Project

Early Detection Of Chronic Kidney Disease Using Machine Learning

Done By

Team ID: PNT2022TMID14357

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the project along with code)

7.1 Feature 1

7.2 Feature 2

7.3 Database Schema (if Applicable)

8. TESTING

8.1 Test Cases

8.2 User Acceptance Testing

9. RESULTS

9.1 Performance Metrics

10. ADVANTAGES &amp; DISADVANTAGES

11. CONCLUSION

12. FUTURE SCOPE

13. APPENDIX

Source Code

GitHub &amp; Project Demo Link

1. INTRODUCTION

1.1 Project Overview:

Chronic kidney disease prediction is one of the most important issues in health care-analytics. The most interesting and challenging tasks in day-to-day lives as one third of adult population is affected by chronic kidney disease (CKD), and millions die each year because they do not have access to affordable treatment. Chronic Kidney Disease can be cured, if treated in the early stages. The main aim of the project is to predict whether the patient have chronic kidney disease or not in a painless, accurate and faster way based on certain diagnostic measurement like Blood Pressure(BP), Albumin(Al) etc., and then appropriate treatment can be given based on the details provided by the model.

1.2 Purpose:

This Project aims at creating a model for early detection of Chronic Kidney Disease using Machine Learning technology. The model output is integrated with Flask framework. The front end developed in html is used to receive user input on various parameters needed to decide on the early detection of kidney disease.The same model is deployed into IBM cloud using API keys and scoring endpoints.

The purpose of the project is to alert doctors for an early detection of kidney disease and hence ensure speedy recovery or prevention of kidney disease.

2. LITERATURE SURVEY

First we have done literature survey of various IEEE papers to arrive at the idea of the project development. It is given below:

2.1 Existing Problem:

Our modern life style and environmental pollution has increased kidney disease. Presently kidney disease are detected at late stages in many countries leading to loss of precious lives. There are very less means to identify them at an early stage.

2.2 References:

1. https://www.researchgate.net/publication/335698017_Detection_of_Chronic_Kid ney_Disease_using_Machine_Learning_Algorithms_with_Least_Number_of_Predict ors
2. https://pubmed.ncbi.nlm.nih.gov/34211680/
3. https://www.primescholars.com/articles/early-prediction-of-chronic-kidney-diseaseby-using-machine-learning-techniques-92643.html
4. https://www.webology.org/abstract.php?id=3038
5. https://www.ijert.org/chronic-kidney-disease-prediction-using-machine-learning

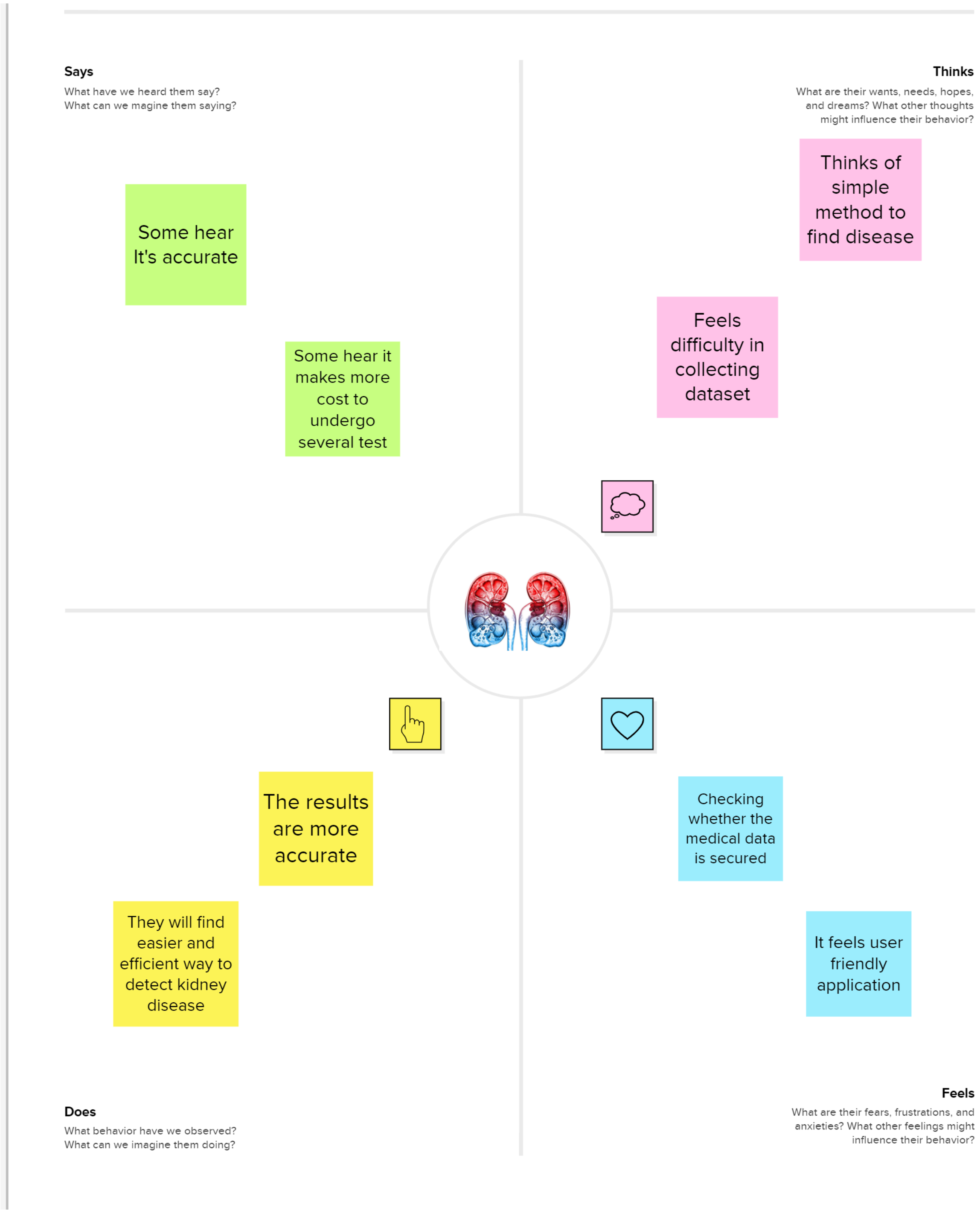
2.3 Problem Statement Definition

Kidney diseases avert the normal function of the kidney. Due to the large amount of alcohol consumption kidney disease arises. Early prediction of kidney disease using classification and regression
algorithms are an efficacious task that can help the doctors to diagnose the disease within a short
duration of time. Discovering the existence of kidney disease at an early stage is complex task for the

doctors. The main objective of this project is to analyses the parameters of various classification
algorithms and compare their predictive accuracy, to find out the best classifier for determining the
kidney disease. This Project examines data from kidney patients concentrating on relationships between
a key list of kidney enzymes, proteins, age and gender using them to try and predict the likeliness of
kidney disease. Here we are building a model by applying various machine learning algorithms find

3. IDEATION &amp; PROPOSED SOLUTION

3.1 Empathy Map Canvas



Says

What have we heard them say?
What can we magine them saying?

Some hear It's accurate

Some hear it makes more cost to undergo several test

Thinks

What are their wants, needs, hopes, and dreams? What other thoughts might influence their behavior?

Thinks of simple method to find disease

Feels difficulty in collecting dataset

The results are more accurate

They will find easier and efficient way to detect kidney disease

Checking whether the medical data is secured

It feels user friendly application

Does

What behavior have we observed?
What can we imagine them doing?

Feels

What are their fears, frustrations, and anxieties? What other feelings might influence their behavior?

3.3 Proposed Solution

Project Design Phase-I
Proposed Solution Template

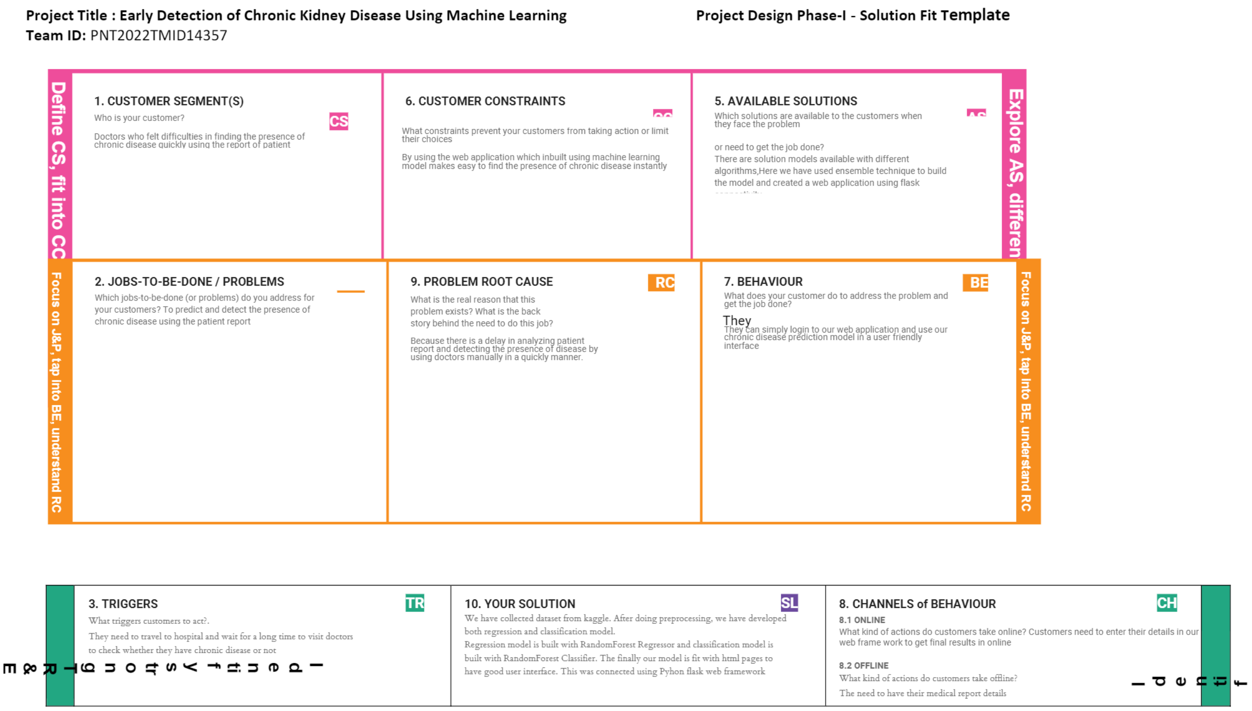
Date	10 October 2022
Team ID	PNT2022TMID14357
Project Name	Early Detection of Chronic Kidney Disease using Machine Learning
Maximum Marks	2 Marks

Proposed Solution Template:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	1. Noncommunicable illnesses are the leading cause of early death, and CKD is the leading noncommunicable disease. Chronic Kidney Disease is a major concern for the global health care system. People with CKD must focus on implementing proven, cost-effective therapies to as many people as possible while taking into consideration restricted needs, human and financial resources. 2. Chronic kidney disease (CKD) is now wreaking havoc on society and is spreading at an alarming rate. Various efforts have been undertaken to advance early therapy to prevent the condition from progressing to chronic disease. Recent research suggests that some of the negative outcomes can be avoided with early identification and treatment.
2.	Idea / Solution description	To predict chronic kidney disease, this study employs Decision Tree Classifiers, Random Forest Classifiers, Support Vector Machines, and Artificial Neural Networks. Among these algorithms, we attempt to construct our prediction model, and we choose the best performance by assessing their accuracy. Support Vector Machine (SVM) This is the most well-known and useful supervised machine-learning method, which works on classification and regression issues but is most used for classification. To segregate labelled data, SVM employed a kernel function. One of the benefits of employing kernels in SVM is that SVM applies kernel dentitions to

		non-vector inputs, and kernels may be built using a variety of data types.
3.	Novelty / Uniqueness	• SVR boasted great prediction accuracy for two of the nine factors. • By classifying the water according to their quality, the usage of water will be more efficient. • Aquatic life preservation practical.
4.	Social Impact / Customer Satisfaction	• The database of developments in the health sector is growing very rapidly. The data is very important to be processed and needs to be useful. • Machine Learning and data mining are fields of research which can process databases into knowledge that can be used for diagnosing disease, such as Chronic Kidney Disease (CKD). • This mining technique is used to predict CKD condition using two-fold regression algorithms namely Multivariate Linear Regression and Logistic Regression
5.	Business Model (Revenue Model)	Early prediction and proper treatments can possibly stop, or slow the progression of this chronic disease to end-stage, where dialysis or kidney transplantation is the only way to save patient's life.
6.	Scalability of the Solution	• The server in which the app is deployed containing the ml model must be capable of handling concurrent request and handle multiple request • maintaining the ml model by tweaking the parameter which doesn't play vital role in prediction by seeing the next set of dataset • regular maintenance and changes in model with new features included in it

3.4 Problem Solution fit



Project Title : Early Detection of Chronic Kidney Disease Using Machine Learning
Team ID: PNT2022TMID14357

Project Design Phase-I - Solution Fit Template

1. CUSTOMER SEGMENT(S) CS

Who is your customer?

Doctors who felt difficulties in finding the presence of chronic disease quickly using the report of patient

6. CUSTOMER CONSTRAINTS

What constraints prevent your customers from taking action or limit their choices

By using the web application which inbuilt using machine learning model makes easy to find the presence of chronic disease instantly

5. AVAILABLE SOLUTIONS

Which solutions are available to the customers when they face the problem

or need to get the job done?
There are solution models available with different algorithms,Here we have used ensemble technique to build the model and created a web application using flask

2. JOBS-TO-BE-DONE / PROBLEMS

Which jobs-to-be-done (or problems) do you address for your customers? To predict and detect the presence of chronic disease using the patient report

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job?

Because there is a delay in analyzing patient report and detecting the presence of disease by using doctors manually in a quickly manner.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?

They
They can simply login to our web application and use our chronic disease prediction model in a user friendly interface

3. TRIGGERS TR

What triggers customers to act?.

They need to travel to hospital and wait for a long time to visit doctors to check whether they have chronic disease or not

10. YOUR SOLUTION SL

We have collected dataset from kaggle. After doing preprocessing, we have developed both regression and classification model.
Regression model is built with RandomForest Regressor and classification model is built with RandomForest Classifier. The finally our model is fit with html pages to have good user interface. This was connected using Pyhon flask web framework

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Customers need to enter their details in our web frame work to get final results in online

8.2 OFFLINE
What kind of actions do customers take offline?
The need to have their medical report details

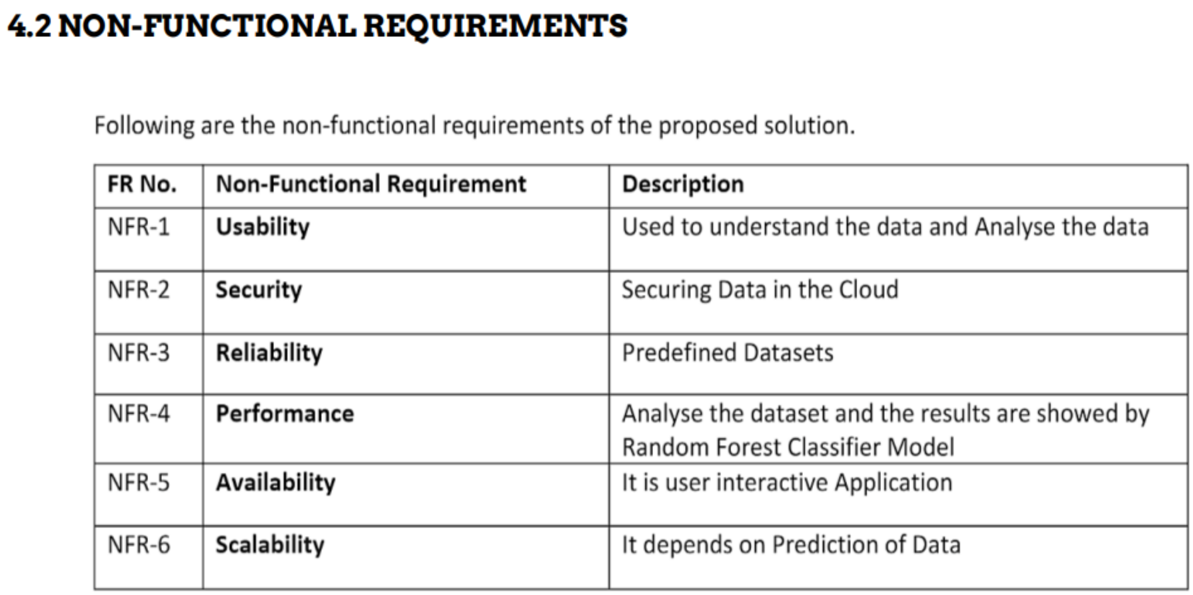
Define CS, fit into CC
Explore AS, differen
Focus on J&P, tap into BE, understand RC
Focus on J&P, tap into BE, understand RC
Identify strong TR & E
Identif

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

Solution Requirements are identified before the technical solution is selected and/or designed. They describe the characteristics of a solution (functional and non-functional) that meet business requirements and stakeholder requirements. A solution requirement is aimed at the concerns of the people who will build and deliver the solution. It tells those people what the functional and non-functional requirements for the solution will be and how the solution will deliver on the business and stakeholder requirements. Solution Requirements – Describe the features, functions, and characteristics of a product, service, or result that will meet the business and stakeholder requirements.

4.2 Non-Functional requirements



4.2 NON-FUNCTIONAL REQUIREMENTS

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to understand the data and Analyse the data
NFR-2	**Security**	Securing Data in the Cloud
NFR-3	**Reliability**	Predefined Datasets
NFR-4	**Performance**	Analyse the dataset and the results are showed by Random Forest Classifier Model
NFR-5	**Availability**	It is user interactive Application
NFR-6	**Scalability**	It depends on Prediction of Data

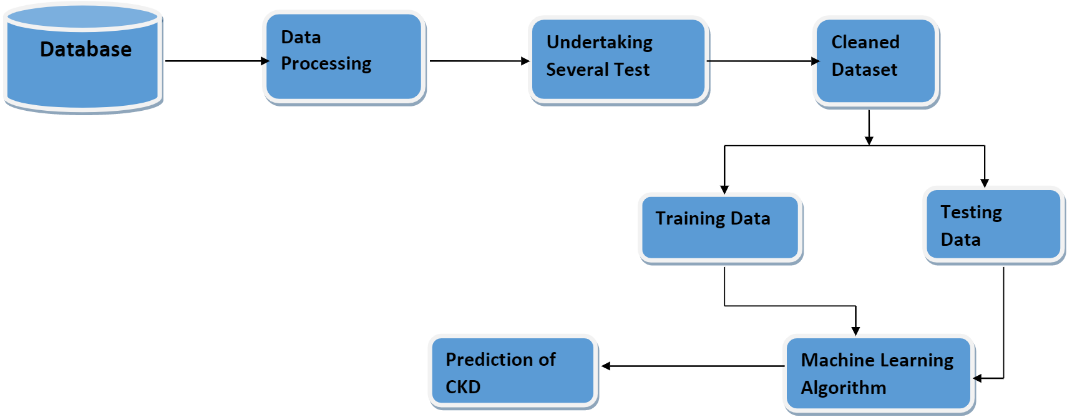
5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

A Data Flow Diagram (DFD) is a graphical representation of the “flow” of data through an information system(as shown on the DFD flow chart Figure 5), modeling its process aspects. Often it is a preliminary step used to create an overview of the system that can later be elaborated. In software development and product management, a user story is an informal, natural language description of features of a software system. They are written from the perspective of an end user or user of a system, and may be recorded on index cards, Post-it notes, or digitally in project management software.

Project Design Phase-II
Data Flow Diagram &User Stories

Date	31 October 2022
Team ID	PNT2022TMID14357
Project Name	Early detection of chronic kidney disease
Maximum Marks	4 Marks



5.2 Solution &amp; Technical Architecture

Project Design Phase-I

Solution Architecture

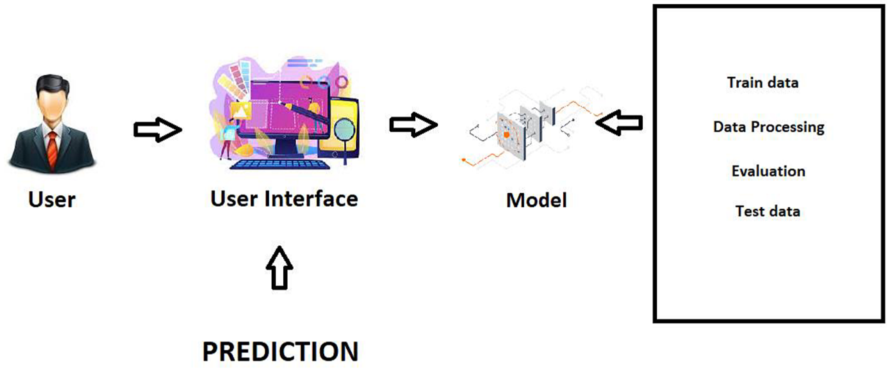
Date	10 October 2022
Team ID	PNT2022TMID14357
Project Name	Early Detection of Chronic Disease Using Machine Learning
Maximum Marks	4 Marks

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Problem : Chronic Kidney Disease (CKD) is major medical problem and can be cured if treated in the early stages. Usually, people are not aware that medical tests we take for different purposes could contain valuable information concerning kidney diseases.
- Some machine learning methods: Supervised learning , Unsupervised learning, Reinforcement learning.
- Methods : Pre-Processing, Feature Selection, Classification.
- Tests : Blood Test, Urine Test.

Solution Architecture Diagram:



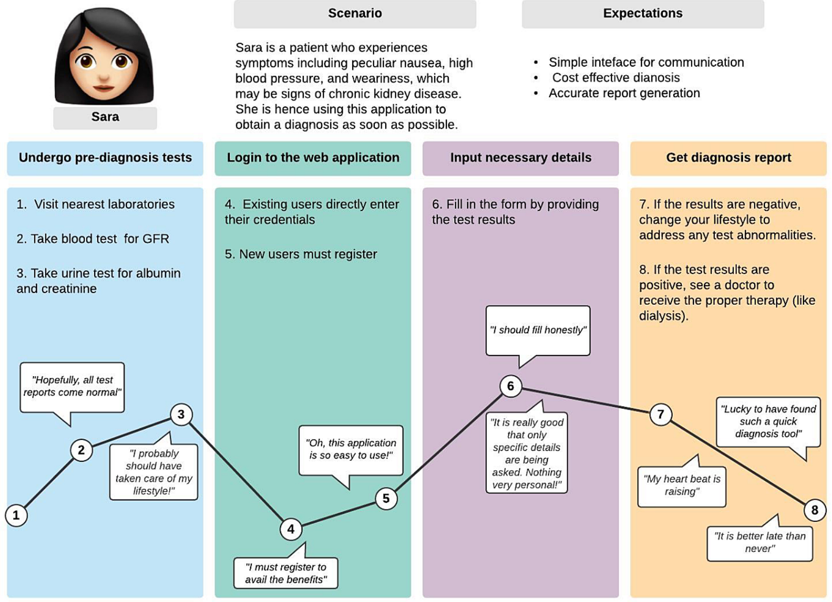
5.3 User Stories

During the Design Phase II we have done Customer journey map, Data flow diagram & user stories, Solution Requirement and Technology Architecture. Let us see in detail each activity. A customer journey map is a visual storyline of every engagement a customer has with a service, brand, or product. The creation of a journey map puts the organization directly in the mind of the consumer, so they can see and understand their customer's processes, needs, and perceptions.

Project Design Phase-II
Customer Journey Map

Date	11 November 2022
Team ID	PNT2022TMID14357
Project Name	Early Detection of Chronic Kidney Disease using Machine Learning

Customer Journey Map:



Sara

Scenario

Sara is a patient who experiences symptoms including peculiar nausea, high blood pressure, and weariness, which may be signs of chronic kidney disease. She is hence using this application to obtain a diagnosis as soon as possible.

Expectations

- Simple inteface for communication
- Cost effective dianosis
- Accurate report generation

Undergo pre-diagnosis tests

1. Visit nearest laboratories

2. Take blood test for GFR

3. Take urine test for albumin and creatinine

Login to the web application

4. Existing users directly enter their credentials

5. New users must register

Input necessary details

6. Fill in the form by providing the test results

Get diagnosis report

7. If the results are negative, change your lifestyle to address any test abnormalities.

8. If the test results are positive, see a doctor to receive the proper therapy (like dialysis).

"Hopefully, all test reports come normal"
"I probably should have taken care of my lifestyle!"
"Oh, this application is so easy to use!"
"I must register to avail the benefits"
"I should fill honestly"
"It is really good that only specific details are being asked. Nothing very personal!"
"Lucky to have found such a quick diagnosis tool"
"My heart beat is raising"
"It is better late than never"
1
2
3
4
5
6
7
8

6. PROJECT PLANNING &amp; SCHEDULING

6.1 Sprint Planning &amp; Estimation

Project Planning Phase
Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

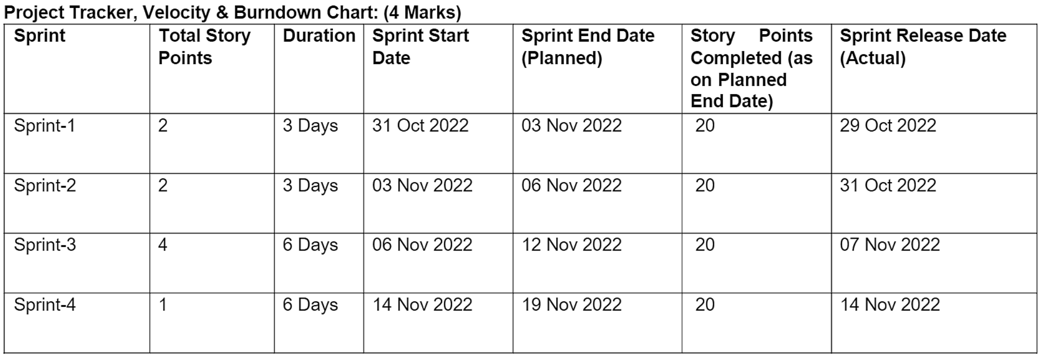
Date	31 October, 2022
Team ID	PNT2022TMID14357
Project Name	Early Detection of Chronic Kidney Disease using Machine Learning
Maximum Marks	8 Marks

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

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Collection of Dataset	USN-1	Collect and clean the dataset	5	High	Muppala Mona Sree
Sprint-1	Model	USN-2	First create the model, then test the model	5	High	Monika M, Priyadharshini EM
Sprint-2	Home page	USN-3	The user can access the home page	6		Manju Parkavi G
Sprint-2	Prediction methodology	USN-4	User can use the prediction model	4	High	Monika M

Sprint-3	Prediction page	USN-5	Reports should be created based on the prediction	3	Low	Priyadharshini EM
Sprint-3		USN-6	User should enter the blood glucose values	7	Medium	Manju Parkavi G
Sprint-4	Result	USN-7	Output will be obtained	4	High	Muppala Mona Sree
Sprint-4	Deployment	USN-8	Deploy into IBM CLOUD	6	High	Muppala Mona Sree, Monika M, Priyadharshini EM, Manju Parkavi G



Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	2	3 Days	31 Oct 2022	03 Nov 2022	20	29 Oct 2022
Sprint-2	2	3 Days	03 Nov 2022	06 Nov 2022	20	31 Oct 2022
Sprint-3	4	6 Days	06 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	1	6 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

6.2 Sprint Delivery Schedule

A milestone list is a project management document that identifies all project milestones. A milestone is a significant event or a point in a project. It represents nothing more than a moment in time; hence, when scheduling, milestones should be assigned zero duration. A milestone is a specific point within a project's life cycle used to measure the progress toward the ultimate goal. Milestones in project management are used as signal posts for a project's start or end date, external reviews or input, budget checks, submission of a major deliverable, etc. Milestone is a point on the schedule, which has one clearly defined deliverable, where as a task is an activity should be completed to achieve a milestone. An activity / task has a start and end date. It's two dimensional, where as a milestone is a single date upon which a deliverable gets completed

6.3 Reports from JIRA

Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team. Sprint is one time-boxed iteration of a continuous development cycle. Within a Sprint, planned amount of work has to be completed by the team and made ready for review. The term is mainly used in Scrum Agile methodology but somewhat basic idea of Kanban continuous delivery is also essence of Sprint Scrum.

The 3 Essential Phases of Planning Successful Sprints

- Phase One: Designing. ...

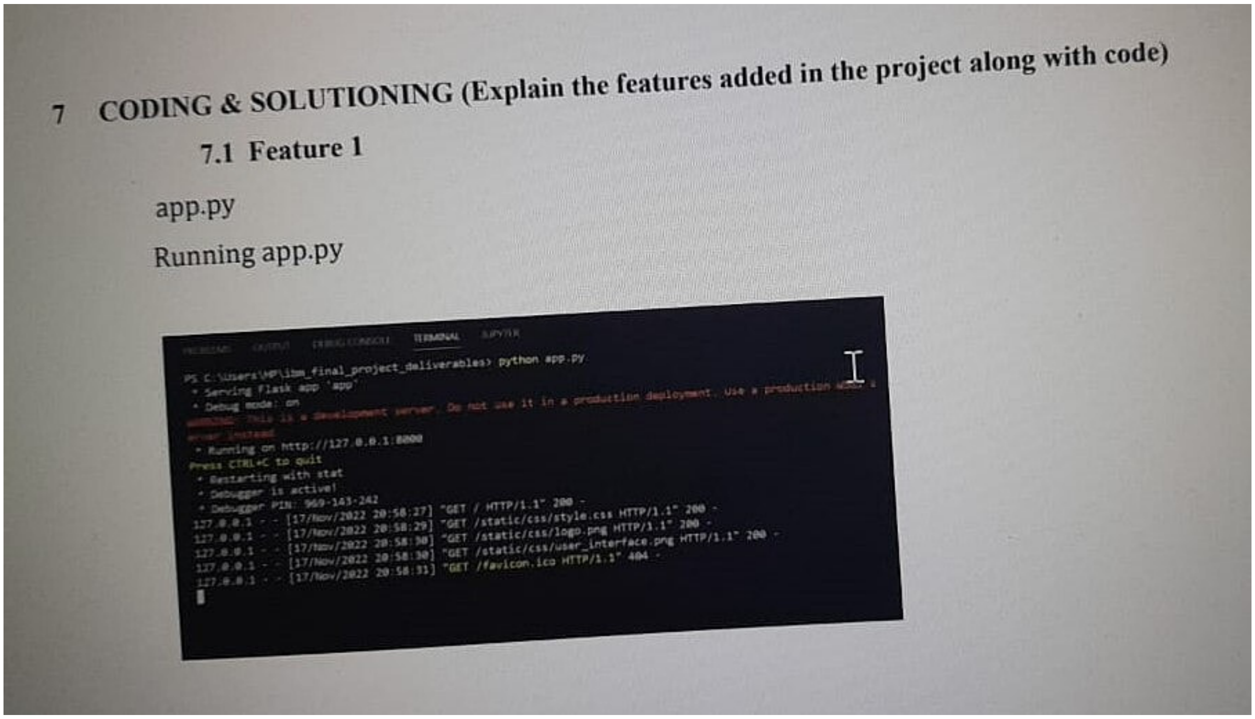
- Phase Two: Estimate Sprint Velocity. ...

- Phase Three: Allocate Work to the Sprint

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

During the Project Development Phase we have done four Sprints they are Sprint 1, Sprint 2, Sprint 3 and Sprint 4.In Agile product development, a sprint is a set period of time during which specific work has to be completed and made ready for review. Each sprint begins with a planning meeting. During the meeting, the product owner (the person requesting the work) and the development team agree upon exactly what work will be accomplished during the sprint. The development team has the final say when it comes to determining how much work can realistically be accomplished during the sprint, and the product owner has the final say on what criteria need to be met for the work to be approved and accepted. The duration of a sprint is determined by the scrum master, the team's facilitator and manager of the Scrum framework. Once the team reaches a consensus for how many days a sprint should last, all future sprints should be the same. Traditionally, a sprint lasts 30 days. After a sprint begins, the product owner must step back and let the team do their work. During the sprint, the team holds daily stand-up meetings to discuss progress and brainstorm solutions to challenges. The project owner may attend these meetings as an observer but is not allowed to participate unless it is to answer questions. (See pigs and chickens). The project owner may not make requests for changes during a sprint and only the scrum master or project manager has the power to interrupt or stop the sprint. At the end of the sprint, the team presents its completed work to the project owner and the project owner uses the criteria established at the sprint planning meeting to either accept or reject the work.

7.1 Feature 1



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

7.1 Feature 1

app.py

Running app.py

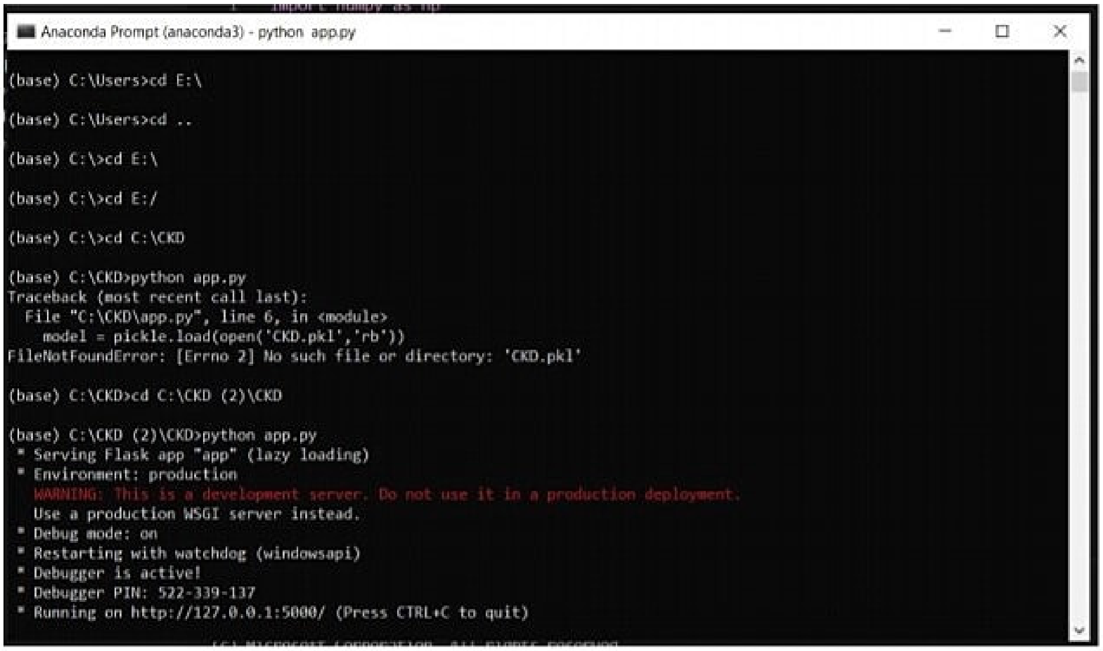
```
PS C:\Users\HP\ibm_final_project_deliverables> python app.py
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI s
erver instead.
 * Running on http://127.0.0.1:8000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 969-143-242
127.0.0.1 - - [17/Nov/2022 20:58:27] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [17/Nov/2022 20:58:29] "GET /static/css/style.css HTTP/1.1" 200 -
127.0.0.1 - - [17/Nov/2022 20:58:30] "GET /static/css/logo.png HTTP/1.1" 200 -
127.0.0.1 - - [17/Nov/2022 20:58:30] "GET /static/css/user_interface.png HTTP/1.1" 200 -
127.0.0.1 - - [17/Nov/2022 20:58:31] "GET /favicon.ico HTTP/1.1" 404 -
```

7.2 Feature 2

RUN THE APP

Date	18 November 2022
Team ID	PNT2022TMID14357
Project Name	Early Detection of Chronic Kidney Disease Using Machine Learning

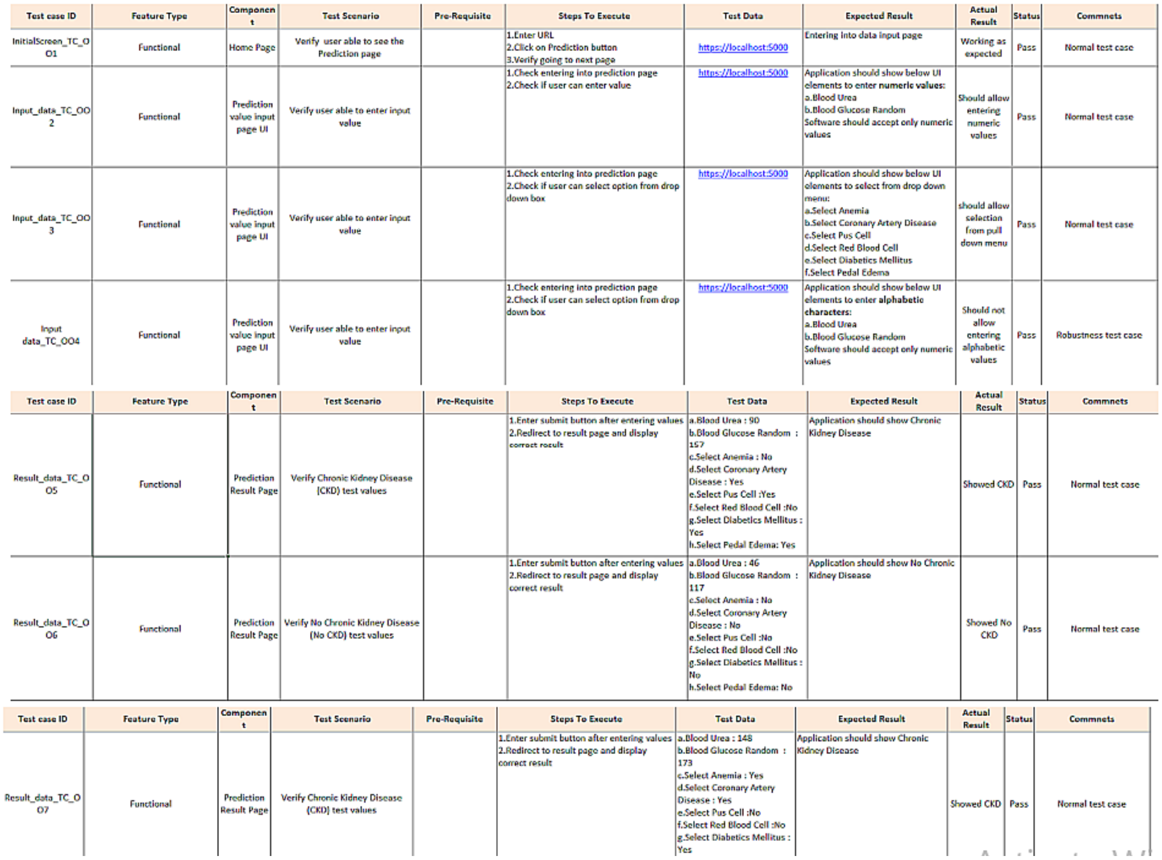
Python code



```
(base) C:\Users>cd E:\

(base) C:\Users>cd ..

(base) C:\>cd E:\

(base) C:\>cd E:/

(base) C:\>cd C:\CKD

(base) C:\CKD>python app.py
Traceback (most recent call last):
  File "C:\CKD\app.py", line 6, in <module>
    model = pickle.load(open('CKD.pkl','rb'))
FileNotFoundError: [Errno 2] No such file or directory: 'CKD.pkl'

(base) C:\CKD>cd C:\CKD (2)\CKD

(base) C:\CKD (2)\CKD>python app.py
 * Serving Flask app "app" (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: on
 * Restarting with watchdog (windowsapi)
 * Debugger is active!
 * Debugger PIN: 522-339-137
 * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
```

8. TESTING

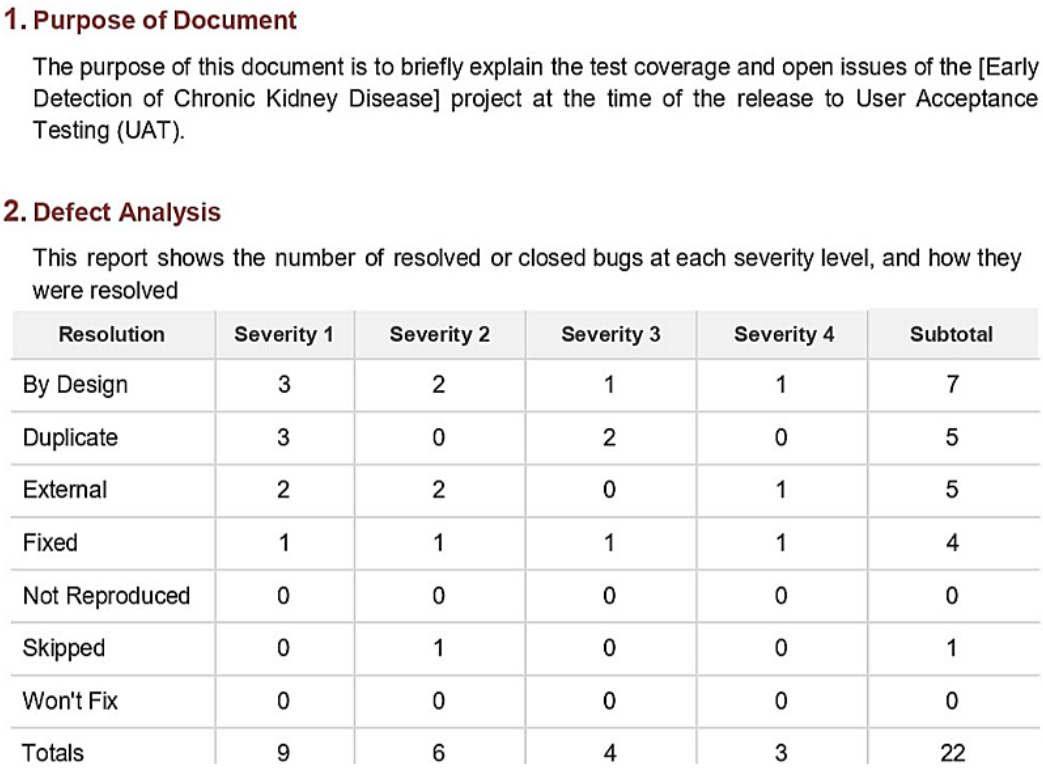
8.1 Test Cases



Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets
InitialScreen_TC_OO1	Functional	Home Page	Verify user able to see the Prediction page		1.Enter URL 2.Click on Prediction button 3.Verify going to next page	https://localhost:5000	Entering into data input page	Working as expected	Pass	Normal test case
Input_data_TC_OO2	Functional	Prediction value input page UI	Verify user able to enter input value		1.Check entering into prediction page 2.Check if user can enter value	https://localhost:5000	Application should show below UI elements to enter **numeric values:** a.Blood Urea b.Blood Glucose Random Software should accept only numeric values	Should allow entering numeric values	Pass	Normal test case
Input_data_TC_OO3	Functional	Prediction value input page UI	Verify user able to enter input value		1.Check entering into prediction page 2.Check if user can select option from drop down box	https://localhost:5000	Application should show below UI elements to select from drop down menu: a.Select Anemia b.Select Coronary Artery Disease c.Select Pus Cell d.Select Red Blood Cell e.Select Diabetics Mellitus f.Select Pedal Edema	should allow selection from pull down menu	Pass	Normal test case
Input data_TC_OO4	Functional	Prediction value input page UI	Verify user able to enter input value		1.Check entering into prediction page 2.Check if user can select option from drop down box	https://localhost:5000	Application should show below UI elements to enter **alphabetic characters:** a.Blood Urea b.Blood Glucose Random Software should accept only numeric values	Should not allow entering alphabetic values	Pass	Robustness test case
Result_data_TC_OO5	Functional	Prediction Result Page	Verify Chronic Kidney Disease (CKD) test values		1.Enter submit button after entering values 2.Redirect to result page and display correct result	a.Blood Urea : 90 b.Blood Glucose Random : 157 c.Select Anemia : No d.Select Coronary Artery Disease : Yes e.Select Pus Cell :Yes f.Select Red Blood Cell :No g.Select Diabetics Mellitus : Yes h.Select Pedal Edema: Yes	Application should show Chronic Kidney Disease	Showed CKD	Pass	Normal test case
Result_data_TC_OO6	Functional	Prediction Result Page	Verify No Chronic Kidney Disease (No CKD) test values		1.Enter submit button after entering values 2.Redirect to result page and display correct result	a.Blood Urea : 46 b.Blood Glucose Random : 117 c.Select Anemia : No d.Select Coronary Artery Disease : No e.Select Pus Cell :No f.Select Red Blood Cell :No g.Select Diabetics Mellitus : No h.Select Pedal Edema: No	Application should show No Chronic Kidney Disease	Showed No CKD	Pass	Normal test case
Result_data_TC_OO7	Functional	Prediction Result Page	Verify Chronic Kidney Disease (CKD) test values		1.Enter submit button after entering values 2.Redirect to result page and display correct result	a.Blood Urea : 148 b.Blood Glucose Random : 173 c.Select Anemia : Yes d.Select Coronary Artery Disease : Yes e.Select Pus Cell :No f.Select Red Blood Cell :No g.Select Diabetics Mellitus : Yes	Application should show Chronic Kidney Disease	Showed CKD	Pass	Normal test case

8.2 User Acceptance Testing

8.2 USER ACCEPTANCE TESTING:



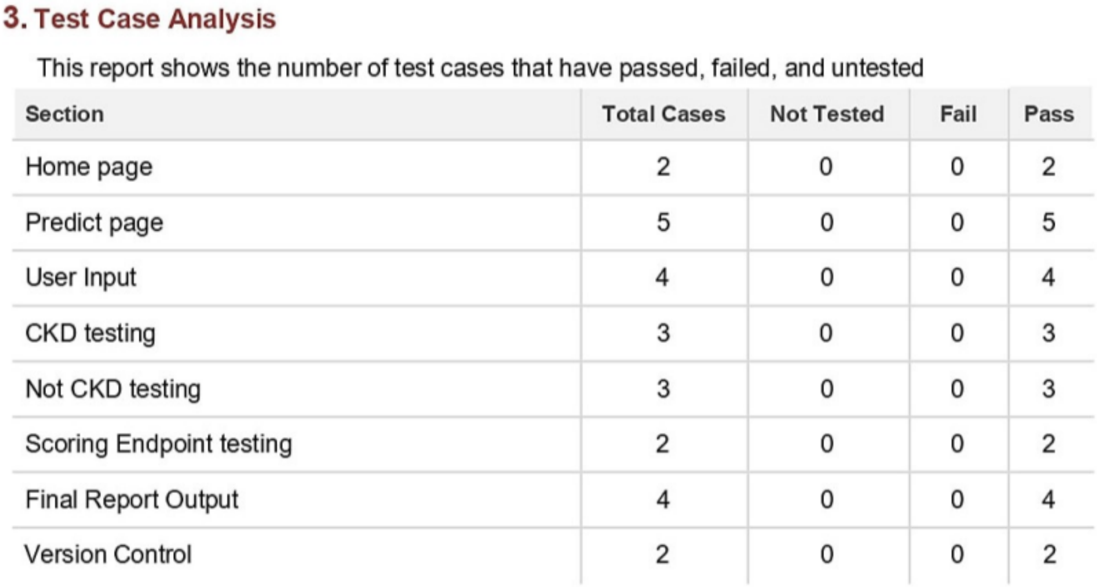
1. Purpose of Document

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

2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	3	2	1	1	7
Duplicate	3	0	2	0	5
External	2	2	0	1	5
Fixed	1	1	1	1	4
Not Reproduced	0	0	0	0	0
Skipped	0	1	0	0	1
Won't Fix	0	0	0	0	0
Totals	9	6	4	3	22



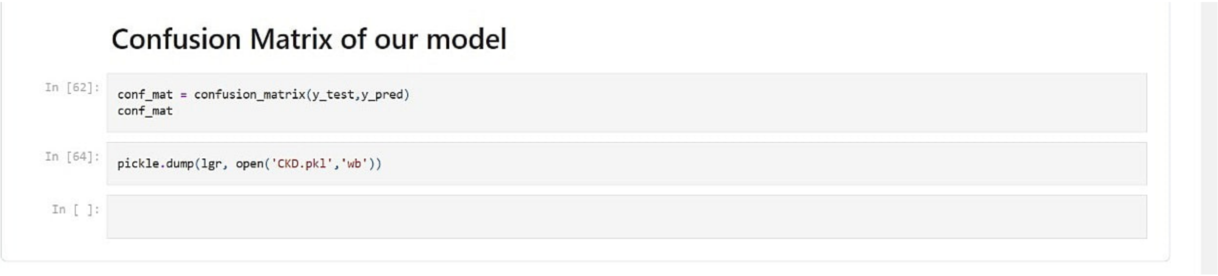
3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Home page	2	0	0	2
Predict page	5	0	0	5
User Input	4	0	0	4
CKD testing	3	0	0	3
Not CKD testing	3	0	0	3
Scoring Endpoint testing	2	0	0	2
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

9.1 Performance Metrics



Confusion Matrix of our model

```
In [62]: conf_mat = confusion_matrix(y_test,y_pred)
         conf_mat

In [64]: pickle.dump(lgr, open('CKD.pkl','wb'))

In [ ]:
```

10. ADVANTAGES &amp; DISADVANTAGES

ADVANTAGES AND DISADVANTAGES:

ADVANTAGES:

Predictive modeling is a statistical technique using machine learning and data mining to predict and forecast likely future outcomes with the aid of historical and existing data. It works by analyzing current and historical data and projecting what it learns on a model generated to forecast likely outcomes.We found that machine learning can predict the occurrence of individual chronic diseases, progression, and their determinants and in many contexts. The findings are original and relevant to improve clinical decisions and the organization of health care facilities.

DISADVANTAGES:

In Chronic Disease prediction, for classification problem we get a very good accuracy but for regression, we get considerable error rate. So, we need to add some more data or change the machine algorithm or by using deep learning techniques for reducing the error in predicting the probability values.

11. CONCLUSION

The principal part of this work is to make an effective diagnosis system for chronic disease of patients.The application will have the option to predict chronic disease prior and advise the wellbeing condition. This application can be surprisingly gainful in low-salary nations where our absence of medicinal foundations and just as particular specialists. In our study, there are a few bearings for future work in this field. We just explored some popular supervised machine learning algorithms, more algorithms can be picked to assemble an increasingly precise model of chronic kidney disease prediction and performance can be progressively improved. Additionally, this work likewise ready to assume a significant role in health care research and just as restorative focuses to anticipate chronic disease.

12. FUTURE SCOPE

Diseases related to kidney is becoming more and more common with time. With continuous technological advancements, these are only going to increase in the future. Although people are becoming more conscious of health nowadays and are joining yoga classes, dance classes; still the sedentary lifestyle and luxuries that are continuously being introduced and enhanced; the problem is going to last long. So, in such a scenario, our project will be extremely helpful to the society. With the dataset that we used for this project, we got 89% accuracy for Random forest model, and though it might be difficult to get such accuracies with very large datasets, from this projects results, one can clearly conclude that we can predict the risk of chronic diseases with accuracy of 95 % or more. Also it can be incorporated into a wide range commercial website and these app and website will be highly beneficial for a large section of society.

13. APPENDIX

GITHUB
LINK:https://careereducation.smartinternz.com/Student/guided_project_workspace/34342

Source Code:

```
import numpy as np
import pandas as pd
from flask import Flask,request,render_template
import pickle
app = Flask(_name_)
model = pickle.load(open('CKD.pkl','rb'))
@app.route('/')
def home():
   return render_template('home.html')
@app.route('/Prediction',methods=['Post','Get'])
def prediction():
   return render_template('predictor.html')
@app.route('/Home',methods=['Post','Get'])
def my_home():
   return render_template('home.html')

@app.route('/predict',methods=['Post'])
def predict():
   input_feature = [float(x) for x in request.form.values()]
   features_value = [np.array(input_feature)]

   features_name = ['blood_urea','blood glucose random','coronary_artery_disease',
   'anemia','pus_cell','red_blood_cells','diabetesmellitus','pedal_edema']

   df = pd.DataFrame(features_value, columns=features_name)
   output = model.predict(df)
   return render_template('result.html',prediction_text=output)

if _name_ == '_main_':
   app.run(debug=True)
```

Home.html

```
 <html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
    <link rel="stylesheet" href="style.css">
</head>
<body>
    <div class="nav-1">
        <button>
            <a href="home.html">
                HOME
            </a>
        </button>
        <button>
            <a href="predictor.html">
                PREDICTOR
            </a>
        </button>
    </div>
```

```
<div class="background"></div>
<h1 class="kidney-text"><b>CHRONIC KIDNEY DISEASE <br> PREDICTION</b></h1>
</body>
</html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
    <link rel="stylesheet" href="style.css">
</head>
<body style="background-color: #FF8787;">
    <button><a href="home.html">Back</a></button>
    <div class="container">
        <br>
        <h2 class="pred-text">Chronic kidney disease</h2>
        <p class="pred">A Machine Learning Web App</p>

    </div>

    <div class="form-class">
        <form action="">
            <textarea class="text" name="Enter your Blood_urea" id="" cols="30" rows="10">Enter your
Blood_urea</textarea>
            <br><br>
            <textarea class="text" name="Enter your Blood_glucose_random" id="" cols="30"
rows="10">Enter your Blood_glucose_random</textarea>
            <br><br>
            <select name="Select anamia or not" id="">
                <option value="Select anamia or not">Select anamia or not</option>
                <option value="anamia">anamia</option>
                <option value="no anamia">no anamia</option>
            </select>
            <br><br>
            <select name="Select coronary artery or not" id="">
                <option value="Select coronary artery or not">Select coronary artery or not</option>
                <option value="coronary artery">coronary artery</option>
                <option value="no coronary artery">no coronary artery</option>
            </select>
            <br><br>
            <select name="Select pus_cell or not" id="">
                <option value="Select pus_cell or not">Select pus_cell or not</option>
                <option value="pus_cell">pus_cell</option>
                <option value="no pus_cell">no pus_cell</option>
            </select>
            <br><br>
            <select name="Select red_blood_cell or not" id="">
                <option value="Select red_blood_cell or not">Select red_blood_cell or not</option>
                <option value="red_blood_cell">red_blood_cell</option>
                <option value="no red_blood_cell">no red_blood_cell</option>
            </select>
            <br><br>
            <select name="Select diabetesmellitus or not" id="">
                <option value="Select diabetesmellitus or not">Select diabetesmellitus or not</option>
                <option value="diabetesmellitus">diabetesmellitus</option>
                <option value="no diabetesmellitus">no diabetesmellitus</option>
            </select>
            <br><br>
            <select name="Select pedal_edema or not" id="">
                <option value="Select pedal_edema or not">Select pedal_edema or not</option>
                <option value="pedal_edema">pedal_edema</option>
                <option value="no pedal_edema">no pedal_edema</option>
            </select>
            <br><br>
            <button><a href="result.html"></a> PREDICT</button>
        </form>
    </div>
</body>
</html>
[12:10 AM, 11/20/2022] Priya Dharshini .EM: <html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
    <link rel="stylesheet" href="style.css">
</head>
<body style="background-color: #FF8787;">
    <div class="container">
        <br>
        <h2 class="pred-text">Chronic kidney disease</h2>
        <p class="pred">A Machine Learning Web App</p>
    </div>
    <br><br><br><br><br><br>
    <h1 style="text-align: center; color: white;">Prediction: Oops! You have Chronic Kidney
Disease</h1>
</body>
</html>
background{
    background-image: url(kidney_bg.jpg);
    background-repeat: no-repeat;
    background-size: cover;
    background-position: center;
    position:absolute;
    top: 0;
    bottom: 0;
    left: 0;
    right: 0;
    opacity: 0.4;
}

.kidney-text{
    font-size: 50px;
    text-align: center;
    padding-top: 200px;
}

.nav-1{
    flex: 1;
    text-align: right;
    font-size: 30px;
    cursor: pointer;
}

li{
    list-style: none;
    display: inline-block;
    padding: 15px 20px;
    position: relative;
    cursor: pointer;
}
```

```
li a{
   color: black;
   text-decoration: none;
   font-size: 25px;
   cursor: pointer;
}

li::after{
   content: '';
   width: 0%;
   height: 2px;
   background: white;
   display: block;
   margin: auto;
   transition: 0.5s;
   cursor: pointer;
}

li:hover::after{
   width: 100%;
   cursor: pointer;
}

.container{
   width: 100%;
   height: 130px;
   padding: 0px;
   margin: 0px;
   background-color: #E26868;
}

.pred-text{
   margin-top: -6px;
   font-size: 40px;
   text-align: center;
   color: #EDEDED;
}

.pred{
   font-size: 25px;
   margin-top: -25px;
```

```
    text-align: center;
    color: #EDEDED;
}

select{
    width: 300px;
    height: 40px;
}

.form-class{
    margin-top: 30px;
    margin-left: 40%;
}

.text{
    width: 300px;
    height: 40px;
}

body{
    background: #E3F2FD;
}
```