DETECTING PARKINSON’S DISEASE USING MACHINE LEARNING

[**IBM Project 14968-1659592740**](https://github.com/IBM-EPBL/IBM-Project-14968-1659592740)

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**COIMBATORE**

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**DETECTING PARKINSON’S DISEASE USING MACHINE LEARNING**

1. **INTRODUCTION**

# ProjectOverview

The Parkinson Disease Obstructive rest apnea (PDSA) which is the most well-known rest issue breathing (SDB), forces substantial expenses on wellbeing and economy. The point of this investigation was to give models dependent on information mining draws near (Sequential insignificant Optimization ) and pick a top model for foreseeing PDSAD without polysomnography (PSG) gadgets that is a standard strategy for analysis of this ailment, to recognize patients with this disorder installment.

Machine Learning is an analytic process designed to explore data usually large amounts of data - typically business or market related in search of consistent patterns and/or systematic relationships between variables, and then to validate the findings by applying the detected patterns to new subsets of data. The ultimate goal of Machine Learning is prediction - and predictive Machine Learning is the most common type of Machine Learning and one that has the most direct business applications.

# Purpose

❖ To provide an efficient solution to detect the presence of Parkinson’s Disease in a patient using Deep Learning Architecture.

❖ Develop a Histogram Oriented Gradient (HOG) Architecture to boost the accuracy of prediction.

❖ Reduces the time required for manual classification and eliminates the human error.

❖ Due to Early detection of the disease further medication cost will be reduced.

# LITERATURESURVEY

* 1. **Existing problem**

The Acute respiratory distress disease accounts to be the leading cause of death worldwide. It is difficult for medical practitioners to predict the Acute respiratory distress disease as it is a complex task that requires experience and knowledge. Machine Learning enable the health sector to predict patterns in the dataset. Analyze the Acute respiratory distress disease dataset available from the UCI machine learning with the aim of developing accurate prediction models for Acute respiratory distress disease using Machine Learning techniques. The collected dataset was investigated with Weka library and Net Beans IDE and a decision tree is produced using Fisher Filtering and classification is done effectively with Support Vector Machine..

# References

1. Anupama Bhan, Sona Kapoor, Manan Gulati," Diagnosing Parkinson's disease in Early Stages using Image Enhancement, ROI Extraction and Deep Learning Algorithms".[2021]

2.Beaumon, P. Onoma, M. Rimlinger, D. Broggio, P. CaldeiraIdeias andD.Franck,"Age-specific experimental and computational calibration of thyroid in vivomonitoring",IEEE Transactions on Radiation and Plasma Medical Sciences, Vol:2829931,2019 3. Chenchen Qin, Yi Wang, Na Wang, Min Xu, Junxiong Yu, Xiao Luo, Xin Yang. Tianfu Wang, Anhua Li, and Dong Ni" Deeply-Supervised Networks with ThresholdLoss for Cancer Detection in Automated Breast Ultrasound [Vol 0278-0062,2019]

3. David Russell, Jose M. Anton-Rodriguez, Peter Julyan, Ibrahim Djoukhadar, D. Gareth Evans, Alan Jackson, and Julian C. Matthews," Comparison of a Standard Resolution PET-CT Scanner With an HRRT Brain Scanner for Imaging Small Tumors Within the Head", IEEE Transactions on radiation and plasma medical sciences, vol. 3. no. 4, july 2019.

4. Jin Tae Kwak, Shekoofeh Azizi, ShararchBayat, Pingkun Yan, Amir Tahmasebi, Sheng Xu, Baris Turkbey, Peter Choyke, Peter Pinto, Bradford Wood, Parvin Mousavi, PurangAbolmaesumi," Deep Recurrent

Neural Networks for Prostate Cancer Detection: Analysis of Temporal Enhanced Ultrasound IEEE Transactions on Medical Imaging "[Vol.no:0278-0062,2018]

# ProblemStatementDefinition

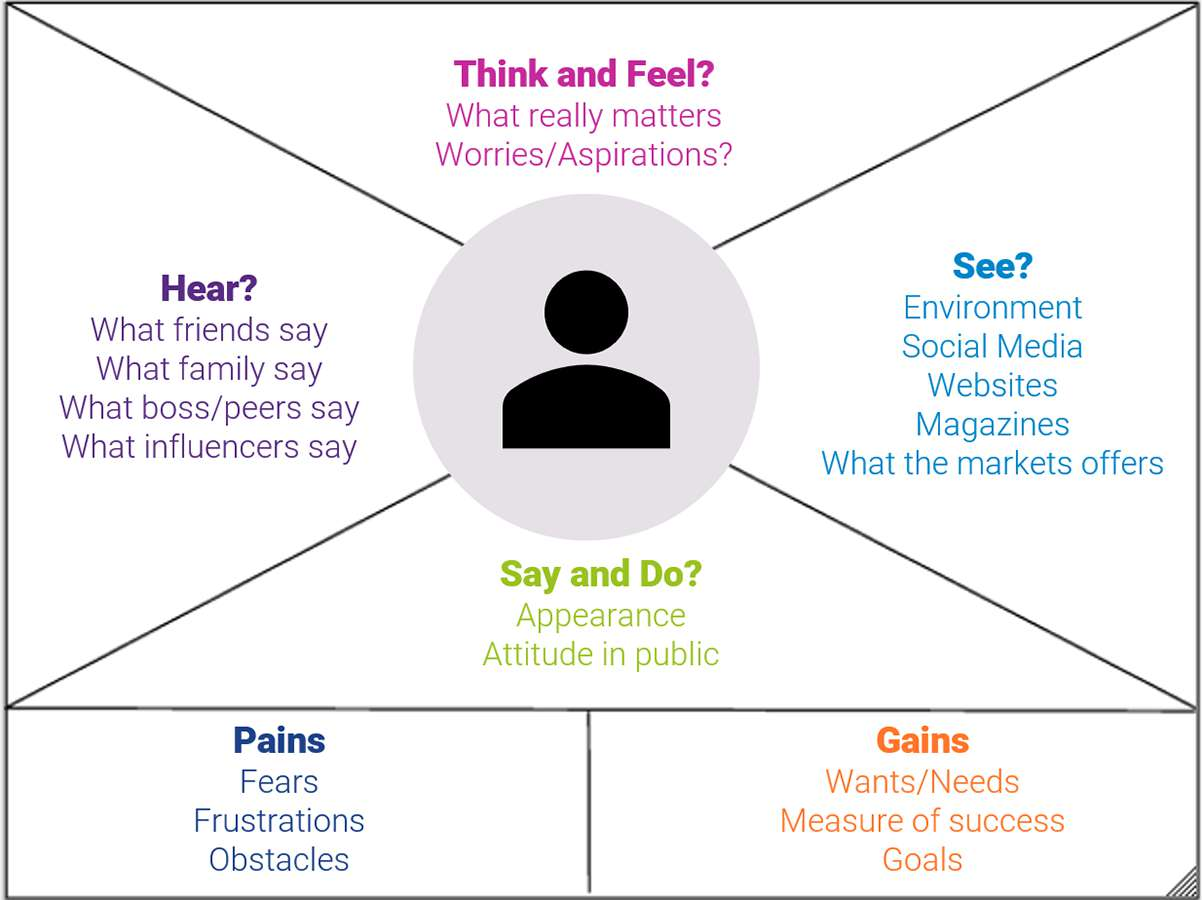
* The problem statement aims at detecting the presence of Parkinson's disease at an

early stage with the help of hand drawings to provide with essential medication to improve the expectancy of life.

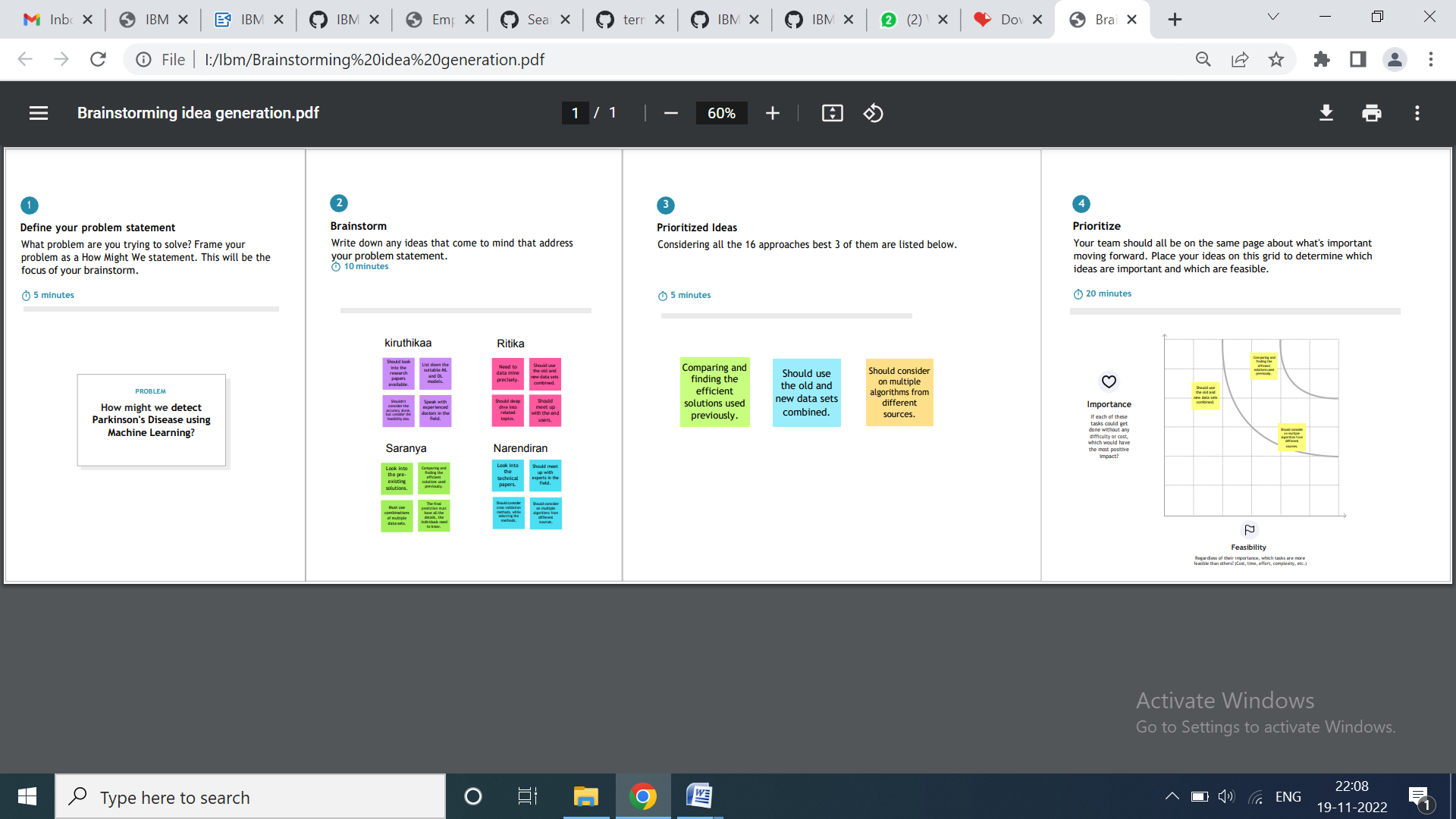
* User needs a way to know whether they are affected by Parkinson's disease so that they can consult for early medication.
* User with symptoms who needs to detect the disease to overcome suffering.

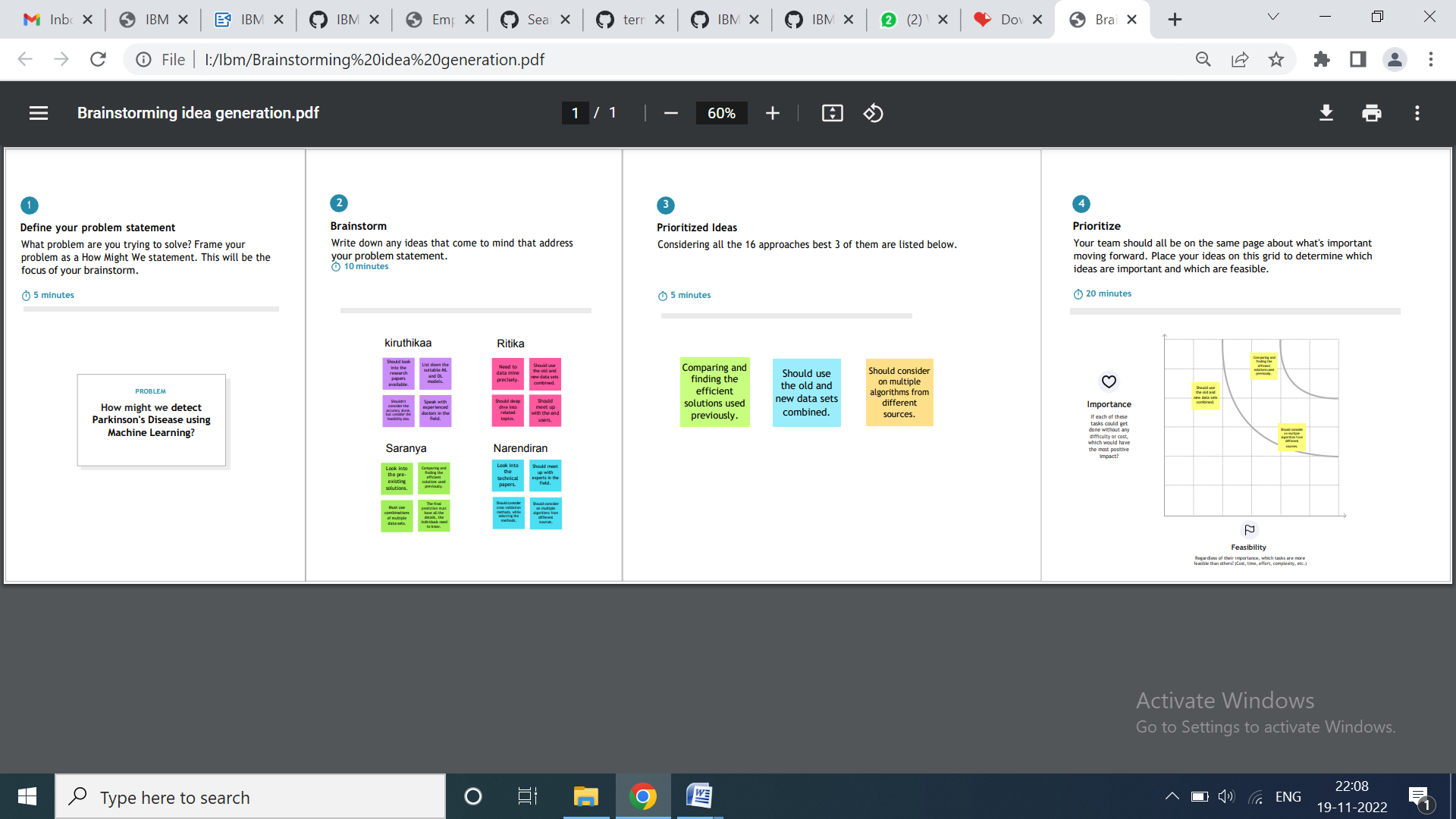
# IDEATION&PROPOSEDSOLUTION

* 1. **EmpathyMapCanvas**

****

# Ideation&Brainstorming

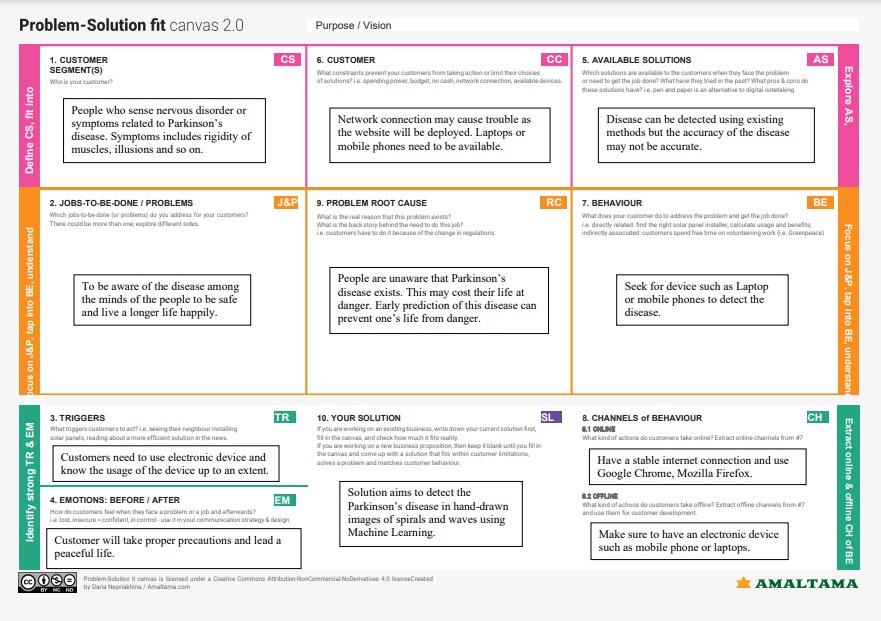
****



* 1. **Proposed Solution**

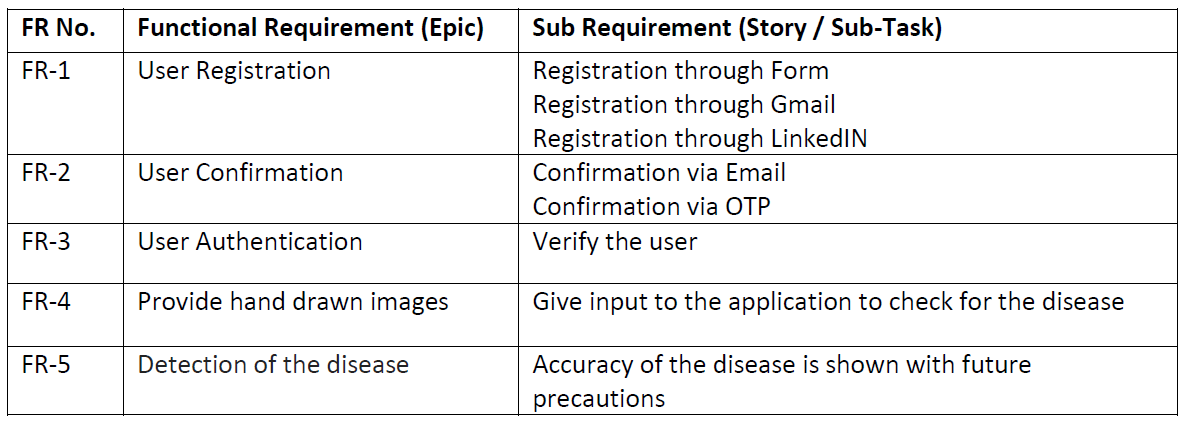
|  |  |  |
| --- | --- | --- |
| **S. No.** | **Parameter** | **Description** |
| 1. | Problem Statement (Problem to be solved) | Early and Automatic detection of Parkinson’s Disease in hand drawn images. |
| 2 | Idea / Solution description | Detection is done by using Histogram of Oriented Gradients (HOG) image descriptor along with a Random Forest classifier. |
| 3 | Novelty / Uniqueness | In this method, the approach to predict Parkinson's disease from hand-drawn wave and spiral images using computer vision and machine learning techniques has been recommended. The previous methods have their constraints. |
| 4 | Social Impact / Customer Satisfaction | People can detect the disease at a very early stage and improve the quality of living. They can take proper precautions and lead a healthy and safe life. |
| 5 | Business Model (Revenue Model) | It is cost efficient as it is a Software as a Service Platform. People need not spend much money to detect the disease. |
| 6 | Scalability of the Solution | Better execution in accuracy, sensitivity, and specificity as well as in system design flexibility. |

# ProblemSolutionfit

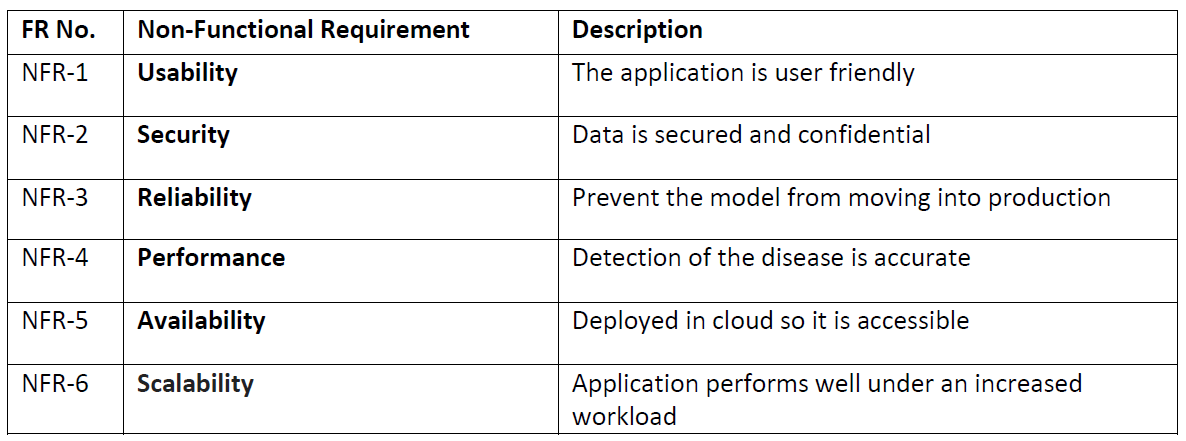


1. **REQUIREMENTANALYSIS**

# Functionalrequirement

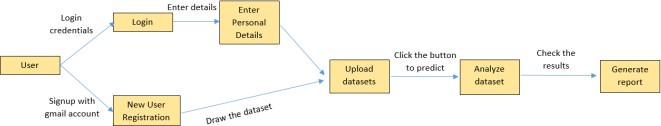


* 1. **Non-Functionalrequirements**



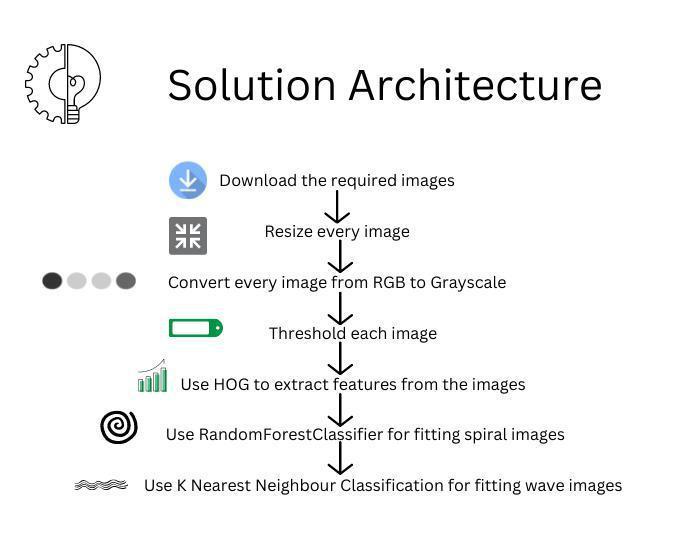
# PROJECTDESIGN

* 1. **DataFlowDiagrams**

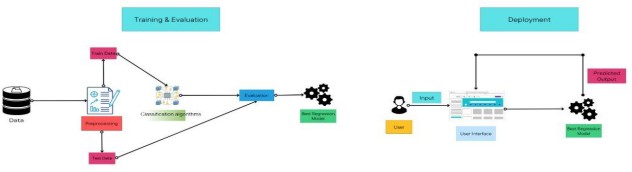
****

# Solution&TechnicalArchitecture

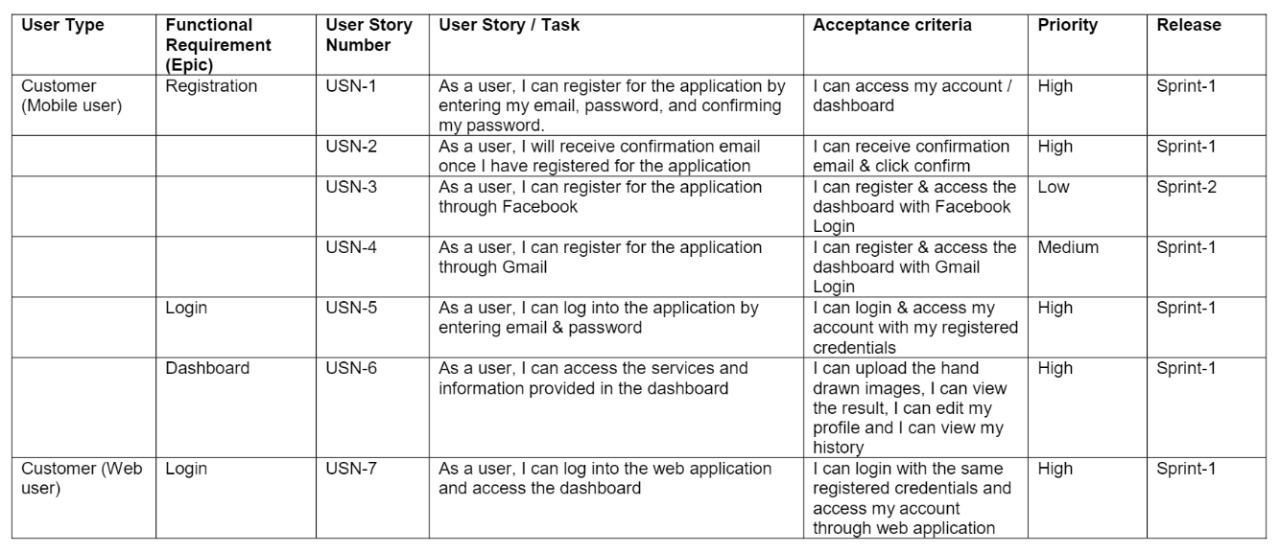
* + 1. **SolutionArchitecture**

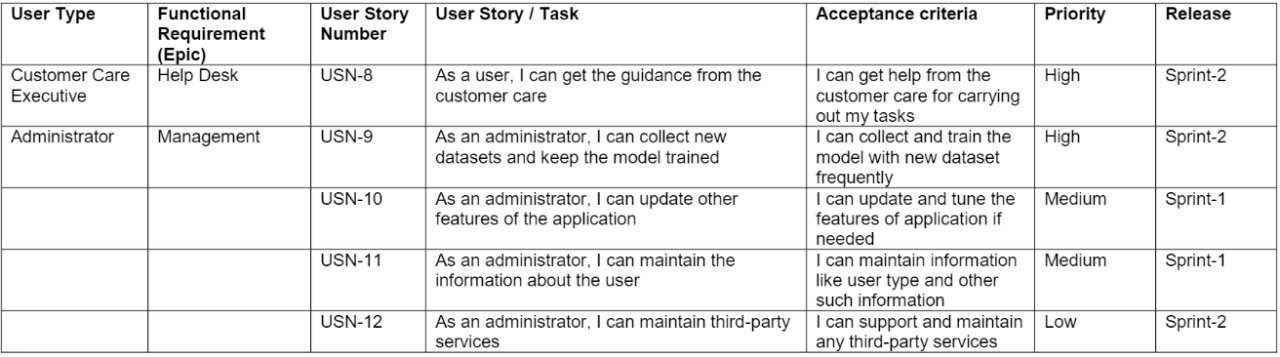


# TechnicalArchitecture

****

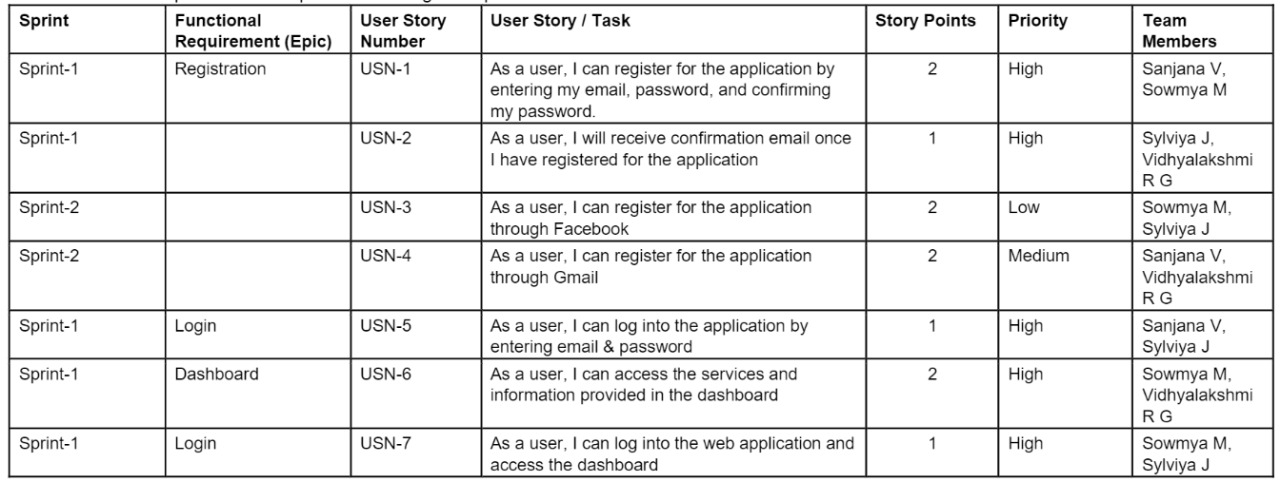
* 1. **UserStories**

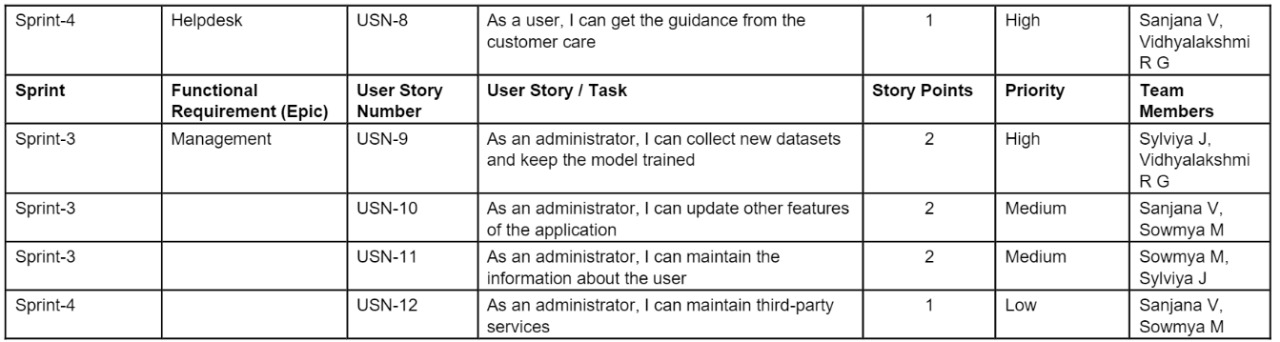




# PROJECTPLANNING&SCHEDULING

* 1. **SprintPlanning&Estimation**





# SprintDeliverySchedule



# CODING&SOLUTIONING

* 1. **Feature1Homepage:**

Parkinson’s Detection App is a responsive web application which detects the disease of the uploaded drawn image. The home page contains information about the application. It also contains the home tab to upload the hand drawn image.

# Home.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-color:moccasin;

position: relative;

background-size: cover;

background-repeat: no-repeat;

height: 100%;

width: 100%;

}

h3{

text-align:center;

color:blue;

}

.main{

margin-top:100px;

}

p{

color:black;

text-indent:10px;

margin:10px;

font-size:20px;

}

.navbar{

margin: 0px;

padding:20px;

background-color:chocolate;

opacity:0.6;

color:black;

font-family:'Roboto',sans-serif;

font-style: italic;

border-radius:20px;

font-size:25px;

font-color:

}

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>

<br>

</div>

<br>

<center><b class="pd"><font color="black" size="15" font-family="Comic Sans MS" >Detecting Parkinson Disease using ML</font></b></center>

<div>

<br>

<br>

<center>

<p align="justify"> Parkinson's disease is a progressive disorder that affects the nervous system and the parts of the body controlled by the nerves. Symptoms start slowly. The first symptom may be a barely noticeable tremor in just one hand. Tremors are common, but the disorder may also cause stiffness or slowing of movement.Parkinson's disease signs and symptoms can be different for everyone. Early signs may be mild and go unnoticed. Symptoms often begin on one side of the body and usually remain worse on that side, even after symptoms begin to affect the limbs on both sides.</p>

</center>

<span><img src="img1.jpg" title="diagnosis"></span>

<span><img src="img2.jpg" title="Symptoms"></span>

<span><img src="img3.jpg" title="Stages"></span>

<span><img src="img4.jpg" title="Effect"></span>

<span><img src="img5.jpg" title="Cause"></span>

<span><img src="img6.jpg" title="diagnosis"></span>

<span><img id="im" src="img7.jpg" title="Stage"></span>

<br><br><br><br><br>

</div>

</body>

</html>

<html>

<head>

<title>PARKINSON'S DISEASE </title>

<link rel = "stylesheet" href="style.css">

</head>

<body>

<div class="hero">

<div class="form-box">

<br><br>

&nbsp;ENTER USER ID AND PASSWORD:

<form id="login" class="input-group" action="/form\_login" method="post">

<input type="text" class="input-field" placeholder="User Id" name ="userid" required><br><br>

<input type="text" class="input-field" placeholder="Password" name="pwd" required><br><br>

<button type="submit" class="submit-btn" value="Login">Login</button>

</form>

<h6 class="err"></h6>

<form id="register" class="input-group" action="/form\_reg" method="post">

<input type="email" class="input-field" placeholder="Email Id"><br><br>

<input type="text" class="input-field" placeholder="User Id" name ="userid"

required><br><br>

<input type="text" class="input-field" placeholder="Password" name="pwd" required><br><br>

<button type="submit" id = "sub" class="submit-btn" >Register</button>

</form>

<h6 class="err"></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>

\*{

margin: 1;

padding: 0;

font-family: sans-serif;

}

.hero{

height: 100%;

width: 100%;

background-color: #c8e8ee;

background-position: center;

background-size: cover;

position: absolute;

}

.form-box{

height: 380px;

width: 360px;

position: relative;

margin: 6% auto;

background: #fff;

padding: 5px;

overflow: hidden;

}

.button-box{

width: 220px;

margin: 35px auto;

position: relative;

box-shadow: 0 0 20px 9px #5f97e51f;

border-radius: 40px;

}

.toggle-btn{

padding: 10px 30px;

cursor: pointer;

background: transparent;

border: 0;

outline: none;

position: relative;

}

#btn{

top: 0;

left: 0;

position: absolute;

width: 110px;

height: 100%;

background: linear-gradient(to right, #7369ca,#11b1c3);

border-radius: 30px;

transition: 0.5s;

button-color:blue;

}

.input-group{

top: 120px;

position: absolute;

width: 280px;

transition: .5s;

}

.input-field{

width: 100%;

padding: 10px 0;

margin: 5px 0;

border-left: 0;

border-top: 0;

border-right: 0;

border-bottom: 1px solid rgb(161, 183, 231);

outline: none;

background: transparent;

}

.submit-btn{

width: 85%;

padding: 10px 30px;

cursor: pointer;

display: block;

margin: auto;

background:#11b1c3;

border: 0;

outline: 2px;

border-radius: 30px;

}

.check-box{

margin: 30px 10px 30px 0;

}

span{

color: rgb(37, 50, 85);

font-size: 14px;

bottom: 68px;

position: absolute;

}

#login{

left: 50px;

}

#register{

left: 450px;

}

.err{

color:rgb(198, 156, 243);

margin: 265px 0 0 145px;

}

# Feature

# Prediction page:

The user will add the hand drawn image in the home page and press the predict button. Then the page will redirect to a new page and provide information whether the person is affected by the disease or not

{% extends "base.html" %} {% block content %}

<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>

{% endblock %}

from flask import Flask,request,render\_template

import pickle

app = Flask(\_\_name\_\_)

@app.route('/')

def hello\_world():

return render\_template("index.html")

class my\_dictionary(dict):

def \_\_init\_\_(self):

self = dict()

def add(self, key, value):

self[key] = value

database=my\_dictionary()

@app.route('/form\_reg',methods=['POST','GET'])

def reg():

name2=request.form['userid']

pwd1=request.form['pwd']

if name2 in database:

return render\_template('index.html',info='UserName Already Taken!!')

else:

database.add(name2,pwd1)

return render\_template("index.html")

@app.route('/form\_login',methods=['POST','GET'])

def login():

name1=request.form['userid']

pwd=request.form['pwd']

if name1 not in database:

return render\_template('index.html',info='Invalid User!!')

else:

if database[name1]!=pwd:

return render\_template('index.html',info='Invalid Password!!')

else:

return render\_template('home.html',name=name1)

if \_\_name\_\_ == '\_\_main\_\_':

app.run()

$(document).ready(function() {

// Init

$('.image-section').hide();

$('.loader').hide();

$('#result').hide();

// Upload Preview

function readURL(input) {

if (input.files && input.files[0]) {

var reader = new FileReader();

reader.onload = function(e) {

$('#imagePreview').css('background-image', 'url(' + e.target.result + ')');

$('#imagePreview').hide();

$('#imagePreview').fadeIn(650);

};

reader.readAsDataURL(input.files[0]);

}

}

$("#imageUpload").change(function() {

$('.image-section').show();

$('#btn-predict').show();

$('#result').text('');

$('#result').hide();

readURL(this);

});

// Predict

$('#btn-predict').click(function() {

var form\_data = new FormData($('#upload-file')[0]);

// Show loading animation

$(this).hide();

$('.loader').show();

// Make prediction by calling api /predict

$.ajax({

type: 'POST',

url: '/predict',

data: form\_data,

contentType: false,

cache: false,

processData: false,

async: true,

success: function(data) {

// Get and display the result

$('.loader').hide();

$('#result').fadeIn(600);

$('#result').text('Prediction : ' + data);

console.log('Success!');

},

});

});

});

<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>

body {

background-image:url(bg.jpg);

background-position: center;

background-repeat: no-repeat;

background-size: cover;

height: 100%;

width: 100%;

}

h1 {

font-size: 40px;

text-align: center;

color: black;

font-style: italic;

font-weight: bolder;

}

h2 {

font-size: 35px;

text-align: center;

color: black;

font-style: italic;

font-weight: bolder;

}

h5 {

font-size: 25px;

text-align: center;

color: black;

font-weight: bolder;

}

a {

color: grey;

float: right;

text-decoration: none;

font-style: normal;

padding-right: 20px;

}

a:hover {

background-color: black;

color: white;

font-size: 30px;

padding-left: 10px;

border-radius: 5px;

}

ul {

align-items: center;

display: flex;

list-style-type: none;

width: 100%;

gap: 3rem;

justify-content: center;

font-size: 2rem;

position: fixed;

top: 0;

margin: 0;

padding: 1rem;

background-color: white;

}

li {

cursor: pointer;

}

li a {

text-decoration: none;

color: inherit;

}

li.active {

font-weight: bold;

color: rgb(34, 64, 110);

}

</style>

</head>

<body>

<nav>

<ul>

<li class="active"><a href="/home">Home</a></li>

<li class="active"><a href="/upload">Predict-Results</a></li>

</ul>

</nav>

<br />

<h1><b>Prevention is better than cure!</b></h1>

<br />

<h2>

<center>

Diagnosis is not the end, but the beginning of practice.

</center>

</h2>

<br />

<h2><center>Detect the disease and take measures wisely</center></h2>

<br />

<h5>

NOTE: Upload an spiral or wave page drawn by the patient/user in a white

sheet

</h5>

<div class="container">

<center>

<div id="content" style="margin-top: 2em">

</div>

</center>

</div>

</body>

<footer>

<script

src="{{ url\_for('static', filename='js/main.js') }}"

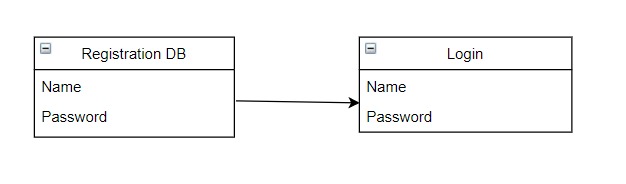
type="text/javascript"

></script>

</footer>

</html>

# DatabaseSchema



1. **TESTING**

# TestCases

|  |  |  |  |
| --- | --- | --- | --- |
| **Testcase ID** | **TestScenario** | **ExpectedResult** | **Status** |
| Login\_TC\_001 | Verify whether the user is valid or not. If valid, user enters the home page. | If valid, user enters the dashboard | Pass |
| ImageUpload\_TC\_002 | When the user uploads the image the, page is redirected for prediction | The Hand-drawn image should be processed and predicted by the model. | Pass |
| Prediction\_TC\_003 | Process the uploaded image with high accuracy | Display whether the user is affected or not by the disease. | Pass |
| Information\_TC\_004 | Verify the UI Elements in Information page | Information Page with good look and feel is displayed | Pass |
| Password\_TC\_005 | Categorize Strong/Weak password | Display Strong/Weak Password | Fail |

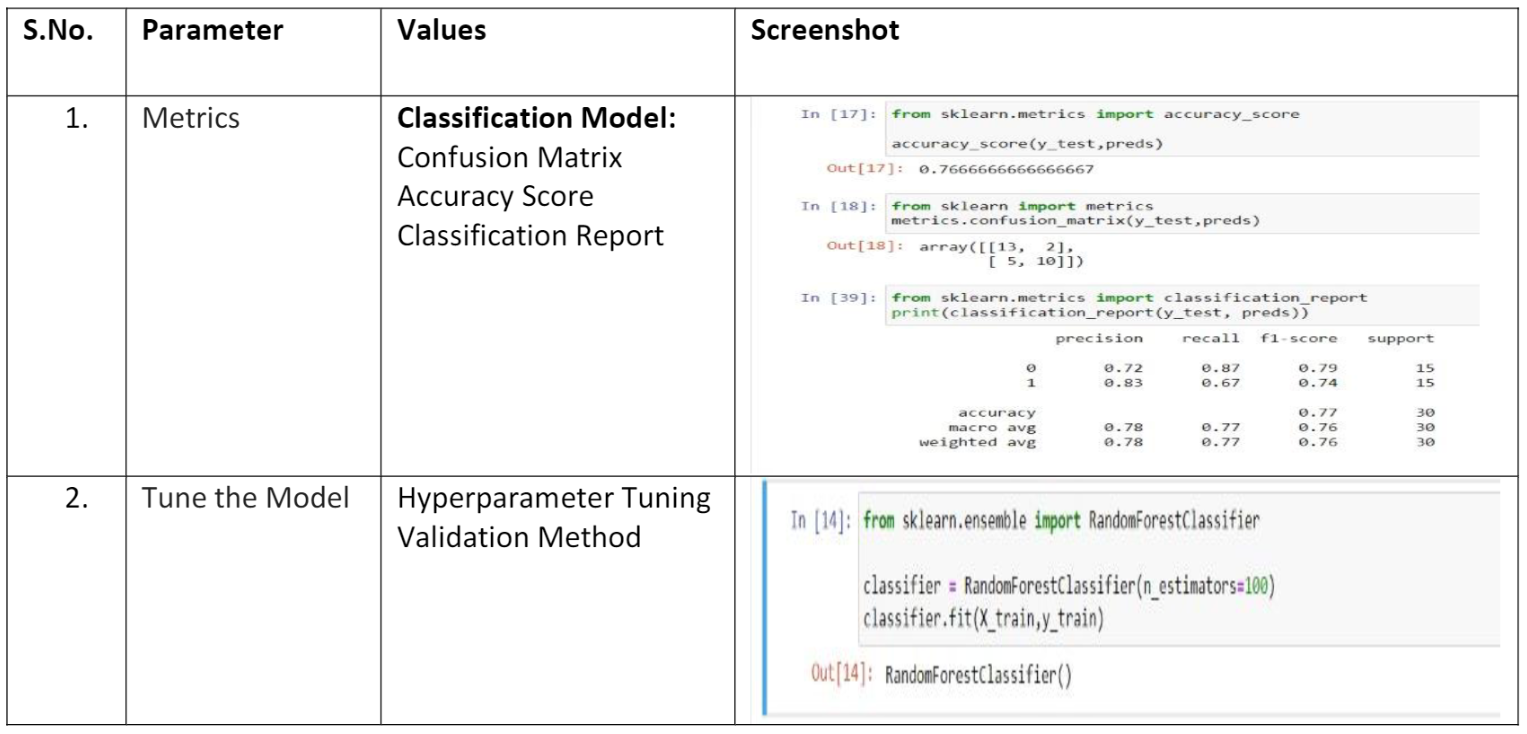
# UserAcceptanceTesting

# 

# 

# RESULTS

* 1. **PerformanceMetrics**

****



# ADVANTAGES&DISADVANTAGES

**Advantages:**

* An efficient and accurate solution to detect Parkinson's disease.
* Parkinson's disease effectively.
* Easy and cheap to determine the presence of Parkinson's disease.
* Eliminates the human error rate.

# Disadvantages:

* + - Itrequires anactiveinternetconnection.
    - Better UI
    - Theusercannotupdatetheirpersonaldetailsonce ithasbeen registered.

# CONCLUSION

This project is used to accurately perform diagnosis for Parkinson's disease in a patient using their brain MRI scans thus, using a web application developed using reactJS. This also help in providing efficient treatment în a most cheap way and eventually reduce the time required for determining the Parkinson's disease in the patient cost effectively. Currently the conventional medical diagnosis is done manually which consumes more time and also involves human error rate. So, reduces the time required for manual classification and eliminates the human error rate by this project.

# FUTURESCOPE

In future, the application of the Parkinson's disease diagnosis technology in the healthcare field can be reviewed and also it can promote for detecting the stages of the Parkinson's disease with more accuracy. In medical field they are more chance to develop or convert this project in many ways. Thus, this project has an efficient scope in coming future where manual predicting can be converted to computerized production in a cheap way.

# APPENDIX

**Source Code:**

<!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-color: rgb(182, 233, 233);

background-size: cover;

background-position: relative;

background-repeat: no-repeat;

height: 100%;

width: 100%;

}

h3 {

text-align: center;

color: white;

}

.main {

margin-top: 100px;

}

p {

color: black;

text-indent: 10px;

margin: 10px;

font-size: 20px;

}

a {

color: grey;

float: right;

text-decoration: none;

font-style: normal;

padding-right: 20px;

}

a:hover {

background-color: black;

color: white;

font-size: 30px;

padding-left: 10px;

border-radius: 5px;

}

ul {

align-items: center;

display: flex;

list-style-type: none;

width: 100%;

gap: 3rem;

justify-content: center;

font-size: 2rem;

position: fixed;

top: 0;

margin: 0;

padding: 1rem;

background-color: white;

}

li {

cursor: pointer;

}

li a {

text-decoration: none;

color: inherit;

}

li.active {

font-weight: bold;

color: rgb(54, 102, 141);

}

img {

width: 450px;

height: 400px;

padding: 25px;

}

img:hover {

border-color: grey;

}

#im {

width: 1450px;

height: 700px;

padding: 25px;

}

</style>

</head>

<body>

<nav>

<ul>

<li class="active"><a href="/home">Home</a></li>

</ul>

</nav>

<br /><br /><br />

<h1>

<center>

<b class="pd"

><font color="black" size="15" font-family="Comic Sans MS"

>Detection of Parkinson's Disease using ML</font

></b

>

</center>

</h1>

<div>

<center>

<p style="text-align: justify">

Parkinson disease (PD) is a progressive neuro degenerative disorder

that impacts more than 6 million people around the world. Parkinson's

disease is non-communicable, early-stage detection of Parkinson's can

prevent further damages in humans suffering from it.

However,Nonetheless, non-specialist physicians still do not have a

definitive test for PD, similarly in the early stage of the diseased

person where the signs may be intermittent and badly characterized. It

resulted in a high rate of misdiagnosis (up to 25% among

non-specialists) and many years before treatment, patients can have

the disorder. A more accurate, unbiased means of early detection is

required, preferably one that individuals can use in their home

setting.However, it has been observed that PD's presence in a human is

related to its hand-writing as well as hand-drawn subjects. From that

perspective, several techniques have been proposed by researchers to

detect Parkinson's disease from hand-drawn images of suspected people.

But the previous methods have their constraints.

</p>

</center>

<h4>

<center>

<b class="pd"

><font color="black" size="12" font-family="Comic Sans MS"

>Causes and Symptoms of Parkinson's Disease</font

>

</b>

</center>

</h4>

<span>

<img

src="img1.jpg"

title="Disease"

/>

</span>

<span>

<img

src="img2.jpg"

title="Symptoms"

/></span>

<span

><img

src="img3.jpg"

title="Stages"

/></span>

<span

><img

src="img4.jpg"

title="Effect"

/></span>

<span

><img

src="img5.jpg"

title="Cause"

/></span>

<span

><img

src="img6.jpg"

title="diagnosis"

/></span>

<h3>

<center>

<font color="black" size="12" font-family="Comic Sans MS"

>Treatment for parkinson disease</font

>

</center>

</h3>

<span

><img

src="https://www.mdpi.com/biomolecules/biomolecules-11-00612/article\_deploy/html/images/biomolecules-11-00612-g001.png"

title="diagnosis"

/></span>

<span

><img

src="https://media.springernature.com/m685/springer-static/image/art%3A10.1038%2Fs41401-020-0365-y/MediaObjects/41401\_2020\_365\_Fig1\_HTML.png"

title="diagnosis"

/></span>

<span

><img

src="https://www.verywellhealth.com/thmb/BgjmOKb2W-7z0gqLZryKBd4FFHs=/1500x0/filters:no\_upscale():max\_bytes(150000):strip\_icc()/advanced-parkinsons-disease-5200544\_color\_text\_v1-3bc74418259340ceaf5f6d407daeff73.jpg"

title="diagnosis"

/></span>

<span

><img

id="im"

src="https://img.parkinsonsinfoclub.com/wp-content/uploads/back-conditions-neck-conditions-london-back-pain-clinic-scaled.jpeg"

title="Stage"

/></span>

<br /><br />

</div>

</body>

</html>

# GitHub&ProjectDemoLink

**GitHub:** **https://github.com/IBM-EPBL/IBM-Project-14968-1659592740**