CHAPTER 1
INTRODUCTION

1.1 Motivation

Under the current conditions, human instinct and standard measurements do not often coincide. In order to solve this problem, we need to take advantage of innovative approaches , which are computationally intensive and non-traditional. In addition to improving patient’s quality of life, we are predicting symptoms of the disease and making life easy. Viewing medical reports may lead radiologists to miss other disease conditions and also side-effects to patients because of radiation for older ones. So, it’s better to take a few steps before proceeding into medical tests. As a result, it only considers a few causes and conditions. The goal here is to identify the knowledge gaps and potential opportunities.

1.2 Scope

The main aim of the system is to predict Alzheimer’s disease. Predicting Alzheimer’s disease or Dementia in adult patients using a website where the AD symptoms are predicted by inserting certain data. Data has been preprocessed by removing some unnecessary features.Currently, there is no cure for Alzheimer’s disease. However, early detection could assist doctors and researchers in the development of treatment to slow or halt the disease before irreparable damage occurs. This will increase reliability and enhance the performance of the system.

Once the website reviewed all the data, the user would receive a risk core regarding the likelihood she/he is showing signs of dementia/AD. Despite this, it would be a doctor making the final diagnosis, not a computer or a website.

However, the website would also help close the gap in care disparities by allowing individuals to have affordable self-assessments. Additionally, the website would encourage patient engagement and early intervention.

You cannot replace that human interaction. The final assessment will be done by a disease predictor before consulting a physician. But if you have doubts and the website predicts you're at a higher risk, you don't have to wait. You can visit a clinician and take further steps. Hopefully, it will help patients to get early treatment for Dementia and improve their life.

1.1 Objectives

- Able to predict Alzheimer disease and stage of disease by conducting SMMSE tests for patients and CDR test for caretaker of patient.
- Can predict the chance of getting AD in future.
- Website is user friendly and predicts AD for free of cost.
- It is to make the diagnosis of the disease easier, to detect the disease in its early stages.

1.2 Need for Product Realization

- For understanding product requirement design and development.
- For process management and customer identification.
- For purchasing and product preservation.
- For development of a product which satisfies the customer specifications.
- To develop a product which optimizes human effort.

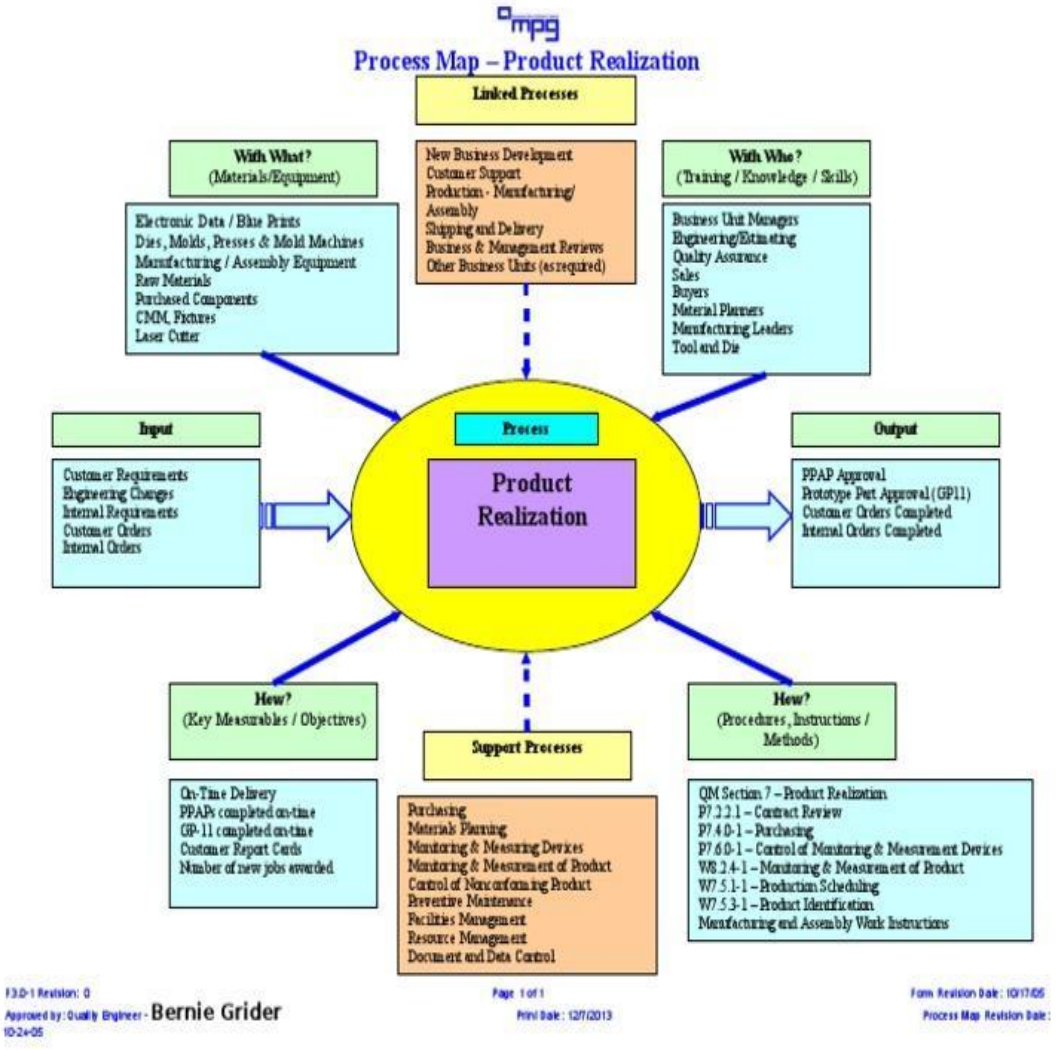
1.5 Product Realization Process

Product Realization combines market requirements, technological capabilities, and resources to define new product designs and the requisite manufacturing and field support processes. The relevance and viability of specific elements of the product realization process (PRP) are determined by considerations related to the roles of customers, including channels and suppliers; technological feasibility, including information requirements; and organization, including people, management, and the incentives and measures that affect productivity.

National Academies of Sciences, Engineering, and Medicine. 1991. The Competitive Edge: Research Priorities for U.S. Manufacturing. Washington, DC: The National Academies Press.

Customers : Corporate commitment to quality and responsiveness will be key differentiators in the competitive environment of the future. To accommodate rapid adjustment to customer needs, the PRP must view customers as integral to the organization.National Academies of Sciences, Engineering, and Medicine. 1991. The Competitive Edge: Research Priorities for U.S. Manufacturing. Washington, DC: The National academy

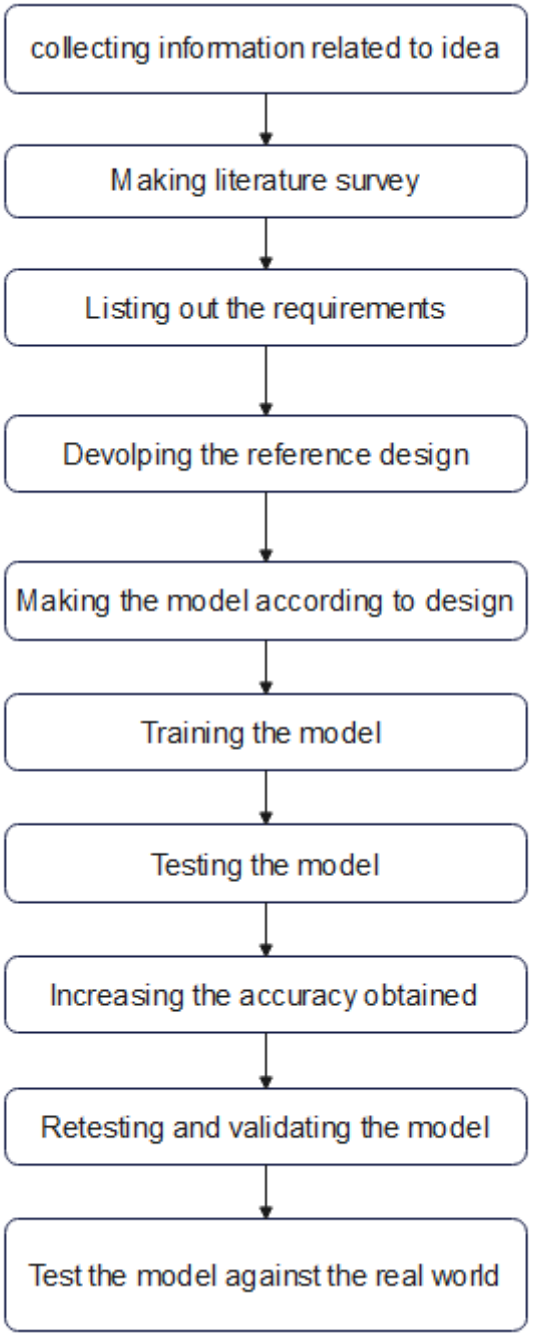
Technology:The technological infrastructure must support the management of very short product life cycles, be able to satisfy customer expectations for improved quality, deal with cost-competition pressures, facilitate complex manufacturing processes, including the integration of frequently changing equipment technology and evolving manufacturing applications, meet demands for high equipment availability, and be able to handle enormous volumes of data.National Academies of Sciences, Engineering, and Medicine. 1991. The Competitive Edge: Research Priorities for U.S. Manufacturing. Washington, DC: The National Academies Press.



CHAPTER 2

PRODUCT REALIZATION PLANNING

2.1 Flow Chart



2.2 Steps involved for Product Realization

There are 5 steps in the planning of our product:

Identification of problem statement:

In the existing system it is difficult to identify if a person is suffering from Alzheimer’s disease. It can be only done with the help of clinical history and by knowing if the person has some genetic disorder.In its early stages, the memory loss is mild while in the later stages, the patient’s conversation and their ability to respond degrades dramatically. The current treatments cannot stop Alzheimer’s disease (AD) from developing but early diagnosis can aid in precluding the severity of the disease and help the patients to improve the quality of life.

Identify and the requirements

After planning,start researching various Alzheimer’s disease prediction algorithms. Identify all the basic requirements and gather the resources. And then analyze the algorithms to choose the best algorithm for accurate results and can proceed with the project development.

Customer analysis and error detection:

After taking the survey from the customers after deployment we will rectify the mistakes and try to add the features /change the structure based on the customer advice. We will also rectify the bugs and technical errors if any.

Final product development:

After all the above changes and modifications, the product will be created with both internal and external factors.

Paper writing on the project:

After completion of the product, if the product is efficient then one can write a paper following ISO or IEEE standards about their product and apply for the patients.

2.3 Gantt Chart

Particulars	Month 1	Month 2	Month 3	Month 4	Month 5
Project idea					
Literature Survey					
Website development					
Testing					
Implementation					
Feedback to know efficiency					

A Gantt chart is a chronological bar chart, an easy-to-digest timeline that transforms your project details into a clear visual representation. Gantt charts are strongly associated with waterfall-type project management. In other words, each project phase must complete before the next step can begin, and phases are never repeated.

CHAPTER 3

Community partner-Related Processes

3.1 Details of Community partner

Care at Mayo

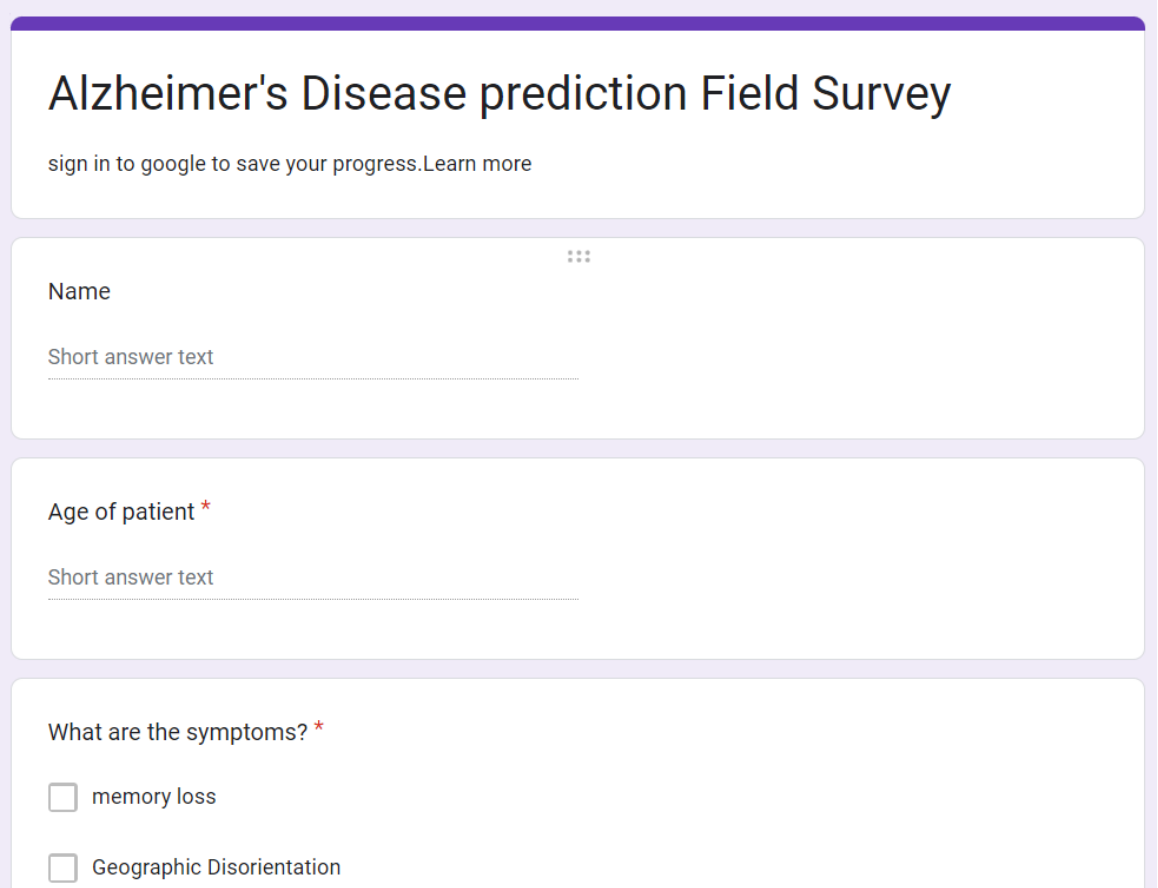
Person 1

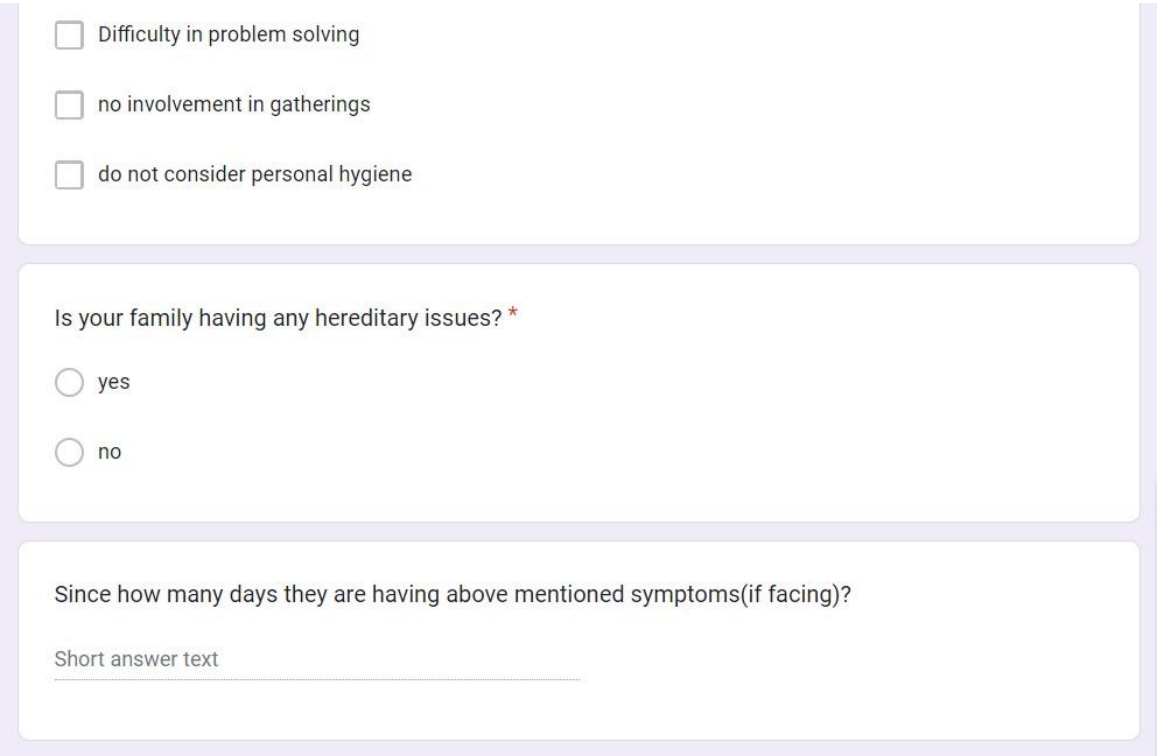
Name	:	Dr.Siddhartha Reddy
Professional details	:	MBBS, DM - Neurology, Neurologist.
Ph no	:	9989002073

person 2

Name	:	Dr.Kaushal Ippili
Professional details	:	MBBS, MS - General Surgery, DNB - Neurosurgeon.
Ph no	:	7670958976

3.2 A field survey form





3.3 Questioner with Community Partners responses

1.What do you think will be our Alzheimer's detection detects the disease and stage of disease?

Yes, I think Alzheimer's disease prediction will help to know whether the person is having disease and also detect the stage of the disease.

2.Is there any advantage to this approach than the previous ones?

Yes, this approach of taking SMMSE and CDR tests before moving to scanning helps one to understand whether they are really having disease or not and also saves them from not being affected by radiation.

3.Did all the features of the website are satisfied ?

Yes, as of now all the features in the website are very useful for predicting one's disease.

4.Do all the patient's symptoms are satisfied by our website?

Yes, all the symptoms are given on the website for every stage respectively.

5.Would you like to suggest any features to be added to the website?

It would be nice if there are more rounds to predict whether the person is having disease or not.

3.4 List the Community Partner Specifications

- Product should be of low cost so that it can be reasonable to use.
- Should be in an easy way to use.
- Time should be saved by using this product.
- It should be easily operated by any unskilled person.
- It should eliminate proxy.

CHAPTER 4

Design and Development of Product

4.1 Design of Product

Alzheimer’s Disease prediction is based on identification of disease and stage of Alzheimer's by conducting some basic tests for both patient and patient’s caretaker. This product is designed and developed using:

- HTML
- CSS, JavaScript
- Flask framework - Python
- Support Vector Machine - Classification algorithm

FLASK Framework

Flask is a web framework which uses python programming language. This means flask provides you with tools, libraries and technologies that allow you to build a web application. This web application can be some web pages, a blog, a wiki or go as big as a web-based calendar application or a commercial website. Flask is part of the categories of the micro-framework. Microframework is normally a framework with little to no dependencies to external libraries. This has pros and cons. Pros would be that the framework is light, there is little dependency to update and watch for security bugs, cons is that some time you will have to do more work by yourself or increase yourself the list of dependencies by adding plugins. In the case of Flask, its dependencies are: Werkzeug a WSGI utility library and jinja2, which is its template engine.

Note:WSGI is basically a protocol defined so that a Python application can communicate with a web-server and thus be used as a web-application outside of CGI.

SUPPORT VECTOR MACHINE(SVM)

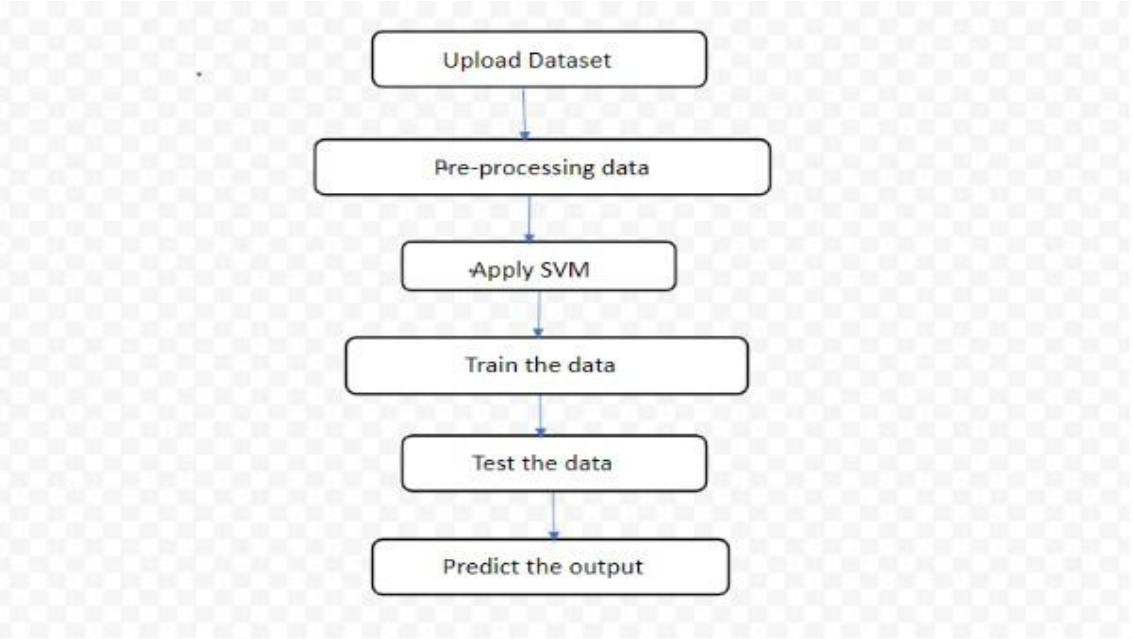
One of the most well-liked methods for Supervised Learning, Support Vector Machine (SVM) is used for both Classification and Regression issues. It is largely utilized in Machine Learning Classification issues, though. The SVM algorithm's objective is to establish the best decision boundary or line that can divide n-dimensional space into classes so that subsequent data points can be quickly assigned to the appropriate category. The term "hyperplane" refers to this optimal decision boundary. In order to create the hyperplane, SVM selects the extreme points and vectors. Support vectors are the word for these extreme circumstances, and the method is known as a support vector machine.

Given that the linear SVM methodology is one of the simplest methods in classification, it has been determined to utilize it to establish a basic baseline for accuracy.

TYPES OF SVM

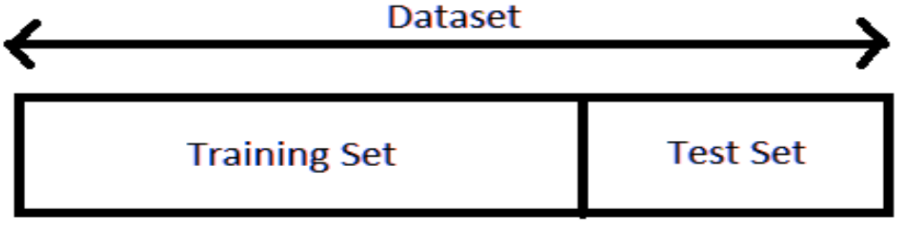
Linear SVM : Linear SVM is used for linearly separable data, which is defined as data that can be divided into two classes using just one straight line. The classifier used for such data is called the Linear SVM classifier.

Non-linear SVM : Non-Linear SVM is used for non-linearly separated data, which means if a dataset cannot be classified by using a straight line, then such data is referred to as non-linear data and the classifier employed is called a Non-linear SVM classifier.



Train - Test Split

The train-test split is a technique for evaluating the performance of a machine learning algorithm.It can be used for classification or regression problems and can be used for any supervised learning algorithm.The procedure involves taking a dataset and dividing it into two subsets - Training and Testing datasets.



The first subset is used to fit the model and is referred to as the training dataset. The second subset is not used to train the model, instead, the input element of the dataset is provided to the model, then predictions are made and compared to the expected values. This second dataset is referred to as the test dataset. We usually split the data around 20% - 80 % between testing and training stages.

Train Dataset : Used to fit the machine learning model.

Test Dataset : Used to evaluate the fit machine learning model.

The objective is to estimate the performance of the machine learning model on new data: data not used to train the model.This is how we expect to use the model in practice. Namely, to fit it on available data with known inputs and outputs, then make predictions on new examples in the future where we do not have the expected output or target values. The train-test procedure is appropriate when there is a sufficiently large dataset available.

Performing Alzheimer’s detection

After the algorithm is trained, we perform the steps again as validation.The severity of the disorder is assessed using a variety of factors, including socioeconomic status (SES), the Standard Mini-Mental State Examination (MMSE), the Clinical Dementia Rating (CDR), estimated Total Intracranial Volume (eTIV), normal Whole Brain Volume(nWBV), Atlas Scaling Factor (ASF), etc. The patient should initially complete the SMMSE test, while a relative of the patient should take the CDR test, which lists the patient's symptoms. We designed a user interface where we can collect data from the patient and use the SVM algorithm to identify whether or not he has Alzheimer's and the stage he is in. The results we acquire will be accurate, and the patient can follow the recommended course of treatment based on the results.

4.2 Purchasing information

Alzheimer’s disease prediction is a software product,hence no physical components are required.This is a cost-free website which is user friendly. It takes some information about the patient and makes the patient take some simple activity based test, also and gives the results based on their performances.

4.3 Development Process

- Website opens directly by clicking on the link generated by Flask.
- Taking some information about the patient (person who needs to be tested) from the third party by CDR test.

- Making the patient take some simple activity based tests.
- Concluding about the symptoms and if symptoms present, displays the respective stage of disease based on the data given.
- Displaying the medications to be taken.
- Displays the result and information about the best hospitals.

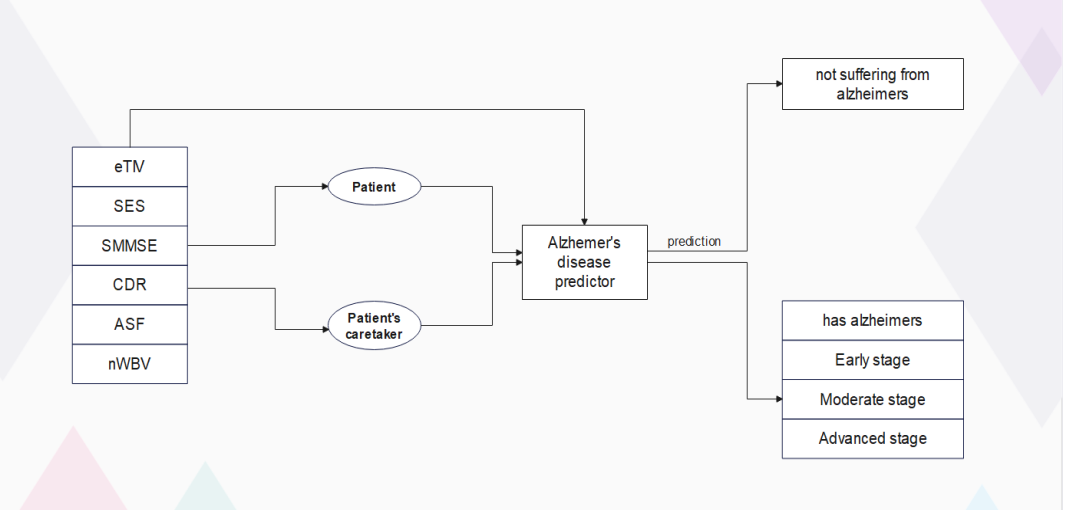


Figure -1 : Flowchart

4.4 Final Product

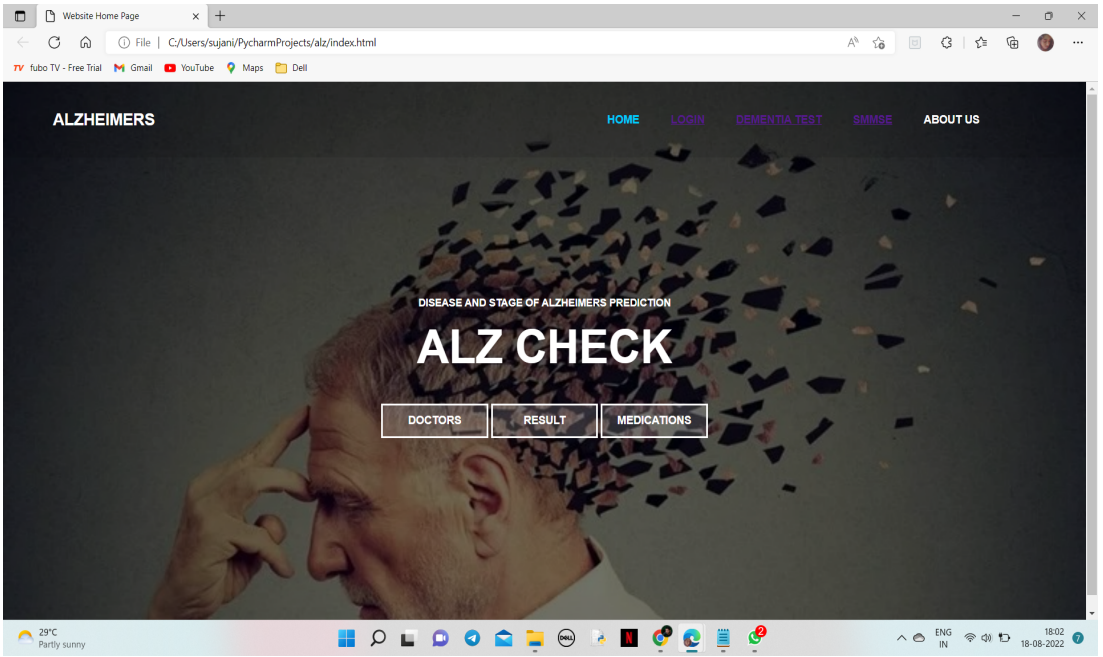


Figure-2 : Picture of final product

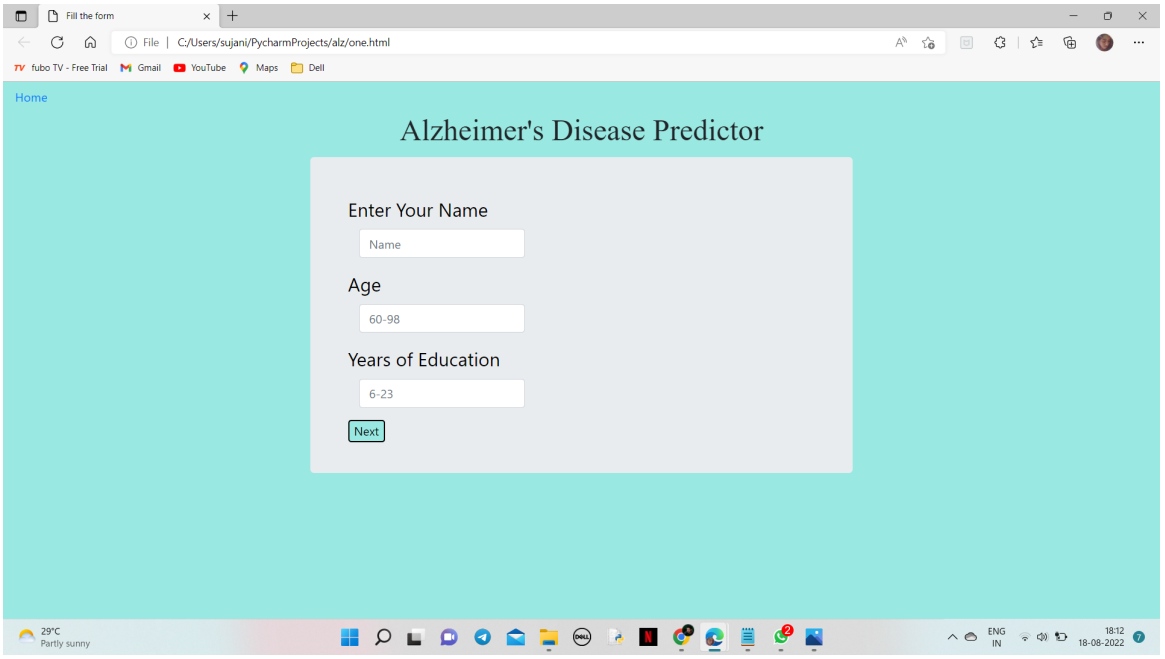


Figure-3 : First page

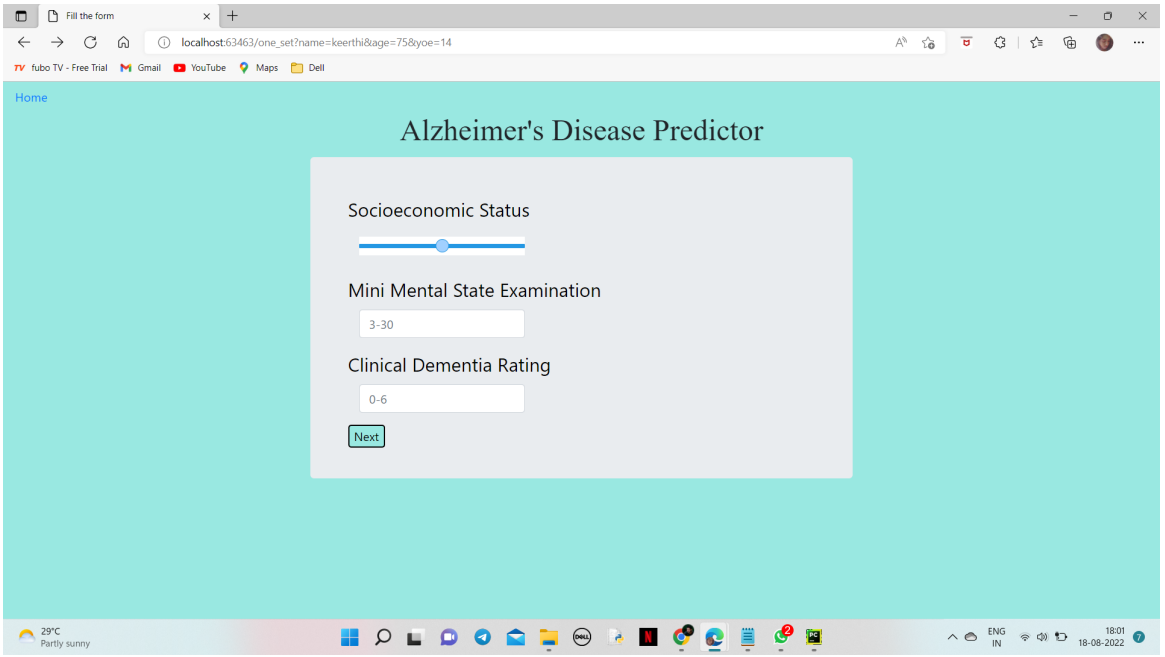


Figure-4 : Second page

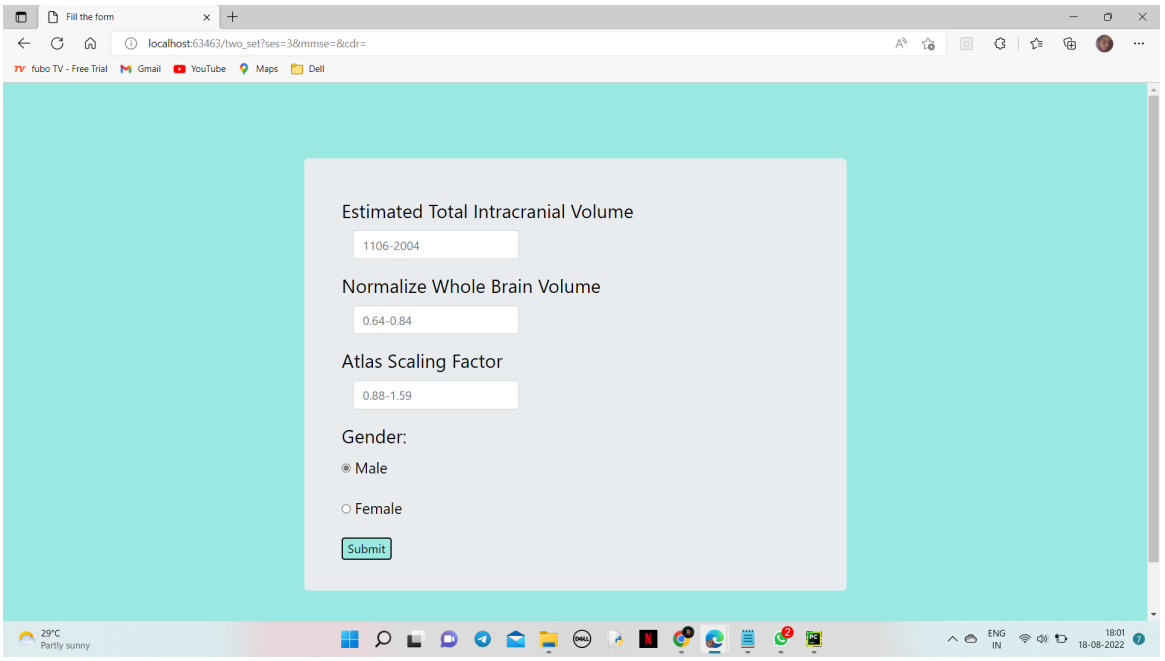


Figure-5 : Third page

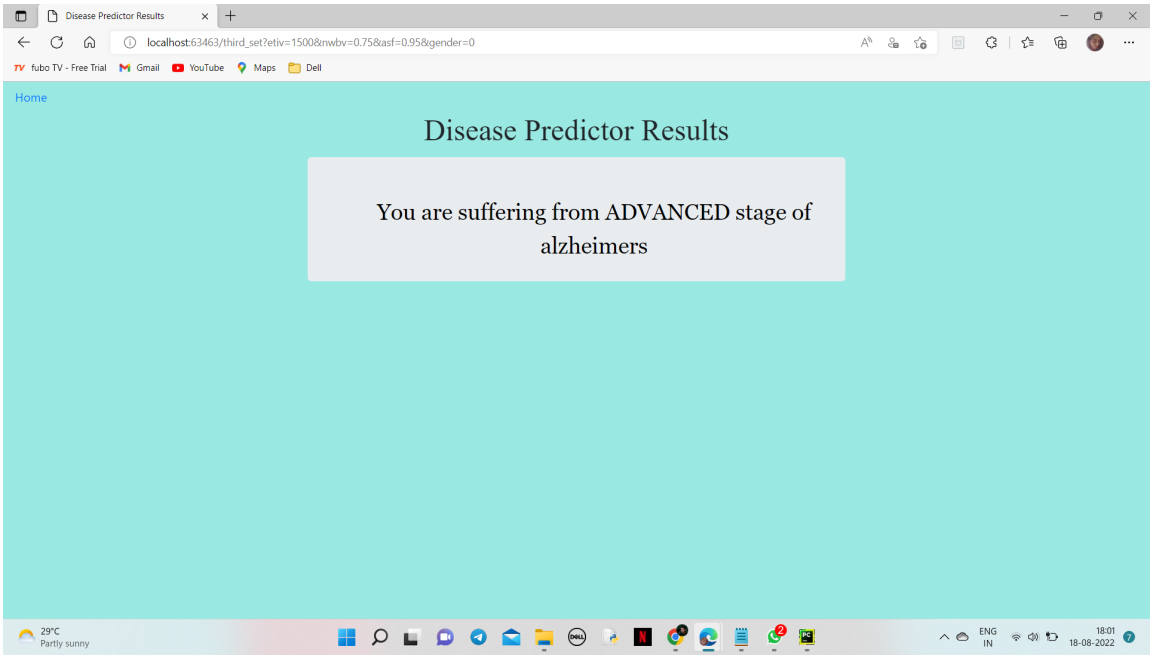


Figure-6 : Example of result page

Test Cases:

Test case 1:

The following test case test the component "Demented". This component classifies a particular row into "Demented" group. If we give the values that results into a demented group which is in the dataset, then we will get result as "You are suffering from Alzheimer's disease".

Table 1. Description of "demented" group

S No	Action	Expected System Response	Pass/Fail
1	Fill the first form	Should open second web page	Pass
2	Fill the second form	Should open third web page	Pass
3	Fill the third form	-	Pass
4	Click submit button	Should display- "You are suffering from dementia"	Pass

Test Case 2:

The following test case tests the component " Non Demented". This component classifies a particular row into "Non Demented" group. If we give the values that results into a demented group which is in the dataset, then we will get result as "You are suffering from Alzheimer's disease(with respective stage)".

Table 2. Description of " non demented" group

S No	Action	Expected System Response	Pass/Fail
1	Fill the first form	Should open second web page	Pass
2	Fill the second form	Should open third web page	Pass
3	Fill the third form	-	Pass
4	Click submit button	Should display- "You are suffering from Alzheimer's(with respective stage)".	Pass

CHAPTER 5

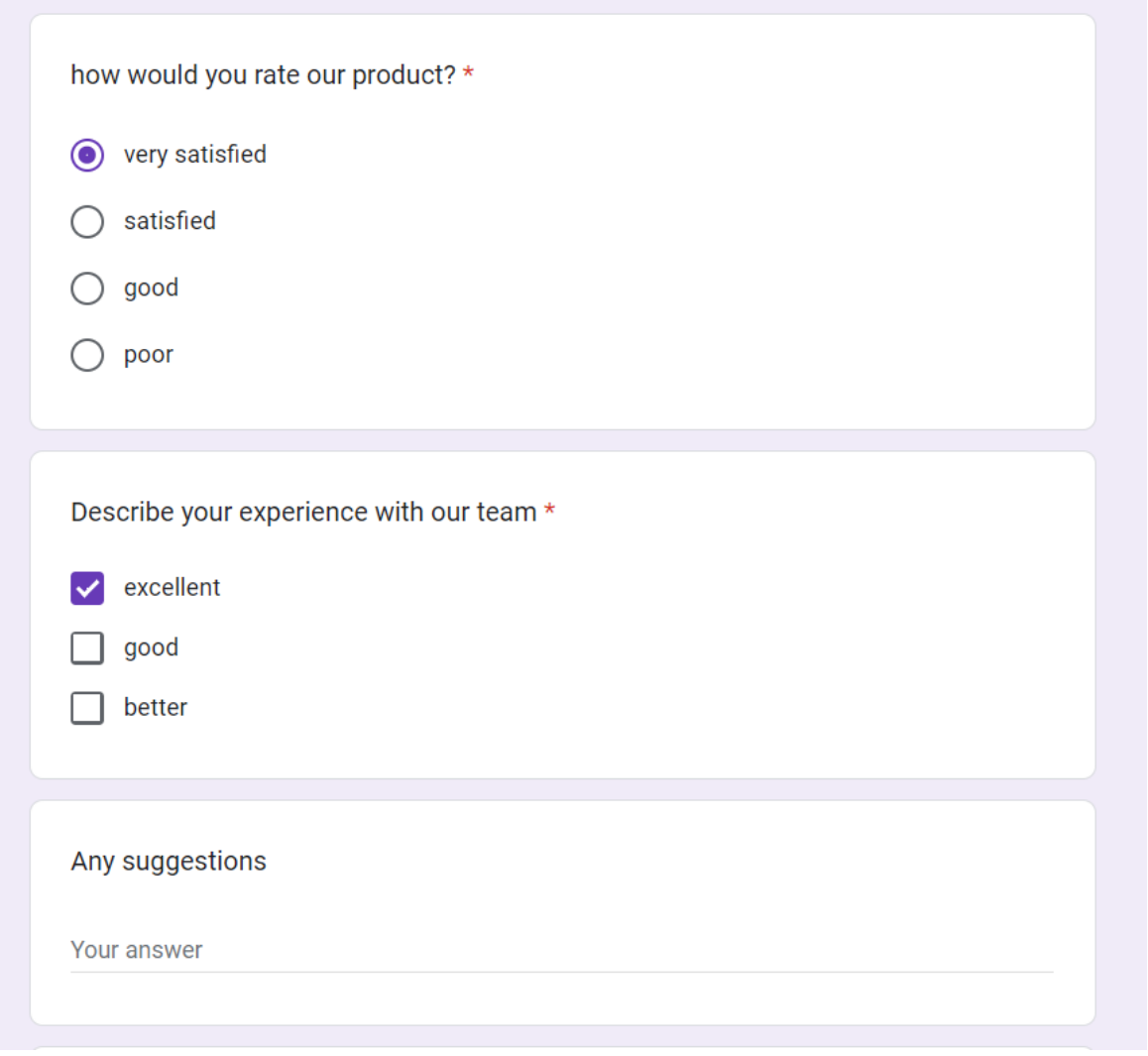
Post Product Realization Activities

5.1 Delivery details (Date, Place, means etc,.)

We want to deploy our project in a community or in an organization where there is a need of identifying Alzheimer's disease.We have demonstrated our product to Jeevana Sandhya old age home in Khammam through online meeting on jJuly 18, 2022, they have accepted our project by listening to our explanation. They want to integrate with us i.e., they want their old age home people to take the test on our website. For that they want to add our product to their organization.

5.2 Feedback on delivered product

The feedback we collected from our community partner after demonstrating our product we received a positive feedback and appreciation from our community partner.



CHAPTER 6

Paper information

Enhanced Machine Learning Technique for Multi-Stages Alzheimer's Disease Classification

line 1: 1st Given Name Surname
line 2: *dept. name of organization (of Affiliation)*
line 3: *name of organization (of Affiliation)*
line 4: City, Country
line 5: email address or ORCID

line 1: 2nd Given Name Surname
line 2: dept. name of organization (of Affiliation)
line 3: name of organization (of Affiliation)
line 4: City, Country
line 5: email address or ORCID

line 1: 2nd Given Name Surname
line 2: dept. name of organization (of Affiliation)
line 3: name of organization (of Affiliation)
line 4: City, Country
line 5: email address or ORCID

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***Abstract*-Recently, there has been a lot of concern about Alzheimer's. Around 45 million people around the world are effected by this illness. Alzheimer's is a degenerative mental condition with no recognized early stages that typically affects elderly people. It took away people's capacity for thought, reading, and a wide range of other activities. The sickness is identified, but only at an advanced stage. Therefore, if the condition is identified earlier, its symptoms may be slowed. Patients with cognitive mental issues, such as confusion and forgetfulness, as well as other symptoms, such as behavioral and psychological issues, are also advised to undergo neuroimaging procedures using CT, MRI, PET, and EEG. Traditional methods for diagnosing Alzheimer's disease (AD) take a very long time, and they also take a lot of time to learn and train. The main objective is to detect the early stages of Alzheimer's in a range of people. So, we use CDR and SMMSE tests online before moving on to MRI or CT scans. and then follow them up with machine learning algorithms to evaluate the data along with test results. With the aid of these tests, it will be possible to identify Alzheimer's disease in its early stages. An ML framework can help resolve this issue by diagnosing the disorder. The outcomes and analysis of various machine learning models for dementia diagnosis are presented in this work. A variety of methods have been used to find the most accurate parameters for Alzheimer's disease prediction, including Decision Tree, Random Forest, Support Vector Machine, and K Nearest Neighbor classifiers. The Open Access Series of Imaging Studies (OASIS) data is used to generate predictions for Alzheimer's disease, and the performance of ML models is gauged using metrics including Precision, Recall, Accuracy, and F1-score. Despite the dataset's limited size, some important numbers are included. Two machine learning models were utilized to analyze the data. Following system development, findings demonstrate that SVM performs better than other models. Based on metrics, we can say that SVM gives the best results. The method is simple and can assist people in identifying dementia promptly.*

Keywords – Stages in Alzheimer's disease, Support Vector Machine, Logistic Regression, Decision Tree Classifier, K-Nearest neighbor

I.INTRODUCTION

Originally, the term "artificial intelligence" was used to describe technology that mimics and demonstrates "human" cognitive skills related to the human mind, such as "learning" and "problem-solving." Major AI researchers increasingly describe AI in terms of reason and acting in a reasoned manner. They reject this notion and do away with all restrictions on what constitutes intelligence.

Robots can display artificial intelligence (AI), which is intelligence, in contrast to the natural intelligence displayed by animals, including humans. AI research is the study of intelligent agents, or any system that perceives its environment and takes actions to maximize its chances of achieving its goals. People are unable to interpret, assess, and make judgments using even a small percentage of the vast amount of data that exists in today's society. To make such complex decisions, higher cognitively capable entities than humans are required.

Machine learning is a branch of computer science and artificial intelligence (AI) that focuses on simulating human learning by using data and algorithms to improve the system's accuracy over time. It is a field of study devoted to understanding and creating "learning" strategies, or approaches that make use of data to improve performance on a certain set of tasks. Machine learning algorithms build a model from sample data, also known as training data, to make predictions or judgments without being explicitly trained to do so. In several fields, including speech recognition, email filtering, computer vision, and many more, where using conventional algorithms is either unfeasible or impractical, machine learning techniques are applied.

The process of teaching algorithms to correctly classify data or predict outcomes using labelled datasets is known as "supervised learning," which is also used to refer to supervised machine learning. As input data is introduced into the model, the weights are adjusted until the model is well-fitted. To ensure that the model does not fit either too well or too badly, this occurs as part of the cross-validation process. Putting spam in a separate folder from your email is an example of how supervised learning benefits businesses. Techniques like neural networks, naive bayes, linear regression, logistic regression, random forests, and support vector machines are utilized in supervised learning (SVM). Regression techniques make predictions about a continuous value based on the input variables. Estimating a mapping function based on the input and output variables is the primary objective of regression issues.

A classification model approximates a mapping function from input variables to predict discrete output variables, such as labels or categories. The mapping function in classification algorithms is in charge of figuring out what the input variables' labels or categories should be. A classification method can include both discrete and real-valued variables, but it still requires that the instances belong to one of at least two classes.

Support Vector Machine (SVM), one of the most popular supervised learning techniques, is applied to classification and regression.

TABLE-I ALZHEIMER STAGES AND SYMPTOMS

S.NO	STAGE OF ALZHEIMERS	SYMPTOMS INCLUDES
1	Early stage	Misplacing the items unknowingly Losing track of place and thing names Repeating themselves frequently, for as by repeatedly posing the same quer ybecoming hesitant
2	Moderate stage	Confusion and disorientation are getting worse Impulsive, obsessive, or repeated behavior Delusions (believing things that are untrue) Issues with language or speech (aphasia) Sleep disturbances Mood fluctuations that are regular or that cause you to feel angry, nervous, or frustrated Poor judgement and poor decision-making
3	Advanced stage	Difficulty moving or changing positions without assistance significant weight reduction Speech short-term and long-term memory gradually decline

problems. However, machine learning classification problems make up the majority of its use. The goal of the SVM algorithm is to find the optimal decision boundary or line that can classify the n-dimensional space into subspaces, allowing following data points to be swiftly classified. This ideal decision boundary is referred to as a "hyperplane". SVM chooses the extreme points and vectors to build the hyperplane. These exceptional situations are referred to as support vectors, and the technique is referred to as a support vector machine. It has been decided to utilize the linear SVM approach to establish a fundamental degree of accuracy because it is one of the simplest classification techniques.

Linear SVM: Linear SVM is used for data that can be separated into two classes using only a single straight line, also known as linearly separable data. The Linear SVM classifier is the one employed for such data.

Non-linear SVM is used for non-linearly separated data, which implies that if a dataset cannot be classified using a straight line, it is considered to be non-linear data, and the classifier utilised is referred to as a Non-linear SVM classifier.

II.ALZHEIMERS DISEASE AND STAGE PREDICTION

A neurological illness called Alzheimer's disease causes the brain to shrink (atrophy) and kills brain cells, which results in memory loss and cognitive impairment. The most common form of dementia, Alzheimer's disease affects a person's ability to operate independently and is characterized by a continuous deterioration in social, behavioral, and cognitive capacities. As time goes on, the patient's condition gets worse and worse. At its worst, it severely obstructs daily tasks, making it difficult for the patient to even engage in casual contacts and potentially necessitating round-the-clock care. It is extremely upsetting to see how this illness affects older people, as we have seen. Memory loss is the main symptom of Alzheimer's disease. One of the first signs is having trouble recalling previous conversations or events. As the condition worsens, memory issues get worse, and new symptoms start to show up. An individual with Alzheimer's disease may initially be aware of having difficulty organizing their thoughts and recalling details. A family member or acquaintance may be more aware of the symptoms' escalation. Alzheimer's disease-related brain modifications result in increasing problems with:

1.Memory
2.Reasoning and Thinking
3.making judgements and decisions
4.Making similar plans and carrying them out
5.changes in personality and behavior
6. maintained expertise

Similar methods are used for diagnosing and treating dementia in general and Alzheimer's disease in particular. AD cannot be cured, although there are numerous treatments that can halt its progression. An individual with AD lives, on average, 4 to 8 years after diagnosis, according to the Alzheimer's Association. People, however, can survive for up to 20 years after receiving a diagnosis of the illness. The brain is so severely damaged in the late stages of AD that the affected person frequently loses their ability to move and must be bedridden. These conditions can result in infections, blood clots, and sepsis, all of which have the potential to be fatal. In the last stages of Alzheimer's, people may swallow food into their windpipe rather than their food pipe. Aspiration pneumonia, another illness that can emerge from this, is a cause of death for people with Alzheimer's disease.

III.RELATED WORK

[1] In this paper, the dataset is divided into subgroups in the embedded space using the quick shift clustering algorithm. Employing the Clinical Dementia Rating (CDR) scale as a benchmark, the studies using the suggested methodologies provide extremely strong performance for clustering images into AD and normal ageing.[2] In this study, a kernel combination method with a 93% accuracy rate was employed to combine three biomarker modalities, including MRI, FDG-PET, and CSF biomarkers, to distinguish between AD (or MCI) and healthy controls.[3] Described a new technique based on multidimensional classification of hippocampus shape parameters to automatically distinguish between patients with Alzheimer's disease (AD) or moderate cognitive impairment (MCI) and older controls. While approaches [6–9] employ conventional computer vision methods, use deep CNN to predict the disease in [10–16]. [4] Based on diffusion tensor imaging (DTI) and anatomical magnetic resonance imaging, a fully automated system for classifying patients with Alzheimer's disease (AD) and aged control participants is proposed in this study (MRI).[5] The suggested methodology is based on the selection of voxels that exhibit Welch's t-test results that are greater than a specified threshold between the two groups, normal and Alzheimer pictures with accuracy 95%.

IV.MACHINE LEARNING BASED CLASSIFICATION SYSTEM

Our work aims to develop a categorization system based on machine learning that provides quick and efficient approaches to reduce the complexity of complicated challenges. We also put a lot of effort into creating solutions that are easier to adapt to our modern, technologically sophisticated world. In order to recognize this lifestyle illness, we developed a procedure. Alzheimer's disease, the most common form of dementia, is characterized by a gradual decline in social, behavioral, and cognitive skills that reduces a person's ability to operate independently. The Support Vector Machine (SVM) algorithm, a straightforward supervised machine learning algorithm that can be used to tackle both classification and regression issues, can assist in making this.

In this study, we divided the Alzheimer's dataset into two sets. One is employed in testing, and the other in training. The training data is used to make sure the algorithm used to train the machine is more accurate and effective, and the test data is used to assess how well the machine can anticipate fresh answers based on its training. In this dataset, we employ a number of phrases to elicit information on the disease. Socioeconomic status (SES), the Standard Mini-Mental State Examination (MMSE), the Clinical Dementia Rating (CDR), the estimated Total Intracranial Volume (eTIV), the normal Whole Brain Volume (nWBV), the Atlas Scaling Factor (ASF), and other variables are used to determine the severity of the disorder.

A relative of the patient should take the CDR exam, which lists the patient's symptoms, after the patient has finished the SMMSE test. With the help of the SVM algorithm, we created a user interface that allows us to gather information from the patient and determine whether or not he has Alzheimer's disease and what stage he is in, the process is shown in the figure 1. If the results are accurate, the patient can proceed with the suggested course of action.

Figure 1: Architecture of classification system

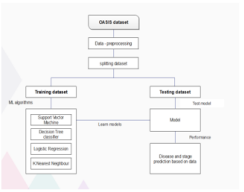


Figure 2: Classification workflow

V.ATTRIBUTES APPLIED IN CLASSIFICATION SYSTEM

A.Socioeconomic Statur(ses)

The term "socioeconomic status" refers to a person or group's social standing or class. Utilizing a combination of work, money, and education is a common method of assessment. The analysis of socioeconomic statuses frequently uncovers differences in resource access as well as issues with privilege, power, and control.

B.Total Intracranial Volume Assumed (etiv)

Total intracranial volume (TIV/ICV), which can substitute for maximum premorbid brain capacity, is an important covariate for volumetric evaluations of the brain and various brain regions, notably in the research of neurodegenerative illnesses. The gold-standard method for delineating brain images manually requires painstaking work from skilled operators.

C.Standard Mini Mental State Examination(SMMSE)

A 30-point questionnaire called the Standard Mini-Mental State Examination, often known as the Folstein test, is frequently used in clinical and research settings to assess cognitive impairment. The process of screening for dementia is widely utilized in medicine and allied health. It is also used to track the course of a person's cognitive changes over time and gauge the severity and evolution of cognitive impairment, making it a useful tool for documenting a patient's reaction to therapy.

D.Clinical Dimentia Rating(CDR)

CDR is calculated using a semi-structured interview with the subject and the caregiver (informant) as well as the clinician's clinical opinion. The CDR is determined by evaluating six distinct cognitive and behavioral areas, including memory, orientation, judgement and problem-solving, and community affairs, home and hobbies performance, and personal care which is a scale of 0 – 5.

TABLE-II ALZHEIMER STAGES AND SYMPTOMS

	No dementia	Early Stage	Moderate Stage	Advanced stage	Maximum Score
SMMSE	24 - 30	19 - 24	10 - 19	0 - 9	30
CDR	0 – 0.5	0.5 - 1.0	1.0 - 2	3 - 7	5

E.Normalized Whole Brain Volume(NWBV)

Among the most well-researched techniques for calculating the progression of neurodegeneration in MS are measurements of changes in normalized brain volume and brain parenchymal fraction (BPF) across time. With image segmentation, especially when combined with registration-based approaches, excellent reproducibility and sensitivity to change have been established. Compared to healthy controls, MS patients have brain shrinkage at a higher pace, and it appears to be correlated with measures of impairment.

F.Atlas Scaling Factor(ASF)

Automated atlas transformation produced the Atlas Scaling Factor (ASF), which is the volume-scaling factor necessary to fit each person to the atlas target. Atlas normalization equalizes head size; hence, the ASF ought to be proportionate to TIV.

VI.IMPLEMENTATION

LOGISTIC REGRESSION

One of the most popular machine learning techniques that belongs to supervised learning is logistic regression. The categorical dependent variable is anticipated using a given set of independent variables. As a result, the result must be a discrete or categorical value. It provides the probability values that fall between 0 and 1, rather than the exact response of 0 or 1. It could be either True or False, 0 or 1, or Yes or No. The main difference between linear regression and logistic regression is how they are used. In logistic regression, rather of fitting a regression line, we fit a "S" shaped logistic function that anticipates two maximum values (0 or 1). Logistic regression can be used to quickly pinpoint the variables that will be effective when classifying observations using multiple sources of data.

DECISION TREE CLASSIFIER

A supervised learning method called a decision tree can be used to solve classification and regression problems, but it is typically favored for doing so. It is a tree-structured classifier, where internal nodes stand in for a dataset's features, branches for the decision-making process, and each leaf node for the classification result. The Decision Node and Leaf Node are the two nodes of a decision tree. While Leaf nodes are the results of decisions and do not have any more branches, Decision nodes are used to create decisions and have numerous branches. The given dataset's features are used to execute

the test or make the decisions. It is a graphical depiction for obtaining all feasible answers to a choice or problem based on predetermined conditions. It is known as a decision tree because, like a tree, it begins with the root node and grows on subsequent branches to form a structure resembling a tree. The CART algorithm, which stands for Classification and Regression Tree algorithm, is used to construct a tree. A decision tree only poses a question and divides the tree into subtrees according to the response (Yes/No).

K Nearest Neighbours

One of the easiest and most straightforward machine learning algorithms is K-Nearest Neighbor, which uses the supervised learning methodology. By placing the new case in the category that most closely resembles those categories, it makes the assumption that the data in the new case and the cases that are currently accessible are comparable. A new data point is classified based on similarity, and all previously saved data is also stored. This demonstrates how the K-NN algorithm can quickly classify fresh data when it first appears into the right category. Although it can be applied to regression, it is most frequently employed to address classification issues. Since the K-NN approach is non-parametric, it makes no assumptions about the underlying data. The approach is also known as the "lazy learner" since it saves the training dataset rather than immediately learning from it. Instead, it takes action while using the dataset to classify data. By only preserving the data during the training phase, KNN is able to classify new data into a category that is somewhat comparable to the training data.

RESULT AND ANALYSIS

Accuracy is defined as the number of events that were accurately predicted. It falls under a specific label for classification. It is a frequently used presentation measuring criterion in a wide range of applications. For datasets with an equal amount of false positives and false negatives, or symmetric datasets, it is the most effective production measurement criterion.

It is specified as:

True Positive=TP False Positive=FP

True Negative=TN False Negative=FN

Accuracy=(TP+TN) / (TP+TN+FP+FN)

TABLE-I ACCURACY COMPARISON

Algorithms used	Accuracy	F1 Score	Recall	Precision
K Nearest Neighbor	87.33	85.46	84.74	86.33
Support Vector Machine	96.00	95.65	91.67	94.86
Decision Tree Classifier	93.33	92.96	94.44	97.06
Logistic Regression	94.67	94.29	91.67	97.06

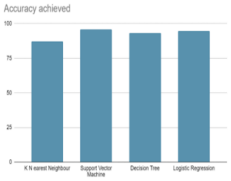


Fig 3. Accuracy achieved

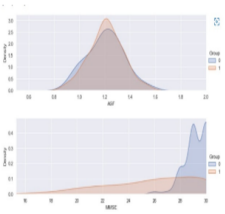
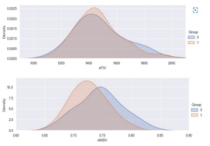


Fig 4. Accuracy achieved



CONCLUSION AND FUTURE ENHANCEMENT

There is a chance that disease detection will get more precise. It is possible to create multi-model frameworks to have a more precise detection system. The data that is widely used in the diagnosis of neurological illnesses is OASIS data. It will be helpful to have a framework for sifting through numerous data sources and extracting information that can be used to diagnose Alzheimer's. Our system will be more accurate if we combine these to more sources. We employ numerical data that is processed using machine learning algorithms in order to identify subjects with Alzheimer's disease and examine data relating to brain regions affected by the disease. Compared to other techniques, Support Vector Machine performs much more accurately.

When this procedure is used, results will be accurate and immediate. In addition to being effective for the given problem, powerful classification methods include Decision Tree Classifier, Logistic Regression, and K Nearest Neighbor classifiers. Alzheimer's disease can be identified at an early stage, and by receiving the essential therapy at this time, the risk of patients developing new difficulties is reduced.

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CHAPTER 7
CONCLUSION

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When this procedure is used, results will be accurate and immediate. In addition to being effective for the given problem, powerful classification methods include Decision Tree Classifier, Logistic Regression, and K Nearest Neighbor classifiers. Alzheimer's disease can be identified at an early stage, and by receiving the essential therapy at this time, the risk of patients developing new difficulties is reduced.

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