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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 PROJECT OVERVIEW**

The Parkinson's disease is progressive neuro-degenerative disorder that affects a lot of people significantly affecting their quality of life. It mostly affects the motor functions of human. The symptoms of Parkinson's disease will occur slowly, the symptoms include shaking, rigidity, slowness of movement and difficulty with walking, Thinking and behavior change, Depression and anxiety are also common. It has been observed that impairment in the handwriting is directly proportional to the severity of the disease. Also, the speed and pressure applied to the pen while sketching or writing something are also much lower in patients suffering from Parkinson's disease. Therefore, correctly identifying such biomarkers accurately and precisely at the onset of the disease will lead to a better clinical diagnosis. Therefore, in this project, a system design is proposed for Analyzing Spiral drawing patterns in patients suffering from Parkinson's disease.

### **1.2 PURPOSE**

Parkinson Disease is a brain neurological disorder. It leads to shaking of the body, hands and provides stiffness to the body. No proper cure or treatment is available yet at the advanced stage. Treatment is possible only when done at the early or onset of the disease. These will not only reduce the cost of the disease but will also possibly save a life. Most methods available can detect Parkinson in an advanced stage; which means loss of approx. 60% dopamine in basal ganglia and is responsible for controlling the movement of the body with a small amount of dopamine.

## CHAPTER 2

### LITERATURE SURVEY

#### 2.1 EXISTING PROBLEM

Diagnosis of Parkinson's disease is commonly based on medical observations and assessment of clinical signs, including the characterization of a variety of motor symptoms. However, traditional diagnostic approaches may suffer from subjectivity as they rely on the evaluation of movements that are sometimes subtle to human eyes and therefore difficult to classify, leading to possible misclassification. In the meantime, early non-motor symptoms of Parkinson Disease may be mild and can be caused by many other conditions. Therefore, these symptoms are often overlooked, making diagnosis of Parkinson Disease at an early stage challenging. To address these difficulties and to refine the diagnosis and assessment procedures of Parkinson Disease, machine learning methods have been implemented for the classification of Parkinson Disease.

#### 2.2 REFERENCES

- [https://www.researchgate.net/publication/357448942\\_THE\\_PARKINSON'S\\_DISEASE\\_DETECTION\\_USING\\_MACHINE\\_LEARNING\\_TECHNIQUES#:~:text=There%20is%20a%20model%20for,affected%20person%20by%20Parkinson%27s%20disease.](https://www.researchgate.net/publication/357448942_THE_PARKINSON'S_DISEASE_DETECTION_USING_MACHINE_LEARNING_TECHNIQUES#:~:text=There%20is%20a%20model%20for,affected%20person%20by%20Parkinson%27s%20disease.)
- [https://www.analyticsvidhya.com/blog/2021/07/parkinson-disease-onset-detection-using-machine-learning/.](https://www.analyticsvidhya.com/blog/2021/07/parkinson-disease-onset-detection-using-machine-learning/)
- <https://www.frontiersin.org/articles/10.3389/fnagi.2021.633752/full.>

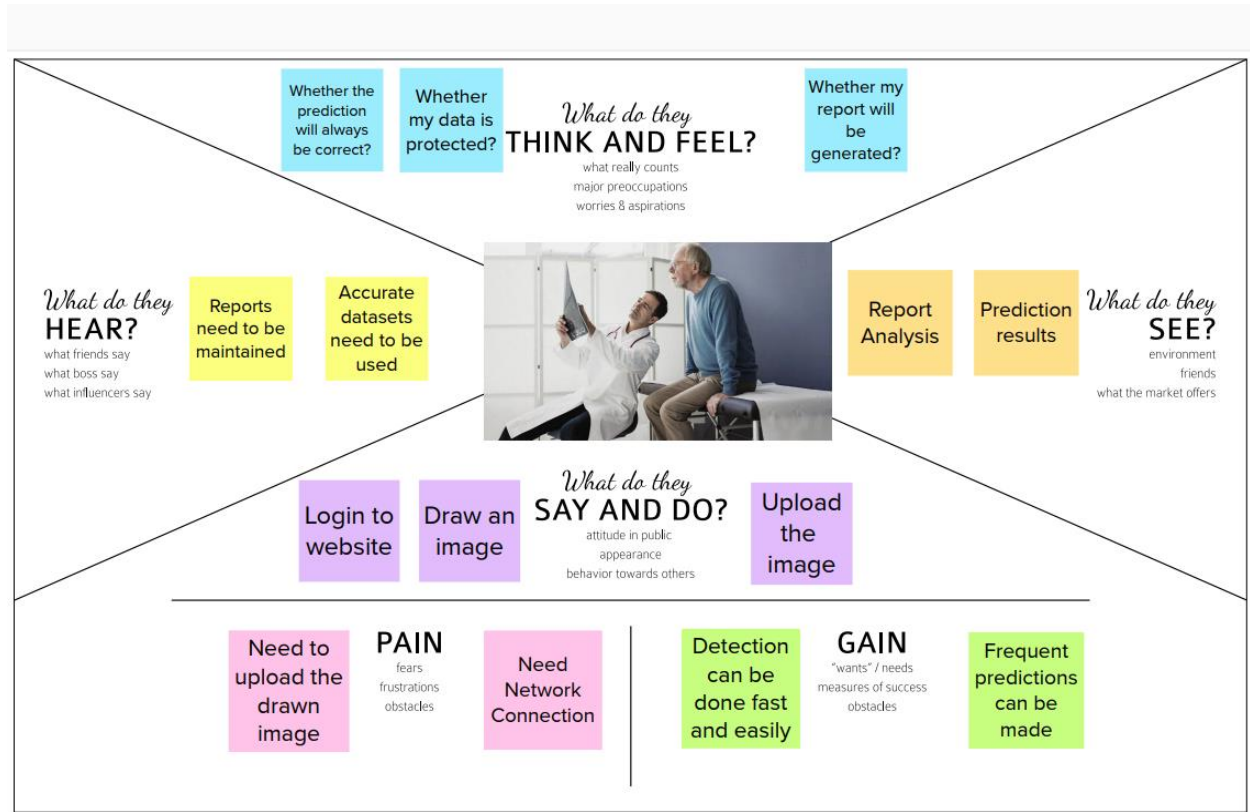
#### 2.3 PROBLEM STATEMENT DEFINITION

One of the indications of Parkinson's is tremors and rigidity in the muscles, making it difficult to draw smooth spirals and waves. It is possible to detect Parkinson's disease using the drawings alone instead of measuring the speed and pressure of the pen on paper. Our goal is to quantify the visual appearance (using HOG method) of these drawings and then train a machine learning model to classify them. In this project, we are using, Histogram of Oriented Gradients (HOG) image descriptor along with a Random Forest classifier to automatically detect Parkinson's disease in hand-drawn images of spirals and waves.

# CHAPTER 3

## IDEATION AND PROPOSED SOLUTION


### 3.1 EMPATHY MAP CANVAS



## 3.2 IDEATION AND BRAINSTORMING

### 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

**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 Superpowers 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**

Detecting Parkinson's Disease Using Machine Learning

**Key rules of brainstorming**

To run a smooth and productive session

🗣️ Stay in topic.

🧠 Defer judgment.

🗣️ Go for volume.

💡 Encourage wild ideas.

👂 Listen to others.

👁️ If possible, be visual.

### STEP 2: BRAINSTORM, IDEA LISTING AND GROUPING

#### Aruna A P

Website will accept only clear images

Need to draw the spiral or wave for detection

One who feel difficulty in writing can upload the drawn images

Person of any age can upload their drawn images

#### keerthika E

The system should be trained with variety of test case

Voice detection - Patients voice may get softer, breathier and horse over time

Handwriting detection - Patients writting will be small and cramped this condition is called micrographia

Patient's details will be maintained securely.

#### Deepakkumar G

Patients face difficulties like stiffness and tremours in hand, arms, legs etc

Patients need a periodic treatment called levoda (meditation)

Patients can periodically note the change by periodical analysis

Early detection is only way for curing

#### Abilash S

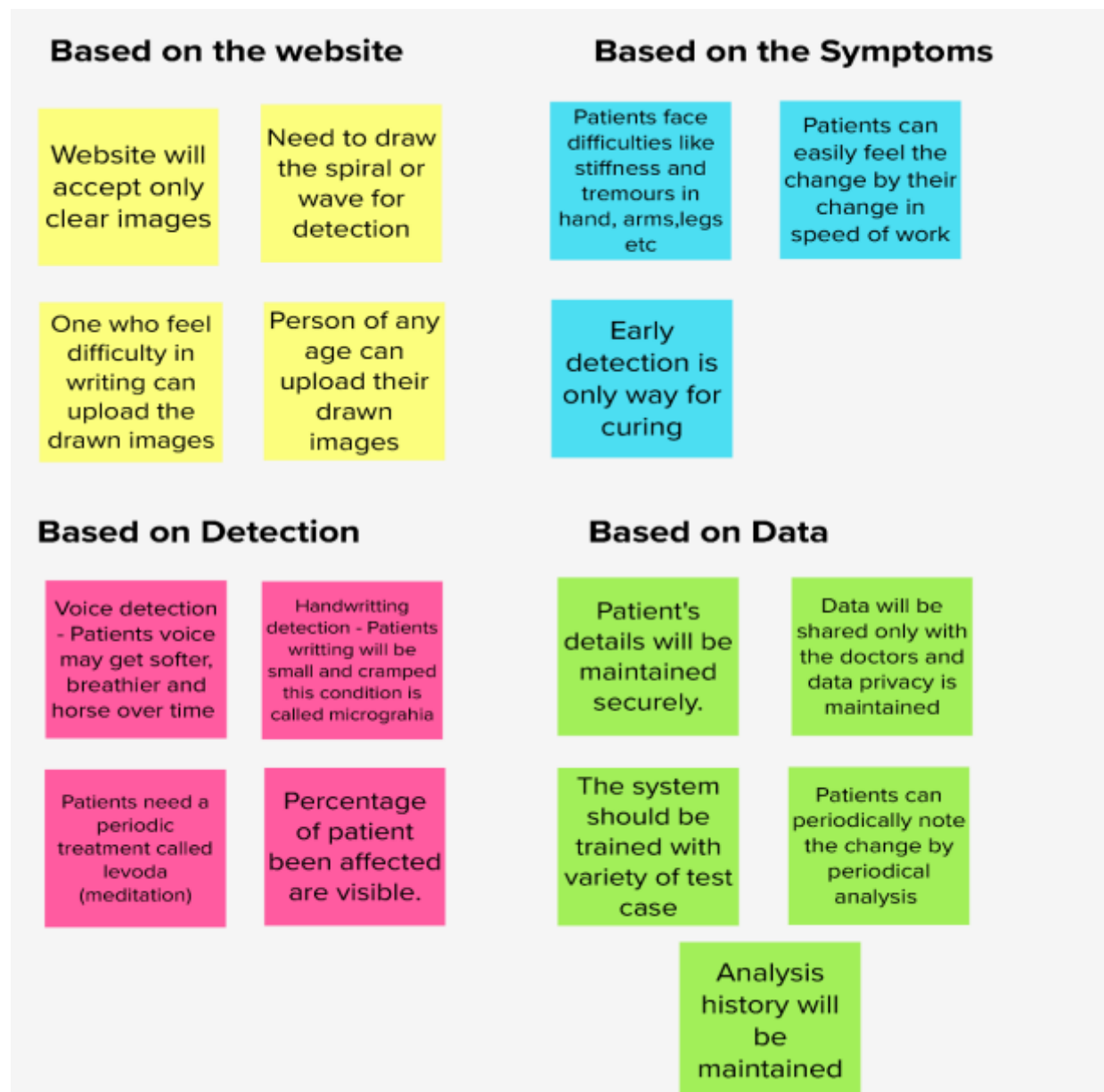
Patients can easily feel the change by their change in speed of work

Percentage of patient been affected are visible.

Data will be shared only with the doctors and data privacy is maintained

Analysis history will be maintained

### STEP 3: GROUP IDEAS



## STEP 4: IDEA PRIORITIZATION





### 3.3 PROPOSED SOLUTION

| S.No | Parameter                           | Description   |
|------|-------------------------------------|---|
| 1.   | Problem Statement                   | The main aim of this project is to detect Parkinson's Disease. More than 10 million people are living with Parkinson's Disease worldwide.                                       |
| 2.   | Idea/Solution description           | Machine Learning is used to identify the affected people by their uploaded images. Where they need to upload their drawn spiral or wave images.                                 |
| 3.   | Novelty/Uniqueness                  | By using more datasets for training. We need to train the model by spiral and wave images to detect the disease. And need to differentiate the healthy and unhealthy people.    |
| 4.   | Social Impact/Customer Satisfaction | This model will find the person who is affected by Parkinson's and also the percentage of the impact of the disease. The results provided by the project will be more accurate. |
| 5.   | Business Model(Revenue Model)       | This project is free of cost. And can be easily accessed by all the users. Doesn't need any technical knowledge to use.   |
| 6.   | Scalability of the solution         | This model can able to handle many number of inputs and provide the respective outputs.   |

## 3.4 PROBLEM SOLUTION FIT

### Problem-Solution fit canvas 2.0

### Parkinson's Disease Detection using machine learning

|                         |  |   |  |                                   |
|-------------------------|--|---|--|-----------------------------------|
| Define CS, fit into CC  | <b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span><br>Who are your customers?<br>i.e. working professionals, kids <ul style="list-style-type: none"> <li>Person who are affected by progressive neurodegenerative disorder.</li> <li>People above the age of 60 are mostly affected.</li> <li>Mainly used by Doctors for testing the accuracy of Parkinson's Disease.</li> </ul>  | <b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span><br>What constraints prevent your customers from taking action on their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. <ul style="list-style-type: none"> <li>Users Need to have a proper network connectivity.</li> <li>They need to show interest towards taking test.</li> <li>They Need either a mobile or a desktop.</li> </ul>  | <b>5. AVAILABLE SOLUTIONS</b> <span>AS</span><br>Which solutions are available to the customer to solve the problem once they do the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. personal papers and health records, digital health tracking <ul style="list-style-type: none"> <li>Prediction using sensors.</li> <li>Prediction using uploading of spiral and wave images drawn by Patients.</li> <li>Prediction using speech.</li> </ul> | Explore AS, differentiate         |
|                         | <b>2. JOBS-TO-BE-DONE/PROBLEMS</b> <span>J&amp;P</span><br>Which jobs-to-be-done (problems) do you add for your customers? These could be more than one, e.g. job to do <ul style="list-style-type: none"> <li>Customer have to upload their spiral and wave diagrams to detect their state and accuracy of the disease.</li> <li>It also help us to detect whether person is healthy or unhealthy.</li> <li>Customers have to just sign-in and upload their documents and get results.</li> <li>Early detection helps the customer to suggest meditation for recovery of patients.</li> </ul> | <b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> <ul style="list-style-type: none"> <li>Certain nerve cells (neurons) in the brain gradually break down or die.</li> <li>Due to a loss of neurons that produce a chemical messenger in your brain called dopamine.</li> <li>Decrease in dopamine level causes atypical brain activity, leading to impaired movement and other symptoms.</li> </ul>  | <b>7. BEHAVIOUR</b> <span>BE</span> <ul style="list-style-type: none"> <li>User Need to contact the doctor for further treatment if they face severe issues.</li> <li>Need to find the way to reduce the power of the disease.</li> <li>Need to talk to their family and friends about the diagnosis and ask for general help.</li> </ul>  |                                   |
|                         | <b>3. TRIGGERS</b> <span>TR</span><br>What triggers customer to act? i.e. seeing the news, going out installing solar panels, reading job ads, more efficient solution in the news. <ul style="list-style-type: none"> <li>Customers should be provided with awareness through advertisements.</li> <li>Social awareness about the disease should be</li> </ul>  | <b>10. YOUR SOLUTION</b> <span>SL</span> <ul style="list-style-type: none"> <li>It is observed that the affected persons can't able draw correctly. So the user need to upload the images of drawn spiral and waves.</li> <li>Using Histogram of Oriented Gradients for Human Detection (HOG), a structural descriptor that measures variations in local gradient in the input image, the picture will be quantified.</li> <li>Random Forest classifier is used to detect Parkinson's disease in hand-drawn images of spirals and waves.</li> </ul> | <b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span><br><b>8.1 ONLINE</b> <ul style="list-style-type: none"> <li>People can able to access the website anywhere at anytime.</li> <li>It is cost-effective production to check the condition of patients in online.</li> </ul> <b>8.2 OFFLINE</b> <ul style="list-style-type: none"> <li>Get appointment and meet doctors for report analysis.</li> <li>In-person analysis can be taken.</li> </ul>  |                                   |
| Identify strong TR & EM | <b>4. EMOTIONS: BEFORE/AFTER</b> <span>EM</span><br>How do customers feel before they face the problem and how do they feel afterwards? <ul style="list-style-type: none"> <li>Before: Patients may feel anxious, stressed, depressed, tremors.</li> <li>After: Patients can perform action without any ones help, walk steadily, etc.</li> </ul>  |   |  | Extract online & offline CH or BE |

## CHAPTER 4

### REQUIREMENT ANALYSIS

#### 4.1 FUNCTIONAL REQUIREMENT

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 Form<br>Registration through Gmail.   |
| FR-2   | User Confirmation                | Confirmation<br>via Email<br>Confirmation<br>via OTP   |
| FR-3   | User Login                       | User needs to log in to the website using the registered email.  |
| FR-4   | Upload the Image                 | User need to draw spiral or wave pictures and upload them to the website for prediction                                |
| FR-5   | Predicting                       | Prediction will be done based on the drawn images.   |
| FR-6   | Result after prediction          | The result will be provided immediately after the prediction of whether the user is having Parkinson's disease or not. |
| FR-7   | Suggestion and Report generation | Suggestions of doctors and the report of the user can be downloaded.   |

## 4.2 NON-FUNCTIONAL REQUIREMENT

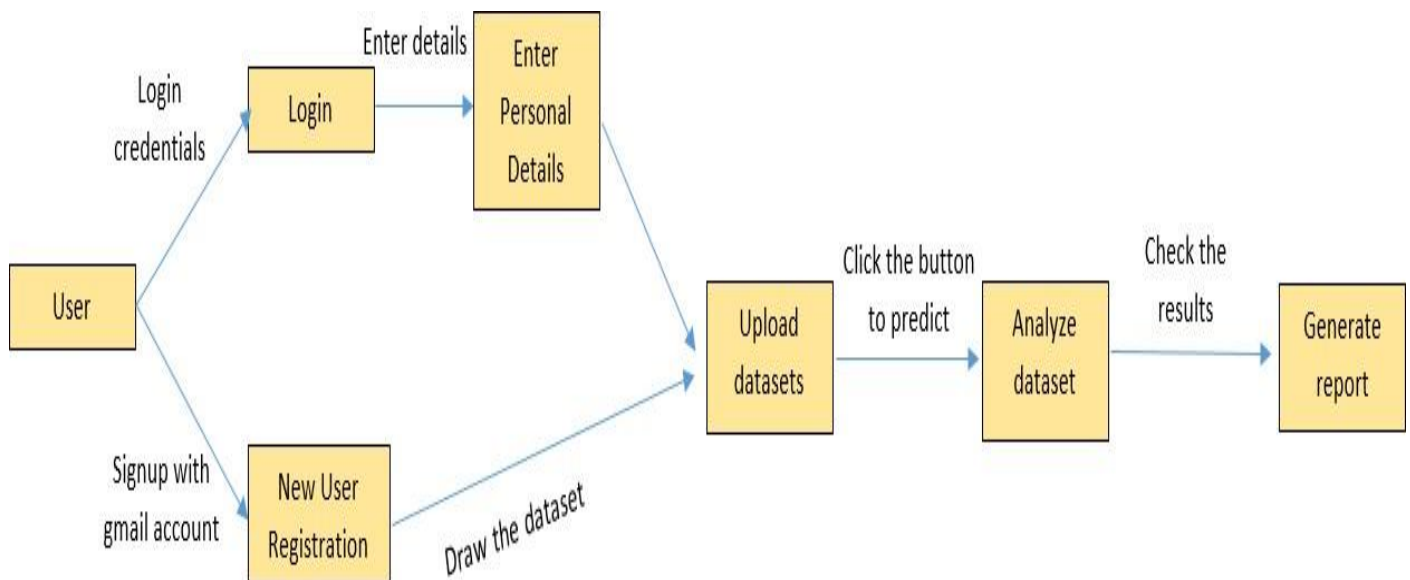
Following are the non-functional requirements of the proposed solution.

| FR No. | Non-Functional Requirement | Description   |
|--------|----------------------------|---|
| NFR-1  | <b>Usability</b>           | Our Website can be easily accessed by everyone, irrespective of any technical knowledge.                    |
| NFR-2  | <b>Security</b>            | The details provided by the user are securely maintained.   |
| NFR-3  | <b>Reliability</b>         | The prediction provided by this system will be accurate.  |
| NFR-4  | <b>Performance</b>         | This model can give results for a large number of inputs with a high rate of accuracy and high performance. |
| NFR-5  | <b>Availability</b>        | This Website is freely(Open Source) available for all users.  |
| NFR-6  | <b>Scalability</b>         | This Website can handle a large number of users and work efficiently.                                       |

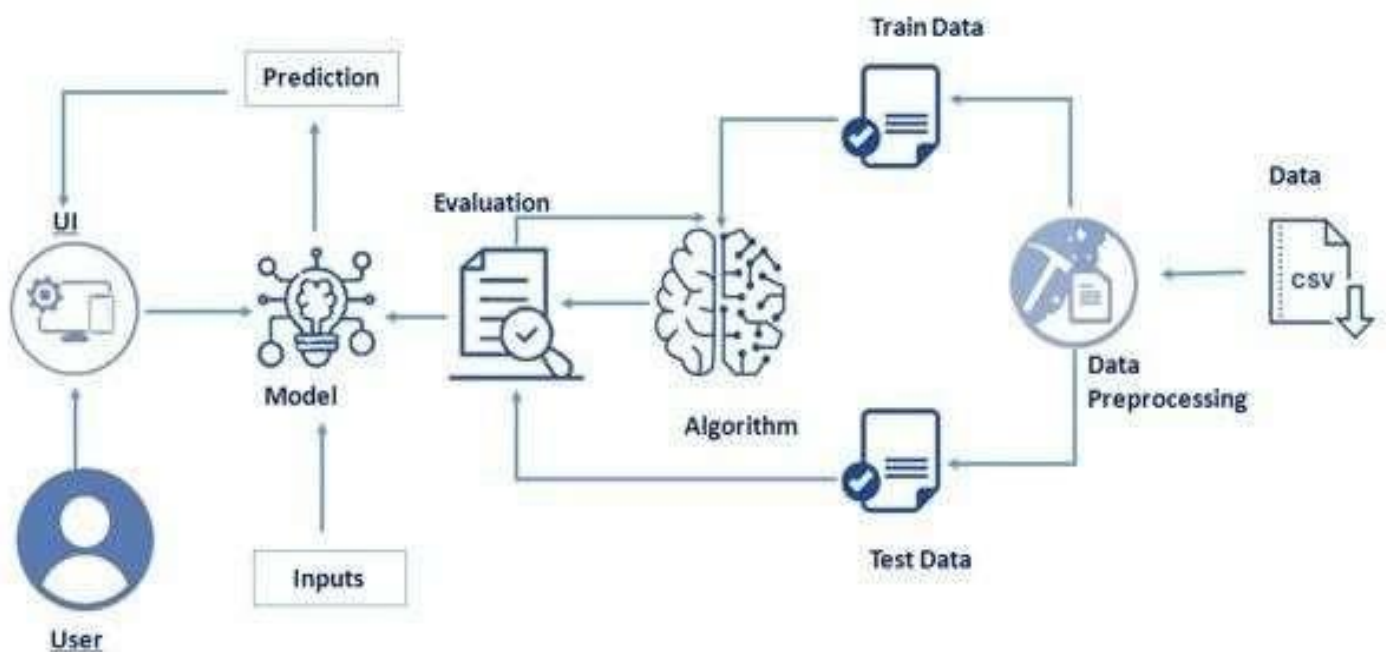
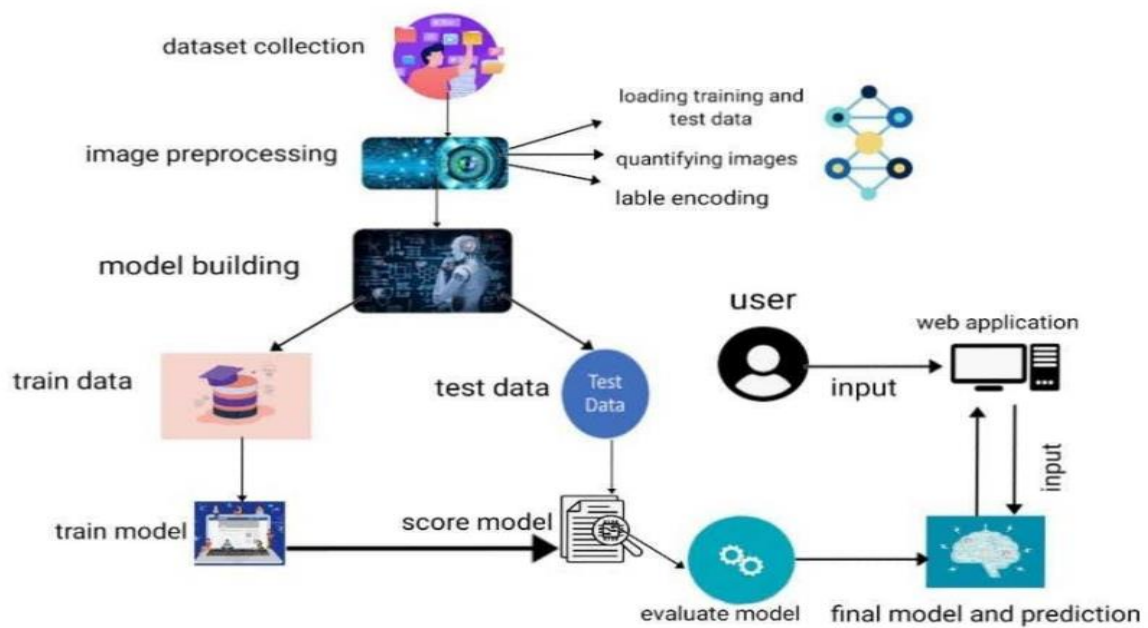
## CHAPTER 5

### PROJECT DESIGN

#### 5.1 DATA FLOW DIAGRAMS



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE



### 5.3 USER STORIES

| User Type      | Functional Requirement (Epic) | User Story Number | User Story / Task   | Acceptance criteria                              | Priority | Release  |
|----------------|-------------------------------|-------------------|---|--|----------|----------|
| Customer(user) | Registration                  | USN-1             | As a user, I can register for the application by entering my email, password, and confirming my password. | I can access my account dashboard                | High     | Sprint-1 |
|                |                               | USN-2             | As a user, I will receive confirmation email once I have registered for the application                   | I can receive confirmation email & click confirm | High     | Sprint-1 |
|                |                               | USN-3             | As a user, I can register for the through Gmail   | I can register through gmail                     | Medium   | Sprint-1 |
|                | Login                         | USN-4             | As a user, I can log into the application by entering email & password                                    | I can login and verify my account                | High     | Sprint-1 |
|                | Personal Details              | USN-5             | As a user, I can complete my profile.   | I can fill my details in the profile section     | Low      | Sprint-2 |
|                |                               | USN-6             | As a User, I have to draw datasets  | I can draw and make it available for uploading   | Medium   | Sprint-3 |
|                | Upload the Datasets           | USN-7             | As a User, I have to upload the datasets for prediction.  | I can upload the datasets drawn                  | High     | Sprint-3 |
|                | Analyse the Dataset           | USN-8             | As a User, I can analyse the result of the dataset uploaded   | I can visualize the result of prediction         | High     | Sprint-4 |
|                | Generate Report               | USN-9             | As a User, I can collect my reports   | I can get my reports for further process         | Low      | Sprint-4 |

## CHAPTER 6

### PROJECT PLANNING AND SCHEDULING

#### 6.1 SPRINT PLANNING AND ESTIMATION

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

**USER:**

| Sprint   | Functional Requirement (Epic) | User Story Number | User Story / Task  | Story Points | Priority | Team Members   |
|----------|-------------------------------|-------------------|--|--------------|----------|--|
| Sprint-1 | Landing Page                  | USN-1             | As a user, I can view the homepage and instructions to use the website.                    | 4            | Medium   | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-1 | Registration                  | USN-2             | As a user, I can register for the application through Gmail.                               | 4            | High     | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-1 | Authorization                 | USN-3             | As a user, I will receive a confirmation email once I have registered for the application. | 4            | High     | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-1 | Login                         | USN-4             | As a user, I can log into the application by entering email & password.                    | 4            | Medium   | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |

| Sprint   | Functional Requirement (Epic) | User Story Number | User Story / Task  | Story Points | Priority | Team Members   |
|----------|-------------------------------|-------------------|--|--------------|----------|--|
| Sprint-1 | Personal Details              | USN-5             | As a user, I can complete my profile.                        | 4            | Low      | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-2 | Drawing the dataset           | USN-6             | As a User, I have to draw datasets.                          | 6            | Medium   | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-2 | Upload the Datasets           | USN-7             | As a User, I have to upload the datasets for prediction.     | 8            | High     | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-3 | Analyse the Dataset           | USN-8             | As a User, I can analyse the result of the dataset uploaded. | 10           | High     | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-4 | Generate Report               | USN-9             | As a User, I can collect my reports.                         | 10           | Medium   | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |



**DEVELOPER:**

| <b>Sprint</b> | <b>Functional Requirement (Epic)</b> | <b>User Story Number</b> | <b>User Story / Task</b>  | <b>Story Points</b> | <b>Priority</b> | <b>Team Members</b>                                    |
|---------------|--------------------------------------|--------------------------|---|---------------------|-----------------|--|
| Sprint-2      | Collecting Datasets                  | USN-10                   | I need to collect the datasets from the users input.  | 6                   | High            | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-3      | Logic building                       | USN-11                   | I need to use machine learning algorithms like random forest classifiers to analyse the datasets. | 10                  | High            | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |
| Sprint-4      | Front End                            | USN-12                   | I need to create the front end using html,css.  | 10                  | Medium          | Abilash S<br>Aruna A P<br>Deepakkumar G<br>Keerthika E |

**6.2 SPRINT DELIVERY SCHEDULE:**

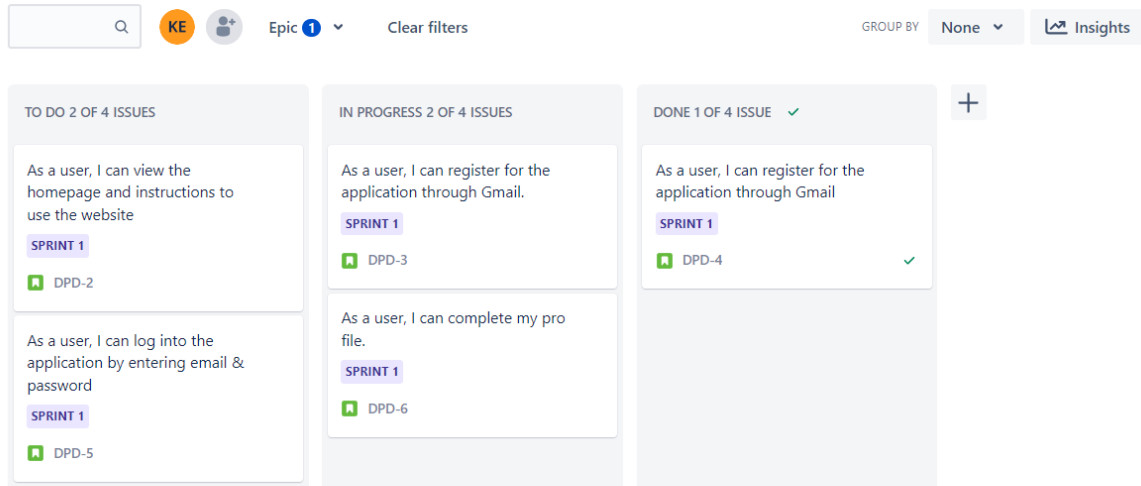
| <b>Sprint</b> | <b>Total Story Points</b> | <b>Duration</b> | <b>Sprint Start Date</b> | <b>Sprint End Date (Planned)</b> | <b>Story Points Completed (as on Planned End Date)</b> | <b>Sprint Release Date (Actual)</b> |
|---------------|---------------------------|-----------------|--------------------------|----------------------------------|--|-------------------------------------|
| 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   | 05 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                         |

## 6.3 REPORTS FROM JIRA

Projects / Detecting Parkinson Disease

### All Sprint

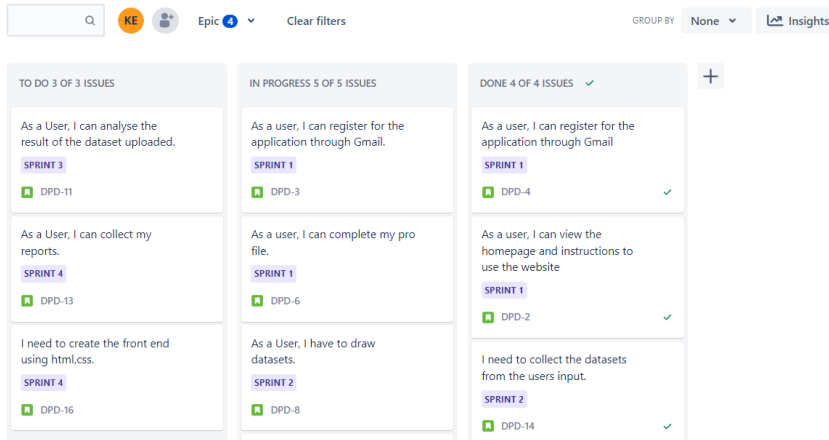
🔗 ☆ ⌚ 0 days remaining [Complete sprint](#) ⋮



Projects / Detecting Parkinson Disease

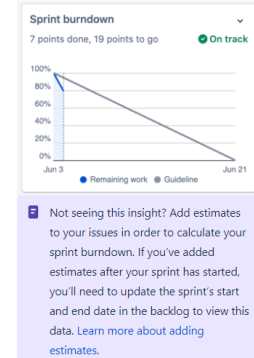
### All Sprint

🔗 ☆ ⌚ 0 days remaining [Complete sprint](#) ⋮



🔍 Search help articles

### Understand the burndown insight



## CHAPTER 7

### CODING & SOLUTIONING

#### 7.1. FEATURE 1

Using our website everyone can easily access and upload their drawn images. In the UI we have complete information about Parkinsons Disease. They can easily understand all the details about the disease. The one who has no knowledge about Parkinson's disease can grab the causes and symptoms and its recovery. And we also attached the images for easy understanding.

PDD

[Home](#) [About](#) [Predict](#)

#### PARKINSON DISEASE

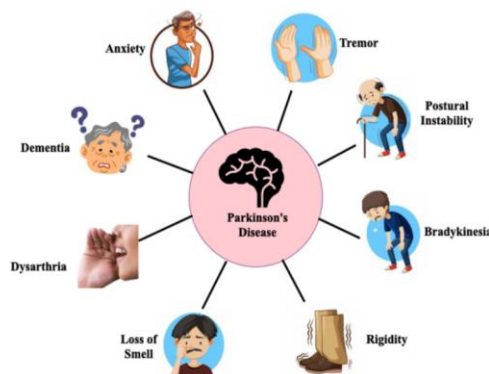
Parkinson's disease (PD) is a prevalent neurodegenerative disease affecting about 1% of the world population over the age of 55 (Nussbaum and Ellis, 2003). About five million people worldwide are estimated to have PD. PD Prevalence is expected to double by the year 2030 . Parkinson's disease (PD) patient 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.



PDD

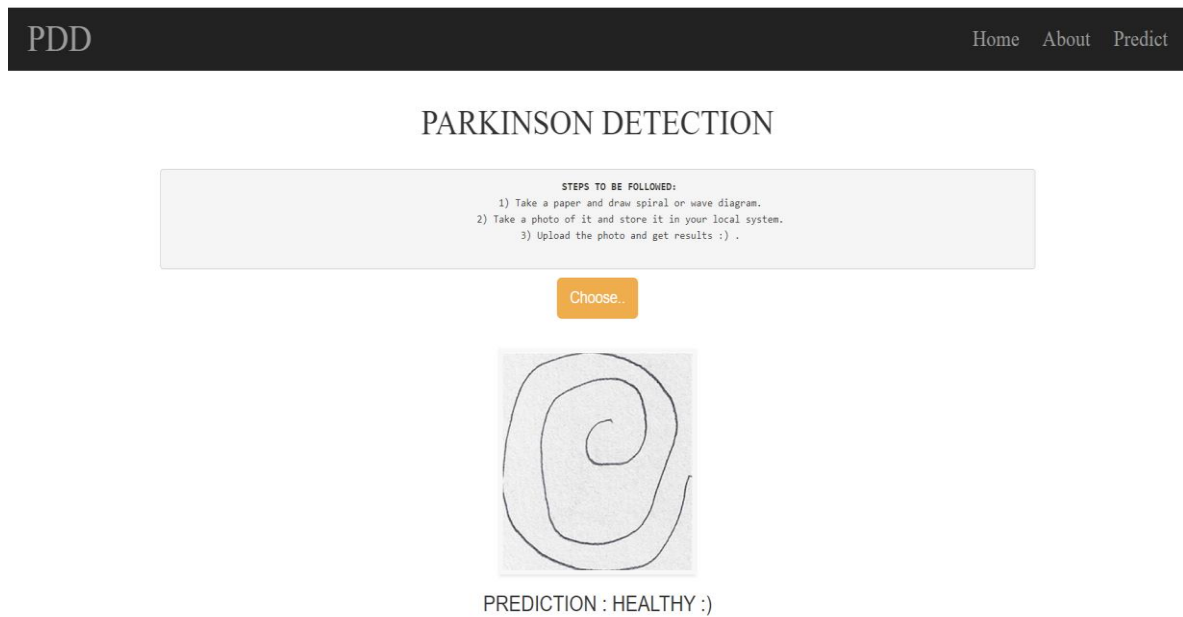
[Home](#) [About](#) [Predict](#)

#### SYMPTOMS OF PARKINSON DISEASE



## 7.2. FEATURE 2

Using Machine learning we have created a prediction website. The users can upload their images and they need to simply click the Predict button. The user can refer to the note mentioned there for the steps to upload their images. Then the result will be displayed as either Parkinson or Healthy. And we used Random Forest Classifier for the prediction. And the one who is affected needs to reach out to the doctor immediately.



## CHAPTER 8

### TESTING

#### 8.1 TEST CASE

| Test case ID            | Feature Type | Component        | Test Scenario   | Steps To Execute   | Expected Result  | Actual Result       | Status | Comments   | Executed By    |
|-------------------------|--------------|------------------|---|--|--|---------------------|--------|--|----------------|
| Home Page_TC_O01        | Functional   | Home Page        | To Verify if the user is able to see the Home page when they click on the link  | 1. Enter URL<br>2. Click Direct and check if the Home page is displayed or not   | The Home page should be displayed to the user or who clicks the url  | Working as expected | P      | The Home Page can be seen  | Aruna AP       |
| Home Page_TC_O02        | UI           | Home Page        | To Verify the UI elements in Homepage<br>1.Home icon<br>2. Information icon<br>3.Predict Icon                                 | 1. Enter the URL<br>2. Verify the UI elements in homepage:<br>a. Home icon<br>b. Information icon<br>c. Predict Icon                           | Application should show below UI elements:<br>a. Home<br>b. Information<br>c. Predict  | Working as expected | P      | Can to view all the icons  | Keerthika E    |
| Information Page_TC_O03 | Functional   | Information page | To Verify if the Information and the predict icons functions properly   | 1.Enter URL and click Direct<br>2. Click on Information icon on homepage<br>3. Click on Predict Icon on the homepage                           | 1. The user should be navigated to the Information page<br>2. The user should be navigated to the Predict page that asks for the upload of files | Working as expected | P      | Both Information page and the prediction page is displayed           | Abilash S      |
| Predict Page_TC_O04     | Functional   | Predict page     | To Verify user is able to view the upload file option and its function  | 1.Enter URL and click Direct<br>2.Click on Upload file option<br>3. It should navigate to the local file system                                | Application should navigate the user to the local file system to upload the files  | Working as expected | P      | Navigated to the local file system                                   | Deepak kumar G |
| Predict Page_TC_O05     | Functional   | Predict Page     | To Verify if the user is able to choose the file from the local file system and click on predict to find the predicted result | 1.Enter URL and click Direct<br>2. Click on the choose option<br>3. Choose a File<br>4. It should be on a Valid Format<br>5.Click on Predict   | Choose the file popup screen must be displayed and the user should be able to click on the predict button and the result must be displayed       | Working as expected | P      | Result got Displayed as "The Person has parkinson's"                 | Abilash S      |
| Predict Page_TC_O06     | Functional   | Predict page     | To Verify whether the user is able to select the invalid file formats   | 1.Enter URL and click Direct<br>2. Click on the choose option<br>3. Choose a file<br>4. It should be on a Invalid format<br>5.Click on Predict | The Application won't allow to attach the files in the formats other than ".png, .jpg"   | Working as expected | Pass   | The app shows error message while uploading unsupported file formats | Aruna AP       |

## 8.2 USER ACCEPTANCE TESTING

### 1.Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Detection of Parkinson's Disease project at the time of the release to User Acceptance Testing (UAT).

### 2.Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

| Resolution     | Severity 1 | Severity 2 | Severity 3 | Severity 4 | Subtotal |
|----------------|------------|------------|------------|------------|----------|
| By Design      | 5          | 2          | 1          | 3          | 11       |
| Duplicate      | 1          | 0          | 0          | 1          | 2        |
| External       | 3          | 4          | 1          | 0          | 8        |
| Fixed          | 9          | 3          | 2          | 13         | 27       |
| Not Reproduced | 0          | 1          | 0          | 0          | 1        |
| Skipped        | 1          | 1          | 0          | 0          | 2        |
| Won't Fix      | 0          | 1          | 2          | 1          | 4        |
| Totals         | 19         | 12         | 6          | 18         | 55       |

### 3.Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

| Section      | Total Cases | Not Tested | Fail | Pass |
|--------------|-------------|------------|------|------|
| Login        | 5           | 0          | 1    | 4    |
| Image Upload | 2           | 0          | 0    | 2    |
| Prediction   | 2           | 0          | 0    | 2    |

# CHAPTER 9

## RESULTS

### 9.1 PERFORMANCE METRICS

#### Model Performance Testing:

Project team shall fill the following information in model performance testing template

| S.No.        | Parameter      | Values   | Screenshot   |         |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
|--------------|----------------|--|--|---------|-----------|--------|----------|---------|---|------|------|------|----|---|------|------|------|----|----------|--|--|------|----|-----------|------|------|------|----|--------------|------|------|------|----|
| 1.           | Metrics        | <b>Classification Model:</b> Confusion Matrix Accuracy Score Classification Report | <pre>In [17]: from sklearn.metrics import accuracy_score accuracy_score(y_test,preds)  Out[17]: 0.7666666666666667  In [18]: from sklearn import metrics metrics.confusion_matrix(y_test,preds)  Out[18]: array([[13,  2], [ 5, 10]])  In [39]: from sklearn.metrics import classification_report print(classification_report(y_test, preds))</pre> <table><thead><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr></thead><tbody><tr><td>0</td><td>0.72</td><td>0.87</td><td>0.79</td><td>15</td></tr><tr><td>1</td><td>0.83</td><td>0.67</td><td>0.74</td><td>15</td></tr><tr><td>accuracy</td><td></td><td></td><td>0.77</td><td>30</td></tr><tr><td>macro avg</td><td>0.78</td><td>0.77</td><td>0.76</td><td>30</td></tr><tr><td>weighted avg</td><td>0.78</td><td>0.77</td><td>0.76</td><td>30</td></tr></tbody></table> |         | precision | recall | f1-score | support | 0 | 0.72 | 0.87 | 0.79 | 15 | 1 | 0.83 | 0.67 | 0.74 | 15 | accuracy |  |  | 0.77 | 30 | macro avg | 0.78 | 0.77 | 0.76 | 30 | weighted avg | 0.78 | 0.77 | 0.76 | 30 |
|              | precision      | recall   | f1-score   | support |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
| 0            | 0.72           | 0.87   | 0.79   | 15      |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
| 1            | 0.83           | 0.67   | 0.74   | 15      |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
| accuracy     |                |  | 0.77   | 30      |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
| macro avg    | 0.78           | 0.77   | 0.76   | 30      |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
| weighted avg | 0.78           | 0.77   | 0.76   | 30      |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |
| 2.           | Tune the Model | Hyper parameter Tuning Validation Method   | <pre>In [14]: from sklearn.ensemble import RandomForestClassifier  classifier = RandomForestClassifier(n_estimators=100) classifier.fit(X_train,y_train)  Out[14]: RandomForestClassifier()</pre>  |         |           |        |          |         |   |      |      |      |    |   |      |      |      |    |          |  |  |      |    |           |      |      |      |    |              |      |      |      |    |

## **CHAPTER 10**

### **ADVANTAGES AND DISADVANTAGES**

#### **10.1 ADVANTAGES**

1. Traditional diagnostic approaches may suffer from subjectivity as they rely on the evaluation of movements that are sometimes subtle to human eyes and therefore difficult to classify, leading to possible misclassification. To address these difficulties and to refine the diagnosis and assessment procedures of PD, machine learning methods have been implemented for the classification of PD and healthy controls or patients with similar clinical presentations.
2. It is Cost effective and user-friendly model and easy to use.
3. It requires only few steps to identify whether a person has Parkinson's disease or not.

#### **10.2 DISADVANTAGES**

1. It requires more number of dataset to train the model so that the percentage of accuracy while be near to the actual diagnosis of the disease
2. Training the model will be little more complex with huge number of datasets.
3. It can only predict whether a patient is having Parkinson's disease or not. But it cannot able to predict the Severity of the disease.



## **CHAPTER 11**

### **CONCLUSION**

Managing Parkinson's disease in day-to-day life is very challenging for an individual. Limited care due to inadequate, infrequent 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. Therefore we use ML-based research algorithm (Random Forest Algorithm) to diagnose Parkinson's disease in terms of handwritten spiral and wave patterns in order to predict whether a particular person is undergoing Parkinson's disease or not. The improvements that can be made in the current methodology is that the number of data samples can be increased significantly.

## **CHAPTER 12**

### **FUTURE SCOPE**

1. The model will be even more accurate as the number of datasets trained increases.  
The more the datasets acquired and trained higher the accuracy of the model.
2. We can add additional features to the already existing model which will be able to predict the intensity of the disease.
3. According to the intensity of the disease we can recommend the specialists doctor to treat the patient by including features such as chat room, video calling, etc.

## CHAPTER 13

### APPENDIX

#### 13.1 SOURCE CODE:

##### Home.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Parkinson Disease Detection</title>
  <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css"
>
  <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></scr
ipt>
  <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></
script>
  <link rel="stylesheet" href="style.css">
  <link rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-
awesome.min.css">
</head>
<style>

</style>
<body>
  <section id="home">
    <!--navbar-->
    <nav class="navbar navbar-inverse navbar-fixed-top" style="padding:
10px;">
      <div class="container-fluid">
        <div class="navbar-header">
          <button type="button" class="navbar-toggle" data-
toggle="collapse" data-target="#menu">
            <span class="icon-bar"></span>
            <span class="icon-bar"></span>
            <span class="icon-bar"></span>
          </button>
          <!--action="/action_page.php"-->
          <a href="/home" class="navbar-brand" style="font-family:
Roboto; font-size: 300%;"> PDD</a>
        </div>
```

```

        <div class="collapse navbar-collapse" id="menu" style="font-size: 25px;">

            <ul class="nav navbar-nav navbar-right" style="font-family: roboto;">

                <li><a href="/home"> Home</a></li>
                <li> <a href="/info"> About</a></li>
                <li> <a href="/upload">Predict</a></li>

            </ul>
        </div>
    </div>
</nav>
<div class="container-fluid">
    <div class="col-md-12 " style=" position: absolute; margin-right: 80px; right: 10px; top: 150px; margin-left: 100px; color: white;" class="nav navbar-nav navbar-right">
        <h1 style="font-size:50px; font-family: Roboto; color: black;" class="nav navbar-nav navbar-right">PARKINSON DISEASE DETECTION</h1>
        <br><br><br><br>
        <h2 style="font-size:40px; position:absolute; right: 150px; font-family: Roboto; color: black;" class="nav navbar-nav navbar-right">EASIEST WAY TO DETECT</h2>
        <br><br><br>
        <H2 style="font-size:35px; position:absolute; right:200px; font-family: Roboto; color: black;" class="nav navbar-nav navbar-right">Get results with just 3 steps</H2>
        <br><br><br>
        <p style="font-size:30px; position:absolute; right:260px; font-family: Roboto; color: black;" class="nav navbar-nav navbar-right">Step 1: Draw diagram</p>
        <br><br><br>
        <p style="font-size:30px; position:absolute; right:285px; font-family: Roboto; color: black;" class="nav navbar-nav navbar-right">Step 2: Take photos</p>
        <br><br><br>
        <p style="font-size:30px; position:absolute; right:340px; font-family: Roboto; color: black;" class="nav navbar-nav navbar-right">Step 3: Upload</p>
        
    </div>
    <br>
</div>
</section>
</body>
</html>

```

## App.py:

```
import pickle
import cv2
from skimage import feature
from flask import Flask,request, render_template
import os.path
app=Flask(__name__)#our flask app

@app.route("/") #default route
def about():
    return render_template("home.html")#rendering html page

@app.route("/home") #route about page
def home():
    return render_template("home.html")#rendering html page

@app.route("/info") # route for info page
def information():
    return render_template("info.html")#rendering html page

@app.route("/upload") # route for uploads
def test():
    return render_template("index6.html")#rendering html page

@app.route('/predict', methods=['GET', 'POST'])
def upload():
    if request.method == 'POST':
        f = request.files['file'] # requesting the file
        #filename_secure = secure_filename(f.filename)
        basepath = os.path.dirname(
            '__file__') # storing the file directory
        # storing the file in uploads folder
        filepath = os.path.join(basepath, "uploads", f.filename)
        f.save(filepath) # saving the file

        # Loading the saved model
        print("[INFO] loading model...")
        model = pickle.loads(open('parkinson.pkl', "rb").read())
        '''local_filename = "./uploads/"
        local_filename += filename_secure
        print(local_filename)'''

        # Pre-process the image in the same manner we did earlier
        image = cv2.imread(filepath)
        output = image.copy()

        # Load the input image, convert it to grayscale, and resize
        output = cv2.resize(output, (128, 128))
```

```

image = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
image = cv2.resize(image, (200, 200))
image = cv2.threshold(image, 0, 255,
                      cv2.THRESH_BINARY_INV | cv2.THRESH_OTSU)[1]

# Quantify the image and make predictions based on the extracted
features using the last trained Random Forest
features = feature.hog(image, orientations=9, pixels_per_cell=(10,
10), cells_per_block=(2, 2), transform_sqrt=True, block_norm="L1")
preds = model.predict([features])
print(preds)
ls = ["HEALTHY :)", "PARKINSON \n :( You are affected by Parkinson
please Consult a Doctor."]
result = ls[preds[0]]

color = (0, 255, 0) if result == "HEALTHY :)" else (0, 0, 255)
cv2.putText(output, result, (3, 20), cv2.FONT_HERSHEY_SIMPLEX, 0.5,
color, 2)
cv2.imshow("Output", output)
cv2.waitKey(0)
return result

return None

if __name__ == '__main__':
    app.run()

```

## 13.2 GITHUB AND DEMO LINK:

Github link: <https://github.com/IBM-EPBL/IBM-Project-16839-1659623741>

Demo link: <https://www.kapwing.com/videos/6378f37bfb7ee1002508b383>