# DETECTION OF PARKINSON'S DISEASE USING MACHING LEARNING

NALAIYA THIRAN PROJECT BASED LEARNING

on

PROFESSIONAL READLINES FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

A PROJECT REPORT


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# CHAPTER 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&disease.

# CHAPTER 2

# LITRERATURE REVIEW

## 2.1 REFERENCE


- L.C. Afonso et al. A recurrence plot-based approach for Parkinson's disease identification Future Gener. Compute. Syst. (2019)

- L. Moro-Velazquez et al. A forced Gaussians based methodology for the differential evaluation of Parkinson's disease by means of speech processingBiomed. Signal Process. Control (2018)

- D. Gupta et al. Optimized cuttlefish algorithm for diagnosisof Parkinson's disease Cognit. Syst. Res. (2018)

- L. Parisi et al. Feature-driven machine learning to improve early diagnosis of Parkinson's disease Expert Syst. Appl. (2018)

- Sharma et al. Diagnosis of Parkinson's disease using modified grey wolf optimization Cognit. Syst. Res. (2019)

- D. Montaña et al. A diadochokinesis-based expert system considering articulatory features of plosive consonants for early detection of Prkinson's disease Compute. Methods Programs Biomed. (2018)

- C.R. Pereira et al. Handwritten dynamics assessment through convolutional neural networks: an application to parkinson's disease identification Arif. Intell. Med. (2018)

- D. Gupta et al. Improved diagnosis of Parkinson's disease using optimized crow search algorithm Compute. Elector. Eng. (2018)

- J. Vásquez-Correa et al. Towards an automatic evaluation of the dysarthria level of patients with Parkinson's disease J. Commun. Discord. (2018)

- M. Cernak et al. Characterisation of voice quality of Parkinson's disease using differential phonological posterior features Compute. Speech Lang. (2017)

- Virika's et al. Data dependent random forest applied to screening for laryngea disorders through analysis of sustained phonation: acoustic versuscontact microphone Med. Eng. Phys. (2015)

- B. Harel et al. Variability in fundamental frequency during speech in prodromal and incipient parkinson's disease: alongitudinal case study Brain Cognit. (2004)

- C.R. Pereira et al. A new computer vision-based approach to aid the diagnosis of Parkinson's disease Compute. Methods Programs Biomed. (2016)

- J. Parkinson An essay on the shaking palsy J. Neuropsychiatry Clin Neurosci. (2002)

## 2.2 EXISTING PROBLEM

In this section, we examine various current machine learning and deep learning methods for Parkinson disease diagnosis

**AUTHOR: Indira R.et al**

**YEAR: 2020**

Indira R. et al. (2014) have proposed an automatically machine learning approach and detected the Parkinson disease on behalf of speech/voice of the person. The author used fuzzy C-means clustering and pattern recognition based approach for the discrimination between healthy and Parkinson disease affected people. The authors of this paper have achieved 68.04% accuracy, 75.34% sensitivity and 45.83% specificity. Indira R. et al. (2014) have proposed a back propagation based approach for the discrimination between healthy and Parkinson diseases affected peoples with the help of artificial neural network. Boosting was used by filtering technique, and for data reduction principle component analysis was used

**AUTHOR: REVETT ET AL**

**YEAR:2009**

Revett et al. (2009) proposed jitter, shimmer, fundamental frequency, harmonics/noise ratios, descriptive statistics, and correlational factors (nonlinear dynamic analysis) using all 22 features, and a binary decision class (‘0’is healthy and ‘1’ is IPD decision class). The testing and training set are classified and an ROC and confusion matrix was generated to examine the accuracy of theclassification process. Predict of accuracy shows 100%

**AUTHOR: SHAHABI ET AL. (2014)**

**YEAR:2014**

Shahabi et al. (2014) presented that a Genetic Algorithm (GA) and SVM were used for classification between healthy and people with Parkinson. Voice signals that 14 features were based on F0 (fundamentafrequency or pitch), jitter, shimmer and noise to harmonics ratio, which are main factors in voice signal. Results show that classification accuracy 94.50, 93.66 and 94.22 per 4, 7 and 9 optimized features respectively.

**AUTHOR: R. DAS ET AL.**

**YEAR:2010**

R. Das et al. (2010) have proposed neural networks, Data Mining Neural analysis, and regression analysis and decision trees made a comparative study on Parkinson disease data set with regard to with the Presented results of classification accuracy of 92.9%, 84.3%, 88.6% and 84.3% respectively. To the classification method was diagnosis Parkinson disease based on the SAS software. Ene M. et al. (2008) proposed a probabilistic neural network (PNN) variant to discriminate between healthy people and people with Parkinson's disease. Three PNN types are used in this classification process, related to the smoothing factor search: incremental search (IS) Monte Carlo search (MCS) and hybrid search (HS). The accuracies reaching run between 79% and 81% for new, undiagnosed patients.

## 2.3 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.

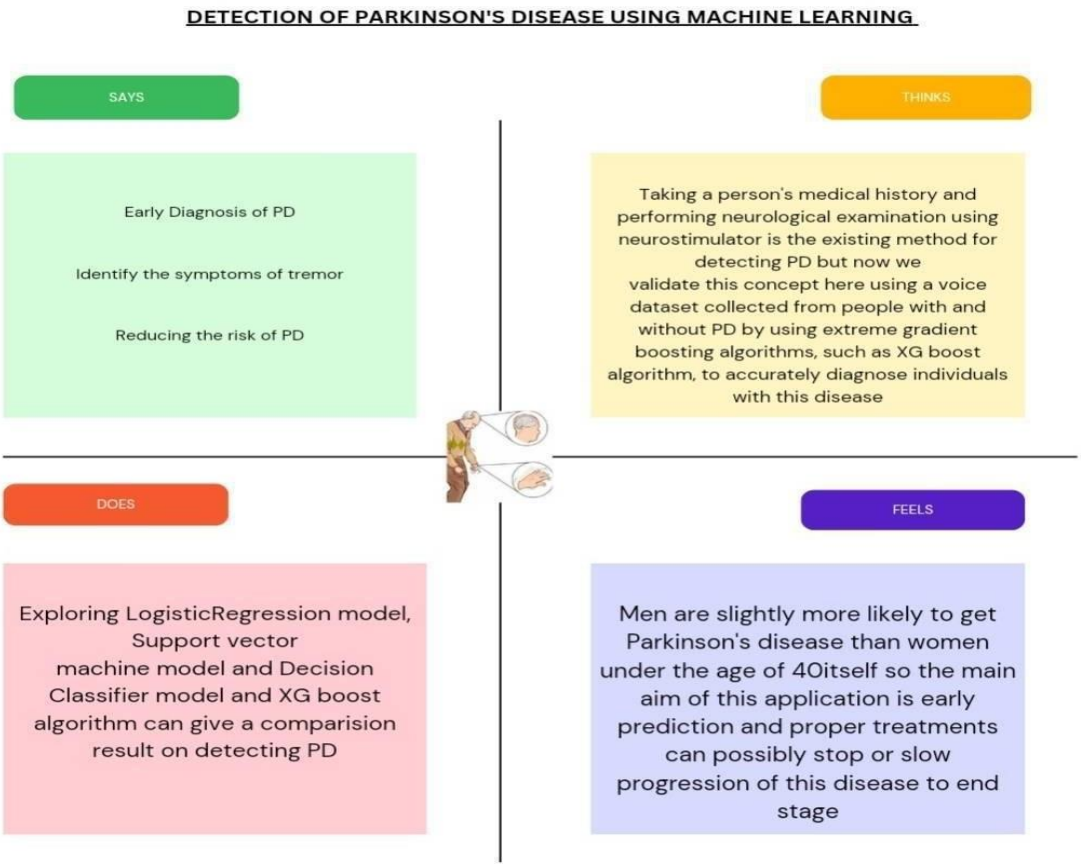
The problem that how will they know this is happening because of aging or they have Parkinson's disease is difficulty to identify. Here when the patient decides to speak and cannot produce the correct vocal sounds. Parkinson's disease is a neurodegenerative disorder that affects millions of people around 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% help full 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

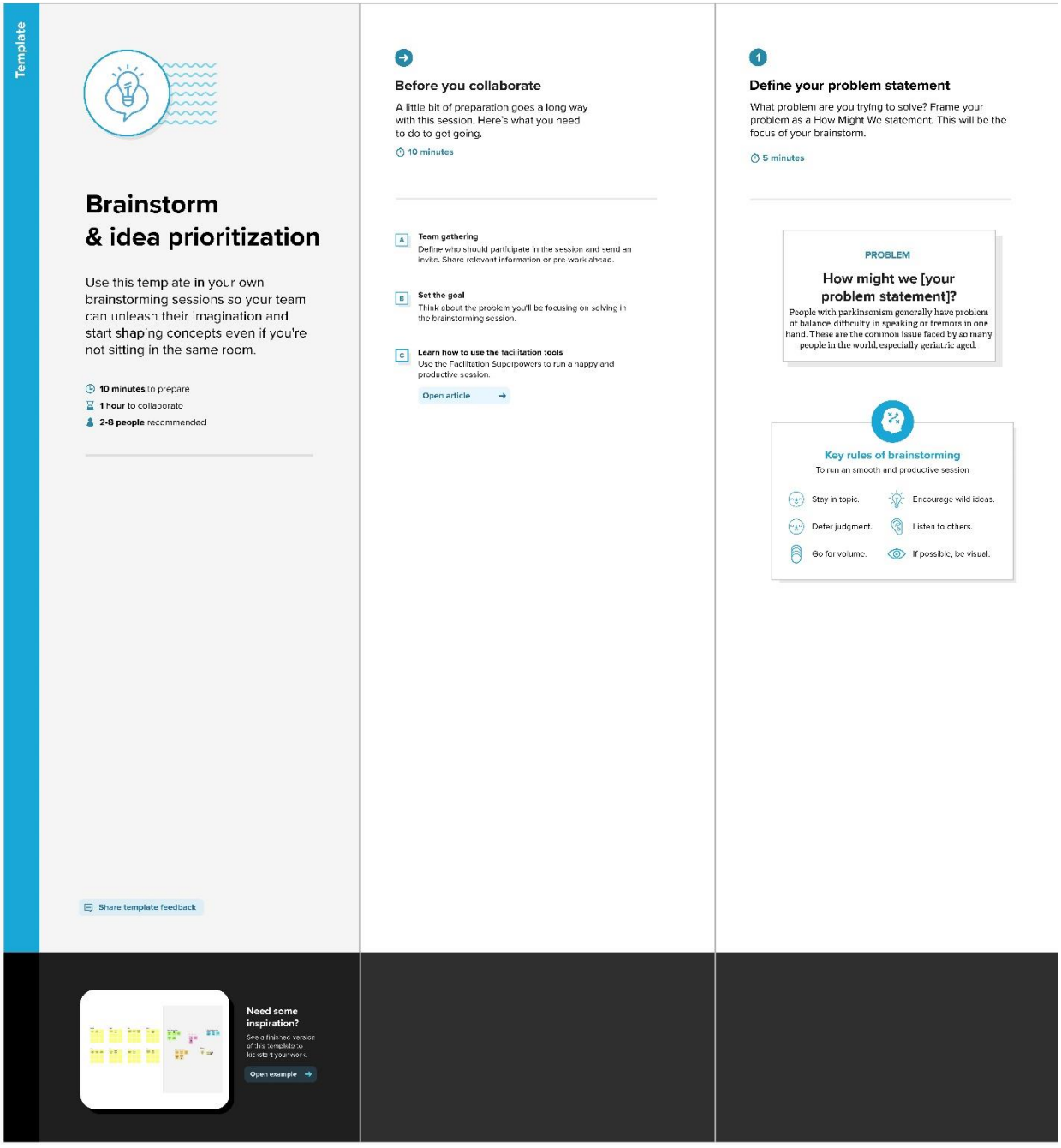
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's Behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise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



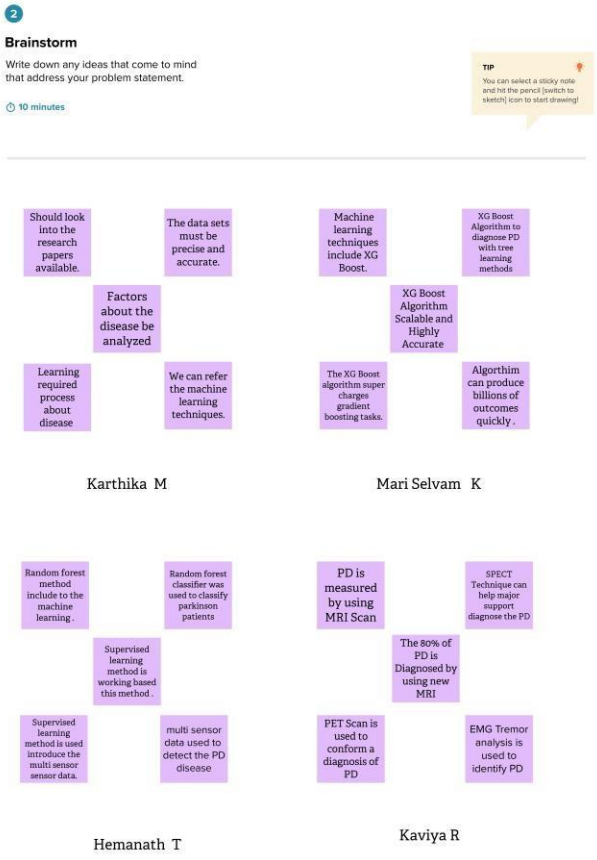
## 3.2 IDEATION & BRAINSTORMING

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,out participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

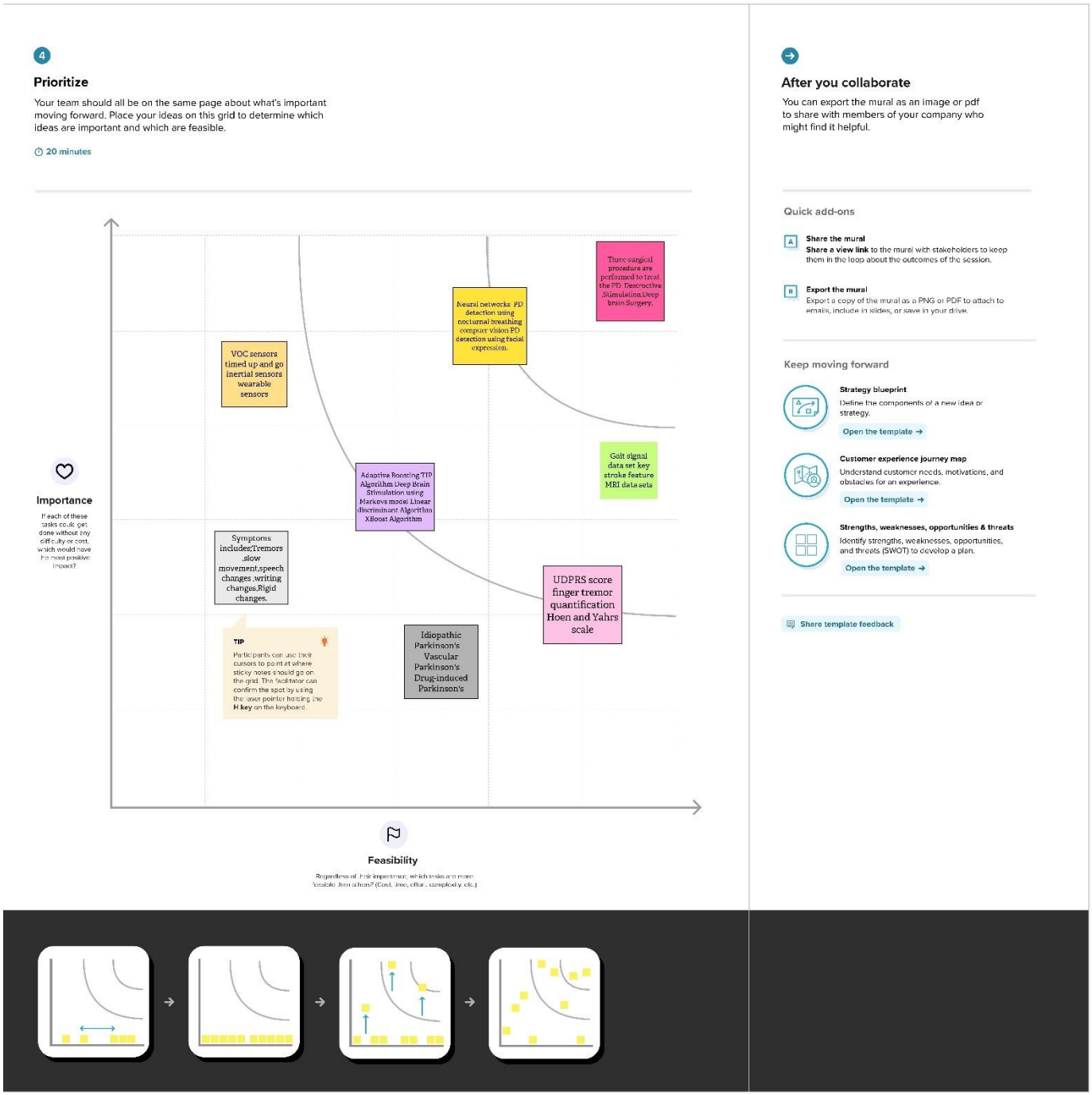
### Step-1: Team Gathering, Collaboration and Select the Problem Statement



# Step-2: Brainstorm, Idea Listing and Grouping




# Step-3: Idea Prioritization

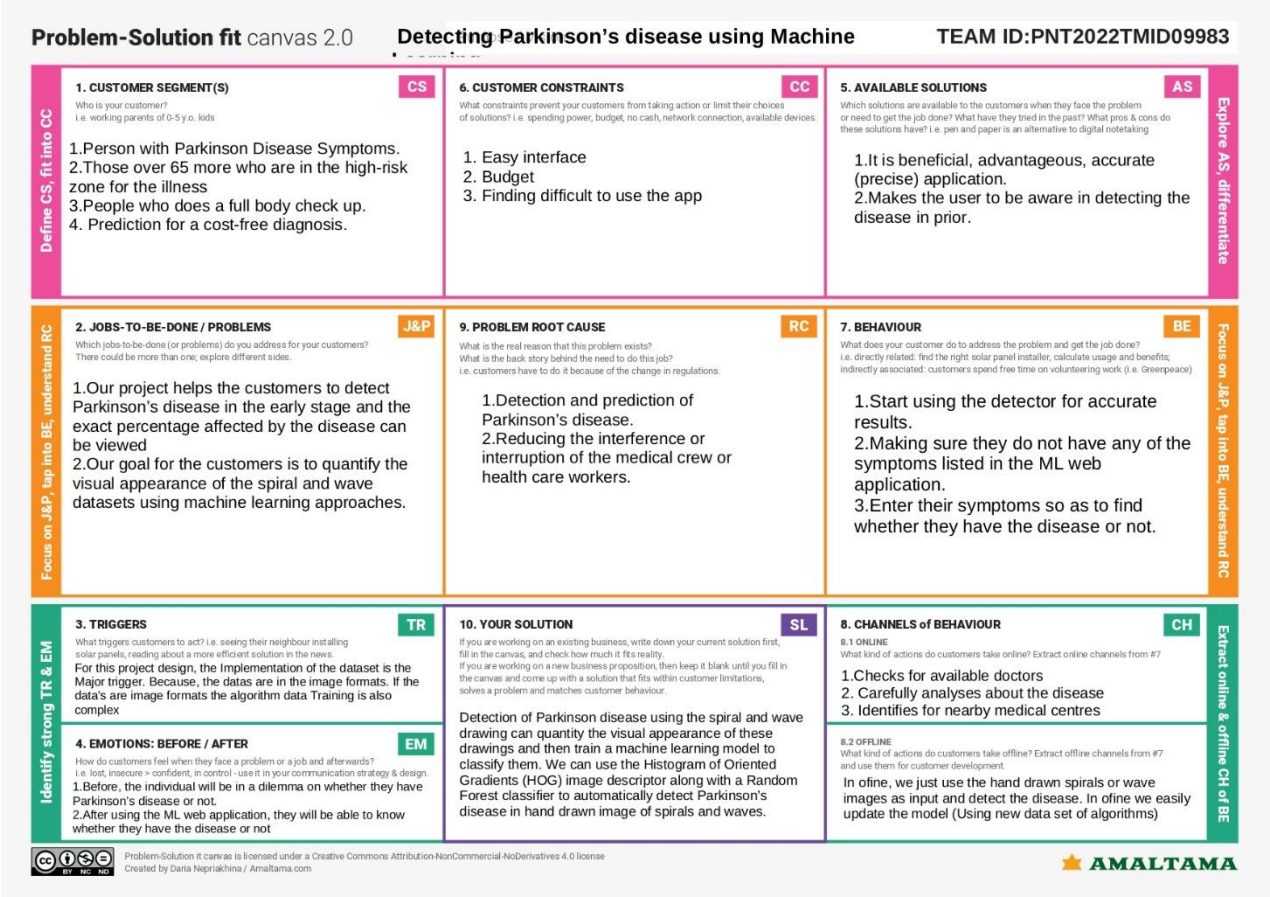


## 3.1 PROPOSED SOLUTION

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

| S.NO | PARAMETER | DESCRIPTION |
|---|---|---|
| 1 | Problem Statement (Problem to be solved | Parkinson's cannot be cured; early detection along with proper medication may decrease the symptoms and will improvequality of life. We focus on predicting the disease using Random Forest classifier to automatically detect Parkinson's disease in handdrawn images of spirals and waves. |
| 2 | Idea / Solution description. | In this project, we are using the HOG (Histogram of OrientedGradients) which uses the image detector and processor along with the Random Forest Classifier which can automatically detect the presence of Parkinson's Diseasein the hand drawn image of the waves and spirals |
| 3 | Novelty / Uniqueness | The histogram of oriented gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in localized portions of an image.random forest in combination with this can help in the better tree building. We combining the both will help in developing th model. |
| 4 | Social Impact/ Customer Satisfaction | In the Scientific perspective, the "Early" is easy to comprehend within the Framework of Disease pathology and itsmanifestation,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 focuses and concentrates on reaching the patients those who are suffering from Parkinson's and taking treatment from doctors. |
| 6 | Scalability of the Solution | The nature of RF is such that convergence and numerical precision issues, which can sometimes trip up the algorithms used in logistic and linear regression, as well as neural networks, aren't so important. Because of this, you don't need to transform variables to a common scale like you might with a NN. |

# 3.4 PROBLEM SOLUTION FIT



# 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 / SubTask)** |
|---|---|---|
| FR-1 | User Authentication | 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 itrecognize the voice and return the required output. |

## 4.2 NON-FUNCTIONAL REQUIREMENT

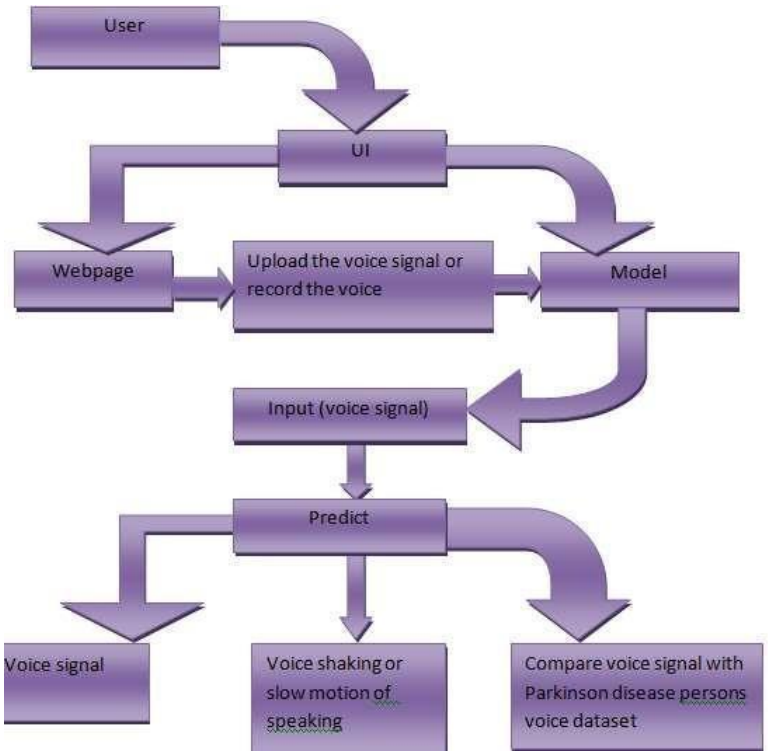
Following are the non-functional requirements of the proposed solution.

| 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 amixed 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 maximum number of clients. . The system must use higher RAM and CPU processing | This software will be enterprise s |

# CHAPTER 5
# PROJECT DESIGN

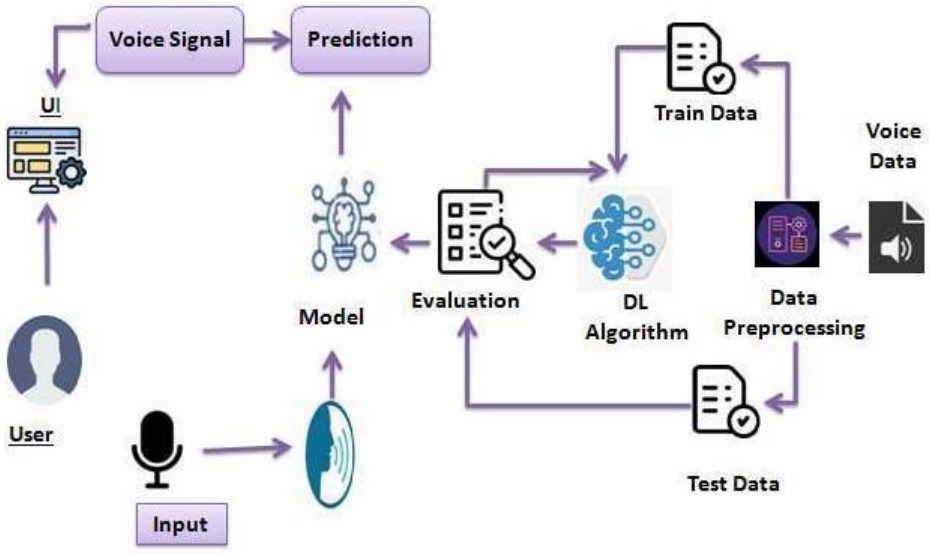
## 5.1 DATA FLOW DIAGRAM

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.



## 5.2 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 displayhelps you keep track of events or activities quickly by displaying important data insights and analyses on one or more pages or screens.



## 5.3 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 | EnteringWebpage | Enter the application | High | Sprint 1 |
| **INPUT DATA** | Homepage | USN-2 | Entering to the “Homepage” of the UI(Webpage) | Enter the homepage | High | Sprint 1 |
| **DATA VALIDATION** | About | USN-3 | I can click on the “About” to details about the Application | Get the details about the application | Low | Sprint 2 |
| **CLASSIFICATION** | Begin | USN-4 | As a user I can upload my voice signal from the computer. | Choose my voice recording from my device | High | Sprint 2 |
| **APP WORK** | Predict | USN-5 | As a user I can turn on the microphone or earphone to record my voice | Turn on the microphone or earphone forprediction | High | Sprint 3 |
| | | USN-6 | Predicting by using voice signal | Can monitor voice change or voice shaking | High | Sprint 3 |

# CHAPTER 6
# PROJECT PLANNING & SCHEDULING

## 6.1 SPRINT PLANNING & ESTIMATION

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| Sprint1 | Registration | USN-1 | As a user, I can register for the application by entering my email, password, and confirming my password. | 3 | High | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint1 | | USN-2 | As a user, I will receive confirmation email once I have registered for the application | 2 | High | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint2 | | USN-3 | As a user, I can register for the application through Facebook | 3 | Low | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint2 | | USN-4 | As a user, I can register for the application through Gmail | 3 | Medium | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint2 | Login | USN-5 | As a user, I can log into the application by entering email & password | 3 | High | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint3 | Dashboard | USN-6 | As a user, I can upload my images and get my details. | 3 | High | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint1 | Logout | USN-7 | As a user I can logout successfully. | 2 | Medium | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sprint4 | 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 | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| **Sprint** | **Functional Requirement (Epic)** | **User Story Number** | **User Story / Task** | **Story Points** | **Priority** | **Team Members** |
| | | | | | | |
| Sprint3 | Image processing localization | USN-9 | The uploaded image is pre-processed and fed into trained model. | 3 | High | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint4 | Classification and prediction | USN-9 | The model classifies and predicts the type of disease. | 3 | High | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |
| Sprint4 | Report generation | USN-10 | Based on the prediction of Parkinson's disease, the health care is generated to provide the feedback. | 2 | Medium | Karthika M<br>Mari Selvam K<br>Hemanath T<br>Kaviya R |

## 6.2 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) |
|---|---|---|---|---|---|---|
| Sprint1 | 20 | 6 Days | 20 Oct 2022 | 26 Oct 2022 | 20 | 26 Oct 2022 |
| Sprint2 | 20 | 6 Days | 27 Oct 2022 | 02 Nov 2022 | 20 | 31 O ct 2022 |
| Sprint3 | 20 | 6 Days | 02 Nov 2022 | 08 Nov 2022 | 20 | 06 Nov 2022 |
| Sprint4 | 20 | 6 Days | 08 Nov 2022 | 14 Nov 2022 | 20 | 08 Nov 2022 |

# CHAPTER 7
# CODING &SOLUTION

## 7.1 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.

## 7.2 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 a nonlinear radial basis function kernel to categorise 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 controls.

# CHAPTER 8
# TESTING

## 8.1 TEST CASES

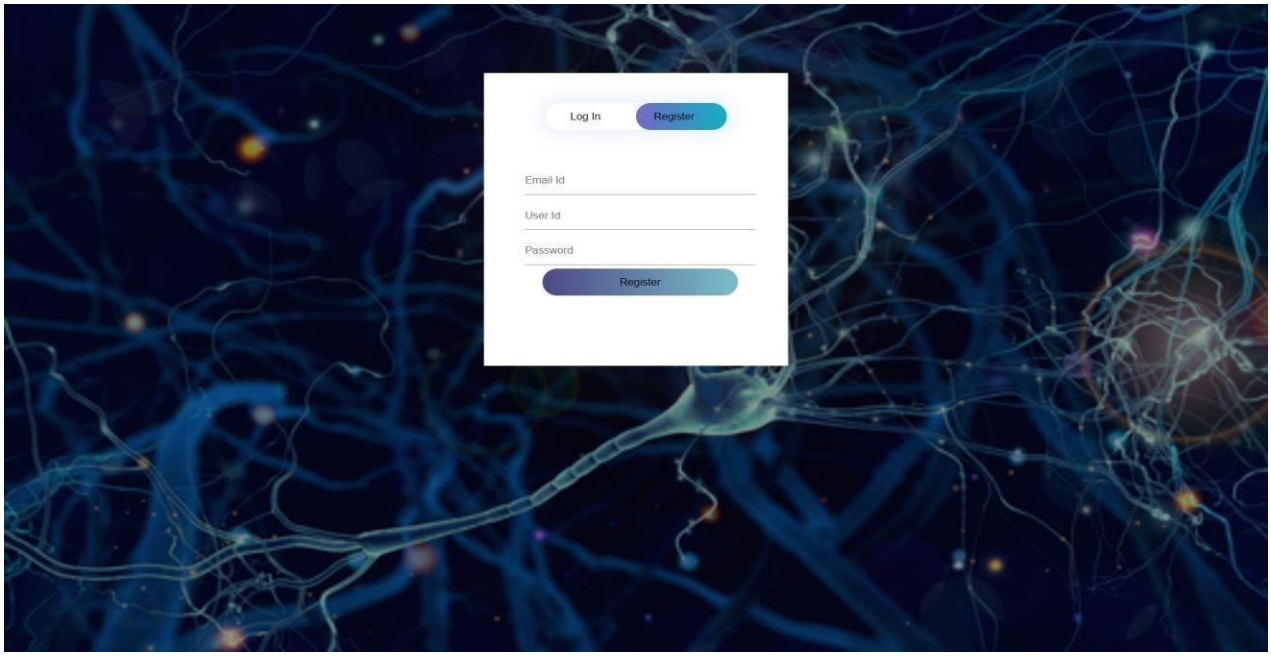
The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product. It is the process of exercising software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

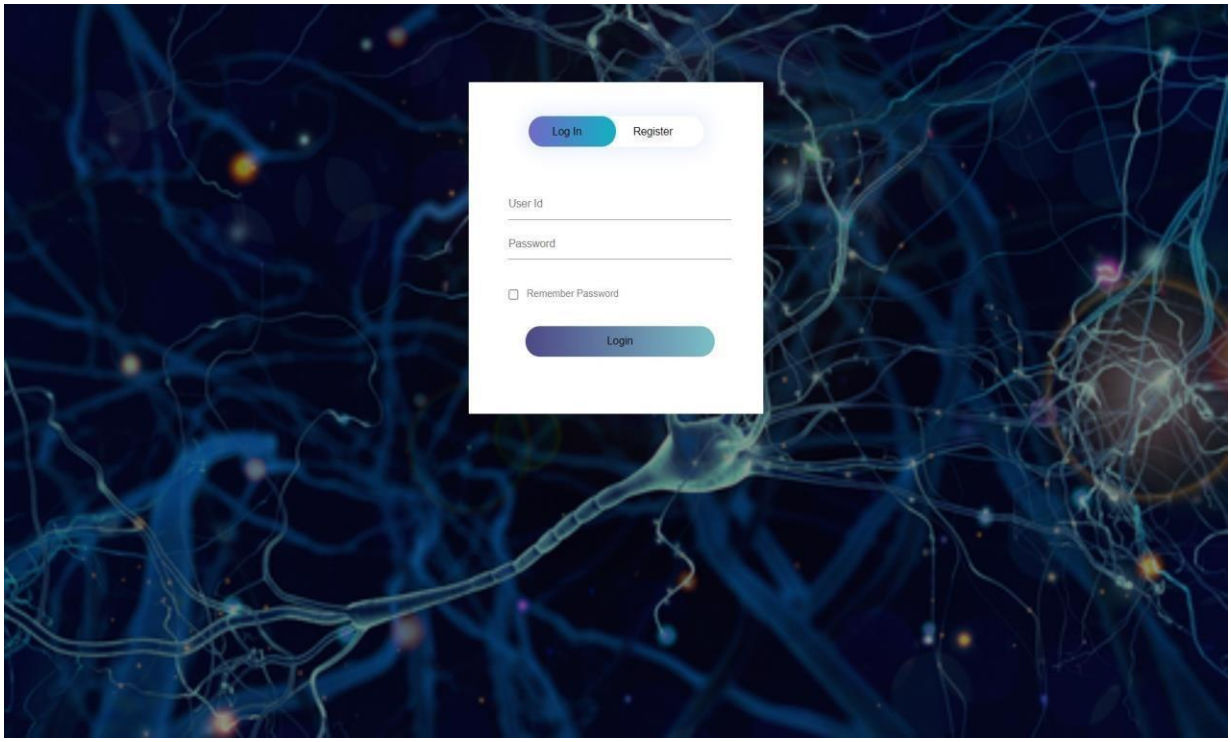
## 8.2 USER ACCEPTANCE TESTING

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.

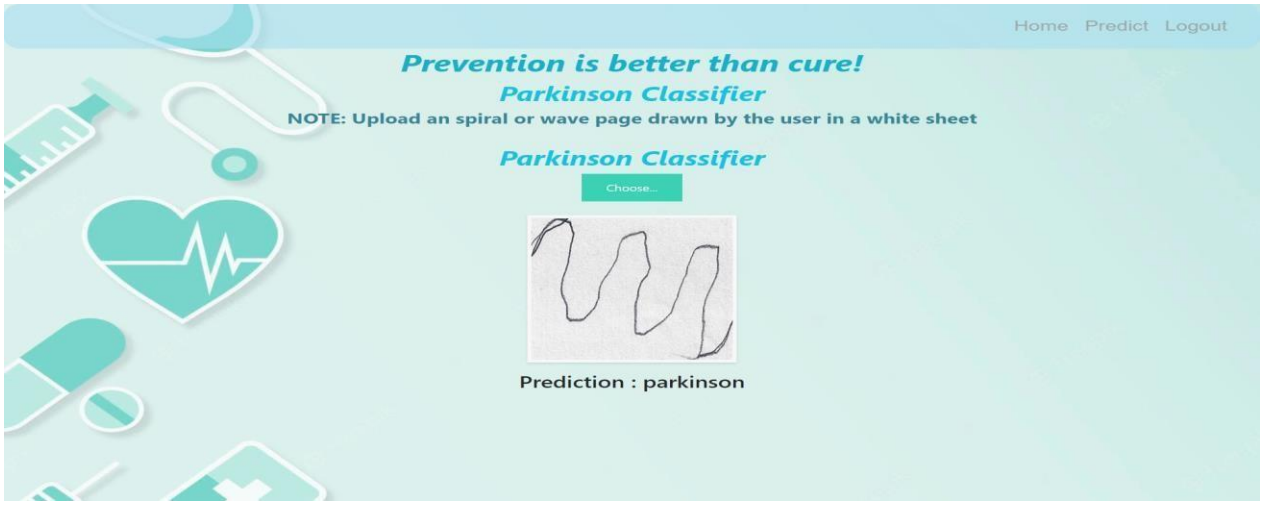
# CHAPTER 9

# RESULTS 9.1

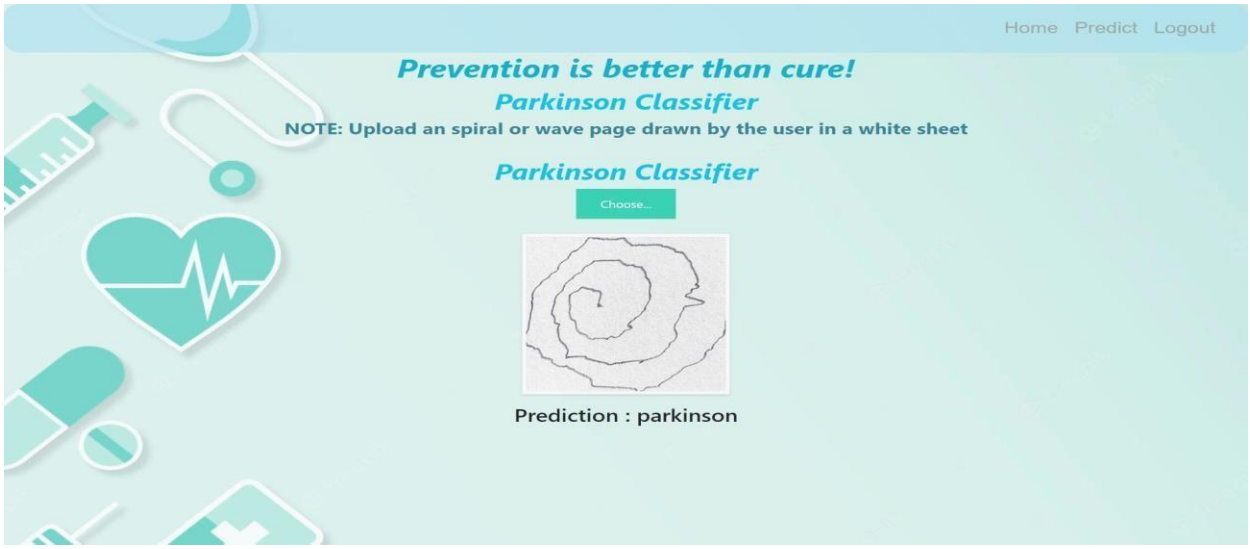



Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : healthy


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : parkinson


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : healthy


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : parkinson

# CHAPTER 10

## 10.1 ADVANTAGES 1.

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.

## 10.2 DISAVANTAGES 1.

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 8

## 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 emphasise the importance of early Parkinson's disease prediction and detection

# CHAPTER 12

## 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 13

## APPENDIX 13.1

```
<!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><img src="https://www.scientificanimations.com/wp-content/uploads/2017/12/Parkinson%E2%80%99s-Disease.jpg" title="Disease"></span>
    <span><img src="https://image.freepik.com/free-vector/parkinson-disease-symptoms-infographic_1308-46947.jpg" title="Symptoms"></span>
    <span><img src="http://media.eurekalert.org/multimedia_prod/pub/web/212358_web.jpg" title="Stages"></span>
    <span><img src="http://media.eurekalert.org/multimedia_prod/pub/web/212358_web.jpg" title="Effect"></span>
    <span><img src="https://images.fineartamerica.com/images-medium-large-5/1-parkinsons-disease-gunilla-elamscience-photo-library.jpg" title="Cause"></span>
    <span><img src="https://jnnp.bmj.com/content/jnnp/91/8/795/F4.large.jpg" title="diagnosis"></span>


    <span><img id="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>
```

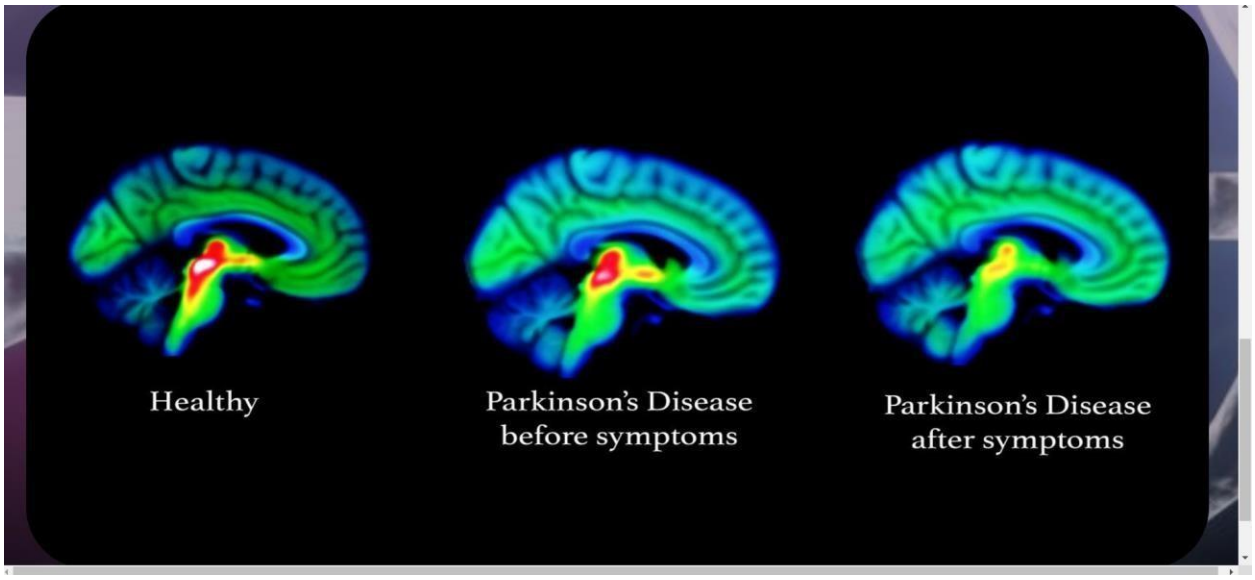
```
<!DOCTYPE
html>
                <html lang="en">
                  <head>
                    <meta charset="UTF-8">
                    <meta name="viewport" content="width=device-width, initial-scale=1.0">
                    <meta http-equiv="X-UA-Compatible" content="ie=edge">
                    <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;
```

```
    text-align:center;
    color:rgb(20, 176, 204);
    font-style:italic;
    font-weight:bolder;
}
h2{
    font-size:60px;
    text-align:center;
    color:rgb(17, 196, 227);
    font-style:italic;
    font-weight:bolder;
}
h5{
    font-size:25px;
    text-align:center;
    color:rgb(53, 134, 152);
    font-weight:bolder;
}
.upload-label{
    display: inline-block;
    padding: 12px 30px;
    background: #90efdc;
    color: #fff;
    font-size: 1em;
    transition: all .4s;
    cursor: pointer;
}



.upload-label:hover{
    background: #bacada;
    color: #39D2B4;
}
.btn-pred{
    display: inline-block;
    padding: 12px 30px;
    background: #4f8c80;
    color: #fff;
    font-size: 1em;
    transition: all .4s;
    cursor: pointer;
}
.img-preview {
    width: 256px;
    height: 256px;
    position: relative;
    border: 5px solid #F8F8F8;
```

```
        box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
        margin-top: 1em;
        margin-bottom: 1em;
      }


      .img-preview>div {
        width: 100%;
        height: 100%;
        background-size: 256px 256px;
        background-repeat: no-repeat;
        background-position: center;
      }


      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>
```

## OUTPUT


```
<!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:400px;
            height:350px;
            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>More than 10 million people are living with Parkinson’s Disease worldwide, according to the Parkinson’s Foundation. While Parkinson’s cannot be cured, early detection along with proper medication can significantly improve symptoms and quality of life</p>
    <p>The researchers found that the drawing speed was slower and the pen pressure is lower among Parkinson’s patients. One of the indications of Parkinson’s is tremors and rigidity in the muscles, making it difficult to draw smooth spirals and waves.</p>
    </center>
    <span><img src="https://www.scientificanimations.com/wp-content/uploads/2017/12/Parkinson%E2%80%99s-Disease.jpg" title="Disease"></span>
    <span><img src="https://image.freepik.com/free-vector/parkinson-disease-symptoms-infographic_1308-46947.jpg" title="Symptoms"></span>
    <span><img src="http://media.eurekalert.org/multimedia_prod/pub/web/212358_web.jpg" title="Stages"></span>
    <span><img src="http://media.eurekalert.org/multimedia_prod/pub/web/212358_web.jpg" title="Effect"></span>
    <span><img src="https://images.fineartamerica.com/images-medium-large-5/1-parkinsons-disease-gunilla-elamscience-photo-library.jpg" title="Cause"></span>
    <span><img src="https://jnnp.bmj.com/content/jnnp/91/8/795/F4.large.jpg" title="diagnosis"></span>
    <span><img id="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>
  <head>
    <title>PARKINSON'S DISEASE </title>
    <link rel = "stylesheet" href="{{url_for('static',filename='css/style.css')}}">
  </head>
```

```
  <body>
    <div class="hero">
      <div class="form-box">
        <div class="button-box">
          <div id="btn"></div>
          <button type="button" class="toggle-btn" onclick="login()">Log In</button>
          <button type="button" class="toggle-btn" onclick="register()">Register</button>
        </div>
        <form id="login" class="input-group" action="/form_login" method="post">
          <input type="text" class="input-field" placeholder="User Id" name ="userid" required>
          <input type="text" class="input-field" placeholder="Password" name="pwd" required>
          <input type="checkbox" class="check-box"><span>Remember Password</span>
          <button type="submit" class="submit-btn" value="Login">Login</button>
        </form>
        <h6 class="err">{{info}}</h6>
        <form id="register" class="input-group" action="/form_reg" method="post">


<input type="email" class="input-field" placeholder="Email Id">
          <input type="text" class="input-field" placeholder="User Id" name ="userid" required>
          <input type="text" class="input-field" placeholder="Password" name="pwd" required>
          <button type="submit" id = "sub" class="submit-btn" >Register</button>
        </form>
        <h6 class="err">{{info}}</h6>
      </div>
    </div>
    <script>
      var x = document.getElementById("login")
      var y = document.getElementById("register")
      var z = document.getElementById("btn")
      function register(){
        x.style.left = "-400px";
        y.style.left = "50px";
        z.style.left = "110px";
      }
      function login(){
        x.style.left = "50px";
        y.style.left = "450px";
        z.style.left = "0px";
      }
    </script>
  </body>
</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>Predict</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
    <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
    <style>
      .bar
      {
        margin: 0px;
        padding:20px;
```

```
            background-color:rgb(169, 223, 241);
            opacity:0.6;
            color:black;
            font-family:'Roboto',sans-serif;
            font-style: italic;
            border-radius:20px;
            font-size:25px;
        }
        a{
            color:grey;
            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;
        }
        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%;
        }
        h1{
            font-size:40px;
            text-align:center;
            color:rgb(20, 176, 204);
            font-style:italic;
            font-weight:bolder;
        }









        h2{
            font-size:35px;
            text-align:center;
            color:rgb(17, 196, 227);
            font-style:italic;
            font-weight:bolder;
        }
        h5{
            font-size:25px;
            text-align:center;
            color:rgb(53, 134, 152);
            font-weight:bolder;
        }
    </style>
</head>
<body>
    <div class="bar">
        <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">{% block content %}{% endblock %}</div></center>
      </div>
   </body>

   <footer>
      <script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
   </footer>
</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>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:400px;
            height:350px;
            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>More than 10 million people are living with Parkinson’s Disease worldwide, according to the Parkinson’s Foundation. While Parkinson’s cannot be cured, early detection along with proper medication can significantly improve symptoms and quality of life</p>
    <p>The researchers found that the drawing speed was slower and the pen pressure is lower among Parkinson’s patients. One of the indications of Parkinson’s is tremors and rigidity in the muscles, making it difficult to draw smooth spirals and waves.</p>
    </center>
    <span><img src="https://www.scientificanimations.com/wp-content/uploads/2017/12/Parkinson%E2%80%99s-Disease.jpg" title="Disease"></span>
    <span><img src="https://image.freepik.com/free-vector/parkinson-disease-symptoms-infographic_1308-46947.jpg" title="Symptoms"></span>
    <span><img src="http://media.eurekalert.org/multimedia_prod/pub/web/212358_web.jpg" title="Stages"></span>
    <span><img src="http://media.eurekalert.org/multimedia_prod/pub/web/212358_web.jpg" title="Effect"></span>
    <span><img src="https://images.fineartamerica.com/images-medium-large-5/1-parkinsons-disease-gunilla-elamscience-photo-library.jpg" title="Cause"></span>
    <span><img src="https://jnnp.bmj.com/content/jnnp/91/8/795/F4.large.jpg" title="diagnosis"></span>
    <span><img id="im" src="https://www.genengnews.com/wp-content/uploads/2019/06/203938_web.jpg" title="Stage"></span>
    <br><br><br><br><br>
    </div>
</body>
```

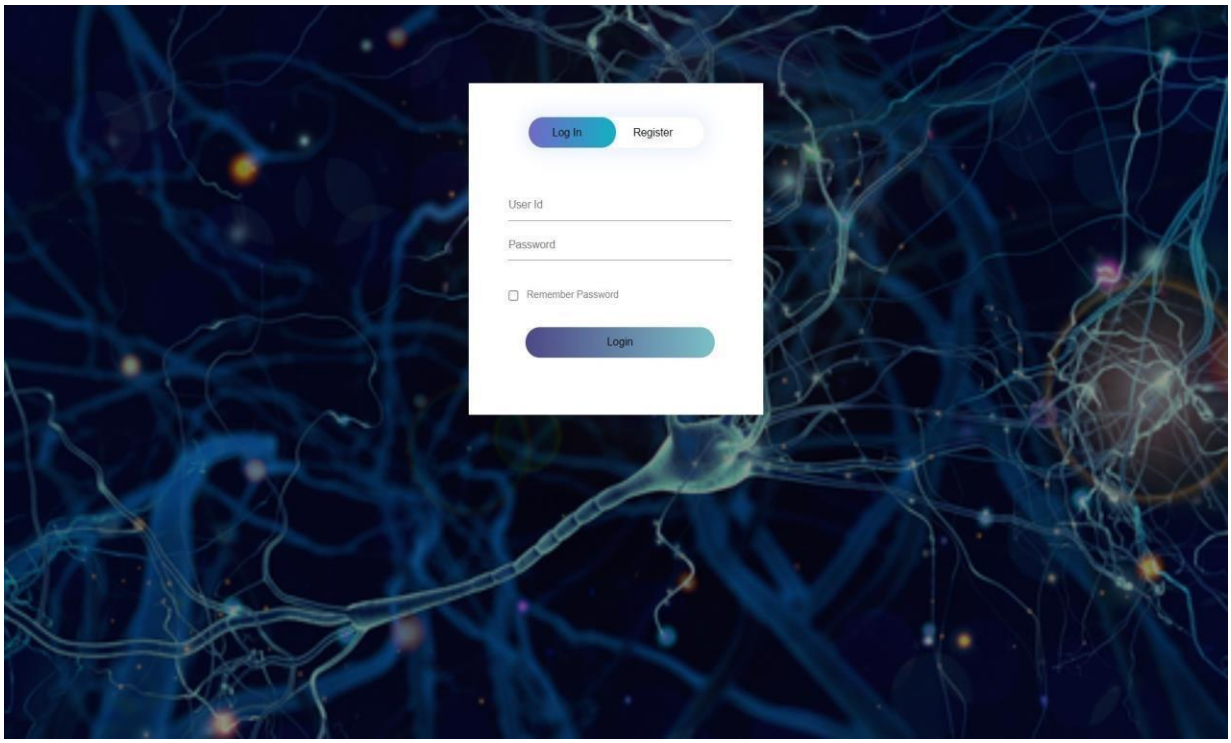
```
</html>



<html>
  <head>
    <title>PARKINSON'S DISEASE </title>
    <link rel = "stylesheet" href="{{url_for('static',filename='css/style.css')}}">
  </head>
  <body>
    <div class="hero">
      <div class="form-box">
        <div class="button-box">
          <div id="btn"></div>
          <button type="button" class="toggle-btn" onclick="login()">Log In</button>
          <button type="button" class="toggle-btn" onclick="register()">Register</button>
        </div>

        <form id="login" class="input-group" action="/form_login" method="post">
          <input type="text" class="input-field" placeholder="User Id" name ="userid" required>
          <input type="text" class="input-field" placeholder="Password" name="pwd" required>
          <input type="checkbox" class="check-box"><span>Remember Password</span>
          <button type="submit" class="submit-btn" value="Login">Login</button>
        </form>
        <h6 class="err">{{info}}</h6>
        <form id="register" class="input-group" action="/form_reg" method="post">
          <input type="email" class="input-field" placeholder="Email Id">
          <input type="text" class="input-field" placeholder="User Id" name ="userid" required>
          <input type="text" class="input-field" placeholder="Password" name="pwd" required>
          <button type="submit" id = "sub" class="submit-btn" >Register</button>
        </form>
        <h6 class="err">{{info}}</h6>
      </div>
    </div>
    <script>
      var x = document.getElementById("login")
      var y = document.getElementById("register")
      var z = document.getElementById("btn")
      function register(){
        x.style.left = "-400px";
        y.style.left = "50px";
        z.style.left = "110px";
      }
      function login(){
        x.style.left = "50px";
        y.style.left = "450px";
        z.style.left = "0px";
      }
    </script>
  </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{
```

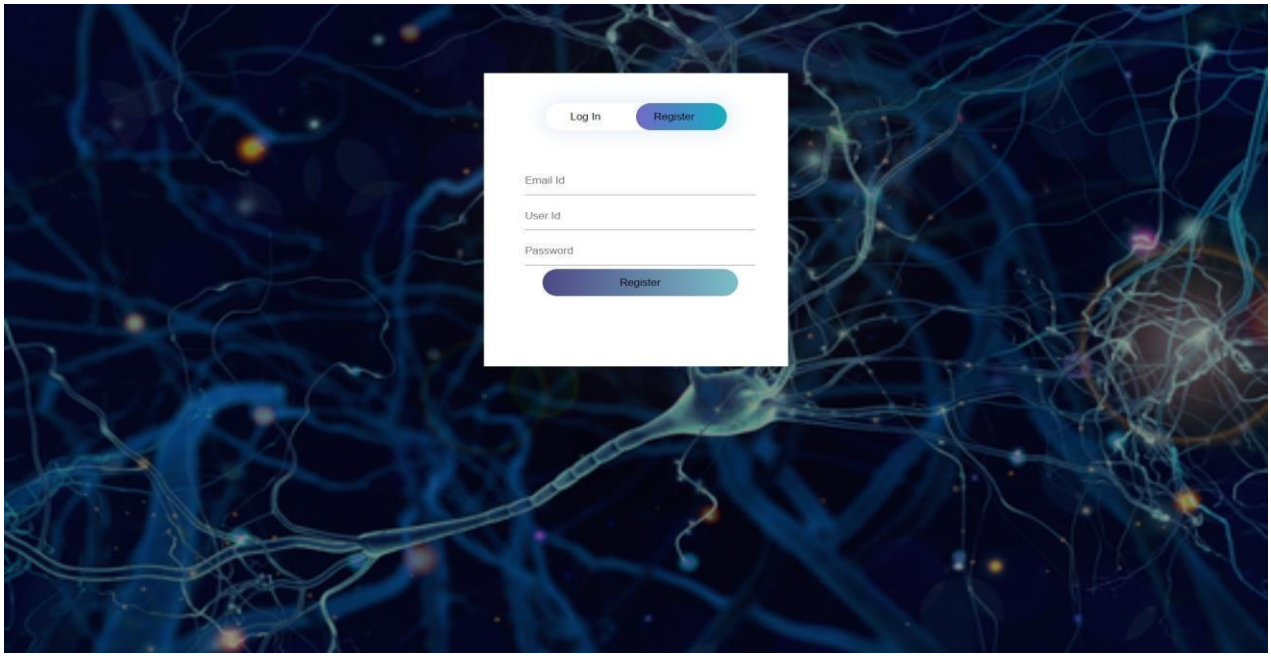
```
        background-image:
url("https://images.creativemarket.com/0.1.0/ps/6189315/1820/1214/m1/fpnw/wm1/dzrx62h86ilgel8q1meaokwa8tb26gwc6ea3
vrpxmmf14wdpom9wpt1zznfi7dut-.jpg");
        position: relative;
        background-size: cover;
        background-repeat: no-repeat;
        height: 100%;
        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;
        text-align:center;
        color:rgb(20, 176, 204);
        font-style:italic;
        font-weight:bolder;
    }
    h2{
        font-size:60px;
        text-align:center;
        color:rgb(17, 196, 227);
        font-style:italic;
        font-weight:bolder;
    }
    h5{
        font-size:25px;
        text-align:center;
        color:rgb(53, 134, 152);
        font-weight:bolder;
    }
    .upload-label{
        display: inline-block;
        padding: 12px 30px;
        background: #90efdc;
        color: #fff;
        font-size: 1em;
        transition: all .4s;
```

```
            cursor: pointer;
        }


        .upload-label:hover{
            background: #bacada;
            color: #39D2B4;
        }
        .btn-pred{
            display: inline-block;
            padding: 12px 30px;
            background: #4f8c80;
            color: #fff;
            font-size: 1em;
            transition: all .4s;
            cursor: pointer;
        }
        .img-preview {
            width: 256px;
            height: 256px;
            position: relative;
            border: 5px solid #F8F8F8;
            box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
            margin-top: 1em;
            margin-bottom: 1em;
        }

        .img-preview>div {
            width: 100%;
            height: 100%;
            background-size: 256px 256px;
            background-repeat: no-repeat;
            background-position: center;
        }

        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>
```

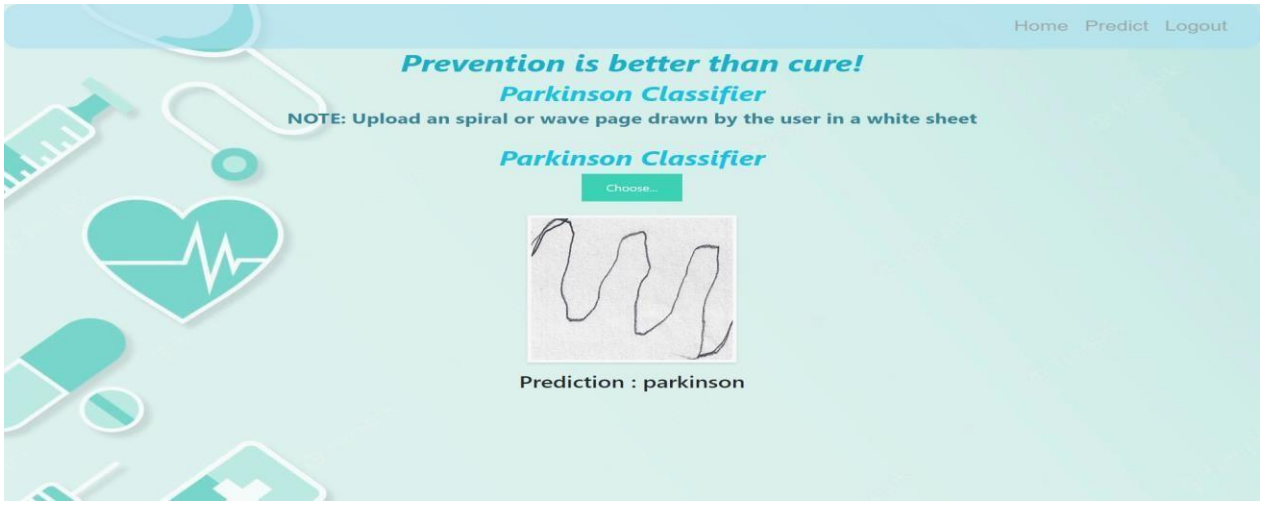
```
    <h5>NOTE: Upload an spiral or wave page drawn by the user in a white sheet</h5>
    <div class="container">
      <center> <div id="content" style="margin-top:2em">
        <div>
          <form id="upload-file" method="post" enctype="multipart/form-data">
            <center>
              <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>
```

## OUTPUT

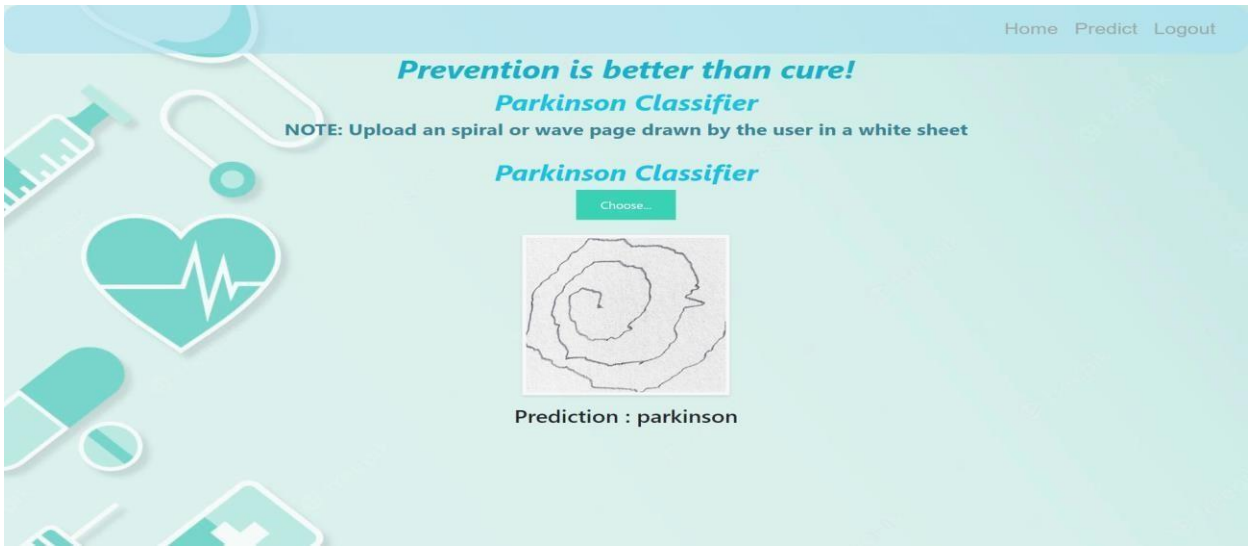

Log In
Register
User Id
Password
Remember Password
Login


Log In
Register
Email Id
User Id
Password
Register


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : healthy


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : parkinson


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : healthy


Home Predict Logout
Prevention is better than cure!
Parkinson Classifier
NOTE: Upload an spiral or wave page drawn by the user in a white sheet
Parkinson Classifier
Choose...
Prediction : parkinson