EARLY DETECTION OF CHRONIC KIDNEY DISEASE USING MACHINE LEARNING

ATCHAYA V [822719106007]

HARITHA S [822719106017]

JOY HELEENA F[822719106018]

PRAVEENA U [822719106029]

KARTHIKA S [822719106021

ABSTRACT:

Chronic Kidney Disease (CKD) is a 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. Consequently, attributes of various medical tests are investigated to distinguish which attributes may contain helpful information about the disease. The information says that it helps us to measure the severity of the problem and we make use of such information to build a machine learning model that predicts Chronic Kidney Disease. 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. With the help of a machine learning classifier algorithms, the doctor can detect the disease on time.

INTRODUCTION:

PROJECT OVERVIEW:

A kind of artificial intelligence is machine learning (ML) (AI). Its heart is algorithmic procedures, which allow the machine to solve issues without the need for specialist computer programming. The widespread use of ML in the industry promotes medical innovation, lowers medical expenses, and improves medical quality. However, further research on using ML to solve clinical problems in nephrology is needed. Understanding the aim and technique of ML application, as well as the present state of its use in nephrology, is required to properly address and overcome these issues. Machine learning has previously been used to identify human body state, evaluate disease-related aspects, and diagnose a variety of disorders. The term machine learning (ML) is very popular these days, and a lot of clinical prediction model studies have employed this type of technology. While the capacity to capture vast volumes of

information on individual patients is transforming the healthcare business, the enormous volume of data being gathered is impractical for humans to comprehend. Machine learning allows healthcare practitioners to advance toward individualized care, often known as precision medicine, by automatically finding patterns and reasoning about data. The integration of machine learning, health informatics, and predictive analytics provides prospects to alter clinical decision support systems and assist improve patient outcomes.

PURPOSE:

Chronic Kidney Disease refers to the kidneys' inability to fulfil their normal blood filtration role and other functions (CKD). The term "chronic" refers to the progressive deterioration of kidney cells over time. This is a severe renal failure in which the kidney no longer filters blood and there is a significant fluid accumulation in the body. This causes an abnormally high level of potassium and calcium salts in the body. High quantities of these salts in the body cause a variety of additional problems. The primary function of the kidneys is to filter excess water and wastes from the blood. This mechanism must work properly to balance the salts and minerals in our bodies. The proper salt balance is required to manage blood pressure, activate hormones, and create red blood cells, among other things. A high calcium concentration causes bone problems and cystic ovaries in women. CKD can also cause a sudden sickness or an allergy to specific medications. Acute is the medical term for this condition.

LITERATURE SURVEY:

Chronic kidney disease (CKD) is a significant public health problem worldwide, especially for low and medium in come countries. Chronic kidney disease (CKD) means that the kidney does not work as expected and cannot correctly filter blood. About 10% of the population worldwide suffers

from (CKD), and millions die each year because they cannot get affordable treatment, with the number increasing in the elderly. According to the Global Burden Disease 2010 study conducted by the International Society of Nephrology, chronic kidney disease (CKD) has been raised as an important cause of mortality worldwide with the number of deaths increasing by 82.3% in the last two decades [1, 2]. Also, the number of patients reaching end-stage renal disease (ESRD) is increasing, which requires kidney transplantation or dialysis to save patients' lives [1, 3, 4]. CKD, in its early stages, has no symptoms; testing may be the only way to find out if the patient has kidney disease.Early detection of CKD in its initial stages can help the patient get effective treatment and then prohibit the progression to ESRD [1]. It is argued that every year, a person that has one of the CKD risk factors, such as a family history of kidney failure, hypertension, or diabetes, get checked. The sooner they know about having this disease, the sooner they can get treatment. To raise awareness and to encourage those who are most susceptible to the disease to perform the tests periodically, we hope that the disease can be detected with the least possible tests and at low cost. So, the objective of this research is to provide an effective model to predict the CKD by least number of predictors. In this paper, Section II reviews various research works that target the diagnosis of CKD using different intelligent techniques. Section III presents the dataset source and description. Section IV presents the methodology used for the prediction, including the data preprocessing steps and the modeling stage. Section V shows the results of the experiment and discusses the performance of ML algorithms in detecting CKD. Finally, Section VI includes the conclusion and future work of this work.

Related Work:

In recent years, few studies have been done on the classification or diagnosis of chronic kidney disease. In 2013, T. Di Noia et al. [5], presented a software tool

that used the artificial neural network ANN to classify patient status, which is likely to lead to end-stage renal disease (ESRD). The classifiers were trained using the data collected at the University of Bari over a 38-year period, and the evaluation was done based on precision, recall, and F-measure. The presented software tool has been made available as both an Android mobile application and online web application. Using data from Electronic Health Records (EHR) in 2014, H. S. Chase et al. [6] identified two groups of patients in stage 3: 117 progressor patients (eGFR

declined >3ml/min/1.73m2 /year) and 364 non-progressor patients (eGFRdeclined <1 ml/min/1.73m2) Where GFR is a glomerular filtration rate that commonly used to detect CKD. Based on initial lab data recorded, the authors used Naïve Bayes and Logistic Regression classifiers to develop a predictive model for progression from stage 3 to stage 4. They compared the metabolic complications between the two groups and found that phosphate values were significantly higher, but bicarbonate, hemoglobin, calcium, and albumin values were significantly lower in progressors compared to nonprogressors, even if initial eGFR values were similar. Finally, they found that the probability of progression in patients classified as progressors was 81% (73% − 86%) and nonprogressors was 17% (13% − 23%).The kidneys are positioned in the abdominal cavity, on each side of the spine. They generally weigh around 5 times their body weight yet receives only 20% of the blood flow from the heart. The urine generated by each kidney drains into the urinary bladder, which is positioned in the pelvic area, via a distinct urethra. The kidney is the most essential organ in the human body because it manages fluid levels, electrolyte balance, and other elements that maintain the body's internal environment stable and comfortable. Kidney diseases are conditions that impact the kidney's functioning. Renal disorders can lead to kidney failure in its advanced stages. Kidney diseases are conditions that impact the kidney's

functioning. Kidneys can be injured, which means they can't accomplish what they should. This is known as chronic kidney disease (CKD).

Kidney diseases avert the normal function of the kidney. Mainly 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 This Project examines data from kidney patients concentrating on relationships between a keylist of kidney enzymes, proteins, age and gender using them to try and predict the likeliness of kidney disease at an early stage is a complex task for the doctors.

Here we are building a model by applying various machine learning algorithms find the best accurate model. And integrate to flask based web application

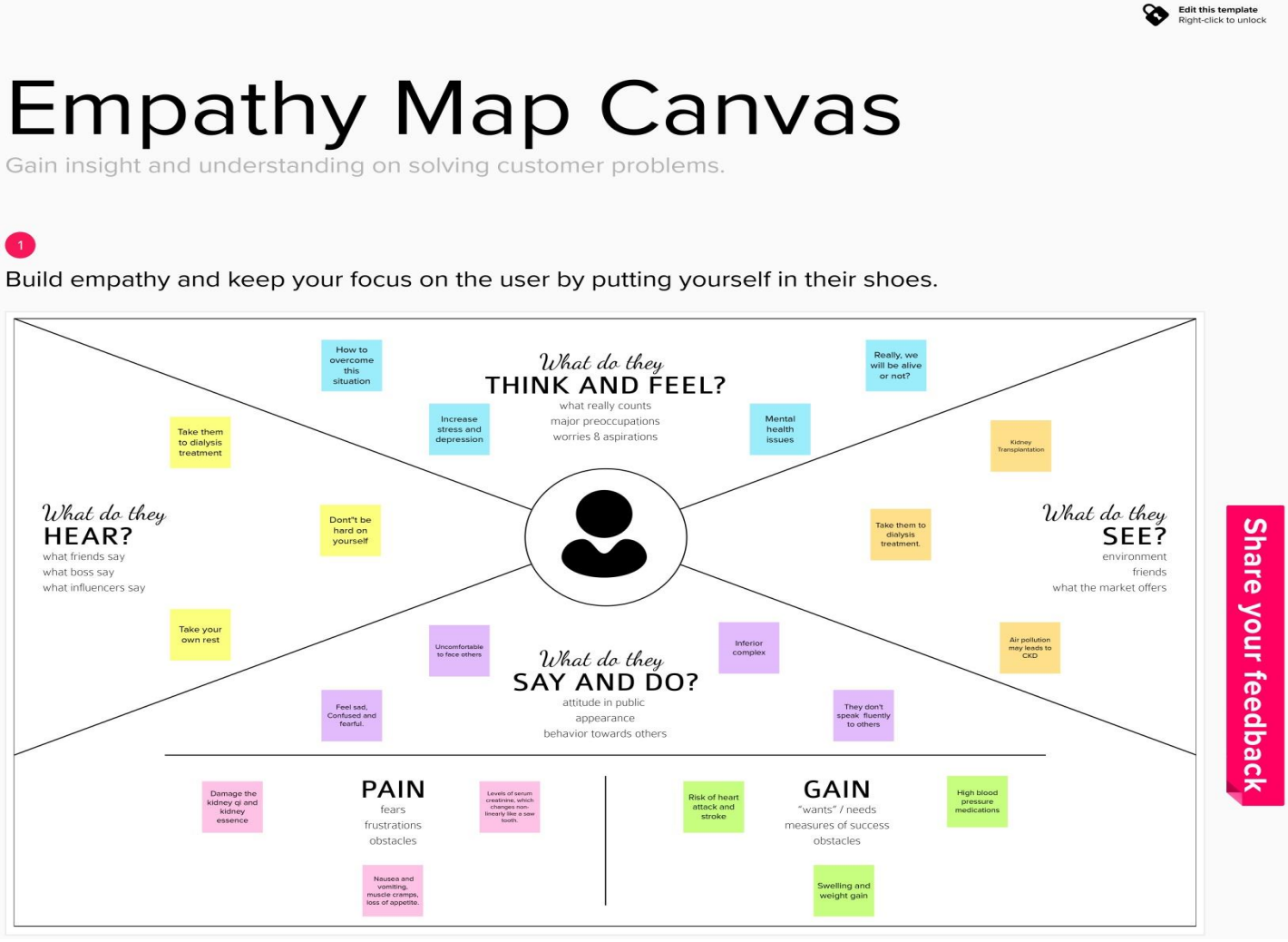
PROBLEM STATEMENT:

Noncommunicable illnesses are the leading cause of earlydeath, 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. 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.

IDEATION PHASE AND SOLUTION:

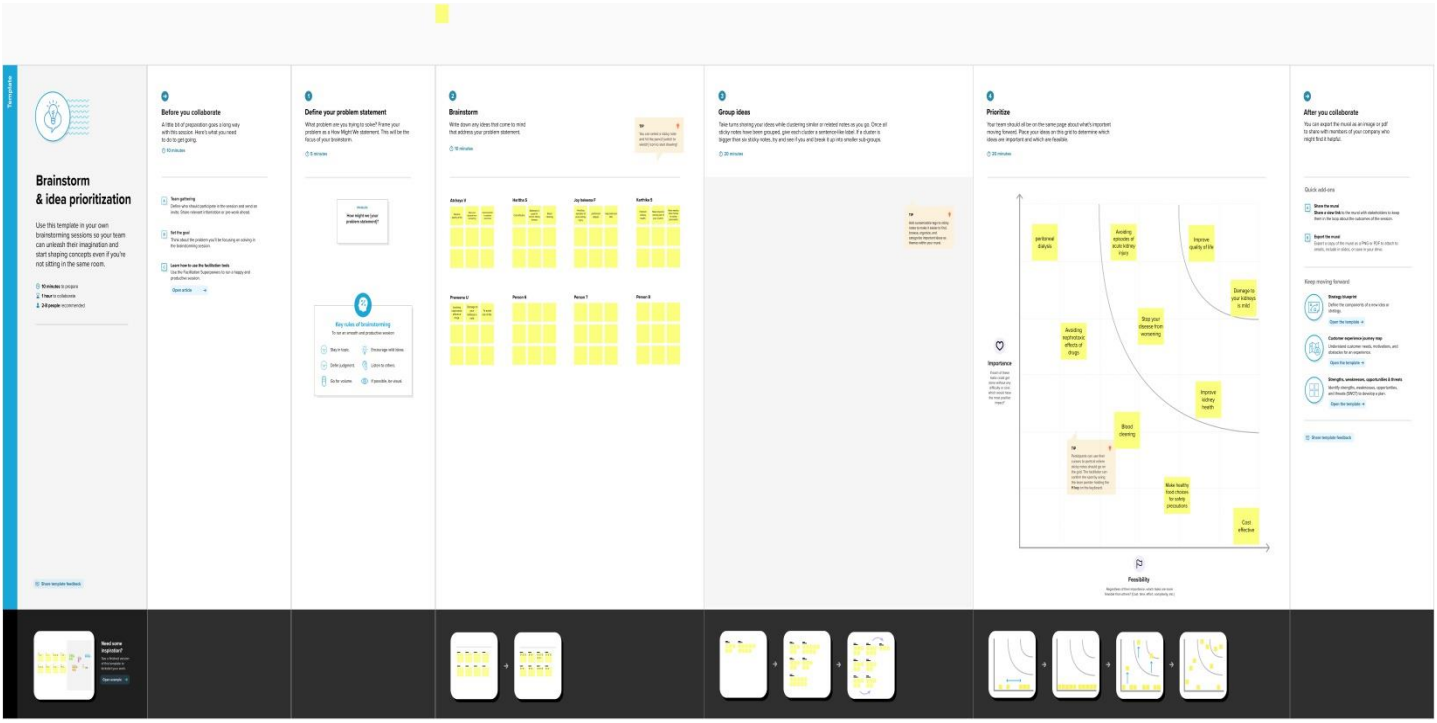
EMPATHY MAP:

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment.



IDEATION AND BRAINSTROM:

Brainstorming is a way of generating ideas and organising your thinking on a topic. It can take shape as a simple list, an outline or a mind map. Once you have generated some ideas, you can evaluate and organise them, and narrow down your focus



PROPOSED SOLUTION:

Your proposed solution should relate the current situation to a desired result and describe the benefits that will accrue when the desired result is achieved. So, begin your proposed solution by briefly describing this desired result.

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

S.NO	PARAMETER	DESCRIPTION
1	Problem Statement (Problem to be solved)	People who do not know to enter data in a device (mobile, laptop, computer) face problems in uploading data.
2	Idea / Solution description	Outcome reporting through voice offers a great alternative for people who don’t know to use devices
3	Novelty / Uniqueness	Building blocks from AWS such as Amazon LEX and Amazon Connect enable clinical researchers to quickly stand up a hands-free voice interface for patient outcome reporting.

4	Social Impact / Customer Satisfaction	Effective use of resource Enhanced diagnosis Improved treatment Enhancing the overall quality of treatment and life of patients
5	Business Model (Revenue Model)	WHO PAYS: Sponsor WHAT IS PAID: Shares FOR WHAT IS PAID: Per use HOW IS PAID: Credit HOW MUCH IS PAID: Dynamic pricing
6	Scalability of the Solution	A variety of institutions must store, evaluate and take action on the massive amount of data being produced by the health care sector as it expands quickly. India is a vast culturally varied nation with a sizable population that is increasingly able to access centralised healthcare access

PROBLEM SOLUTION FIT:

1. CUSTOMER SEGMENT(S)

CKD is more common in people aged 65 years or older (38%) than in people aged 45–64 years (12%) or 18– 44 years (6%). CKD is slightly more common in women (14%) than men (12%).

2. JOBS-TO-BE-DONE / PROBLEMS:

They may also losing weight, if necessary, exercising more, limiting alcohol consumption, and quitting smoking. You may be able to lower blood pressure by eating a diet rich in fruit, vegetables, fish, nuts, legumes, and healthy fats, such as olive oil. Reducing stress may also help lower blood pressure.

3. TRIGGERS :

A severe decrease in kidney function can lead to a buildup of toxins and impurities in the blood. This can cause people to feel tired, weak and can make it hard to concentrate. Another complication of kidney disease is anemia, which can cause weakness and fatigue.

4. EMOTIONS:

BEFORE / AFTER

Before : low mood, anxiety, panic attacks, feelings of being a burden on others, guilt, loss of control, unacceptance and disbelief.

After : Relieved , calm , confident , happy.

5. AVAILABLE SOLUTIONS(AS)

The main treatments are: lifestyle changes – to help you stay as healthy as possible. medicine – to control associated problems, such as high blood pressure and high cholesterol. dialysis – treatment to replicate some of the kidney's functions, which may be necessary in advanced (stage 5) CKD.

6. CUSTOMER CONSTRAINTS(CC)

- Control your blood pressure.
- Monitor your blood glucose.
- Eat a kidney-friendly diet and exercise regularly.
- Use caution when taking over-the counter supplements and medicines.
- Stay informed.

7. BEHAVIOUR

Neuropsychiatric conditions including depression, anxiety disorders, and cognitive impairment are prevalent in patients with chronic kidney disease (CKD). These conditions often make worse the quality of life and also lead to longer hospitalizations and higher mortality.

8.CHANNELS of BEHAVIOUR:

ONLINE:

eGFR Calculator. Helps medical professionals estimate kidney function using five separate eGFR calculators. Also includes an easy-to-use reference list and other information to help clinicians identify risk factors, evaluate for CKD.

OFFLINE :

• Blood tests. Kidney function tests look for the level of waste products, such as creatinine and urea, in your blood.

• Urine tests.

• Imaging tests.

• Removing a sample of kidney tissue for testing.

9. PROBLEM ROOT CAUSE:

Diabetes is the most common cause of kidney disease. Both type 1 and type 2 diabetes. But also heart disease and obesity can contribute to the damage that causes kidneys to fail. Urinary tract issues and inflammation in different parts of the kidney can also lead to long-term functional decline.

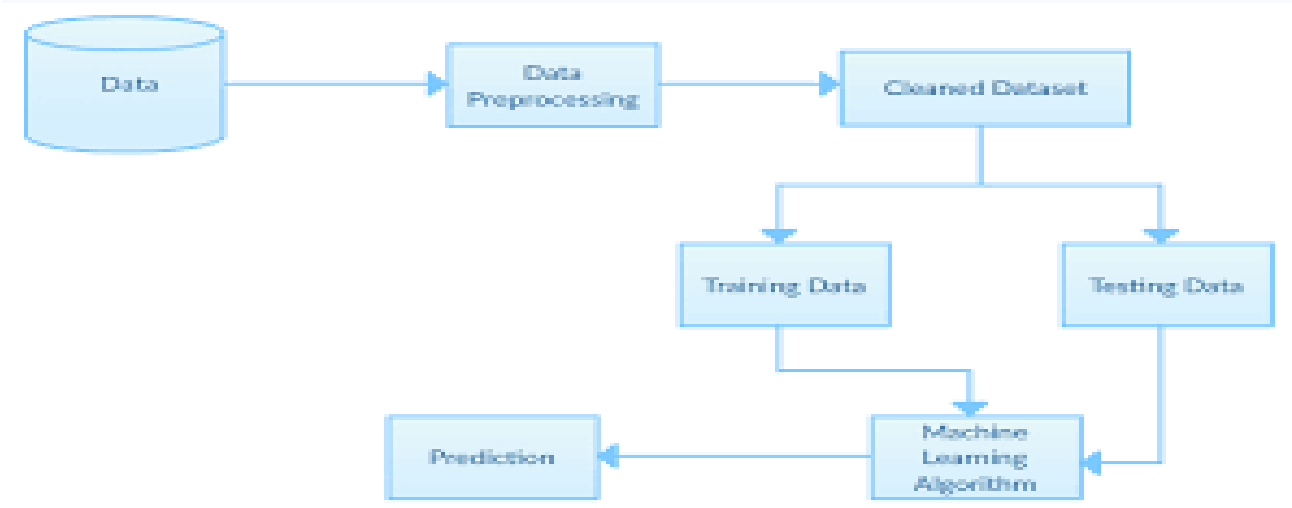
10. YOUR SOLUTION:

Medication helps manage symptoms. In later stages, filtering the blood with a machine (dialysis) or a transplant may be required.

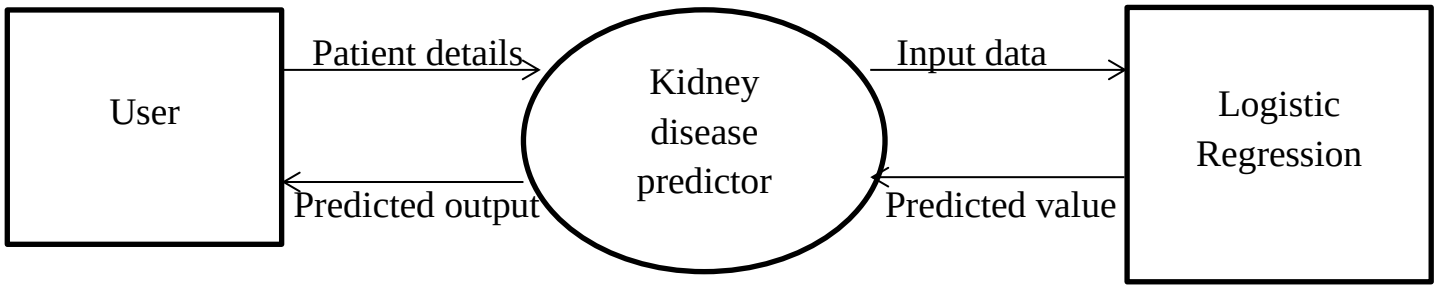
DATA FLOW DIAGRAMS:

A data flow diagram shows the way information flows through a process or system. It includes data inputs and outputs, data stores, and the various sub processes the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships

Data Flow Diagrams For Machine Learning based Vehicle Performance Analyzer:



LEVEL 0



SOLUTION REQUIERMENTS:

FUNCTIONAL REQUIERMENTS:

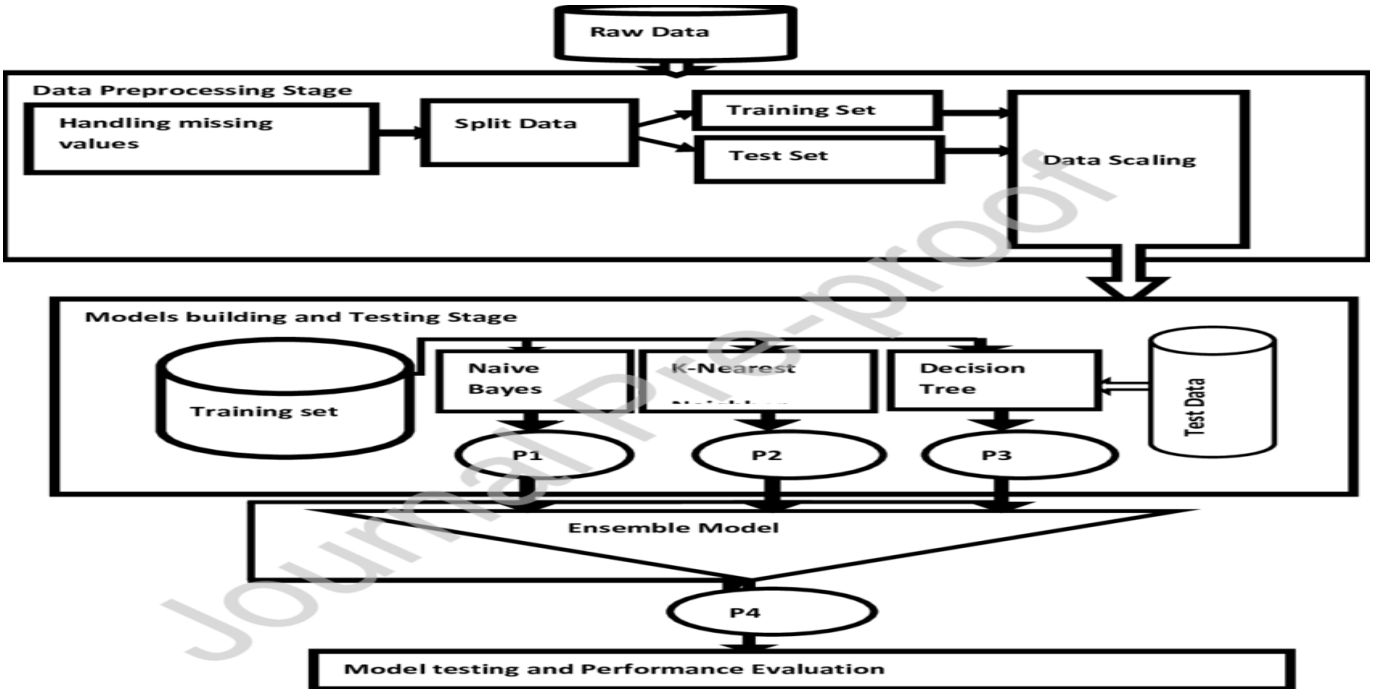
FR.NO	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR- 1	User Registration	Registration through Form.
FR- 2	User Confirmation	Confirmation via retyping password.
FR- 3	Obtain Information	The system should be able to get the information for predicting the disease from the user
FR-4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

NON-FUNCTIONAL REQUIERMENTS:

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

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

TECHNICAL ARCHEITECTURE:



Models of Machine Learning:

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. The SVM algorithm divides data into two data points when the hyperplane sits between two branches. SVM generates a distinct hyper plane in the training data's signifier space, and compounds are categorized based on which side of the hyper plane they are found on. SVM has been used in a variety of applications, including bioinformatics and handwriting recognition. Other uses for SVM include medical diagnosis, weather prediction, financial market analysis, and image processing. SVM, like all other machine learning approaches, is a computer algorithm that assigns labels to objects based on experience and examples.

The Decision Tree:

The decision tree algorithm is a supervised machine learning technique that can handle both classification and regression issues, however it is most employed to tackle classification problems. The Decision Tree approach solves the classification issue by turning the dataset into a tree representation through feature value sorting. Every node in a decision tree represents a feature of an instance to be categorized, and every leaf node represents a class label to which the instance belongs.

Random Forest:

The random forest technique is a simple and adaptable supervised machine learning approach that uses diverse collections of decision trees to solve classification and regression problems. Random forest works by constructing the forest, which is an ensemble of decision trees that are typically trained using the bagging approach. Bagging techniques are a method of combining learning

models to improve overall outcomes. This model consists of numerous decision trees and outputs the class target that is the target with the highest selection outcomes from each tree.

Neural Network Artificial:

Artificial Neural Networks, or ANN, are essentially computational models. These computations Models are composed of a sophisticated network of fundamental components or nodes known as neurons. The nodes are connected to one another. Each node-to-node link has a weight associated with it. A neural network's fundamental structure consists of three layers. The first layer is referred to as the input layer, the intermediate layer as the concealed layer, and the last layer as the output layer. All three layers of a neural network will almost certainly include one or more nodes. A rudimentary neural network will only have one hidden layer. A sophisticated neural network, on the other hand, may include numerous hidden layers. The network's inputs are routed through the basic input layers. The calculation takes place in the hidden layers, and the resulting output is sent through the output layers. There are several types of neural networks accessible. Nowadays, neural networks with several hidden layers are common and serve an important part in a variety of large computing tasks Preceptor is an excellent example of a neural network with numerous hidden layers (MLP). Even a basic neural network cannot address a complicated issue that an MLP can.

SOURCE CODE:

```
!git clone https://github.com/IBM-EPBL/IBM-Project-50129-1660894462.git
```

```
fatal: destination path 'IBM-Project-50129-1660894462' already exists and is not an empty directory.
```

```
from google.colab import drive
```

```
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
!pip install flask-ngrok
```

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: flask-ngrok in /usr/local/lib/python3.7/dist-packages (0.0.25)

Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from flask-ngrok) (2.23.0)

Requirement already satisfied: Flask>=0.8 in /usr/local/lib/python3.7/dist-packages (from flask-ngrok) (1.1.4)

Requirement already satisfied: Jinja2<3.0,>=2.10.1 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask-ngrok) (2.11.3)

Requirement already satisfied: itsdangerous<2.0,>=0.24 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask-ngrok) (1.1.0)

Requirement already satisfied: click<8.0,>=5.1 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask-ngrok) (7.1.2)

Requirement already satisfied: Werkzeug<2.0,>=0.15 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask-ngrok) (1.0.1)

Requirement already satisfied: MarkupSafe>=0.23 in /usr/local/lib/python3.7/dist-packages (from Jinja2<3.0,>=2.10.1->Flask>=0.8->flask-ngrok) (2.0.1)

Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests->flask-ngrok) (1.24.3)

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests->flask-ngrok) (2022.9.24)

Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests->flask-ngrok) (2.10)

Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests->flask-ngrok) (3.0.4)

!pip install pyngrok==4.1.1

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: pyngrok==4.1.1 in /usr/local/lib/python3.7/dist-packages (4.1.1)

Requirement already satisfied: future in /usr/local/lib/python3.7/dist-packages (from pyngrok==4.1.1) (0.16.0)

Requirement already satisfied: PyYAML in /usr/local/lib/python3.7/dist-packages (from pyngrok==4.1.1) (6.0)

!ngrok authtoken 23Jg2oDy2N9PJD3njx9iWFHSfCs_3J7KXYfQXtzxHX3a5digi

Authtoken saved to configuration file: /root/.ngrok2/ngrok.yml

x = '''

CKD Prediction

href="https://fonts.googleapis.com/css2?family=Poppins:wght@400;600;700;900&dis play=swap" rel="stylesheet">

body:before {

content: '';

position: fixed;

width: 100vw;

height: 100vh;

background-image: url({{url_for('static',filename='images/ckd.jpg')}});

background-position: center center;

background-repeat: no-repeat;

background-attachment: fixed;

-webkit-background-size: cover;

background-size: cover;

-webkit-filter: blur(10px);

```
  -moz-filter: blur(10px);
  filter: blur(10px);
}
CHRONIC KIDNEY DISEASE PREDICTOR
Chronic Kidney Disease prediction is one of the most important issues in healthcare analytics. 10
% of the population worldwide is affected by chronic kidney disease (CKD), and millions die each year because they do not have access to affordable treatment. It is essential to check if you have CKD or not. Find out NOW
Take our CKD test now!!
'''
file3 = open("index.html", "w")
file3.write(x)
file3.close()
f = '''
</span>
    CKD Prediction Form
      html, body {
      min-height: 100%;
      }
      body, div, form, input, select, p {
      padding: 0;
      margin: 0;
      outline: none;
      font-family: 'Poppins', sans-serif;
```

```
font-size: 14px;
color: black
}
h1 {
margin: 0;
font-weight: 400;
font-family: sans-serif;
font-weight: bolder;

}
h3 {
margin: 12px 0;
color: black;
}
.main-block {
display: flex;
justify-content: center;
align-items: center;
background: #fff;
background-image: url({{url_for('static',filename='images/ckd.jpg')}});
height: 100%;
background-position: center;
background-repeat: no-repeat;
background-size: cover;
```

```
    }
      form {
      width: 100%;
      padding: 20px;
      }
      fieldset {
      border: none;
      border-top: 1px solid black;
      }
      .account-details, .personal-details {
      display: block;
      flex-wrap: wrap;
      /*justify-content: space-between;*/
      }
      .account-details >div, .personal-details >div >div {

      display: flex;
      align-items: center;
      margin-bottom: 10px;
      .account-details >div, .personal-details >div, input, label {
  width: 100%;
      }
      label {
      padding: 0 5px;
```

```
text-align: right;
vertical-align: middle;
}
input {
padding: 5px;
vertical-align: middle;
}
.checkbox {
margin-bottom: 10px;
}
select, .children, .gender, .bdate-block {
width: calc(100% + 26px);
padding: 5px 0;
}
select {
background: transparent;
}
.gender input {
width: auto;
}
.gender label {
padding: 0 5px 0 0;
}
.bdate-block {
```

```
display: flex;
justify-content: space-between;
}
.birthdate select.day {
width: 35px;
}
.birthdate select.mounth {
width: calc(100% - 94px);
}
.birthdate input {
width: 38px;
vertical-align: unset;
}
.checkbox input, .children input {
width: auto;
margin: -2px 10px 0 0;
}
button {
width: 100%;
padding: 10px 0;
margin: 10px auto;
border-radius: 5px;
border: none;
background: red;
```

```
font-size: 14px;
font-weight: 600;
color: #fff;
box-shadow: 0 8px 16px 0 rgba(0,0,0,0.2), 0 6px 20px 0 rgba(0,0,0,0.19);
}
button:hover {
background: red;
opacity: 0.4;
}
@media (min-width: 568px) {
.account-details >div, .personal-details >div {
width: 50%;
}
label {
width: 40%;
}
input {
width: 60%;
}
select, .children, .gender, .bdate-block {
width: calc(60% + 16px);
}
}
```

ENTER YOUR DETAILS

Personal Details

Name

    Gender

Male

Female

Age

Medical Details

Blood Pressure

Specific Gravity

Albumin

Sugar

    How about RBC's?

Normal

Abnormal

    Pus Cell

Normal

Abnormal

    Any clumps in your Puss cells?

Present

Not Present

    Bacteria?

Present

Not Present

Blood Glucose Random

Blood Urea

Serum Creatinine

Sodium

Potassium

Hemoglobin

Packed Cell Volume

WBC Count

RBC Count

    Do you have hypertension

Yes

No

    Do you have Diabetes Mellitus?

Yes

No

    Do you have CAD?

Yes

No

    How's your apetite?

Good

Poor

    Do you have Pedal Edema?

Yes

No

    Do you have Anaemia?

Yes

No

'''

```
file1 = open("form.html", "w")
file1.write(f)
file1.close()
```

```
r = '''
        Results


href="https://fonts.googleapis.com/css2?family=Poppins:wght@400;600;700;900&dis play=swap" rel="stylesheet">



body:before {
content: '';
position: fixed;
  width: 100vw;
  height: 100vh;
  background-image: url({{url_for('static',filename='images/ckd.jpg')}});
  background-position: center center;
  background-repeat: no-repeat;
  background-attachment: fixed;
  -webkit-background-size: cover;
  background-size: cover;
  -webkit-filter: blur(10px);
  -moz-filter: blur(10px);
  filter: blur(10px);
}
CHRONIC KIDNEY DISEASE PREDICTOR
```

{{ data }}

Take CKD test again!!

'''

file2 = open("result.html", "w")

file2.write(r)

file2.close()

#importing libraries

import os

import numpy as np

import flask

import pickle

from flask import Flask, render_template, request

from flask_ngrok import run_with_ngrok

import requests

NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud account.

API_KEY = "xsc0DgO5B50sSt04GVW3Lnrcm1Bou0Bn9oFqlEK7g01N"

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"]

```
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' +
mltoken}



#model = pickle.load(open('model.pkl', 'rb'))

#creating instance of the class

app=Flask(__name__, template_folder="/content/")

run_with_ngrok(app)


#to tell flask what url shoud trigger the function index()

@app.route('/')

def man():

    return flask.render_template('index.html')

@app.route('/form.html')

def forw():

    return flask.render_template('form.html')


@app.route('/predict',methods = ['POST'])

def home():

    x=[param for param in request.form.values()]

    x=[float(p) for p in x[2:]]

    print(x)
```

```
    #x = [[65.0, 70.0, 1.01, 0.0, 0.0, 1.0, 1.0, 0.0, 0.0, 93.0, 66.0, 1.6, 137.0, 4.5,
11.6, 23.0, 69.0, 17.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0]]

    lis = [['age', 'blood_pressure', 'specific_gravity', 'albumin', 'sugar',

      'red_blood_cells', 'pus_cell', 'pus_cell_clumps', 'bacteria',

      'blood_glucose_random', 'blood_urea', 'serum_creatinine', 'sodium',

      'potassium', 'hemoglobin', 'packed_cell_volume',

      'white_blood_cell_count', 'red_blood_cell_count', 'hypertension',

      'diabetesmellitus', 'coronary_artery_disease',
'appetite','pedal_edema','anemia']]

    payload_scoring = {"input_data": [{"field": lis, "values": [x]}]}

    response_scoring = requests.post('https://us-
south.ml.cloud.ibm.com/ml/v4/deployments/f4af460b-49e4-4b53-9c7a-
25929a2729b8/predictions?version=2022-11-24', json=payload_scoring,

    headers={'Authorization': 'Bearer ' + mltoken})


    pred = response_scoring.json()

    p = pred['predictions'][0]['values'][0][0]

    print(p)

    if int(p)== 0:

      prediction ='YOU HAVE CHRONIC KIDNEY DISEASE'

    else:

      prediction ='YOU DON\'T HAVE CHRONIC KIDNEY DISEASE'

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


if __name__ == "__main__":

        app.run()
```

* Serving Flask app "__main__" (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: off

INFO:werkzeug: * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)

* Running on http://22b7-35-230-96-3.ngrok.io

* Traffic stats available on http://127.0.0.1:4040

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:06] "GET / HTTP/1.1" 200 -

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:06] "GET /static/styles/logincss.css HTTP/1.1" 200 -

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:07] "GET /static/images/ckd.jpg HTTP/1.1" 200 -

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:08] "GET / HTTP/1.1" 200 -

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:09] "GET /favicon.ico HTTP/1.1" 404 -

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:09] "GET /static/styles/logincss.css HTTP/1.1" 200 -

INFO:werkzeug:127.0.0.1 - - [25/Nov/2022 09:31:12] "GET /static/images/ckd.jpg HTTP/1.1" 200 -

CONCLUSION:

This study developed an algorithm for predicting CKD at an early stage. The dataset contains input parameters obtained from CKD patients, and the models are trained and validated using the valid parameters. To diagnose CKD, decision tree, random forest, and support vector machine learning models are built. The accuracy of prediction is used to assess the

performance of the models. The study's findings revealed that the Random Forest Classifier model outperforms Decision Trees and Support Vector Machines in predicting CKD. As an extension of this research, the comparison may also be done depending on the duration of execution and feature set selection