The 3rd International Conference on Japan–Bangladesh Research and Practice (JBRP2024)
November 29–30, 2024
Online, Coordinated from The University of the Ryukyus, Okinawa, Japan
Organized by the Network of Bangladeshi Researchers in Japan (NBRJ)
Submission Number: 14

Sentiment Analysis of Bangladeshi Roman Chakma Language Using Lightweight CNN

Juel Sikder[1]*, Sharifu Ura[2], Nippon Datta[3], Utpol Kanti Das[1]

[1] Department of Computer Science & Engineering, Rangamati Science & Technology University, Bangladesh.
[2] Division of Mechanical and Electrical Engineering, Kitami Institute of Technology, Japan.
[3] Department of Computer Science & Engineering, Chittagong University of Engineering & Technology, Bangladesh.
* Corresponding Author's Email: juelsikder48@gmail.com

Track: Natural Sciences, Engineering, and ICT

Keywords: CNN, Sentiment, NLP, Engineering, Roman Chakma Language.

Extended Abstract

Sentiment analysis has become an essential approach for evaluating public opinion and sentiment in various languages; nonetheless, there is still a shortage of study in this area for low-resource languages like Roman Chakma. Roman Chakma language is used by the Chakma population of the Chittagong Hill Tracts, Bangladesh, for communication, particularly on digital platforms. In this study, we have gathered the Roman Chakma language data from the Chittagong hill tracks area and developed a robust model using lightweight CNN. Because of its balanced design, the architecture is appropriate for resource-constrained applications. It balances computational efficiency with performance. The accuracy of our proposed model is 77%. Sentiment analysis is crucial to comprehending public opinion globally, particularly across linguistic and cultural divides. In this study, Lightweight CNN models provide an effective way to bridge language gaps in digital communication in Bangladesh by analyzing sentiments in regional languages such as Roman Chakma. In recent years, sentiment analysis has seen a considerable increase in interest [1]. Some of them are mentioned in Table 1.

Table 1. Related Works of Sentiment Analysis System.

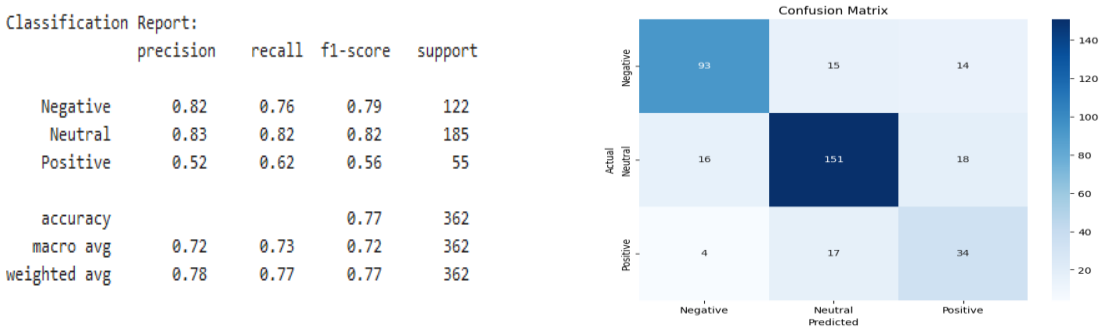
Article	Data source	Category	Algorithm
[2]	Movies and social sites	Positive & Negative	Naïve Bayes
[3]	Tweet Data	02 categories	Decision Tree

The detailed parameters of the proposed lightweight CNN model of the proposed model are illustrated in Table. 2 where it is seen that, the Proposed Model has 361,751 parameters and consumes only 1.38 Megabytes. Fig. 1(a) illustrates the classification report, whereas 1(b) illustrates the confusion matrix of the system. From the values of confusion matrix we have seen that the accuracy (derived using Eq. 1) of the proposed model is 77%. Using the random input to the system, the output is shown in Fig. 2.

This study fills a significant research gap by creating a lightweight CNN model for sentiment analysis in the underrepresented Roman Chakma language. It achieves 77% accuracy while maintaining computational efficiency, making contributions to digital communication in low-resource languages and linguistic technology.

Table 2. Detailed Parameters of the Proposed Lightweight CNN Model.

Layer Name	Output Shape	Param
Embedding	(None, 32, 64)	320,000
Conv1D	(None, 28, 128)	41,088
GlobalMaxpooling1D	(None, 128)	0
Dense	(None, 5)	645
Dense	(None, 3)	18
Total Params	**361,751(1.38 MB)**	



(a) (b)

Figure 1: (a) Classification Report, (b) Confusion Matrix.

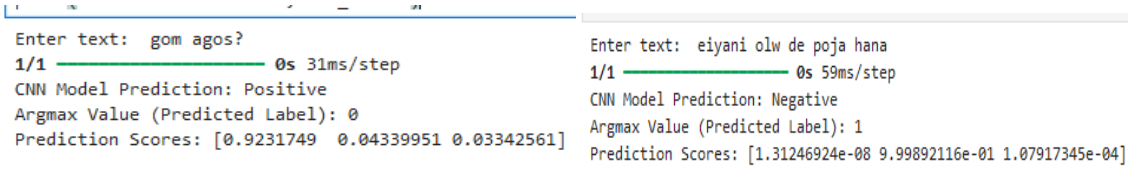


Figure 2: Result using Several random inputs.

$$\text{Accuracy} = \frac{\text{True Positive} + \text{True Negative} + \text{True Neutral}}{\text{Total Predictions}} = \frac{278}{362} = 0.77 \qquad \textbf{(Equation 1)}$$

References

[1].Sikder, J., Chakraborty, P., Das, U.K., et al. A hybrid approach for Bengali sentence validation. Artif Intell Rev 57, 316, 2024.
[2].Singh, J., Singh, G., and Singh, R., Optimization of sentiment analysis using machine learning classifiers, Human-centric Computing and Information Sciences, 7, 1-12, 2017.
[3].Naresh, A., and Venkata Krishna, P., An efficient approach for sentiment analysis, Evol. Intel. 14, 725–731, 2021.