

# Daraz Product Review Classification Using LSTM

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**Abstract**—This thesis presents a novel Deep Neural Network (DNN) method for classifying text in Bangla found in product reviews on the Daraz e-commerce platform. Our methodology includes dataset preparation, LSTM-based modeling, and ethical considerations, and it leverages bert-base-multilingual for sentence embedding. By integrating LSTM and BERT, our model accomplishes an impressive 40.4% accuracy in product analysis. The work advances natural language processing by providing information on how to classify Bangla text in the expanding e-commerce sector in Bangladesh. The merged BERT and LSTM architecture successfully captures contextual nuances in Bangla product classifications, demonstrating the promise of deep learning in this linguistic setting, according to our study of the results. Through manual collecting, a carefully selected dataset of 3,000 examples was put together. Each entry was then manually annotated, classifying feelings into separate categories like negative, mildly negative, neutral, mildly positive, and positive. This rigorous procedure guarantees the accuracy and fineness of classification labels applied to every data point, offering a strong basis for the ensuing phases of analysis and modeling in this research project.

**Keywords:** LSTM, BERT, Natural Language Processing (NLP)

## I. Introduction

In this thesis, a Deep Neural method for categorizing product reviews on the Daraz e-commerce platform is introduced, using Long Short-Term Memory (LSTM). First and foremost, the goal is to identify and classify customer opinions regarding various products that are offered on the website. Users actively share their thoughts on a wide range of product categories on international e-commerce platforms, especially through comments and product reviews, which are constantly growing.

User reviews and ratings are highly important since they are intrinsically valuable measures of the general caliber of products and services. By effectively classifying products, the industry consequently obtains critical information into

its target market, consumer preferences, and product qualities. The development of goods that are more closely aligned with consumer wants is made easier by this knowledge acquisition.

Although Bangladesh has witnessed a surge in e-commerce, there is a noticeable lack of Bangla review classification methods. This study aims to close this gap by performing a thorough analysis, setting the groundwork for upcoming developments that may greatly help the Bangladeshi e-commerce industry. This study tries to improve our comprehension of customer feelings stated in Bangla by applying deep learning techniques, especially LSTM. This will add to the body of knowledge on e-commerce research and help the local business make well-informed decisions.

## II. Literature Review

Zulfikar et al. [1] applied six different machine learning algorithms (Multinomial Naive Bayes (MNB), Logistic Regression (LR), Support Vector Machine (SVM), Decision Tree (DT), Random Forest (RF), and Stochastic Gradient Descent (SGD)) to predict and analyze the polarity of public sentiments. They have collected the dataset from different social media pages and groups. They worked only with Bangla comments and collected 1,631 understandable Bangla reviews and comments. After collecting data, they labeled them manually as positive or negative. They have found a maximum accuracy of 90.68% in SVM classifiers. Mahmud et al. [2] focused on Bangla product review classification and aimed to solve these problems by applying Deep Neural Network (DNN). They have collected product reviews from various e-commerce sites namely Daraz, BDshop, and Evally which are the topmost online shops in Bangladesh. They have found 84% and 69% accuracy of their works.

Gobinda et al. [3] used various Deep Neural Network

(DNN) based models on Rokomari Book Review datasets like LSTM, BiLSTM, and CNN and used various transformers models like Bangla BERT, mBERT, XLM roberta and found almost 84.89% accuracy in LSTM, 82% in BiLSTM, 86.95% in Bangla BERT, and 86.7% in mBERT. Minhajul et al. [4] used five machine-learning approaches that are KNN(accuracy 80.14%), Decision Tree(accuracy 83.03%), Support Vector Machine (SVM)(accuracy 88.81%), Random Forest(accuracy 85.92%), and Logistic Regression (accuracy 88.09%) on various e-commerce sites. They took a total of 1020 reviews for their dataset. In their works, with the highest accuracy of 88.81%, SVM outperformed all the other algorithms.

Jahed et al. [5] used six different types of machine learning classifiers that are multinomial naive Bayes, KNN, Decision Tree, Support Vector Machine (SVM), Random Forest, and Logistic Regression in Bengali product review, English Product review, and Romanized Bangla dataset that are taken from the daraz e-commerce platform. In their works, SVM obtained a better accuracy of 94% for the Bangla and Random Forest achieved the best accuracy of 93% in the English Dataset, and again Random Forest algorithms obtained the best accuracy score of 94% in the Romanized Bangla Dataset. Afrin et al. [6] used LSTM(accuracy 94%), RNN(accuracy 78%), CNN(accuracy 84%), and SVM(accuracy 81%) on Prothom Alo news headline dataset with a size of 3,600. Their the proposed model achieves an accuracy of nearly 94% which proves to be better compared to the others. Tuhin et al. [7] implemented a Random Forest classifier, Logistic Regression, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and XGBoost algorithms with daraz dataset and obtained a higher accuracy of 96.25% in KNN.

Eftekhar et al. [8] proposed a Deep learning model like BiLSTM and a machine learning model like Logistic Regression (LR), Decision Tree (DT), Random Forest (RF), Naive Bayes (NB), Support Vector Machine(SVM) on restaurant review dataset with a size of 8,435 and obtained the highest accuracy of 91.35% in BiLSTM.

### III. Methodology

We are providing an overview of the data collection and preprocessing steps taken as well as the techniques used in this study.

We collect our dataset from the review section of 'daraz.com', one of the most popular websites for e-commerce in Bangladesh. We manually collect the dataset, and extract the unwanted tokens. The dataset was labeled and annotated to guarantee that it was relevant to the classification objective. Finally based on their labels we calculate Cohen's kappa score.<sup>1</sup> Applied Bert tokenizer to tokenize. To embed sentences, we used BERT (Bidirectional Encoder Representations from Transformers).

<sup>1</sup>[https://colab.research.google.com/drive/113X\\_jILUWm0xaQ1CxSdrTqdRvHab4GnR?usp=sharing](https://colab.research.google.com/drive/113X_jILUWm0xaQ1CxSdrTqdRvHab4GnR?usp=sharing)

used the bert-base-multilingual model to identify subtle linguistic variations in material written in Bangla. Combined conventional numerical characteristics with integrated BERT embeddings to generate thorough input representations.

To train DNN algorithms, we need to convert raw text to numerical data. To make training and evaluating the model easier, we divide the dataset into training and validation sets. utilized the Adam optimizer and a categorical cross-entropy loss function to achieve effective convergence. To avoid overfitting, the model was trained over a suitable number of epochs while performance was being monitored on the validation set. Embeddings then allow us to build a more generalized model since similar words share parameters and computation paths instead of handling disconnected input. Every unique word in our dataset is transformed into a feature vector. These vectors are stacked to form an embedding matrix. The output sequence of the embedding layer is fed to the LSTM.

Our approach combines the most recent developments in natural language processing with LSTM-based sequence modeling and BERT-based sentence embeddings to efficiently classify Bangla text in the context of e-commerce product reviews on the Daraz platform. The figure 1 shows our model architecture.

### IV. Dataset

A custom dataset is being created primarily focused on the e-commerce website, 'Daraz'. We manually collected 3000 data from Daraz website, and it has been added with 5 classes (Negative, Mildly Negative, Neutral, Mildly Positive, Positive). Cohen's kappa is being used to determine the level of agreement for the ratings. The Score is 45% which is labeled as moderate, and The table I shows the sample text of our dataset. We split our model with 70% (2100) training and 30% (900) testing.

TABLE I  
Sample Dataset of our Dataset

text	label
একদমই বাজে সেলার আমার কাছ থেকে অতিরিক্ত টাকা নিয়েছে।	0
অনেক লুস ছিল	1
দাম কমানো দরকার	2
যেমনটা আশা করছিলাম তেমনটাই দিয়েছেন	3
খুবই চমৎকার একটা ঘড়ি। ধন্যবাদ	4

### V. Experimental Result

We report the findings of our research work, which mainly concentrated on applying LSTM (Long Short-Term Memory) models for the given problem, in the experimental results section. The performance of our trained LSTM model was excellent; it achieved an accuracy of 40.4%. This outcome emphasizes how well LSTM handles the intricacies present in our field of study. Moreover, the attained precision offers a significant understanding

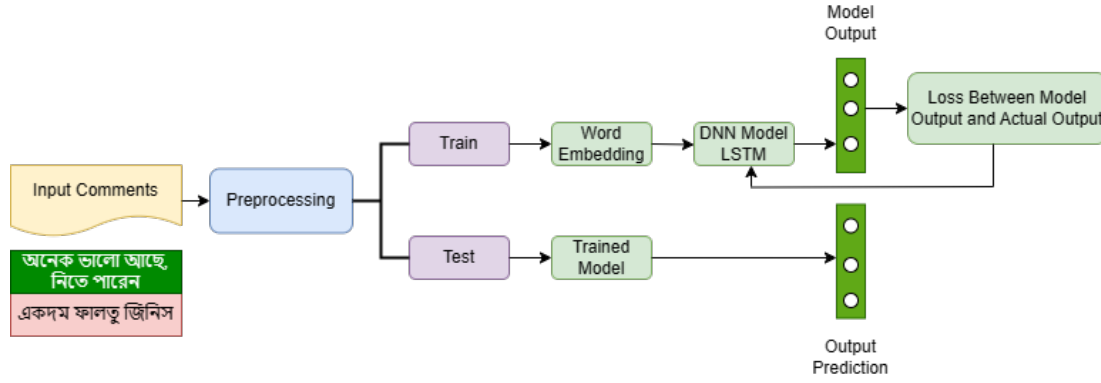


Fig. 1. Model Architecture of Product Review Classification.

of the model's capacity to identify trends and anticipate outcomes, highlighting the importance of LSTM designs within the framework of our investigation. The experimental results are a crucial component in our overall comprehension of the issue our thesis attempts to solve.

## VI. Result Analysis

The 40.4% accuracy that was attained provides a baseline for assessing the effectiveness of the LSTM model. Although this accuracy represents a noteworthy accomplishment, it must be understood in the context of the particular difficulties and subtleties of the problem domain. The investigation demonstrates the LSTM model's proficiency with sequential data by showing how well it collects and handles temporal dependencies. Furthermore, any patterns or trends in misclassifications that are noticed can offer information on possible areas for data augmentation or model improvement. This analysis not only confirms the effectiveness of our LSTM-based strategy but also establishes the foundation for further improvements and additions to improve the model's predictive power within our intended application domain.

## VII. Conclusion

In this paper, we have attempted to classify Bangla product review classification into negative, mildly negative, neutral, mildly positive and positive categories. In Bangla, there is no benchmark corpus for product review classification. So, we manually developed our dataset from an online product-selling platform. We have investigated the performance of a deep learning models such as LSTM. In our study, we found the highest of 40.4% performance in the LSTM model. In the future, we will increase the dataset and will implement various deep neural and transformers models in our dataset.

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