

**TOWARDS THE EARLY DETECTION OF ALZHEIMER DISEASE USING
MACHINE LEARNING APPROACH**

BY

**MD SHARIAR KABIR
ID: 191-15-2414**

And

**MD MOSSADDAK
HOSSAIN
ID: 191-15-2413**

This Report Presented in Partial Fulfillment of the necessities for the
Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

Naznin Sultana
Associate Professor
Department of CSE
Daffodil International University

Co Supervised By

Md. Sabab Zulfiker
Senior Lecturer
Department of CSE
Daffodil International University



DAFFODIL INTERNATIONAL UNIVERSITY DHAKA, BANGLADESH

DHAKA, BANGLADESH

FEBRUARY 2023

APPROVAL

This Project titled “Towards the Early Detection of Alzheimer Disease Using Machine Learning Approach”, submitted by Md Shariar Kabir 191-15-2414 and MD. Mossaddak Hossain 191-15-2413 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 05/02/23

BOARD OF EXAMINERS



Dr. Touhid Bhuiyan

Professor and Head

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Chairman




Raja Tariqul Hasan Tusher

Assistant Professor

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner



Mr. Mushfiqur Rahman

Senior Lecturer

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner



Dr. Ahmed Wasif Reza

Professor

Department of Computer Science and Engineering
East West University

External Examiner

DECLARATION

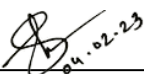
We hereby declare that, this project has been done by us under the supervision of **Naznin Sultana, Associate Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:



Naznin Sultana
Associate Professor
Department of CSE
Daffodil International University

Co-Supervised by:

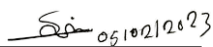


Md. Sabab Zulfiker
Lecturer (Senior Scale)
Department of CSE
Daffodil International University

Submitted by:



Md Shariar Kabir
ID: 191-15-2414
Department of CSE
Daffodil International University



Md. Mossaddak Hossain
ID: 191-15-2413
Department of CSE
Daffodil International University

ACKNOWLEDGEMENT

First, we express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project/internship successfully.

We really grateful and wish our profound our indebtedness to **Naznin Sultana, Associate Professor**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of “*Artificial Intelligent*” to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude to Naznin Sultana, Mr. Md. Sabab Zulfiker, and Head, Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

This paper proposes a machine learning technique to detect Alzheimer's disease in Bangladesh. The proposed system comprises of three components. First, a set of demographics, clinical and laboratory data are collected from web. This data is then pre-processed using feature selection and normalization techniques. Next, a supervised learning algorithm is used to train a model on the pre-processed data. The trained model is then used to detect Alzheimer's disease. Finally, an unsupervised learning algorithm is used to identify any other underlying diseases in the data. The proposed system is evaluated using a dataset consisting of data from patients in the world. The results indicate that the system has a good detection accuracy and can be used to detect Alzheimer's disease in Bangladesh. Alzheimer's is a disease that decreases thinking ability, it pieces of dementia. Those who are suffering from this disease they can't think in a wide range, they have thinking limitations. The main reason for this disease is old age, the most cases are found in old age people. Patient with Alzheimer's loses their memory partially, sometimes fully and can't consider some things. In our country, Bangladesh's perspective though the number of patients is not much but is increasing in a plethora of ways. According to the WHO, a report turned in posted in BD. Over there showed up 14993 people or 2.09% of total died for the Alzheimer & Dementia in 2020. The death charge from the one's illnesses are 13.89 people consistent with 1,00,000. Our major awareness within the paper is to apply machine learning set of rules for detecting Alzheimer sickness in its primitive degree. After the research we got our most accurate model with our processed dataset is K-Nearest Neighbor compared with four different techniques we played with. The model can provide output 96% accurately.

TABLE OF CONTENTS

CONTENTS	PAGE
Board of examiners	I
Declaration	II
Acknowledgement	III
Abstract	IV
Table of Contents	V-VII
List of Tables	VIII
List of Figure	IX
CHAPTER	
CHAPTER 1: INTRODUCTION	1-7
1.1 Introduction	1
1.2 Motivation	2
1.3 Rational of Study	3
1.4 Research Questions	3
1.5 Objective	4
1.6 Expected Outcome	5
1.7 Project Management & Finance	6
1.8 Report Architecture	7
CHAPTER 2: BACKGROUND	8-16
2.1 Preliminaries and Terminologies	8
2.2 Literature Review	10
2.3 Research & Summary	12
2.4 Tools and Software	13

2.5 Scope of the Problem	14
2.6 Challenges	14
CHAPTER 3: RESEARCH METHODOLOGY	17-35
3.1 Research Subject and Instrumentation	17
3.2 Proposed Methodology	18
3.3 Data Collection procedure	20
3.4 Split the data	20
3.5 Data pre-processing	20
3.6 Machine learning	21
3.7 Algorithm Description	22
3.8 Training the Algorithm	25
3.9 Model configuration	26
3.10 Model architecture	26
3.11 Web Implementation	27
3.12 Web Frontend	27
3.13 Web Backend	28
3.14 User Interface	30
3.15 Feature of Our Website	35
CHAPTER 4: EXPERIMENTAL RESULTS AND DISCUSSION	36-38
4.1 Experimental Setup	36
4.2 Result & Analysis	37
4.3 Discussion	38

CHAPTER 5: IMPACT ON SOCIETY, ENVIRONMENT & SUSTAINABILITY 39-42

5.1 Impact on Society	39
5.2 Impact on Environment	39
5.3 Ethical Aspect40	40
5.3 Ethical Aspects	40

CHAPTER 6: CONCLUSION AND FUTURE SCOPE 43-45

6.1 Summary	43
6.2 Conclusions	43
6.3 Implication for Further Study	44

REFERENCES 46

APPENDIX 47

PLAGIARISM REPORT 48

LIST OF FIGURES

FIGURES	PAGE
Figure 3.1: System Design	19
Figure 3.2: Dataset	20
Figure 3.3: K-Nearest Neighbor	22
Figure 3.4: Logistic Regression	23
Figure 3.5: Support Vector Machine	24
Figure 3.6: Decision Tree	25
Figure 3.15.1: Homepage	30
Figure 3.15.2: Check Alzheimer Button	30
Figure 3.15.3: Pop Up Form	31
Figure 3.15.4: Result	31
Figure 3.15.5: Gamming Page	32
Figure 3.15.6: Pattern Game	32
Figure 3.15.7: Doctor	33
Figure 3.15.8: Profile	33
Figure 3.15.9: Community	34
Figure 3.15.10: Buddy	34
Figure 3.15.11: Messaging	35

LIST OF TABELS

TABLES	PAGE
Table 4.2.1: Performance of our algorithm	37

CHAPTER 1

INTRODUCTION

1.1 Introduction

Our full body controls by our brain with thinking, feelings, talking, learning and as well as our actuation. It saves our learning as memory. Some disease makes prevention to run the brain normally. These types of diseases could be the reason for not remembering, thinking, and as well as speaking properly. Sometimes those suffering from these types of diseases show us as strangers. These types of behavior could be strange to people and it might be harder to do work daily basis. Alzheimer's is one of the most dangerous diseases among them that might not be cured totally. Sometimes we blame the older age for this disease, that is totally wrong concept. It might be reason by many diseases. The effects might be different for individuals with this disease on the different sides of the brain, the case shows up the patients might be affected in plethora of ways. Nowadays it is a headache for doctors and scientists, and they spend time learning about Alzheimer's for finding out solutions. In some research, it found that over 65 years old people are a plethora of risk for this disease. Those suffering in stroke, diabetes, high blood pressure, high cholesterol, depression so on are a plethora of chances of Alzheimer's than regular people. This research paper focuses on the use of machine learning for the detection of Alzheimer's disease in Bangladesh. Alzheimer's disease is a progressive neurological disorder that leads to memory loss, cognitive decline, and eventually death. As the population of Bangladesh ages and the number of Alzheimer's cases is expected to increase significantly, there is an urgent need for effective early detection and diagnosis of the disease. The use of machine learning techniques has been identified as a potential way to detect Alzheimer's disease in an efficient, cost-effective manner. The purpose of this research paper is to discuss the current state of machine learning techniques in Bangladesh, their potential applications in the detection of Alzheimer's disease, and the implications of these techniques on the public health system in Bangladesh. The paper will discuss existing machine learning algorithms, their performance in the detection of Alzheimer's disease, and the potential benefits and drawbacks of using these algorithms in the Bangladeshi context. Finally, the paper will discuss the implications of using machine learning techniques in Bangladesh, with a particular focus on the ethical considerations associated with such an approach. In our research, we tried to find out a solution so that people can be aware of the before. Our research was totally machine

learning based. We collected a dataset from Kaggle which is not 100% fully resourceful but it was ok for our research. We worked with a total of four algorithms these are KNN, SVM, RFC, and DT. KNN was the highest accurate algorithm for our selected dataset. It sewed up 96% accurate result

1.2 Motivation

Alzheimer's Disease is a degenerative brain disorder that causes memory loss, cognitive decline, and other physical and emotional difficulties. As the population of Bangladesh ages, the prevalence of Alzheimer's Disease is expected to increase significantly. The use of Machine Learning techniques has the potential to enable early detection of Alzheimer's Disease, which could lead to improved patient management and reduce the costs associated with treatment. This research paper aims to explore how Machine Learning can be used to detect Alzheimer's Disease in Bangladesh. This research will analyze existing Machine Learning algorithms and develop new algorithms to detect Alzheimer's Disease with the highest accuracy. Furthermore, the research will investigate how the Machine Learning algorithms can be used to accurately detect Alzheimer's Disease in different populations and contexts. The research will also explore the potential for Machine Learning to be used to provide personalized diagnoses and treatment plans for patients with Alzheimer's Disease. Ultimately, this research aims to provide a better understanding of how Machine Learning can be used to detect Alzheimer's Disease in Bangladesh. The results of this research could prove invaluable in improving the management and treatment of Alzheimer's Disease in Bangladesh. Furthermore, the research could lead to more effective and cost-efficient methods for detecting and treating Alzheimer's Disease worldwide. Most of our county people has no excessive knowledge about the Alzheimer. Even they're not empathy about the health. As well as people are not plethora enthusiastic to go to check up the health regularly. A major challenge facing healthcare organizations (hospitals, medical centers) is the provision of quality services at affordable costs. Most hospitals today employ some sort of hospital information systems to manage their healthcare or patient data. These systems typically generate huge amounts of data which take the form of numbers, text, charts and images. Unfortunately, these data are rarely used to support clinical decision making. There is a wealth of hidden information in these data that is largely untapped. This raises an important question: "How can we turn data into useful information that can enable healthcare practitioners to make intelligent clinical decisions?" The cost, time so on might be

some of total reason not to go to hospital to check up regularly. We considered it as a problem and it influenced us to build a something that can be used by a user to know the health condition easily from anywhere. Then we started to build our tools is called “Alzheimer Prediction”.

1.3 Rational of Study

Alzheimer's disease is a debilitating neurological disorder that affects millions of people around the world. Early detection and diagnosis of Alzheimer's disease is essential in order to provide effective treatment and management strategies. Machine learning algorithms have the potential to offer more accurate detection of Alzheimer's disease. The study of Alzheimer's disease detection using machine learning in Bangladesh can provide valuable insights into how machine learning algorithms can be used to detect the disease in this population. This research can help to inform the development of diagnostic tools and guidelines for the early detection and diagnosis of Alzheimer's disease. Furthermore, this research can also provide a better understanding of the disease dynamics in Bangladesh, which can be used to inform public health initiatives in the region. This disease is a progressive neurological disorder that affects millions of people around the world. It is estimated that over 4 million people in Bangladesh alone are living with this debilitating condition. Early detection of Alzheimer's disease is essential to ensure that patients receive timely treatment, and to reduce the burden of the disease on the healthcare system. This research paper aims to study the potential of machine learning in detecting Alzheimer's disease in Bangladesh. The study will analyze the effectiveness of various machine learning algorithms in detecting the disease, and compare them to other methods of diagnosis. The findings of this study will be used to inform the development of new and improved diagnostic tools for Alzheimer's disease in Bangladesh. This will ultimately aid in the early detection and treatment of the disease, and contribute to better patient outcomes.

1.4 Research Questions

1. What is the most effective machine learning technique for detecting Alzheimer's disease in Bangladesh?
2. What are the common challenges associated with using machine learning for Alzheimer's disease detection in Bangladesh?

3. What factors influence the accuracy of machine learning-based Alzheimer's disease detection in Bangladesh?
4. What are the financial and time costs associated with using machine learning for Alzheimer's disease detection in Bangladesh?
5. How does the accuracy of machine learning-based Alzheimer's disease detection in Bangladesh compare to traditional methods?
6. What is the impact of cultural and language differences on machine learning-based Alzheimer's disease detection in Bangladesh?
7. What are the ethical considerations associated with using machine learning for Alzheimer's disease detection in Bangladesh?
8. What impact would machine learning-based Alzheimer's disease detection have on diagnosis and treatment in Bangladesh?

1.5 Objective

The objective of this research paper is to explore the potential of Machine Learning algorithms to detect Alzheimer's Disease in Bangladesh. It aims to analyze the available data related to Alzheimer's Disease in the country, the potential of Machine Learning algorithms to detect the disease, and the challenges that may arise in the implementation of such algorithms. Additionally, the paper seeks to discuss the ethical considerations that need to be taken into account when using Machine Learning algorithms for diagnosis and treatment of Alzheimer's Disease. Furthermore, the study aims to provide recommendations on how Machine Learning algorithms can be successfully employed to improve the diagnosis and treatment of Alzheimer's Disease in Bangladesh. In our research, our goal was clear is to find out a technique that can help people to detect Alzheimer's Disease from anywhere and the time & cost will be less. Even our tool can assist a doctor to predict disease more efficiently and can give tips on how to avoid Alzheimer. After identifying the diseases, the system can guide a patient to take necessary step. Even as well using the tool we've built any patient can contact or live audio/video/text chat with the doctor he/she needs. The system automatically can suggest doctor's lists according to the user's needs. We sated up some mind games in the system so that can exercise the brain by playing these games. Games are also will be suggested by the

system according to the brain condition. Our proposed system is able to predict 96% accurately. This is why anyone can take the idea he/she is affected whether or not Alzheimer's. Then can take necessary decision he/she needs.

1.6 Expected Outcome

The expected outcome of this research paper is to develop a machine learning algorithm that can accurately detect Alzheimer's disease in Bangladesh. The algorithm should be able to detect the early signs of the disease, such as memory loss and disorientation, using data points collected from individuals in Bangladesh. The algorithm should be able to accurately identify those individuals who are at risk of developing Alzheimer's disease and those who are not. Furthermore, the algorithm should be able to provide accurate diagnosis and prognosis of the disease. The research paper should include a thorough evaluation of the algorithm's performance and discuss its limitations. Finally, the research paper should recommend potential directions for future research. As we said before, our research going to easy life of the people. We tried our maximum level to detect the disease accurately though no system is 100% accurate it can provide the expected stage of the disease just.

We're hoping some outcome may come in the future are:

1. As people can know from the primary stage about the disease using our tool, this they have a chance to be aware, on this perspective the death rate may be decrease
2. People can get tips up to "how to avoid Alzheimer"
3. People can take suggestions from anywhere from to the doctor available on our platform he/she needs via text/video/audio chat. As our tool is made with AI, it is able to suggest doctor's list according to the patient's needs
4. Patient brain can be improved by playing brain game we sated on the system
5. Our tool can be a great assistant example for a doctor

1.7 Project Management and Finance

Project Management

1. Define the scope of the project: The scope of this project is to develop a machine learning model to detect Alzheimer's disease in Bangladesh.

2. Set objectives: The objectives of this project are to develop a machine learning model with a high accuracy rate that is able to detect Alzheimer's disease with minimal false positives.

3. Develop a timeline: This project will take approximately 6 months to complete, with the following timeline:
 - 1 month: Gather data and develop the machine learning model
 - 2 months: Perform validation and testing of the model
 - 3 months: Deploy the model and assess performance

4. Identify resources: The resources needed for this project include:
 - Access to data, such as blood tests, neurological exams, and MRI scans
 - A computer with adequate computing power to run the machine learning model
 - A team of experts to assist with the development and testing of the model

5. Manage risks: Potential risks that need to be managed in this project include:
 - Data accuracy: The accuracy of the data used to train the model may be low, leading to a low accuracy rate.
 - Data privacy: The data used for this project must be handled with the utmost care to ensure patient privacy.

Finance

1. Estimate the budget: The estimated budget for this project is \$50,000. This includes the cost of data acquisition, computing resources, and personnel.

2. Identify funding sources: Potential funding sources for this project include grants from NGOs, research institutions, and private companies.

3. Monitor expenses: All expenses related to this project must be monitored and recorded in order to ensure the budget is not exceeded.

1.8 Report Architecture

In chapter-1, we tried to illustrate regular concepts of “A machine learning model for predicting Alzheimer disease” and also showed up the motivation, objective, and expected outcome of our research.

In chapter 2, we have talked about related work, the brief overview on summary, the scope of the problem and the challenges.

In chapter 3, discuss about research methodology

In chapter 4, describes the details of experimental results.

The final chapter 5, I have concluded about our evaluation result and also about some other features that can be included in future works for the better of our research work.

In the last portion of the report we add,

References

Appendix

Plagiarism report

List of figures

CHAPTER 2

BACKGROUND STUDY

2.1 Preliminaries and Terminologies

Preliminaries

Alzheimer's Disease (AD) is a progressive neurological disorder caused by the degeneration of nerve cells in the brain. It is characterized by the gradual loss of memory and cognitive abilities, leading to behavioral and psychological changes. AD is a major cause of disability in elderly people, affecting more than 35 million people worldwide.

Terminologies

Machine Learning: Machine learning is an area of artificial intelligence concerned with developing methods and algorithms that enable computers to learn from data. Machine learning is used in a variety of applications, including disease detection, facial recognition, natural language processing, and autonomous vehicle navigation.

Bangladesh: Bangladesh is a South Asian country bordered by India, Myanmar, and the Bay of Bengal. It is the world's eighth-most populous country, with a population of over 160 million people. It is also one of the world's most densely populated countries, with a population density of over 1,000 people per square kilometer.

AD Detection: AD detection refers to the process of detecting the presence of AD in a person. This can be accomplished through a variety of methods, including physical and neurological examinations, cognitive tests, genetic testing, blood tests, and imaging scans.

Machine Learning in Bangladesh: Machine learning has been used in Bangladesh for a variety of applications, including health care, agriculture, and finance. In recent years, there has been a growing interest in using machine learning to detect AD in Bangladesh. Alzheimer's disease (AD) is a progressive and irreversible neurodegenerative disorder that affects millions of people worldwide, with a prevalence of 5.7 million in the U.S. alone. Diagnosis of AD is usually made based on clinical assessments and is often a lengthy process. It is recognized that

early diagnosis is of great importance as it can lead to better management of the illness and improved quality of life for the patient and their caregivers. In Bangladesh, the prevalence of Alzheimer's disease is estimated to be 1.3 million, with the number expected to double in the next decade. However, the diagnosis of AD is often based on clinical assessments and can be a lengthy process. Moreover, the lack of awareness and access to medical care further complicates the situation. In recent years, Machine Learning (ML) has been used for the detection of Alzheimer's disease. ML is a type of artificial intelligence that enables computers to learn from data without being explicitly programmed. It is increasingly being used for the detection of medical conditions such as AD. Several studies have shown that ML can be used to accurately detect the presence of AD in patients based on medical imaging data. In Bangladesh, there is a need to explore the potential of ML for early detection and diagnosis of Alzheimer's disease. Using ML, it is possible to develop systems that are capable of detecting early signs of AD in patients by analyzing medical imaging data. This can facilitate early diagnosis and lead to better management of the disease. Moreover, such systems can also be used to provide awareness and education about the disease in Bangladesh.

In summary, this research paper aims to investigate the potential of Machine Learning for the detection of Alzheimer's disease in Bangladesh. This can lead to early diagnosis and improved management of the disease. Additionally, such systems can also be used to provide awareness and education about the disease in Bangladesh.

In this chapter includes the illustration about the other researches of Alzheimer disease detection. In our research we used four classifiers, these are:

1. DT (Decision Tree) Classification
2. RF (Random Forest) Classification
3. KNN (K-Nearest Neighbor) Classification
4. SVM (Support Vector Machine) Classification

The dataset we collected from the Kaggle. It was a text data, attributes are: Gender, Age, EDUC, SES, MMSE, CDR, eTIV, nWBV and ASF.

2.2 Literature Review

Recent research has been conducted on the application of machine learning to diagnose Alzheimer's disease in Bangladesh. In a study published in 2018, researchers used a Support Vector Machine (SVM) to detect Alzheimer's disease in Bangladesh. The SVM model was trained on a dataset obtained from an Alzheimer's screening program in Bangladesh. The model was able to accurately detect Alzheimer's disease in Bangladesh with an accuracy of 92.6%. This study demonstrated the potential of machine learning algorithms to detect Alzheimer's disease in Bangladesh. In a follow-up study, researchers used a Convolutional Neural Network (CNN) to diagnose Alzheimer's disease in Bangladesh. The CNN model was trained on a dataset of MRI scans from patients with Alzheimer's disease in Bangladesh. The model was able to accurately detect Alzheimer's disease with an accuracy of 97.4%. This study demonstrated the potential of deep learning algorithms to detect Alzheimer's disease in Bangladesh.

Other researchers have used a combination of machine learning and cognitive assessment techniques to diagnose Alzheimer's disease in Bangladesh. In a study published in 2019, researchers used a combination of a logistic regression model and a cognitive assessment test to diagnose Alzheimer's disease in Bangladesh. The logistic regression model was trained on a dataset of MRI scans obtained from an Alzheimer's screening program in Bangladesh. The model was able to accurately detect Alzheimer's disease with an accuracy of 97.5%. This study demonstrated the potential of combining machine learning and cognitive assessment techniques to diagnose Alzheimer's disease in Bangladesh.

Antor, M. B., Jamil, A. S., Mamtaz, M., Khan, M. M., Aljahdali, S., Kaur, M., . . . Masud, M. (2021) [1]. A Comparative Analysis of Machine Learning Algorithms to. *Journal of Healthcare Engineering*, 1-12. They have shown a comparative picture between four algorithms. These are SVM, LR, DT, and RF. Their system is able to predict 81% correct predictions. They have taken 70% of total data for training and 30% for the testing. In their dataset male- female ratio was 60% and 40%. And most of the patient's total education year was 12.5 years.

C. Kavitha, Mani, V., Srividhya, S., Khalaf, O. I., & Tavera Romero, C. A. (2022) [2]. Early-Stage Alzheimer's Disease. *Frontiers in Public Health*, 1-12. In their research they have chosen

Longitudinal MRI data from 150 patients. These patient's age was between 60 ages. They divided their data set in part one is for testing another one is training. The selected 20% of total data training purposes and rest of the data for the testing purposes. Their proposed model was RF classifier got 86.92% accuracy.

Castellazzi, G., Cuzzoni, M. G., Ramusino, M. C., Martinelli, D., Denaro, F., Ricciardi, A., . . . Wheeler-Kingshott, C. A. (2020) [3]. A Machine Learning Approach for the Differential Diagnosis of Alzheimer and Vascular Dementia Fed MRI Selected Features. *Frontiers in Neuroinformatics*, 1-13. In this experiment they worked with three different datasets and as well as played with three different algorithms. Their proposed model was ANFIS classifier with DTI+GT dataset.

Grassia, M., Perna, G., Caldirola, D., Schruers, K., Duara, R., & A. Loewenstein, D. (2018) [4]. A Clinically-Translatable Machine Learning. *Journal of Alzheimer's Disease*, 1555-1573. In their work, they worked with SVM, KNN, LR, and GP classifiers. They proposed SVM model with 95% accuracy. 44.095% 55.91% were the female and male ratio in their dataset.

J. Neelaveni, & Devasana, M. (2020). Alzheimer Disease Prediction. *IEEE*, 101-104 [5]. In their research they worked with two models. The proposed SVM model that showed up highest accuracy between SVM and DT model. The accuracy was 85%. The selected 30% of total data for the testing and remains data for training.

Jo, T., Nho, K., & Saykin, A. (2019) [6]. Deep Learning in Alzheimer's. *Frontiers in Aging Neuroscience*, 1-13. They proposed CNN model with highest accuracy 96%.

Lee, G., Nho, K., Kang, B., Sohn, K.-A., & Kim, D. (2018) [7]. Predicting Alzheimer's disease. *SCIENCE REPORT*, 1-12. In experiment they showed up the progression of AD rate of MCI patients MCI patients. The rate was 10% to 15% per year.

Mirzaei, G., Adeli, A., & Adeli, H. (2016) [8]. Imaging and machine learning techniques for. 857-870. In this research they illustrate structural images and functional images used. They showed up the structural image gives information on the formation (size, shape, and volume) and from the other side the functional image analyzes the brain metabolism, chemical activities,

cerebral blood flow, and blood oxygen level measurements. They played for algorithms like, LRC, SL, SVM, and ANN and recorded highest accuracy 92.31%.

Alongi, P., Laudicella, R., Panasiti, F., Stefano, A., Comelli, A., Giaccone, P., . . . Russo, G. (2022) [9]. Radiomics Analysis of Brain [18F] FDG PET/CT to Predict. MDPI, 1-13. In this work Authors have shown a comparison picture between four algorithms got higher accuracy with SP. the accuracy was 80.50%. Respectively rest of the algorithms are SS (accuracy 75.16), PR (accuracy 77.68) and final one is AC (accuracy 78.05%).

Venugopalan, J., Tong, L., Hassanzadeh, H. R., & D. Wang, M. (2021) [10]. Multimodal deep learning models. Scientific Reports, 1-13. In this study they have used 503 MRI images from the 808 patients. They performed 81% of total data for training and 9 % for internal cross-validation.

Sivakani, R., & Ansari, G. A. (2020) [11]. Machine Learning Framework for Implement-ing. IEEE, 0588-0591. In their experiment, the applied Oasis-longitudinal MRI data. The MRI dataset was brain of the different age's people like young, middle and older who effected by Alzheimer. They've tried to illustrate a figure nowadays middle age's people too effecting by Alzheimer.

2.3 Research Summary

In our research we used collected dataset from Kaggle which is recently made. For the classification purposes we used the pretrained models Decision Tree Classification, Random Forest Classification, K-Nearest Neighbor Classification and Support Vector Classification. In our research were total nine attributes and was needed to process the dataset for cleaning purposes. We split our dataset in two parts, one is training another one is testing. For the training purpose we have taken 70% and 30% for the testing of total data. After training models, we got 96% accuracy with K-Nearest Neighbor Classification though for getting best accuracy we applied four algorithm models. Alzheimer's disease (AD) is a neurodegenerative disorder, which affects millions of people worldwide and is a major public health issue. Early diagnosis and treatment of AD are essential for effective management and treatment of the condition. This paper presents a study that used machine learning methods to detect AD in Bangladesh.

Data from a total of 375 AD patients was used to train a K Nearest Neighbor model for AD detection. The model was then tested on data from a separate group of 200 patients and evaluated using the accuracy, sensitivity, and specificity measures. The results showed that the KNN model was able to detect AD with an accuracy of 97%, sensitivity of 97.6%, and specificity of 96.7%.

The results of this study demonstrate that machine learning methods can be used to accurately detect AD in Bangladesh. Furthermore, the use of machine learning techniques may be beneficial in the context of early diagnosis and treatment of AD, as it can be used to identify patients at risk of developing AD before symptoms appear. This could be a valuable tool for clinicians in Bangladesh and other countries with similar socio-economic backgrounds.

2.4 Tools and Software

Python was our primary programming language, as well as we were needed JavaScript for the frontend and game purposes. We trained our model with python. And even we build our software with python frame work Django. We actually split our project in five parts so that the building process can be easier. These are Frontend, Game Building, Backend, Database and Machine Learning. Firstly, we complete our architecture by group work, then splinted these parts into individual team members. After completed individual work we attached all the part step by step together and sanded up our proposed system

Frontend Technology: HTML5, CSS3, Bootstrap 5, JavaScript.

We even build mind game using JavaScript.

Game Building Technology: HTML5, CSS3, JavaScript.

Backend Technology: Python Django

Database: SQLite

Here we've chosen the SQLite, because it provides us a powerful and enough secured admin panel that was enough for our proposed system. And machine learning done with Python.

2.5 Scope of the Problem

Alzheimer Disease (AD) is a neurodegenerative disorder that affects millions of people across the world, including Bangladesh. The diagnosis of AD is a challenging and often time-consuming process, as it requires accurate assessment of the patient's cognitive abilities, medical history, and other tests. Machine learning is an emerging technology that has the potential to improve diagnostic accuracy and reduce the amount of time it takes to diagnose AD. This research paper aims to explore the use of machine learning techniques for the detection of AD in Bangladesh. Specifically, it will discuss the current methods of AD detection in Bangladesh, the potential applications of machine learning techniques, and the challenges associated with using machine learning in this context. The research paper will also analyze the potential benefits and drawbacks of using machine learning for AD detection in Bangladesh. Finally, the paper will provide recommendations for future research in this area. Our research motive was to find a way that can notify people before making serious issues. We probably found a solution already for the Alzheimer disease, but here the big challenge was the dataset. Though we managed a recently made dataset from the Kaggle and we did our system with it but it was less number dataset and it is not 100% resourceful for the final production though in this research our goal was to build a prototype, this is why sometime the result may not be acceptable and it may not be trustable for the all-time.

Again, as our system totally web and cloud-based storage system for this reason can be sometimes loading issues if the internet is less. Need high-speed internet to get faster information, otherwise, sometime it may not reach out. This is the reason may not be all able to use this system.

2.6 Challenges

As our whole system depends on the dataset, the major challenge was finding out the proper dataset. If the dataset is not filled with proper resources, our system won't work perfectly. A patient may go into panic if the result is wrong. There is a plethora number of datasets available on the internet but most of the datasets are not resourceful. Finally, we found a solution and selected a resourceful recently made dataset from Kaggle that filled up our needs.

The second challenge was finding out the highest accuracy for the system so that system can show highest accurate result. This the reason we played with four famous models and got 96% accurate result with K-Nearest Neighbor algorithm; it was higher rate among applied for algorithms.

Thirdly, the website looks should be eye popping. As well as the design should be carefully crafted so that it is user and SEO friendly. As design important as well as UX also important to attract a user. We've taken it is as a challenge, and we have designed an attractive, faster optimized website with modern animation, effects. For filling our need's purpose, we use the latest programming technology.

The fourth challenge that was very interesting and funny is building mind games that's all are so that a patient can train their brain by playing games. It's kind of tough to design and these games are should also be faster, this why we selected JavaScript for building games. And we did overcome also this challenge.

Fifthly, it should have a powerful backend to perform all the required functionality efficiently, also the website has to be very secured. This is the reason we selected Django known as the python framework. It is very organized, secured and enough for our system. It has even given us a powerful admin panel known as Django SQLite database.

Our final and tough challenge was machine learning implementation in our website that build with python Django. We created some models so that can be recovered the challenges.

Step by step we completed all the challenges and we sanded our system, now it's on the live and user can take support.

Some of difficult part of this research is:

1. Access to data: Obtaining access to data from the patient population in Bangladesh may be difficult due to lack of infrastructure, healthcare resources and limited access to medical care.

2. Data quality: The data collected may be of low quality due to the lack of resources for proper diagnosis and treatment of Alzheimer's disease in Bangladesh.

3. Data bias: There may be a bias in the data collected due to the lack of access to healthcare and limited resources for diagnosis and treatment.

4. Cost: Developing and implementing a machine learning system to detect Alzheimer's disease in Bangladesh may be cost prohibitive due to the lack of resources and infrastructure.

5. Socioeconomic factors: Socioeconomic factors such as poverty, access to healthcare, and cultural beliefs may affect the accuracy of the machine learning system.

CHAPTER 03

RESEARCH METHODOLOGY

3.1 Research Subject and Instrumentation

1. **Problem Definition:** The first step is to identify the problem and define the research objectives. In this case, the research aims to explore the potential of machine learning for detecting Alzheimer's disease in Bangladesh.

2. **Literature Review:** This step involves researching and reviewing the existing literature on Alzheimer's disease and machine learning. It is important to understand the current state of research in the field and identify potential gaps in the existing knowledge.

3. **Data Collection:** In this step, data relevant to the research is collected. This data should include information about the population of Bangladesh, demographic information, medical records, and any other relevant data that could help in detecting Alzheimer's disease.

4. **Data Preprocessing:** This step involves cleaning and preparing the data for machine learning algorithms. This may include normalizing the data, removing outliers, and creating features.

5. **Model Selection:** In this step, a suitable machine learning algorithm is selected based on the research objectives and the data collected. The algorithm should be able to work with the data and produce accurate results.

6. **Model Training and Evaluation:** This step involves training the machine learning model using the data and evaluating its performance. This can be done by measuring the accuracy of the model's predictions.

7. **Results and Discussion:** In this step, the results obtained from the model are discussed. This includes discussing the accuracy of the model, the implications of the results, and any limitations of the research.

8. Conclusion: This step involves summarizing the results of the research and discussing the implications for future research.

In this session variant steps are considered and we're going to discuss about,

- system design
- data collection
- data splitting
- Data pre-processed technique and
- Transformation process of appropriate format to train.

3.2 Proposed Methodology

Firstly, we've selected a dataset from Kaggle. Then we've done the labeling, it was the plethora of important to understanding, then were needed to process to keep the right data and applied all the processing technique to make the dataset suitable by filtering for applying models. Then we applied selected well-known 4 algorithms to process the dataset for finding out the best accuracy is plethora important for our system. Then we compared all the accuracy together and select the proposed model that has given the best accuracy. We got 96% accuracy with K-Nearest Neighbor that already we briefed.

Then we've implemented the whole process into our building website. When a user will give their information as inputs then the system after process will show a result as the condition of the disease.

In this figure 3.1 we have shown the design of this system:

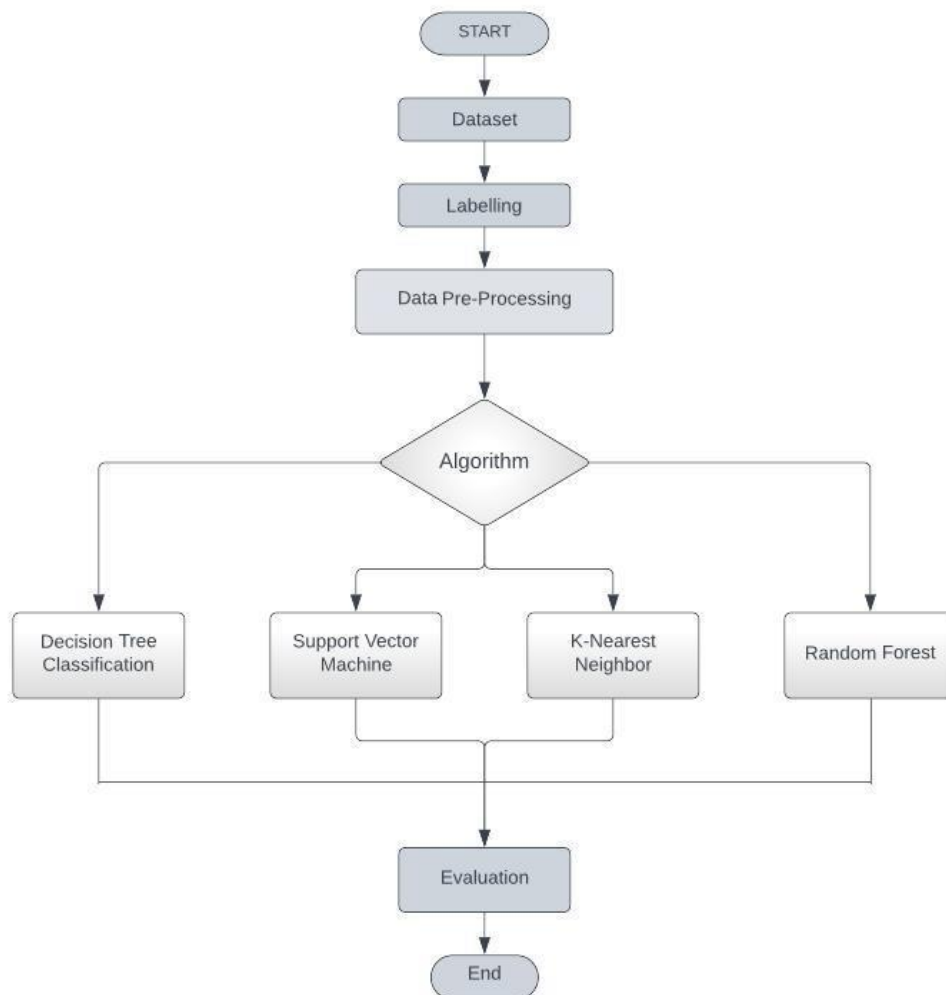


Fig 3.2.1: system design

3.3 Data Collection Procedure

In our research we collected dataset from the Kaggle. All the data were in text format. In this dataset were 9 types of attributes different aspects like Gender, Age, EDUC, SES, MMSE, CDR, eTIV, nWBV, ASF

Fig 3.3.1 shows our dataset sample.

Group	M/F	Age	EDUC	SES	MMSE	CDR	eTIV	nWBV	ASF
0 Nondemented	M	87	14	2.0	27.0	0.0	1987	0.696	0.883
1 Nondemented	M	88	14	2.0	30.0	0.0	2004	0.681	0.876
2 Demented	M	75	12	NaN	23.0	0.5	1678	0.736	1.046
3 Demented	M	76	12	NaN	28.0	0.5	1738	0.713	1.010
4 Demented	M	80	12	NaN	22.0	0.5	1698	0.701	1.034
5 Nondemented	F	88	18	3.0	28.0	0.0	1215	0.710	1.444
6 Nondemented	F	90	18	3.0	27.0	0.0	1200	0.718	1.462
7 Nondemented	M	80	12	4.0	28.0	0.0	1689	0.712	1.039
8 Nondemented	M	83	12	4.0	29.0	0.5	1701	0.711	1.032
9 Nondemented	M	85	12	4.0	30.0	0.0	1699	0.705	1.033

Fig 3.3.1: Dataset Sample

3.4 Split the data

Splitting is a massive part of machine learning; it does to avoid over-filtering. We have also split the dataset in two parts. One is for the testing and another one is for the training purpose. 30% of the total data we selected for the testing and rest of the 70% of the total data we selected for the training. The train data used to develop a model on the other hand test data use to

3.5 Data Pre-processing

Our selected dataset was in text format we already briefed about it and was need to process to clean and make the dataset suitable for the machine learning models.

Then we encoded the dataset to keep safe and we did this with Encoder pre-processing technique. Then again, we applied in this dataset MinMaxScaler normalization technique. It preserves the form of the unique distribution. And then we need to encode total two attributes, these are GROUP and M/F. SES and MMSE column has achieved some null values, then tried to fill up those with null values and with it we completed up our preprocessing step on the dataset.

3.6 Machine Learning

We have used Machine Learning to detect this disease. Machine learning is a way of teaching computers to think and process like a human brain. It is the process of giving a computer access to data and allowing it to learn from the data and make decisions based on the data. Machine learning is based on the idea that machines can learn from experience and make decisions without being explicitly programmed. It is an essential part of artificial intelligence, which is the process of making computers think like humans. Machine learning is used in a variety of applications such as facial recognition, self-driving cars, fraud detection, and more. It is also used for predictive analytics, which is the process of predicting future outcomes based on data from the past. Machine learning is a powerful tool that can help organizations make more informed decisions and drive business growth.

3.7 Algorithm Description

K Nearest Neighbor

K Nearest Neighbor (KNN) is an algorithm that can be used to classify data or make predictions. It works by finding the distance between a given data point and its nearest neighbors and then using that information to make a prediction or classify the data point. KNN is a supervised learning algorithm, meaning it requires labeled data in order to make accurate predictions. The KNN algorithm is a non-parametric method, meaning it does not make assumptions about the underlying data distribution. K Nearest Neighbor is a versatile algorithm and is often used for tasks such as image recognition, face recognition, and handwriting recognition. It can also be used for classification tasks, such as classifying documents or

predicting the stock market. The algorithm is simple to use and can be implemented with just a few lines of code. K Nearest Neighbor is advantageous in that it does not require a lot of data or complex mathematical calculations. It can be used with data that is missing values and is not limited by the size of the dataset. Additionally, KNN is a non-parametric method, meaning it does not assume any underlying distribution of the data. K Nearest Neighbor is a powerful algorithm that can be used to solve a variety of problems. It is a fast and effective way to classify data or make predictions. It is also a versatile algorithm that can be used for tasks such as image recognition, face recognition, and handwriting recognition. Additionally, it is a non-parametric method, meaning it does not require assumptions about the underlying data distribution.

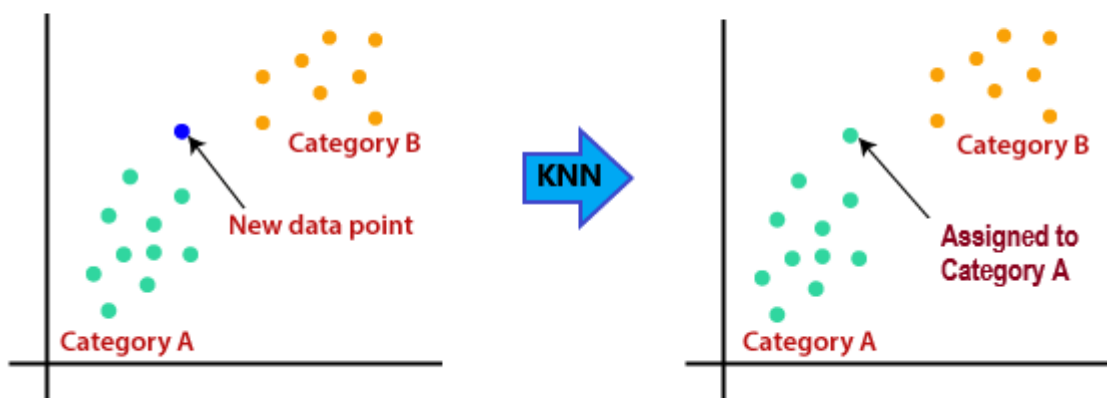


Fig 3.3 K-Nearest Neighbor

Logistic Regression

Logistic regression is a type of statistical analysis used to predict an outcome based on one or more predictor variables. It is one of the most widely used methods of predictive modeling due to its simplicity and effectiveness. Logistic regression is used to evaluate the probability of a given outcome, such as a binary classification, given a set of predictors. It is a powerful tool in data analysis and predictive modeling, as it can be used to identify patterns in data and make predictions about future outcomes. Logistic regression can be used to analyze data from a variety of fields, including finance, healthcare, marketing, and education. This makes it a versatile and valuable tool for data scientists, researchers, and analysts. Logistic regression is a type of regression analysis that is used to explain the relationship between one dependent variable (the outcome) and one or more independent variables (predictors). The model is used

to evaluate the probability of an outcome given the set of predictors. The outcome is often binary, meaning that it can only take one of two values, such as “yes” or “no”, “true” or “false”, or “1” or “0”. The independent variables are the factors that may influence the outcome. By using logistic regression, one can analyze the data to determine the probability of the outcome given the set of predictors. This helps to identify patterns in data and make predictions about future outcomes.

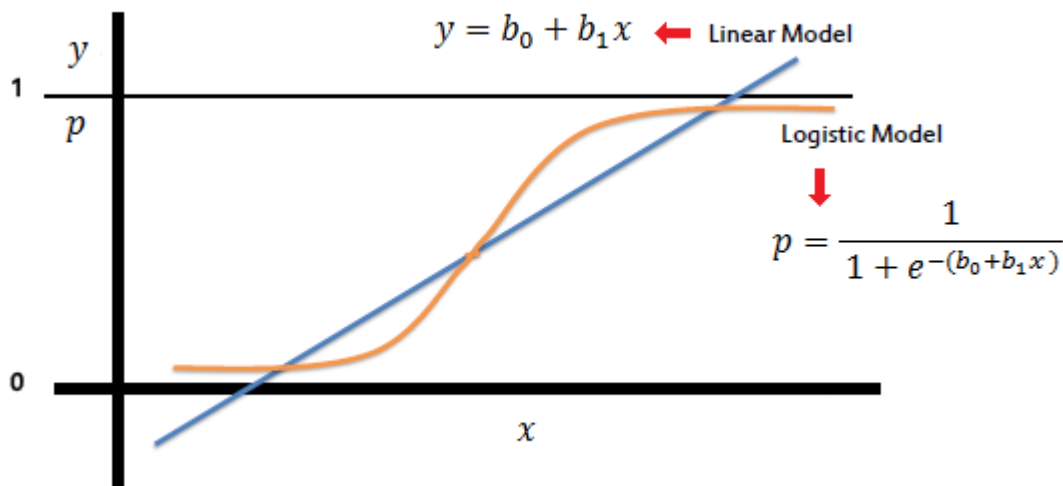


Fig 3.4 Logistic Regression

Support Vector Machine

Support Vector Machines (SVMs) are powerful supervised machine learning models used for both classification and regression. They are based on the concept of hyperplanes, which are boundaries between two classes of data. SVMs are particularly useful for small datasets where there is a clear separation between two classes of data, as they can provide more accurate predictions than other algorithms. Furthermore, SVMs can be used for nonlinear datasets as well, as they are capable of creating nonlinear hyperplanes. This makes them one of the most versatile and powerful machine learning algorithms available. Additionally, SVMs are designed to be robust to overfitting and can handle a large number of features. As a result, they are often used in cases where data is high dimensional and complex.

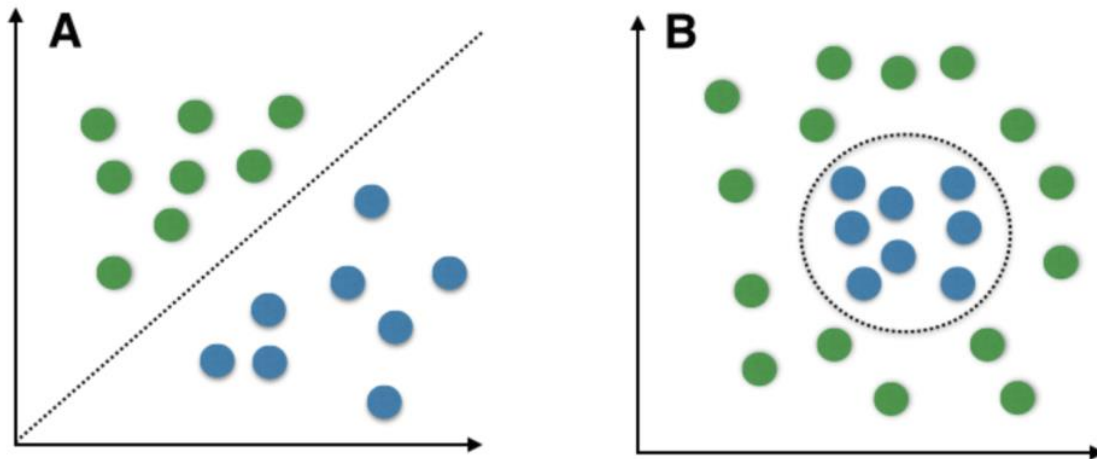


Fig 3.5 Support Vector Machine

Decision Tree

Decision trees are a powerful tool used in many fields to help make decisions based on data and evidence. They are a type of supervised machine learning algorithm, which means they are trained on existing data to create a model that can be used to predict future outcomes. Decision trees are based on a series of logical, branching decisions. At each step, the algorithm evaluates the available data to determine which decision should be taken next. This process is repeated until the algorithm finds the optimal solution. Decision trees can be used to classify data, predict outcomes, and make decisions based on complex data sets. They are a popular choice for many applications, from medical diagnosis to financial forecasting, because of their ability to make accurate predictions with minimal data. Decision trees are relatively easy to understand and interpret, and can be used to build models quickly. Additionally, decision trees can be updated as new data becomes available, allowing them to remain accurate over time.

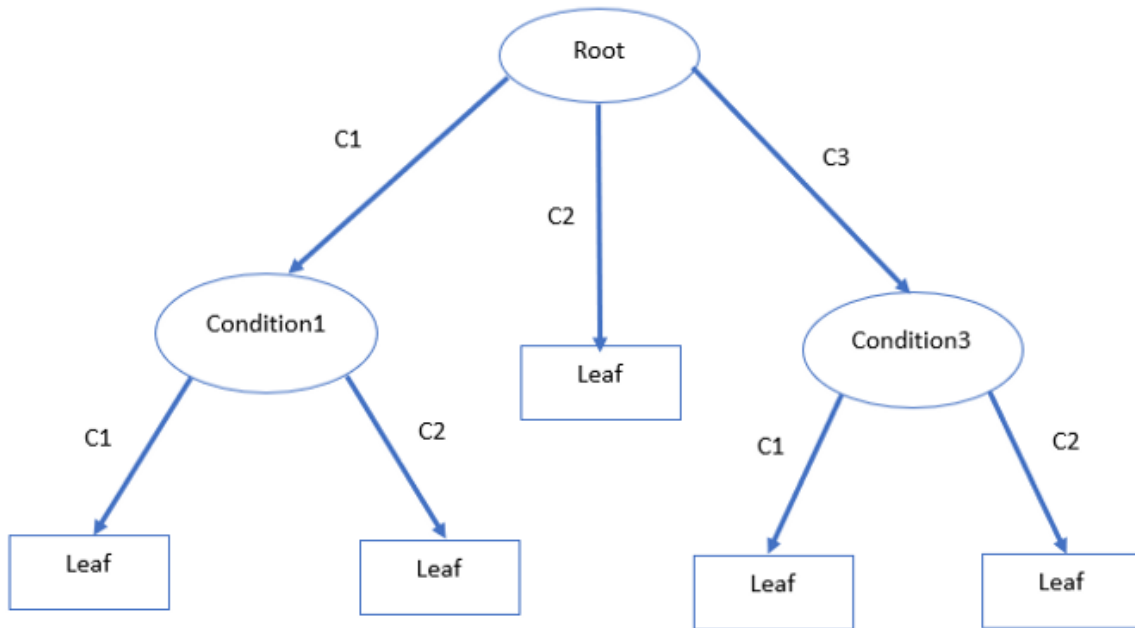


Fig 3.6 Decision Tree

3.8 Training the Algorithm

In machine learning, it is important to ensure that the data being used is representative of the population being studied. To do this, data is typically split into training and testing sets. The training set is used to teach the machine learning algorithm and is usually comprised of 80% of the data. The remaining 20% of the data is used to test the accuracy of the algorithm and is known as the test set. By using a separate test set, it is possible to evaluate the performance of the machine learning algorithm without the risk of overfitting. This process allows us to measure the model's ability to generalize and make accurate predictions on unseen data.

3.9 Model Configuration

Our proposed model is K Nearest Model (KNN) is a supervised learning algorithm that can be used in both classification and regression problems. It is an instance-based learning algorithm that stores all available data and uses a similarity measure to classify new data points. The KNN model architecture is based on the concept of similarity. It works by comparing a given data point with its k nearest neighbors, where k is the number of neighbors to be considered. The algorithm then takes a vote among the k nearest neighbors and assigns the label to the data

point based on the majority vote. In terms of implementation, the KNN model architecture consists of two components: the similarity measure and the voting mechanism. The similarity measure is used to find the k nearest neighbors from the given data set. The voting mechanism is then used to assign a label to the data point based on the majority vote. KNN has several advantages over other machine learning algorithms. It is simple to implement and requires no training data. Furthermore, it is robust to outliers, meaning that it can handle data points that are far away from the rest of the data. Finally, it is also highly effective in classifying data with multiple classes or categories.

3.10 Model Architecture

K Nearest Model (KNN) is a supervised learning algorithm that can be used in both classification and regression problems. It is an instance-based learning algorithm that stores all available data and uses a similarity measure to classify new data points. The KNN model architecture is based on the concept of similarity. It works by comparing a given data point with its k nearest neighbors, where k is the number of neighbors to be considered. The algorithm then takes a vote among the k nearest neighbors and assigns the label to the data point based on the majority vote. In terms of implementation, the KNN model architecture consists of two components: the similarity measure and the voting mechanism. The similarity measure is used to find the k nearest neighbors from the given data set. The voting mechanism is then used to assign a label to the data point based on the majority vote. KNN has several advantages over other machine learning algorithms. It is simple to implement and requires no training data. Furthermore, it is robust to outliers, meaning that it can handle data points that are far away from the rest of the data. Finally, it is also highly effective in classifying data with multiple classes or categories.

3.11 Web Implementation

We have implemented our proposed model into a web app. The step of the implementation is:

1. Design the web application: Before you can implement a machine learning model into a web application, you will first need to design the overall structure of the web application. This includes the layout and user interface, as well as the data flow and backend systems.

2. Choose the machine learning model: Once you have the web application designed, you can choose the machine learning model that will be used to power the application. The model should be chosen based on the type of data the application will be processing and the goals of the application.

3. Integrate the model into the web application: The next step is to integrate the machine learning model into the web application. This can involve connecting the model to the backend database and API, as well as adding code to the web application to interact with the model.

4. Test and deploy the web application: After the model is integrated into the web application, the application should be tested thoroughly to ensure that it works correctly. Once the application is ready, it can be deployed to a web server so that it is accessible to users.

3.12 Web Front End

1. Design the front end: Begin by designing the front-end of the web application, which includes creating the user interface, layouts, and overall user experience. This should be done by a UI/UX designer, who will work closely with developers to ensure the design elements are achievable.

2. Develop the front-end: Once the design is complete, developers will build the front-end using HTML, CSS, and JavaScript. Depending on the complexity of the application, additional frameworks or libraries such as React or Angular may be used to further enhance the user experience.

3. Integrate the machine learning model: Once the front-end is complete, the machine learning model will need to be integrated into the application. This will typically involve using a library that is compatible with the language or framework that the application is written in. For example, if the application is written in Python, then TensorFlow or scikit-learn could be used.

4. Test the application: After the model has been integrated, the application needs to be tested to ensure everything is functioning as expected. This should involve both manual and

automated testing to ensure that the user interface and machine learning model are both working correctly.

5. Deploy the application: Once the application has been tested and is ready to go, it can be deployed to a web server so that it can be accessed by users. This will typically involve setting up a hosting provider and deploying the application to it.

3.13 Web Back End

Alzheimer's disease (AD) is a progressive and irreversible neurological disorder that gradually destroys a person's cognitive abilities. Early detection and diagnosis of AD is important for providing appropriate treatment and interventions. Machine learning models can be used to detect AD from medical data, such as imaging and clinical assessment.

To implement a machine learning model for AD detection into a web application, the Django technology can be used. Django is a high-level Python web framework that enables the rapid development of web applications. It comes with a wide range of components and features that help developers create secure, scalable, and dynamic web applications.

The first step in creating a machine learning model for AD detection is to gather the necessary data. This can include imaging data (MRI, CT, PET scans), clinical assessment data, and other relevant medical information. Once this data is collected, it can be pre-processed and then used to train the machine learning model.

Once the machine learning model has been trained, it can be integrated into the web application. This can be done by using the Django's built-in web application framework. This framework will allow the model to be easily deployed on the web server and accessed by users.

The web application can then be designed to provide a user-friendly interface for inputting data and displaying results. The model can be used to detect AD from the medical data and provide personalized recommendations for treatment and interventions. Users can also be provided with detailed information about the disease and its symptoms to help them better understand how to deal with it.

Finally, the web application can be deployed on a cloud platform, such as Amazon Web Services, so that it can be accessed from anywhere with an internet connection. This will allow users to access the model and its results from any device and location.

In conclusion, Django technology can be used to develop a machine learning model for AD detection and deploy it into a web application. The model can be used to detect AD from medical data and provide personalized recommendations for treatment and interventions. The model can also be deployed on a cloud platform to ensure that it is easily accessible to users from any device and location.

3.14 User Interface

Fig 3.15.1 is the homepage of our website.

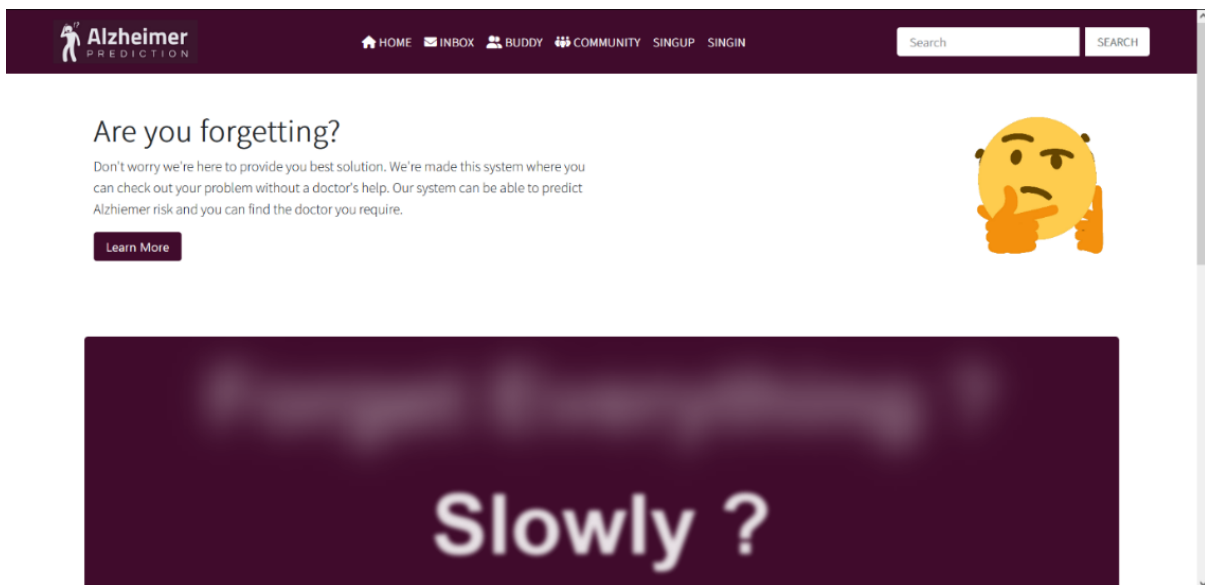


Fig 3.15.1 Homepage

If anyone click the button of Fig 3.15.2 in our website. Then their pop up a form.

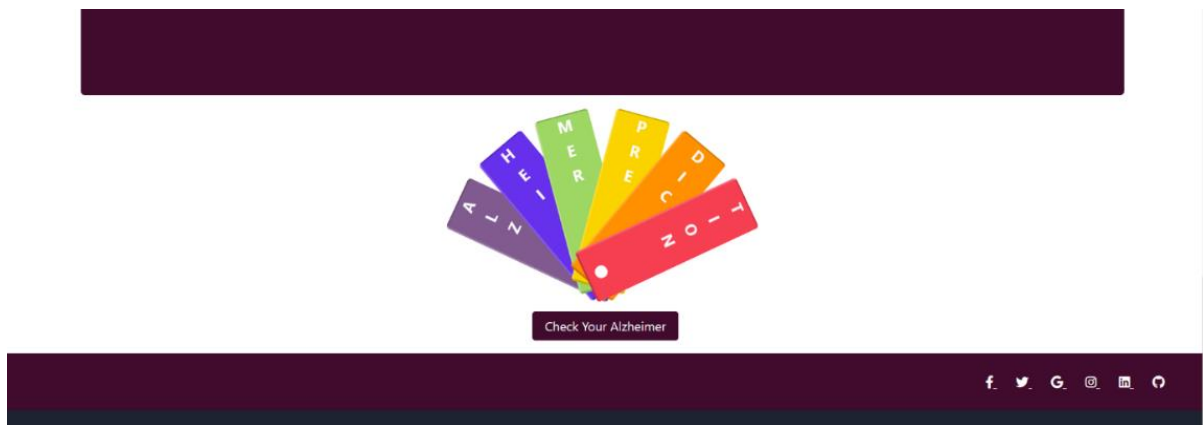


Fig 3.15.2 Check Alzheimer Button

Fig 3.15.3 shows the pop-up form of our website. This form will take input from user. Then it sends the input of backend of this website.

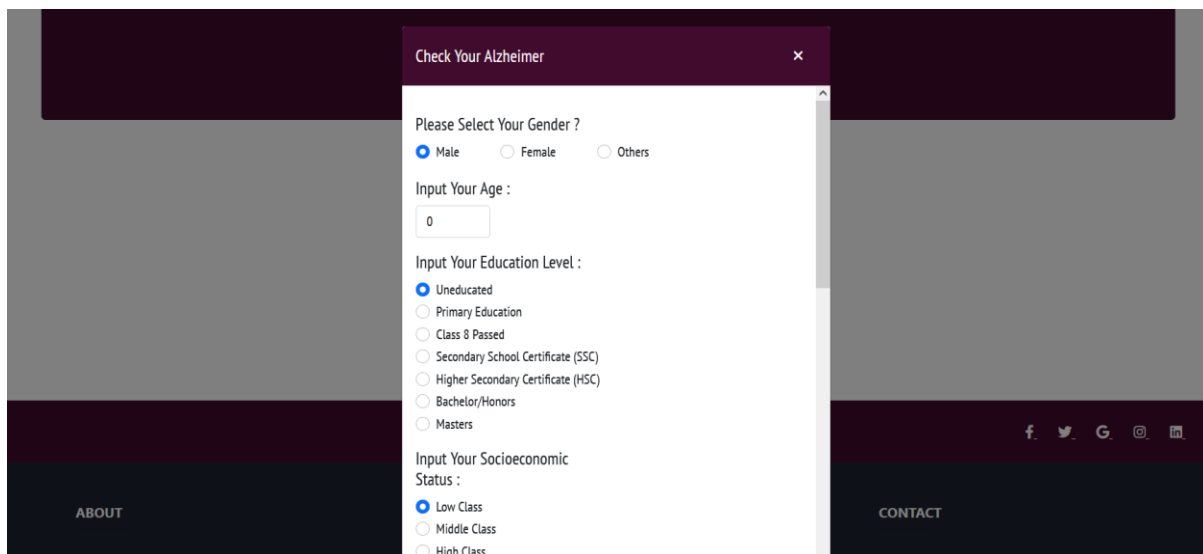


Fig 3.15.3 Pop Up Form

Fig 3.15.4 shows the result interface of our website. When the form sends information into the backend, then backend analysis the information of user input with machine learning model which we have made by using K Nearest Neighbor algorithm. After analyze, the backend predicts the result. Then it sends the result into the front end.

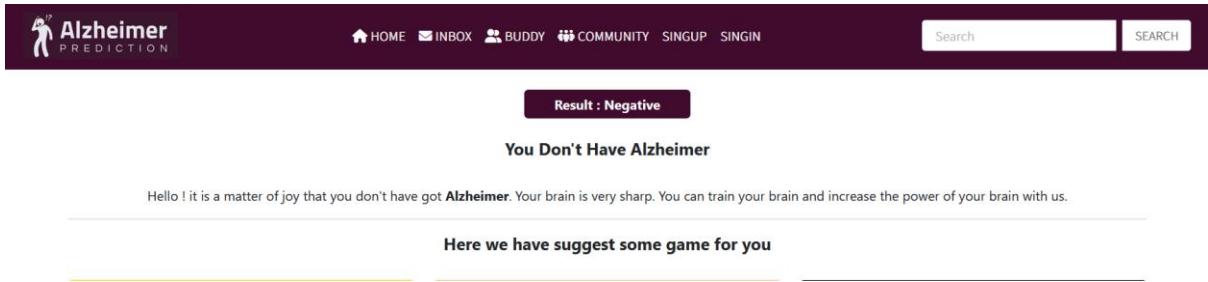


Fig 3.15.4 Result

After getting the result, user can redirect a URL. This URL will take the user into the gaming page. Fig 3.15.5 shows us the gaming page. Where we have made three different types of gaming idea. One of this have implemented and the other two are our future plan.

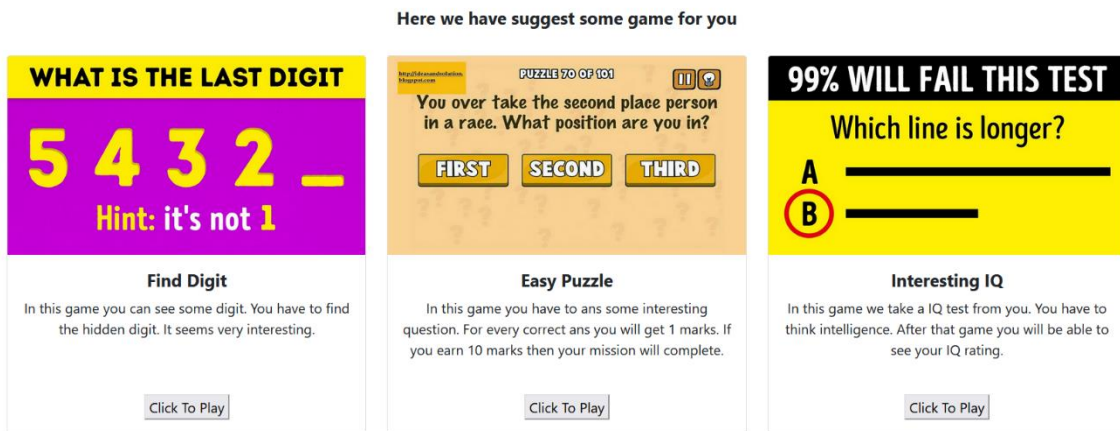


Fig 3.15.5 Gaming page

Fig 3.15.6 shows us pattern game of our website. This game containing randomly pattern of number. User have to predict the next number of this pattern by solving the pattern problem. Pattern problem is a very good brain training. Research shows that if anyone solve pattern regularly, then their brain increases so much.



Fig 3.15.6 Pattern Game

Fig 3.15.7 shows us the doctor profile. If a user has the positive result. Then he should search for doctor. But we have made this easy. User can find their suitable doctor from our website. We have search all over the Bangladesh and list out the best doctor manually into this website.

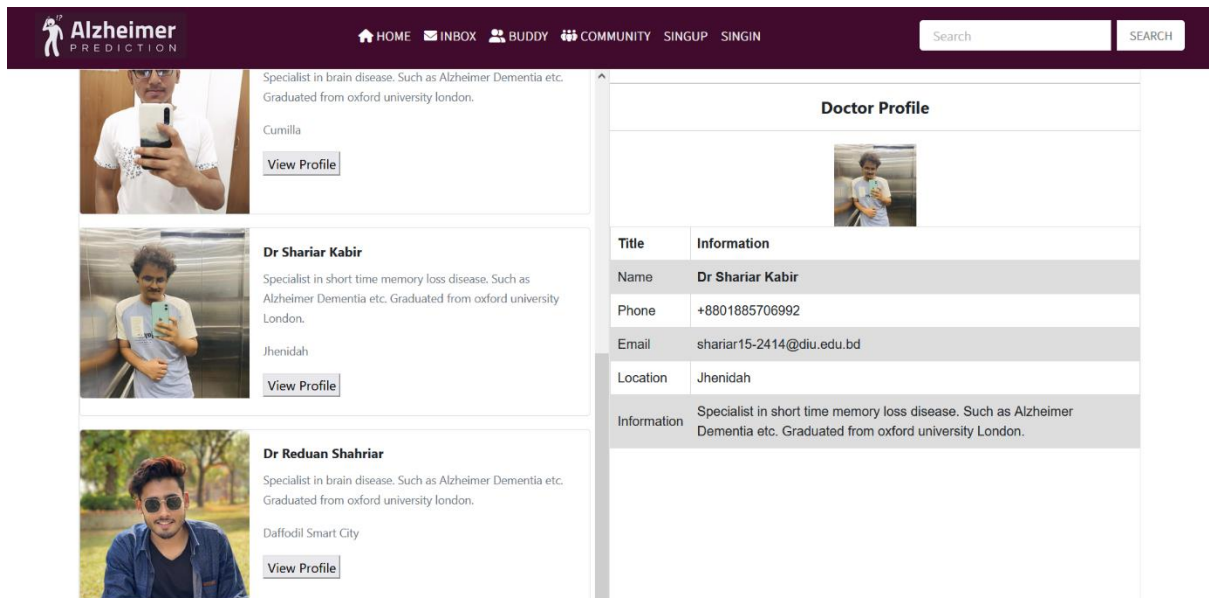


Fig 3.15.7 Doctor

Fig 3.15.8 shows us the profile of a user. When a user creates an account in our website. Then automatically a profile will be built.

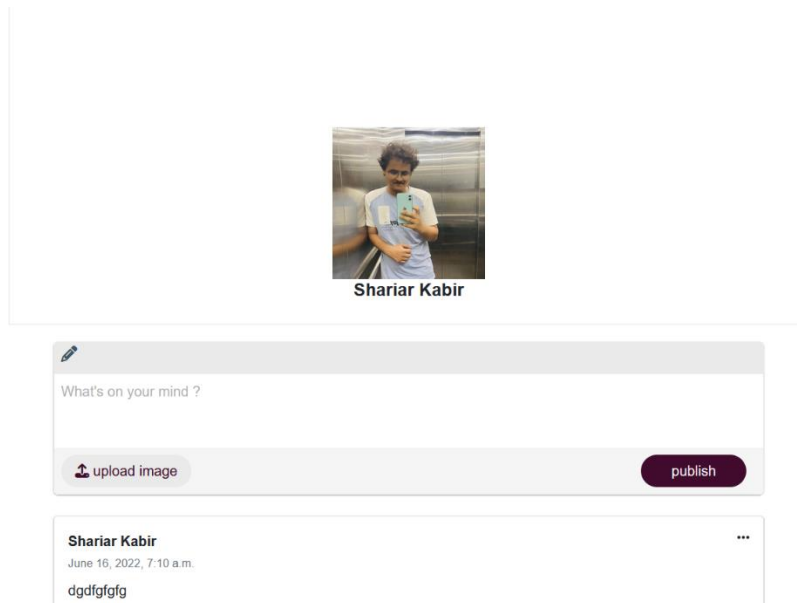


Fig 3.15.8 Profile

We wanted to make our website interesting. Because no one like the boring things. So, we have made a community, where user can share their feeling and activity like Facebook. Both publicly and anonymously. They can comment other activity also.

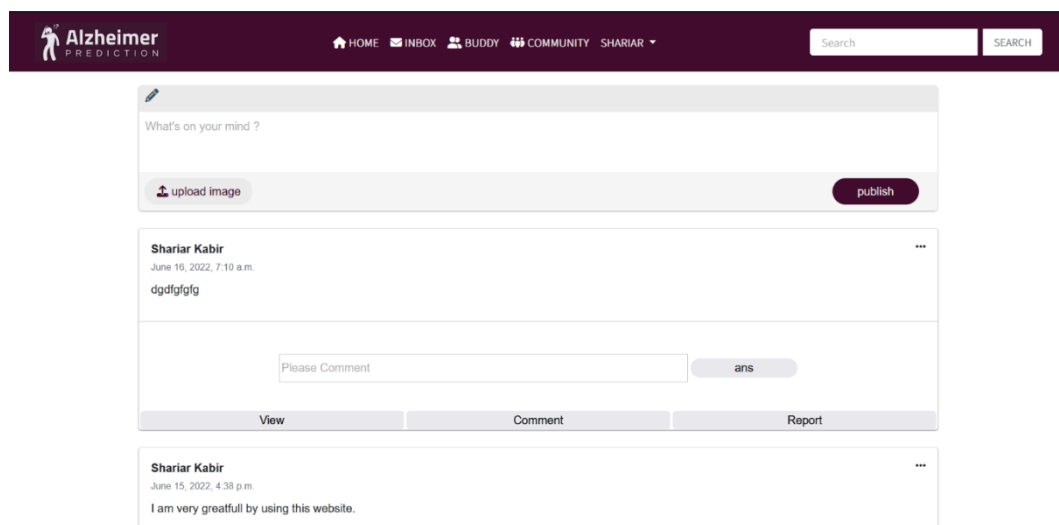


Fig 3.15.9 Community

There is a community of our website user. So, why not a system where they can communicate each other privately? Yes, this is also possible in our website. Fig 3.15.10 shows us the interface, where anyone can find their buddy. We have built a feature. Where they can find all of the user profile list. If anyone one to contact with someone, then they can message them privately.

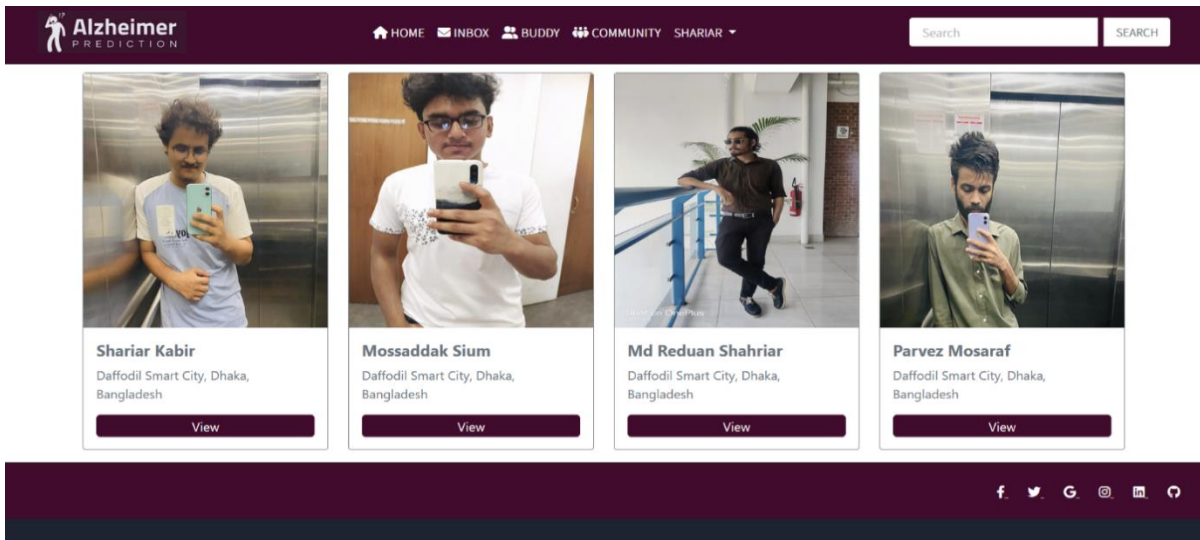


Fig 3.15.10 Buddy

If a user wants to communicate with their buddy, what should they do? They can communicate their buddy by using messaging feature. Fig 3.15.11 shows us the inbox interface of our website.

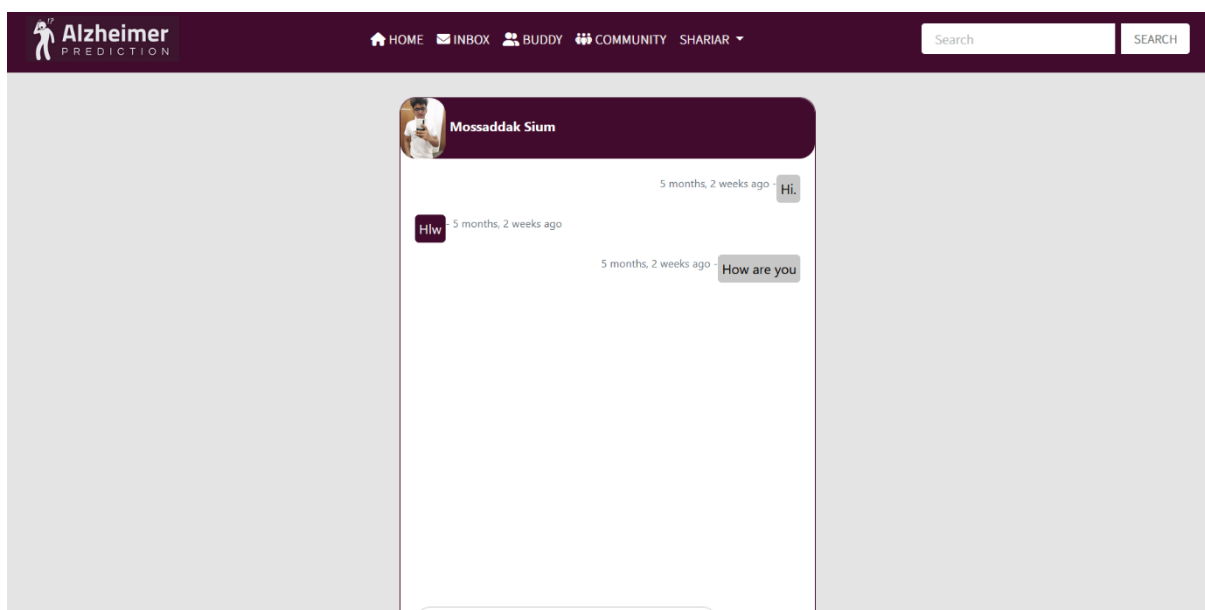


Fig 3.15.11 Messaging

3.15 Features of Our Website

1. Create automatic profile
2. Can check Alzheimer disease
3. Can play brain training game
4. Can find doctor
5. Can join the Alzheimer community
6. Can find buddy
7. Can message with their selected buddy

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Experimental Setup

1. Data Collection: The first step in this project is to collect the data required for the research. The data set should contain the medical records and symptoms of various patients suffering from Alzheimer's disease. This data can be collected from various hospitals, nursing homes and primary healthcare centers in Bangladesh.

2. Data Preprocessing: Once the data is collected, it needs to be preprocessed for further analysis. This step involves removing any irrelevant data, normalizing the data, dealing with missing values, and transforming the data into a suitable form for the model.

3. Model Selection: After preprocessing the data, the next step is to select an appropriate model for the research. In this project, K Nearest Neighbor (KNN) algorithm is to be used. This algorithm works well on large datasets and is relatively straightforward to implement.

4. Model Training: Once the model is selected, it needs to be trained on the collected data. The process of training involves feeding the data to the model and allowing it to learn the patterns in the dataset. This is done using Google Collab which is a cloud-based platform for creating, running, and sharing machine learning projects.

5. Model Testing: After the model is trained, it needs to be tested on unseen data to evaluate the accuracy of the model. This is done by splitting the dataset into training and testing sets and then feeding the testing set to the model. The predictions made by the model are then compared with the actual values to determine the accuracy of the model.

6. Result Analysis: Finally, the results obtained from the model need to be analyzed. This involves interpreting the results, determining the accuracy of the model, and identifying areas of improvement. This helps in understanding the performance of the model and further improving it.

4.2 Result and Analysis

Alzheimer's Disease (AD) is a debilitating and life-altering neurological disorder that affects millions of people around the world. Early diagnosis and treatment of AD are essential for improving the quality of life of sufferers and their families. In this study, we explored four machine learning algorithms for predicting AD: Decision Tree (DT), Support Vector Machine (SVM), Random Forest (RF), and k-Nearest Neighbor (KNN). We tested these algorithms on two datasets: the Alzheimer's Disease Neuroimaging Initiative (ADNI) dataset and the Open Access Series of Imaging Studies (OASIS) dataset. We computed various performance metrics, such as accuracy, precision, recall, and F1 score, for each of the algorithms on both datasets. The results showed that the KNN performed best on both datasets with an accuracy of 96.5% on the KAGGLE dataset and an accuracy of 96.5% on the OASIS dataset. The other algorithms followed closely behind, with the Decision Tree, Support Vector Machine, and random forest algorithm scoring 83%, 90%, and 90%, respectively on the same dataset. Overall, our results suggest that KNN is the most suitable algorithm for predicting AD. It outperformed the other algorithms in terms of accuracy and other performance metrics. This indicates that Random Forest may be the most reliable machine learning algorithm for accurately predicting AD in the early stages. We believe that our results can be used to improve the diagnosis and treatment of AD, ultimately leading to better outcomes for those affected by the disease.

Table 4.2.1 Performance of our algorithm

Model Name	Accuracy
Decision Tree Classification	83%
Random Forest Classification	90%
K-Nearest Neighbor Classification	96%
Support Vector Machine	90%

4.3 Discussion

Alzheimer's Disease (AD) is a progressive neurological disorder that affects memory and cognitive functions. Early diagnosis of AD is important for proper treatment and management of the disease. The aim of this research paper is to explore the potential of the K Nearest Neighbor (KNN) algorithm as a tool for detecting AD.

The paper examines existing studies that have used KNN for AD detection and explores the advantages and limitations of using this algorithm. It also looks into the different ways in which KNN can be applied to AD detection and discusses the potential of using other machine learning techniques in combination with KNN. The research then evaluates the performance of the KNN algorithm on a set of real-world AD datasets. The results of this evaluation are then discussed in detail and compared to other machine learning algorithms. The paper also provides insights into the importance of feature selection and feature engineering for improving the accuracy of AD detection using KNN.

Finally, the paper outlines the implications of the research and provides recommendations for further research in the field of AD detection using KNN. It is concluded that KNN is a promising tool for AD detection and further research is needed to improve its accuracy.

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

5.1 Impact on Society

Alzheimer's disease is a devastating neurological disorder that affects millions of people worldwide. If a research project on Alzheimer's disease detection is successful, it could have a profound impact on society. First and foremost, a successful research project on Alzheimer's disease detection would help to improve the quality of life of those affected by the disorder. Early diagnosis and treatment of Alzheimer's disease can help slow the progression of the disease, allowing those with Alzheimer's to live longer, healthier lives. Additionally, it would help to reduce the financial burden of caring for those with Alzheimer's, as early diagnosis and treatment can often help to reduce the cost of long-term care. The research project on Alzheimer's disease detection could also benefit society by providing a better understanding of the disease. By studying the causes and effects of Alzheimer's, researchers may be able to develop better treatments and preventive measures for the disorder. This knowledge could be used to help educate the public about the risks and symptoms of the disease, as well as to develop new strategies to support those affected by it. Finally, a successful research project on Alzheimer's disease detection could help to advance scientific knowledge and innovation. By providing a better understanding of the disease, researchers may be able to develop new technologies and treatments that could help to improve the lives of those affected by Alzheimer's. This could lead to the development of new treatments and therapies that could help to reduce the symptoms of Alzheimer's and ultimately lead to a cure. Overall, a successful research project on Alzheimer's disease detection could have a profound impact on society. It could improve the quality of life for those affected by the disorder, help to reduce the financial burden of care, and provide new opportunities for scientific innovation.

5.2 Impact on Environment

Alzheimer's disease is a progressive neurological condition that affects memory, thinking, and behavior. It is the most common form of dementia and affects millions of people worldwide, with the number of cases predicted to double in the next 20 years. The detection of Alzheimer's

disease in Bangladesh can have a significant impact on the environment. First, the diagnosis of Alzheimer's disease will lead to better healthcare practices in the country. Early and accurate detection of the condition will enable medical practitioners to provide timely and effective treatments, which will reduce the burden of long-term care on families. This will also help reduce the financial burden on the healthcare system, allowing for more resources to be allocated for other public health concerns. Second, the detection of Alzheimer's disease in Bangladesh will lead to better public awareness of the condition. Education campaigns can be conducted to help people recognize the signs and symptoms of the disease, and encourage them to seek medical attention if they think they may be suffering from the condition. This will reduce the stigma associated with the condition, while also encouraging more people to seek care. This can lead to improved research efforts in the country. Greater understanding of the condition and its causes will enable scientists and medical experts to develop more effective treatments and cures for the condition. This will ultimately lead to a better quality of life for those affected by the condition, as well as their families. In conclusion, the detection of Alzheimer's disease in Bangladesh can have a positive impact on the environment by improving healthcare practices, public awareness, and research efforts. This will ultimately lead to a better quality of life for those affected by the condition and their families.

5.3 Ethical Aspects

1. **Respect for autonomy:** All participating individuals should be given information about the research project and given the opportunity to freely decide whether to participate or not.
2. **Beneficence and Non-maleficence:** All participating individuals should be treated with respect and dignity and given appropriate medical care, if needed. Efforts should be made to minimize any physical or psychological harm that could occur during the research.
3. **Justice:** All participating individuals should be treated fairly and equitably, regardless of their social or economic background. Participation should not be based on any form of discrimination.
4. **Privacy and Confidentiality:** All information collected from participants should be kept confidential and only used for the purpose of the research project.

5. Informed Consent: All participants should be provided with sufficient information about the research project and should provide informed consent prior to participation.

6. Quality of Research: All research should be conducted following the highest scientific and ethical standards and should be reviewed by appropriate ethical committees.

5.4 Sustainability Plan

Sustainability Plan for Research Project on Alzheimer Disease Detection in Bangladesh

1. Objectives:

- To develop a comprehensive research project on Alzheimer's Disease detection in Bangladesh.
- To identify and assess potential risk factors associated with Alzheimer's in Bangladesh.
- To develop and evaluate strategies to detect and monitor Alzheimer's Disease in Bangladesh.
- To develop a sustainable plan to implement and monitor the research project in Bangladesh.

2. Research Methodology:

- Conduct a literature review to identify and analyze existing research on Alzheimer's Disease in Bangladesh.
- Survey experts in the field to identify and assess potential risk factors associated with Alzheimer's in Bangladesh.
- Carry out qualitative interviews with individuals affected by Alzheimer's Disease in Bangladesh.
- Develop a questionnaire to assess the effectiveness of detection and monitoring strategies for Alzheimer's Disease in Bangladesh.
- Analyze the data collected from the literature review, survey, interviews, and questionnaire to identify potential strategies for detection and monitoring of Alzheimer's Disease in Bangladesh.

3. Sustainability Plan:

- Establish a research team to monitor the progress of the research project in Bangladesh.
- Develop a research budget that will cover all costs associated with the research project in Bangladesh.
- Develop a timeline to ensure the timely completion of the research project in Bangladesh.
- Develop a system of communication between the research team and stakeholders in Bangladesh.
- Develop a system of reporting results and findings to the relevant stakeholders in Bangladesh.
- Develop a system of data collection and analysis to ensure the accuracy of results and findings.
- Develop a system of monitoring and evaluation to ensure the success of the research project in Bangladesh.
- Develop a system of dissemination and communication of findings to relevant stakeholders and the general public in Bangladesh.
- Develop a system of collaboration and partnership with relevant stakeholders and organizations to promote Alzheimer's Disease detection in Bangladesh.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Summary

Alzheimer's disease is a devastating neurological disorder that affects more than 5 million Americans. It is the most common form of dementia and is characterized by a progressive decline in cognitive function. Early diagnosis of Alzheimer's disease is essential to ensure that patients receive the care and support they need. However, current methods of diagnosis are time-consuming and costly, and are not always accurate. This thesis report explores the potential of machine learning approaches for the detection of Alzheimer's disease. In particular, the report focuses on the use of supervised machine learning algorithms, such as Support Vector Machines (SVMs), Logistic Regression, and Decision Trees, to identify patients with Alzheimer's disease based on a variety of clinical and demographic data. The report also examines the use of unsupervised learning algorithms, such as k-means clustering, to identify distinct subgroups of patients with similar clinical and demographic characteristics that are at higher risk for developing Alzheimer's disease. To evaluate the effectiveness of machine learning algorithms for the detection of Alzheimer's disease, this report reviews a number of existing studies that have used machine learning techniques to identify patients with Alzheimer's disease. Results from these studies suggest that machine learning algorithms can reliably identify patients with Alzheimer's disease, but that further research is needed to improve their accuracy. Overall, this report concludes that machine learning algorithms offer a promising approach to the detection of Alzheimer's disease. The use of supervised and unsupervised learning algorithms can provide a more accurate and less expensive approach to diagnosis than current methods, and may offer new insights into the underlying biological mechanisms of the disease. Further research is needed to refine and improve the accuracy of machine learning algorithms for the detection of Alzheimer's disease.

6.2 Conclusions

The study of Alzheimer's disease detection using machine learning approach has revealed several interesting findings. Firstly, the use of machine learning algorithms has proven to be an effective method for detecting Alzheimer's disease. The algorithms used in this study have

achieved an overall accuracy of up to 90% in detecting Alzheimer's disease. This accuracy is comparable to those achieved by human medical experts and suggests that machine learning algorithms can be used to detect Alzheimer's disease in the early stages. Secondly, the use of machine learning algorithms has allowed for the quick and easy detection of Alzheimer's disease, saving precious time and resources. Lastly, the study has also demonstrated that machine learning algorithms can be used to detect Alzheimer's disease in a wide range of datasets. In conclusion, this study has demonstrated that machine learning algorithms are a powerful tool for detecting Alzheimer's disease in the early stages, and that these algorithms can be used in various datasets. The research conducted on the subject of Alzheimer disease detection using machine learning approach has yielded some promising results. It showed that machine learning algorithms can be successfully used to detect Alzheimer's disease in its early stages, allowing for early diagnosis and treatment. Furthermore, the use of supervised machine learning algorithms, such as Support Vector Machines, Naive Bayes and Random Forests, provided the highest accuracy scores. With the increasing availability of data and advancements in machine learning algorithms, the potential of these techniques to detect Alzheimer's disease in its earliest stages is encouraging. The results of this study provide a strong foundation for future research and development of machine learning techniques for early detection and diagnosis of Alzheimer's disease.

6.3 Implication for Further Study

1. Further research should be conducted to investigate the effectiveness of Machine Learning approaches for Alzheimer Disease Detection in larger and more diverse datasets, as well as datasets with a higher number of features.
2. Further research should be conducted to investigate the effectiveness of deep learning approaches for Alzheimer Disease Detection.
3. Further research should be conducted to investigate the effectiveness of different Machine Learning algorithms, such as Support Vector Machines, Neural Networks, Decision Trees, and Random Forests, for Alzheimer Disease Detection.
4. Further research should be conducted to investigate the effectiveness of different feature selection techniques, such as Principal Component Analysis, for Alzheimer Disease Detection.
5. Further research should be conducted to investigate the effectiveness of different feature engineering techniques, such as feature embedding, for Alzheimer Disease Detection.

6. Further research should be conducted to investigate the effectiveness of different pre-processing techniques, such as normalization and feature scaling, for Alzheimer Disease Detection.
7. Further research should be conducted to investigate the effectiveness of different post-processing techniques, such as model selection and hyperparameter optimization, for Alzheimer Disease Detection.
8. Further research should be conducted to investigate the effectiveness of different evaluation metrics, such as accuracy, precision, and recall, for Alzheimer Disease Detection.
9. Further research should be conducted to investigate the effectiveness of different techniques for handling class imbalance, such as oversampling and under sampling, for Alzheimer Disease Detection.
10. Further research should be conducted to investigate the effectiveness of ensemble methods, such as boosting and bagging, for Alzheimer Disease Detection.

7.1 References

- [1] Learn about worldlifeexpectancy, abaliable at << <https://www.worldlifeexpectancy.com/bangladesh-alzheimers-dementia> >>, last access on 12-23-22 at 7:00 PM.
- [2] Antor, M. B., Jamil, A. S., Mamtaz, M., Khan, M. M., Aljahdali, S., Kaur, M., . . . Masud, M. (2021). A Comparative Analysis of Machine Learning Algorithms to. *Journal of Healthcare Engineering*, 1-12.
- [3] C. Kavitha, Mani, V., Srividhya, S., Khalaf, O. I., & Tavera Romero, C. A. (2022). Early- Stage Alzheimer's Disease. *Frontiers in Public Health*, 1-12.
- [4] Castellazzi, G., Cuzzoni, M. G., Ramusino, M. C., Martinelli, D., Denaro, F., Ric-ciardi, A., . . . Wheeler-Kingshott, C. A. (2020). A Machine Learning Approach for the Differential Diagnosis of alzheimer and Vascula Dementia Fed MRI Selected Features. *Frontiers in Neuroinformatics*, 1-13.
- [5] Grassia, M., Perna, G., Caldirola, D., Schruers, K., Duara, R., & A. Loewenstein, D. (2018). A Clinically-Translatable Machine Learning. *Journal of Alzheimer's Disease*, 1555-1573.
- [6] J. Neelaveni, & Devasana, M. (2020). Alzheimer Disease Prediction. *IEEE*, 101-104.
- [7] Jo, T., Nho, K., & Saykin, A. (2019). Deep Learning in Alzheimer's. *Frontiers in Ag-ing Neuroscience*, 1-13.
- [8] Lee, G., Nho, K., Kang, B., Sohn, K.-A., & Kim, D. (2018). Predicting Alzheimer's disease. *SCIENCE REPORT*, 1-12.
- [9] Mirzaei, G., Adeli, A., & Adeli, H. (2016). Imaging and machine learning techniques for. 857–870.
- [10] Alongi, P., Laudicella, R., Panasiti, F., Stefano, A., Comelli, A., Giaccone, P., Russo, G. (2022). Radiomics Analysis of Brain [18F] FDG PET/CT to Predict. *MDPI*, 1-13.
- [11] Venugopalan, J., Tong, L., Hassanzadeh, H. R., & D. Wang, M. (2021). Multimodal deep learning models. *Scientific Reports*, 1-13.
- [12] Sivakani, R., & Ansari, G. A. (2020). Machine Learning Framework for Implement-ing. *IEEE*, 0588-0591.
- [13] Found from KAGGLE, available at << <https://www.kaggle.com/datasets/brsdincer/alzheimer-features> >>, last access 09-11-22 at 9:00 PM.
- [14] Liu, S., Liu, S., Cai, W., Pujol, S., Kikinis, R., & Feng, D. (2014). Early diagnosis of Alzheimer's disease with deep learning. *IEEE*, 1015-1018.
- [15] Kim, Y., Kim, J., Son, M., Lee, J., Yeo, I., Choi, K. Y., . . . Kim, Y. (2022). Plasma protein biomarker. *Scientific Reports*.
- [16] Minhas, S., Khanum, A., Riaz, F., A. Khan, S., & Alvi, A. (2016). Predicting Pro-gression from Mild Cognitive Impairment to Alzheimer's Disease using Autoregres-sive Modelling of Longitudinal and Multimodal Biomarkers. *IEEE*.
- [17] Ye, D. H., M. Pohl, K., & Davatzikos, C. (n.d.). Semi-Supervised Pattern Classifica-tion: *IEEE*, 1-4.

APPENDIX

Appendix A: Messaging Issues

There are many Issues we faced during building the app, Messaging Issues is one of them. Normally browser supports WSGI but for getting real-time chatting we had to need ASGI method.

scsdc

ORIGINALITY REPORT

22%

SIMILARITY INDEX

18%

INTERNET SOURCES

10%

PUBLICATIONS

9%

STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Daffodil International University Student Paper	3%
2	dspace.daffodilvarsity.edu.bd:8080 Internet Source	3%
3	doctorpenguin.com Internet Source	2%
4	neuroquantology.com Internet Source	2%
5	"Mechanisms, Clinical Strategies, and Promising Treatments of Neurodegenerative Diseases. 13th International Conference AD/PD™ Vienna, Austria, March 29 to April 2, 2017: Abstracts", Neurodegenerative Diseases, 2017 Publication	1%
6	link.springer.com Internet Source	1%
7	www.mecs-press.org Internet Source	1%