



**Department of Electrical and Computer Engineering  
North South University**

**Senior Design Project**  
**Adaptative NLP for Low Resource Environment and**  
**SAFE: Semantic-Syntactic Based Text Augmentation**  
**Technique**

**Sunjare Zulfiker            ID# 1912050042**

**S.M. Ashraful Hasan      ID# 1911570042**

**Fahid Shadman Karim    ID# 1911110042**

**Faculty Advisor:**  
**Dr. MD Shahriar Karim**  
**Assistant Professor**  
**ECE Department**

**Spring, 2023**

# LETTER OF TRANSMITTAL

July, 2023

To

Dr. Rajesh Palit  
Chairman,  
Department of Electrical and Computer Engineering  
North South University, Dhaka

Subject: **Submission of Capstone Project Report on “Adaptative NLP for Low Resource Environment and Semantic-Syntactic Based Text Augmentation Technique”**

Dear Sir,

With due respect, we would like to submit our **Capstone Project Report** on “**Adaptative NLP for Low Resource Environment and Semantic-Syntactic Based Text Augmentation Technique**” as a part of our BSc program. The report deals with Natural Language Processing (NLP) in low resource environment. For us, this project was quite helpful as it helped us to enhance our knowledge about NLP in non-dominant language and low computing facilities. This project was extremely beneficial to us since it allowed us to gather knowledge in the field of deep learning, particularly NLP, and use that experience to push forward the subject using our own techniques.

We will be highly obliged if you kindly receive this report and provide your valuable judgment. It would be our immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Sincerely Yours,

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Sunjare Zulfiker  
ECE Department  
North South University, Bangladesh

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S.M. Ashraful Hasan  
ECE Department  
North South University, Bangladesh

.....  
Fahid Shadman Karim  
ECE Department  
North South University, Bangladesh

# APPROVAL

Sunjare Zulfiker (ID # 1912050042), S.M. Ashraful Hasan (ID # 1911570042) and Fahid Shadman Karim (ID # 1911110042) from Electrical and Computer Engineering Department of North South University, have worked on the Senior Design Project titled “Adaptative NLP for Low Resource Environment and Semantic-Syntactic Based Text Augmentation Technique” under the supervision of Dr. MD Shahriar Karim partial fulfillment of the requirement for the degree of Bachelors of Science in Engineering and has been accepted as satisfactory.

## **Supervisor’s Signature**

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**Dr. MD Shahriar Karim**

**Assistant Professor**

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

## **Chairman’s Signature**

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**Dr. Rajesh Palit**

**Professor**

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.



# DECLARATION

This is to declare that this project is our original work. No part of this work has been submitted elsewhere partially or fully for the award of any other degree or diploma. All project related information will remain confidential and shall not be disclosed without the formal consent of the project supervisor. Relevant previous works presented in this report have been properly acknowledged and cited. The plagiarism policy, as stated by the supervisor, has been maintained.

Students' names & Signatures

**1. Sunjare Zulfiker**

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**2. S.M. Ashraful Hasan**

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**3. Fahid Shadman Karim**

## ACKNOWLEDGEMENTS

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Furthermore, the authors would like to thank the Department of Electrical and Computer Engineering, North South University, Bangladesh for facilitating the research. The authors would also like to thank their loved ones for their countless sacrifices and continual support.

## ABSTRACT

# **Adaptative NLP for Low Resource Environment and Semantic-Syntactic Based Text Augmentation Technique**

Natural language processing (NLP) is a popular method for extracting context and syntax from text data for use in automation. NLP research focuses on dominant languages and advanced computing, neglecting low resourced languages with limited computational capabilities. In this research, We propose the use of data augmentation (SAFE) approaches, suggest methods including Fusion architecture models (BiLSTM+CNN+BiLSTM) with optimized cyclic learning rate scheduler, layer wise optimization, freezing early layers, and employing the multichannel approach to address the issue of low resource text data. In the domain of NLP where vast amounts of labeled data are scarce or expensive to collect, we offer our proposed method of SAFE augmentation technique for sentiment classification. This augmentation technique identifies the Subject, Verb and Object in a sentence and alternates their position in six different permutations. The Object is also broken down into Subject, Verb and Object again and are further rearranged. This aims to preserve the semantic meaning of the sentence while allowing some syntactic variation. We have also generated and calculated semantic and syntactic scores of the augmented sentences with respect to the original sentences.