



Senior Design Project

Automatic Sleep Stages Detection Using Supervised Machine Learning

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Summer'20

LETTER OF TRANSMITTAL

October, 2020

To

Dr. Mohammad Rezaul Bari

Associate Professor and Chairman,

Department of Electrical and Computer Engineering

North South University, Dhaka

Subject: Submission of Capstone Project on “Automatic Sleep Stages Detection Using Supervised Machine Learning”.

Dear Sir,

With due respect, we would like to submit Our Capstone Project Report on “Automatic Sleep Stages Detection Using Supervised Machine Learning” as a part of our BSC program. The report deals with biomedical signal processing which can able to detect different sleep stage accuracy using supervise machine learning. We tried our level best to make the report meaningful and informative.

The Capstone project was very much valuable to us as it helped us to gain experience from practical field. It was a great learning experience for us. We tried to the maximum competence to meet all the dimensions required from this report.

We will be highly obliged if you are kind enough to 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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Saidul Islam Tanveer
ECE Department
North South University, Bangladesh

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Tangim Hossain Akash
ECE Department
North South University, Bangladesh

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Rakibul Hoque Foysal
ECE Department
North South University, Bangladesh

APPROVAL

The capstone project entitled “Automatic Sleep Stages Detection Using Supervised Machine Learning” by Saidul Islam Tanveer (ID # 1611556043), Tangim Hossain Akash (ID # 1530092042) and Rakibul Hoque Foysal (ID # 1431238043), is approved in partial fulfillment of the requirement

of the Degree of Bachelor of Science in Computer Science and Engineering on Summer '20 and has been accepted as satisfactory.

Supervisor:

Dr. Tanzilur Rahman

Assistant Professor

Department of Electrical and Computer Engineering

North South University Dhaka,

Bangladesh.

DECLARATION

This is our truthful declaration that the “Capstone Project Report” we have prepared is not a copy of any “Capstone Project Report” previously made by any other team. We also express

our honest confirmation in support of the fact that the said “Capstone Project Report” has neither been used before to fulfill any other course related purpose nor it will be submitted to any other team or authority in future.

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Saidul Islam Tanveer
ECE Department
North South University, Bangladesh

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North South University, Bangladesh

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ACKNOWLEDGEMENT

First of all, we wish to express our gratitude to the Almighty for giving us the strength to perform our responsibilities and complete the report.

The capstone project program is very helpful to bridge the gap between the theoretical knowledge and real life experience as part of Bachelor of Science (BSc) program. This report has been designed to have a practical experience through the theoretical understanding.

We also acknowledge our profound sense of gratitude to all the teachers who have been instrumental for providing us the technical knowledge and moral support to complete the project with full understanding.

We would like to convey our gratitude to our faculty Dr. Tanzilur Rahman for his stimulating inspiration, kind guidance, valuable suggestions, sagacious advice and kind cooperation throughout the period of work undertaken, which has been instrumented in the success of our project. At this level of understanding it is often difficult to understand the wide spectrum of knowledge without proper guidance and advice. His suggestions & guidance have made the report a good manner.

We thank our friends and family for their moral support to carve out this project and always offer their support.

ABSTRACT

Sleep is a natural behavior and part and parcel of Human's life. Nowadays, sleeping disorder is common question for both man and women. So, sleep related research is accelerated by researcher and health care community. Sleep research can achieve the better way for diagnosis and treatment of sleeping related complaint. Over the past few decades, sleep classification is introduced. Automatic

sleep stages classification is preferable approach for sleep researchers. Manual sleep scoring also visible Sometimes, nowadays. There is lot of difficulty in manual scoring which is very time consuming and prone to Human error. Automatic sleep stages classification using Machine learning model can create a great solution for diagnosis purpose. Different kinds of machine learning algorithms are used by many researchers. Here, in this research we use multiple supervised machine learning model to classify the sleep stages. In this research using EEG patterns of healthy and mild difficulty subjects over 95% of accuracy is obtained by the classifier. Total 31 features (spectral and statistical features) is applied to dataset before that 10 features were taken. For finding the significance nature of features Kruskalwallis anova test is applied. After that using Knn, Decision tree and Bagged tree algorithms evaluated the model accuracy. Bagged tree algorithm take vital role in accuracy which is higher than two other algothoms.So, the model used in this thesis is effective for both healthy and mild difficulty subject.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION	1
1.1 Overview	2
1.2 Why Our Project?	3
1.3 Thesis Objective	3
1.4 Thesis Outline	4
CHAPTER 2: LITERATURE REVIEW	5
2.1 Overview	6
2.2Sleep Stages	7