

APPLIED DATA SCIENCE – HEALTH CARE

**EARLY DETECTION OF CHRONIC KIDNEY
DISEASE USING MACHINE LEARNING**

PROJECT REPORT

Submitted by:

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1.INTRODUCTIO

1.1 Project Overview:

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

1.2 Purpose:

Early detection might help prevent kidney disease from progressing to kidney failure. Due to busy lifestyle of people in the modern day, people do not have time to check in with the doctors. Hence, in our project, we have implemented a software to detect chronic kidney disease at its early stage. This allows people to check the health status of their kidney at the comfort of their homes.

2.LITERATURE SURVEY

2.1 Existing Problem:

1. Early detection of Chronic Kidney Disease using Machine Learning

Tahmid Abrar,

Samiha Tasnim,

Md Hossain

Brac University, 2019

Chronic kidney disease (CKD) is a global prevalent ailment that causes lives in a predominant number. CKD is the 11th most deadly cause of global mortality with 1.2 million death each year and according to kidney Foundation of Bangladesh, around 40,000 CKD people experienced kidney failure annually as well as several thousand passed away in short stage of life because of CKD. Predictive analytics for healthcare using machine learning is a challenged task to help doctors decide the exact treatments for saving lives. Scientist researched collaboratively chronic kidney diseases, with the majority of their work on pure statistical models, generating numerous gaps in the development of machine-learning models. In this article we discussed the current methods and suggested improved technology based on the XGBoost (Extreme Gradient Boost), which combined significant characteristics of the F scores and evaluated four pre-processing scenarios. In addition, we provided machine training methods for anticipating chronic renal disease with clinical information. Four techniques of master teaching are explored including Support Vector Regression (SVR), logistic Regressor (LR), AdaBoost, Gradient Boosting Tree and Decision Tree Regressor. The components are made from

UCI dataset of chronic kidney disease and the results of these models are compared to determine the best regression model for the prediction. From this four pre-processing cases, replacing missing values with mean values of each column and choosing important features was most logical as it allows to train with more data without dropping. However, XGBoost gave the best outcomes in all four cases where it obtained 98% accuracy in case one where null values are dropped, 98.75% testing accuracy for both case two and three where null values were replaced with minimum and maximum values of each column and it scores 100% accuracy in case four where null values are replaced with mean values. Thus, the system can be implemented for early-stage CKD prediction in a cost-efficient way which will be helpful for under developed and developing countries.

2. Identifying important attributes for early detection of CKD

Anandanadarajah Nishanth,

Tharmarajah Thiruvanan .

IEEE reviews in biomedical engineering 11, 208-216, 2017

Individuals with chronic kidney disease (CKD) are often not aware that the medical tests they take for other purposes may contain useful information about CKD, and that this information is sometimes not used effectively to tackle the identification of the disease. Therefore, attributes of different medical tests are investigated to identify which attributes may contain useful information about CKD. A database with several attributes of healthy subjects and subjects with CKD are analyzed using different techniques. Common spatial pattern (CSP) filters and linear discriminant analysis are first used to identify the dominant attributes that could contribute in detecting CKD. Here, the CSP filter is applied to optimize a separation between CKD and non-CKD subjects. Then, classification methods are also used to identify the dominant attributes. These analyses suggest that hemoglobin, albumin, specific gravity, hypertension, and diabetes mellitus, together with serum creatinine, are the most important attributes in the early detection of CKD. Further, it suggests that in the absence of information on hypertension and diabetes mellitus, random blood glucose and blood pressure attributes may be used.

3. Intelligent systems on the cloud for the Early detection of Chronic Kidney Disease

Ruey Kei Chiu,

Renee Y Chen,

Shin-An Wang,

Sheng-Jen Jian

International Conference on Machine Learning and Cybernetics 5, 1737-1742, 2012

This paper aims to construct intelligence models by applying the technologies of artificial neural networks including back-propagation network (BPN), generalized feed forward neural networks (GRNN), and modular neural network (MNN) are developed respectively for the early detection of chronic kidney disease (CKD). The comparison of accuracy, sensitivity, and specificity among three models is subsequently performed. The model of best performance is chosen for system development. The system developed aligned with the best model is deployed to the Google cloud platform by leveraging Google Application Engine. By doing so, the result can more efficiently provide CKD physicians an alternative way to detect chronic kidney diseases in early stage of a patient. Meanwhile, it may also be used by publics for self-detecting the risk of contracting CKD

2.2 References:

https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Early+detection+of+Chronic+kidney+disease++&oeq=

2.3 Problem Statement:

Nowadays, there are many people who suffer from chronic kidney disease. With the use of modern-day software, we can detect chronic kidney disease at its early stages to prevent further complications. This method is cost efficient and less time consuming, and provides accurate details about the health of the patient's kidney

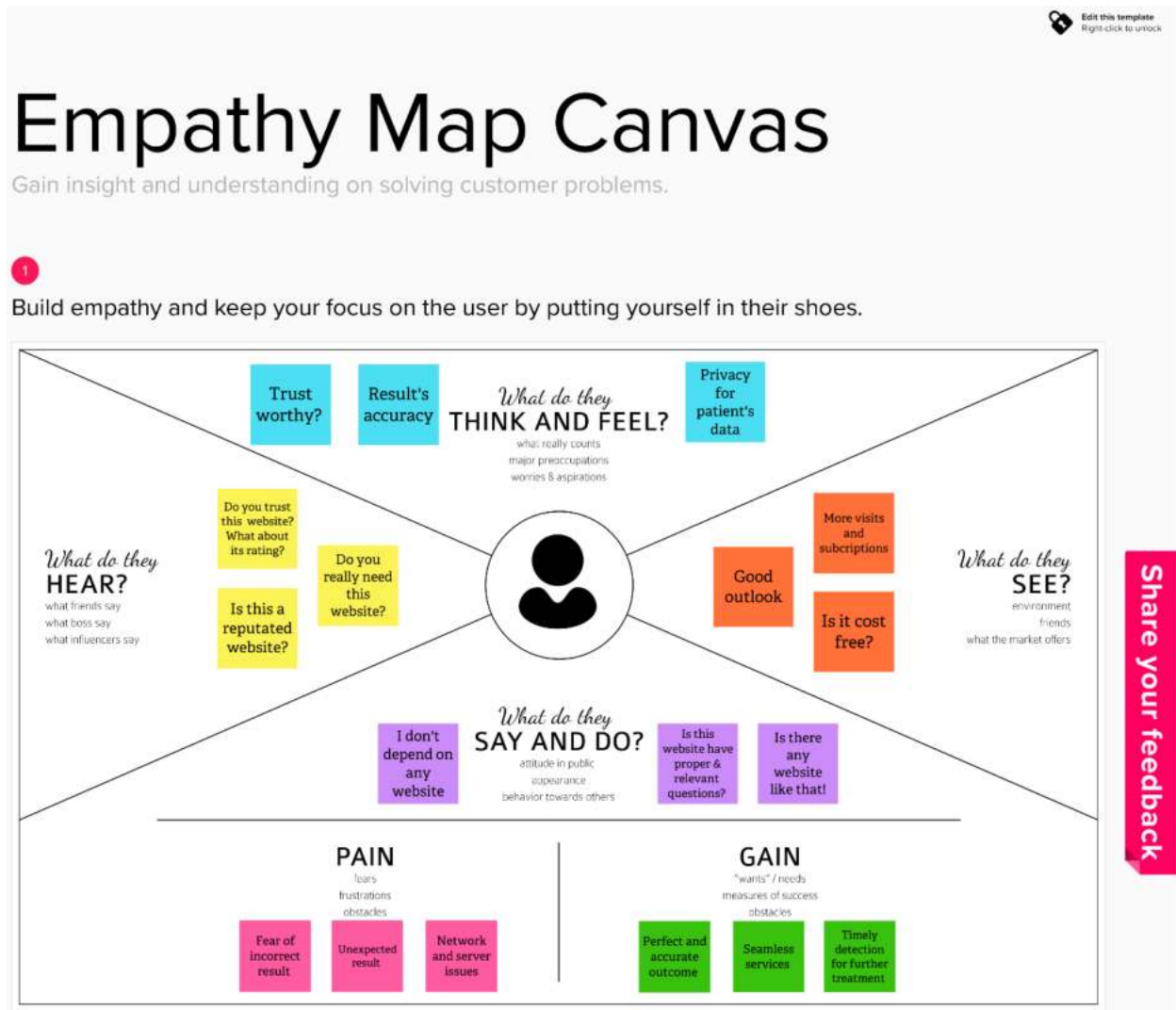
Who does the problem affect?	CKD is more common in people aged 65 years or older (38%) than in people aged 45–64 years (12%) or 18–44 years (6%).
What are the boundaries of the problem?	Albuminuria (ACR \geq 30 mg/g), Urine sediment abnormalities, Electrolyte and other abnormalities due to tubular disorders, Abnormalities detected by histology, Structural abnormalities detected by imaging, History of kidney transplantation.
What is the issue?	Your kidneys are damaged and can't filter blood the way they should. The disease is called "chronic" because the damage to your kidneys happens slowly over a long period of time. This damage can cause wastes to build up in your body.
When does the issue occurs?	Chronic kidney disease occurs when a disease or condition impairs kidney function, causing kidney damage to worsen over several months or years. Diseases and conditions that cause chronic kidney disease include: Type 1 or type 2 diabetes. High blood pressure.
Where is the issue occurring?	The kidneys grow larger and gradually lose the ability to function as they should. Chronic kidney disease occurs when a disease or condition impairs kidney function, causing kidney damage to worsen over several months or years.

Why is it important that we fix the problem?	The older you get the more likely you are to have some degree of kidney disease. This is important because CKD increases the risk of heart attack and stroke, and in
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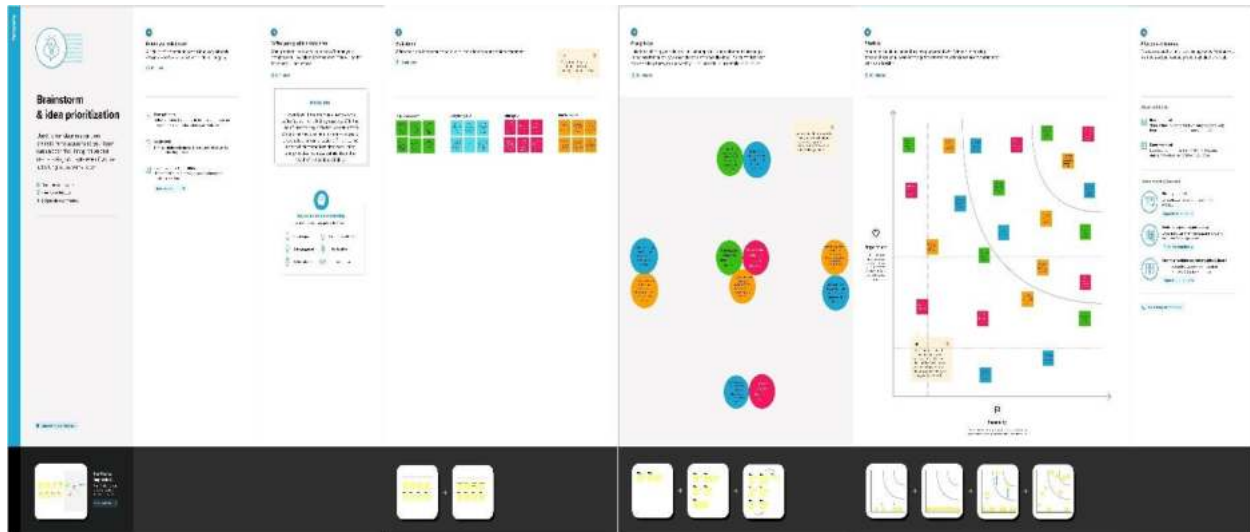
	some cases can progress to kidney failure requiring dialysis or transplantation.
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3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map



3.2 Ideation & Brainstorming:



3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Nowadays, there are many people who suffer from chronic kidney disease. Due to their busy lives, they often neglect their health. With the use of modern-day software, we can detect chronic kidney disease at its early stages to prevent further complications. The method should be cost efficient and less time consuming, and provides accurate details about the health of the patient's kidney.
2.	Idea / Solution description	This work detects the Chronic Kidney Disease (CKD) using machine learning algorithms while considering the least number of tests or features. We approach this aim by applying four machine learning classifiers: logistic regression, SVM, random forest, and gradient boosting on a small dataset of 400 records. A filter feature selection method has been applied to the remaining attributes and found that

		there are hemoglobin, albumin, and specific gravity have the most impact to predict the CKD.
3	Novelty / Uniqueness	This web is user friendly, low cost and the result's accuracy will be high.
4	Social Impact / Customer Satisfaction	The most obvious societal effect of this website is we can reduce the tremendous financial cost and loss of productivity associated with kidney failure. Since we detect the chronic kidney disease earlier the psychosocial factors including depression, anxiety and lower social support are common in patients with CKD can also be reduced.
5	Business Model (Revenue Model)	While individuals with CKD can pose substantial expense to the healthcare system, those with end-stage renal disease cost exponentially more. This application may detect the chronic kidney disease earlier with low cost.
6	Scalability of the Solution	In order to reduce the chance of false report, the association between the variables have been studied. By using the algorithms which has the most accuracy it will be more useful to get the accurate results.

3.4 Problem Solution fit:

Problem-Solution fit canvas 2.0

Project Title : Early Detection of Chronic Kidney Disease using Machine Learning

Team ID : PNT2022TMID49652

<p>1. CUSTOMER SEGMENT(S) CS</p> <p>Who is your customer? i.e. working parents of 0-5 y.o. kids</p> <p>All kind of People, Living in busy life.</p>	<p>6. CUSTOMER CONSTRAINTS CC</p> <p>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.</p> <p>* User can't access the website without register into the website. * User may find difficulty if he/she don't have proper internet connection.</p>	<p>5. AVAILABLE SOLUTIONS AS</p> <p>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What price & costs do these solutions have? i.e. pen and paper is an alternative to digital notetaking</p> <p>* In the past, the only way is medical testing, now they can do it in online also. * But the user can find difficulty in the currently available websites.</p>	<p>Explore AS, differentiate</p>
<p>2. JOBS-TO-BE-DONE / PROBLEMS J&P</p> <p>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</p> <p>* Because of their busy lives, they don't have enough time to spend for their health. * With this website, the use of modern science software, one can detect CKD at early stages to avoid complications. * It provides an accurate information about the health of the patient's kidney.</p>	<p>9. PROBLEM ROOT CAUSE RC</p> <p>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</p> <p>* In this modern world, People are no time to check their health status in daily life. * But, everyone don't forget to use Smart phones, Laptops. * By using this web application they check and detect their kidney health.</p>	<p>7. BEHAVIOUR BE</p> <p>What does your customer do to address the problem and get the job done? i.e. directly related: find the right water panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</p> <p>* They take medical test for the prediction of chronic kidney disease and get the report of it. * It may cause high cost and it is a time taking process. * In the past, the customers use this way only. * They may feel insecure about the online applications and websites.</p>	
<p>3. TRIGGERS TR</p> <p>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</p> <p>The advantages of CKD web application triggers the users : * This web is cost effective and less time consuming. * Also, it provides an exact results for patients using this web.</p> <p>4. EMOTIONS: BEFORE / AFTER EM</p> <p>How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure - confident, in control - use it in your communication strategy & design.</p> <p>Before: Fear of health, Confusion, Worried about check-up, etc. After: Self-confidence, Take decisions for next step of treatment.</p>	<p>10. YOUR SOLUTION SL</p> <p>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour</p> <p>* People with busy life can find solution to their problem with this website. * This website will have higher accuracy in result. * The data of the user will be kept safely. * This website have simple registration process. * Therefore the user need not to feel insecure.</p>	<p>8. CHANNELS of BEHAVIOUR CH</p> <p>8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7 Users who live in busy life and needs budget friendly way, use the online websites or applications for predicting CKD.</p> <p>8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 On the other hand, majority of the people feel insecure about the online sites, so they take medical tests and check the reports.</p>	<p>Identify strong TR & EM</p>



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Created by Daria Napierkova / Amaltama.com



4. REQUIREMENT ANALYSIS

4.1 Functional & Non-Functional requirements:

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	23 October 2022
Team ID	PNT2022TMID49652
Project Name	Early Detection of Chronic Kidney Disease using Machine Learning
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Home page	Name of the web application. Switch to enter into prediction page.
FR-2	Prediction Page	Chronic kidney disease description.
FR-3	Test Vital Form	Information about Test Vitals required for prediction. Test Vitals should be waited for prediction.
FR-3	Result	If Positive –Test Result along with the information about what is to be done next will be displayed. If Negative – Test result along with the preventive measures to prevent them from getting chronic kidney disease will be displayed.

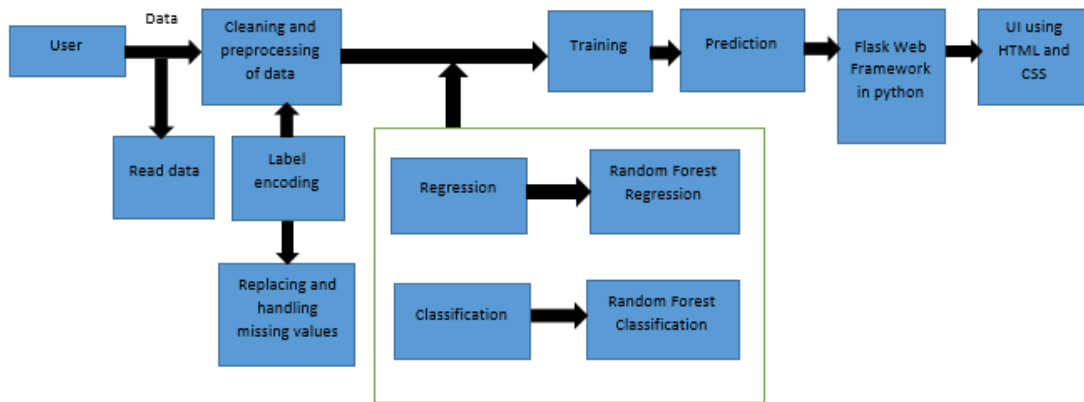
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Even Illiterates and people with no understanding of computer/mobile should be able to use the product.
NFR-2	Security	Access permission for particular system information may be changed by systems data administration.
NFR-3	Reliability	The database update process must roll back all related updates when any updates fails.
NFR-4	Performance	The Home-page load time must be no more than 2 seconds for users that access the website using an LTE mobile connection.
NFR-5	Availability	New Model Deployment must not impact Home page , test page and result page availability and must not take longer than 1 hour.
NFR-6	Scalability	The website Traffic limit must be scalable enough to support 2000,000 users at a time.

4. REQUIREMENT ANALYSIS

4.1 Functional & Non-Functional requirements:

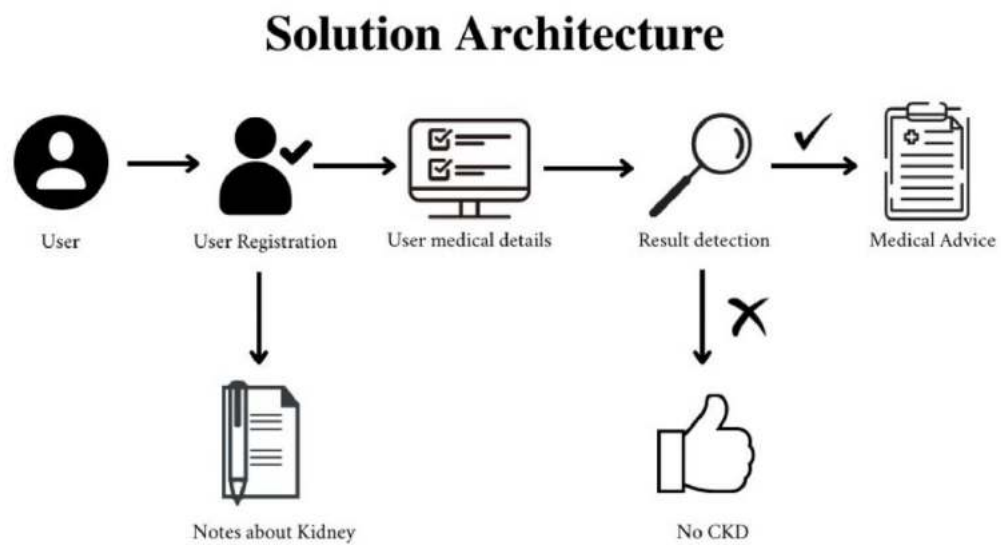


Data flow of Chronic Kidney Disease Prediction:

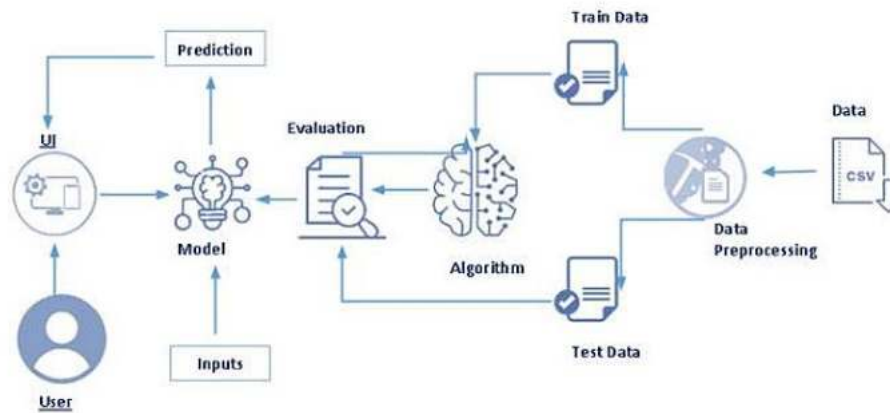
1. Medical data of patients is collected from Kaggle.
2. Exploratory data analysis done on the input dataset.
3. Replacing and handling missing values.
4. Label encoding is done.
5. Train test split is done.
6. Both classification and regression model are built.
7. For classification, the model is trained with Random Forest Classifier and tested with test dataset.
8. For Regression, the model is trained with Random Forest Regressor and tested with test dataset.
9. Then the model is fitted with front end which is developed using HTML, CSS with the help of Python Flask Web Framework.

10. Finally, the output will be predicted for the user input data.

5.2 Solution & Technical Architecture:



Technical Architecture:



5.3 User Stories:

Functional Requirement (Epic)	User Story Number	User Story / Task
Clean the dataset	USN-1	The downloaded dataset is not suitable for training the machine learning model of randomness so we need to clean the dataset properly in order to fetch good results
Model	USN-2	Model Building. Test the model, Model Evaluation and save the model
Home page	USN-3	To build a simple home page which is having a logo, a home scree, our project title, and a prediction button
Prediction page	USN-4	To observe we have our/predict route with us which returns the form values to our flask application
Result Page	USN-5	Output is a categorical in nature here we are just performing if- else condition to the value which will be returned by the prediction page.
Run the app	USN-6	Give the input and see the prediction on UI

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning & Estimation:

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	Clean the dataset	USN-1	The download data set is not suitable for training the machine learning model of randomness so we need to clean the dataset properly in order to fetch good results.	20	High	Mari Kumari M, Jaslyn Angel D
Sprint-2	Model	USN-2	Model Building, Test the model, Model Evaluation and Save the model	20	High	Anusuya S, Mari Kumari M, Priyacharshini M
Sprint-3	Home page	USN-3	To build a simple home page which is having a logo, a home screen, our project title, and a prediction button.	5	Medium	Priyacharshini M, Anusuya S
Sprint-3	Prediction page	USN-4	To observe we have our /predict route with us which returns the form values to our flask application	8	Medium	Jaslyn Angel D, Anusuya S, Mari Kumari M
Sprint-3	Result Page	USN-5	Output is a categorical in nature here we are just performing if-else condition to the value which will be returned by the prediction page.	5	High	Jaslyn Angel D, Priyacharshini M,
Sprint-4	Run the app	USN-6	Running the web application by integrating all the created files	20	High	The team

6.2 Sprint Delivery Schedule:

Project Tracker, Velocity & Burn down 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	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

Imagine we have an 6-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \text{sprint duration} / \text{velocity} = 6 / 20 = 0.3$$

6.3 Reports from JIRA:

		NOV
Sprints	JC Sp...	JC Sp... JC Sp... JC Sp...
>  <u>JC-1 Clean the dataset</u>		
>  <u>JC-2 Model</u>		
>  <u>JC-3 Home page</u>		
>  <u>JC-4 Prediction page</u>		
>  <u>JC-5 Result Page</u>		
>  <u>JC-6 Run the app</u>		

7. CODING & SOLUTIONING

App.py:

```
import joblib
```

```
from flask import Flask, render_template, redirect, url_for, request
```

```
from flask_bootstrap import Bootstrap
```



```
from flask_wtf import FlaskForm
from wtforms import StringField, PasswordField, BooleanField
from wtforms.validators import InputRequired, Email, Length
from flask_sqlalchemy import SQLAlchemy
from werkzeug.security import generate_password_hash, check_password_hash
from flask_login import LoginManager, UserMixin, login_user, login_required, logout_user
import pandas as pd
import pickle
import numpy as np
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split

filename = 'diabetes-prediction-rfc-model.pkl'
classifier = pickle.load(open(filename, 'rb'))
model = pickle.load(open('model.pkl', 'rb'))

app = Flask(__name__)
app.config['SECRET_KEY'] = 'secret'
app.config['SQLALCHEMY_DATABASE_URI'] = 'sqlite:///database.db'
bootstrap = Bootstrap(app)
db = SQLAlchemy(app)

login_manager = LoginManager()
login_manager.init_app(app)
login_manager.login_view = 'login'

class User(UserMixin, db.Model):
    id = db.Column(db.Integer, primary_key=True)
    username = db.Column(db.String(15), unique=True)
```

```
email = db.Column(db.String(50), unique=True)
password = db.Column(db.String(80))
```

```
@login_manager.user_loader
def load_user(user_id):
    return User.query.get(int(user_id))
```

```
class LoginForm(FlaskForm):
    username = StringField('Username', validators=[InputRequired(), Length(min=4, max=15)])
    password = PasswordField('Password', validators=[InputRequired(), Length(min=8, max=80)])
    remember = BooleanField('remember me')
```

```
class RegisterForm(FlaskForm):
    email = StringField('Email', validators=[InputRequired(), Email(message='Invalid email'),
Length(max=50)])
    username = StringField('Username', validators=[InputRequired(), Length(min=4, max=15)])
    password = PasswordField('Password', validators=[InputRequired(), Length(min=8, max=80)])
```

```
@app.route('/')
def index():
    return render_template("index.html")
```

```
@app.route('/about')
def about():
    return render_template("about.html")
```

```
@app.route('/help')
def help():
    return render_template("help.html")
```

```
@app.route('/terms')
def terms():
    return render_template("tc.html")
```

```
@app.route('/login', methods=['GET', 'POST'])
def login():
    form = LoginForm()
    if form.validate_on_submit():
        user = User.query.filter_by(username=form.username.data).first()
        if user:
            if (form.password.data):
                login_user(user, remember=form.remember.data)
                return redirect(url_for('dashboard'))

    return render_template("login.html", form=form)
return render_template("login.html", form=form)
```

```
# KEY:3123-1664284021
```

```
@app.route('/signup', methods=['GET', 'POST'])
def signup():
    form = RegisterForm()
```

```
    if form.validate_on_submit():
        new_user = User(username=form.username.data, email=form.email.data,
password=form.password.data)
        db.create_all()
        db.session.add(new_user)
        db.session.commit()

        return redirect("/login")
    return render_template('signup.html', form=form)
```

```
@app.route("/dashboard")
@login_required
def dashboard():
    return render_template("dashboard.html")
```

```
@app.route("/disindex")

def disindex():
    return render_template("disindex.html")
```

```
@app.route("/kidney")
@login_required
def kidney():
    return render_template("kidney.html")
```

```

def ValuePredictor(to_predict_list, size):
    to_predict = np.array(to_predict_list).reshape(1, size)
    if size == 7:
        loaded_model = joblib.load('kidney_model.pkl')
        result = loaded_model.predict(to_predict)
    return result[0]

```

```

@app.route("/predictkidney", methods=['GET', 'POST'])
def predictkidney():
    if request.method == "POST":
        to_predict_list = request.form.to_dict()
        to_predict_list = list(to_predict_list.values())
        to_predict_list = list(map(float, to_predict_list))
        if len(to_predict_list) == 7:
            result = ValuePredictor(to_predict_list, 7)
            if(int(result) == 1):
                prediction = "Patient has a high risk of Kidney Disease, please consult your doctor immediately"
            else:
                prediction = "Patient has a low risk of Kidney Disease"
        return render_template("kidney_result.html", prediction_text=prediction)

```

```

@app.route('/logout')
@login_required
def logout():
    logout_user()
    return redirect(url_for('index'))

```

```
df1 = pd.read_csv('diabetes.csv')
```

```
df1 = df1.rename(columns={'DiabetesPedigreeFunction': 'DPF'})
```

```
df_copy = df1.copy(deep=True)
```

```
df_copy[['Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI']] = df_copy[['Glucose',  
'BloodPressure',
```

```
        'SkinThickness', 'Insulin',  
        'BMI']].replace(0, np.NaN)
```

```
df_copy['Glucose'].fillna(df_copy['Glucose'].mean(), inplace=True)
```

```
df_copy['BloodPressure'].fillna(df_copy['BloodPressure'].mean(), inplace=True)
```

```
df_copy['SkinThickness'].fillna(df_copy['SkinThickness'].median(), inplace=True)
```

```
df_copy['Insulin'].fillna(df_copy['Insulin'].median(), inplace=True)
```

```
df_copy['BMI'].fillna(df_copy['BMI'].median(), inplace=True)
```

```
X = df1.drop(columns='Outcome')
```

```
y = df1['Outcome']
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20, random_state=0)
```

```
classifier = RandomForestClassifier(n_estimators=20)
```

```
classifier.fit(X_train, y_train)
```

```
filename = 'diabetes-prediction-rfc-model.pkl'
```

```
pickle.dump(classifier, open(filename, 'wb'))
```

```
if __name__ == "__main__":
```

```
app.run(debug=True)
```

7.2 Feature 2:

About.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title>JAMP | About Us</title>
  <link rel = "icon" href="/static/img/jelly.png"
    type = "image/x-icon">
  <link                                     rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
  <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
  <script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"></script>
  <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
  <script src="https://use.fontawesome.com/releases/v5.0.8/js/all.js"></script>
  <link rel="stylesheet" type="text/css" href="static/css/aboutus.css">
  <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">

  <style>
    body {
      padding-top: 3.5rem;
    }
  </style>
</head>
<body>
  <div class="container">
    <div class="row">
      <div class="col-md-12">
        <h1>JAMP</h1>
        <h2>About Us</h2>
        <p>JAMP is a company that is dedicated to providing the best quality products and services to our customers. We are a team of passionate professionals who are committed to excellence in everything we do. Our mission is to create a better world for everyone, and we are proud to be a part of it. We are currently looking for talented individuals who are interested in joining our team and making a difference in the world. If you are interested in learning more about us, please visit our website at jamp.com. We would love to hear from you!</p>
      </div>
    </div>
  </div>
</body>
</html>
```

```
nav {  
    font-family: 'Poppins', sans-serif;  
}
```

```
.navbar-brand {  
    font-size: 20px;  
    font-family:'Poppins', sans-serif;  
}  
  
</style>
```

```
</head>
```

```
<body>
```

```
    <form id="form1">
```

```
        <header>
```

```
            <nav class="navbar navbar-expand-md navbar-dark fixed-top bg-dark">
```

```
                <a class="navbar-brand" href="#"><b>JAMP</b></a>
```

```
                <button    class="navbar-toggler"    type="button"    data-toggle="collapse"    data-  
target="#navbarCollapse"    aria-controls="navbarCollapse"    aria-expanded="false"    aria-  
label="Toggle navigation">
```

```
                    <span class="navbar-toggler-icon"></span>
```

```
                </button>
```

```
                <div class="collapse navbar-collapse" id="navbarCollapse">
```

```
                    <ul class="navbar-nav ml-auto">
```

```
                        <li class="nav-item">
```

```
                            <a class="nav-link" href="/">Home</a>
```

```
                        </li>
```

```
                        <li class="nav-item active">
```

```
                            <a class="nav-link" href="/about">About Us</a>
```

```
                        </li>
```

```
                        <li class="nav-item">
```



```
<a class="nav-link" href="/help">Help</a>
</li>
<li class="nav-item">
    <a class="nav-link" href="/login">Login</a>
</li>
<li class="nav-item">
    <a class="nav-link" href="/signup">Sign Up</a>
</li>
</ul>
</div>
</nav>
</header>

<main role="main">

<div class="jumbotron">
<div class="container">
    <h1 class="display-4">About JAMP</h1>

    <p>Welcome to JAMP, a software-based prediction system for users to know their chances of
having chronic kidney disease. JAMP is an upcoming company that focuses on the welfare of
human society. We use the latest tools to predict the chances of a person having chronic kidney
disease. These tools enable the user to diagnose their kidneys at the comfort of their home,
providing they have necessary data. This process saves the user's time and energy. Click below for
Help.
    </p>
    <p><a class="btn btn-primary btn-lg" href="/help" role="button">Help &raquo;</a></p>
</div>
</div>

<div class="container">

<div class="row">
```

```

<div class="col-md-4">
  <h2>How does it Work?</h2>
  <p>JAMP makes use of machine learning models to predict chronic kidney disease with high accuracy.</p>
  <p><a class="btn btn-secondary" href="/login" role="button">Start Diagnose
  &raquo;</a></p>
</div>
</div>

<hr>

</div>

</main>

<footer class="container">
  <p>&copy; JAMP. All Rights Reserved</p>
</footer>

<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js" integrity="sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj"
crossorigin="anonymous"></script>

  <script>window.jQuery || document.write('<script
src="../assets/js/vendor/jquery.slim.min.js"></script>')</script><script
src="../assets/dist/js/bootstrap.bundle.js"></script>

</form>
</body>
</html>

```

Dashboard.html

```
<!DOCTYPE html>
```

```
<html lang="en">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title>JAMP | Get Started</title>
  <link rel = "icon" href="/static/img/jelly.png"
    type = "image/x-icon">
  <link                                     rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
  <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
  <script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"></script>
  <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
  <script src="https://use.fontawesome.com/releases/v5.0.8/js/all.js"></script>
  <link rel="stylesheet" type="text/css" href="static/css/aboutus.css">
  <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">

  <style>
    body {
      padding-top: 3.5rem;
    }

    nav {
      font-family: 'Poppins', sans-serif;
    }

    .navbar-brand {
      font-size: 20px;
      font-family: 'Poppins', sans-serif;
    }
```

</style>

</head>

<body>

<form id="form1">

<header>

<nav class="navbar navbar-expand-md navbar-dark fixed-top bg-dark">

JAMP

<button class="navbar-toggler" type="button" data-toggle="collapse" data-target="#navbarCollapse" aria-controls="navbarCollapse" aria-expanded="false" aria-label="Toggle navigation">

</button>

<div class="collapse navbar-collapse" id="navbarCollapse">

<ul class="navbar-nav ml-auto">

<li class="nav-item active">

Get Started

<li class="nav-item">

Start Diagnose

<li class="nav-item">

|

<li class="nav-item">

Logout

</div>

</nav>

<main role="main">

<div class="jumbotron">

<div class="container">

<h1 class="display-4">Hi there! Let's Get Started with JAMP</h1>

<p>Welcome to JAMP!, a software-based prediction system for users to know their chances of having chronic kidney disease. JAMP is an upcoming company that focuses on the welfare of human society. We use the latest tools to predict the chances of a person having chronic kidney disease.</p>

<p>Get Started »</p>

</div>

</div>

<div class="container">

<div class="row">

</div>

<div class="row">

<div class="col-md-4">

<h2>Start Diagnose</h2>

<p>Go to the "Start Diagnose" section and input the necessary details. Then click on predict to know the results.</p>

</div>

<hr>

```

</div>
</main>

<footer class="container">
  <p>&copy;JAMP. All Rights Reserved</p>
</footer>

<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js" integrity="sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj"
crossorigin="anonymous"></script>

  <script>window.jQuery || document.write('<script
src="../assets/js/vendor/jquery.slim.min.js"></script>')</script><script
src="../assets/dist/js/bootstrap.bundle.js"></script>

</form>
</body>
</html>

```

Disindex.html

```

<!DOCTYPE html>
<html>
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
  <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
  <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">
  <link rel="stylesheet" type="text/css" href="{ { url_for('static', filename='index.css') } }">
  <title>JAMP | Disease Index</title>
  <link rel = "icon" href="/static/img/jelly.png"
type = "image/x-icon">

```

```
</head>
```

```
<style>
```

```
    #main-footer
```

```
{
```

```
    color: #FFFFFFF;
```

```
    font-family: "Segoe UI";
```

```
    background: #2B2B2B;
```

```
    text-align: center;
```

```
    margin-top: 75px;
```

```
    padding: 16px;
```

```
    bottom: 8px;
```

```
}
```

```
.img_holder img{
```

```
    max-width: 100%; max-height: 100%;
```

```
}
```

```
.btn-file {
```

```
position: relative;
```

```
overflow: hidden;
```

```
}
```

```
.btn-file input[type=file] {
```

```
    position: absolute;
```

```
    top: 0;
```

```
    right: 0;
```

```
    min-width: 100%;
```

```
    min-height: 100%;
```

```
    font-size: 100px;
```

```
    text-align: right;
```

```
    filter: alpha(opacity=0);
```

```
    opacity: 0;
    outline: none;
    background: white;
    cursor: inherit;
    display: block;
}
.dot {
    position: absolute;
    margin-left: 1%;
    margin-top: 1%;
    height: 80px;
    width: 80px;
    opacity: 80%;
    background-color: #ff990a;
    border-radius: 50%;
    display: inline-block;
}
.dots {
    position: absolute;
    margin-left: 80px;
    margin-top: 80px;
    height: 40px;
    width: 40px;
    opacity: 80%;
    background-color: #ff0051;
    border-radius: 50%;
    display: inline-block;
}
.dotss {
    position: absolute;
```



```
margin-left: 120px;
margin-top: 120px;
height: 8px;
width: 8px;
opacity: 80%;
background-color: red;
border-radius: 50%;
display: inline-block;
}
```

```
</style>
```

```
<body>
```

```
<div class="dot">
```

```
</div>
```

```
<div class="dots"></div>
```

```
<div class="dotss"></div>
```

```
<header>
```

```
<nav class="navbar navbar-expand-md navbar-dark fixed-top bg-dark">
```

```
<a class="navbar-brand" href="dashboard"><b>JAMP</b></a>
```

```
<button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarCollapse" aria-controls="navbarCollapse" aria-expanded="false"
label="Toggle navigation">
```

```
<span class="navbar-toggler-icon"></span>
```

```
</button>
```

```
<div class="collapse navbar-collapse" id="navbarCollapse">
```

```
<ul class="navbar-nav ml-auto">
```

```
<li class="nav-item">
  <a class="nav-link active" href="/disindex">Disease Index</a>

<li class="nav-item">
  <a class="nav-link" href="/kidney">Kidney Disease</a>
</li>

<li class="nav-item">
  <a class="nav-link" href="#">|</a>
</li>

<li class="nav-item">
  <a class="nav-link" href="/logout">Logout</a>
</li>
</ul>
</div>
</nav>

</header>

<br/>
<br/>
<div class="container">
  <h1 style="text-align:center;">JAMP - Disease Index</h1>
  <p style="text-align:center;">This is a list of all the diseases related to diagnosis. This provides
in-depth details about the disease including its symptoms.</p>

<h2>Kidney Disease</h2>
<div style="text-align: center; margin-top: 20px">
  <br/>
</div>
<h3>Overview</h3>
```

<p>The kidneys are two reddish-brown bean-shaped organs found in vertebrates. They are located on the left and right in the retroperitoneal space. The kidney participates in the control of the volume of various body fluids, fluid osmolality, acid-base balance, various electrolyte concentrations, and removal of toxins. Filtration occurs in the glomerulus: one-fifth of the blood volume that enters the kidneys is filtered.

The nephron is the structural and functional unit of the kidney. Each adult human kidney contains around 1 million nephrons, while a mouse kidney contains only about 12,500 nephrons. The kidneys also carry out functions independent of the nephrons.

</p>

Lethargy

Weakness

Shortness of breath

Generalized swelling (edema)

Generalized weakness due to anemia

Loss of appetite

Lethargy

Fatigue

Congestive heart failure

Metabolic acidosis

High blood potassium (hyperkalemia)

Fatal heart rhythm disturbances (arrhythmias) including ventricular tachycardia and ventricular fibrillation

Rising urea levels in the blood (uremia) may lead to brain encephalopathy, pericarditis (inflammation of the heart lining), or low calcium blood levels (hypocalcemia)

<hr>

<h3>Causes</h3>

<div style="text-align: center; margin-top: 20px">

</div>

<p>The most common causes of CKD are high blood pressure and diabetes.

Each kidney contains about 1 million tiny filtering units, called nephrons. Any disease that injures or scars the nephrons can cause kidney disease. Diabetes and high blood pressure can both damage your nephrons.

High blood pressure can also damage the blood vessels of your kidneys, heart, and brain. The kidneys are highly vascularized, meaning they contain lots of blood vessels. So, blood vessel diseases are generally dangerous to your kidneys.

Autoimmune diseases such as lupus can damage blood vessels and can make antibodies against kidney tissue.

There are various other causes of CKD. For example, polycystic kidney disease is a hereditary cause of CKD. Glomerulonephritis can be due to lupus. It can also appear after a streptococcal infection.</p>

<hr>

<div style="text-align: center; margin-top: 20px">

</div>

<h3>Symptoms</h3>

<p>

CKD does not cause any symptoms until most of your kidney is destroyed. Once the kidney is severely damaged, the symptoms of CKD can include:

swelling around your eyes, called periorbital edema

swelling of your legs, called pedal edema

fatigue

shortness of breath

- nausea
- vomiting, especially in the morning and after eating
- a urine-like odor to your breath
- bone pain
- abnormally dark or light skin
- an ashen cast to your skin, called uremic frost
- drowsiness
- mental cloudiness
- numbness in your hands and feet
- restless leg syndrome
- brittle hair and nails
- itching
- weight loss
- a loss of muscle mass
- muscle twitching and cramps
- easy bruising and bleeding
- blood in your stools
- hiccups
- excessive thirst
- decreased interest in sex
- impotence
- insomnia
- sleep apnea

</p>

<hr>

<h3>How is chronic kidney disease diagnosed?</h3>

<p> Diagnosis of CKD starts with a medical history. A family history of kidney failure, high blood pressure, or diabetes may alert your doctor. However, other tests are necessary to confirm that you have CKD, such as:</p>

<div>

<h4>1. Blood Count</h4>

A complete blood count can show anemia. Your kidneys make erythropoietin, which is a hormone. This hormone stimulates your bone marrow to make red blood cells. When your kidneys are severely damaged, your ability to make erythropoietin decreases. This causes a decline in red blood cells, or anemia.

</div>

<div>

<h4>2. Electrolyte Level Test</h4><p>

CKD can affect your electrolyte levels. Potassium may be high and bicarbonate levels may be low if you have CKD. There may also be an increase of acid in the blood.

</p>

</div>

<div>

<h4>3. Blood Urea Nitrogen Test</h4>

<p>Blood urea nitrogen can become elevated when your kidneys start to fail. Normally, your kidneys clear the products of protein breakdown from your blood. After kidney damage, these byproducts build up. Urea is one byproduct of protein breakdown and is what gives urine its odor. Your doctor may check for buildup.

</p>

</div>

<div>

<h4>4. Creatinine test</h4><p>

As kidney function declines, your creatinine increases. This protein is also related to muscle mass.

</p>

</div>

<hr>

<div>

<div style="text-align: center; margin-top: 20px">

</div>

<h4>

5. Parathyroid hormone (PTH) test</h4>

<p>The kidney and the parathyroid glands interact through the regulation of calcium and phosphorus. A change in kidney function affects the release of PTH. This affects calcium levels throughout your body.

</p>

</div>

<p> When your kidney progresses to end-stage renal disease, it no longer excretes enough phosphorus and impairs vitamin D synthesis. Your bones may release calcium, too. This causes your bones to become weak over time.

<div>

</p>

<h4>6. Renal flow and scan</h4><p>

A renal scan is an imaging study of kidney function.

</p>

</div>

<div>

<h4>7. Renal ultrasound</h4><p>

This noninvasive test provides images to help your doctor determine whether there's an obstruction.

</p>

</div>

<div>

<h4>8. Other tests</h4>

Additional tests for CKD include:

a kidney biopsy

a bone density test

- an abdominal CT scan

- an abdominal MRI

</div>

<div style="text-align: center; margin-top: 20px">

</div>

<h4>Medical treatment</h4>

<p>You may need dialysis to purify your blood. In some cases, you may need a kidney transplant. You should also talk to your doctor about controlling your blood sugar and diabetes, if you have it.

</p>

<p>You may be more susceptible to infection if you have CKD or ESRD. Doctors recommend that you get the following vaccinations:

</p>

pneumococcal vaccine

hepatitis B vaccine

influenza vaccine

H1N1 (swine flu) vaccine

<h4>Prevention</h4>

<p>You can't always prevent CKD. However, controlling conditions like high blood pressure and diabetes can help. You should get regular screenings for CKD if you're at high risk. Getting an early diagnosis of CKD can help slow its progression.</p>

</div>

<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-KJ3o2DKtIkvYIK3UENzmM7KCkRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN" crossorigin="anonymous"></script>


```
<script      src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"
integrity="sha384-
ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/ScQsAP7hUibX39j7fakFPskvXusvfa0b4Q"
crossorigin="anonymous"></script>

<script      src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"
integrity="sha384-
JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5+76PVCmYl"
crossorigin="anonymous"></script>

</body>
</html>
```

Help.html

```
<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head>
  <title>JAMP | Help</title>
  <link rel = "icon" href="/static/img/jelly.png"
    type = "image/x-icon">
  <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />
  <link                                rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
    <script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"></script>
    <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <script src="https://use.fontawesome.com/releases/v5.0.8/js/all.js"></script>
  <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">
  <link href="static/css/help.css" rel="stylesheet" />
```

```
<style>
  body {
padding-top: 3rem;
padding-bottom: 3rem;
color: #5a5a5a;
font-family: 'Poppins', sans-serif;
overflow-x: hidden;
}

nav {
  font-family: 'Poppins', sans-serif;
}

.navbar-brand {
  font-size: 20px;
  font-family: 'Poppins', sans-serif;
}

@media (min-width: 768px) {
  html {
    font-size: 16px;
  }
}

.container {
  max-width: 960px;
}

.pricing-header {
  max-width: 700px;
```

```
}
```

```
.card-deck .card {  
  min-width: 220px;  
}
```

```
.themed-container {  
  padding: 15px;  
  margin-bottom: 30px;  
  background-color: rgb(217, 186, 244);  
  border: 1px solid rgba(99, 1, 255, 0.74);  
}
```

```
</style>
```

```
</head>
```

```
<body>
```

```
  <form id="form1">
```

```
    <header>
```

```
      <nav class="navbar navbar-expand-md navbar-dark fixed-top bg-dark">
```

```
        <a class="navbar-brand" href="#"><b>JAMP</b></a>
```

```
        <button class="navbar-toggler" type="button" data-toggle="collapse" data-  
target="#navbarCollapse" aria-controls="navbarCollapse" aria-expanded="false" aria-  
label="Toggle navigation">
```

```
          <span class="navbar-toggler-icon"></span>
```

```
        </button>
```

```
        <div class="collapse navbar-collapse" id="navbarCollapse">
```

```
          <ul class="navbar-nav ml-auto">
```

```
            <li class="nav-item">
```

```
              <a class="nav-link" href="/">Home</a>
```

```

    </li>

    <li class="nav-item">
        <a class="nav-link" href="/about">About Us</a>
    </li>

    <li class="nav-item active">
        <a class="nav-link" href="/help">Help</a>
    </li>

    <li class="nav-item">
        <a class="nav-link" href="/login">Login</a>
    </li>

    <li class="nav-item">
        <a class="nav-link" href="/signup">Sign Up</a>
    </li>

</ul>

</div>

</nav>

</header>

<div class="pricing-header px-3 py-3 pt-md-5 pb-md-4 mx-auto text-center">
    <h1 class="display-5">How do you use JAMP?</h1>
    <p class="lead">Please refer the below steps to use JAMP's tools. Click to <a href="/about">Learn More</a></p>
</div>

<div class="container themed-container">1. If you are a registered user, log-in to the system. Else, register using your mail ID.</div>

<div class="container themed-container">2. Select the type of disease for which you want to generate risks</div>

<div class="container themed-container">3. Input the patient's details.</div>

<div class="container themed-container">4. Click Submit button.</div>

<div class="container themed-container">5. Get the results based on inputted data(you can download your results as pdf).</div>

```

```
<div class="container themed-container">6. Decide on your next step based on predicted results.</div>
```

```
</form>
```

```
</body>
```

```
</html>
```

Index.html

```
<!DOCTYPE html>
```

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

```
<head>
```

```
    <meta charset="utf-8">
```

```
    <meta name="viewport" content="width=device-width, initial-scale=1">
```

```
    <title>JAMP</title>
```

```
    <link rel = "icon" href="/static/img/jelly.png"
```

```
        type = "image/x-icon">
```

```
    <link                                     rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
```

```
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
```

```
    <script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"></script>
```

```
    <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
```

```
    <script src="https://use.fontawesome.com/releases/v5.0.8/js/all.js"></script>
```

```
    <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">
```

```
<style>
```

```
.bd-placeholder-img {
```

```
    font-size: 1.125rem;
```

```
    text-align: middle;
```

```
    -webkit-user-select: none;
```

```
-moz-user-select: none;
-ms-user-select: none;
user-select: none;
}
```

```
@media (min-width: 768px) {
  .bd-placeholder-img-lg {
    font-size: 3.5rem;
  }
}
</style>
```

```
<link rel="stylesheet" type="text/css" href="{ { url_for('static', filename='index.css') }}">
```

```
</head>
```

```
<body>
```

```
<form id="form1">
```

```
<header>
```

```
<nav class="navbar navbar-expand-md navbar-dark fixed-top bg-dark">
```

```
<a class="navbar-brand" href="#"><b>JAMP</b></a>
```

```
<button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarCollapse" aria-controls="navbarCollapse" aria-expanded="false" aria-
label="Toggle navigation">
```

```
<span class="navbar-toggler-icon"></span>
```

```
</button>
```

```
<div class="collapse navbar-collapse" id="navbarCollapse">
```

```
<ul class="navbar-nav ml-auto">
```

```
<li class="nav-item active">
```

```
<a class="nav-link" href="/">Home</a>
```

```
</li>
<li class="nav-item">
  <a class="nav-link" href="/about">About Us</a>
</li>
<li class="nav-item">
  <a class="nav-link" href="/help">Help</a>
</li>
<li class="nav-item">
  <a class="nav-link" href="/login">Login</a>
</li>
<li class="nav-item">
  <a class="nav-link" href="/signup">Sign Up</a>
</li>
</ul>
</div>
</nav>
</header>
```

```
<div id="myCarousel" class="carousel slide" data-ride="carousel">
<ol class="carousel-indicators">
  <li data-target="#myCarousel" data-slide-to="0" class="active"></li>
  <li data-target="#myCarousel" data-slide-to="1"></li>
  <li data-target="#myCarousel" data-slide-to="2"></li>
</ol>
<div class="carousel-inner">
  <div class="carousel-item active">
    <svg class="bd-placeholder-img" width="100%" height="100%"
xmlns="http://www.w3.org/2000/svg" preserveAspectRatio="xMidYMid slice"
focusable="false" role="img"><rect width="100%" height="100%" fill="#777"/></svg>
```

```

    
<div class="container">
    <div class="carousel-caption text-left">
        <h1><b>Easy to Use.</b></h1>
        <p>A relatively simple tool for chronic kidney disease diagnosis. Click on the Help Button
for additional support.</p>
        <p><a class="btn btn-lg btn-primary" href="/help" role="button">Help</a></p>
    </div>
</div>
<div class="carousel-item">
    <svg          class="bd-placeholder-img"          width="100%"          height="100%"
xmlns="http://www.w3.org/2000/svg"          preserveAspectRatio="xMidYMid slice"
focusable="false" role="img"><rect width="100%" height="100%" fill="#777"/></svg>
    
    <div class="container">
        <div class="carousel-caption">
            <h1><b>Efficient and Reliable.</b></h1>
            <p>A time efficient and a reliable tool to predict your chances of chronic kidney disease.
Learn more about JAMP .</p>
            <p><a class="btn btn-lg btn-primary" href="/about" role="button">Learn More</a></p>
        </div>
    </div>
</div>
<div class="carousel-item">
    <svg          class="bd-placeholder-img"          width="100%"          height="100%"
xmlns="http://www.w3.org/2000/svg"          preserveAspectRatio="xMidYMid slice"
focusable="false" role="img"><rect width="100%" height="100%" fill="#777"/></svg>
    
    <div class="container">
        <div class="carousel-caption text-right">
            <h1><b>Simple and Non-Complex.</b></h1>

```


<p>The process is simplified using a clean and smooth User Interface with less complexities.</p>

<p>About Us</p>

</div>

</div>

</div>

</div>

Previous

Next

</div>

<div class="container-fluid">

<div class="row jumbotron">

<div class="col-xs-12 col-sm-12 col-md-9 col-lg-9 col-xl-10">

<p class="lead">Welcome to our website JAMP! Here you can diagnose your kidney for chronic kidney disease.

Stuck somewhere? Check out the Help or About us pages.

</p>

</div>

<div class="col-xs-12 col-sm-12 col-md-3 col-lg-3 col-xl-2">

<button type="button" class="btn btn-outline-secondary btn-lg">About Us</button>

</div>

</div>

</div>

<!--Build with Ease and Logos section-->

<div class="container-fluid padding">

<div class="row welcome text-center">

<div class="col-12">

<h1 class="display-4">Diagnose with JAMP.</h1>

</div>

<hr />

<div class="col-12">

<p class="lead">

A software-based tool that diagnoses for chronic kidney disease using modern technology.

</p>

</div>

</div>

</div>

<div class="container-fluid">

<div class="row text-center padding">

<div class="col-xs-12 col-sm-6 col-md-4">

<i class="fa fa-bolt" aria-hidden="true"></i>

<h3>Quick</h3>

<p>Fast and Smooth</p>

</div>

<div class="col-xs-12 col-sm-6 col-md-4">

<i class="fa fa-lock" aria-hidden="true"></i>

<h3>Reliable</h3>

<p>JAMP is trustworthy</p>

</div>

<div class="col-sm-12 col-md-4">

<i class="fa fa-check-square" aria-hidden="true"></i>

<h3>Highly Secure</h3>

```
        <p>Safety is of great importance</p>
    </div>
</div>
<hr class="my-4"/>
</div>
</form>
</body>
</html>
```

Kidney.html

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
    <link                                     rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
    <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">
    <link rel="stylesheet" type="text/css" href="{ { url_for('static', filename='index.css') } }">
    <title>JAMP | Chronic Kidney Disease Prediction</title>
    <link rel = "icon" href="/static/img/jelly.png"
        type = "image/x-icon">
</head>
<style>

        button
    {
        border-style:none;
    }
```

```
h1, h2, h3, h4, h5{
    text-align: center;

}
```

```
form {
    margin-top: 3%;
    margin-left: 25%;
    margin-right: 21%;
    padding: 30px;
    border-width: 20px;

}
```

```
form fieldset{
    padding: 30px;
    border-width: 40px;
    background: linear-gradient(135deg, rgba(255, 255, 255, 0.1), rgba(255, 255, 255, 0));
    backdrop-filter: blur(10px);
    -webkit-backdrop-filter: blur(10px);
    border-radius: 20px;
    border:1px solid rgba(255, 255, 255, 0.18);
    box-shadow: 0 8px 32px 0 rgba(0, 0, 0, 0.37);
    color: #077ca3;

}
```

```
fieldset h1 {
    color: #5a5a5a;
```

```
padding-bottom: 20px;
margin-left: 35px;
display: inline-block;
cursor: pointer;
font-size: 28px;
text-align: center;
}
```

```
fieldset label {
margin-left: 20px;
margin-right: 40px;
padding: 23px;
font-size: 20px;
display: inline-block;
width : 240px;
}
```

```
fieldset input{
padding:8px;
color: #938c8c
}
```

```
fieldset input:focus{
color: #000;
}
```

```
fieldset button
{
margin-left: 80px;
color: #fff;
background-color: #5a5a5a;
border-radius: 3px;
padding: 13px 39px;
```

```
text-align: center;
letter-spacing: 0.9px;
text-decoration: none;
/* margin-right: 15px; */
line-height: 26px;
font-size: 16px;
box-shadow: 0px 1px 3px 0px #5a5a5a;
right: 0px;
margin-top: 15px;
}
```

```
.submit{
margin-left: 60px;
color: #fff;
background-color: #5a5a5a;
border-radius: 3px;
padding: 13px 39px;
text-align: center;
letter-spacing: 0.9px;
text-decoration: none;
margin-right: 10px;
line-height: 26px;
font-size: 16px;
box-shadow: 0px 1px 3px 0px #5a5a5a;
right: 100px;
margin-top: 15px;
}
```

```
#link_to_edit{
    padding-left: 45px;
}
```

```
.fieldset{
    margin-top: 3%;
    margin-left: 0%;
    margin-right: 0%;
    padding: 30px;
    border-width: 25px;
    border-style: ridge;
    border-color: #257a7a;
    box-shadow: 6px 13px 13px 0px black;
    background-color: #ebfffa;
}
```

```
</style>
```

```
<header>
```

```
<nav class="navbar navbar-expand-md navbar-dark fixed-top bg-dark">
```

```
<a class="navbar-brand" href="dashboard"><b>JAMP</b></a>
```

```
<button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarCollapse" aria-controls="navbarCollapse" aria-expanded="false"
label="Toggle navigation">
```

```
<span class="navbar-toggler-icon"></span>
```

```
</button>
```

```
<div class="collapse navbar-collapse" id="navbarCollapse">
```

```
<ul class="navbar-nav ml-auto">
```

```
<li class="nav-item">
```

```
<a class="nav-link" href="/disindex">Index</a>
```

```

        <li class="nav-item">
            <a class="nav-link active" href="/kidney">Kidney Disease</a>
        </li>

        <li class="nav-item">
            <a class="nav-link" href="#">|</a>
        </li>

        <li class="nav-item">
            <a class="nav-link" href="/logout">Logout</a>
        </li>

    </ul>
</div>
</nav>
</header><br/><br/>
<h1 style="text-align:center;
font-family: 'Poppins', sans-serif;">Chronic Kidney Disease Prediction</h1>
<h5 style="text-align:center;
font-family: 'Poppins', sans-serif;">Please enter the required details</h5>

<form action="{ { url_for('predictkidney') } }" method="post" class="form-inline">
    <fieldset>
        <div class="tabcontent" id="new">
            <div class="form-group">
                <label for="bp">Blood Pressure</label>
                <input class="form-control" type="number" id="bp" name="Year"
required="required" placeholder="95 – 135 mm Hg">
            </div>

            <div class="form-group">

```



```
    <label for="sg">Specific Gravity</label>
    <input class="form-control" type="number" step="any" id="sg" name="sg"
required="required" placeholder="1.005 to 1.030 Nsg">
  </div>
```

```
<div class="form-group">
  <label for="al">Albumin</label>
  <input class="form-control" type="number" id="al" name="al" required="required"
placeholder="3.4 to 5.4 g/dL">
</div>
```

```
<div class="form-group">
  <label for="su">Blood Sugar Level</label>
  <input class="form-control" type="number" id="su" name="su" required="required"
placeholder="100 to 125 mg/dL">
</div>
```

```
<div class="form-group">
  <label for="rbc">Red Blood Cells Count</label>
  <input class="form-control" type="number" id="rbc" name="rbc"
required="required" placeholder="4.7 to 6.1 cells/mcL">
</div>
```

```
<div class="form-group">
  <label for="pc">Pus Cell Count</label>
  <input class="form-control" type="number" id="pc" name="pc" required="required"
placeholder="0-5/hpf">
</div>
```

```
<div class="form-group">
  <label for="pcc">Pus Cell Clumps</label>
```



```

    <link                                                    rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css">
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
    <script
src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"></script>
    <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <script src="https://use.fontawesome.com/releases/v5.0.8/js/all.js"></script>
    <link rel="canonical" href="https://getbootstrap.com/docs/4.5/examples/carousel/">
    <script
src="https://cdnjs.cloudflare.com/ajax/libs/html2pdf.js/0.9.2/html2pdf.bundle.js"></script>
    <script type="text/javascript" language="JavaScript">
window.onload = function () {
document.getElementById("download")
    .addEventListener("click", () => {
        const invoice = this.document.getElementById("assess");
        console.log(invoice);
        console.log(window);
        var opt = {
            margin: 1,
            filename: 'Kidney_Assessment.pdf',
            image: { type: 'jpeg', quality: 0.98 },
            html2canvas: { scale: 2 },
            jsPDF: { unit: 'in', format: 'letter', orientation: 'landscape' }
        };
        html2pdf().from(invoice).set(opt).save();
    })
}</script>
<style>
    body {
padding-top: 3rem;

```

```
padding-bottom: 3rem;
color: #5a5a5a;
font-family: 'Poppins', sans-serif;
overflow-x: hidden;
}
```

```
nav {
  font-family: sans-serif;
}
```

```
.navbar-brand {
  font-size: 20px;
  font-family: Georgia, 'Times New Roman', Times, serif;
}
```

```
@media (min-width: 768px) {
  html {
    font-size: 16px;
  }
}
```

```
.container {
  max-width: 960px;
}
```

```
.pricing-header {
  max-width: 700px;
}
```

```
.card-deck .card {
```

```

min-width: 220px;
}

.themed-container {
  padding: 15px;
  margin-bottom: 30px;
  background-color: rgba(0, 123, 255, .15);
  border: 1px solid rgba(0, 123, 255, .2);
}

</style>
</head>
<body>
<div id="assess">
<div class="pricing-header px-3 py-3 pt-md-5 pb-md-4 mx-auto text-center">
  <h1 class="display-5">Predicted Chance</h1>
  <p class="lead">Please find the chance of having Chronic Kidney Disease below.</p>
</div>
<div
      class="container
      themed-container"><h1
      style="text-align:
center;">{{prediction_text}}</h1></div>
  <p style="text-align: center;">Click <a href="/disindex">here</a> to learn more about Kidney
Disease</p>
  <p style="text-align: center;">&copy;ckdpredict.com</p>
</div>
<br/>

```

[illegible]


```

    {{ form.hidden_tag() }}
    {{ wtf.form_field(form.username) }}
    {{ wtf.form_field(form.password) }}
    {{ wtf.form_field(form.remember) }}
    <br/>
    <button class="btn btn-lg btn-primary btn-block" type="submit">Login</button><br/>
    <p style="text-align:center">Don't have an account? <a href="/signup" style="color:
red;">Sign Up</a></p>
    <br/>
    <p style="text-align:center"><a href="/">Back Home</a></p>
</form>

</div>
{% endblock %}

```

Signin.html

```

{% extends "bootstrap/base.html" %}
{% import "bootstrap/wtf.html" as wtf %}

{% block title %}
JAMP | Sign Up
{% endblock %}

{% block styles %}
{{ super() }}

```

```
<link rel="stylesheet" href="{{url_for('.static', filename='login.css')}}">
```

```
<link rel = "icon" href="/static/img/jelly.png"
      type = "image/x-icon">
```

```
{% endblock %}
```

```
{% block content %}
```

```
<div class="background-image"></div>
```

```
<div class="container">
```

```
<form class="form-signin" method="POST" action="/signup">
```

```
<h1 style="text-align:center; font-size:30px">JAMP</h1>
```

```
<p style="text-align:center">Create Account</p>
```

```
{{ form.hidden_tag() }}
```

```
{{ wtf.form_field(form.username) }}
```

```
{{ wtf.form_field(form.email) }}
```

```
{{ wtf.form_field(form.password) }}
```

```
<br/>
```

```
<button class="btn btn-lg btn-primary btn-block" type="submit">Sign Up</button><br/>
```

```
<p style="text-align:center" >Already have an account? <a href="/login"
style="color:red">Login</a></p>
```

```
<p style="text-align:center"><a href="/">Back Home</a></p>
```

```
</form>
```

```
</div>
```


{% endblock %}

8. TESTING

8.1 Test Cases:

<https://docs.google.com/spreadsheets/d/1JGtT2VOQ8hvjeGleMXXN19iCiNnSTHCe/edit?usp=drivesdk&ouid=101803651614934320104&rtpof=true&sd=true>

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 [Product Name] 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	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	3	1	1	1	6
Duplicate	4	0	2	0	6
External	2	2	0	1	5
Fixed	1	1	1	1	4
Not Reproduced	0	0	0	0	0
Skipped	0	0	0	1	0
Won't Fix	0	0	0	1	0
Totals	10	4	4	3	21

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	1	0	0	1
User Input	3	0	0	3
Security	2	0	0	2

CKD Testing	2	0	0	2
No CKD Testing	2	0	0	2
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

9.1 Performance Metrics:

Project Development Phase Model Performance Test

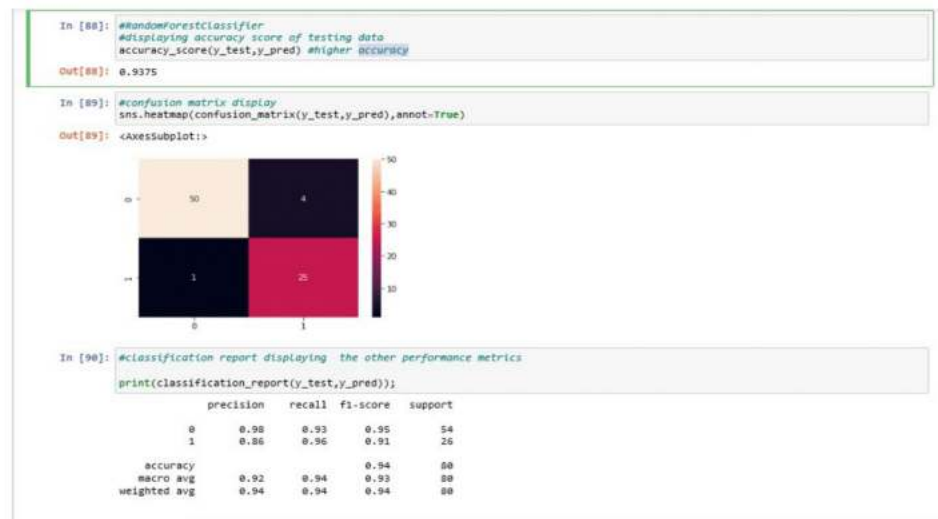
Date	17 November 2022
Team ID	PNT2022TMID49652
Project Name	Project – Early Detection of Chronic Kidney Disease using Machine Learning
Maximum Marks	10 Marks

Model Performance Testing:

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

S.No.	Parameter	Values	Screenshot
1	Metrics	Regression Model: MAE-, MSE-, RMSE-, R2 score- Classification Model: Confusion Matrix - Accuracy Score- & Classification Report-	See Below
2	Tune the Model	Hyper parameter Tuning-Validation Method-	See Below

RANDOM FOREST CLASSIFICATION:



```
In [147]: #Regression model
```

```
In [138]: import numpy as np
import sklearn.metrics as metrics
import matplotlib.pyplot as plt

Y = np.array([y_test])
Yhat = np.array([y_pred])
X = list(range(len(Y)))
```

```
In [142]: d = Y-Yhat
mse_f = np.mean(d**2)
mae_f = np.mean(abs(d))
rmse_f = np.sqrt(mse_f)
r2_f = 1-(sum(d**2)/sum((Y-np.mean(Y))**2))

print("Results by manual calculations")
print("MAE:", mae_f)
print("RMSE:", rmse_f)
print("R-Squared:", r2_f)
```

```
Results by manual calculations
MAE: 0.451875
MSE: 0.451875
RMSE: 0.6722164829874376
R-Squared: [[ 1.          1.          1.          ...   1.         -0.46745562]
 [ 1.          1.          1.          ...   1.         -0.46745562]
 [ 1.          1.          1.          ...   1.         -0.46745562]
 [ 1.          1.          1.          ...   1.         -0.46745562]
 [-1.19478738 -1.19478738 -1.19478738 ... -1.19478738  1.]
 [ 1.          1.          1.          ...   1.         -0.46745562]]
```

```
In [ ]: #Running using cross validation

In [201]: from sklearn.model_selection import train_test_split
# split the data with 50% in each set
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=2)

In [205]: model.fit(x_train, y_train)
y_model = model.predict(x_test)

In [206]: accuracy_score(y_test, y_model)

Out[206]: 0.75

In [146]: tuned_parameters = [{'n_estimators':[7,8,9,10,11,12,13,14,15,16], 'max_depth':[2,3,4,5,6,None],
                                'class_weight':[None,(0: 0.33,1:0.67)], 'balanced': ['balanced'], 'random_state':[42]]}
clf = GridSearchCV(RandomForestClassifier(), tuned_parameters, cv=10, scoring='f1')
clf.fit(x_train, y_train)

Out[146]: GridSearchCV(cv=10, estimator=RandomForestClassifier(),
                        param_grid=[{'class_weight': [None, (0: 0.33, 1: 0.67),
                        'balanced'],
                        'max_depth': [2, 3, 4, 5, 6, None],
                        'n_estimators': [7, 8, 9, 10, 11, 12, 13, 14, 15, 16],
                        'random_state': [42]]},
                        scoring='f1')

In [149]: print("Detailed classification report:")
y_true, lr_pred = y_test, clf.predict(x_test)
print(classification_report(y_true, lr_pred))

confusion = confusion_matrix(y_test, lr_pred)
print('Confusion Matrix:')
print(confusion)

Detailed classification report:
          precision    recall  f1-score   support

      0         1.00        0.91        0.95         54
      1         0.84        1.00        0.91         26

   accuracy                           0.94         80
  macro avg                          0.93         80
 weighted avg                          0.94         80

Confusion Matrix:
[[49  5]
 [ 0 26]]
```

LOGISTIC REGRESSION:

```
In [95]: LogisticRegression()
Out[95]: LogisticRegression()

In [96]: y_pred=model1.predict(x_test)

In [97]: y_pred1

Out[97]: array([[0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1,
                0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0,
                0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0,
                0, 1, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1, 0]])

In [98]: #Model Evaluation

In [99]: accuracy_score(y_test,y_pred1)
Out[99]: 0.9125

In [100]: sns.heatmap(confusion_matrix(y_test,y_pred1),annot=True)
Out[100]: <AxesSubplot>
```



```
In [101]: print(classification_report(y_test,y_pred1))

              precision    recall  f1-score   support

    0         1.00        0.87    0.93         54
    1         0.79        1.00    0.88         26

 accuracy         0.89
 macro avg         0.89    0.94    0.91         80
 weighted avg         0.93    0.91    0.91         80
```

REGRESSION MODEL FOR LOGISTIC REGRESSION:

```
In [247]: import numpy as np
import sklearn.metrics as metrics
import matplotlib.pyplot as plt

Y = np.array([y_test])
Yhat = np.array([y_pred1])
X = list(range(len(Y)))


In [248]: d = Y-Yhat
mse_f = np.mean(d**2)
mae_f = np.mean(abs(d))
rmse_f = np.sqrt(mse_f)
r2_f = 1-(sum(d**2)/sum((Y-np.mean(Y))**2))

print("Results by manual calculations")
print("MAE:",mae_f)
print("MSE:",mse_f)
print("RMSE:",rmse_f)
print("R-Squared:",r2_f)

Results by manual calculations
MAE: 0.469375
MSE: 0.469375
RMSE 0.6851094803022361
R-Squared: [[ 1.         1.         1.         ... -8.46745562 -8.46745562
 1.         ]
 [ 1.         1.         1.         ... -8.46745562 -8.46745562
 1.         ]
 [ 1.         1.         1.         ... -8.46745562 -8.46745562
 1.         ]
 ...
 [ 1.         1.         1.         ... -8.46745562 -8.46745562
 1.         ]
 [-1.19478738 -1.19478738 -1.19478738 ... 1.         1.
 -1.19478738 ]
 [ 1.         1.         1.         ... -8.46745562 -8.46745562
 1.         ]]
```

GAUSSIAN NB:

```
model2.fit(X_train,y_train)
Out[102]: GaussianNB()
In [103]: GaussianNB()
Out[103]: GaussianNB()
In [104]: y_pred3=model2.predict(x_test)
y_pred3
Out[104]: array([0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1,
        0, 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0,
        0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 0, 0,
        1, 1, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0])
In [105]: accuracy_score(y_test,y_pred3)
Out[105]: 0.875
In [106]: sns.heatmap(confusion_matrix(y_test,y_pred3),annot=True)
Out[106]: <AxesSubplot:~>
```



```
In [107]: print(classification_report(y_test,y_pred3))
              precision    recall  f1-score   support

     0       1.00        0.81        0.90         54
     1       0.72        1.00        0.84         26

 accuracy          0.86        0.91        0.88         80
 macro avg          0.86        0.91        0.87         80
 weighted avg          0.91        0.88        0.88         80
```

REGRESSION MODEL FOR GAUSSIAN NB:

```
In [255]: import numpy as np
import sklearn.metrics as metrics
import matplotlib.pyplot as plt

Y = np.array([y_test])
yhat = np.array([y_pred3])
X = list(range(len(Y)))

In [256]: d = Y-yhat
mse_f = np.mean(d**2)
mae_f = np.mean(abs(d))
rmse_f = np.sqrt(mse_f)
r2_f = 1-(sum(d**2)/sum((Y-np.mean(Y))**2))

print("Results by manual calculations")
print("MAE:",mae_f)
print("MSE:",mse_f)
print("RMSE:",rmse_f)
print("R-Squared:",r2_f)

Results by manual calculations
MAE: 0.4825
MSE: 0.4825
RMSE 0.6946221994724903
R-Squared: [[ 1.          1.          1.          ... -8.46745562 -8.46745562
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
 ...
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
 [-1.19478738 -1.19478738 -1.19478738 ... 1.          1.
 [-1.19478738 -1.19478738 -1.19478738 ... 1.          1.
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
 [ 1.          1.          1.          ... -8.46745562 -8.46745562
```

SUPPORT VECTOR MACHINE:

```
In [108]: #fit model based on Support vector machine
```

```
from sklearn.svm import SVC  
model3=SVC()  
model3.fit(x_train,y_train)
```

```
Out[108]: SVC()
```

```
In [109]: y_pred4=model3.predict(x_test)  
y_pred4
```


```
Out[109]: array([0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0,  
       1, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0,  
       0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0,  
       0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0])
```

```
In [207]: accuracy_score(y_test,y_pred4) #least accuracy
```

```
Out[207]: 0.6875
```

```
In [111]: sns.heatmap(confusion_matrix(y_test,y_pred4),annot=True)
```

```
Out[111]: <AxesSubplot>
```



	0	1
0	80	12
1	10	15

```
In [112]: print(classification_report(y_test,y_pred4))
```

	precision	recall	f1-score	support
0	0.78	0.74	0.76	54
1	0.52	0.58	0.55	26
accuracy			0.69	80
macro avg	0.65	0.66	0.65	80
weighted avg	0.70	0.69	0.69	80

REGRESSION MODEL FOR SVM:

```
In [262]: import numpy as np
import sklearn.metrics as metrics
import matplotlib.pyplot as plt

V = np.array([[y_test]])
vhat = np.array([y_preds])
X = list(range(len(V)))

In [263]: d = V.vhat
mse_f = np.mean(d**2)
mse_v = np.mean(vbs(d))
rmse_f = np.sqrt(mse_f)
r2_f = 1 - (sum(d**2)/sum((y-np.mean(y))**2))

print("Results by manual calculations")
print("MAE: ", mse_f)
print("RMSE: ", rmse_f)
print("RMSE: ", rmse_v)
print("R-Squared: ", r2_f)

Results by manual calculations
MAE: 0.451875
RMSE: 0.451075
RMSE: 0.6722164829874376
R-Squared: [[ 1. 1. 1. ... -0.46745562 -0.46745562]
 [ 1. 1. 1. ... -0.46745562 -0.46745562]
 [ 1. 1. 1. ... -0.46745562 -0.46745562]
 [ 1. 1. 1. ... -0.46745562 -0.46745562]
 [-1.19476738 -1.19476738 -1.19476738 ... 1. 1.]
 [-1.19476738 1. 1. ... -0.46745562 -0.46745562]
 [ 1. 1. 1. ... -0.46745562 -0.46745562]]
```

DECISION TREE CLASSIFIER:

```
In [113]: #5th model is based on Decision tree
from sklearn.tree import DecisionTreeClassifier
model4=DecisionTreeClassifier(criterion='entropy')
model4.fit(x_train,y_train)

Out[113]: DecisionTreeClassifier(criterion='entropy')

In [114]: y_pred5=model4.predict(x_test)
y_pred5

Out[114]: array[[0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 1,
0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0,
0, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0,
0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0]]

In [115]: accuracy_score(y_test,y_pred5) #has same high accuracy as Random Forest

Out[115]: 0.9275

In [116]: sns.heatmap(confusion_matrix(y_test,y_pred5),annot=True)

Out[116]: <AxesSubplot:~>
```

```

0      1
0  50      4
1      5     21

```

```
In [117]: print(classification_report(y_test,y_pred5))
```

	precision	recall	f1-score	support
0	0.91	0.93	0.92	54
1	0.84	0.81	0.82	26
accuracy			0.89	80
macro avg	0.87	0.87	0.87	80
weighted avg	0.89	0.89	0.89	80

REGRESSION MODEL FOR DECISION TREE:

```
import matplotlib.pyplot as plt

Y = np.array([[y_test]])
yhat = np.array([y_preds])
X = list(range(len(Y)))

In [270]: d = Y-yhat
mse_f = np.mean(d**2)
mae_f = np.mean(abs(d))
rmse_f = np.sqrt(mse_f)
r2_f = 1-(sum(d**2)/sum((Y-np.mean(Y))**2))

print("Results by manual calculations")
print("MAE:",mae_f)
print("MSE:",mse_f)
print("RMSE:",rmse_f)
print("R-Squared:",r2_f)

Results by manual calculations
MAE: 0.43875
MSE: 0.43875
RMSE 0.6623820649745885
R-Squared: [[ 1.          1.          1.          ...  1.          -0.46745562
 [ 1.          1.          1.          ...  1.          -0.46745562
 [ 1.          1.          1.          ...  1.          -0.46745562
 [ 1.          1.          1.          ...  1.          -0.46745562
 ...
 [ 1.          1.          1.          ...  1.          -0.46745562
 [ 1.          1.          1.          ...  1.          -0.46745562
 [-1.19478738 -1.19478738 -1.19478738 ... -1.19478738  1.
 [-1.19478738 -1.19478738 -1.19478738 ... -1.19478738  1.
 [ 1.          1.          1.          ...  1.          -0.46745562
 [ 1.          1.          1.          ...  1.          -0.46745562]
```

10. ADVANTAGES & DISADVANTAGES

This software has various advantages where it can be used as an expert guide to doctors for early detection of chronic kidney disease. It is also seen in performance metrics that it has an accuracy of 95% which gives good confidence to the users.

Machine Learning is autonomous but highly susceptible to errors. Suppose you train an algorithm with data sets small enough to not be inclusive. You end up with biased predictions coming from a biased training set.

11. CONCLUSION

This Project has helped team members to understand various concepts of Machine learning, Flask file, IBM cloud and Python notebook.

This project can be scaled for usage in prediction of other chronic diseases which will help doctors in diagnosis of disease at an early stage thereby helping in early detection of various disease.

12. FUTURE SCOPE

This software can be used to detect various other chronic diseases by modifying the dataset and the user inputs received. The model can be further trained with enormous amount of data to improve the accuracy.

13. APPENDIX

GitHub link

<https://github.com/IBM-EPBL/IBM-Project-42367-1660660597>

Modelling link

[http://localhost:8889/nbconvert/notebook/Downloads/CKD%20\(1\)%20\(1\).ipy_nb?download=true](http://localhost:8889/nbconvert/notebook/Downloads/CKD%20(1)%20(1).ipy_nb?download=true)

Project Demo Link

<https://youtu.be/PqfHjUJC8>

