Department of Electrical & Computer Engineering

North South University

Senior Design Project

"Detection of Alzheimer's Disease using Deep Learning"

Submitted by:

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Faculty Advisor:

Dr. K.M.A. Salam

Professor & Director

Office of Admissions

Department of Electrical & Computer Engineering

Spring 2023

LETTER OF TRANSMITTAL

Spring, 2023

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

Subject: **Submission of Capstone Project Report on "Detection of Alzheimer's Disease using Deep Learning"**

Dear Sir,
With due respect, we would like to submit our **Capstone Project Report** on **"Detection of Alzheimer's Disease using Deep Learning"** as a part of our BSc program. The report examines the earlier prediction of Alzheimer disease in patients. This project was very valuable to us as it helped us gain practical experience in the data science field that we could apply in real life. We made every effort to fulfil all the requirements of this report.

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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Md. Saron Ahmed
ECE Department
North South University, Bangladesh

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Sharmin Akter Mukti

ECE Department

North South University, Bangladesh

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Salman Sad Shakil

ECE Department

North South University, Bangladesh

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Chayan Banik

ECE Department

North South University, Bangladesh

APPROVAL

We, Md. Saron Ahmed **(ID - 1821641642)**, Sharmin Akter Mukti **(ID – 1831029642),** Salman Sad Shakil **(ID –1711064642)** and Chayan Banik **(ID – 1521170642)** members of CSE: 499 (Senior Design) from the Electrical and Computer Engineering department of **North South University**; have worked on the project titled **"Detection of Alzheimer's Disease using Deep Learning"** under the supervision of Dr. K. M. A. Salam as a partial fulfilment of the requirement for the degree of Bachelors of Science in Computer Science & Engineering and has been accepted as satisfactory.

Supervisor's Signature

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Dr. K. M. A. Salam

Professor

Department of Electrical & Computer Engineering

North South University

Dhaka, Bangladesh.

Chairman's Signature

…….

Dr. Rajesh Palit

Professor & Chairman

Department of Electrical & Computer Engineering

North South University

Dhaka, Bangladesh

DECLARATION

This is to certify 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. Any material reproduced in this project has been properly acknowledged.

Students' names & Signatures

1. **Md. Saron Ahmed**

2. **Sharmin Akter Mukti**

3. **Salman Sad Shakil**

4. **Chayan Banik**

ACKNOWLEDGEMENT

By mercy of the Almighty Allah, we have completed our senior design capstone project entitled "**Detection of Alzheimer's Disease using Deep Learning**".

Foremost, we would like to express our sincere gratitude to our advisor Dr. K. M. A. Salam for his continuous support in our capstone project progress throughout the whole 499A and 499B, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped us in all the time of research, writing and completing of this project.

Our sincere thanks also go to North South University, Dhaka, Bangladesh for providing an opportunity in our curriculum which enabled us to have an industrial level experience as part of our academics.

We are also very grateful to few of our dearest friends, Mamdud Hasan, Nishat tamanna for his help in this project.

Last but not the least, we would like to thank our family as their inspiration and guidance kept us focused and motivated.

ABSTRACT

Over the past many years, Machine Learning has been at its peak. It has many uses, such as predictive online browsing, email and text classification, detecting objects, and recognizing faces. Deep learning has grown in prominence during the past several years relative to all other machine learning applications. It helps researchers solve problems in the field of biomedicine, such as finding cancer, Alzheimer's, and malaria and figuring out what kind of blood cell something is. Deep learning is a subset of machine learning techniques used to pull out features for classification, image processing, etc. Using Magnetic Resonance Imaging (MRI) data, we classified Alzheimer patients from healthy patients using a Convolutional Neural Network (CNN).

The OASIS-1 dataset has 416 people with Alzheimer's disease ranging from mild to moderate severity. Classifying this medical data is essential for making a prediction model or system that can tell if an infection is present in different people or what stage it is in. Alzheimer's disease has always been hard to put into a category, and figuring out what makes it different is the hardest part of this process. We have distinguished Alzheimer's patients from healthy participants using MRI data and various CNN architectures, including InceptionV3, Resnet50, MobileNetV2, VGG16, and VGG19, by calculating model accuracy, confusion matrix, and ROC curve. The most accurate models are the basic CNN and the InceptionV3, with an accuracy of up to 90.62 percent. This research demonstrates the performance of various CNN architectures on our MRI data of Alzheimer's patients and healthy participants in terms of classification. It enables us to identify the most effective models for detecting Alzheimer's disease.

Keywords: Alzheimer; Machine Learning; Deep Learning; CNN; MRI; OASIS-1; Confusion Matrix; ROC curve.