



DETECTING PARKINSON'S DISEASE USING MACHINE LEARNING



NALAIYATHIRAN REPORT

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CHAPTER 1

1.1 INTRODUCTION

In the present decade of accelerated advances in Medical Sciences, most studies fail to lay focus on ageing diseases. These are diseases that display their symptoms at a much advanced stage and makes a complete recovery almost improbable. Parkinson's disease (PD) is the second most commonly diagnosed neurodegenerative disorder of the brain. One could argue, that it is almost incurable and inflicts a lot of pain on the patients. All these make it quite clear that there is an oncoming need for efficient, dependable and expandable diagnosis of Parkinson's disease. The aim of this work is to compare various machine learning models in the successful prediction of the severity of Parkinson's disease and develop an effective and accurate model in order to help diagnose the disease accurately at an earlier stage which could in turn help the doctors to assist in the cure and recovery of PD Patients. For the aforementioned purpose we plan on using the Parkinson's Tele monitoring dataset which was acquired from the UCIML repository

1.2 PURPOSE

The aim of this work is to compare various machine learning models in the successful prediction of the severity of Parkinson's disease and develop an effective and accurate model in order to help diagnose the disease accurately at an earlier stage which could in turn help the doctors to assist in the cure and recovery. This project showed 90% efficiency. In our model, a huge amount of data is collected from the normal person and also previously affected person by Parkinson's disease.

CHAPTER 2

LITERATURE REVIEW

2.1 LITERATURE SURVEY

1. Paper Title: The Parkinson's Disease Detection Using Machine Learning Techniques

Publication: Oct 2021

Author name: Dr. C K GOMATHY, Mr. B. DHEERAJ KUMAR REDDY, Ms.B.VARSHA, Ms. B. VARSHINI

Methodology: The Parkinson's disease is a progressive neuro degenerative disorder that mostly affect the motor functions of human. The main motor symptoms are shaking, rigidity, slowness of movement and difficulty with walking. There is a model for detecting Parkinson's using voice. The deflections in the voice will confirm the symptoms of Parkinson's disease. The data of any person can be entered in to check whether the person is affected by Parkinson's disease or not. 60% of the data is used for training and 40% for testing. This project showed 73.8% efficiency using machine learning algorithms.

2. Paper Title: Parkinson Disease Detection Using Deep Neural Networks

Publication: august 2019

Author name: Shivangi, Anubhav Johri, Ashish Tripathi

Methodology: Parkinson's disease (PD) is a neurodegenerative disorder, which is responsible for the deterioration of motor function. Two neural network based models namely, VGFR Spectrogram Detector and Voice Impairment Classifier have been introduced. The proposed models outperformed the existing state of the art in terms of accuracy. The classification accuracy on VGFR Spectrogram

Detector is recorded as 88.1% while Voice Impairment Classifier has shown 89.15% accuracy.

3. Paper Title: A nonlinear decision tree based classification approach to predict the Parkinson's disease using different feature sets of voice data

Publication: March 2018

Author Name: Satyabrata Aich, Kim Younga, Kueh Lee Hui, Ahmed Abdulhakim Al-Absi, Mangal Sain

Methodology: Recently machine learning based approach has been used by many researchers across the field because of its accuracy on the complex data. Machine learning based approach has been used in many cases of Parkinson's disease using gait data as well as voice data. However, so far no body has compared the performance metrics using different feature sets by applying non-linear based classification approach based on the voice data. This paper proposed a new approach by comparing the performance metrics with different feature sets such as original feature sets as well as Principal component Analysis based feature reduction technique for selecting the feature sets. It shows an accuracy of 96.83% using random forest classifiers using PCA based feature sets. This analysis will help the clinicians to differentiate the PD group from healthy group based on the voice data.

4. Paper Title: Diagnosis of Parkinson's Disease Using Speech Samples and Threshold-Based Classification

Publication: November 2015

Author Name: Froelich, Wojciech; Wrobel, Krzysztof; Porwik, Piotr

Methodology: This paper proposed the diagnosis of Parkinson's disease on the basis of characteristic features of a person's voice. First, the individual voice samples are classified as belonging either to a sick or to a healthy person. For that

task, decision trees (the most efficient classifier) are selected. Second, using the threshold-based method, the final diagnosis of a person is made using previously classified voice samples. The value of the threshold determines the minimal number of individual voice samples (indicating the disease) that is required for the reliable diagnosis of a sick person. After numerous experiments with real- world data, the accuracy of classification achieved 90%. The high efficiency of diagnosis justifies that the proposed approach is worth using in medical practice.

2.2 PROBLEM STATEMENT

People with parkinsonism generally have problem of balance, difficulty in speaking or tremors in one hand. These are the common issue faced by so many people in the world, especially geriatric aged.

The problem that how will they know this is happening because of aging or they have Parkinson's disease is difficult to identify. Here when the patient decides to speak and cannot produce the correct vocal sounds. Parkinson's disease is a neurodegenerative disorder that affects millions of people around the world. Parkinson's disease can affect a person's voice, causing them to speak softly or have difficulty in forming sound clearly. Speech or voice data is assumed to be 90% helpful to diagnose the result. The proposed system used a data set parkinson.csv. A speech data set includes the number of voice features such as jitter, shimmer, pitch, and frequency. Different data pre-processing methods, such as data standardization technique to improve the quality of data. In the present work relevant features were then extracted using Mel Frequency Cepstral Coefficient (MFCC) algorithm. Classification is performed using a Support Vector Machine (SVM) algorithm to differentiate between healthy and people with Parkinson's

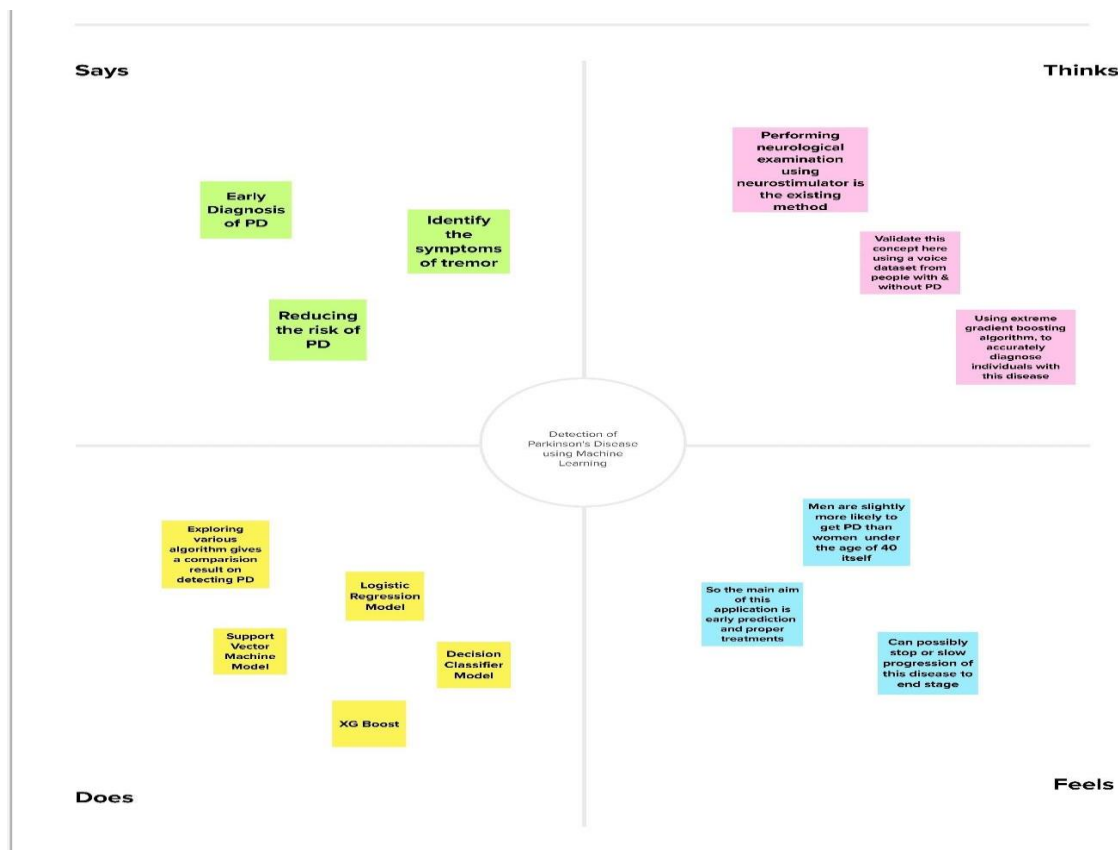
disease. The outcome of the proposed system is early detection of Parkinson's disease, which may help to better diagnose the disease. Medical observations and assessment of clinical indicators, including the identification of a variety of motor symptoms, are often used to diagnose Parkinson's disease (PD). Traditional diagnostic procedures, on the other hand, may be vulnerable to subjectivity because they rely on the assessment of motions that are sometimes subtle to human sight and hence difficult to define, potentially leading to misdiagnosis. Meanwhile, early nonmotor symptoms of Parkinson's disease can be minor and be caused by a variety of other illness. As a result, these symptoms are frequently missed, making early PD diagnosis difficult.

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's Behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenge




3.2 IDEATION & BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, our participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Template




Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

[Share template feedback](#)



Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A

Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B

Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C

Learn how to use the facilitation tools
Use the Facilitation Supercipowers to run a happy and productive session.

[Open article](#)

1

Define your problem statement


What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM







How might we [your problem statement]?

People with parkinsonism generally have problem of balance, difficulty in speaking or tremors in one hand. These are the common issue faced by so many people in the world, especially geriatric aged.



Key rules of brainstorming

To run a smooth and productive session

 Stay in topic.	 Encourage wild ideas.
 Defer judgment.	 Listen to others.
 Go for volume.	 If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

Should look into the research papers available.

The data sets must be precise and accurate.

Machine learning techniques include XG Boost.

XG Boost Algorithm to diagnose PD with tree learning methods

Factors about the disease be analyzed

XG Boost Algorithm Scalable and Highly Accurate

Learning required process about disease

We can refer the machine learning techniques.

The XG Boost algorithm super charges gradient boosting tasks.

Algorithm can produce billions of outcomes quickly.

Subapriya M

Vaishnavi S

Random forest method include to the machine learning.

Random forest classifier was used to classify parkinson patients

Supervised learning method is working based this method.

PD is measured by using MRI Scan

SPECT Technique can help super support diagnose the PD

Supervised learning method is used introduce the multi sensor sensor data.

multi sensor data used to detect the PD disease

The 80% of PD is Diagnosed by using new MRI

PET Scan is used to conform a diagnosis of PD

DWG Tremor analysis is used to identify PD

Thareni Sree M

Shanmugapriya G

3

Group Ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

Algorithms & Models

Adaptive Boosting TIP

Algorithm Deep Brain Stimulation using Markovs model

Linear discriminant Algorithm

XBoost Algorithm

Sensors

VOC sensors timed up and go inertial sensors

wearable sensors

Data Sets

Gait signal data set key stroke feature

MRI data sets

ML Score Estimation

UDPRS score finger tremor quantification

Hoen and Yahr's scale

Symptoms

Symptoms includes; Tremors ,slow movement, speech changes ,writing changes, Rigid changes.

Types

Idiopathic Parkinson's

Vascular Parkinson's

Drug-induced Parkinson's

ML Methods

Neural networks PD detection using nocturnal breathing computer vision

PD detection using facial expression.

Treatment Approache

Three surgical procedure are performed to treat the PD

Destructive ,Stimulation, Deep brain Surgery.

8

Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

The grid shows several ideas plotted based on Importance (Y-axis) and Feasibility (X-axis). A curved line separates the high-impact, high-feasibility ideas from the others.

Idea	Importance	Feasibility
VOC sensors (lined up and go inertial sensors wearable sensors)	High	Low
Neural networks PD detection using nocturnal breathing computer vision PD detection using facial expression	High	High
Three surgical procedure are performed to treat the PD Destructive Stimulation, Deep brain surgery	High	High
Adaptive Boosting TIP Algorithm Deep Rins Stimulation using Markov model Linear discriminant Algorithm Xboost Algorithm	Medium	Medium
Gait signal data set key stroke feature MRI data sets	Medium	High
Symptoms includes Tremors slow movement, speech changes, writing changes, Rigid changes	Low	Low
UDPRS score finger tremor quantification Hoehn and Yahr's scale	Low	High
Idiopathic Parkinson's Vascular Parkinson's Drug-induced Parkinson's	Low	Medium

TIP
Participants can use their cursor to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the H key on the keyboard.

+

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A

Share the mural

Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B

Export the mural

Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint

Define the components of a new idea or strategy.

Open the template →

Customer experience journey map

Understand customer needs, motivations, and obstacles for an experience.

Open the template →

Strengths, weaknesses, opportunities & threats

Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.

Open the template →

Share template feedback

3.3 PROPOSED SOLUTION:

Project team shall fill the following information in proposed solution template.

S.NO	PARAMETER	DESCRIPTION
1	Problem Statement (Problem to be solved)	Parkinson's disease cannot be cured, but early diagnosis and the right medicine can lessen the symptoms and enhance quality of life. Our main goal is to use the Random Forest classifier to predict the disease and to automatically identify Parkinson's disease in hand-drawn spirals and waves.
2	Idea / Solution description	In this project, we're utilising the HOG (Histogram of Oriented Gradients), which combines the Random Forest Classifier with an image detector and processor to automatically identify Parkinson's Disease in a hand-drawn image of waves and spirals.
3	Novelty Uniqueness	A feature descriptor used in computer vision and image processing for object detection is the histogram of oriented gradients (HOG). The method counts instances of gradient orientation in specific areas of a picture. Combining this with random forest may improve tree construction. Combining the two will assist in creating the model.
4	Social Impact/ Customer Satisfaction	In the Scientific perspective, the "Early" is easy to comprehend within the Framework of Disease pathology and its manifestation, making an Economic Burden on the Health Care System, Society and the patients themselves so the Early Detection can Reduce that cost burden
5	Business Model (Revenue Model)	This project model emphasises and focused on helping people who have Parkinson's disease and are receiving medical therapy.
6	Scalability of the Solution	Convergence and numerical precision problems, which can cause problems for the algorithms employed in logistic and linear regression as well as neural networks, aren't as significant in RF due to its nature. This means that unlike with a NN, there is no need to translate the variables to a common scale.

3.4 PROBLEM SOLUTION FIT

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) <small>Who is your customer? i.e. working parents of 0-5 y.o. kids</small> 1. Person with Parkinson Disease Symptoms. 2. Those over 65 more who are in the high risk zone for the illness 3. People who does a full body check up. 4. Prediction for a cost free diagnosis.	6. CUSTOMER CONSTRAINTS <small>What constraints prevent your customers from taking action or limit their choices of solution? i.e. spending power, budget, no cash, network connection, available devices</small> 1. Easy interface 2. Budget 3. Finding difficult to use the app	5. AVAILABLE SOLUTIONS <small>Which solutions are available to the customers when they face the problem? or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital</small> 1. It has advantages and is applied precisely. 2. Encourages the user to be aware of early disease detection.
	2. JOBS-TO-BE-DONE / PROBLEMS <small>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different ideas.</small> 1. Our project assists users in identifying Parkinson's disease at an early stage and displaying the precise proportion of people who have the condition. 2. Using machine learning techniques, we aim to measure the visual appeal of the spiral and wave datasets for the clients.	9. PROBLEM ROOT CAUSE <small>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in environment</small> 1. Parkinson's disease detection and prognosis 2. Lessening the medical team's or the healthcare employees' disruption or interference.	7. BEHAVIOUR <small>What does your customer do to address the problem and get the job done? i.e. directly related: find the right color panel installer; calculate usage and benefits; indirectly associated: customers spend less time on volunteer's work</small> 1. To get reliable findings, start utilising the detector. 2. Verifying that none of the symptoms given in the ML online application apply to them. 3. Enter their symptoms to see whether they are affected by the condition.
Focus on J&P, turning BE, understand RC	3. TRIGGERS <small>The implementation of the dataset is the primary driver for this project design. due to the fact that the data is in picture formats. The algorithm data training is complicated if the data are picture formats.</small> 4. EMOTIONS: BEFORE / AFTER <small>How do customers feel when they face a problem or a job and afterwards? i.e. less, nervous or confident, in control - use it in your communication strategy & design</small> 1. Initially, the person will be unsure if they have Parkinson's disease or not. 2. They will be able to determine whether they are affected by the disease after utilising the ML online application.	10. YOUR SOLUTION <small>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, draw, keep a blank and you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</small> The visual appearance of the spiral and wave drawings may be quantified, and a machine learning model can be trained to categorise them in order to detect Parkinson's disease. We can automatically identify Parkinson's illness in hand-drawn spirals and waves using the Histogram of Oriented Gradients (HOG) image descriptor and a Random Forest classifier.	8. CHANNELS OF BEHAVIOUR 8.1 ONLINE <small>What kind of actions do customers take online? Extract online channels from #7</small> 1. Looks for physicians who are open 2. Thoroughly examines the illness 3. Lists adjacent medical facilities 8.2 OFFLINE <small>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</small> To diagnose the sickness, we just utilise the manually generated spirals or wave visualisations as input. Finally, updating the model is simple (Using new data set of algorithms)

3.5 Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Link (HTML page)
FR-2	User Confirmation	Confirmation via Email
FR-3	Upload voice as input	Add voice Device or through Drive
FR-4	Microphone on	When the microphone is on it recognize the voice and return the required output.

3.6 Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

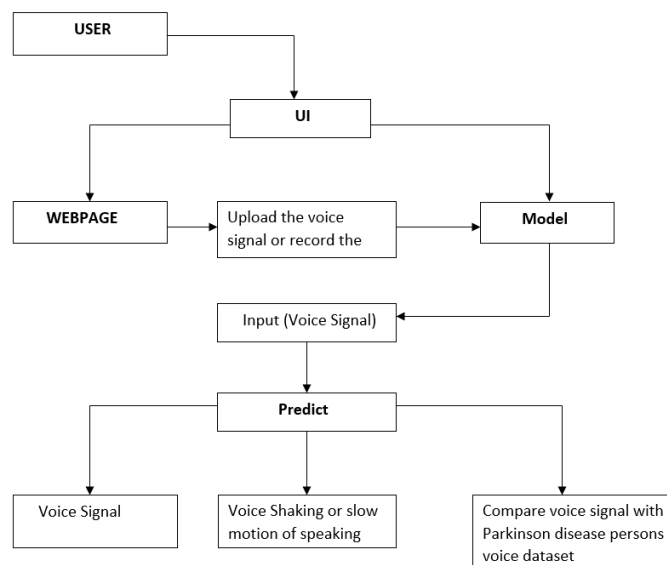
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	This software will be easy to use for all users with minimal instructions. User experiences are assessed in a mixed methods approach with patients and experts.
NFR-2	Security	The user of the system should be provided the surety that their account details are secure. The System will provide security against crosssite request forgery.
NFR-3	Reliability	This software will be operable in all conditions. Regardless of the person physically challenged(who can't speak)
NFR-4	Performance	This software will minimize the number of calculations used to perform with more accuracy and processed fast.
NFR-5	Availability	This software will be available to all operating system. While it is currently has a relatively limited role in direct patient care, its evolving role in Complex clinical decision making
NFR-6	Scalability	This software will be enterprise scalability of AI development and deployment.

CHAPTER 4

PROJECT DESIGN

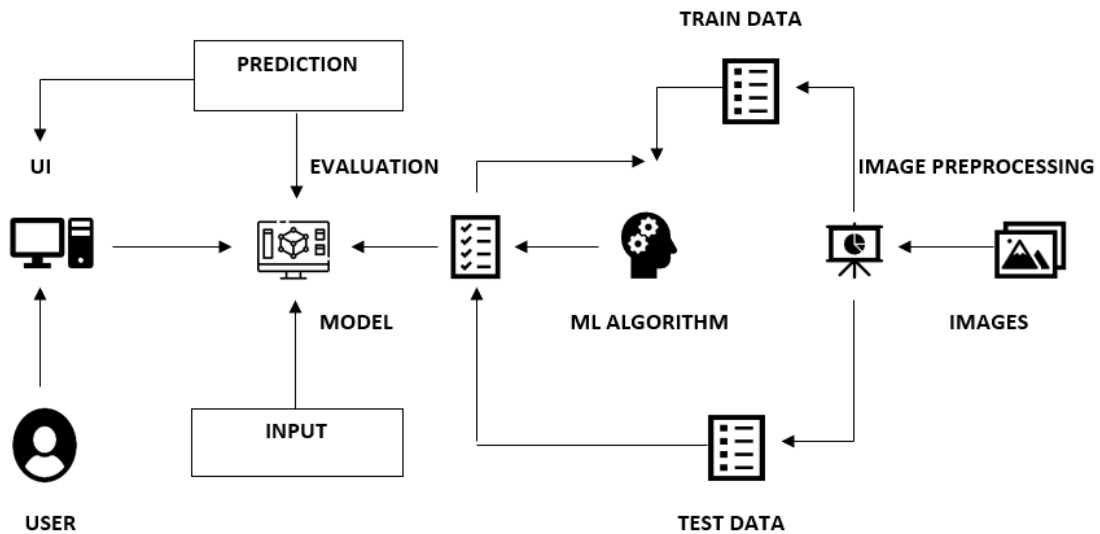
4.1 DATA FLOW DIAGRAM

A data flow diagram shows how information flows through a process or system. This includes data input/output, data storage, and various sub processes through which data moves. DFDs are created using standardized symbols and notations to describe various entities and their relationships.



4.2 SOLUTION & TECHNICAL ARCHITRCTURE

To present your insights and analysis, IBM Cognos Analytics offers dashboards and stories. A view that includes visualizations, such as a graph, chart, plot, table, map, or any other type of visual representation of data, can be put together. Discover trends and correlations that have an influence on your business by exploring stunning data visualizations in IBM Cognos Analytics. A display helps you keep track of events or activities quickly by displaying important data insights and analyses on one or more pages or screens.



4.3 USER STORIES

A “user narrative” is a casual, generic explanation of a software feature written from the perspective of the client or end user. A user narrative explains how a piece of work will give the client a specific of a value.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Login	USN-1	Entering Webpage	Enter the application	High	Sprint-1
	Homepage	USN-2	Entering to the “Homepage” of the UI(Webpage)	Enter the homepage	High	Sprint-1
	About	USN-3	I can click on the “About” to the details about the application	Get the details about the application	Low	Sprint-2
	Begin	USN-4	As a user, I can upload my voice signal from	Choose my voice recording from my	High	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			the computer	device		
	Predict	USN-5	As a user, I can turn on microphone or earphone to record my voice	Turn on the microphone or earphone for As a user I can upload my voice signal from the computer prediction	High	Sprint-3
		USN-6	Predicting by using voice signal	Can monitor voice change or voice shaking	High	Sprint-3

CHAPTER 5

PROJECT PLANNING & SCHEDULING

5.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-2		USN-4	As a user, I can register for the application through Gmail	2	Medium	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-2	Login	USN-5	As a user, I can login into	1	High	Subapriya M Thareni Sree M

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			the application by entering email& password			Vaishnavi S Shanmugapriya G
Sprint-3	Dashboard	USN-6	As a user, I can upload my images and get my details.	3	High	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-1	Logout	USN-7	As a user I can logout successfully.	2	Medium	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-4	Feedback	USN-8	A customer care executive, I can able to interact with all the customer and get their feedback which is used to enhance the scope of the project	2	Medium	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-3	Image processing localization	USN-9	The uploaded image is preprocessed and fed into trained model.	3	High	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-4	Classification and prediction	USN-9	The model classifies and predicts the type of disease.	3	High	Subapriya M Thareni Sree M Vaishnavi S Shanmugapriya G
Sprint-4	Report generation	USN-10	Based on the prediction of	2	Medium	Subapriya M Thareni Sree M

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			Parkinson's disease, the health care is generated to provide the feedback.			Vaishnavi S Shanmugapriya G

5.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	07 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

CHAPTER 6

CODING & SOLUTION

6.1 FEATURE 1

HANDWRITING TASKS IN PARKINSON'S DISEASE:

In this study, we looked into the representativeness of a group of handwriting-related proposed features for PD detection and assessment. In particular, we classified healthy people and PD patients (PD detection), as well as mild and moderate PD patients, using a histogram and random forest algorithms (PD rating). High levels of accuracy, sensitivity, and specificity demonstrated by the implemented and evaluated methodologies demonstrated positive outcomes. These findings point to the viability of the suggested configuration for use in clinical settings to assist in diagnosing Parkinson's disease. Thus, the straightforward procedure continued after days and years.

6.2 FEATURE 2

Due to the necessity of lifting the pen from the paper's surface and repositioning it in order to continue writing, in-air movements continue to be a fascinating area of research. It is reasonable to suppose that individuals with PD would have much longer in-air times than controls due to their delay in initiating movements. The significance of the in-air manoeuvre has been stressed by and Rosenblum. Patients with PD apparently wrote in a smaller size, needed longer performance time, and exerted much less pressure to the writing surface than controls. It's interesting to note that the variance in stroke duration between groups 23 in the air was bigger than the variance in stroke duration on paper. By carefully differentiating between on-surface movement, in-air movement, and pressure and examining their respective contributions in differentiating patients with PD from healthy controls,

were able to validate this. Employed a supervised machine learning support vector machine with an nonlinear radial basis function kernel to categorize samples as PD or controls. 46 An accuracy of about 90% may be attained using fundamental kinematics and pressure characteristics. 47 If the air stroke can be investigated similarly to the on-surface stroke, the question still has to be answered. It seems likely that PD patients' in-air stroke kinematic characteristics, such as velocity, acceleration, and jerk, would be different from those of healthy control

CHAPTER 7

TESTING

7.1 TEST CASES

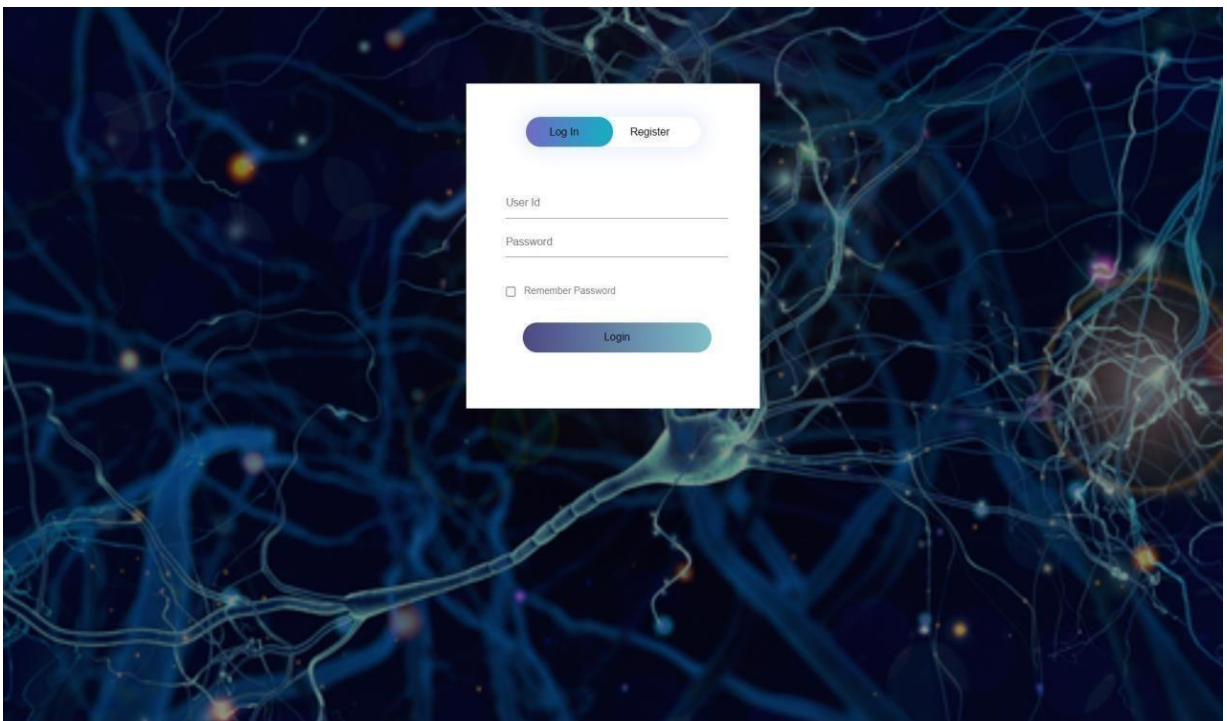
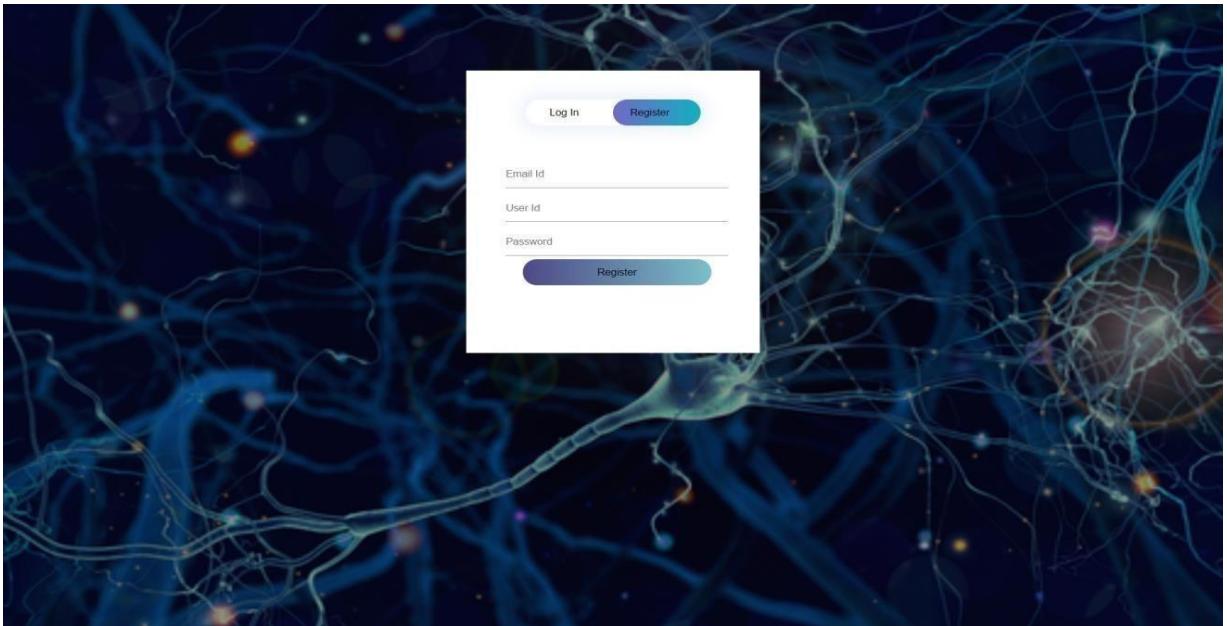
The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner.

7.2 USER ACCEPTANCE TESTING

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements. All test cases are run at this point to ensure that the program is right and complete. The test must be completed successfully before the program can be accepted by the customer. The customer formally approves the delivery of this system after customer workers have checked that the preliminary production statistics load is correct and that the test suite has been achieved with perfect results

CHAPTER 8

RESULTS 8.1



Parkinson's Disease Prediction

Drop files here

or

Choose File

No file chosen

Predict

Ohh No!!! You are affected by Parkinson's disease.. Don't Worry we'll cure it!!

Parkinson's Disease Prediction

Drop files here

or

Choose File

No file chosen

Predict

Ohh No!!! You are affected by Parkinson's disease.. Don't Worry we'll cure it!!

CHAPTER 9

9.1 ADVANTAGES.

Another significant indicator of illness progression may be handwriting. 2. Only image recognition allows for the effective automatic classification of PD. 3. We created the Archimedes spiral hand-drawing dataset without the use of templates or restrictions on application scenarios. 4. Our method has an accuracy rate for Parkinson's disease categorization of roughly 89.3%. 5. Due to the lack of the use of expensive tools, the cost of the material used is quite low.

9.2 DISADVANTAGES.

The suggested approach is the best way to blend static and dynamic handwriting traits for various tasks. 2. The method is less efficient for PD categorization than the performance of the various handwriting modalities. 3. This approach does not always yield accurate findings.

CHAPTER 10

CONCLUSION

Previous research only focused on a single imaging modality, such MRI or PET, or a single type of dementia, like AD. The proposed method tried to cover a wider spectrum of imaging and machine learning technologies for the diagnosis of mental diseases in order to enable researchers in the domain to swiftly identify the state of the art in the field. In order to provide patients with therapy and support as soon as possible and lessen the disease's effects, we also emphasize the importance of early Parkinson's disease prediction and detection

CHAPTER 11

FUTURE SCOPE

The non-invasive nature of this handwriting method makes it incredibly intriguing. Only specific figures must be drawn by the patient on a tablet. Medical decision support tools for PD identification and patient supervision can be created using this handwriting technique (after a positive diagnosis). In order to boost the accuracy of the diagnosis, it is now necessary to combine handwriting techniques based on symptoms like tremor, bradykinesia, and rigidity. In this situation, patient screening and the use of biomarkers can help to enhance healthcare. By doing so, doctors can concentrate on the patients who have the best chance of being diagnosed quickly. Early detection would enable 29 the creation of particular treatment plans for PD patients. The care of patients is crucial for tracking the development of PD.

CHAPTER 12

APPENDIX 12.1

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="X-UA-Compatible" content="ie=edge">
<title>HomePage</title>
<style> body{
background-image:      linear-gradient(rgba(218,      185,      231,      0.9),
rgba(0,0,0,0.4)),url("https://i0.wp.com/cdn-
prod.medicalnewstoday.com/content/images/articles/321/321337/blue-neuron-on-
blue-background.jpg");
position: relative; background-size: cover;
background-repeat: no-repeat; height: 100%;
width: 100%;
}
h3{
text-align:center; color:white;
}
.main{
margin-top:100px;
}
p{
color:white;
text-indent:10px; margin:10px; font-size:20px;
}
.navbar{ margin: 0px; padding:20px;

background-color:rgb(169, 120, 159); opacity:0.6;
color:black;
font-family:'Arial',sans-serif; font-style: italic;
border-radius:20px; font-size:25px;
}
a{
color:rgb(11, 3, 21); float:right;
text-decoration:none; font-style:normal; padding-right:20px;
}
a:hover{
background-color:black; color:white;
```

```

border-radius:15px;
font-size:30px; padding-left:10px;
}
img{
width:450px; height:400px; padding:25px;

}
img:hover{
border-radius:100px; border-color:grey;
}
#im{
width:1450px; height:700px; padding:25px;
}
</style>
</head>
<body>
<div class="navbar">
<a href="/logout" >Logout</a>
<a href="/upload" >Predict</a>
<a href="/home">Home</a>
<a>Welcome!</a>
<br>
</div>
<br>
<center><b class="pd"><font color="white" size="15" font-family="Comic Sans
MS" >Detecting Parkinson Disease using ML</font></b></center>
<div>
<br>
<br>
<center>
<p>Parkinson's disease (PD) is a prevalent neurodegenerative disease affecting
about 1% of the world population over the age of 55 (Nussbaum and Ellis, 2003).
About five million people worldwide are estimated to have PD. PD Prevalence is
expected to double by the year 2030 . Parkinson's disease (PD) patient care is
limited by inadequate, sporadic symptom monitoring, infrequent access to care, and
sparse encounters with healthcare professionals leading to poor medical decision
making and sub-optimal patient health-related outcomes. Recent advances in digital
health approaches have enabled objective and remote monitoring of impaired motor
function with the promise of profoundly changing the diagnostic, monitoring, and
therapeutic landscape in PD.</p>
</center>
<span><imgsrc="https://www.scientificanimations.com/wp-
content/uploads/2017/12/Parkinson%E2%80%99s-Disease.jpg"
title="Disease"></span>

```

```

<span><imgsrc="https://image.freepik.com/free-vector/parkinson-disease-
symptoms-infographic_1308-46947.jpg" title="Symptoms"></span>
<span></span>
<span></span>
<span><imgsrc="https://images.fineartamerica.com/images-medium-large-5/1-
parkinsons-disease-gunilla-elamscience-photo-library.jpg" title="Cause"></span>
<span><imgsrc="https://jnnp.bmj.com/content/jnnp/91/8/795/F4.large.jpg"
title="diagnosis"></span>

<span><imgid="im"src="https://www.genengnews.com/wp-
content/uploads/2019/06/203938_web.jpg" title="Stage"></span>
<br><br><br><br><br>
</div>
</body>
</html>

```

```

<!DOCTYPE
html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="X-UA-Compatible" content="ie=edge">
<title>PredictionPage</title>
<style>
body{
background-image: url("https://img.freepik.com/free-vector/clean-medical-
background_53876-97927.jpg?w=2000");
position: relative;
background-size: cover;
background-repeat: no-repeat;
height: 100%;
width: 100%;
}
.main{
margin-top:100px;
}
.navbar{
margin: 0px;
padding:20px;
background-color:rgb(188, 245, 249);
opacity:0.6;
color:black;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a{
color:rgb(11, 3, 21);
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
background-color:black;
color:white;

```

```
border-radius:15px;
font-size:30px;
padding-left:10px;
}
h1{
font-size:60px;
}
```

```
input[type="file"] {
display: none;
}
.loader {
border: 8px solid #f3f3f3; /* Light grey */
border-top: 8px solid #3498db; /* Blue */
border-radius: 50%;
width: 50px;
height: 50px;
animation: spin 1s linear infinite;
}
```

```
@keyframes spin {
0% { transform: rotate(0deg); }
100% { transform: rotate(360deg); }
}
```

```
</style>
</head>
<body>
<div class="navbar">
<a href="/logout" >Logout</a>
<a href="/upload" >Predict</a>
<a href="/home">Home</a>
<br>
</div>
<h1>Prevention is better than cure!</h1>
<h2><center>Parkinson Classifier</center></h2>
<h5>NOTE: Upload an spiral or wave page drawn by the user in a
white sheet</h5>
<div class="container">
<center> <div id="content" style="margin-top:2em">
<div>
```



```

<form id="upload-file" method="post" enctype="multipart/form-data">
<center>
<label for="imageUpload" class="upload-label">
Choose...
</label>
<input type="file" name="file" id="imageUpload" accept=".png, .jpg,
.jpeg">
</center>
</form>

<center> <div class="image-section" style="display:none;">

<div class="img-preview">
<div id="imagePreview">
</div></center>
</div>
<center>
<div>
<button type="button" class="btn btn-primary btn-lg " id="btn-
predict">Predict!</button>
</div>
</center>
</div>

<div class="loader" style="display:none;"></div>

<h3 id="result">
<span> </span>
</h3>
</div>
</center>
</div>
</body>
<footer>
<script src="{ { url_for('static', filename='js/main.js') } }"
type="text/javascript"></script>
</footer>
</html>

```



PARKINSON DISEASE DETECTION

Being Physically Fit Is A Choice!

Parkinson's disease is a progressive disorder that affects the nervous system and the parts of the body controlled by the nerves. Symptoms start slowly. The first symptom may be a barely noticeable tremor in just one hand. Tremors are common, but the disorder may also cause stiffness or slowing of movement.

Live In The Moment

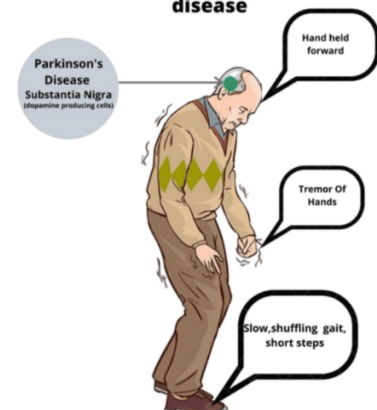
PREVENTION IS BETTER THAN CURE!

Nothing..Just Listen.

Prevention. Parkinson's disease is a neurological condition with a wide range of effects, including problems with movement, blood pressure and thinking, and mood, sensory, and sleep difficulties. The symptoms of Parkinson's disease (PD) usually begin gradually, and they affect each person differently. The symptoms a person has will vary widely, regardless of how severe they are or how quickly they develop.

Stay Healthy

Symptoms Of Parkinson's disease



Parkinson's Disease Prediction

Drop files here

or

Choose File

No file chosen

Predict

Parkinson's Disease Prediction

Drop files here

or

Choose File

No file chosen

Predict

Ohh No!!! You are affected by Parkinson's disease.. Don't Worry we'll cure it!!

Parkinson's Disease Prediction

Drop files here

or

Choose File

No file chosen

Predict

Ohh No!!! You are affected by Parkinson's disease.. Don't Worry we'll cure it!!

REFERENCES

- [1] L.C. Afonso et al. A recurrence plot-based approach for Parkinson's disease identification Future Gener. Compute. Syst. (2019)
- [2] L. Moro-Velazquez et al. A forced Gaussians based methodology for the differential evaluation of Parkinson's disease by means of speech processing Biomed. Signal Process. Control (2018)
- [3] D. Gupta et al. Optimized cuttlefish algorithm for diagnosis of Parkinson's disease Cognit. Syst. Res. (2018)
- [4] L. Parisi et al. Feature-driven machine learning to improve early diagnosis of Parkinson's disease Expert Syst. Appl. (2018)
- [5] Sharma et al. Diagnosis of Parkinson's disease using modified grey wolf optimization Cognit. Syst. Res. (2019)
- [6] D. Montaña et al. A diadochokinesis-based expert system considering articulatory features of plosive consonants for early detection of Parkinson's disease Compute. Methods Programs Biomed. (2018)
- [7] C.R. Pereira et al. Handwritten dynamics assessment through convolutional neural networks: an application to parkinson's disease identification Arif. Intell. Med. (2018)