EARLY DETECTION OF CHRONIC KIDNEY DISEASE USING MACHINE LEARNING

PROJECT REPORT

TEAM ID: PNT2022TMID15929

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1. INTRODUCTION

1.1 PROJECT OVERVIEW :

Chronic Kidney Disease (CKD) or chronic renal disease has become a major issue with a steady growth rate. A person can only survive without kidneys for an average time of 18 days, which makes a huge demand for a kidney transplant and Dialysis. It is important to have effective methods for early prediction of CKD. Machine learning methods are effective in CKD prediction. This work proposes a workflow to predict CKD status based on clinical data, incorporating data prepossessing, a missing value handling method with collaborative filtering and attributes selection. Out of the 11 machine learning methods considered, the extra tree classifier and random forest classifier are shown to result in the highest accuracy and minimal bias to the attributes. The research also considers the practical aspects of data collection and highlights the importance of incorporating domain knowledge when using machine learning for CKD status prediction.

1.2 PURPOSE:

Chronic Kidney Disease (CKD) is a major medical problem and can be cured if treated in early stages. Usually, people are not aware of the medical test we take for different purposes could contain valuable information concerning kidney disease .Consequently
, attributes of various medical test are investigated to distinguish which attributes may contain helpful information about the disease. The information says that it helps us to measure the severity of the problem and we make use of such information to build a machine learning model to that predict CKD.

2. LITERATURE SURVEY:

2.1 EXISTING SYSTEM

Chronic kidney disease (CKD) is a type of kidney disease in which there is gradual loss of kidney function over a period of months to years. Initially there are generally no symptoms; later, symptoms may include leg swelling, feeling tired, vomiting, loss of appetite, and confusion. Complications can relate to hormonal dysfunction of the kidneys and include (in chronological order) high blood pressure (often related to activation of the Renin-Angiotensin- Aldosterone system), bone disease, and anemia. Additionally CKD patients have markedly increased cardiovascular complications with increased risks of death and hospitalization.

2.2 REFERENCES

1. Bikbov B, Perico N, Remuzzi G (23 May 2018). "Disparities in Chronic Kidney Disease Prevalence among Males and Females in 195 Countries: Analysis of the Global Burden of Disease 2016 Study". Nephron.
2. "What Is Chronic Kidney Disease?" National Institute of Diabetes and Digestive and Kidney Diseases. June 2017. Retrieved 19 December 2017.
3. Liao MT, Sung CC, Hung KC, Wu CC, Lo L, Lu KC (2012)."Insulin resistance in patients with chronic kidney disease". Journal of Biomedicine & Biotechnology. 2012
4. "Kidney Failure". MedlinePlus. Retrieved 11 November 2017.
5. "What is renal failure?" Johns Hopkins Medicine, Retrieved 18 December2017.
6. Wang H, Naghavi M, Allen C, Barber RM, Bhutta ZA, Carter A, et al. (GBD 2015 Mortality Causes of Death Collaborators) (October 2016).
7. "Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study2015".
8. "Chronic Kidney Disease Tests & Diagnosis". National Institute of Diabetes and Digestive and Kidney Diseases. October 2016. Retrieved 19 December 2017.
9. "Kidney Failure". National Institute of Diabetes and Digestive and Kidney Diseases. Retrieved 11 November2017.
10. "Managing Chronic Kidney Disease". National Institute of Diabetes and Digestive and Kidney Diseases. October 2016.
11. "Eating Right for Chronic Kidney Disease | NIDDK". National Institute of Diabetes and Digestive and Kidney Diseases. Retrieved 5 September 2019.
12. "Anemia in Chronic Kidney Disease". National Institute of Diabetes and Digestive and Kidney Diseases. July 2016. Retrieved 19 December 2017.
13. "Mineral & Bone Disorder in Chronic Kidney Disease". National Institute of Diabetes and Digestive and Kidney Diseases. November 2015. Retrieved19 December 2017.

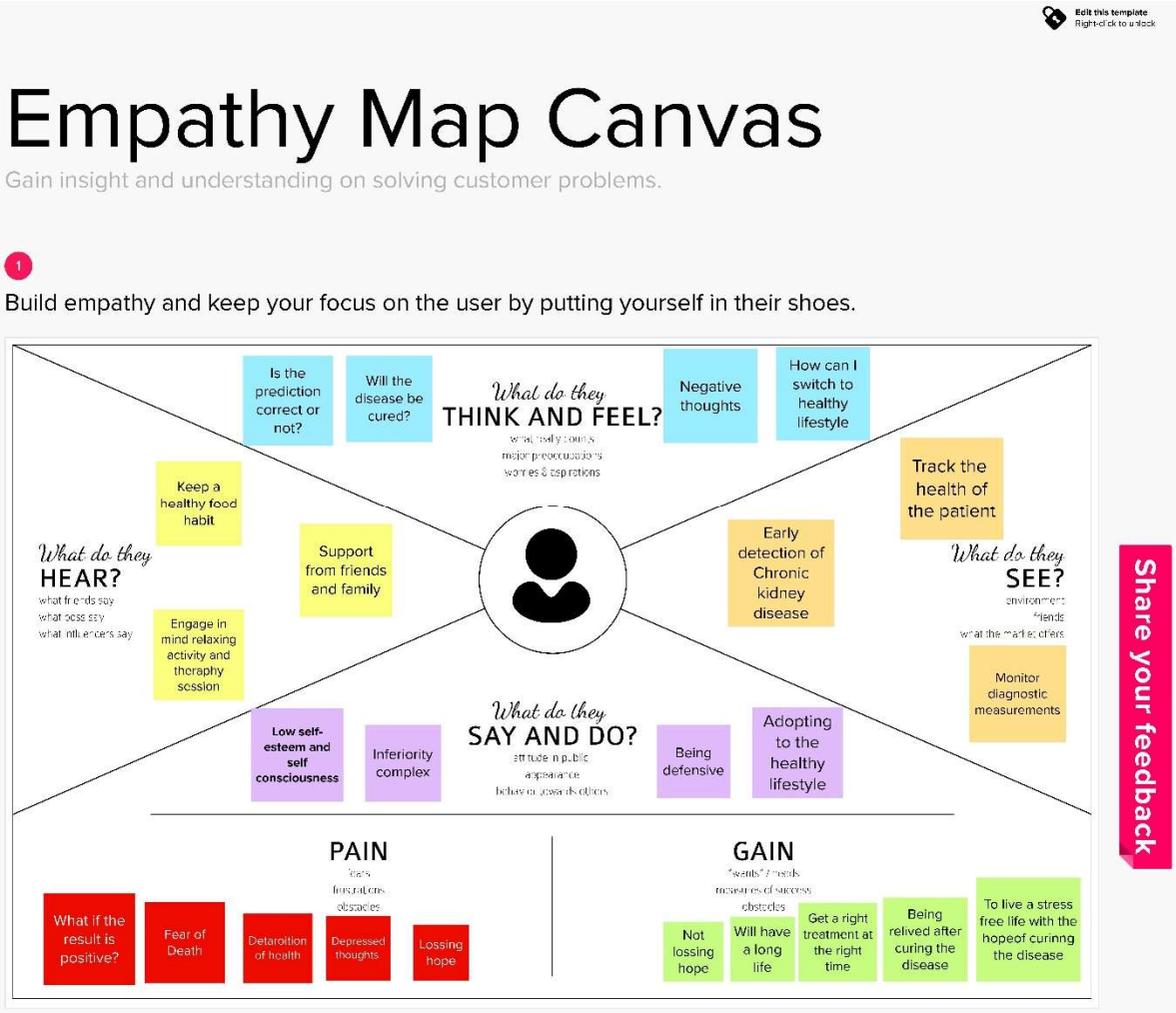
2.3 PROBLEM STATEMENT

Kidney disease can lead to other health problems, such as heart disease. If you have kidney disease, it increases your chances of having a stroke or heart attack. High blood pressure damages your kidneys, and damaged kidneys don't work as well to help control your blood pressure. If you have CKD, you also have a higher chance of having a sudden change in kidney function. Diagnosis is by blood tests to measure the estimated glomerular filtration rate (eGFR), and a urine test to measure albumin ion caused by illness, injury, or certain medicines. This is called acute kidney injury (AKI).Screening at- risk people is recommended. Initial treatments may include medications to lower blood pressure, blood sugar, and cholesterol.

Many people are afraid to learn that they have kidney disease because they think that all kidney disease leads to dialysis. However, most people with kidney disease will not need dialysis. If you have kidney disease, you can continue to live a productive life, work, spend time with friends and family, stay physically active, and do other things you enjoy. You may need to change what you eat and add healthy habits to your daily routine to help you protect your kidneys.

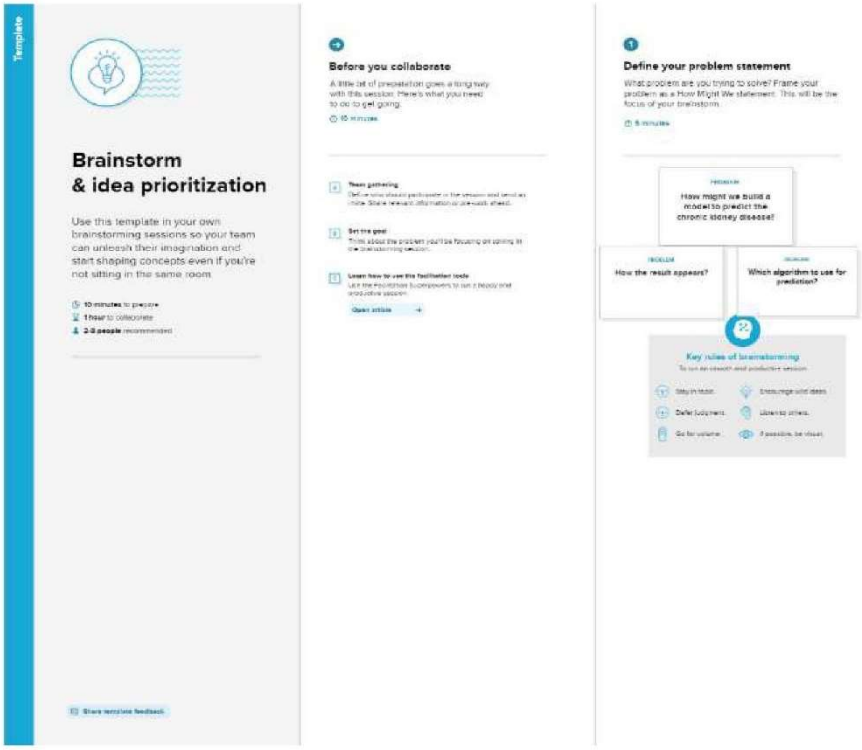
3. IDEATION & PROPOSED SOLUTION:

3.1 EMPATHY MAP CANVAS

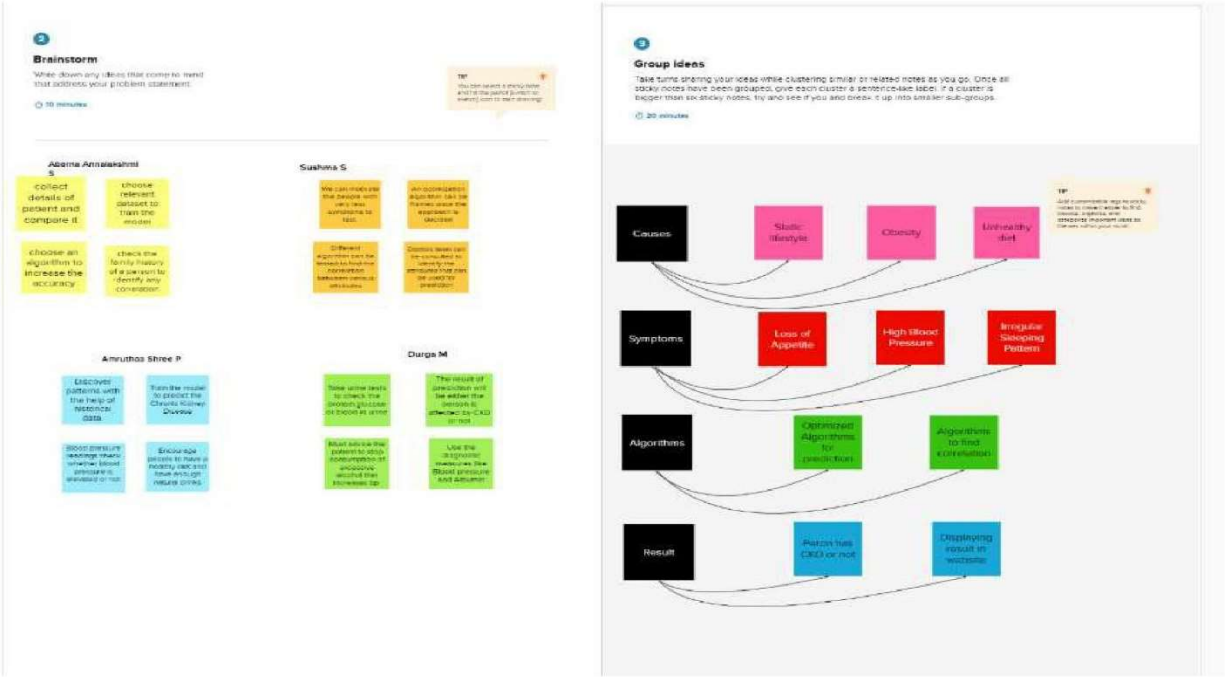


3.2 IDEATION AND BRAINSTORMING

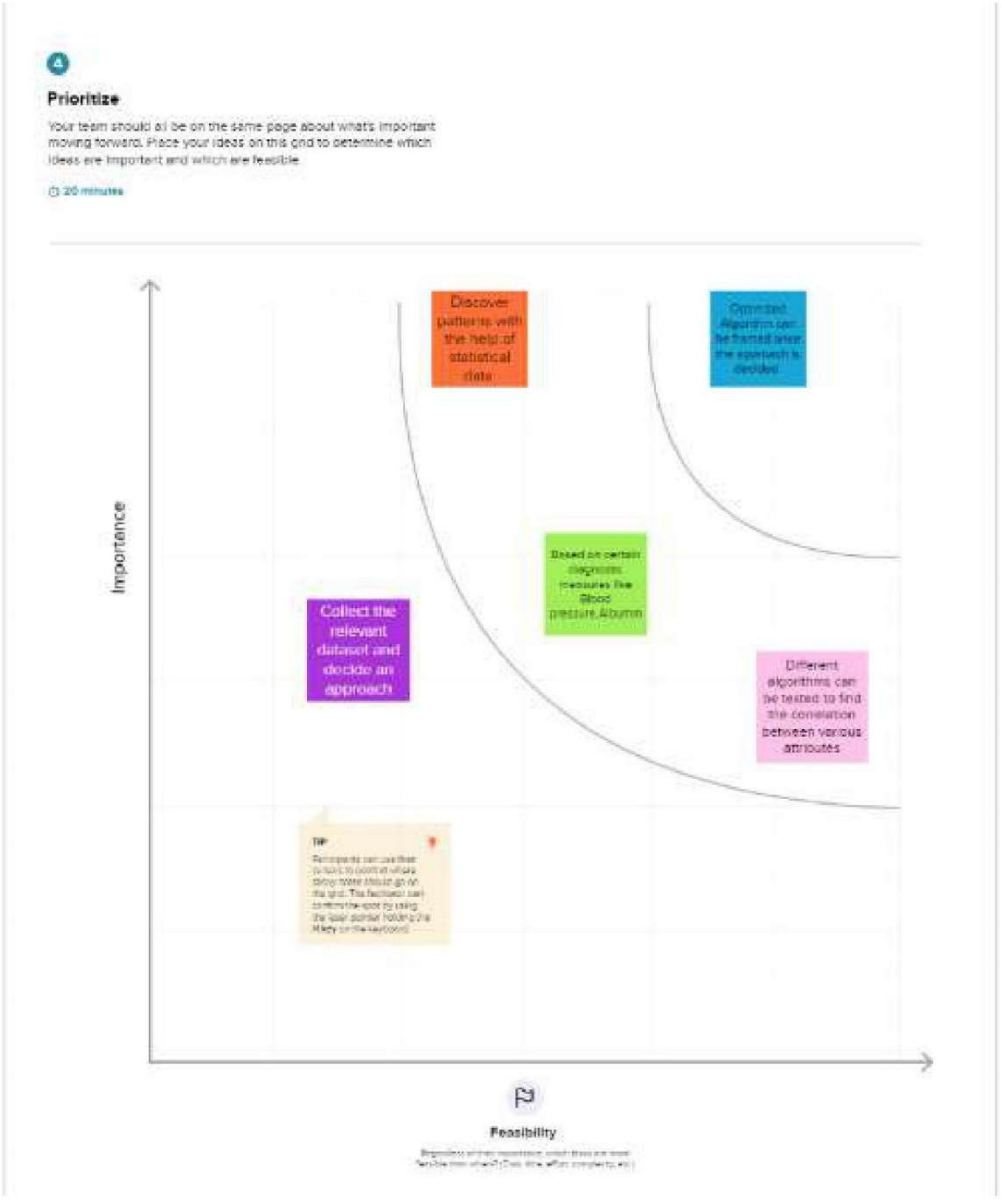
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3.3 PROPOSED SOLUTION

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Predicting whether the person is affected by early chronic kidney disease due to issues like high blood pressure, diabetes, high sugar level etc. This may even lead to the death of person if it's found in later stage. So there is need to predict in advance.
2.	Idea / Solution description	The parameters that are collected from the user can be analysed with the trained models to predict the chronic kidney disease in advance. To solve this problem, models are developed using machine learning algorithms to make prediction with higher accuracy.
3.	Novelty / Uniqueness	The model is focused on various parameters which helps to predict the person is affected or not to ensure the high accuracy.
4.	Social Impact / Customer Satisfaction	The main goal to help the person to know whether they are affected by chronic kidney disease or not. Thus, it is necessary to provide higher accuracy results.
5.	Business Model (Revenue Model)	The customers get attracted to the application as they can know their condition from their place instead of travel over a distance to get the results. As all the parameters are analysed, they provide accurate results.
6.	Scalability of the Solution	Through the analysis of all the data and solutions, our solution is scalable. We could optimize it by changing the parameters to predict the disease.

3.4 PROBLEM SOLUTION FIT

Project Title: Early chronic kidney disease prediction

Project Design Phase-I - Solution Fit Template **Team ID:** PNT2022TMID15929

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS
- ✓ Patients.

6. CUSTOMER
- ✓ Health details
- ✓ cash

5. AVAILABLE SOLUTIONS
- ✓ With available health and family health background like blood pressure,age,cardiovascular disorder,family disease,etc..,

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P
- ✓ To predict the kidney disease from the available test samples.

9. PROBLEM ROOT CAUSE RC
- ✓ Due to the delay in prediction of kidney disease in the available solution , we tend to predict the kidney disease.

7. BEHAVIOUR BE
- ✓ Directly related: find the kidney disease at the right time.
- ✓ Indirectly associated: patients will have a relaxation and inner peace.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR
- ✓ Fast and efficient application
- ✓ User-friendly
- ✓ Early prediction compared to other application leads to faster recovery.

4. EMOTIONS: BEFORE / AFTER EM
- ✓ Fear, insecure > confident, in control, satisfactory.

10. YOUR SOLUTION SL

In our application ,we get the patient details like blood pressure,diabetes...as inputs and as output we predict whether the kidney disease is detected or not.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

They can search the website for early kidney disease prediction.

8.2 OFFLINE

What kind of actions do customers take offline?

They bring their test samples .

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form.
FR-2	User Confirmation	Confirmation via retyping password.
FR-3	Obtain Information	The system should be able to get the information for predicting the disease from the user.
FR-4	Displaying Result	The system must be able to display whether the user is affected or not.

4.2 NON FUNCTIONAL REQUIREMENT

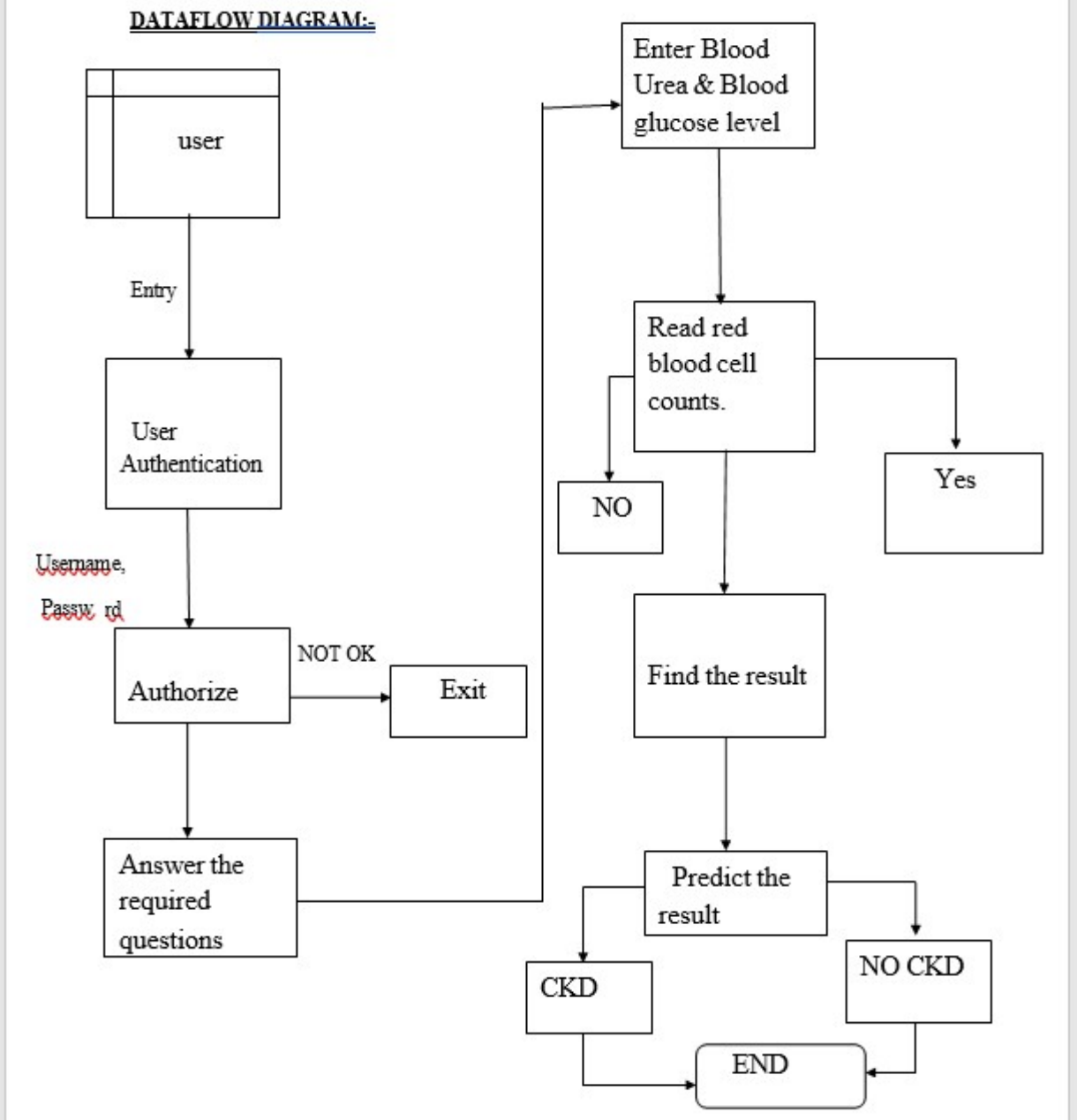
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Access to use the application is permitted only to the registered users.
NFR-2	**Security**	Authentication is done for security process.
NFR-3	**Reliability**	The user gets the correct and predicted value and standard results.
NFR-4	**Performance**	The user gets the results faster accessing the application from remote location.
NFR-5	**Availability**	The application is accessible only when the user is online.
NFR-6	**Scalability**	This application can be used anywhere as it is portable(ie.computer,laptop etc).

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION AND TECHNICAL ARCHITECTURE

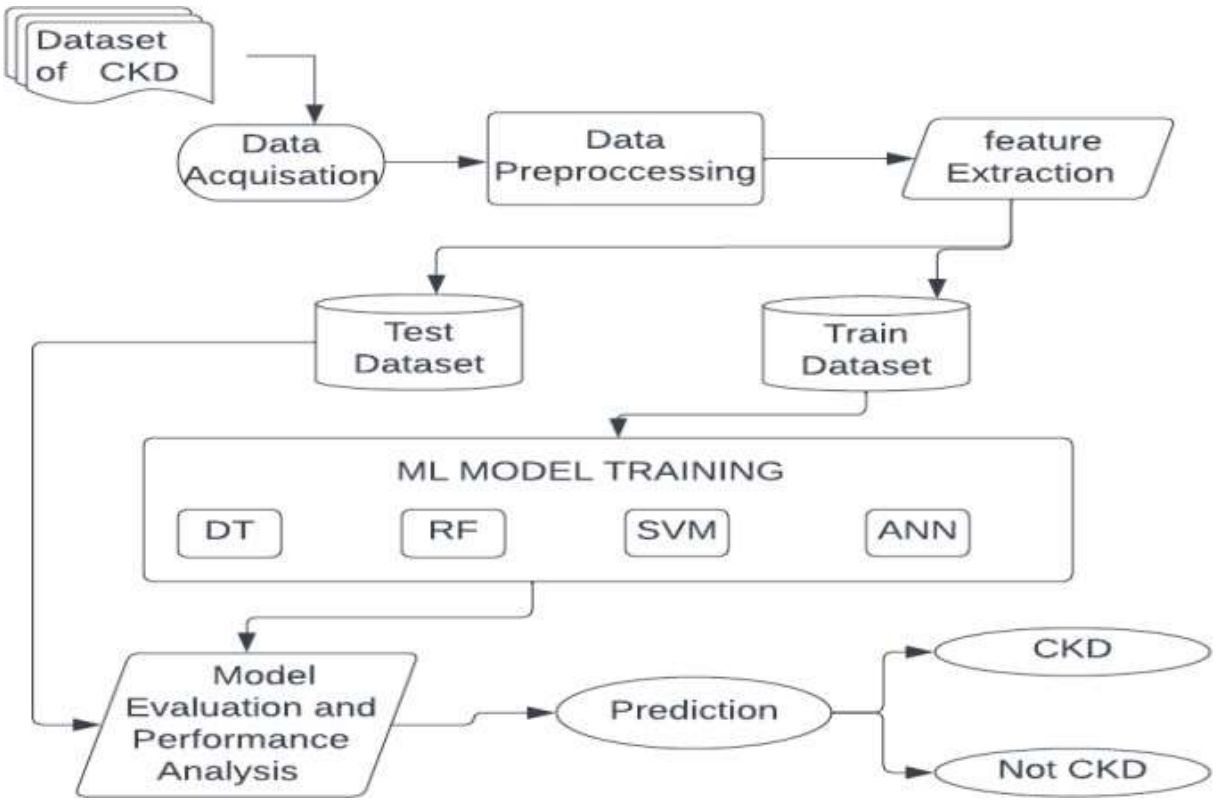


Table: Components & Technologies:

S.N	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript etc
2.	Application Logic-1	Logic for a process in the prediction	Python
3.	Application Logic-2	Logic for a process in the prediction	IBM Watson Studio
4.	Application Logic-3	Logic for a process in the prediction	IBM Watson machine learning
5.	Cloud Storage	Object storage on Cloud	IBM Cloud Storage
6.	Machine Learning Model	To build a machine learning model for test & train the data for prediction	Logistic Regression model.
7.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Flask. IBM Deployment using API key & Scoring End Point

5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
	Registration	USN-1	Registering the email Id for the software	I can access my account / dashboard	High	Sprint 1
		USN-2	Gets OTP to register email	I will receive confirmation email	High	Sprint- 1
		USN-3	As a user, I can register for the software through my Gmail	I can register and access the dashboard with my Gmail Login	Low	Sprint- 4
	Login	USN-4	As a user, I can log into the application by entering my email.	I can login and access past records	High	Sprint- 1
	Dashboard	USN - 5	As a user, I can see my past records and activities	I can access the functionality as diagnosing tool	High	Sprint- 3
	Entry form	USN - 6	As a user, I must enter my pre- diagnostic test results	I can use the form to input test results	High	Sprint- 2
	Report	USN - 7	As a user, I can view the report generated bythe tool	I can view negative/ positive results produced after diagnosis	High	Sprint- 3

Customer Care Executive	Remedies	USN - 8	As a user, I will receive initial steps to treat my symptom	I can cure my symptoms with the remedies suggested	Medium	Sprint- 3
	Queries	USN - 9	As a customer care executive, I must assist users that face problems through Q&A	I will provide 24/7 support for the tool	Low	Sprint- 4
Administrator	Feedback	USN - 10	As a customer care executive, I should get input for the tool's enhancement from users	I must work on improving tool's performance	Low	Sprint- 4
	Feature importance	USN - 11	As an administrator, I should identify the most significant factors that lead to CKD based on the present trend	I must identify important features	High	Sprint- 2
	Train model	USN - 12	As an administrator, I must use the most suitable ML model for detection of CKD	I should efficiently train the ML model	High	Sprint- 2

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Collection Of Data	USN-1	Collect the dataset and clean the dataset	5	High	ROAHIT S
Sprint-1		USN-2	Create, test and save the model	5	High	RAGHURAJ S
Sprint-2	Home page	USN-3	The user can enter into the homepage.	6	High	RAGHUL V
Sprint-2		USN-4	The user can click the prediction button to enter into the prediction page	4	Medium	NITHISHKUMAR S
Sprint-3	Prediction Page	USN-5	The user will be presented with the prediction page where he can enter the values of report	3	Medium	RAGHUL V
Sprint-3		USN-6	User should enter the bloodglucose parameters	7	High	ROAHIT S
Sprint-4	Result	USN-7	The user will get the output	4	Medium	RAGHURAJ S
Sprint-4		USN-8	Deploy into IBM CLO JD	6	High	NITHISHKUMAR S

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)
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 Now 2022
Sprint-4	20	6 Days	14 Nov 2022	18 Nov 2022	20	18 Nov 2022

6.3 REPORTS FROM JIRA

JIRA:ROADMAP:

BURNDOWN

CHART: SPRINT 1

SPRINT 2

SPRINT 3

SPRINT 4

7. CODING AND SOLUTIONING

7.1 FLASK DEPLOYMENT

Using Flask we are locally deploying our machine learning model. Flask acts as a web Framework .There are three html files a home page, index page and a prediction page. Additionally we have app.py file to locally deploy the model

Homepage.html

templates > home.html > html > head > style > * > *:before > *:after

```
<!DOCTYPE html>
<html lang="en">
<head>
    <style>
        *,
*:before,
*:after{
    padding: 0;
    margin: 0;
    box-sizing: border-box;
}
body{
    height: 100vh;
    background:linear-gradient(
        45deg,
        rgba(50, 47, 50, 0.6),
        rgba(117, 111, 122, 0.7)
    ),
     url("https://img.freepik.com/premium-photo/illustration-kidney-stones-ureter-businesswoman-gray-background_4652
    background-size: cover;
}
h1{
    font-size: 4em;
    margin: 0;
    padding:0;
    text-align: center;
    font-family: Cambria;
    position:absolute;
    top:45%;
    left:50%;
    transform:translateX(-49%) translateY(-49%);
    color: rgb(221, 208, 208);

}
.container{
    width:100%;
    margin:0 auto;
```

```
header : : after(
    content :    ;
    display:table;
    clear: both ;



nav(
    float:right;



nav ul(
    margin:0;
    padding:0;
    list-style:none;

nav li{
    display:inline-block;
    margin-left:70px;
    padding-top:23px;

nav a{
    color: ■ rgb(232, 221, 221);
    text-decoration:none;
    text-transform:uppercase;
    font-size:14px;

nav a:hover(
     coIOF“ : O #8OB ;

    ‹ style:
    ‹title›Home Pages title:









    ‹ IJ1 »CHRONIC KIDNEY DISEASE PREDICTION ‹ h1 :
    ‹ lie ate r:
        :div class="container”:.
```

```
nav a{
    color: rgb(232, 221, 221);
    text-decoration:none;
    text-transform:uppercase;
    font-size:14px;
}
nav a:hover{
    color: #000;
}
    </style>
    <title>Home Page</title>

</head>
<body>
    <h1>CHRONIC KIDNEY DISEASE PREDICTION</h1>
    <header>
        <div class="container">
            <nav>
                <ul>
                    <li><a href="#">HOME</a></li>
                    <li><a href="#">ABOUT</a></li>
                    <li><a href="index.html">PREDICT</a></li>
                </ul>
            </nav>
        </div>
    </header>

</body>
```

index.html

```
/* Box */
        #first {
            border-radius: 14px;
            height: 30px;
            width: 300px;
        }

        #sec
            font-size: 20px;
            text-align: center;
        }

        #third {
            border-radius: 14px;
            height: 25px;
            width: 120px;
            font-size: 20px;
            text-align: center;
        }

        #fourth {
            border-radius: 14px;
            height: 25px;
            width: 160px;
            font-size: 20px;
            text-align: center;
        }

        #fifth {
            border-radius: 14px;
```

Indicates the desired height of glyphs from the font. For scalable fonts, the font-size is a scale factor applied to the EM unit of the font. (Note that certain glyphs may bleed outside their EM box.) For non-scalable fonts, the font-size is converted into absolute units and matched against the declared font-size of the font, using the same absolute coordinate space for both of the matched values.

Syntax: <absolute-size> | <relative-size> | <length-percentage>

MDN Reference

```
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <title>Chronic Kidney Disease Model</title>

    <link rel = "stylesheet" href="https://fonts.googleapis.com/css?family=Trirong">
    <style>

        /* Color */
        body{
            background-image:url('https://img.freepik.com/premium-photo/illustration-kidney-stones-ureter-businesswoman-gray-background_4
            background-position: center;
            background-repeat: no-repeat;
            background-size: 100% 100%;
            font-family: Arial, Helvetica,sans-serif;
            text-align: center;
            margin: 0;
            padding: 0;
            width: 100%;
            height: 100%;
            /* display: block;
            flex-direction: column; */
        }


        /* Heading Font */
        .container-heading{
            margin: 0;
        }


        /* Box */
            #first {
                border-radius: 14px;
```

```
          class=':ortainer-              class="heading font" Chronic Kidney Disease


       style=":olor: ■ white; class="u.-container"
            action="} ur.for 'predict' }]"


              Specific




              Hemoglobin


              Diabetes Mellitus
                 id="tourth" name="dm' required="required"

              Al bum1n
                 i d= " t i ft h " name = " a. " nequ T red = "i°eq u i°e c "

              Appetite
                 id=" ixth" name="appe'" reouired="
                 'ec,uired"

              Red Blood Cell Count
                 id="set.tenth" name="rc" required=" -Quired"
              Pus Cell



                  id =" s rt b " type= " srlbrJT* " S ubm1t
```

```
            <br>
            <button id="sub" type="submit ">Submit</button>
            <br>
            <br>
            <br>
            <br>


        </form>
    </div>









</body>

</html>
```

result.html

```
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Chronic Kidney Disease Result</title>
    <link rel = "stylesheet" href="https://fonts.googleapis.com/css?family=Trirong">

</head>

<body>

    <div style="color: white;" class="container">
        <form action="{{ url_for('predict')}}" method="post">
            <h2 class='container-heading'><span class="heading_font">Chronic Kidney Disease Prediction</span></h2>

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

        <!-- Result -->
        <div style="color: white;" class="results">
            {% if prediction==1 %}
                <h1><span class='danger'>Oops!<br><br>You have CHRONIC KIDNEY DISEASE.<br><br>Please Consult Doctor.</span></h1>
                <br><br><br><br><br><br>

            {% elif prediction==0 %}
                <h1><span class='safe'>GREAT !<br><br>You dont't have Chronic Kidney Disease.</span></h1>


            {% endif %}
        </div>
        </form>

    </div>
    <div>
            <br><br> <br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>
```

```
<style>

/* Background Image */
body
{
background-image:url("https://img.freepik.com/premium-photo/illustration-kidney-stones-ureter-businesswoman-gray-backgro
height: 100%;
 background-size: 100% 100%;

/* Center and scale the image nicely */
background-position: center;
background-repeat: no-repeat;
background-size: 100% 100%;

}

/* Color */
body{
    font-family: Arial, Helvetica,sans-serif;
    text-align: center;
    margin: 0;
    padding: 0;
    width: 100%;
    height: 100%;
    display: flex;
    flex-direction: column;
}


/* Heading Font */
.container-heading{
    margin: 0;
}
```

```
/* Color */
body{
    font-family: Arial, Helvetica,sans-serif;
    text-align: center;
    margin: 0;
    padding: 0;
    width: 100%;
    height: 100%;
    display: flex;
    flex-direction: column;
}


/* Heading Font */
.container-heading{
    margin: 0;
}



</style>
</body>

</html>
```

app.py

```
app = Flask(  name  )
model  = pickle.load(open 'modem.pk ', 'rb'))


§app. FDute (   ‘‘ ' )
   — home ( ) :
      return render template (" home . htm ")


§app. rDute ( .‘ i nc x . html ' ,methods= [ ' E E" ] )
 --  Index():
     return  render template('inJex.htrl')

§app  rDute (  @r’edzct ',   methods=['PCST   )
   - pred1ct () :
      zf  request. method  ==  'POS ' :
            sg =  I to at  ( request . form [   sg ] )
            htn  =   float (request.  form[ ' htn '   )
            hemo = float ( request . form [ ' henio ' ] )
            dv = I to at ( request . form [   d r  ] )
            al   =  I to at  ( request . form [   o1   ])
            appet    =    float (  request . foes    opp ed ' ])
            cc   =  I to  at  ( request . form [    c c ])
            pc    =  I to at  ( request . form [    p c ] )
```

```python
@app.route('/index.html',methods=['GET'])
def Index():
    return render_template('index.html')

@app.route("/predict", methods=['POST'])
def predict():
    if request.method == 'POST':
        sg = float(request.form['sg'])
        htn = float(request.form['htn'])
        hemo = float(request.form['hemo'])
        dm = float(request.form['dm'])
        al = float(request.form['al'])
        appet = float(request.form['appet'])
        rc = float(request.form['rc'])
        pc = float(request.form['pc'])

        values = np.array([[sg, htn, hemo, dm, al, appet, rc, pc]])
        prediction = model.predict(values)
        print('Hiiiiiiiiiiiii', prediction)

        return render_template('result.html', prediction=prediction)


if __name__ == "__main__":
    app.run(debug=True)
```

7.2 IBM DEPLOYMENT

Now after locally deploying our machine Learning model we deployed our model into IBM deployment.

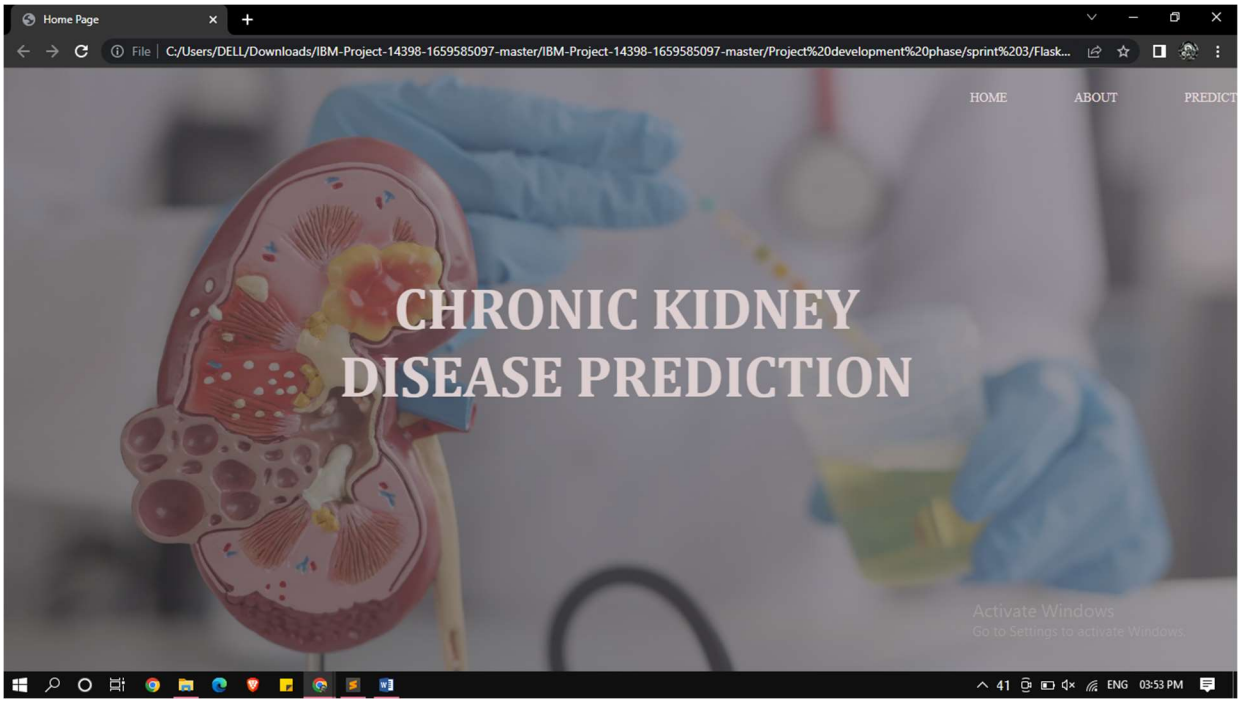
appibm.py

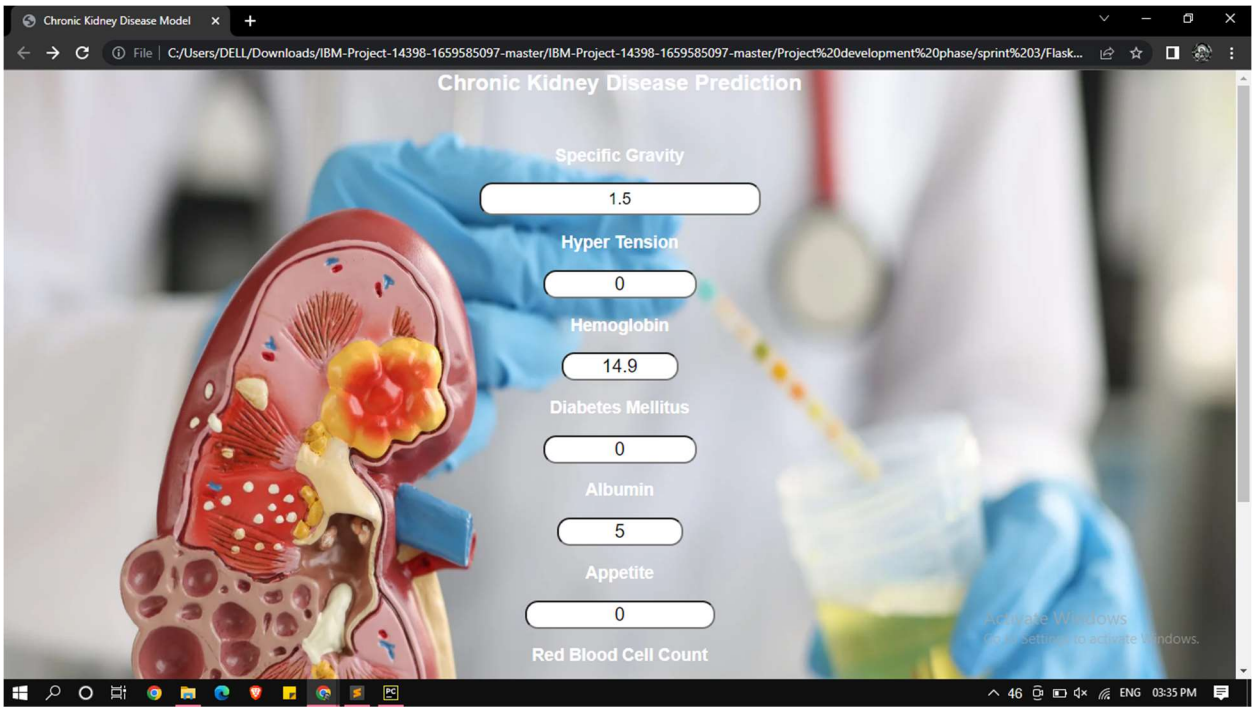
```
from pyexoat import model
from flask import Flask, render template,
request lmpo t l uopy as
lW@O°t
impo t requests

  'I?TE                                                                    '. data= [ " a p t
ñPl_KEY = "firiK'_8UpqCu\'yZx'JTF'..'g'.-.'be L4-u1s1fJ1S.
fm2 1 1" token response = r eque st s . post ('

header = ('Content-T,pe':'application''json','Authorizatvon':'3earer' +
mltoken}



@app.route(',•",methods=['GET'])
 -- Home():
    eturn render template('index.html')

@app.route(",•'predict", methods=['PCST''')
 -- predict():
    if request.method == 'POS':
        sg =
        float(request.form['sg'])
        htn =
        float(request.form['htn''')
        hemo =
```

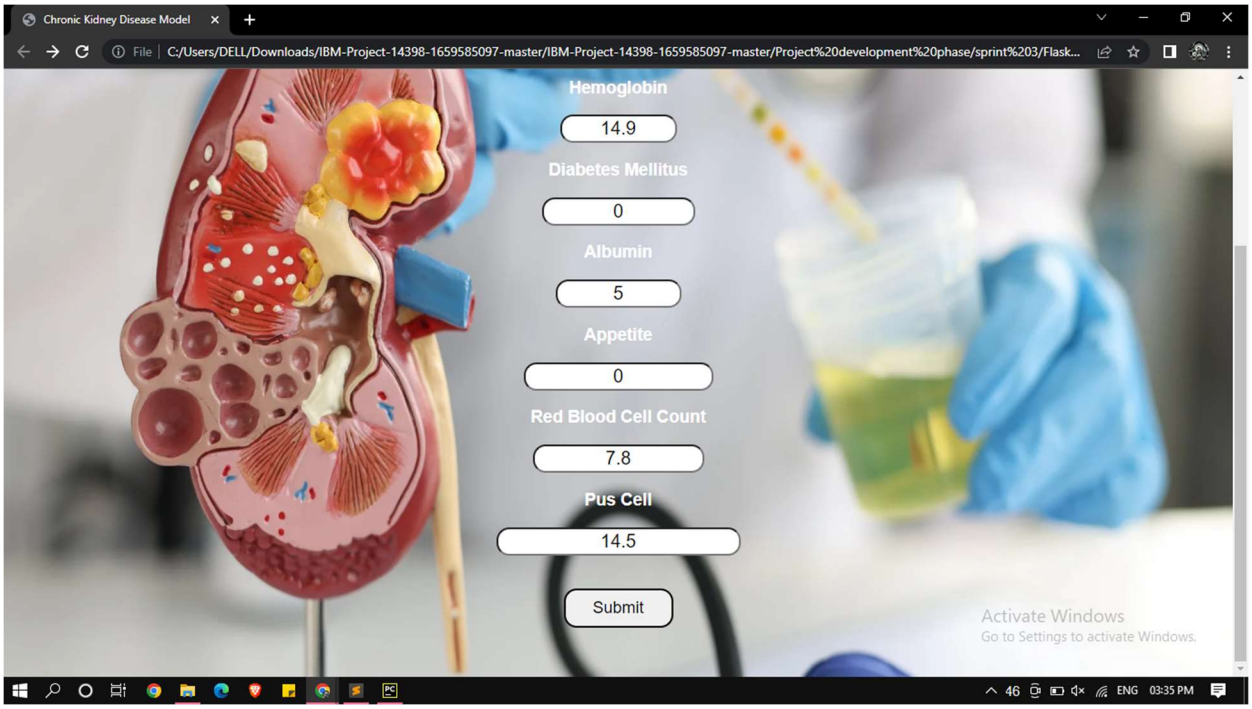
```
@app.route("/predict", methods=['POST'])
def predict():
    if request.method == 'POST':
        sg = float(request.form['sg'])
        htn = float(request.form['htn'])
        hemo = float(request.form['hemo'])
        dm = float(request.form['dm'])
        al = float(request.form['al'])
        appet = float(request.form['appet'])
        rc = float(request.form['rc'])
        pc = float(request.form['pc'])

        values = [[sg, htn, hemo, dm, al, appet, rc, pc]]

        payload_scoring = {"input_data": [{"field": [[sg, htn, hemo, dm, al, appet, rc, pc]],"values": values}]}

        response_scoring = requests.post('https://eu-gb.ml.cloud.ibm.com/ml/v4/deployments/3a87143a-e956-4c61-8fde-9b2b904ce0a8/predictio
        headers={'Authorization': 'Bearer ' + mltoken})
        print("response_scoring ")

        predictions = response_scoring.json()
        prediction = model.predict(values)
        print('Hiiiiiiiiiiii', prediction)


        return render_template('result.html', predict=predict)


if __name__ == "__main__":
    app.run(debug=True)
```

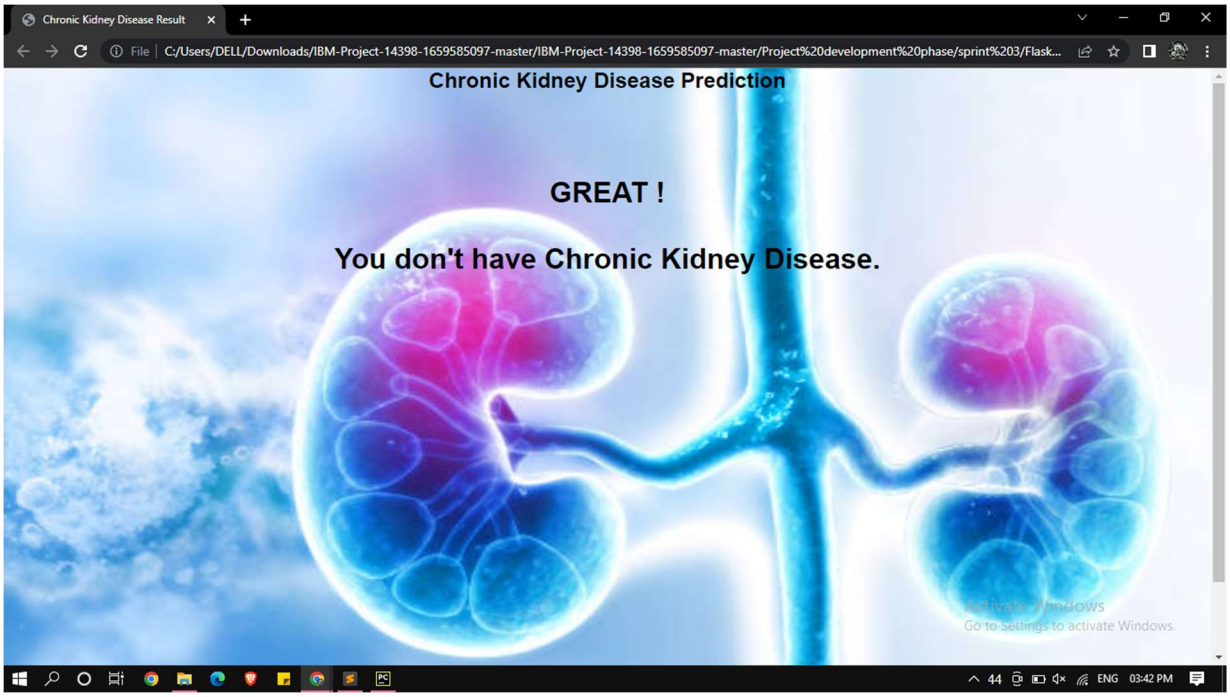
8. TESTING

8.1 TEST CASES

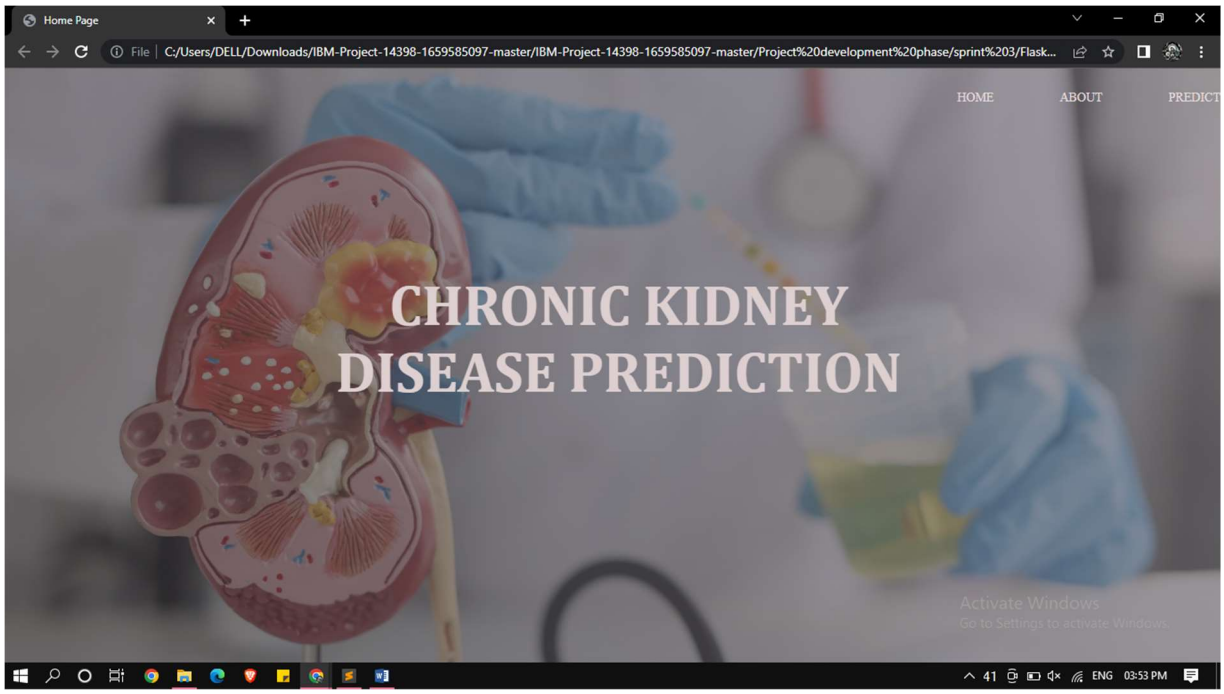


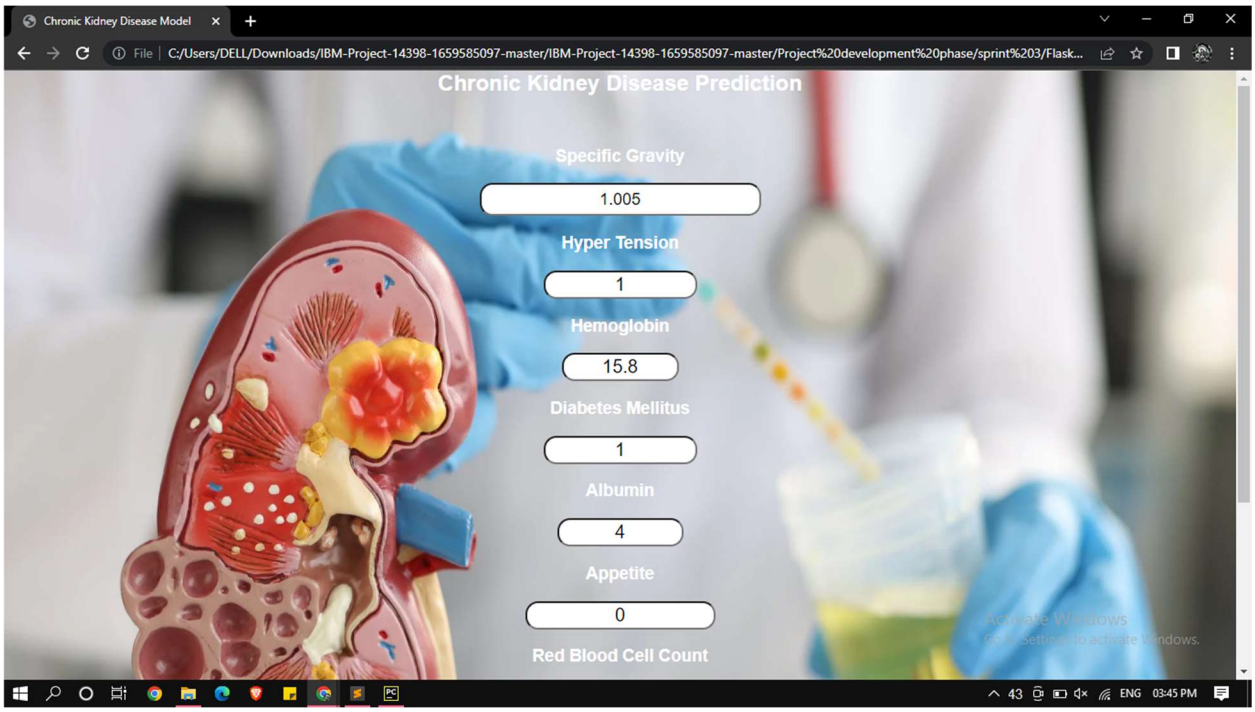


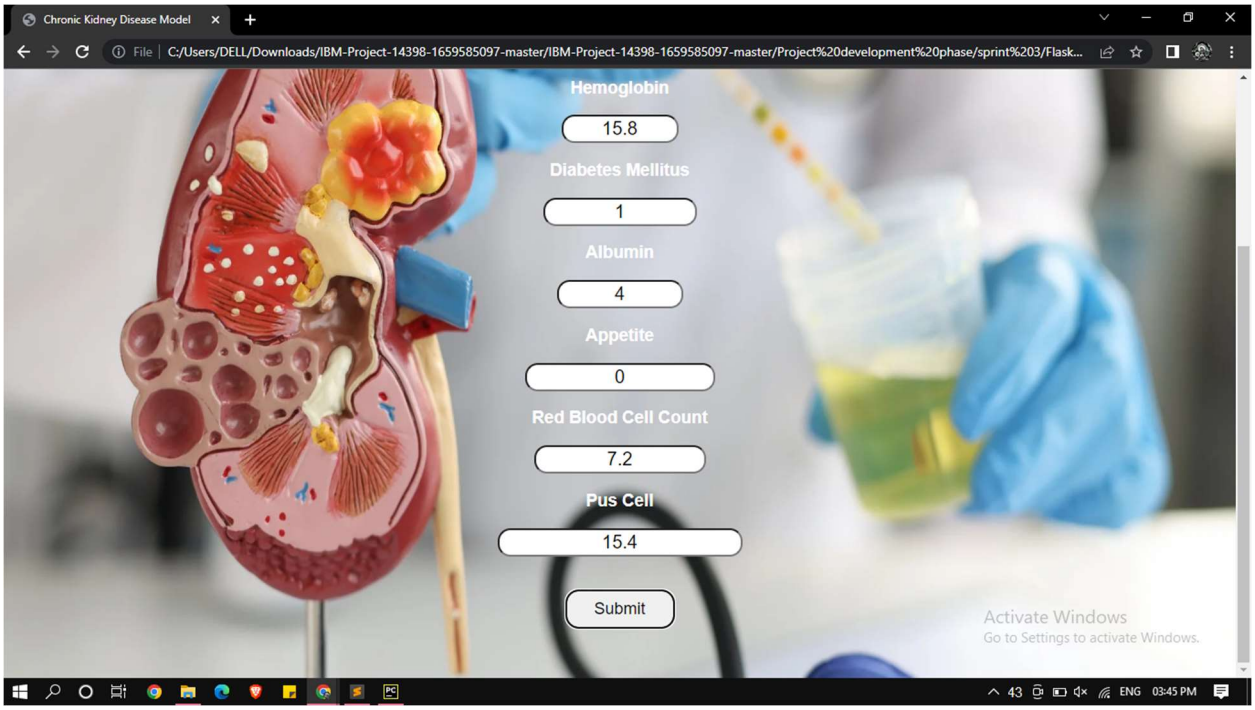

Chronic Kidney Disease Model
File | C:/Users/DELL/Downloads/IBM-Project-14398-1659585097-master/IBM-Project-14398-1659585097-master/Project%20development%20phase/sprint%203/Flask...
Hemoglobin
14.9
Diabetes Mellitus
0
Albumin
5
Appetite
0
Red Blood Cell Count
7.8
Pus Cell
14.5
Submit
Activate Windows
Go to Settings to activate Windows.
46
ENG
03:35 PM

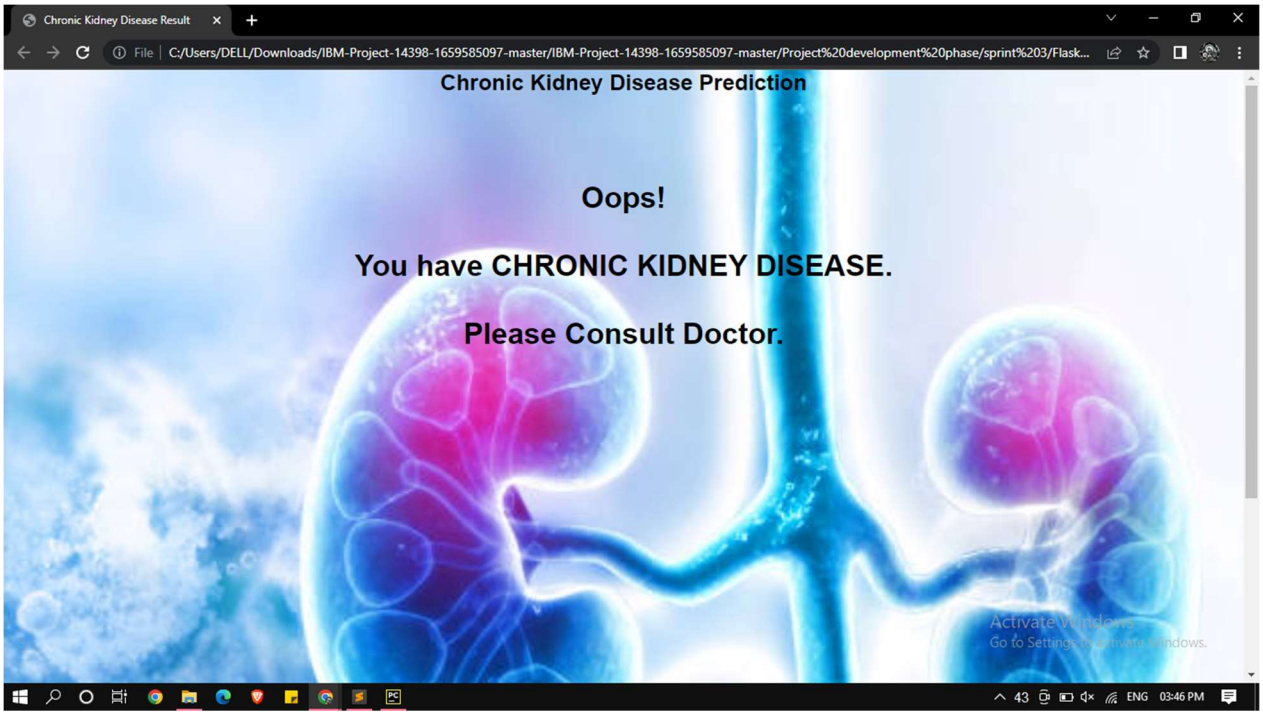

Chronic Kidney Disease Result
File | C:/Users/DELL/Downloads/IBM-Project-14398-1659585097-master/IBM-Project-14398-1659585097-master/Project%20development%20phase/sprint%203/Flask...
Chronic Kidney Disease Prediction
GREAT !
You don't have Chronic Kidney Disease.
Activate Windows
Go to Settings to activate Windows.
44
ENG
03:42 PM

8.2 USER ACCEPTANCE TESTING






Chronic Kidney Disease Model
File | C:/Users/DELL/Downloads/IBM-Project-14398-1659585097-master/IBM-Project-14398-1659585097-master/Project%20development%20phase/sprint%203/Flask...
Hemoglobin
15.8
Diabetes Mellitus
1
Albumin
4
Appetite
0
Red Blood Cell Count
7.2
Pus Cell
15.4
Submit
Activate Windows
Go to Settings to activate Windows.
43
ENG
03:45 PM


Chronic Kidney Disease Result
File | C:/Users/DELL/Downloads/IBM-Project-14398-1659585097-master/IBM-Project-14398-1659585097-master/Project%20development%20phase/sprint%203/Flask...
Chronic Kidney Disease Prediction
Oops!
You have CHRONIC KIDNEY DISEASE.
Please Consult Doctor.
43
ENG
03:46 PM

8.3 USER ACCEPTANCE TESTING

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	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

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
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

9.1 PERFORMANCE METRICS

Model Evaluation

```
In [37]: accuracy_score(y_test,y_pred)
Out[37]: 0.875

In [38]: ## Confusion matrix of our model

In [39]: conf_mat = confusion_matrix(y_test,y_pred)
         conf_mat
Out[39]: array([[46,  8],
                [ 2, 24]], dtype=int64)
```

10. ADVANTAGES AND DISADVANTAGES

Advantages:

Increased recognition of CKD may facilitate implementation of therapeutic strategies to delay progression of kidney function decline or prevent CKD related metabolic complications and CVD.
Finally, a uniform disease classification and action plan including all patients irrespective of the need or type of renal replacement therapy (i.e. dialysis or transplantation), may enhance the continuity of patient care.
Early detection of chronic kidney disease is the advantage because we can cure in firs stage.

Disadvantages:

CKD is associated with increased risks of cardiovascular morbidity, premature mortality, and has severe impact on quality of life (QoL) [4]. Mortality from cardiovascular disease (CVD) is estimated to be at least 8 to 10 fold higher in CKD patients as compared to non-CKD patients.

Chronic kidney disease can cause other problems throughout your body including: Heart and blood vessel problems. Anemia (low red blood cell count) Bone problems.

11. CONCLUSION

The benefit of this approach is that the prediction process takes far less time doctors to initiate treatment at the earliest for patients with CKD and further to classify larger population of patients within shorter span. Because the dataset used in this paper is tiny with 400 examples, we prefer to work with larger datasets in the future or compare the results of this dataset with a different dataset with the same. In addition, to help minimize the incidence of CKD, we try to predict if a person
With this syndrome chances chronic risk factors such as hypertension, family history of kidney failure and diabetes using the appropriate dataset. Early prediction is very crucial for both the experts and the patients to prevent and slow down the progress of chronic kidney disease to kidney failure.

12. FUTURE SCOPE

This work will be considered as basement for the healthcare system for CKD patients. Also extension to this work is that implementation of Machine learning provides high- quality performance. The hope is that it would encourage people to seek early treatment for chronic renal disease and to make improvements in their lives.

13. APPENDIX

Chronic Kidney Disease (CKD) or chronic renal disease has become a major issue with a steady growth rate. A person can only survive without kidneys for an average time of 18 days, which makes a huge demand for a kidney transplant and Dialysis. It is important to have effective methods for early prediction of CKD. Machine learning methods are effective in CKD prediction. This work proposes a workflow to predict CKD status based on clinical data, incorporating data prepossessing, a missing value handling method with collaborative filtering and attributes selection. Out of the 11 machine learning methods considered, the extra tree classifier and random forest classifier are shown to result in the highest accuracy and minimal bias to the attributes. The research also considers the practical aspects of data collection and highlights the importance of incorporating domain knowledge when using machine learning for CKD status prediction.

GITHUB LINK

https://github.com/IBM-EPBL/IBM-Project-12675-1659457471.git