Sentiment Analysis For Bengali Using Transformer Based Models

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Introduction:

- Internet users share their reviews on books, movies, contents, etc on online platforms which helps the next in line users to know the feedbacks
- These reviews highlight the fundamentals of the sentiment analysis task, which aids in classifying texts based on their polarity, or whether they exhibit positive, negative, or neutral feeling.
- Sentiment analysis of texts can be helpful for a variety of applications, such as identifying hate speech, e-commerce recommendation systems, and cyberbullying.
- In this paper, sentiment analysis tasks for the Bengali language have been examined by using fine-tuned multilingual BERT and XLM-RoBERTa (XLM-Roberta is referred to as XLM-R in the research for convenience)

Related Works

- Researchers have put a lot of effort into studying sentiment analysis for languages with abundant resources, like English, but these efforts are rare for languages with limited resources.
- Researchers have recently developed a solution for sentiment analysis tasks for low resource languages including Hindi, Telegu, Bengali, Assamese, Manipuri, Indonesian, etc. and even for English-Hindi, English-Bengali code-mixed languages.
- To assess the sentiment of Hindi tweets, Gupta et al. (2021) employed an LSTMRNN-based method and contrasted it with CNN, machine learning, and Lexicon-based methods.

Datasets

- In this paper, three datasets have been used.
- Prothom Alo: This study's first dataset, which was generated from user comments on 10 trending news subjects from the Prothom Alo online Bengali news portal, is a publicly accessible dataset.
- Youtube-B: There are 8500 positive and 3307 negative reviews in this compilation of manually annotated reviews of Bengali drama on YouTube.
- Book-B: It is a compilation of reviews of Bengali books that have been gathered from online sources like blogs, Facebook, and e-commerce websites.

Proposed Approach

- For the Bengali sentiment analysis task in this research, the cutting-edge multilingual BERT model and XLM-RoBERTa model are taken into consideration.
- First, they are used separately in a new architecture design by Islam et al. (2020), which builds on the transformer model by using Long Short Term Memory (LSTM), Convolutional Neural Network (CNN), and Gated Recurrent Unit (GRU).
- The pre-trained BERT and XLM-RoBERTa model is then fine-tuned using each of the three datasets individually, and the performances are analyzed.
- BERT and XLM-RoBERTa are the primary transformers in both directions of the study.

Experimental setup

- The model from the work by Islam et al. (2020) is adopted and used as a baseline model for the set of experiments conducted.
- An advanced multilingual BERT that has been pre-trained on several languages makes up this standard model. GRU, LSTM, and CNN are used as additional deep neural network layers on top of BERT in order to create three distinct architecture.
- Next, BERT is substituted in the same architecture with XLM-R.
- BERT (bert-basemultilingual-cased) and XLM-R (xlm-robertalarge) are used in another series of experiments, and they are then fine-tuned.

Result:

Samples	Model	#(Classes)	Target	Prediction
প্রথম আলোর এই ডিপারমেন্ট খুব কাঁচা রিপোর্টের দিক দিয়ে । This department of Prothom Alo is very raw in terms of reporting.	BERT-Fine	3	Neg	Neg
খেলাধুলায় ভ্রাতৃত্ববোধ থাকা প্রয়োজন । রেষারেষি নয় । There needs to be a sense of brotherhood in sports. Not a rivalry.	BERT-Fine	3	Pos	Pos
সবার সাথেই সেম অবস্থা , বুঝতে হবে আমাদের ন্যাচার The situation is same with everyone, we have to understand nature.	BERT-Fine	3	Neu	Pos
অসাধারন নাটক এমন টা হয়েছিলো আমার সাথে মত । Such an extraordinary drama. The same happened to me.	BERT-Fine	2	Pos	Pos
প্রথম আলোর এই ডিপারমেন্ট খুব কাঁচা রিপোর্টের দিক দিয়ে । This department of Prothom Alo is very raw in terms of reporting.	BERT-Fine	2	Neg	Pos
প্রথম আলোর এই ডিপারমেন্ট খুব কাঁচা রিপোর্টের দিক দিয়ে । This department of Prothom Alo is very raw in terms of reporting.	XLM-R-Fine	3	Neg	Neg
আমরা এমন রেসারেসি চাই না , সবার সাথে বন্ধুত্ব পূর্ণ সম্পর্ক চাই । We do not want such a race, we want a friendly relationship with everyone.	XLM-R-Fine	3	Pos	Pos
ঘুমন্ত ব্যক্তিকে জাগানো যায় কিন্তু জাগ্রতকে নয় The sleeping person can be awakened but not watchful.	XLM-R-Fine	3	Pos	Neu
শুধুই ভালোবাসা নিশ ভাই Take Only love brother.	XLM-R-Fine	2	Pos	Pos
কুরুচিপূরণ শব্দে ভরতি বই A book full of ugly words.	XLM-R-Fine	2	Neg	Pos

Table 5: Sample predictions for fine-tuned BERT and XLM-RoBERTa extracted from different datasets. 'Target' column represents gold standard class as per dataset and 'Prediction' column represents predicted class by our models. 'Neu', 'Pos' and 'Neg' represents the neutral, positive and negative class.

Conclusion:

An experimental investigation demonstrating the suitability of multilingual BERT and XLM-R (with fine-tuning) for the Bengali sentiment analysis job can be found in this paper. The models are assessed using three datasets, and each dataset shows encouraging results. The next stage would be to look into the cases that were incorrectly classified in order to determine what went wrong and how to fix it.