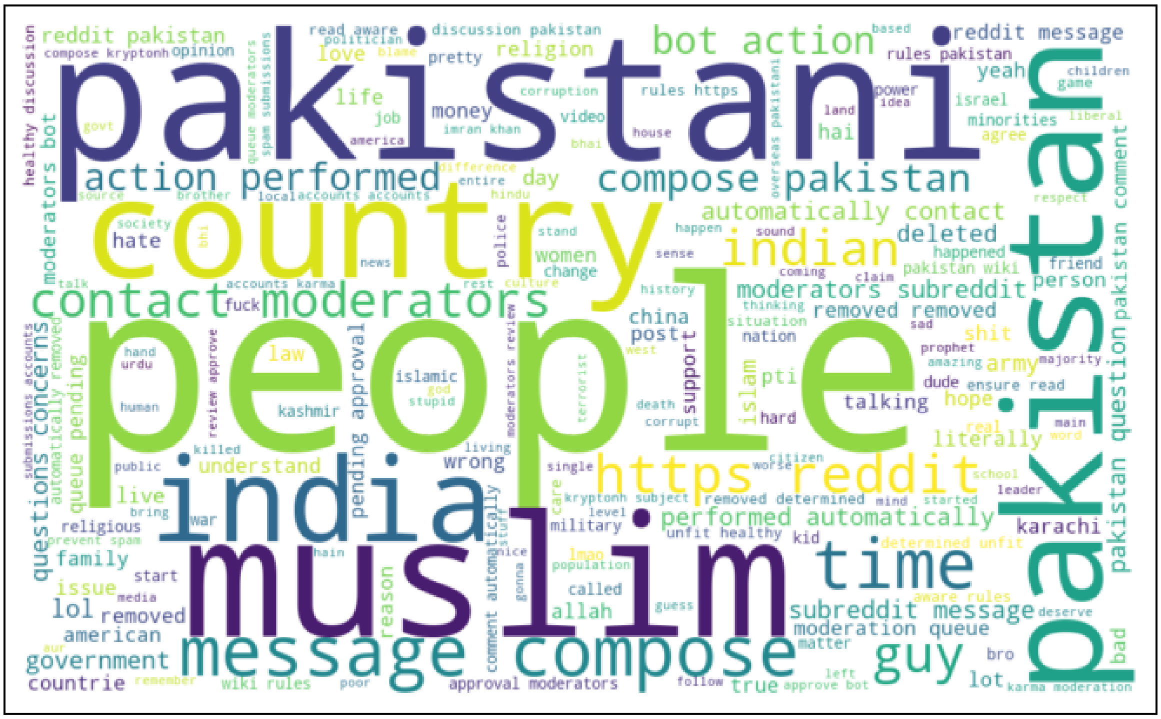
   Human evaluation:-

   - Among the 100 comments, discrepancies in the majority of annotations between human annotators and the model were observed in 37 cases.

- The comments that exhibited mismatches predominantly featured a significant usage of emojis and special characters that are not commonly found within the Hinglish and English linguistic corpora. See all mismatched rows in google colab.

- After conducting a human analysis on the majority of labels, we discovered significant disparities between the labels assigned through human evaluation and those predicted by the model. A substantial number of comments, which were predominantly neutral in nature, received positive or negative classifications from the model. This divergence could potentially stem from the model's reliance on the presence of negative keywords. Contrarily, humans tend to categorise a comment as negative only when explicit vulgarity is used; otherwise, they perceive it as an expression of opinion, which is often neutral. It's worth noting that the model lacks the contextual understanding required to determine the subject matter underpinning the sentiment judgment—whether a comment is negative, positive, or neutral.

2. Word Cloud of the entire corpus using after removing the stop words and including set words whose length of at least 3:-



Here is the code for Word Cloud using the Word Cloud package for the entire corpus. (for reference):

References:

1. https://www.surgehq.ai/blog/inter-rater-reliability-metrics-an-introduction-to-krippendorffs-alpha
2. https://www.lighttag.io/blog/krippendorffs-alpha/
3. https://colab.research.google.com/drive/1lno4DQA_bdT2Xd8cv3mwtRnwR1MdM-3u#scrollTo=w2frnq1OczG3
4. https://praw.readthedocs.io/en/stable/
5. https://www.geeksforgeeks.org/generating-word-cloud-python/

Contribution:

Index	Task	Team Members
1	Data Scraping	Tejas Parmar
2	Sentiment Analysis through models	Prakram Rathore
3	Exploratory Data Analysis	Venkata Sriman Narayana Malli, Zeeshan Snehil Bhagat
4	Human Annotation	Rahul Kumar, Sandeep Patel, Dhakad Bhagat Singh
5	Krippendorff's alpha	Dhakad Bhagat Singh, Rahul Kumar
6	Creating word cloud	Sandeep Patel, Prey Patel
7	Documentation	Prey Patel, Dhakad Bhagat Singh