**A Framework for Social Media Opinion Mining for Low Resource Marathi Text**

***Abstract* — Sentiment Analysis is one of the most important tasks for any language and a very important domain in Natural Language Processing which has shown remarkable progress in recent years. Popular and widely used languages like English, Russian and Spanish have a great availability of language models for these tasks and widely available datasets too. But the research in Low Resource Languages like Hindi and Marathi is far behind. The Marathi language is one of the prominent languages used in India, being the third most spoken language. It is predominantly spoken by the people of Maharashtra. Over the past decade, the usage of language on online platforms has tremendously increased. However, research on Natural Language Processing (NLP) approaches for Marathi text has not received much attention. Therefore in this project we will be creating a framework that can be used for the opinion mining of the social media marathi texts without using any translations. Not using translations will not only get better results but also an error free model trained over the target language only. The multilingual model XLM-RoBERTa will be put under training over the Marathi tweets dataset for the task of opinion mining and classification. We aim at presenting the results of multiple XLM-R models over the Marathi tweets dataset for the task of opinion mining.**

**Keywords –**

**1. Introduction**

The USA elections of 2020 and the fake news that was spread during and after the presidential campaigns shows us the importance of social media companies in the fight against fake news. The Ability of Twitter to flag tweets considered as hateful or inciting violence was based on sentiment analysis of the tweets using Machine Learning models. However there has been miniscule research on opinion mining in low resource languages like Marathi, Gujarati and other Indian languages.Social media users in India are currently mainly from the urban areas mainly using the English language.However with the National Optical Fibre Mission and other initiatives to bring internet connectivity to rural areas, there is going to be a boom in the number of users using non-english native languages to text on social media. Hence the need for opinion mining in these languages is urgent.The current models and systems available are designed to analyze the data of tweets in the English language. The accuracy of data converted from regional languages to English and then performing opinion mining was found to be too low. Hence,we here propose to create a system that is capable of social media opinion mining in the Marathi language.Huge surge of social media users is expected in India and 90% of these users will use Indian languages to communicate. This will lead to tremendous data generation in the regional languages. Marathi is the 3rd most spoken native language in India, with 83 million native speakers according to the 2011 census.

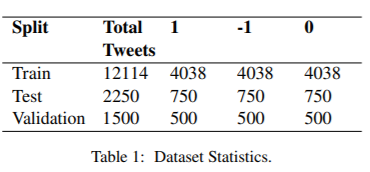
Current best available models for marathi text classification have been trained over news articles and news headlines data. This cannot give a very accurate analysis of the social media texts. We will be using the dataset that is created from twitter tweets that were in marathi language. We propose to train the XLM-RoBERTa model over the marathi tweets to achieve better accuracies for the opinion mining of the social media texts. Based upon the probabilities achieved from the final model, we will classify the text in not only 3, but 5 categories, i.e., very positive, positive, neutral, negative and very negative. We will create a framework where the model will be deployed and can be used by multiple people for generating opinions out of their marathi text.

**2. Literature Review**

Social Media plays a significant role in determining the opinion of people and hence is an important NLP task for detecting and analysing the text. This will help in knowing the polarity of texts and understanding people's opinions on various issues.The majority of existing works for sentiment analysis in the Marathi language have used a limited dataset based on news articles as in [1].They achieve higher accuracy for sentiment analysis of news headlines and news articles,but the accuracy diminishes for non news article. Hence,there is a need for using a wider dataset and training it on models which yield better results on low resource languages, like the XLM-R model.There has been research work on generating sentiment analysis of low resource languages by translating them into the English language. However authors in [4] have studied the effect of translating the English reviews into German, Urdu, and Hindi and compared the classification results of all languages, their research shows low accuracy is yielded when sentiment analysis is performed through translation There are various Machine Learning models that can be used for NLP, however authors in [5] have shown that XLM-R, significantly outperforms multilingual BERT (mBERT) on a variety of cross-lingual benchmarks,the model performs particularly well on low-resource languages, improving 15.7% in XNLI accuracy for Swahili and 11.4% for Urdu over previous XLM models. There has been a tremendous rise in events of hate speech on social media,authors in [2] provide an effective neural network based technique for the hostility detection in the low resource language Hindi text.It is very important to classify the social media texts in categories like very negative, negative, neutral, positive and very positive to locate the hostile texts. We have used word embeddings for deciding the polarity of texts as authors in [6] have shown that proper word embeddings can boost performances by a large margin.The dataset used for training was cleaned of any emojis,english language text along with white space removal, stemming, removal of stop words, removal of numbers, removal of URL links to ensure higher accuracy as shown by authors in [7] and [8] where they had performed sentiment analysis for the Hindi and the Manipuri language respectively.In sentiment analysis,there has been the problem of dealing with tweets and social media texts where negation occurrence does not necessarily mean negation,authors in [9] have presented a comprehensive research in the field of sentiment analysis by looking into tweet normalization and negation which are the critical aspects of NLP. In recent years educational and specialized web resources have seen heated discussions.People using these sites are characterized by restraint in statements and expressions of emotion characterised by ridicule, sharp jokes, provocative statements and hidden injections.Hence there is also a need for annotating these low toxic statements as done by authors in [3].

**3. Dataset**

In this work, we used the publically available L3CubeMahaSent [1] Twitter corpus, which is the first publicly available dataset in Marathi language for the task of Twitter Sentiment Analysis. This corpus was released in 2021 alongside their experiments on the baseline models available for sentiment analysis. This includes approximately 15900 Marathi tweets manually classified into the 3 classes. Our goal is tweet polarity classification, that is, classifying a tweet into positive, negative, or neutral classes. Table 1 provides a statistic on training and testing data sets, which clearly shows the perfect balance of the classified tweets among them. So there is lesser chance of a bias in the training and testing of the models.



**4. Methodology**

**4.1 Dataset Preprocessing**

The data that is fetched directly from twitter is not clean and contains many unwanted text and noise. This needs to be cleaned before putting the data under training for the models to properly understand the language we train it on.

**Links:** Every tweet scraped from any API contains the link to that particular tweet followed b the tweet itself. We removed all the links and urls present in the tweets as they have no significance in our required task.

**Hashtags and Mentions:**

Hashtags are words that are preceded by #(symbol), these are used when referring to a known or popular topic or keyword. Hashtags serve as URL to a page displaying posts about that same topic. We removed all the hashtags except the one’s in Marathi language as hey might have a significant meaning in the tweet. So in the Marathi hashtags, only the symbol # was removed.

Mentions are words that are preceded by @(symbol), containing another twitter user's username in the tweet body and are used when talking to or about someone. We removed all the mentions in the tweets as they serve no purpose in the sentiment analysis task.

**Emojis:**

People these days use the social media creatively and this increases the usage of the emojis in the tweets, messages and posts. Although these emojis can be replaced with its meaning in the English datasets, it is not possible to do so in Marathi yet. Hence we completely removed all the emojis present in the tweets.

**Spaces:** The extra spaces from the tweets were removed and replaced with a single space.

**Numbers and Punctuations:** Numbers have no role in the sentiment analysis, hence numbers and the punctuations of the tweets were removed.

**4.2 Experiments**

**XLM-R**

**5. Performance Evaluation**

**Table of Results**

**6. Conclusion**

This article contributes in presenting a comprehensive research in the field of sentimental analysis in the marathi language.Extensive research work is already available for NLP in the English language. Globalisation has led to the spread of the English language in various parts of the world including India. However the English language is mainly spoken in urban areas while the vast majority in rural areas of India speak vernacular languages. The spread of the internet has been relatively new in the rural areas of Maharashtra with the people using mainly the marathi language in social media conversations.Thus leading to tremendous generation of data.However there are few tools for sentiment analysis in the local languages like Marathi,hence there was a need for sentiment analysis in the Marathi language.In this article, an overview of the Marathi language sentiment analysis has been presented using the XLM-R models,based on existing research that has been performed in other low resource Indian languages like Hindi and Manipuri.The dataset trained on the XLM-R models shows higher accuracy and better performance for NLP on low resource languages like Marathi.The experimental investigation used three different seeds and received the highest accuracy of 83% on seed 40. We aim to deploy the model over a GUI for sentiment analysis of Marathi text where users will get the feedback on the input text with the sentiment probabilities and a final sentiment according to these values.This will help governments in states like Maharashtra and Goa where Marathi is the most widely spoken language to analyse responses on government schemes and make necessary changes if required.This can also be deployed by social media intermediaries to flag the hateful content helping in removing of these toxic texts help in maintaining social harmony along with saving the modesty of a person especially women who bear the unequal burden of social media bullying.Researchers further can strive to achieve higher accuracy by using expanded datasets,higher trained language models.

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