

Project Report

Early Detection of Chronic Kidney Disease Using Machine Learning

Team ID: PNT2022TMID53288

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Project Report

Project- Early Detection of Chronic Kidney Disease using Machine Learning

Team ID: PNT2022TMID53288

1. INTRODUCTION

a. Project Overview

Chronic kidney disease, also called chronic kidney failure, involves a gradual loss of kidney function. Advanced chronic kidney disease can cause dangerous levels of fluid, electrolytes and wastes to build up in your body. Chronic Kidney Disease is one of the most critical illness nowadays and proper diagnosis is required as soon as possible. Machine learning technique has become reliable for medical treatment. So using this machine learning algorithms and strategies we should detect whether the person has a chronic kidney disease or not.

b. Purpose

The purpose of early detection are to prevent the progression of chronic kidney disease and its associated complications, with subsequent improvements in patient outcomes and reductions in the impact of chronic kidney disease on healthcare resources.

2. LITERATURE SURVEY

a. Existing problem

End-stage kidney disease (ESKD) is the last stage of long-term (chronic) kidney disease. This is when your kidneys can no longer support your body's needs. Kidney disease also increases the risk of having heart and blood vessel disease. These problems may happen slowly over a long time. Early detection and treatment can often keep chronic kidney disease from getting worse. When kidney disease progresses, it may eventually lead to kidney failure, which requires dialysis or a kidney transplant to maintain life. Earlier ckd detection could improve patient outcomes and delay the need for dialysis . Potentially reducing the cost. This is made possible by this application. This application aim at saving people from the severe symptoms of CKD by detecting CKD at earlier stages.

b. References

1. Kunwar V, Chandel K, Sai Sabitha A, Bansal A (2016) Chronic Kidney Disease Analysis Using Data Mining Classification Techniques. 2016 6th International Conference-Cloud System and Big Data Engineering.
2. Amirgaliyev Y, Shamiluulu S, Serek A (2018) Analysis of Chronic Kidney Disease Dataset by Applying Machine Learning Methods. 2018 IEEE 12th International Conference on Application of Information and Communication Technologies (AICT).

3. Devika R, Sai Vaishnavi A, Subramaniaswamy V (2019) Comparative Study of Classifier for Chronic Kidney Disease Prediction Using Naive Bayes, KNN and Random Forest. 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC).

4. Avci E, Karakus S, Ozmen O, Avci D (2018) Performance Comparison of Some Classifiers on Chronic Kidney Disease Data. 2018 6th International Symposium on Digital Forensic and Security (ISDFS)

c. Problem Statement Definition

Chronic kidney disease (CKD) is increasingly recognized as a global public health problem. There is now convincing evidence that CKD can be detected using simple laboratory tests, and that treatment can prevent or delay complications of decreased kidney function, slow the progression of kidney disease, and reduce the risk of cardiovascular disease (CVD). Translating these advances to simple and applicable public health measures must be adopted as a goal worldwide. Understanding the relationship between CKD and other chronic diseases is important to developing a public health policy to improve outcomes. So taking all these into account we are creating a chronic kidney disease detector which is very user friendly and easy to be used by everyone.

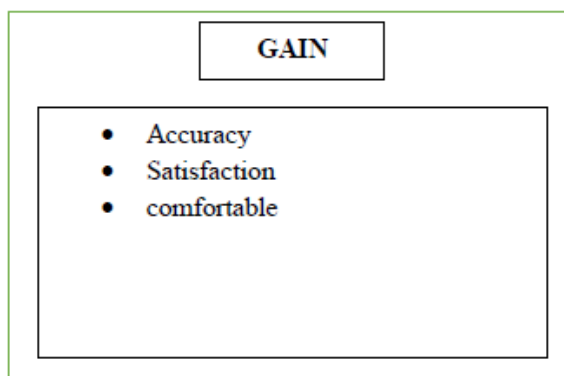
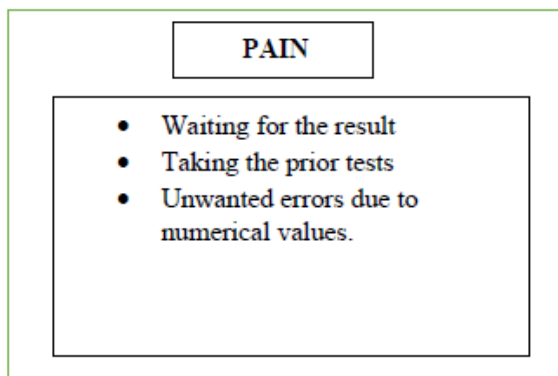
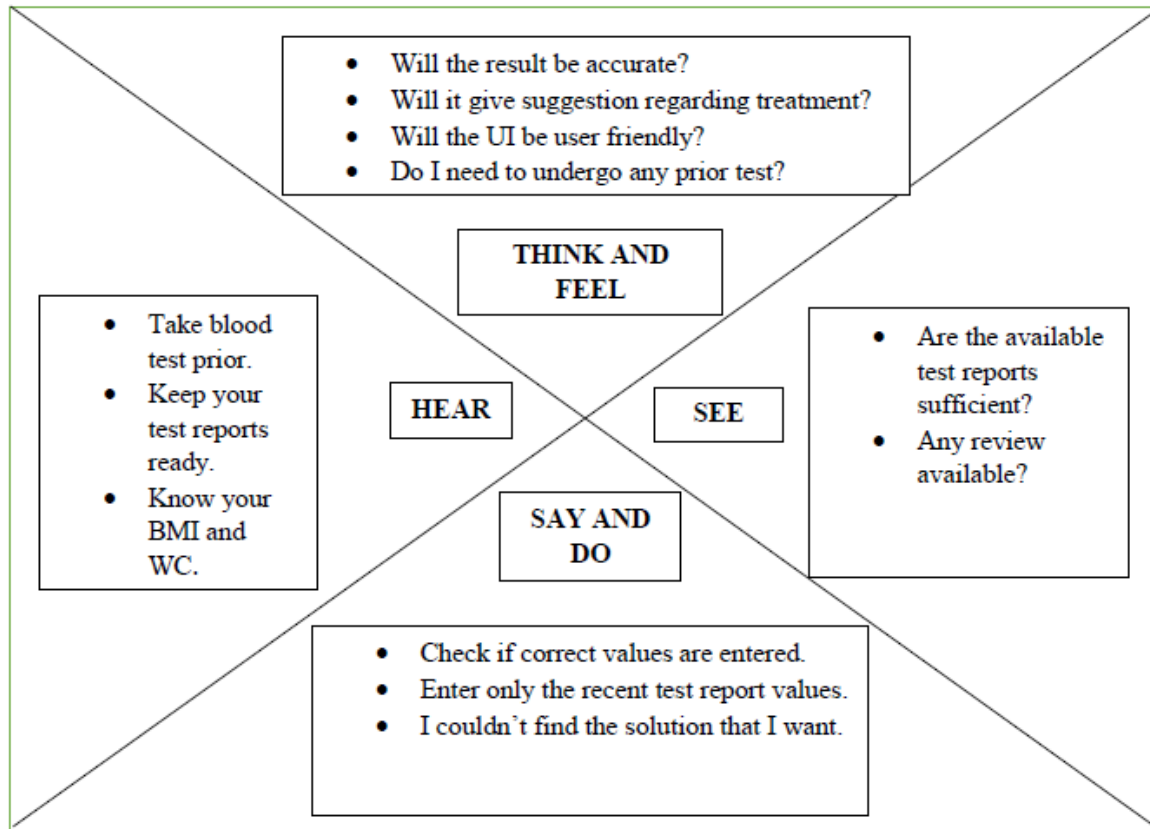
3. IDEATION & PROPOSED SOLUTION

a. Empathy Map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to help teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



b. Ideation & Brainstorming



Brainstorm & idea prioritization

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

🕒 10 minutes to prepare
🕒 1 hour to collaborate
👥 2-3 people recommended



Before you collaborate

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

🕒 10 minutes

- A** Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.
- B** Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.
- C** Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) →



Define your problem statement

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

🕒 5 minutes

PROBLEM
How might we detect the chronic kidney disease?



Key rules of brainstorming

To run a smooth and productive session

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

2

Brainstorm

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

🕒 10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Yamini P

High Accuracy	User Friendly	Minimize error
Preprocess the data	Accurate Prediction of CKD	Clear Focus on testing dataset

Rakshana B

Find the tools needed	Perform the appropriate algorithm	Collect user feedback
Get knowledge about the algorithms	Performance efficiency	Find the parameter that differentiates people

Rithanya D

Visualize Data	Precision	Collect Accurate dataset
Refer related medical reports	Instant Detection	Fix ideal range for data

Sangamithra S

Understand the data	Remove duplications in the dataset	Filter dataset
Define dataset labels	Adaptability	Find the correlation between the dataset

3

Group ideas

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

🕒 20 minutes

DataSet

Perform Data
Preprocessing

Clear Cut
Visualization
of Data

Find the
Correlation
in the
Dataset

Training and Testing

Train the
Dataset

Test the
Dataset

Improve the
Performance

Work and Deliverables

User
Friendly
Interface

Accurate
Prediction of
CKD

Get User
Feedback

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Prioritize

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

20 minutes



After you collaborate

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

Quick add-ons

- A Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.
- B Export the mural**
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

- Strategy blueprint**
Define the components of a new idea or strategy.
[Open the template →](#)
- Customer experience journey map**
Understand customer needs, motivations, and obstacles for an experience.
[Open the template →](#)
- Strengths, weaknesses, opportunities & threats**
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
[Open the template →](#)

[Share template feedback](#)

c. Proposed Solution

S. No	Parameter	Description
1.	Problem statement	<p>The Chronic Kidney disease is a progressive disease often resulting in leading cause of death in the world. There needs to be work done to help prevent the risks of having this. Therefore, early detection of this is necessary.</p> <p>Globally, in 2017, 1.2 million (95% uncertainty interval [UI] 1.2 to 1.3) people died from CKD. The global all-age mortality rate from CKD increased 41.5% (95% UI 35.2 to 46.5) between 1990 and 2017, although there was no significant change in the age-standardised mortality rate (2.8%, -1.5 to 6.3).</p> <p>To predict which patients are most likely to suffer from this disease in present as well as in the near future using the features given so that they can take educated, planned steps for the next phase of treatment.</p>
2.	Idea / Solution description	<p>In this project, we plan to build an interactive dashboard for understanding and visualising chronic kidney diseases using this platform, in which we classify a person as prone to disease or not by considering various factors like age, blood pressure, RBC and maximum haemoglobin level etc</p>

3.	Novelty / Uniqueness	<p>There is no further working models to predict with high accuracy. So, a model with better accuracy is aimed since false predictions results in unwanted fear and treatments.</p> <p>Finding the diseases in the early stages by predicting all possible outcomes in such a way by visualising the data obtained to educate the user easily and effectively</p>
4.	Social Impact / Customer Satisfaction	<p>Early prediction of the kidney disease helps the users to estimate the seriousness of the problem and allows the user to start the treatment in early stage of the disease to prevent from resulting in critical condition.</p> <p>Also helps in reducing the cost, travel time, and avoid the direct consultation with the doctors therefore providing a platform which is available for identification of disease 24/7.</p>
5.	Business Model (Revenue Model)	<p>This system can be mainly used by Healthcare and Hospitals. They can have a track of the patient of their kidney condition before consulting the doctors. Even labs can use this application.</p>
6.	Scalability	<p>This model will be initially used by a couple of users but when this model gets well-known to the environment the number of users will increase.</p> <p>Even we can include doctors for suggestion for the users, like what should be the next step after that user is being subjected to the kidney disease. As when the users get to know that doctors are suggesting, the popularity of this application increases which result vast users to use this model.</p> <p>Advertising is also another way of promoting this model by giving ads,</p>

		conducting a campaign to create an awareness of kidney disease.
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d. Problem Solution fit

TITLE: EARLY DETECTION OF CHRONIC KIDNEY DISEASE		PROJECT DESIGN PHASE 1-SOLUTION FIT TEMPLATE		TEAM ID: PNT2022TMID53288	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS A Users of this application are patients who can be a normal person or Doctors or Medical professionals who want to know whether they are prone to chronic kidney disease.	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none"> Expenses in treating chronic kidney disease Not having enough time to visit doctor and get their advice and proper treatment Doctors may not be available 	5. AVAILABLE SOLUTIONS AS <ul style="list-style-type: none"> Urine test Blood test: serum creatine test Blood urea nitrogen test Kidney ultrasound Kidney biopsy Blood test: eGFR 	Explore AS, differentiate	
	2. JOBS-TO-BE-DONE / PROBLEMS J&P <ul style="list-style-type: none"> Carelessness of a user in application while entering patients test results. User wrongly manipulating the patient's data in application due to insufficient knowledge or improper training. The jobs to be done are: <ul style="list-style-type: none"> Collect the dataset Preprocess the dataset Build the machine learning model Train the model Test the model Improve performance 				9. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none"> Diabetes Prolonged obstruction of urinary tract Not drinking enough water Drinking alcohol un excess High blood pressure

3. TRIGGERS TR <ul style="list-style-type: none"> As there wasn't any online application for detecting kidney disease Increase deaths due to later detection To start the diagnosis of the patient at the early stage. Early detection leads to a less painful treatment of a person rather having a painful treatment in case of very late detection. 	10. YOUR SOLUTION SL <p>A system that provides results and prediction whether or not a person has chronic kidney disease. The user feeds in the necessary data required and system outputs the possibility of the person having the disease or not.</p>	8.CHANNELS OF BEHAVIOUR CH <p>ONLINE: As Patients use and once, they are satisfied with the accuracy of application they share their experience, and other patients are introduced to it. So that individuals will become aware of this application.</p> <p>OFFLINE: The system has high scalability and reliability and can be accessed through browsers like Chrome, Safari, Firefox, etc.</p>
4. EMOTIONS: BEFORE / AFTER BEFORE: Had to undergo different tests to identify whether they have chronic kidney disease and at sometimes the test results are provided too late. AFTER: Accurate results are provided and also the user doesn't have to wait for a long time. EM		

4. REQUIREMENT ANALYSIS

a. Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	<ul style="list-style-type: none"> Registration through Form Registration through Gmail
FR-2	User Confirmation	<ul style="list-style-type: none"> Confirmation via Email
FR-3	User Login	<ul style="list-style-type: none"> User Login via Form
FR-4	Forgot Password	<ul style="list-style-type: none"> Send OTP via Email
FR-5	Data Inputs	<ul style="list-style-type: none"> Get the input data from the user. Upload the data to test the solution.
FR-6	Print Result	<ul style="list-style-type: none"> Perform operations on the input data and predict the result. Print the result to the user.

Non-functional Requirements:.

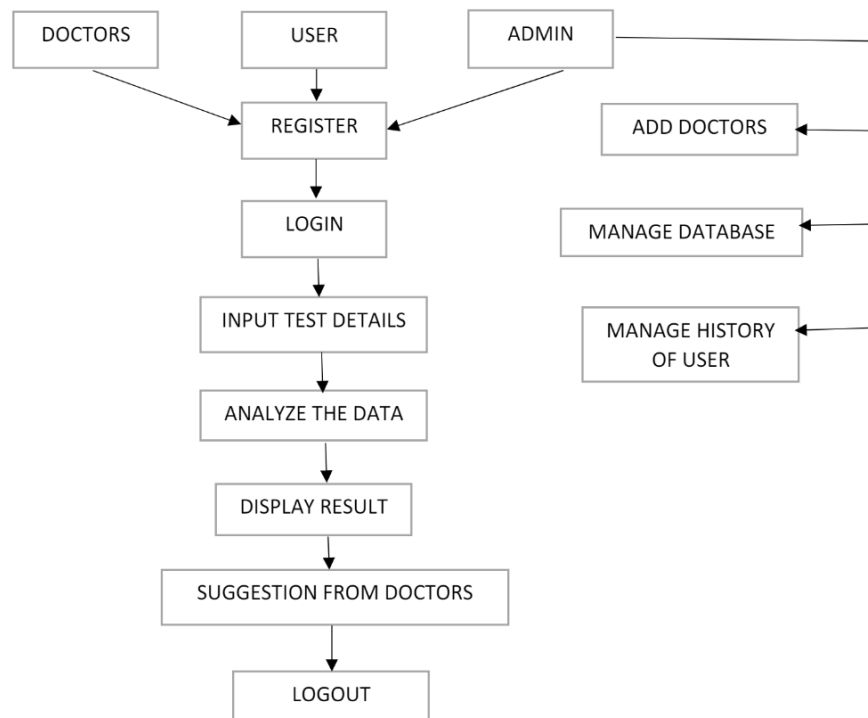
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The proposed solution must be user friendly and should be understandable for everyone who uses it.

NFR-2	Security	The proposed solution must ensure security. It is the developer's responsibility to maintain and safeguard the sensitive data provided by the user.
NFR-3	Reliability	The proposed solution must be reliable in performing the task as it could create confusion in person's health. The delivered solution must be reliable and accurate in predicting chronic kidney disease.
NFR-4	Performance	An eye has to be kept on the performance of the solution developed. The solution must perform efficiently even in critical situations.
NFR-5	Availability	The proposed solution should be accessible to the user at any point of time.
NFR-6	Scalability	The proposed solution should have the ability to handle increasing or decreasing workloads without performance degradation.

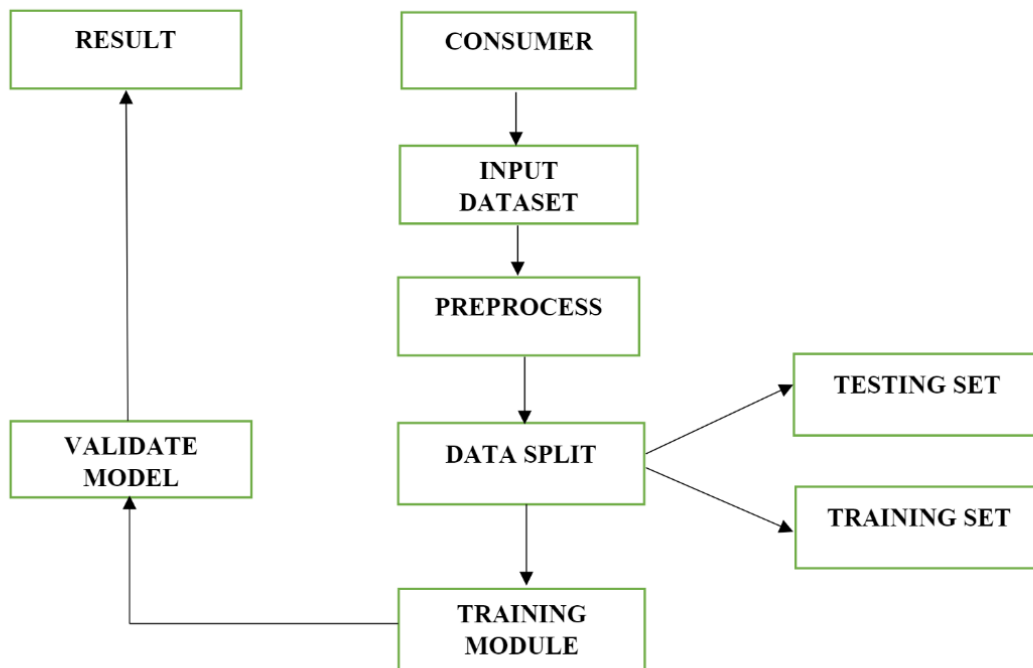
5. PROJECT DESIGN

a. Data Flow Diagrams

Example: [\(Simplified\)](#)



Flow :



b. Solution & Technical Architecture

Technical Architecture:

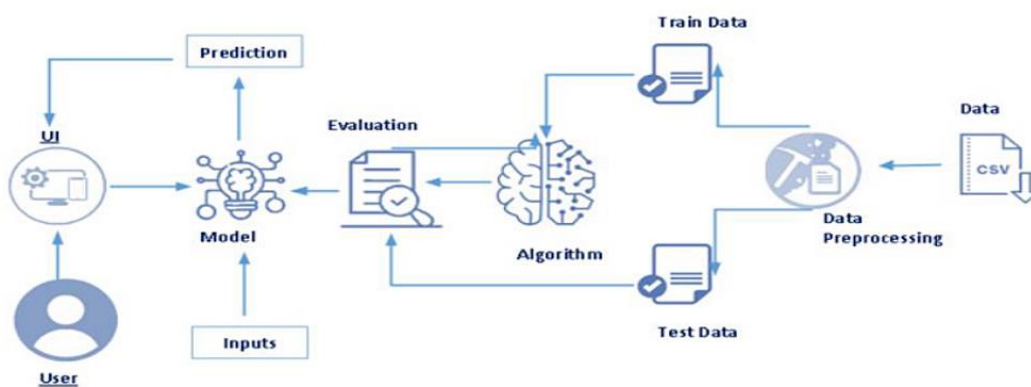


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	Import Data	Data Import lets you upload data from external sources and combine it with data you collect via Analytics.	Python: Numpy, Pandas

2.	Clean the data	Data cleaning is the process of fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset.		Python
3.	Pre-process the data	Data pre-processing is a step in the data mining a data analysis process that takes raw data and transforms it into a format that can be understood and analyzed by computers and machine learning.		Python
4.	Train the data	Training data is used to teach prediction models that use machine learning algorithms how to extract features that are relevant to specific business goals.		Python
5.	Test the data	Test Data in Software Testing is the input given to a software program during test execution. It represents data that affects or affected by software execution while testing.		Python
6.	Machine Learning Model	A machine learning model is a file that has been trained to recognize certain types of patterns. You train a model over a set of data, providing it an algorithm that it can use to reason over and learn from those data		Python
7.	Check Performance Efficiency	The model evaluation is a great way to monitor your model's outcome between different versions.		Python
8.	Improvise the model	In machine learning, the term model accuracy refe to the measurements made to decide whether or n		Python
		a certain model is the best to describe the relationship between the different problem variables.		

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Data Collection	Data collection is the procedure of collecting, measuring and analyzing accurate insights for research using standard validated techniques.	Python: Numpy, Pandas
2.	Train and test the data	Train/Test is a method to measure the accuracy of your model.It is called Train/Test because you split the the data set into two sets: a training set and a testing set.	Technology used

3.	Predict the accurate result	Predict whether the person is affected by CKD or not accurately	Technology used
4.	Display the result	The predicted result gets displayed	Technology used

c. User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Patient) Web User	Registration	USN-1	As a user, I can register by entering my email, phone number, Date of birth, password, and confirm password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive the confirmation message in my email once I have registered or OTP will be sent.	I receive confirmation email & click confirm. or by entering the OTP received	High	Sprint-1
		USN-3	As a user, I can register through Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log in by entering email & password		High	Sprint-1
	Forgot Password	USN-5	As a user, if i forgot my password, by clicking forgot password an OTP is sent to	By entering the OTP sent via phone number or email.	High	Sprint-1
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release

Customer (Patient) Mobile user	Registration	USN-1	As a user, I can register by entering my email,phone number ,Date of birth, password, and confirm password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive the confirmation message in my email once I have registered or OTP will be sent.	I receive confirmation email & click confirm. or by entering the OTP received	High	Sprint-1
		USN-3	As a user, I can register through Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log in by entering email & password		High	Sprint-1
	Forgot Password	USN-5	As a user,if forgot my password, clicking forgot password an OTP is sent to the Registered number	By entering the OTP sent via phone number or email.	High	Sprint-1
	Data collection	USN-6	As a user, I can upload the input data set to diagnose.		High	Sprint-1
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin	Login	USN-2	As an admin, I can login by using email id and password.		High	Sprint-1

	Data redundancy removal	USN-3	As an admin, I can manipulate the data and go for a redundancy check.		High	Sprint-1
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6. PROJECT PLANNING & SCHEDULING

a. Sprint Planning & Estimation

Activity number	Activity name	Detailed activity description	Assigned to
1	Preparation Phase	<ol style="list-style-type: none"> 1. Access the resources (courses) in project dashboard 2. Access the guided project workspace 3. Create GitHub account & collaborate with Project Repository in project workspace 4. Set-up the Laptop / Computers based on the prerequisites for each technology track 	Yamini, Rakshana, Rithanya, Sangamithra
2	Ideation Phase		
2.1	Literature survey	Literature survey on the selected project & Information Gathering	Rithanya, Sangamithra
2.2	Define a problem statement	Prepare the list of problem statements to understand the user needs	Yamini, Rakshana
2.3	Empathy Map	Preparation of Empathy Map Canvas to capture the user Pains & Gains	Yamini, Rakshana, Rithanya, Sangamithra
2.4	Brainstorm & idea prioritization	List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance	Yamini, Rakshana
3	Project Design Phase -I		

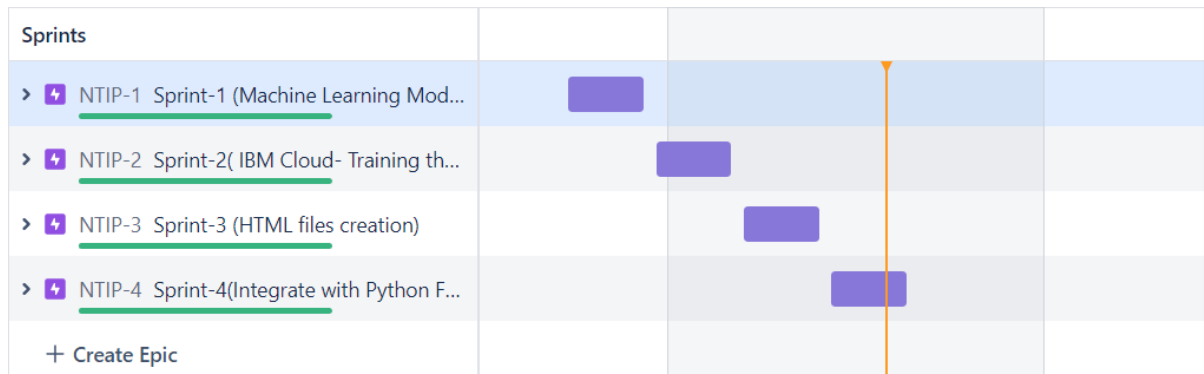
Activity number	Activity name	Detailed activity description	Assigned to
3.1	Proposed Solution	Preparation of proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution	Rithanya, Sangamithra
3.2	Problem Solution Fit	Prepared problem is analysed and make effective solutions for the problem	Yamini, Rakshana, Rithanya, Sangamithra
3.3	Solution Architecture	Prepare an architecture for solution	Yamini, Rakshana
4	Project Design Phase - II		
4.1	Requirement Analysis	Prepare the Functional Requirement and Non- Functional Document	Yamini, Rakshana
4.2	Customer Journey	Preparation of customer journey maps to understand the user interactions & experiences with the application (entry to exit)	Yamini, Rakshana, Rithanya, Sangamithra
4.3	Data Flow Diagrams	Prepare a Data Flow Diagram for Project use level0 (Industry Standard)	Rithanya, Sangamithra
4.4	Technology Architecture	Prepare Technology Architecture of the solution	Yamini, Rakshana, Rithanya, Sangamithra
5	Project Planning Phase		
5.1	Milestones & Tasks	Prepare Milestone & Activity List	Yamini, Rakshana
5.2	Sprint Schedules	Prepare Sprint Delivery Plan	Rithanya, Sangamithra
6	Project Development Phase		
Activity number	Activity name	Detailed activity description	Assigned to
6.1	Coding & Solutioning	Sprint-1 Delivery: Develop the Code, Test and push it to GitHub.	Yamini, Rakshana, Rithanya, Sangamithra
6.2	Acceptance Testing	Sprint-2 Delivery: Develop the Code, Test and push it to GitHub. Sprint-3 Delivery: Develop the Code, Test and push it to GitHub.	Yamini, Rakshana, Rithanya, Sangamithra

6.3	Performance Testing	Sprint-4 Delivery: Develop the Code, Test and push it to GitHub.	Yamini, Rakshana, Rithanya, Sangamithra
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b. Sprint Delivery Schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	3	High	Rakshana, Yamini
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Yamini
Sprint-1		USN-3	As a user, I can register for the application through Gmail	3	Low	Rithanya
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	2	High	Rithanya,Sangamithra
Sprint-2	Dashboard	USN-5	As a user I can view my previous test details and results.	2	Medium	Rakshana, Rithanya
Sprint-2		USN-6	As a user I can view my personal details in the dashboard.	2	Medium	Yamini, Sangamithra
Sprint-2	User Input	USN-7	As a user I will enter the correct input values required for the test to predict CKD.	5	High	Yamini, Rakshana, Rithanya, Sangamithra
Sprint-3	Display Result	USN-8	As a user I can view my test results.	5	High	Yamini, Rakshana, Rithanya, Sangamithra
Sprint-3	Suggestion	USN-9	As a user I can view the suggestions given by the model.	2	Medium	Rakshana
Sprint-3	Feedback	USN-10	As a user I can rate and give feedback to the application.	2	Medium	Sangamithra
Sprint-4	Helpdesk	USN-11	As a user I can post my queries and view the FAQ's	5	Medium	Yamini, Rakshana, Rithanya, Sangamithra
Sprint-4	User Profile	USN-12	As an admin I can manage the details of the users.	4	High	Yamini, Rakshana, Rithanya, Sangamithra

c. Reports from JIRA



Child issues

Order by ▾ ... +









100% Done

	NTIP-5	Clean the dataset	-	YP	DONE ▾
	NTIP-6	Choose the model	-	R	DONE ▾
	NTIP-7	Train the model	-	RB	DONE ▾
	NTIP-9	Evaluate the model	-	SS	DONE ▾
	NTIP-10	Making the predictions	-	YP	DONE ▾

Child issues

Order by ▾ ... +









100% Done

- | | | | | | |
|---|-------------------------|----------------------------|---|--|------------------------|
|  | NTIP-11 | Create the IBM Cloud A... | - |  | DONE ▾ |
|  | NTIP-12 | Watson Studio- Run ju... | - |  | DONE ▾ |
|  | NTIP-13 | ML- Train the model | - |  | DONE ▾ |
|  | NTIP-14 | Store dataset in Cloud ... | - |  | DONE ▾ |

Child issues

Order by ▾ ... +

100% Done

- | | | | | | |
|---|-------------------------|----------------------------|---|--|------------------------|
|  | NTIP-15 | Create Home page | - |  | DONE ▾ |
|  | NTIP-16 | Create the user input p... | - |  | DONE ▾ |
|  | NTIP-17 | Create the Prediction p... | - |  | DONE ▾ |
|  | NTIP-19 | Create Main html page | - |  | DONE ▾ |

Child issues

Order by ▾ ... +

- | | | | | | |
|---|-------------------------|---------------------------|---|--|------------------------|
|  | NTIP-18 | Create the Python Flas... | - |  | DONE ▾ |
|---|-------------------------|---------------------------|---|--|------------------------|

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

a. HOME PAGE:

When the user logs on to our website this homepage will be displayed to them which has information about chronic kidney disease and also the navigation button to the detection or prediction page.

CODE:

```
{% extends 'main.html' %}
{% block content %}
{% if message %}
    <div class="alert alert-danger">{{ message }}</div>
{% endif %}

<html lang="en">
<head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
    <meta name="description" content="">
    <meta name="author" content="">

    <title>Chronic Kidney Disease Prediction</title>

    <link rel="canonical" href="https://getbootstrap.com/docs/4.0/examples/carousel/">

    <!-- Bootstrap core CSS -->
    <link href="../../dist/css/bootstrap.min.css" rel="stylesheet">

</head>
<body>

    <main role="main">

        <section class="jumbotron p-3 p-md-5 text-white rounded bg-dark text-center">
            <div class="container">
                <h1 class="jumbotron-heading">Kidney Disease Prediction</h1>
                <p class="lead">Chronic kidney disease is one of the most critical health problems. In this we aim to predict the chronic kidney disease using the smallest subset of features</p>
                <p>
                    <a href="https://www.kidney.org/atoz/content/about-chronic-kidney-disease" class="btn btn-primary my-2">Know more</a>
                </p>
            </div>
        </section>

        <!-- START THE FEATURETTES -->
```

```

</div><!-- /.container -->
<section class="jumbotron p-3 p-md-5 text-white rounded bg-dark text-center">
  <div class="container">
    <h1 class="jumbotron-heading">Chronic Kidney Disease Prediction</h1>
    <p>
      <a href="{{ url_for('kidneyPage') }}" class="btn btn-primary my-2">TAKE THE TEST</a>
    </p>
  </div>
</section>

</main>

<!-- Bootstrap core JavaScript
===== -->
<!-- Placed at the end of the document so the pages load faster -->
<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-
KJ3o2DKtIkVYIK3UENzmM7KCKRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN" crossorigin="a
nonymous"></script>
<script>window.jQuery || document.write('<script src=" ../assets/js/vendor/jquery-
slim.min.js"><\script>')</script>
<script src=" ../assets/js/vendor/popper.min.js"></script>
<script src=" ../dist/js/bootstrap.min.js"></script>
<!-- Just to make our placeholder images work. Don't actually copy the next line! -->
<script src=" ../assets/js/vendor/holder.min.js"></script>
</body>
</html>

{% endblock %}

```

b. PREDICTION PAGE:

This page is used to check whether there is chronic kidney disease or not by getting the required input values from the user in the required field.

CODE:

```

{% extends 'main.html' %}
{% block content %}

<div class="row" style="margin-bottom: 125px;">
  <div class="col-md-2"></div>
  <div class="col-md-8">
    <center><h1>Kidney Disease Predictor</h1></center>
    <div class="card card-body" style="border: 1px solid black;">
      <form class="form-horizontal" action="{{ url_for('predictPage') }}" method="POST">
        <div class="row">
          <div class="col-md-4">
            <div class="form-group">
              <input style="border: 1px solid black;" class="form-
control" type="text" name="age" placeholder="age">

```



```
        </div>
      </div>
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="bp" placeholder="bp">
        </div>
      </div>
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="al" placeholder="al">
        </div>
      </div>
    </div>
    <div class="row">
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="su" placeholder="su">
        </div>
      </div>
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="rbc" placeholder="rbc">
        </div>
      </div>
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="pc" placeholder="pc">
        </div>
      </div>
    </div>
    <div class="row">
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="pcc" placeholder="pcc">
        </div>
      </div>
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="ba" placeholder="ba">
        </div>
      </div>
      <div class="col-md-4">
        <div class="form-group">
          <input style="border: 1px solid black;" class="form-
control" type="text" name="bgr" placeholder="bgr">
        </div>
      </div>
    </div>
  </div>
```

```
<div class="col-md-4">
  <div class="form-group">
    <input style="border: 1px solid black;" class="form-
control" type="text" name="bu" placeholder="bu">
  </div>
</div>
<div class="col-md-4">
  <div class="form-group">
    <input style="border: 1px solid black;" class="form-
control" type="text" name="sc" placeholder="sc">
  </div>
</div>
<div class="col-md-4">
  <div class="form-group">
    <input style="border: 1px solid black;" class="form-
control" type="text" name="pot" placeholder="pot">
  </div>
</div>
</div>
<div class="row">
  <div class="col-md-4">
    <div class="form-group">
      <input style="border: 1px solid black;" class="form-
control" type="text" name="wc" placeholder="wc">
    </div>
  </div>
  <div class="col-md-4">
    <div class="form-group">
      <input style="border: 1px solid black;" class="form-
control" type="text" name="htn" placeholder="htn">
    </div>
  </div>
  <div class="col-md-4">
    <div class="form-group">
      <input style="border: 1px solid black;" class="form-
control" type="text" name="dm" placeholder="dm">
    </div>
  </div>
</div>
<div class="row">
  <div class="col-md-4">
    <div class="form-group">
      <input style="border: 1px solid black;" class="form-
control" type="text" name="cad" placeholder="cad">
    </div>
  </div>
  <div class="col-md-4">
    <div class="form-group">
      <input style="border: 1px solid black;" class="form-
control" type="text" name="pe" placeholder="pe">
    </div>
  </div>
  <div class="col-md-4">
    <div class="form-group">
      <input style="border: 1px solid black;" class="form-
control" type="text" name="ane" placeholder="ane">
    </div>
  </div>
</div>
```

```
        </div>
    </div>
</div>
<input type="submit" class="btn btn-info btn-block" value="Predict">
</form>
</div>
</div>
<div class="col-md-2"></div>
</div> <br>
<h1 style="text-align: center"> Sample Input</h1> <br>
```

```
<table class="table">
<thead>
<tr>
<th scope="col">age</th>
<th scope="col">bp</th>
<th scope="col">al</th>
<th scope="col">su</th>
<th scope="col">rbc</th>
<th scope="col">pc</th>
<th scope="col">pcc</th>
<th scope="col">ba</th>
<th scope="col">bgr</th>
<th scope="col">bu</th>
<th scope="col">sc</th>
<th scope="col">pot</th>
<th scope="col">wc</th>
<th scope="col">htn</th>
<th scope="col">dm</th>
<th scope="col">cad</th>
<th scope="col">pe</th>
<th scope="col">ane</th>
<th scope="col">Disease</th>
```

```
</tr>
</thead>
<tr>
<td>68</td>
<td>80</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>157</td>
<td>162</td>
<td>9.6</td>
<td>4.9</td>
<td>11000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
```

```

        <td>Present</td>
    </tr>
</tbody>
</table>

```

```
{% endblock %}
```

C)RESULT PAGE:

This page will display the results that whether you have a chronic kidney disease or not.

CODE:

```

{% extends 'main.html' %}
{% block content %}
    <div class="row" style="margin-bottom: 477px;">
        <div class="col-md-3"></div>
        <div class="col-md-6">
            {% if pred == 1 %}
                <div class="jumbotron">
                    <b><h1 class="display-4">Chronic Kidney Disease-Detected!!</h1></b>
                    <p class="lead">Please Consult a Doctor and make sure of health in your diet.</p>
                    <hr class="my-4">
                    <b><p>Doctor Consultation Needed.</p></b>
                </div>
            {% else %}
                <div class="jumbotron">
                    <b><h1 class="display-4">Great! You are Healthy</h1></b>
                    <p class="lead">You are Absolutely Alright ! There is no Marks for Kidney Disease. Enjoy life with
full of Happiness.</p>
                    <hr class="my-4">
                    <b><p>Stay fit as you are. Nothing is important than your health.</p></b>
                </div>
            {% endif %}
        <div class="row">
            <div class="col-md-4"></div>
            <div class="col-md-4"><a href="{{ url_for('home') }}" class="btn btn-block btn-
primary">Back to Home</a></div>
            <div class="col-md-4"></div>
        </div>
    </div>
    <div class="col-md-3"></div>
</div>
{% endblock %}

```

8. TESTING

a. Test Cases

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
TC1	Functional	Home Page	Verify user is able to see the home page after clicking the url of CDK detection website		1.Enter URL and click go 2.Verify Home page is displayed or not	URL	Home page should display	Working as expected	Pass
TC2	UI	Home Page	Verify the UI elements are in correct design		1.Enter URL and click go 2.Verify the home page UI elements is in correct designed way	URL	Application should show below UI elements: a.Explore button b.Test Button c.Home page button (internal linking)	Working as expected	pass
TC3	Functional	Input Test	Verify user is able to enter valid test reports input		1.Enter URL and click go 2.direct to home page 3.click take test button 4.Enter	the vital parameters are the needed test data	User should navigate to the test webpage and be able to enter valid inputs	Working as expected	Pass

					valid test report inputs				
TC4	Functional	Input Test	Verify user is able to predict output with Invalid credentials		1.Enter URL and click go 2.direct to home page 3.click take test button 4.Enter invalid test report inputs	Invalid inputs are taken into account	Application should show 'Invalid inputs' and redirects to home page	Working as expected	Pass
TC5	Functional	Predict page	Verify user is able to direct to the prediction page with valid inputs		1.Enter URL and click go 2.direct to home page 3.click take test button 4.Enter valid test report inputs 5.click predict button 6. directs to the prediction page	valid test inputs	Application should direct to the prediction page after clicking predict button	Working as expected	Pass

TC6	Functional	Predict page	Verify user is able to get the accurate test result values		1.Enter URL and click go 2.direct to home page 3.click take test button 4.Enter valid test report inputs 5.click predict button 6. directs to the prediction page 7.check out the results	valid test inputs	Application should display the accurate prediction message	Working as expected	Pass
-----	------------	--------------	--	--	---	-------------------	--	---------------------	------

This is the homepage ;

KIDNEY DISEASE PREDICTION

Home Kidney-Disease

Kidney Disease Prediction

Chronic kidney disease is one of the most critical health problems. In this we aim to predict the chronic kidney disease using the smallest subset of features

Know more

Chronic Kidney Disease Prediction

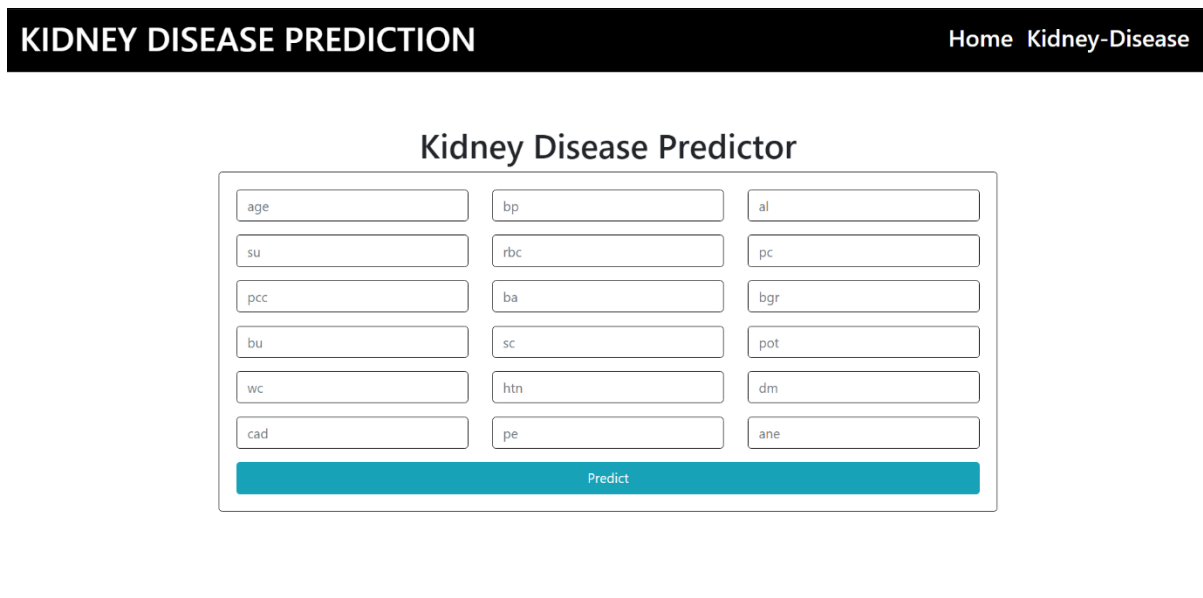
TAKE THE TEST

This is the page where the users can be able to know more about chronic kidney disease.



The screenshot shows the National Kidney Foundation website. At the top, there is a navigation bar with the logo, a search bar, a 'Login' button, and a 'Donate' button. Below the navigation bar, there is a breadcrumb trail: 'Home » A to Z » Chronic kidney disease (CKD)'. The main heading is 'Chronic kidney disease (CKD)'. Below this, there is a 'Table of Contents' section with a list of links: 'What is chronic kidney disease?', 'Kidney disease facts', 'What are the main causes of chronic kidney disease?', 'What are other conditions that affect the kidney?', 'What are the risk factors of chronic kidney disease?', 'What are the symptoms?', 'What will happen if my doctor suspects chronic kidney disease?', and 'Kidney Numbers and the CKD Heat Map'. To the right of the table of contents, there is a 'Save this content:' section with a download icon and a 'Share this content:' section with social media icons for Twitter, Facebook, Pinterest, and LinkedIn. At the bottom right, there is a section 'Is this content helpful?' with a star rating.

This is the testing page and the user needs to give input values in the required fields.



The screenshot shows a form titled 'Kidney Disease Predictor'. The form has a header bar with 'KIDNEY DISEASE PREDICTION' on the left and 'Home Kidney-Disease' on the right. The form itself is a grid of input fields. The first row contains 'age', 'bp', and 'al'. The second row contains 'su', 'rbc', and 'pc'. The third row contains 'pcc', 'ba', and 'bgr'. The fourth row contains 'bu', 'sc', and 'pot'. The fifth row contains 'wc', 'htn', and 'dm'. The sixth row contains 'cad', 'pe', and 'ane'. Below the grid is a large blue button labeled 'Predict'.

This page also contains some sample values for the reference of users.

KIDNEY DISEASE PREDICTION

[Home](#) [Kidney-Disease](#)

<input type="text" value="pcc"/>	<input type="text" value="ba"/>	<input type="text" value="bgr"/>
<input type="text" value="bu"/>	<input type="text" value="sc"/>	<input type="text" value="pot"/>
<input type="text" value="wc"/>	<input type="text" value="htn"/>	<input type="text" value="dm"/>
<input type="text" value="cad"/>	<input type="text" value="pe"/>	<input type="text" value="ane"/>
<input type="button" value="Predict"/>		

Sample Input

age	bp	al	su	rbc	pc	pcc	ba	bgr	bu	sc	pot	wc	htn	dm	cad	pe	ane	Disease
68	80	3	0	0	1	0	0	157	162	9.6	4.9	11000	0	1	0	0	1	Present

127.0.0.1:5000

After the input values are given.

KIDNEY DISEASE PREDICTION

[Home](#) [Kidney-Disease](#)

Kidney Disease Predictor

<input type="text" value="24"/>	<input type="text" value="100"/>	<input type="text" value="2"/>
<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="0"/>
<input type="text" value="1"/>	<input type="text" value="0"/>	<input type="text" value="136"/>
<input type="text" value="60"/>	<input type="text" value="1.9"/>	<input type="text" value="3.7"/>
<input type="text" value="9600"/>	<input type="text" value="1"/>	<input type="text" value="1"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>
<input type="button" value="Predict"/>		

127.0.0.1:5000

This is the result page where the results are displayed.

This is where the user is detected with chronic kidney disease.

Chronic Kidney Disease- Detected!!

Please Consult a Doctor and make sure of health in your diet.

Doctor Consultation Needed.

[Back to Home](#)

This is where the user is in normal and an healthy condition.

Great! You are Healthy

You are Absolutely Alright ! There is no Marks for Kidney Disease. Enjoy life with full of Happiness.

Stay fit as you are. Nothing is important than your health.

[Back to Home](#)

b. User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Early Detection of Chronic Kidney Disease Using Machine Learning project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	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

a. Performance Metrics

Model Performance Testing:

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

S.No	Parameter	Values	Screenshot																														
1.	Metrics	<div>Classification Model:</div> <div>Confusion Matrix and Accuracy Score:</div> <div>Classification Report :</div>	<div><pre>confusion_matrix(y_test, model.predict(X_test))</pre><pre>array([[23, 0], [0, 9]], dtype=int64)</pre><pre>print(f"Accuracy is {round(accuracy_score(y_test, model.predict(X_test))*100, 2)}%")</pre><pre>Accuracy is 100.0%</pre></div> <div><table><thead><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr></thead><tbody><tr><td>0</td><td>1.00</td><td>1.00</td><td>1.00</td><td>23</td></tr><tr><td>1</td><td>1.00</td><td>1.00</td><td>1.00</td><td>9</td></tr><tr><td>accuracy</td><td></td><td></td><td>1.00</td><td>32</td></tr><tr><td>macro avg</td><td>1.00</td><td>1.00</td><td>1.00</td><td>32</td></tr><tr><td>weighted avg</td><td>1.00</td><td>1.00</td><td>1.00</td><td>32</td></tr></tbody></table></div>		precision	recall	f1-score	support	0	1.00	1.00	1.00	23	1	1.00	1.00	1.00	9	accuracy			1.00	32	macro avg	1.00	1.00	1.00	32	weighted avg	1.00	1.00	1.00	32
	precision	recall	f1-score	support																													
0	1.00	1.00	1.00	23																													
1	1.00	1.00	1.00	9																													
accuracy			1.00	32																													
macro avg	1.00	1.00	1.00	32																													
weighted avg	1.00	1.00	1.00	32																													
2.	Tune the Model	<div>Hyperparameter Tuning</div> <div>Validation Method</div>	<div><pre>ran_forest = RandomForestClassifier(n_estimators = 20)</pre><pre>ran_forest.fit(X_train, y_train)</pre></div>																														

			<pre> from sklearn.model_selection import train_test_split X1, X2, y1, y2 = train_test_split(X, y, random_state=0, train_size=0.5) model.fit(X1, y1) y2_model = model.predict(X2) accuracy_score(y2, y2_model) 0.9746835443037974 y2_model = model.fit(X1, y1).predict(X2) y1_model = model.fit(X2, y2).predict(X1) accuracy_score(y1, y1_model), accuracy_score(y2, y2_model) (0.9873417721518988, 0.9873417721518988) from sklearn.model_selection import cross_val_score cross_val_score(model, X, y, cv=5) array([0.96875, 1. , 0.96875, 1. , 1.]) </pre>
--	--	--	---

performance metrics using gatling tool:

Gatling Recorder - Configuration

Http Archive (HAR) Import
HAR File:

Simulation Information
Package: Class Name*: Format*:

☒ Follow Redirects? ☒ Infer HTML resources? ☒ Automatic Referers? ☒ Remove cache headers?
☐ Use Class Name as request prefix? ☐ Use HTTP method and URI as request postfix? ☐ Save & check response bodies?

Output
Simulations folder*:
Encoding:

Filters
Java regular expressions that match the entire URI

AllowList	DenyList
	*.js
	*.css
	*.gif
	*.jpeg
	*.jpg
	*.ico

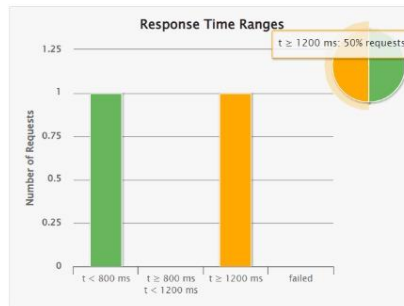
Save preferences ☐

Global:

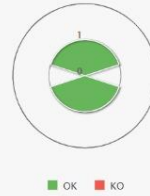
Ranges
Stats
Active Users
Requests / sec
Responses / sec

CDKprediction

Global Details



Number of requests



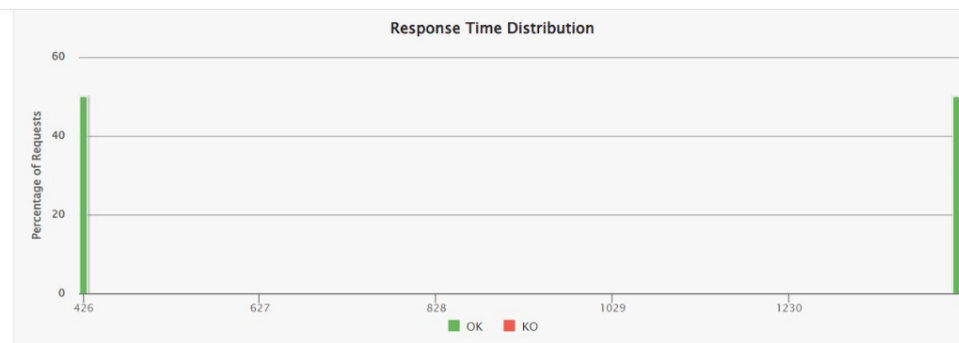
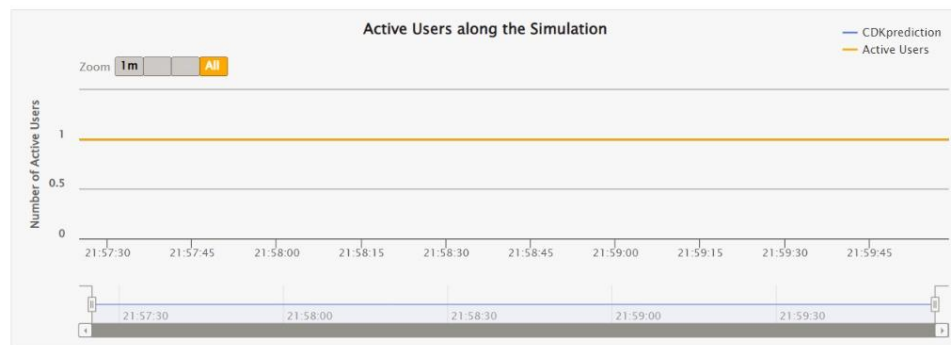
Gatling Version

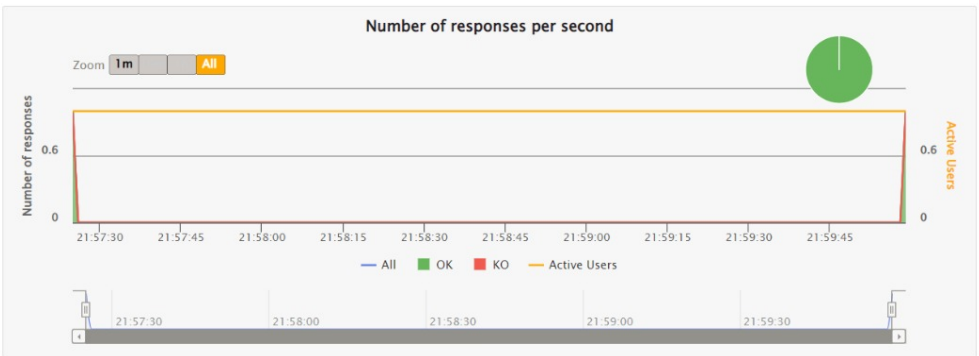
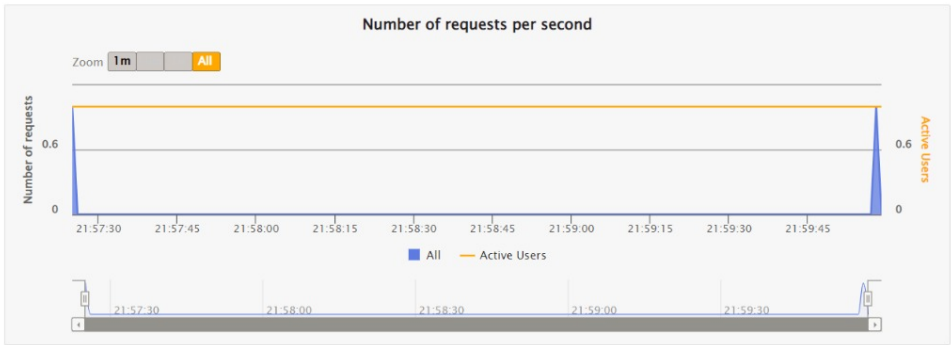
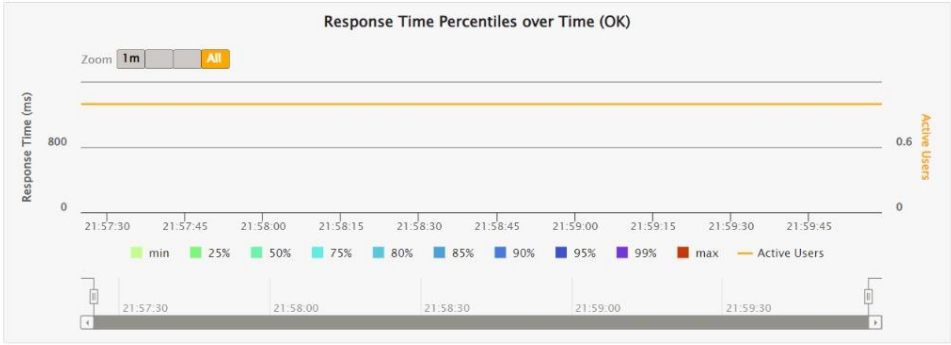
Version: 3.8.4
Released: 2022-09-13

Run Information

Date: 2022-11-18 16:27:24 GMT
Duration: 2m 34s
Description: —

Requests ▾	Executions					Response Time (ms)							
	Total ▴	OK ▴	KO ▴	% KO ▴	Cnt/s ▴	Min ▴	50th pct ▴	75th pct ▴	95th pct ▴	99th pct ▴	Max ▴	Mean ▴	Std Dev ▴
All Requests	2	2	0	0%	0.013	421	924	1175	1376	1416	1426	924	503
request_0	1	1	0	0%	0.006	421	421	421	421	421	421	421	0
request_1	1	1	0	0%	0.006	1426	1426	1426	1426	1426	1426	1426	0





Detail:

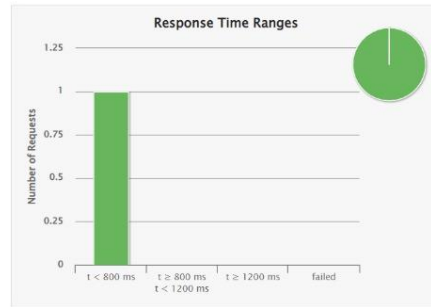
request_0

request_1

CDKprediction

Global

Details



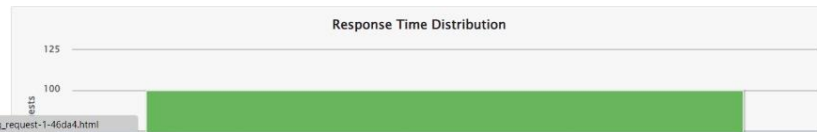
Stats

Executions

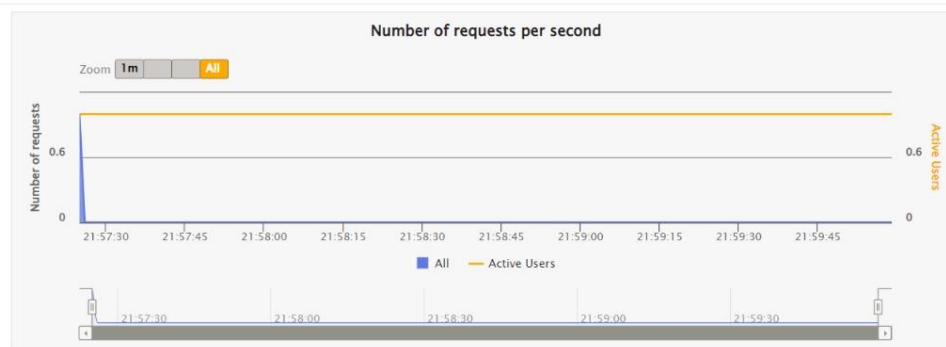
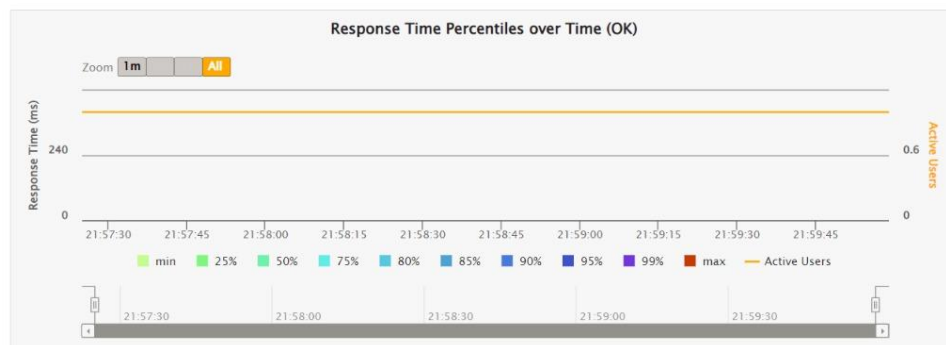
	Total	OK	KO
Total count	1	1	0
Mean count/s	0.006	0.006	-

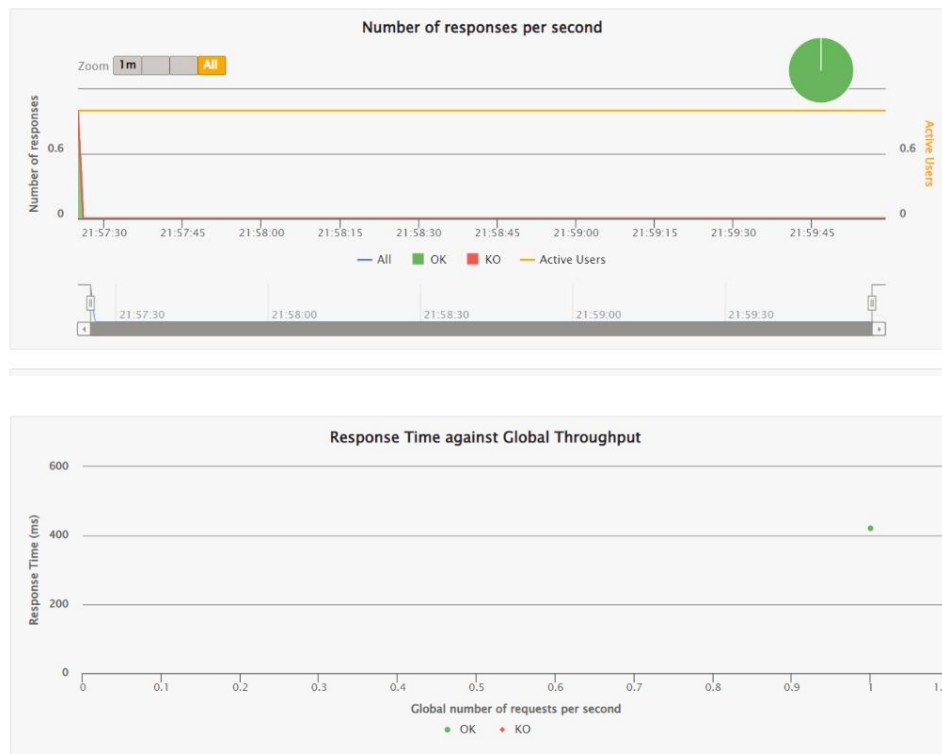
Response Time (ms)

	Total	OK	KO
Min	421	421	-
50th percentile	421	421	-
75th percentile	421	421	-
95th percentile	421	421	-
99th percentile	421	421	-
Max	421	421	-
Mean	421	421	-
Standard Deviation	0	0	-



D:/BM/gatling-charts-highcharts-bundle-3.8.4/results/.../req_request-1-46da4.html





10. ADVANTAGES & DISADVANTAGES

Advantages:

- 1.The user can make use of this application to detect the disease easily from their place.
- 2.As the application provides an accurate result which improves users trustworthiness.
- 3.It's an cost efficient method for the users to get an prediction result.

Disadvantages:

- 1.Continuous Network connection is required for this application to work which is not affordable for some class of people.
- 2.unwanted error due to numerical value.
- 3.Delay in getting the result due to poor network connection.

11. CONCLUSION

Chronic kidney disease affects 8% to 16% of the population worldwide and is a leading cause of death. Optimal management of CKD includes cardiovascular risk reduction, treatment of albuminuria, avoidance of potential nephrotoxins, and adjustments to drug dosing. Patients also require monitoring for complications of CKD, such as hyperkalemia, metabolic acidosis, anemia, and other metabolic abnormalities. Diagnosis, staging, and appropriate referral of CKD by primary care clinicians are important in reducing the burden of CKD worldwide.

The application helps in easy detection of the disease which is of high accuracy and prediction which helps a user to detect the disease. This application is of high user friendly to users.The user can make use of this application to detect the disease easily from their place .

12. FUTURE SCOPE

CKD is a condition in which the kidneys are damaged and cannot filter blood because of this, excess fluid and waste from blood remain in the body and may cause other health

problems, such as heart disease and stroke. Some other health consequences of CKD include:

- Anemia or low number of red blood cells
- Increased occurrence of infections
- Low calcium levels, high potassium levels, and high phosphorus levels in the blood
- Loss of appetite or eating less
- Depression or lower quality of life

Considering these conditions, this application can be a stepping stone for discovering certain other diseases which are caused by CKD.

Secondly, this application can be integrated with other applications which will be able to find different other diseases such as Heart diseases, Lung diseases, so that it would be a complete package and it would be very helpful for the Health care industries.

Finally, this particular application, when integrated with other working disease detection applications would provide free medical check-up for the poor community. This would provide great support for the Government to implement free health check-ups.

13. APPENDIX

Source Code

Main.html:

```
<!DOCTYPE html>
<html>
<head>
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <meta name="og:title" content="Kidney-Disease Prediction">
  <meta name="og:image" content="static/logo1.png">
  <meta name="Keywords" content="Flask, Machine Learning, Deep Learning, Artificial Intelligence, AI, ML, DL, Web Development">
  <meta name="description" content="A Machine Learning and Deep Learning based webapp for Multiple Disease Prediction.">
  <title>Kidney Disease Predictor</title>
  <link rel="icon" href="{{ url_for('static', filename = 'logo1.png') }}" type="image/icon type">
  <p> Kidney Disease </p>
  <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css" integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
  <link href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css" rel="stylesheet"/>
  <link rel="canonical" href="https://getbootstrap.com/docs/4.0/examples/sticky-footer/">
  <script src="https://code.jquery.com/jquery-3.3.1.slim.min.js" integrity="sha384-q8i/X+965Dz00rT7abK41JStQIAqVgRVzpbzo5smXKp4YfRvH+8abtTE1Pi6jizo" crossorigin="anonymous"></script>
  <script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.14.7/umd/popper.min.js" integrity="sha384-UO2eT0CpHqdSJQ6hJty5KVphtPhzWj9WO1clHTMGa3JDZwrnQq4sF86dIHNDz0W1" crossorigin="anonymous"></script>
  <script src="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/js/bootstrap.min.js" integrity="sha384-JjSmVgyd0p3pXB1rRibZUAYoIIy6OrQ6VrjIEaFf/njGzIxFDsf4x0xIM+B07jRM" crossorigin="anonymous"></script>
  <style>
    html, body{ height:100%; margin:0; }
    header{ height:50px; }
```

```

footer{ height:75px; background:black; }

/* Trick */
body{
  display:flex;
  flex-direction:column;
}

footer{
  padding:10px;
  margin-top:auto;
  margin-bottom: auto;
}

</style>

</head>
<body>
  <nav class="navbar navbar-expand-lg navbar-dark fixed-top bg-dark" style="background-color:
black !important;">
    <a style="text-decoration: none; color: white" href="{{ url_for('home') }}"><h1> KIDNEY
DISEASE PREDICTION</h1></a>
    <button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarNav" aria-controls="navbarNav" aria-expanded="false" aria-label="Toggle
navigation">
      <span class="navbar-toggler-icon"></span>
    </button>
    <div class="collapse navbar-collapse" id="navbarNav">
      <ul class="navbar-nav ml-auto">
        <li class="nav-item active">
          <a href="{{ url_for('home') }}" class="nav-link"><h3>Home</h3></a>
        </li>
        <li class="nav-item active">
          <a class="nav-link" href="{{ url_for('kidneyPage') }}"><h3>Kidney-Disease</h3></a>
        </li>
      </ul>
    </div>
  </nav>

  <br>
  <br>
  <br>
  <br>
  <main>
    <div class="container-fluid" style="margin-bottom: 20px;">
      {% block content %}

    {% endblock %}
    </div>
  </main>
</body>
</html>

```

App.py:

```
from flask import Flask, render_template, request, flash, redirect
import numpy as np
from PIL import Image
from tensorflow.keras.models import load_model
import requests
import json

# NOTE: you must manually set API_KEY below using information retrieved from
your IBM Cloud account.
API_KEY = "JJoSicw67yzKlSR_ag0i5li0kDvcZwsd3m4bV0ck9Sjx"
token_response = requests.post('https://iam.cloud.ibm.com/identity/token',
data={"apikey":API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-
type:apikey'})
mltoken = token_response.json()['access_token']
print('mltoken',mltoken)

header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' +
mltoken}
app = Flask(__name__)
@app.route("/")
def home():
    return render_template('home.html')
@app.route("/kidney", methods=['GET', 'POST'])
def kidneyPage():
    return render_template('kidney.html')

@app.route("/predictPage", methods = ['POST', 'GET'])
def predictPage():
    age=request.form['age']
    bp=request.form['bp']
    al=request.form['al']
    su=request.form['su']
    rbc=request.form['rbc']
    pc=request.form['pc']
    pcc=request.form['pcc']
    ba=request.form['ba']
    bgr=request.form['bgr']
    bu=request.form['bu']
    sc=request.form['sc']
    pot=request.form['pot']
    wc=request.form['wc']
    htn=request.form['htn']
    dm=request.form['dm']
    cad=request.form['cad']
    pe=request.form['pe']
    ane=request.form['ane']
```

```

t=[[int(float(age)),int(float(bp)),int(float(al)),int(float(su)),int(float(
rbc)),int(float(pc)),int(float(pcc)),int(float(ba)),int(float(bgr)),int(float(
bu)),int(float(sc)),int(float(pot)),int(float(wc)),int(float(htn)),int(float(
dm)),int(float(cad)),int(float(pe)),int(float(ane))]]
print(t)
payload_scoring = {"input_data": [{"field":
[["age","bp","al","su","rbc","pc","pcc","ba","bgr","bu","sc","pot","wc","htn",
"dm","cad","pe","ane"]], "values": t}]}
response_scoring = requests.post('https://us-
south.ml.cloud.ibm.com/ml/v4/deployments/6b7627de-946c-42c9-a3d2-
563154efd72b/predictions?version=2022-11-17', json=payload_scoring,
headers={'Authorization': 'Bearer ' + mltoken})
print("Scoring response")
predictions=response_scoring.json()
print(predictions)
pred=predictions['predictions'][0]['values'][0][0]
if (pred==0):
    output="Great! You are Healthy"
    print("Great! You are Healthy")
else:
    output="Chronic Kidney Disease-Detected!!"
    print("Chronic Kidney Disease-Detected!!")
return render_template('predict.html', pred = output)

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

```

13. GitHub & Project Demo Link

Github link:

<https://github.com/IBM-EPBL/IBM-Project-20366-1659718049>

DemoLink:

https://drive.google.com/file/d/1ybh1uy2wBNf59vqy64j8P8B4reCuGSYE/view?usp=share_link